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 PDR WASTE  
 MM-10

**ENGINEERING ORDER**  
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 Richland, WA 99352

EO TYPE: Release-Initial  
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 RESPON. ENG.: R. W. Cross 376-7776

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 PROGRAM PHASE: ~~XXXXXX~~  
 WBS #: L339

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 DISPOSITION: Supporting Document  
 BWIP Data Package  
 "Deep Borehole Stratigraphic  
 Correlation Charts and Structure  
 Cross Sections"

ORG. CODE: 10110  
 PHONE: 6-7776  
 DATE: ~~XXXXXX~~

DESIGN SUPPLY: Mgt-Site  
 G. S. Hunt  
 1/15/82

CHECK: XXX May Group  
 T. A. Curran  
 1/15/82

SAFETY Mgt. Unit  
 S. M. Price  
 1/15/82

PRODUCT RESPON. ENG.: R. W. Cross  
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PRODUCT TECH. BASELINE: R. E. Johnson  
 1/15/82

PRODUCT TECH. SYSTEMS: R. T. Wilde  
 1/15/82

QUALITY ASSURANCE: W. F. Todish  
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LEVEL: CONF. P. J. Reder  
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<b>SUPPORTING DOCUMENT</b>	Number: <b>RSD-BWI-DP-035</b>
PROGRAM: <b>Basalt Waste Isolation Project</b>	Work Package No. <b>L339</b> Work Order No. _____ Original Release Date _____
<input checked="" type="checkbox"/> CONTROL <input type="checkbox"/> PROJECT Function Name: _____	Prepared by: <b>R. W. Cross</b> Date: <b>1-15-82</b> Phone: <b>6-7776</b> Room: _____      Bldg.: <b>Tannadore</b> Area: <b>700</b>
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Approvals

*[Signature]* ~~XXXXXXXXXX~~ **BWIP Director**

*[Signature]* ~~XXXXXXXXXX~~ **Responsible Manager**

*[Signature]* ~~XXXXXXXXXX~~ **End Function Manager**

~~XXXXXXXXXX~~ \_\_\_\_\_

*[Signature]* **Systems Dept., Manager**      *1/15/82*

Approvals

\_\_\_\_\_  
Program Business Management

\_\_\_\_\_  
Health, Safety and Environment

*[Signature]* **Quality Assurance**      *1/15/82*

\_\_\_\_\_  
Training

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Abstract

This data package contains information on stratigraphic correlations and generalized structure via cross sections for the upper Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt.

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**INFORMATION  
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DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS  
AND STRUCTURE CROSS SECTIONS**DATA SOURCES

Documents: RHO-BWI-ST-4 and RHO-BWI-ST-14; core photographs labeled by borehole and footage in Basalt Waste Isolation Project (BWIP) Library.

DATA DEVELOPMENT

The attached drawings were developed from documented stratigraphic correlations presented in RHO-BWI-ST-4 and RHO-BWI-ST-14. These correlations were compared to core photographs from which additional detail was generated. This additional detail was added to the referenced data and new, more comprehensive drawings prepared.

DATA LIMITATIONS

Stratigraphic correlations are based on major and trace element chemistry, paleomagnetic analysis, and borehole geophysical logs. Stratigraphic correlations from borehole to borehole are typically more definitive in the Saddle Mountains and Wanapum Formations than in the Grande Ronde Formation. Named flows or units are equivalent from one borehole to another. Unnamed flows, particularly in Grande Ronde and Frenchman Springs, are also correlatable but no attempt is made to show such correlations here (see data package RSD-BWI-DP-008 for detailed flow correlations among boreholes DC-4, DC-3, DC-2 and DC-7/8). Stratigraphic interpretations for all formations shown are subject to revision, pending results from future boreholes and future geologic studies.

SYSTEMS DEPARTMENT CONTACT

Systems Department  
Basalt Waste Isolation Project  
Rockwell Hanford Operations  
P. O. Box 800  
Richland, WA 99352  
Telephone: (FTS) 444-1660  
(509) 376-1660

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## DEFINITIONS OF LITHOLOGIC TERMS

contact: surface between two different lava flows or between a flow and a sedimentary bed

cooling joints: naturally occurring fractures which occur in lava flows; they form during cooling due to thermal contraction

dense basalt: denotes that portion of any basalt flow where vesiculation and/or brecciation are essentially absent (see vesicular basalt)

disking: the occurrence in drill core of regularly spaced flat to slightly saddle-shaped fractures which are approximately perpendicular to the core axis; in basalt core from the Hanford Site, these fractures are fresh breaks which occur during or shortly after the drilling process

flow bottom breccia: brecciated, commonly glassy and/or slightly altered basalt which occurs at or near the base of a flow; analogous to flow top breccia (see flow top breccia)

flow rubble: relatively friable, broken rock occurring in the upper, commonly vesicular, part of a lava flow; estimated to make up less than 15 percent of the part of the core designated as "flow top or flow rubble"

flow top: a general term referring to the upper, vesicular part of a lava flow; commonly consists of dark, scoriaceous glassy basalt but in some places, may be oxidized to a reddish color; may be blocky, slabby and/or exhibit ropy structures; cf flow rubble, flow top breccia and flow bottom breccia

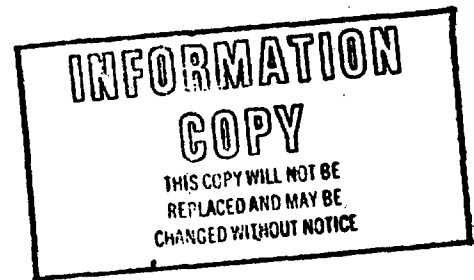
flow top breccia: brecciated, commonly glassy and/or slightly altered basalt which occurs at or near the top of a flow; in Grande Ronde flows, a breccia clasts are commonly a few to several centimeters in diameter, but may range from a millimeter to more than a meter in size; clasts are subrounded to angular; matrix between fragments may be filled or partially filled, with secondary minerals, commonly silica, or palagonite or basalt which apparently crystallized in situ; in this data package, flow top breccia, as defined here, was consistently distinguished from flow top or flow rubble, although it should be recognized that gradations between the two types of flow top material do occur.

interbed: sedimentary bed or beds occurring between two lava flows (see description of units, sheet 7 of 9)

tectonic fracture: fracture(s) or breccia zone occurring in core which are interpreted to be of tectonic origin

undifferentiated suprabasalt sediments: (see description of units, sheet 7 of 9)

vesicular zone: any portion of a basalt flow which contains appreciable vesicles; the vesicles may or may not be filled with secondary minerals; for the purpose of this data package, "appreciable" was arbitrarily defined as less than five volume percent by visual estimate



## DEEP BOREHOLE DATA TABLES

Ground surface elevation = 400'

All numbers within table are drilled depths or thicknesses in feet.

Page 1 of 4

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Ice Harbor	start of core 218	66							
	Levey Interbed	284	15							
	Upper Elephant Mountain	299	55			299-306	306-311			
	Lower Elephant Mountain	354	103	354-361		371-388				
	Rattlesnake Ridge Interbed	457	30.5							
	Pomona	487.5	183.5			487.5-496 670-671	496-513			
	Selah Interbed	671	2							
	Esquatzel	673	95.5	673-702(b) 705-712(b)		712-715				
	Cold Creek Interbed	768.5	76.5							
	Umatilla	845	273	845-870(b)		870-875	875-888 931-945	884-917		
Mabton Interbed										
Manapum Basalt	Priest Rapids (Lolo flow)	1158	134	1158-1163(b) 1165-1166(b)		1166-1171				
	Quincy Interbed	1292	26							

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Manapum Basalt	Roza	1318	145	1324-1337 1342-1347	1318-1324 1337-1342 1347-1351		1368-1371 1449-1450		
	Frenchman Springs 1	1463	69.5	1463-1471	1471-1477 1500-1504	1477-1498	1476-1499		
	Frenchman Springs 2	1532.5	12.5	1532.5-1535	1535-1538				
	Frenchman Springs 3	1545	14.5	1545-1552					
	Frenchman Springs 4	1559.5	48.5	1559-5-1582 1582-1589(b) 1607-1608		1589-1595	1606-1607		
	Frenchman Springs 5	1608	82	1608-1618	1622-1632				
	Frenchman Springs 6	1690	57	1690-1693	1693-1695 1700-1705 1710-1714		1696-1699 1723-1725 1737-1738 1739-1744		
	Frenchman Springs 7	1747	48	1747-1769	1783-1788 1794-1795		1778-1779		
	Frenchman Springs 8	1795	111	1795-1804		1807-1809	1898-1900		
	Frenchman Springs 9	1906	43	1906-1919			1913-1917		
	Frenchman Springs 10	1949	32		1949-1962	1962-1966			
	Frenchman Springs 11	1981	43		1981-2008	2008-2011			
	Frenchman Springs 12	2024	135	2032-2042	2024-2032 2042-2047 2066-2071	2047-2053			
Frenchman Springs 13	2159	38		2159-2166					

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 1	2197	25		2197-2204	2204-2211 2219-2220			
	Grande Ronde 2	2222	151		2222-2261  2370-2373	2261-2265 2282-2288 2300-2305 2322-2334			Very pro- minent zone of vugs and copper stained fracture filling 2230-2265
	Grande Ronde 3	2373	202		2373-2379 2399-2425	2388-2398 2425-2465	2398-2560		
	Grande Ronde 4	2575	21		2575-2580 2589-2592 2594-2596				
	Grande Ronde 5	2596	164	2596-2630(b)			2641-2653 2690-2716 2734-2755	2714	
	Grande Ronde 6	2760	46	2760-2764	2764-2767	2793-2806			
	Grande Ronde 7	2806	46	2806-2812		2813-2825	2825-2850	2808-2810	
	Grande Ronde 8	2851	45		2851-2856	2856-2860	2864-2882		
	Grande Ronde 9	2886	38		2886-2894		2901-2907 2916-2920		
	Grande Ronde 10	2924	60		2924-2944				
	Grande Ronde 11	2984	85		2984-2992	2992-3016	3046-3068		
	Grande Ronde 12	3069	285	3069-3112(b)	3150-3163		3163-3347		
	Grande Ronde 13	3354	114		3354-3378	3378-3391			
	Grande Ronde 14	3468	66		3468-3478	3478-3485			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 15  TD-3540  *units include basalt members, flows, flow lobes, and sedimentary interbeds	3534	6+	3534-3540+					

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Core hole DC-15

DEEP BOREHOLE DATA TABLES

Ground surface elevation = 402'

All numbers within table are drilled depths or thicknesses in feet.

Page 1 of 4

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Ice Harbor (Goose Island)	start of core 208	24						
	Ice Harbor (Martindale)	232	53	232-254	254-257				
	Levey Interbed	285	26						
	Upper Elephant Mountain (Ward Gap)	311	13	311-315	315-317				
	Lower Elephant Mountain	324	114	324-351	357-366 417-419				
	Rattlesnake Ridge Interbed	438	22						
	Pomona Member	460	141	460-480	480-499 585-586	499-514			
	Esquatzel (upper Gable Mtn)	601	31	601-628	628-631				
	Esquatzel (lower Gable Mtn)	632	89	632-646	652-657 659-660 719-721				some pipe vesicles
	Cold Creek Interbed	721	44						
	Asotin	765	251	765-770	770-773 778-803 835-851	775-778			
	Mabton Interbed	1016	30						

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Priest Rapids (Lolo)	1046	106	1046-1064	1144-1145 1150-1152		1121-1130		
	Unnamed Interbed	1152	1						
	Prest Rapids (Rosalia)	1153	87		1153-1173 1232-1236 1238-1240				
	Roza	1240	130	1240-1280(b)	1366-1370	1288-1295	1287-1293		
	Frenchman Springs 1	1370	37	1370-1376	1376-1381				
	Frenchman Springs 2	1407	78	1407-1417(b)					
	Frenchman Springs 3	1485	22	1485-1503(b)					
	Frenchman Springs 4	1507	16	1507-1509	1509-1515				
	Frenchman Springs 5	1523	36	1523-1534(b) 1557-1559(b)	1537-1540				
	Frenchman Springs 6	1559	102	1559-1578.5(b)			1590-1591 1611-1616 1618-1621		
	Frenchman Springs 7	1661	78	1661-1663	1663-1688		1723-1726		
Frenchman Springs 8	1739	21	1739-1741	1741-1754					
Frenchman Springs 9	1760	20	1760-1762	1762-1767 1770-1780					
Frenchman Springs 10	1780	61	1780-1814(b)	1814-1830 1836-1841		1807-1811 1830-1836			
Frenchman Springs 11	1841	218	1841-1880	1880-1883 1889-1899 1913-1920		1886-1887 1892-1995 2003-2017 2020-2053	1970 2000		

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Manapum Basalt	Frenchman Springs 12	2059	58	2059-2060	2060-2079 2115-2117		2067-2079 2080-2091 2102-2107 2111-2115		
	Vantage Interbed	2117	1						
Grande Ronde Basalt	Grande Ronde 1	2118	83	2118-2149	2149-2156 2200-2201	2156-2166	2181-2193		
	Grande Ronde 2	2201	31	2201-2218					
	Grande Ronde 3	2232	210	2232-2260(b) 2265-2294	2262-2264 2305-2341 2352-2362 2441-2442	2296-2305 2344-2352	2297-2329 2333-2441		
	Grande Ronde 4	2442	63	2442-2443	2443-2456 2496-2505				
	Grande Ronde 5	2505	54	2505-2521	2538-2539 2658-2659		2539-2651		
	Grande Ronde 6	2659	68	2659-2661	2661-2671	2671-2681	2705 2718-2724		
	Grande Ronde 7	2727	30	2727-2728.5(b)	2728.5-2735 2756-2757				
	Grande Ronde 8	2757	20	2757-2758	2758-2763				
	Grande Ronde 9	2777	54	2777-2786	2786-2790 2830-2831		2810		
	Grande Ronde 10	2831	47	2831-2836(b)	2836-2852 2877-2878		2861-2864 2868 2875		some vesicle pipes
	Grande Ronde 11	2878	118	2878-2882	2882-2916 2934-2954 2986-2996		2900-2940 2950-2957 2962-2982		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 12	2996	257	2996-3104(b)			3104-3253		
	Grande Ronde 13	3253	81	3253-3261	3261-3270 3277-3285	3270-3275	3290-3292 3296 3302 3306-3334		
	Grande Ronde 14	3334	115	3334-3349(b) 3359-3362(b) 3369-3379(b)	3349-3353 3362-3366 3379-3381 3448-3449		3444		
	Grande Ronde 15	3449	167		3449-3459 3480-3484 3488-3525 3615-3616	3459-3477 3484-3488	3478-3482 3492-3610		
	Grande Ronde 16	3616	30	3616-3622	3625-3626.5		3644		
	Grande Ronde 17	3646	107	3646-3652		3655-3675	3668-3751		
	Grande Ronde 18	3753	421	3753-3834(b)	3881-3910 3946-3954 4155-4158 4173-4174	3838-3852 4158-4170	3847-4141 4171-4173		
	Grande Ronde 19	4174	30	4174-4182	4182-4185 4202-4204	4185-4190			
	Grande Ronde 20	4204	39+		4204-4220		4227-4231 4235-4238 4242		
	TD-4243								

\*units include basalt members, flows, flow lobes, and sedimentary interbeds

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Saddle Mountains Basalt	Upper Elephant Mountain	start of core 702	50		718-731 743-474				
	Lower Elephant Mountain	752	93	752-769	769-775 840-845				
	Rattlesnake Ridge Interbed	845	73						
	Pomona	918	165		918-931	931-968			
	Selah Interbed	1083	15						
	Esquatzel	1098	109	1098-1113	1121-1123		1181-1191 1203-1205		
	Cold Creek Interbed	1207	75						
	Umatilla	1282	223	1282-1288(b)		1299-1308	1305-1309		
Mabton Interbed	1505	64							
Manapum Basalt	Priest Rapids (Lolo)	1569	220	1569-1595					
	Priest Rapids (Rosalia)				1697-1700 1710-1711 1723-1738			1741	
	Roza	1789	212	1789-1837	1864-1868 1997-2000		1850-1851		
	Squaw Creek Interbed	2001	2						
	Frenchman Springs 1	2003	31	2003-2013	2013-2030				

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Wanapum Basalt	Frenchman Springs 2	2034	67	2034-2059	2059-2063				
	Frenchman Springs 3	2101	116	2101-2121	2121-2124 2214-2217	2138-2141	2192-2197		
	Frenchman Springs 4	2217	61	2217-2219	2219-2260 2277-2278		2258-2264		
	Frenchman Springs 5	2278	18		2278-2287 2288-2289		2282-2286		
	Frenchman Springs 6	2296	42		2296-2320				
	Frenchman Springs 7	2338	87		2338-2370	2370-2403	2372-2389		
	Frenchman Springs 8	2425	15		2425-2440				
	Frenchman Springs 9	2440	163.5		2440-2454 2466-2478 2557-2560 2600-2603.5	2460-2466 2478-2483	2460-2466 2530-2534		
	Frenchman Springs 10	2603.5	80.5		2603.5-2613	2614-2629	2614-2622 2634-2640		
	Vantage Interbed	2684	2						
Grande Ronde Basalt	Grande Ronde 1	2686	18	2686-2689	2689-2694 2698-2704				
	Grande Ronde 2	2704	48.5	2704-2713	2720-2723 2726-2732	2732-2736			
	Grande Ronde 3	2752.5	59.5	2752.5-2754	2754-2756 2811-2812	2759-2771	2760-2764		
	Grande Ronde 4	2812	154	2812-2822	2842-2850	2822-2842 2850-2869 2879-2895	2846-2848 2866-2871 2873-2897 2912-2914 2931-2961		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 5	2966	68	2966-2968		2968-6997			
	Grande Ronde 6	3034	191	3034-3074			3112-3130 3133-3167 3172-3199		
	Grande Ronde 7	3225	72	3225-3238	3238-3239	3240-3256	3277-3283		
	Grande Ronde 8	3297	37.5		3297-3304	3304-3312	3325-3327		
	Grande Ronde 9	3334.5	87.5	3334.5-3342	3342-3377 3420-3422	3377-3395	3389-3391 3403-3408		
	Grande Ronde 10	3422	137.5	3422-3459(b)			3483-3490 3498-3506 3518-3521 3528-3529 3549-3552		
	Grande Ronde 11	3559.5	241.5	3559.5-3579.5 3585-3586 3586-3600(b) 3600-3602 3602-3623(b) 3623.5-3525 3625-3630(b) 3633.5-3637.5 (b)		3637.5-3647	3674-3687 3705-3706 3776-3780 3786-3790		
	Grande Ronde 12	3801	22	3801-3807					
	Grande Ronde 13	3823	84.5	3823-3826	3826-3831	3834-3840	3857-3858	3868 3892	
	Grande Ronde 14	3907.5	52.5		3907.5-3912 3916-3925 3931-3934 3937-3939 3958-3960				

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INFORMATION

heavy  
fracture  
filling in  
vuggy zone



BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 15	3960	178		3978-3996	3960-3969 3973-3978 3996-4021	3978-4018 4023-4026 4064-4086 4123		
	TD for DC-8 is 4100 Begin DC-7 core								
	Grande Ronde 16	4138	26	4138-4144	4163-4164				
	Grande Ronde 17	4164	32		4164-4169 4170-4176	4182-4188 4193-4196			
	Grande Ronde 18	4196	27	4196-4203	4203-4205 4217-4221			4207-4210	
	Grande Ronde 19	4223	78	4223-4243	4243-4249	4252-4254 4257-4260	4267-4294		
	Grande Ronde 20	4301	26		4301-4313				
	Grande Ronde 21	4327	157		4327-4328	4329-4409	4388-4409		
	Grande Ronde 22	4484	25	4484-4488	4488-4491	4491-4495	4496-4507		
	Grande Ronde 23	4509	39		4509-4511	4511-4515 4518-4540	4541-4545		
	Grande Ronde 24	4548	18		4548-4552	4552-4557			
	Grande Ronde 25	4566	63	4566-4576	4576-4579	4580-4601	4586-4626		
	Grande Ronde 26	4629	24		4729-4634	4634-4645	4641-4651		
	Grande Ronde 27	4653	19		4653-4656 4670-4672	4656-4664			
Grande Ronde 28	4672	25		4672-4679 4695-4697					
Grande Ronde 29	4697	13		4697-4700 4709-4710	4700-4703	4705			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 30	4710	85	4716-4758	4710-4714 4773-4776 4778-4786 4788-4790				
	Grande Ronde 31	4795	45		4795-4804 4838-4840	4804-4809	4810-4824		
	Grande Ronde 32	4840	39		4840-4848 4878-4879				
	Grande Ronde 33	4879	26	4896-4897(b)	4879-4896 4898-4899				
	Grande Ronde 34	4905	103+	4905-4923		4927-4944	4944-4999		
	TD-5008								
	*units include basalt members, flows, flow lobes, and sedimentary interbeds								

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**INFORMATION**

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 210	65							
	Lower Elephant Mountain	275	55							
	Rattlesnake Ridge Interbed	330	80							
	Pomona	410	173							
	Selah Interbed	583	32							
	Esquatzel	615	90							
	Cold Creek Interbed	705	65							
	Umatilla	770	200							
Mabton Interbed	970	152								
Wanapum Basalt	Priest Rapids (Lolo)	1122	110			1150-1156 1226-1231				
	Priest Rapids (Rosalia)	1232	107			1232-1239 1239-1268 1331-1332		1239-1256 1323		
	Quincy Interbed	1339	2							
	Roza	1341	178	1341-1350		1350-1352 1356-1361 1363-1369				
	Frenchman Springs 1	1519	117	1519-1527		1564-1569	1555-1560 1576-1579	1555-1557		

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Frenchman Springs 2	1636	54.5	1636-1671(b)					
	Frenchman Springs 3	1690.5	90.5	1690.5-1699.5 (b)	1699.5-1702	1702-1714			
	Frenchman Springs 4	1781	36		1781-1788				
	Frenchman Springs 5	1817	51		1817-1829 1834-1839	1839-1847			
	Frenchman Springs 6	1868	54		1868-1886				
	Frenchman Springs 7	1922	136	1922-1937(b)	1943-1960 1990-2015	1960-1990			
	Frenchman Springs 8	2058	164	2058-2067	2067-2078 2084-2105		2111-2113 2119-2129 2135-2145 2151-2164 2175-2183		
	Unnamed Interbed	2222	6						
	Frenchman Springs 9	2228	15.5	2228-2231	2235-2236 2238-2243.5				
Grande Ronde Basalt	Grande Ronde 1	2243.5	35.5	2243.5-2246.5	2249-2256				
	Grande Ronde 2	2279	84		2279-2282 2290-2301 2312-2323				
	Grande Ronde 3	2363	52		2363-2377 2414-2415	2382-2386			
	Grande Ronde 4	2415	158	2415-2436(b)		2436-2442 2451-2456	2442-2444 2446 2448 2454-2478 2482-2497 2500-2508 2510-2518		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 5	2573	32.5	2573-2575	2575-2581 2591-2598 2604-2605.5		2525-2530 2543-2549		
	Grande Ronde 6	2605.5	222.5	2605.5-2631(b) 2631-2637	2696-2698 2732-2735	2698-2703 2735-2738	2670 2678-2696 2743 2752 2773-2775 2783		
	Grande Ronde 7	2828	17	2828-2833	2833-2838				
	Grande Ronde 8	2845	89.5	2845-2854	2866-2875 2879-2883 2897-2905	2854-2859 2862-2866 2883-2897 2905-2910	2918 2925		
	Grande Ronde 9	2934.5	59.5	2934.5-2939(b) 2942-2961(b)	2961-2967	2967-2971			
	Grande Ronde 10	2994	97	2994-2999	2999-3022 3024-3029	3022-3024 3029-3039	3084-3088		
	Grande Ronde 11	3091	120.5	3091-3108(b)	3113-3123	3108-3113 3123-3131	3149-3150 3153-3159		
	Grande Ronde 12	3211.5	235.9	3211.5-3264.5	3446-3447		3266-3273 3276-3407 3432-3442		
	Grande Ronde 13	3447.4	27.6		3447.4-3455	3455-3457	3448-3515		
	Grande Ronde 14	3475	55.5		3475-3478	3478-3486	3525-3530		
	Grande Ronde 15	3530.5	192.5	3530.5-3543	3556-3565	3543-3556 3565-3649	3609-3612 3614-3616 3623-3628		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt							3633-3638 3641-3642 3693-3695 3699-3703		very large Vuggy zone
	Grande Ronde 16	3723	23	3723-3728(b)		3728-3730			
	Grande Ronde 17	3746	91	3746-3755		3755-3767	3763-3836		
	Grande Ronde 18	3837	103	3837-3865(b)	3938-3940		3867-3923		
	Grande Ronde 19	3940	12	3940-3945	3950-3952				
	Grande Ronde 20	3952	42	3952-3957	3957-3962 3993-3994	3962-3970			
	Grande Ronde 21	3994	42	3994-3998		3998-4007 4028-4031			
	Grande Ronde 22	4036	8.5			4036-4042			pipe vesicle 4035
	Grande Ronde 23	4044.5	53.5		4044.5-4055 4097-4098	4055-4060			
	Grande Ronde 24	4098	12.5		4098-4099	4099-4106			
	Grande Ronde 25	4110.5	245	4110.5-4146		4154-4161 4186-4188 4199-4203			
	Grande Ronde 26	4355.5	75.5	4354-4355.5(b) 4355.5-4358	4358-4359				
	Grande Ronde 27	4431	24+	4431-4435	4435-4436	4436-4441			
	TD-4455								

\*units include basalt  
members, flows, flow lobes  
and sedimentary interbeds

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 355	21	355-363					
	Lower Elephant Mountain	376	111	376-391	411-418	391-411			
	Rattlesnake Ridge Interbed	487	29						
	Pomona	516	174	516-520	524-532 542-546 550-559	520-524 532-542 546-550			
	Selah Interbed	690	14						
	Esquatzel	704	74	704-707	707-710				
	Asotin	778	101	778-792(b) 833-864(b)	824-826 828-831 864-870				Invasive
	Umatilla (Sillusi)	879	11						Eroded flow top
	Umatilla	890	103	890-903 912-919	919-925	925-931			
	Mabton Interbed	993	79						
Wanapum Basalt	Priest Rapids (Lolo)	1072	88	1072-1083	1083-1088	1088-1094 1099-1100			
	Priest Rapids (Rosalia)	1160	122	1160-1185	1185-1194 1233-1243			1260	
	Roza	1282	172	1282-1309.5	1309.5-1315	1327-1329	1367-1370		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Squaw Creek Interbed	1454	2						
	Frenchman Springs 1	1456	124	1456-1463	1463-1466	1495-1500 1515-1517			
	Frenchman Springs 2	1580	77	1580-1583  1610-1622	1583-1592 1597-1599 1606-1610 1624-1626				
	Frenchman Springs 3	1657	48	1657-1660	1660-1665 1686-1695 1697-1699 1702.5-1705	1665-1669			
	Frenchman Springs 4	1705	31	1705-1709	1709-1716				pipe vesicle 1720.5-1722
	Frenchman Springs 5	1736	40	1736-1741	1741-1744				
	Frenchman Springs 6	1776	57	1776-1793	1793-1794.5 1796-1815 1816.5-1817.5 1818.5-1823	1823-1825			
	Frenchman Springs 7	1833	109		1833-1845 1853-1861.5	1845-1853 1861.5-1904			
	Frenchman Springs 8	1942	111	1942-1953	1953-1955 1961-1962.5 1969-1988 2049-2053				
	Frenchman Springs 9	2053	102	2053-2058	2154-2155	2058-2079			
	Vantage Interbed	2155	1						

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 1	2156	107	2156-2158	2173-2181 2195-2201 2262-2263	2158-2173 2181-2195			
	Grande Ronde 2	2263	142	2263-2268	2332-2338 2403-2405	2268-2280 2290-2330			
	Grande Ronde 3	2405	53	2405-2410	2421-2423 2454-2456	2410-2421			
	Grande Ronde 4	2458	237	2458-2464	2507-2511.5 2561-2565 2602-2606 2693.5-2695	2464-2469 2478-2480 2494-2507 2546-2560 2565-2567			
	Grande Ronde 5	2695	115	2727-2734 2742-2749 2756-2765	2695-2703 2712-2719 2736-2738 2765-2774.5 2778-2779.5 2780-2783 2799-2803			2670	flow top eroded
	Grande Ronde 6	2810	93	2810-2816	2816-2836 2853-2862 2901-2903	2836-2849	2871-2872		
	Grande Ronde 7	2903	133	2903-2905	2905-2909 2949-2952 2969-2985 2985-2996	2921-2941	2924-2926 2943-2945 2996-3004		mixed vesicular and vuggy

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 8	3036	222	3036-3056(b)			3088-3094 3096-3118 3150-3162 3186-3251		
	Grande Ronde 9	3258	71	3258-3271(b)	3271-3273.5				
	Grande Ronde 10	3329	204	3329-3363	3363-3412 3444-3448	3412-3437	3387-3414 3414-3428 3436-3470 3490-3515		
	Grande Ronde 11	3533	37	3533-3535	3535-3548				
	Grande Ronde 12	3570	30		3570-3579 3596-3600				
	Grande Ronde 13	3600	10	3600-3601.5	3601.5-3602.5				
	Grande Ronde 14	3610	12		3610-3616.5 3620-3622				
	Grande Ronde 15	3622	11	3629-3629.5	3622-3626.5 3629.5-3633				
	Grande Ronde 16	3633	13	3633-3641.5(b)					
	Grande Ronde 17	3646	17	3646-3651					
	Grande Ronde 18	3663	24		3663-3666	3667.5-3668.5			
	Grande Ronde 19	3687	497	3687-3799.5(b)			3803-4158 4166-4180		inclusion at 3771- 3781
Grande Ronde 20	4184	152+	4184-4216.5(b)	4220-4222.5		4218-4336			
	TD-4336								

\*units include basalt members, flows, flow lobes, and sedimentary interbeds

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INFORMATION

Core hole DC-2

DEEP BOREHOLE DATA TABLES

Ground surface elevation = 572'

All numbers within table are drilled depths or thicknesses in feet.

Page 1 of 3

BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Elephant Mountain	start of core 205	39						
	Rattlesnake Ridge Interbed	244	48						
	Pomona	292	192		292-308 323-326				
	Selah Interbed	484	20						
	Esquatzel	504	98		504-526 599-601.5				
	Cold Creek Interbed	602	93						
	Umatilla (Sillusi)	695	50						
	Umatilla	745	90	745-753	753-766			744-754	
Mabton Interbed	835	98							
Wanapum Basalt	Priest Rapids (Lolo)	933	162		948-970				
	Priest Rapids (Rosalia)	1095	50	1095-1096.5	1096.5-1121				
	Roza	1145	202	1145-1175(b)	1175-1187				
	Frenchman Springs 1	1347	106	1347-1350 1411-1412(b)	1350-1357	1357-1364 1385-1400			
	Frenchman Springs 2	1453	47	1453-1470(b)					

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Frenchman Springs 3	1500	62	1500-1509	1509-1511 1515-1517 1520-1521.5				possible vesicle sheets
	Frenchman Springs 4	1562	36	1562-1565	1565-1573 1577-1580 1593-1595				
	Frenchman Springs 5	1598	54	1598-1617	1617-1641				
	Frenchman Springs 6	1652	27	1652-1653.5	1653.5-1664				
	Frenchman Springs 7	1679	31	1679-1684	1684-1697.5				
	Frenchman Springs 8	1710	129	1710-1736(b)	1736-1773 1787.5-1792	1773-1782			
	Frenchman Springs 9	1839	129	1839-1850	1850-1856 1879-1884				
	Frenchman Springs 10	1968	78	1968-1971	1971-1990				
	Vantage Interbed	2046	4						
Grande Ronde Basalt	Grande Ronde 1	2050	60		2062-2083	2050-2056			RSD-BW1-DP-035 27
	Grande Ronde 2	2110	55	2110-2121(b)					
	Grande Ronde 3	2165	153	2165-2169	2169-2175 2195.5-2197 2200-2233	2177-2187			
	Grande Ronde 4	2318	31		2318-2327				
	Grande Ronde 5	2349	278	2349-2363(b)	2363-2369 2438-2441 2441-2443 2446-2470	2444-2446			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 6	2627	121	2627-2637	2637-2640 2645-2647.5 2654-2679 2693-2699		2733		
	Grande Ronde 7	2748	50	2748-2749.5	2749.5-2766			2780	
	Grande Ronde 8	2798	64	2816-2821 (b)	2798-2808.5 2814-2816 2821-2832				
	Grande Ronde 9	2862	96		2862-2874	2874-2886			
	Grande Ronde 10	2958	220	2958-2960 3000-3007	2988-2991 3174-3178		3127 3128	3048-3051	
	Grande Ronde 11	3178	66	3178-3187.5	3201-3203 3242-3244				
	Grande Ronde 12	3244	56+	3244-3247	3248-3300			3319	
	TD-3300								
	*units include basalt members, flows, flow lobes, and sedimentary interbeds								

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Elephant Mountain	520	90						
	Rattlesnake Ridge Interbed	610	80						
	Pomona	690	145						
	Selah Interbed	835	75						
	Esquatzel	910	80						
	Cold Creek Interbed	990	100						
	Umatilla (Sillusi)	1090	50						
	Umatilla	1140	100						
Mabton Interbed	1240	170							
Manapum Basalt	Priest Rapids (Lolo)	1410	85						
	Priest Rapids (Rosalia)	1495	60						
	(Rosalia)	1555	65						
	Roza	1620	175						
	Frenchman Springs 1	1795	180						
	Frenchman Springs 2	1975	85						
	Frenchman Springs 3	2060	23						
Frenchman Springs 4	2083	17							

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Frenchman Springs 5	2100	15						
	Frenchman Springs 6	2115	20						
	Frenchman Springs 7	2135	55						
	Frenchman Springs 8	2190	50						
	Frenchman Springs 9	2240	102						
	Frenchman Springs 10	2342	130						
	Frenchman Springs 11	2472	43						
	Vantage Interbed	2515	20						
Grande Ronde Basalt	Grande Ronde 1	2535	25						
	Grande Ronde 2	2560	115						
	Grande Ronde 3	2675	143						
	Grande Ronde 4	2818	32						
	Grande Ronde 5	2850	265						
	Grande Ronde 6	3115	65						
	Grande Ronde 7	3180	20						
	Grande Ronde 8	3200	55						
	Grande Ronde 9	3255	110						
	Grande Ronde 10	3365	110						
	Grande Ronde 11	3475	160+						
	TD-3635								

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\*units include basalt  
members, flows, flow lobes  
and sedimentary interbeds

Ground surface elevation = 745'

All numbers within table are drilled depths or thicknesses in feet.

Page 1 of 3

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b)	VESICLE ZONE	VUGGY ZONE	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom	top - bottom			
Saddle Mountains Basalt	Lower Elephant Mountain	start of core 623	61		623-664 681.5-684				
	Rattlesnake Ridge Interbed	684	113						
	Pomona	797	132		797-808 908-913				
					915-923(b)				
	Selah Interbed	929	53						
	Esquatzel	982	119		982-1012(b)	1012-1044			
	Cold Creek Interbed	1101	70						
Umatilla	1171	213			1171-1175	1181-1187			
				1208-1211 1221-1223 1240-1242					
Mabton Interbed	1384	130							
Manapum Basalt	Priest Rapids (Lolo)	1514	163	1514-1518	1518-1520 1528-1539 1562-1563 1567-1568.5 1572-1573			1638 1656	vesicle pipes or sheets
	Priest Rapids (Rosalia)	1677	70	1677-1678	1678-1702		1685-1691 1699-1702		
	Roza	1747	169	1747-1749	1749-1757		1754-1757 1761-1764		
	Frenchman Springs 1	1916	187	1916-1926.5	1926.5-1968 2100-2103		1951-1952 1961-1969		

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Manapum Basalt	Frenchman Springs 2	2103	97	2103-2112			2136-2137 2149-2150		
	Frenchman Springs 3	2200	45		2200-2213				
	Frenchman Springs 4	2245	41	2245-2250	2250-2263				
	Frenchman Springs 5	2286	64	2286-2293	2293-2297				
	Frenchman Springs 6	2350	119	2350-2375	2383-2422		2367-2368 2387-2388 2394-2395 2444-2448		
	Frenchman Springs 7	2469	127	2469-2501 (b)	2522-2528				
	Frenchman Springs 8	2596	67	2596-2599	2599-2610 2648-2651 2655-2660				
	Vantage Interbed	2663	13						
Grande Ronde Basalt	Grande Ronde 1	2676	65	2676-2680	2680-2696 2737-2741				
	Grande Ronde 2	2741	55		2741-2751 2794-2796				
	Grande Ronde 3	2796	172	2796-2824 (b)  2966-2968	2824-2825.5 2838-2861 2874-2877	2829-2831 2861-2874	2810-2817 2824-2885 2939-2946		
	Grande Ronde 4	2968	266	2968-2981	3058-3086  3123-3127	2981-2988	2991-3033 3045-3049 3061-3065 3140-3145 3166-3169 3175-3194		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 5	3234	114	3234-3251(b)	3258-3303		3290-3291 3295-3298 3304-3307 3313-3314 3320-3334		
	Grande Ronde 6	3348	41.5	3348-3349	3349-3354 3388-3389.5		3350-3352 3365-3386		
	Grande Ronde 7	3389.5	67.5		3389.5-3420		3406-3452		
	Grande Ronde 8	3457	143	3457-3461	3498-3521	3461-3490	3492-3576		
	Grande Ronde 9	3600	210	3600-3656(b)	3805-3810		3662-3810		
	Grande Ronde 10	3810	69	3810-3813	3813-3820		3842-3856		
	Grande Ronde 11	3879	119+	3879-3898(b)	3907-3926 3943-3950	3899-3900	3939-3940 3951-3952 3953-3960 3966-3998		
	TD-3998								
	*units include basalt members, flows, flow lobes and sedimentary interbeds								

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Core hole DH-4

## DEEP BOREHOLE DATA TABLES

Ground surface elevation = 920

All numbers within table are drilled depths or thicknesses in feet.

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 21	8			21-29				
	Lower Elephant Mountain	29	15	29-33		33-36 37-44				
	Rattlesnake Ridge Interbed	44	1							
	Pomona lobe	45	47	45-49		49-54				
	Pomona lobe	92	75	92-93		93-101 115-132	101-114			
	Asotin	167	177	167-175(b)		175-210				
	Wilbur Creek	344	58	344-349(b)		347-357				
	Mabton Interbed	402	22							
Manapum Basalt	Priest Rapids (Lolo) lobe	424	72			443-450	434-441			
	Priest Rapids (Lolo) lobe	496	11	496-497		497-499	499-507			
	Unnamed Interbed	507	2							
	Priest Rapids (Rosalia) lobe	509	29	509-510		510-524				
	Priest Rapids (Rosalia) lobe	538	85	538-541 544-550		541-544 550-552 556-589				
	Quincy Interbed	623	.5							
	Upper Roza	623.5	140.5	623.5-634		634-640				

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Lower Roza	764	45	764-773	773-784				
	Frenchman Springs 1	809	78	809-820 884-887(b)	820-825	826-829			
	Frenchman Springs 2	887	99	887-894(b)	894-909 983-986				
	Frenchman Springs 3	986	103	986-991 1009-1015 1034-1058	991-1009 1015-1026 1031-1034 1058-1076				
	Frenchman Springs 4	1089	35	1089-1096	1096-1116				
	Frenchman Springs 5	1124	31	1124-1126	1126-1137				
	Frenchman Springs 6	1155	80	1155-1195 1206-1211	1195-1200 1211-1217				
	Frenchman Springs 7	1235	47	1235-1236	1236-1261				
	Frenchman Springs 8	1282	39	1282-1285	1285-1297				
	Frenchman Springs 9	1321	158	1321-1364					
	Vantage Interbed	1479	10						
Grande Ronde Basalt	Grande Ronde 1	1489	18	1489-1491	1491-1497 1506-1507				
	Grande Ronde 2	1507	83	1507-1543	1543-1544 1572-1574				
	Grande Ronde 3	1590	52	1590-1598	1598-1611				
	Grande Ronde 4	1642	28	1642-1650	1650-1663				
	Grande Ronde 5	1670	58	1670-1681	1681-1710 1843-1861	1710-1735			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 6	1928	161	1928-1931	1931-1941 1953-1955 1963-1981	1950-1953 1955-1960			
	Grande Ronde 7	2089	17	2089-2090 2098-2099					
	Grande Ronde 8	2106	112	2106-2107	2107-2112 2115-2133 2174-2176	2133-2139			
	Grande Ronde 9	2218	84	2218-2224	2224-2229	2229-2238	2251-2253 2290-2297		
	Grande Ronde 10	2302	131	2302-2343(b)			2408-2433		
	Grande Ronde 11	2433	112	2433-2436	2436-2439 2453-2458 2464-2522		2461-2463 2506-2544		
	Grande Ronde 12	2545	33	2545-2546	2546-2549 2560-2565 2569-2578				
	Grande Ronde 13	2578	340	2578-2581	2581-2583	2583-2635	2685-2688 2852-2854 2861-2869		
	Grande Ronde 14	2918	49	2918-2921	2921-2929				
	Grande Ronde 15	2967	75	2967-2997	2997-3002	3002-3006			
	Grande Ronde 16	3042	60	3042-3123(b) 3133-3152(b)			3125-3127 3165-3193		
	Grande Ronde 17	3202	76	3202-3204 3237-3239	3204-3212 3239-3244 3248-3254 3257-3264 3274-3278	3264-3267			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 18	3278	103	3278-3299	3299-3311	3325-3332 3362-3378			
	Grande Ronde 19	3381	33	3381-3386	3386-3388				
	Grande Ronde 20	3414	88	3414-3416	3416-3426				
	Grande Ronde 21	3502	134	3502-3506 3518-3520 3526-3531  3546-3561	3506-3410 3520-3522 3525-3526 3531-3534 3561-3566				
	Grande Ronde 22	3636	126	3636-3639 3652-3659  3735-3741	3639-3644 3659-3667 3694-3702 3694-3702  3741-3744 3761-3762	3665-3676 3702-3709			
	Grande Ronde 23	3762	29	3762-3765 3788-3790(b)	3765-3772				
	Grande Ronde 24	3791	105	3791-3806  3867-3883(b)	3806-3811 3895-3896				
	Grande Ronde 25	3896	59	3896-3912	3912-3921				
	Grande Ronde 26	3955	155	3955-3961(b)	3961-3966 3999-4012	3966-3992 4012-4030	3982-4041 4055-4058 4065-4083		
	Grande Ronde 27	4110	52	4110-4121(b)	4121-4134 4144-4157				
	Grande Ronde 28	4162	30	4162-4164	4164-4170	4170-4172			
	Grande Ronde 29	4192	56	4192-4203 4220-4231	4203-4210	4231-4236			

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 30	4248	49	4248-4256	4256-4264				
	Grande Ronde 31	4297	25	4297-4299	4299-4304				
	Grande Ronde 32	4322	214	4322-4328 4337-4439(b)	4328-4330				
	Grande Ronde 33	4536	36	4536-4541	4541-4546				
	Grande Ronde 34	4572	204+	4572-4657(b) 4677-4706			4718-4776		
	TD-4776								
	*units include basalt members, flows, flow lobes, and sedimentary interbeds								

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Core hole DH-5

## DEEP BOREHOLE DATA TABLES

Ground surface elevation = 932

All numbers within table are drilled depths or thicknesses in feet.

Page 1 of 4

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b)	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom					
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 202	38	202-213	232-240				
	Lower Elephant Mountain	240	61	240-268	268-274 284-287 289-291				
	Rattlesnake Ridge Interbed	301	23						
	Pomona	324	136	324-326	326-333				
	Selah Interbed	460	62						
	Asotin	522	87		563-567 570-609				Invasive
	Mabton Interbed	609	77						
Wanapum Basalt	Priest Rapids (Lolo)	686	40	686-688	688-720 725-726				some pipe vesicles
	Priest Rapids (Rosalia)	726	214	726-728 764-765 819-821	728-740 765-782 821-837 848-860				
	Quincy Interbed	910	1						
	Upper Roza	911	137	911-915	915-937				
	Lower Roza	973	75	973-981	981-1020 1040-1043 1046-1048				

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Squaw Creek Interbed	1048	5						
	Frenchman Springs 1	1053	198	1053-1055	1055-1093	1093-1108			
	Frenchman Springs 2	1251	122	1251-1261	1261-1264				
	Frenchman Springs 3	1373	43	1373-1375(b)	1375-1388	1388-1395			
	Frenchman Springs 4	1416	270	1416-1426	1439-1484 1514-1535	1484-1500			
	Vantage Interbed	1686	28						
Grande Ronde Basalt	Grande Ronde 1	1714	95	1714-1718	1718-1751				
	Grande Ronde 2	1809	156	1809-1816	1816-1825 1849-1892				
	Grande Ronde 3	1965	47	1965-1969	1969-1985				
	Grande Ronde 4	2012	234	2012-2024	2024-2041 2131-2135 2145-2163	2092-2099			
	Grande Ronde 5	2246	108	2246-2265	2276-2290 2296-2316	2265-2276 2290-2296 2316-2327	2345-2346		
	Grande Ronde 6	2354	78	2354-2359	2359-2366				
	Grande Ronde 7	2432	182	2432-2454	2481-2501 2503-2525				
	Grande Ronde 8	2614	210	2614-2644(b)			2810-2815		
	Grande Ronde 9	2824	58	2824-2827	2827-2834	2834-2844	2846-2853		
	Grande Ronde 10	2882	271	2882-2884	2888-2890	2894-2807 2924-2933 2941-3020	2906-2921 2969-2978 3001-3023 3044-3151		

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 11	3153	140	3153-3158	3158-3184 3138-3156 3290-3293	3275-3283	3161-3162 3186-3190 3208-3236		
	Grande Ronde 12	3293	292	3293-3323	3323-3330	3330-3338	3337-3345 3353-3432 3533-3582		
	Grande Ronde 13	3585	13	3585-3595					
	Grande Ronde 14	3598	140	3598-3603(b)		3653-3663	3657-3708 3718-3737		
	Grande Ronde 15	3738	18		3738-3742		3746-3752		
	Grande Ronde 16	3756	62	3756-3775	3775-3786		3799-3802		
	Grande Ronde 17	3818	15	3819-3821	3821-3824 3832-3833				
	Grande Ronde 18	3833	114	3833-3861	3861-3863 3871-3878 3886-3917				
	Grande Ronde 19	3947	95	3947-3958 4007-4016(b)	3958-3963	3863-3974	4036-4041	4010	
	Grande Ronde 20	4042	53	4042-4045	4045-4059				
	Grande Ronde 21	4095	83	4096-4100	4100-4103 4106-4129 4141-4154		4170-4178		
	Grande Ronde 22	4178	40	4178-4184	4184-4193				
	Grande Ronde 23	4218	91	4218-4220	4220-4252				
	Grande Ronde 24	4309	31	4309-4315	4339-4340				
	Grande Ronde 25	4340	203	4340-4356(b)	4362-4372 4375-4460 4542-4543		4372-4377 4380-4531		

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 26	4543	30	4543-4551	4551-4554				
	Grande Ronde 27	4573	118	4573-4576	4576-4590	4590-4619			
	Grande Ronde 28	4691	209	4691-4707					
	Grande Ronde 29	4900	27	4900-4901	4901-4910		4914-4923		
	Grande Ronde 30	4927	59	4927-4929	4929-4931 4945-4951	4931-4934	4957-4982		
	Grande Ronde 31	4986	16+	4986-4988	4995-5002				
	TD-5002								
	*units include basalt members, flows, flow lobes, and sedimentary interbeds								

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Elephant Mountain	0	46						
	Pomona	46	124						
	Umatilla	170	222						
	Mabton Interbed	392	83						
Wanapum Basalt	Priest Rapids (Lolo)	475	183						
	Priest Rapids (Rosalia)	658	60						
	Roza	718	150						
	Squaw Creek Interbed	868	34						
	Frenchman Springs 1	902	99						
	Frenchman Springs 2	1001	74						
	Frenchman Springs 3	1075	31						
	Frenchman Springs 4	1106	20						
	Frenchman Springs 5	1126	34						
	Frenchman Springs 6	1160	31						
	Frenchman Springs 7	1191	55						
	Frenchman Springs 8	1246	60						
Frenchman Springs 9	1306	110							
Frenchman Springs 10	1416	160							

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
	Frenchman Springs 11	1576	75						
Grande Ronde Basalt	Grande Ronde 1	1651	44						
	Grande Ronde 2	1695	101						
	Grande Ronde 3	1796	170						
	Grande Ronde 4	1966	222						
	Grande Ronde 5	2188	82						
	Grande Ronde 6	2270	134						
	Grande Ronde 7	2404	119						
	Grande Ronde 8	2523	105						
	Grande Ronde 9	2628	212						
	Grande Ronde 10	2840	91						
	Grande Ronde 11	2931	70						
	Grande Ronde 12	3001	239						
	Grande Ronde 13	3240	150						
	Grande Ronde 14	3390	29						
	Grande Ronde 15	3419	41						
	Grande Ronde 16	3460	274						
	Grande Ronde 17	3734	155						
	Grande Ronde 18	3889	247						
	Grande Ronde 19	4136	81						
	Grande Ronde 20	4217	150						

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 21	4367	193						
	Grande Ronde 22	4560	198						
	Grande Ronde 23	4758	69						
	Grande Ronde 24	4827	109						
	Grande Ronde 25	4936	64						
	Grande Ronde 26	5000	40						
	Grande Ronde 27	5040	260						
	Grande Ronde 28	5300	120						
	Grande Ronde 29	5420	500						
	Grande Ronde 30	5920	300						
	Grande Ronde 31	6220	140						
	Grande Ronde 32	6360	220						
	Grande Ronde 33	6580	80						
	Grande Ronde 34	6660	60						
	Grande Ronde 35	6720	14						
	Grande Ronde 36	6734	129						
	Grande Ronde 37	6863	223						
	Grande Ronde 38	7086	300						
	Grande Ronde 39	7386	182						
	Grande Ronde 40	7568	82						
	Grande Ronde 41	7650	164						

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 42	7814	361						
	Grande Ronde 43	8175	135						
	Grande Ronde 44	8310	180						
	Grande Ronde 45	8490	280						
	Grande Ronde 46	8770	110						
	Grande Ronde 47	8880	130						
	Grande Ronde 48	9010	90						
	Grande Ronde 49	9100	180						
	Grande Ronde 50	9280	195						
	Grande Ronde 51	9475	365						
	Grande Ronde 52	9840	150						
	Grande Ronde 53	9990	190						
	Grande Ronde 54	10180	210						
	Grande Ronde 55	10390	115						
	Grande Ronde 56	10505	150+						
		TD-10655							
	*units include basalt members, flows, flow lobes and sedimentary interbeds								

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Ground surface elevation = 394'

All numbers within table are drilled depths or thicknesses in feet.

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)	VESICLE ZONE	VUGGY ZONE	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom	top - bottom			
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 359	33						
	Lower Elephant Mountain	392	99.5	392-422(b)	433-435 438-445				
	Rattlesnake Ridge Interbed	491.5	18.5						
	Pomona	510	191	510-526	526-529	529-546			
	Selah Interbed	701	56						
	Asotin	757	214	757-764 949-964(b)	764-793 887-906 908-915				
	Mabton Interbed	971	102						
Wanapum Basalt	Priest Rapids (Lolo)	1073	126	1073-1075	1075-1077	1077-1095			
	Priest Rapids (Rosalia)	1199	95	1199-1204 1220-1221 1236-1238	1204-1213 1221-1229 1238-1261	1229-1234			
	Roza	1294	197	1294-1312	1312-1338	1338-1351	1363-1366	1389	
	Frenchman Springs 1	1491	105	1491-1495	1495-1502				
	Frenchman Springs 2	1596	52	1596-1598 1602-1605	1598-1602 1605-1608 1613-1615 1616-1622 1647-1648				

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS	
Wanapum Basalt	Frenchman Springs 3	1648	29	1648-1650	1650-1656					
	Frenchman Springs 4	1677	54	1677-1692(b)						
	Frenchman Springs 5	1731	25	1731-1735	1735-1742					
	Frenchman Springs 6	1756	33	1756-1757	1757-1767					
	Frenchman Springs 7	1789	45	1789-1790	1790-1808					
	Frenchman Springs 8	1834	54	1834-1843	1843-1848	1855-1858				
	Frenchman Springs 9	1888	38	1888-1889	1889-1895 1898-1900		1911			
	Frenchman Springs 10	1926	169	1926-1941 1945-1946	1941-1945 1946-1963 1970-1978	1963-1970				
	Frenchman Springs 11	2095	53	2095-2101	2101-2106 2144-2145		2135-2136			
	Grande Ronde Basalt	Grande Ronde 1	2148	42	2148-2149	2149-2160 2183-2190				
		Grande Ronde 2	2190	178	2190-2196	2196-2199 2204-2222 2237-2243 2272-2289 2292-2295 2297-2314	2243-2249	2285-2290 2292-2304 2346		
Grande Ronde 3		2368	59	2368-2372	2372-2392 2418-2422					
Grande Ronde 4		2427	259	2427-2442 2442-2446(b) 2451-2480(b)	2539-2576 2685-2686		2630-2649			
Grande Ronde 5		2686	44	2686-2688	2688-2700					

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 6	2730	95	2730-2732	2732-2737 2777-2779	2737-2755	2770 2790-2792 2805-2807 2818-2820		
	Grande Ronde 7	2825	73	2825-2827	2827-2857		2853		
	Grande Ronde 8	2898	174	2898-2899 2936-2956	2899-2908 2914-2918 2925-2936 2984-2999 3008-3023	2976-2984 2999-3006	2960-2998 2000-3008 3020	3030-3031	
	Grande Ronde 9	3072	129.2	3072-3106(b) 3111-3118(b) 3124-3136(b) 3200-3201.2(b) vesicular			3075-3077 3138-3173 3179-3187 3190-3193	3189	
	Grande Ronde 10	3201.2	30	3200-3215(b)			3218-3227		
	Grande Ronde 11	3231	50	3231-3232	3232-3238 3274-3281				
	Grande Ronde 12	3281	28	3281-3286 3289-3298(b)	3286-3288				
	Grande Ronde 13	3309	26+	3309-3311	3311-3312 3318-3328				
	TD-3335								
		*units include basalt members, flows, flow lobes and sedimentary interbeds							

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INFORMATION

Ground surface elevation = 121.9 m All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Ice Harbor	start of core 66.4	20.1						
	Levey Interbed	86.6	4.6						
	Upper Elephant Mountain	91.1	16.8		91.1-93.3	93.3-94.8			
	Lower Elephant Mountain	107.9	31.4	107.9-110.0	113.1-118.3				
	Rattlesnake Ridge Interbed	139.3	9.3						
	Pomona	148.6	55.9		148.6-151.2 204.2-204.5	151.2-156.4			
	Selah Interbed	204.5	.6						
	Esquatzel	205.1	29.1	205.1-214.0(b) 214.9-217.0(b)	217.0-217.9				
	Cold Creek Interbed	234.2	23.3						
	Umatilla	257.6	83.2	257.6-265.2(b)	265.2-266.7	266.7-270.7 283.8-288.0	269.4-279.5		
Mabton Interbed	340.8	12.2							
Wanapum Basalt	Priest Rapids	353.0	40.8	353.0-354.5(b) 355.1-355.4(b)	355.4-356.9				
	Quincy Interbed	393.8	7.9						
	Roza	401.7	44.2	403.5-407.5 409.0-410.6	401.7-403.5 407.5-409.0 410.6-411.8	417.0-417.9 441.6-441.9			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Frenchman Springs 1	445.9	21.2	445.9-448.4	448.4-450.2 457.2-458.4	450.2-456.6	449.9-456.9		
	Frenchman Springs 2	467.1	3.8	467.1-467.9	467.9-468.8				
	Frenchman Springs 3	470.9	4.4	470.9-473.0					
	Frenchman Springs 4	475.3	14.8	475.3-482.2 482.2-484.3(b) 489.8-490.1		484.3-486.1	489.5-489.8		
	Frenchman Springs 5	490.1	25.0	490.1-493.2	494.4-497.4				
	Frenchman Springs 6	515.1	17.4	515.1-516.0	516.0-516.6 518.2-519.7 521.2-522.4		516.9-517.8 525.2-525.8 528.8-529.1 529.4-529.7 530.0-531.6		
	Frenchman Springs 7	532.5	14.6	532.5-539.2	543.4-545.0 546.8-547.1		541.9-542.2		
	Frenchman Springs 8	547.1	33.8	547.1-549.8		550.8-551.4	578.5-579.1		
	Frenchman Springs 9	581.0	13	581.0-584.9			583.1-584.3		
	Frenchman Springs 10	594.0	9.7		594.0-598.0	598.0-599.2			
	Frenchman Springs 11	603.8	13.1		603.8-612.0	612.0-612.9			
	Frenchnam Springs 12	616.9	41.1		616.9-619.3 619.3-622.4 622.4-623.9 629.7-631.2	623.9-625.7			
	Frenchman Springs 13	658.1	11.6		658.1-660.2				
Grande Ronde Basalt	Grande Ronde 1	669.6	7.6		669.6-671.8	671.8-673.9 676.3-676.6			51
	Grande Ronde 2	677.3	46.0		677.2-689.1	689.1-690.4 695.5-697.4 701.0-702.6			very promi- nent zone of vugs &

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS	
Grande Ronde Basalt	Grande Ronde 3	723.3	61.6		722.4-723.3 723.3-725.1 731.2-739.1	707.7-711.4	730.9-780.3		Cu stained fracture fillings 679.7-690.4	
	Grande Ronde 4	784.9	6.4		784.9-786.4 789.1-790.0 790.6-791.3	727.9-730.9 739.1-751.3				
	Grande Ronde 5	791.3	50.0	791.3-816.9 (b)			805-808.6 819.9-827.8 833.3-839.7	827.2		
	Grande Ronde 6	841.2	14.0	841.2-842.5	842.5-843.4	851.3-855.3				
	Grande Ronde 7	855.3	14.0	855.3-857.1		857.4-861.1	861.1-868.7	855.9- 856.5		
	Grande Ronde 8	869.0	13.7		869.0-870.5	870.5-871.7	872.9-878.4			
	Grande Ronde 9	879.6	11.6		879.6-882.0		884.2-886.0			
	Grande Ronde 10	891.2	18.3		891.2-897.3					
	Grande Ronde 11	909.5	25.9		909.5-912.0	912.0-919.3	928.4-935.1			
	Grande Ronde 12	935.4	86.9	935.4-948.5(b)	960.1-964.1		964.1-1020.2			
	Grande Ronde 13	1022.3	34.7		1022.3-1029.6	1029.6-1033.6				
	Grande Ronde 14	1057.0	20.1		1057.0-1060.1	1060.1-1062.2				
	Grande Ronde 15	1077.2	1.8+	1077.2+						
		TD-1079.0								

\*units include basalt  
members, flows, flow lobes,  
and sedimentary interbeds

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INFORMATION

Ground surface elevation = 122.5 m All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Ice Harbor (Goose Island)	start of core 63.4	7.3							
	Ice Harbor (Martindale)	70.7	16.1	70.7-77.4	77.4-78.3					
	Levey Interbed	86.9	7.9							
	Upper Elephant Mountain	94.8	4.0	94.8-96.0	96.0-96.6					
	Lower Elephant Mountain	98.8	34.7	98.8-107.0	108.8-111.5 127.1-127.7					
	Rattlesnake Ridge Interbed	133.5	6.7							
	Pomona	140.2	43.0	140.2-146.3	146.3-152.1 178.3-178.6	152.1-156.7				
	Esquatzel (upper Gable Mtn)	183.2	9.4	183.2-191.4	191.4-192.3					
	Esquatzel (lower Gable Mtn)	192.6	27.1	192.6-196.9	198.7-200.2 200.8-201.1 219.1-219.7					
	Cold Creek Interbed	219.8	13.4							
	Asotin	233.2	76.5	233.2-234.7	234.7-235.6 237.1-244.7 254.5-259.4	236.2-237.1				
Mabton Interbed	309.7	9.1								
Manapum Basalt	Priest Rapids (Lolo)	318.8	32.3	318.8-324.3	348.7-349.0 350.5-351.1		341.7-344.4			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Unnamed Interbed	351.1	.3						
	Priest Rapids (Rosalia)	351.4	26.5		351.4-357.5 375.5-376.7 377.3-377.9				
	Roza	378.0	39.5	378.0-390.1 (b)	416.3-417.5	392.6-394.7	392.3-394.1		
	Frenchman Springs 1	417.6	11.2	417.6-419.4	419.4-420.9				
	Frenchman Springs 2	428.8	23.8	428.8-431.9 (b)					
	Frenchman Springs 3	452.6	6.7	452.6-458.1 (b)					
	Frenchman Springs 4	459.3	4.9	459.3-459.9	459.9-461.8				
	Frenchman Springs 5	464.2	11.0	464.2-467.6 (b) 474.6-475.2 (b)	468.5-469.4				
	Frenchman Springs 6	475.2	31.1	475.2-481.1 (b)			484.6-484.9 491.0-492.5 493.1-494.0		
	Frenchman Springs 7	506.3	23.8	506.3-506.9	506.9-514.5		525.2-526.1		
	Frenchman Springs 8	530.0	6.4	530.0-530.6	530.6-538.6 539.5-542.5				
	Frenchman Springs 9	536.4	6.1	536.4-537.0	537.0-538.6 539.5-542.5				
Frenchman Springs 10	542.5	18.6	542.5-552.9 (b)	552.9-557.8 559.6-561.1		550.8-552.0 557.8-559.6			
Frenchman Springs 11	561.1	66.4	561.1-573.0	573.0-573.9 575.7-578.8 583.1-582.2		574.8-575.1 576.7-608.1 610.5-614.8	600.4 609.6		

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
	Frenchman Springs 12	627.6	17.7	627.6-627.9	627.9-633.7 644.6-645.2		615.7-625.7 630.0-633.7 634.0-637.3 640.7-642.2 643.4-644.6		
	Vantage Interbed	645.3	.3						
Grande Ronde Basalt	Grande Ronde 1	645.6	25.3	645.6-655.0	655.0-657.1 670.6-670.9	657.1-660.2	664.8-668.4		
	Grande Ronde 2	670.9	9.4	670.9-676.0					
	Grande Ronde 3	680.3	63.9	680.3-688.8(b) 690.4-699.2	689.4-690.0 702.6-713.5 716.9-719.9 744.0-744.3	699.8-702.6 714.4-716.9	700.1-709.9 711.1-744.0		
	Grande Ronde 4	744.3	19.2	744.3-744.6	744.6-748.6 760.8-763.5				
	Grande Ronde 5	763.5	16.4	763.5-768.4	773.6-773.9 810.1-810.5		773.9-808.0		
	Grande Ronde 6	810.5	20.7	810.5-811.1	811.1-814.1	814.1-817.2	824.5 828.4-830.3		
	Grande Ronde 7	831.2	9.1	831.2-831.6(b)	831.6-833.6 840.0-840.3				
	Grande Ronde 8	840.3	6.1	840.3-840.6	840.6-842.2				
	Grande Ronde 9	846.4	16.4	846.4-849.2	849.2-850.4 862.6-862.9		856.5		some vesicle pipes
	Grande Ronde 10	862.9	14.3	862.9-864.4(b)	864.4-869.3 876.9-877.2		872.0-872.9 874.2 876.3		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 11	877.2	36.0	877.2-878.4	878.4-888.8 894.3-900.4 910.1-913.2		883.9-896.1 899.2-901.3 902.8-908.9		
	Grande Ronde 12	913.2	78.3	913.2-946.1(b)			946.1-991.5		
	Grande Ronde 13	991.5	24.7	991.5-993.9	993.9-996.7 998.8-1001.3	996.7-998.2	1002.8-1003.4 1004.6 1006.4 1007.7-1016.2		
	Grande Ronde 14	1016.2	35.0	1016.2-1020.8 (b) 1023.8-1024.7 1026.9-1029.9 (b)	1020.8-1022.0 1024.7-1025.9 1029.9-1344.4 1050.9-1051.2		1049.7		
	Grande Ronde 15	1051.2	50.9		1051.2-1054.3 1060.7-1061.9 1063.1-1074.4 1101.8-1102.1	1054.3-1059.8 1061.9-1063.1	1060-1061.3 1064.4-1100.3		
	Grande Ronde 16	1102.2	9.1	1102.2-1104.0	1104.9-1105.3		1110.7		
	Grande Ronde 17	1111.3	32.6	1111.3-1113.1		1114.0-1120.1	1118.0-1143.3		
	Grande Ronde 18	1143.9	128.3	1143.9-1168.6 (b)	1182.9-1191.8 1202.7-1205.2 1266.4-1267.3 1271.9-1272.2	1169.8-1174.1 1267.3-1271.0	1172.6-1262.2 1271.3-1741.4		
	Grande Ronde 19	1272.2	9.1	1272.2-1274.7	1274.7-1274.6 1280.8-1281.4	1275.6-1277.1			
	Grande Ronde 20	1281.4	11.9+		1281.4-1286.2		1288.4-1289.6 1290.8-1291.7 1293.0		
	TD-1293.3								

\*units include basalt members, flows, flow lobes, and sedimentary interbeds,

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INFORMATION

Ground surface elevation = 166.1 All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom					
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 214	15.2		218.8-222.8 226.5-227.7				
	Lower Elephant Mountain	229.2	28.3	229.2-234.4	234.4-236.2 256.0-257.5				
	Rattlesnake Ridge Interbed	257.5	22.2						
	Pomona	279.8	50.3		279.8-283.8	283.8-295.0			
	Selah Interbed	330.1	4.6						
	Esquatzel	334.7	33.2	334.7-339.2	341.7-342.3		360.0-363.0 366.7-367.3		
	Cold Creek Interbed	367.9	22.9						
	Umatilla	390.7	68.0	390.7-392.6 (b)		395.0-398.7	397.8-399.0		
	Mabton Interbed	458.7	19.5						
Wanapum Basalt	Priest Rapids (Lolo)	478.2	67.0	478.2-486.1	517.2-518.2				
	Priest Rapids (Rosalia)				517.2-518.2 521.2-521.5 525.2-529.7			530.6	
	Roza	545.3	64.6	545.3-559.9	568.1-569.4 608.7-609.6		563.9-564.2		
	Squaw Creek Interbed	609.9	.6						
	Frenchman Springs 1	610.5	9.4	610.5-613.6	613.6-618.7				

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Frenchman Springs 2	620.0	20.4	620.0-627.6	627.6-628.8				
	Frenchman Springs 3	640.4	35.3	640.4-646.5	646.5-647.4 674.8-675.7	651.7-652.6	668.1-669.6		
	Frenchman Springs 4	675.7	18.6	675.7-676.3	676.3-688.8 694.0-694.3		688.2-690.1		
	Frenchman Springs 5	694.3	5.5		694.3-697.1 697.4-697.7		695.5-696.8		
	Frenchman Springs 6	699.8	12.8		699.8-707.1				
	Frenchman Springs 7	712.6	26.5		712.6-722.4	722.4-732.4	723.0-728.2		
	Frenchman Springs 8	739.1	4.6		739.1-743.7				
	Frenchman Springs 9	743.7	49.8		743.7-748.0 751.6-755.3 779.4-780.3 792.5-793.5	749.8-751.6 755.3-756.8	749.8-751.6 771.1-772.4		
	Frenchman Springs 10	793.5	24.5		793.5-796.4	796.7-801.3	796.7-799.2 802.8-804.7		
	Vantage Interbed	818.1	.6						
Grande Ronde Basalt	Grande Ronde 1	818.7	5.5	818.7-819.6	819.6-821.1 822.3-824.2				
	Grande Ronde 2	824.2	14.8	824.2-826.9	829.0-830.0 830.9-832.7	832.7-833.9			
	Grande Ronde 3	839.0	18.1	839.0-839.4	839.4-840.0 856.8-857.1	840.9-844.6	841.2-842.5		
	Grande Ronde 4	857.1	46.9	857.1-860.1	866.2-868.7	860.1-866.2 868.7-874.5 877.5-882.4	867.5-868.1 873.5-875.1 875.7-883.0 887.6-888.2 893.4-902.5		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 5	904.0	20.7	904.0-904.6		904.6-913.5			
	Grande Ronde 6	924.8	58.2	924.8-936.9			948.5-954.0 954.9-965.3 966.8-975.0		
	Grande Ronde 7	983.0	21.9	983.0-986.9	986.9-987.2	987.5-992.4	998.8-1000.6		
	Grande Ronde 8	1004.9	11.4		1004.9-1007.0	1007.0-1009.5	1013.5-1014.1		
	Grande Ronde 9	1016.3	26.7	1016.3-1018.6	1018.6-1029.3 1042.4-1043.0	1029.3-1034.8	1033.0-1033.6 1037.2-1038.7		
	Grande Ronde 10	1043.0	41.9	1043.0-1054.3 (b)			1061.6-1063.7 1066.2-1068.6 1072.3-1073.2 1075.3-1075.6 1081.7-1082.6		
	Grande Ronde 11	1084.9	73.6	1084.9-1091.0 1092.7-1093.0 1093.0-1097.3 (b) 1097.3-1097.9 1097.9-1104.3 (b) 1104.3-1104.9 1104.9-1106.4 (b) 1107.5-1108.7			1119.8-1123.8 1129.3-1129.6 1150.9-1152.1 1154.0-1155.2		
	Grande Ronde 12	1158.5	6.7	1158.5-1160.4					
	Grande Ronde 13	1165.2	25.7	1165.2-1166.2	1166.2-1167.7	1168.6-1170.4	1175.6-1175.9	1179.0 1186.3	
	Grande Ronde 14	1191.0	16.0		1191.0-1192.4 1193.6-1196.3 1198.2-1199.1				
						1108.7-1111.6			heavy fracture filling in vuggy zone

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 15	1207.0	54.2		1200.0-1200.6 1206.4-1207.0			1197.9	
	Total Depth for DC-8 is 1249.7 m								
	Begin DC-7 core								
	Grande Ronde 16	1261.3	7.9	1261.3-1263.1	1268.9-1269.2		1256.7		
	Grande Ronde 17	1269.2	9.7		1269.2-1270.7 1271.0-1272.8	1274.7-1276.5 1278.0-1278.9			
	Grande Ronde 18	1278.9	8.2	1278.9-1281.1	1281.1-1281.7 1285.3-1286.6			1282.3- 1283.2	
	Grande Ronde 19	1287.2	23.8	1287.2-1293.3	1293.3-1295.1	1296.0-1296.6 1297.5-1298.4	1300.6-1308.8		
	Grande Ronde 20	1310.9	7.9		1310.9-1314.6				
	Grande Ronde 21	1318.9	47.8		1318.9-1319.2	1319.5-1343.9	1337.5-1343.9		
	Grande Ronde 22	1366.7	7.6	1366.7-1367.9	1367.9-1368.8	1368.8-1370.1	1370.4-1373.7		
	Grande Ronde 23	1374.3	11.9		1374.3-1374.9	1374.9-1376.2 1376.2-1383.8	1384.1-1385.3		
	Grande Ronde 24	1386.2	5.5		1386.2-1387.4	1387.4-1389.0			
	Grande Ronde 25	1391.7	19.2	1391.7-1394.8	1394.8-1395.7	1396.0-1402.4	1397.8-1410.0		
Grande Ronde 26	1410.9	7.3		1410.9-1412.4	1412.4-1415.8	1414.6-1417.6			
Grande Ronde 27	1418.2	5.6		1418.2-1419.1 1423.4-1424.0	1419.1-1421.6				

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 28	1424.0	7.6		1424.0-1426.1 1431.0-1431.6				
	Grande Ronde 29	1431.6	4.0		1431.6-1432.6 1435.3-1435.6	1432.6-1433.5	1434.1		
	Grande Ronde 30	1435.6	25.9	1437.4-1450.2	1435.6-1436.8 1454.8-1455.7 1456.3-1458.8 1459.4-1460.0				
	Grande Ronde 31	1461.5	13.7		1461.5-1464.2 1474.6-1475.2	1464.2-1465.8	1466.1-1470.3		
	Grande Ronde 32	1475.2	11.9		1475.2-1477.7 1486.8-1487.1				
	Grande Ronde 33	1487.1	7.9	1492.3-1492.6 (b)	1487.1-1492.3 1492.9-1493.2				
	Grande Ronde 34	1495.0	31.4+	1495.0-1500.5		1501.7-1506.9	1506.9-1523.7		
	TD-1526.4								
	*units include basalt members, flows, flow lobes and sedimentary interbeds								

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Core hole DC-12

DEEP BOREHOLE DATA TABLES

Ground surface elevation = 157.3 m All numbers within table are drilled depths or thicknesses in meters.

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b)			DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom			
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 64.0	19.8						
	Lower Elephant Mountain	83.8	16.8						
	Rattlesnake Ridge Interbed	100.6	24.4						
	Pomona	125.0	52.7						
	Selah Interbed	177.8	9.8						
	Esquatzel	187.5	27.4						
	Cold Creek Interbed	214.9	19.8						
	Umatilla	234.7	61.0						
Mabton Interbed	295.7	46.3							
Wanapum Basalt	Priest Rapids (Lolo)	342.0	33.5		350.5-352.3 373.7-375.2				
	Priest Rapids (Rosalia)	377.6	32.6		375.5-377.6 377.6-386.5 405.7-406.0				
	Quincy Interbed	408.1	0.6						
	Roza	408.7	54.3	408.7-411.48	411.5-412.1 413.3-414.8 415.4-417.3				
	Frenchman Springs 1	463	35.7	463.0-465.4		472.4-475.5	474.0-474.6		
	Frenchman Springs 2	498.6	16.6	498.6-509.3 (b)					

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Frenchman Springs 3	515.3	27.6	515.3-518.0(b)	518.0-518.8	518.8-522.4			
	Frenchman Springs 4	542.8	11.0		542.8-545.0				
	Frenchman Springs 5	553.8	15.5		553.8-557.5 559.0-560.5	560.5-563.0			
	Frenchman Springs 6	569.3	16.5		569.3				
	Frenchman Springs 7	585.8	41.5	585.8-590.4(b)	592.2-597.4 606.6-614.2	597.4-606.6		615.7	
	Frenchman Springs 8	627.3	50.0	627.3-630.0	630.0-633.4 635.2-641.6		643.4-644.0 645.9-648.9 650.7-653.8 655.6-659.6 662.9-665.4		
	Unnamed Interbed	677.3	1.8						
Frenchman Springs 9	679.1	4.72	679.1-680.0	681.2-681.5 682.1-683.8					
Grande Ronde Basalt	Grande Ronde 1	683.6	10.8	683.6-684.7	685.5-687.6				
	Grande Ronde 2	694.6	25.6		694.6-695.6 698.0-701.3 704.7-708.1				
	Grande Ronde 3	720.2	15.8		720.2-724.5 735.8-736.1	726.0-727.3			
	Grande Ronde 4	736.1	48.2	736.1-742.5(b)	748.6-750.1	742.5-744.3 747.1-748.6 750.7-755.3 757.7-761.4	744.3-744.9 745.5 746.2 748.0-755.3 756.5-761.1 762.0-764.4 765.0-767.5 769.6-771.1 775.1-776.9		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 5	784.3	9.9	784.3-784.8	784.8-786.7 789.7-791.9 793.7-794.2				
	Grande Ronde 6	794.2	67.8	794.2-801.9 (b) 801.9-803.8	821.7-822.4 832.7-833.6	822.4-823.9 833.6-834.5	813.8 816.3-821.7 836.1 838.8 845.2-845.8 848.3		
	Grande Ronde 7	862.0	5.2	862-863.5	863.5-865.0				
	Grande Ronde 8	867.2	27.3	867.2-869.9		869.9-871.4 872.3-873.6 873.6-876.3 877.5-878.7 883.0-885.4	878.7-883.0 885.4-887.0	889.4 891.5	
	Grande Ronde 9	894.4	18.1	894.4-895.8(b) 896.7-902.5(b)	902.5-904.3	904.3-905.6			
	Grande Ronde 10	912.6	29.6	912.6-914.1	914.1-921.1 921.7-923.2	921.1-921.7 923.2-926.3	940-941.2		
	Grande Ronde 11	942.1	36.7	942.1-947.3 (b)	948.8-951.9	947.3-948.8 951.9-954.3	959.8-960.1 961.0-962.9		
	Grande Ronde 12	978.9	71.9	978.9-995.0	1050.3-1050.6		995.5-997.6 998.5-1038.5 1046.1-1049.1		
	Grande Ronde 13	1050.8	8.4		1050.8-1053.1	1053.1-1053.7	1051.0-1071.4		
	Grande Ronde 14	1059.2	16.7		1059.2-1060.1	1060.1-1062.5	1074.0-1075.9		
	Grande Ronde 15	1075.9	58.7	1075.9-1979.9		1079.9-1083.9 1083.9-1086.6	1100-1100.9 1101.5-1102.2 1104.3-1105.8 1107.3-1108.8 1109.8-1110.1 1125.6-1126.2		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 16	1134.8	7.0	1134.8-1136.3 (b)		1136.3-1136.9	1127.5		
	Grande Ronde 17	1141.9	27.7	1141.9-1144.5		1144.5-1148.2	1147.0-1169.2		
	Grande Ronde 18	1170.0	31.4	1170.0-1178.1 (b)	1200.3-1200.9		1147.0-1170.2		
	Grande Ronde 19	1200.1	3.7	1200.1-1202.4	1204.0-1204.6				
	Grande Ronde 20	1204.6	12.8	1204.6-1206.1	1206.1-1207.6 1217.1-1217.4	1207.6-1210.1			
	Grande Ronde 21	1217.4	12.8	1217.4-1218.6	1227.1-1227.7 1229.0-1230.2	1218.6-1221.3			
	Grande Ronde 22	1230.2	2.6			1230.2-1232.0			pipe vesicles 1230
	Grande Ronde 23	1232.8	16.3		1232.8-1236.0 1248.8-1249.1	1236.0-1237.5			
	Grande Ronde 24	1249.1	3.81		1249.1-1249.4	1249.4-1251.5			
	Grande Ronde 25	1252.9	74.7	1252.9-1263.7		1266.2-1268.3 1275.9-1276.5 1279.9-1281.1			
	Grande Ronde 26	1327.6	23.0	1327.1-1327.6 (b)	1327.6-1328.3	1328.3-1328.6			
	Grande Ronde 27	1350.6	7.3+	1350.6-1351.8	1351.8-1352.1	1352.1-1353.6			
		TD-1354.8							

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\*units include basalt  
members, flows, flow lobes  
and sedimentary interbeds

Core hole DC-6

DEEP BOREHOLE DATA TABLES

Ground surface elevation = 122.5 All numbers within table are drilled depths or thicknesses in meters.

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 108.2	6.4	108.2-110.6						
	Lower Elephant Mountain	114.6	33.8	114.6-119.2	125.3-127.4	119.2-125.3				
	Rattlesnake Ridge Interbed	148.4	8.8							
	Pomona	157.3	53.0	157.3-158.5	159.7-162.1 165.2-166.4 167.6-170.4	158.5-159.7 162.1-165.2 166.4-167.6				
	Selah Interbed	210.3	4.3							
	Esquatzel	214.6	25.5	214.6-215.5	215.5-216.4					
	Asotin	237.1	30.8	237.1-241.4 (b) 253.9-263.3 (b)	251.1-251.8 252.4-253.3 263.3-265.2					Invasive
	Umatilla (Sillusi)	267.9	3.3							
	Umatilla	271.3	31.4	271.3-275.2 278.0-280.1	280.1-281.9	281.9-283.8				Eroded flow top
	Mabton Interbed	302.7	24.1							
Wanapum Basalt	Priest Rapids (Lolo)	326.7	26.8	326.7-330.1	330.1-331.6	331.6-333.4 335.0-335.3				
	Priest Rapids (Rosalia)	353.6	37.2	353.6-361.2	361.2-363.9 375.8-378.9				384.0	

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Roza	390.7	52.4	390.7-399.1	399.1-400.8	404.5-405.1	416.7-417.6		
	Squaw Creek Interbed	443.2	.6						
	Frenchman Springs 1	443.8	37.8	443.8-445.9	445.9-446.8	455.7-457.2 461.8-462.4			
	Frenchman Springs 2	481.6	23.5	481.6-482.5 490.7-494.4	482.5-485.2 486.8-487.4 489.5-490.7 495.0-495.6				
	Frenchman Springs 3	505.0	14.6	505.0-506.0	506.0-507.5 513.9-516.6 517.2-517.8 518.9-519.7	507.5-508.7			
	Frenchman Springs 4	519.7	9.4	519.7-520.9	520.9-523.0				pipe vesicles 524.4-524.9
	Frenchman Springs 5	529.1	12.2	529.1-530.6	530.6-531.6				
	Frenchman Springs 6	541.3	17.4	541.3-546.5	546.5-547.0 547.4-553.2 553.7-554.0 554.3-555.6	555.6-556.3			
	Frenchman Springs 7	558.7	33.2		558.7-562.3 564.8-567.4	562.3-564.8 567.4-580.3			
	Frenchman Springs 8	591.9	33.8	591.9-595.3	595.3-595.9 597.7-598.2 600.1-605.9 624.5-625.7				
	Frenchman Springs 9	625.7	31.1	625.7-627.3	656.5-656.8	627.3-633.7			
	Vantage Interbed	656.8	.3						

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 1	657.1	32.6	657.1-657.8	662.3-664.8 669.0-670.9 689.4-689.7	657.8-662.3 664.8-669.0			
	Grande Ronde 2	689.7	43.3	689.7-691.3	710.8-712.6 732.4-733.0	691.3-694.9 698.0-710.2			
	Grande Ronde 3	733.0	16.1	733.0-734.6	737.9-738.5 748.0-748.6	734.6-737.9			
	Grande Ronde 4	749.2	72.2	749.2-751.0	764.1-765.5 780.6-781.8 793.1-794.3 821.0-821.4	751.0-752.5 755.3-755.9 760.2-764.1 776-780.3 781.8-782.4			
	Grande Ronde 5	821.4	35.1	821.4-823.9 826.6-828.8 833.9-834.5 831.2-833.3 835.8-837.9 840.0-842.8 842.8-845.7 846.7-847.2 847.3-848.3 853.1-854.4	821.4-823.9 826.6-828.8 833.9-834.5			813.8	flow top eroded
	Grande Ronde 6	855.5	28.3	855.5-858.3	858.3-864.4 869.6-872.3 884.2-884.8	864.4-868.4	875.1-875.4		
	Grande Ronde 7	884.8	40.5	884.8-885.4	885.4-886.7 898.9-899.8 905.0-909.8 909.8-913.2	890.3-896.4	891.2-891.8 897.0-897.6 913.2-915.6		mixed vesicular + vuggy

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 8	925.4	40.5	925.4-931.5 (b)			941.2-943.1 943.7-950.4 960.1-963.8 971.1-990.1		
	Grande Ronde 9	993.0	21.6	993.0-997.0(b)	997.0-997.8				
	Grande Ronde 10	1014.7	62.2	1014.7-1025.0	1025.0-1040.0 1049.7-1051.0	1040.0-1047.6	1032.4-1040.6 1040.6-1044.9 1047.3-1057.6 1063.8-1071.4		
	Grande Ronde 11	1076.9	11.3	1076.9-1077.5	1077.5-1081.4				
	Grande Ronde 12	1088.1	9.1		1088.1-1090.1 1096.1-1097.3				
	Grande Ronde 13	1097.3	.3	1097.3-1097.7	1097.7-1098.0				
	Grande Ronde 14	1100.3	3.7		1100.3-1102.3 1103.4-1104.0				
	Grande Ronde 15	1104.0	3.3	1106.1-1106.3	1104.0-1105.3 1106.3-1107.3				
	Grande Ronde 16	1107.3	4.0	1107.3-1109.9 (b)					
	Grande Ronde 17	1111.3	5.2	1111.3-1112.8					
	Grande Ronde 18	1116.5	7.3		1116.5-1117.4	1117.8-1118.1			
	Grande Ronde 19	1123.8	151.5	1123.8-1158.1 (b)			1159.1-1267.3 1269.8-1274.1		inclusion at 1150.0 -1152.4
	Grande Ronde 20	1275.3	46.3+	1275.3-1285.2 (b)	1286.2-1287.0		1285.6-1321.6		
	TD-1321.6								

\*units include basalt  
members, flows, flow lobes  
and sedimentary interbeds

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Ground surface elevation = 173.7 All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Elephant Mountain	start of core 62.5	11.9							
	Rattlesnake Ridge Interbed	74.4	14.6							
	Pomona	89.0	58.5			89.0-93.9 98.5-99.4				
	Selah Interbed	147.5	6.1							
	Esquatzel	153.6	29.9			153.6-160.3 182.6-183.3				
	Cold Creek Interbed	183.5	28.3							
	Umatilla (Sillusi)	211.8	15.2							
	Umatilla	227.0	27.4	211.8-229.5	229.5-233.5				226.	
Mabton Interbed	254.4	29.9								
Wanapum Basalt	Priest Rapids (Lolo)	284.4	49.4			289.0-295.7				
	Priest Rapids (Rosalia)	333.8	15.2	333.8-334.2	334.2-341.7					
	Roza	349.0	61.6	349.0-358.1 (b)	358.1-361.8					
	Frenchman Springs 1	410.6	32.3	410.6-411.5 430.1-430.4 (b)	411.5-413.6	413.6-415.7 422.1-426.7				
	Frenchman Springs 2	442.9	14.3	442.9-448.1 (b)						

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RSD-BW1-DP-035

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Frenchman Springs 3	457.2	18.9	457.2-459.9	459.9-460.6 461.8-462.4 463.3-463.8				possible vesicle sheets
	Frenchman Springs 4	476.1	11.0	476.1-477.0	477.0-479.5 480.7-481.6 485.5-486.2				
	Frenchman Springs 5	487.1	16.5	487.1-492.9	492.9-500.2				
	Frenchman Springs 6	503.5	8.2	503.5-504.0	504.0-507.2				
	Frenchman Springs 7	510.5	9.4	510.5-513.3	513.3-517.4				
	Frenchman Springs 8	521.2	39.3	521.2-529.1 (b)	529.1-540.4 544.8-546.2	540.4-543.2			
	Frenchman Springs 9	560.5	39.3	560.5-563.9	563.9-565.7 572.7-574.2				
	Frenchman Springs 10	599.8	23.8	599.8-600.8	600.8-606.6				
	Vantage Interbed	623.6	1.2						
Grande Ronde Basalt	Grande Ronde 1	624.8	18.3		628.5-634.9	624.8-626.7		<div style="border: 1px solid black; padding: 5px; text-align: center;">           INFORMATION            COPY            THIS COPY WILL NOT BE            REPLACED AND MAY BE            CHANGED WITHOUT NOTICE         </div>	
	Grande Ronde 2	643.1	16.8	643.1-646.5 (b)					
	Grande Ronde 3	659.9	46.6	659.9-661.1	661.1-662.9 669.1-669.6 670.6-680.6	663.5-666.6			
	Grande Ronde 4	706.5	9.4		706.5-709.3				
	Grande Ronde 5	716.0	84.7	716.0-720.2 (b)	720.2-722.1 743.1-744.0 744.0-744.6 745.5-752.9	744.9-745.5			



BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 6	800.7	36.9	800.7-803.8	803.8-804.7 806.2-807.0 808.9-816.6 820.8-822.7		833.0		
	Grande Ronde 7	837.6	15.2	837.6-838.0	838.0-843.1			847.3	
	Grande Ronde 8	852.8	19.5	858.3-859.8 (b)	852.8-856.0 857.7-858.3 859.8-863.2				
	Grande Ronde 9	872.3	29.3		872.3-876.0	876.0-879.7			
	Grande Ronde 10	901.6	67.1	901.6-902.2 914.4-916.5	910.7-911.7 967.4-968.7		953.1 953.8	929.0- 929.9	
	Grande Ronde 11	968.7	20.1	968.7-971.6	975.7-976.3 988.2-988.8				
	Grande Ronde 12	988.8	17.1+	988.8-989.7	990-1005.8			1011.6	
	TD-1005.8								

\*units include basalt  
members, flows, flow lobes  
and sedimentary interbeds

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Ground surface elevation = 223.1 All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)			DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom			
Saddle Mountains Basalt	Elephant Mountain	158.5	27.4						
	Rattlesnake Ridge Interbed	185.9	24.4						
	Pomona	210.3	44.2						
	Selah Interbed	254.5	22.9						
	Esquatzel	277.4	24.4						
	Cold Creek Interbed	301.7	30.5						
	Umatilla (Sillusi)	332.2	15.2						
	Umatilla	347.5	30.5						
Mabton Interbed	378.0	51.8							
Wanapum Basalt	Priest Rapids (Lolo)	429.8	25.9						
	Priest Rapids (Rosalia)	455.7	18.3						
	(Rosalia)	474.0	19.8						
	Roza	493.8	53.3						
	Frenchman Springs 1	547.1	54.9						
	Frenchman Springs 2	602.0	25.9						
	Frenchman Springs 3	627.9	7.0						
	Frenchman Springs 4	634.9	5.2						
Frenchman Springs 5	640.1	4.6							

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Frenchman Springs 6	644.6	6.1						
	Frenchman Springs 7	650.7	16.8						
	Frenchman Springs 8	667.5	15.2						
	Frenchman Springs 9	682.7	31.1						
	Frenchman Springs 10	713.8	39.6						
	Frenchman Springs 11	753.5	6.1						
	Vantage Interbed	766.6	13.1						
Grande Ronde Basalt	Grande Ronde 1	772.7	7.6						
	Grande Ronde 2	780.3	35.0						
	Grande Ronde 3	815.3	43.6						
	Grande Ronde 4	858.9	9.7						
	Grande Ronde 5	868.7	80.8						
	Grande Ronde 6	949.4	19.8						
	Grande Ronde 7	969.3	6.1						
	Grande Ronde 8	975.4	16.8						
	Grande Ronde 9	992.1	33.5						
	Grande Ronde 10	1025.6	33.5						
	Grande Ronde 11	1059.2	48.8+						
	TD-1107.9								
	*units include basalt members, flows, flow lobes and sedimentary interbeds								

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Ground surface elevation = 227.1 All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom					
Saddle Mountains Basalt	Lower Elephant Mountain	start of core 189.9	18.6		189.9-202.4 207.7-208.5				
	Rattlesnake Ridge Interbed	208.5	34.4						
	Pomona	242.9	40.2		242.9-246.3 276.7-278.3				
					278.9-281.3 (b)				
	Selah Interbed	283.1	16.1						
	Esquatzel	299.3	36.3		299.3-308.4 (b)	308.4-318.2			
	Cold Creek Interbed	335.6	21.3						
	Umatilla	356.9	64.9		356.9-358.1 368.2-369.1 372.2-372.8 377.9-378.6	360.0-361.8			
	Mabton Interbed	421.8	39.6						
Wanapum Basalt	Priest Rapids (Lolo)	461.5	49.7		461.5-462.7 462.7-463.3 465.7-469.1 476.1-476.4 477.6-478.1 479.1-479.4				
	Priest Rapids (Rosalia)	511.1	21.3		511.1-511.4	511.4-518.8	513.6-515.4 517.8-518.8	499.3 504.7	vesicle pipes or sheets 75

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Roza	532.5	51.5	532.5-533.1	533.1-535.5		534.6-535.5 536.7-537.7		
	Frenchman Springs 1	584.0	57.0	584.0-587.2	587.2-599.8 640.1-641.0		594.7-595.0 597.7-600.1		
	Frenchman Springs 2	641.0	29.6	641.0-643.7			651.0-651.3 655.0-655.3		
	Frenchman Springs 3	670.6	13.7		670.6-674.5				
	Frenchman Springs 4	684.3	12.5	684.3-685.8	685.8-689.8				
	Frenchman Springs 5	696.8	19.5	696.8-698.9	698.9-700.1				
	Frenchman Springs 6	716.3	36.3	716.3-723.9	726.3-738.2		721.5-721.8 727.5-727.9 729.7-730.0 744.9-746.1		
	Frenchman Springs 7	752.5	38.7	752.5-762.3 (b)	768.7-770.5				
	Frenchman Springs 8	791.3	20.4	791.3-792.2	792.2-795.5 807.1-808.0 809.2-810.8				
	Vantage Interbed	811.7	4.0						
Grande Ronde Basalt	Grande Ronde 1	815.6	19.8	815.6-816.9	816.9-821.7 834.2-835.4				
	Grande Ronde 2	835.4	16.8		835.4-838.5 851.6-852.2				
	Grande Ronde 3	852.2	52.4	852.2-860.7 (b)  904.0-904.6	860.7-861.2  865.0-872.0 876.0-876.9	862.3-862.9 872.0-876.0	856.5-858.0 860.7-879.0 895.8-897.0		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS	
Grande Ronde Basalt	Grande Ronde 4	904.6	81.1	904.6-908.6	932.1-940.6 951.9-953.1	908.6-910.7	911.6-924.4 928.1-929.3 933.0-934.2 957.1-958.6 965.0-965.9 967.7-973.5			
	Grande Ronde 5	985.7	34.7	985.7-990.9(b)	993.0-1006.7		1002.8-1003.1 1004.3-1005.2 1007.0-1007.9 1009.8-1010.1 1011.9-1016.2			
	Grande Ronde 6	1020.5	12.6	1020.5-1020.8	1020.8-1022.3 1032.7-1033.1		1021.1-1021.7 1025.6-1032.0			
	Grande Ronde 7	1033.1	20.6		1033.1-1042.4		1038.1-1052.2			
	Grande Ronde 8	1053.7	43.6	1053.7-1054.9	1066.2-1073.2	1054.9-1063.7	1064.4-1090.0			
	Grande Ronde 9	1097.3	64.0	1097.3-1114.3 (b)	1159.8-1161.3		1116.2-1161.3			
	Grande Ronde 10	1161.3	21.0	1161.3-1162.2	1162.2-1164.3		1171.0-1175.3			
	Grande Ronde 11	1182.3	36.3+	1182.3-1188.1 (b)	1190.8-1196.6 1201.8-1204.0	1188.4-1188.7	1200.6-1200.9 1204.3-1204.6 1204.9-1207.0 1208.8-1218.6			
	TD-1218.6									
		*units include basalt members, flows, flow lobes and sedimentary interbeds								

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Core hole DH-4

## DEEP BOREHOLE DATA TABLES

Ground surface elevation = 280.4 All numbers within table are drilled depths or thicknesses in meters.

Page 1 of 5

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA (b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 6.4	2.4		6.4-8.8					
	Lower Elephant Mountain	8.8	4.6	8.8-10.0	10.0-10.9 11.2-13.4					
	Rattlesnake Ridge Interbed	13.4	.3							
	Pomona Lobe	13.7	14.1	13.7-14.9	14.9-16.4					
	Pomona Lobe	28.0	22.9	28.0-28.3	28.3-30.8 35.0-40.2	30.8-34.7				
	Asotin	50.9	53.9	50.9-53.3(b)	53.3-64.0					
	Wilbur Creek	104.8	17.7	104.8-106.4(b)	105.8-108.8					
	Mabton Interbed	122.5	6.7							
Wanapum Basalt	Priest Rapids (Lolo) Lobe	129.2	21.9		135.0-137.2	132.3-134.4				
	Priest Rapids (Lolo) Lobe	151.2	3.3	151.2-151.5	151.5-152.1	152.1-154.5				
	Unnamed Interbed	154.5	.6							
	Priest Rapids (Rosalia) Lobe	155.1	8.8	155.1-155.4	155.4-159.7					
	Priest Rapids (Rosalia) Lobe	164.0	25.9	164.0-164.9 165.8-167.6	164.9-165.8 167.6-168.2 169.5-179.5					
	Quincy Interbed	189.9	.1							
	Upper Roza	190.0	42.8	190.0-193.2	193.2-195.1					

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Lower Roza	232.9	13.7	232.9-235.6	235.6-239.0				
	Frenchman Springs 1	246.6	23.8	246.6-250.0 269.4-270.3 (b)	250.0-251.5	251.8-252.7			
	Frenchman Springs 2	270.3	30.2	270.3-272.5 (b)	272.5-277.1 299.6-300.5				
	Frenchman Springs 3	300.5	31.4	300.5-302.0 307.5-309.4 315.1-322.5	302.0-307.5 309.4-312.7 314.2-315.1 322.5-328.0				
	Frenchman Springs 4	331.9	10.7	331.9-334.1	334.1-340.1				
	Frenchman Springs 5	342.6	9.4	342.6-343.2	343.2-346.5				
	Frenchman Springs 6	352.0	24.4	352.0-364.2 367.6-369.1	364.2-365.8 369.1-370.9				
	Frenchman Springs 7	376.4	14.3	376.4-376.7	376.7-384.3				
	Frenchman Springs 8	390.7	11.9	390.7-391.6	391.6-395.3				
	Frenchman Springs 9	402.6	48.1	402.6-415.7					
	Vantage Interbed	450.8	3.0						
Grande Ronde Basalt	Grande Ronde 1	453.8	5.5	453.8-454.4	454.4-456.3 459.0-459.3				
	Grande Ronde 2	459.3	25.3	459.3-470.3	470.3-470.6 479.1-479.7				
	Grande Ronde 3	484.6	15.8	484.6-487.1	487.1-491.0				
	Grande Ronde 4	500.5	8.5	500.5-502.9	502.9-506.9				
	Grande Ronde 5	509.0	17.7	509.0-512.4	512.4-521.2 561.7-567.2	521.2-528.8			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 6	587.6	49.1	587.6-588.5	588.5-591.6 595.3-595.6 598.3-603.8	594.4-595.3 595.6-597.4			
	Grande Ronde 7	636.7	5.2	636.7-637.0 639.5-639.8					
	Grande Ronde 8	641.9	34.1	641.9-642.2	642.2-643.7 644.6-650.1 662.6-663.2	650.1-652.0			
	Grande Ronde 9	676.0	25.6	676.0-677.9	677.9-679.4	679.4-682.1	686.1-686.7 698.0-700.1		
	Grande Ronde 10	701.6	39.9	701.6-714.1 (b)			733.9-741.6		
	Grande Ronde 11	741.6	34.1	741.6-742.5	742.5-743.4 747.7-749.2 751.0-768.7		750.1-750.7 763.8-775.4		
	Grande Ronde 12	775.7	10.0	775.7-776.0	776.0-776.9 780.3-781.8 783.0-785.8				
	Grande Ronde 13	785.8	103.6	785.8-786.7	786.7-787.3	787.3-803.1	818.4-819.3 869.3-869.9 872.0-874.5		
	Grande Ronde 14	889.4	14.9	889.4-890.3	890.3-892.7				
	Grande Ronde 15	904.3	22.9	904.3-913.5	913.5-915.0	915.0-916.2			
	Grande Ronde 16	927.2	18.3	927.2-941.9 (b) 954.9-960.7 (b)			952.5-953.1 964.7-973.2		
	Grande Ronde 17	976.0	23.2	976.0-976.6 986.6-987.2	976.6-979.0 987.2-988.8 990.0-991.8 992.7-994.9	994.9-995.8			

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 18	999.1	31.4	999.1-1005.5	997.9-999.1 1005.5-1009.2		1013.5-1015.6 1024.7-1028.7		
	Grande Ronde 19	1030.5	10.0	1030.5-1032.0	1032.0-1032.6				
	Grande Ronde 20	1040.6	26.8	1040.6-1041.2	1041.2-1044.2				
	Grande Ronde 21	1067.4	40.8	1067.4-1068.6 1072.3-1072.9 1074.4-1074.7 1074.7-1076.2 1080.8-1085.4	1068.6-1069.8 1072.9-1073.5 1074.4-1074.7 1082.3-1083.2 1085.4-1086.9				
	Grande Ronde 22	1108.2	38.4	1108.2-1109.1 1113.1-1115.3 1138.4-1140.2	1109.1-1110.7 1115.3-1117.7 1125.9-1128.4 1125.9-1128.4 1140.2-1141.2 1146.3-1146.6	1117.1-1120.4 1128.4-1130.5			
	Grande Ronde 23	1146.6	8.8	1146.6-1147.5 1154.6-1155.5 (b)	1147.5-1149.7				
	Grande Ronde 24	1155.5	32.0	1155.5-1160.1 1178.7-1183.5 (b)	1160.1-1161.6 1187.2-1187.5				
	Grande Ronde 25	1187.5	18.0	1187.5-1192.4	1192.4-1195.1				
	Grande Ronde 26	1205.5	47.2	1205.5-1297.3 (b)	1207.3-1208.8 1218.9-1222.8	1208.8-1216.8 1222.8-1228.3	1213.7-1231.7 1236.0-1236.9 1239.0-1244.5		
	Grande Ronde 27	1252.7	15.8	1252.7-1256.1 (b)	1256.1-1260.0 1263.1-1267.0				
	Grande Ronde 28	1268.6	9.1	1268.6-1269.2	1269.2-1271.0	1271.0-1271.6			
	Grande Ronde 29	1277.7	17.1	1277.7-1281.1 1286.2-1289.6	1281.1-1283.2	1289.6-1291.1			

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 30	1294.8	14.9	1294.8-1297.2	1297.2-1299.7				
	Grande Ronde 31	1309.7	7.6	1309.7-1310.3	1310.3-1311.8				
	Grande Ronde 32	1317.3	65.2	1317.3-1319.2 1321.9-1322.5 (b)	1319.2-1319.8				
	Grande Ronde 33	1382.6	11.0	1382.6-1384.1	1384.1-1385.6				
	Grande Ronde 34	1393.5	62.2+	1393.5-1419.4 1425.5-1434.4			1438.0-1455.7		
	TD-1455.7								
	*units include basalt members, flows, flow lobes, and sedimentary interbeds								

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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 61.6	11.6	61.6-64.9	70.7-73.1				
	Lower Elephant Mountain	73.1	18.6	73.1-81.7	81.7-83.5 86.6-87.5 88.1-88.7				
	Rattlesnake Ridge Interbed	91.7	7.0						
	Pomona	98.7	41.4	98.7-99.4	99.4-101.5				
	Selah Interbed	140.2	18.9						
	Asotin	159.1	26.5		171.6-172.8 173.7-185.6				Invasive
	Mabton Interbed	185.6	23.5						
Wanapum Basalt	Priest Rapids (Lolo)	209.1	12.2	209.1-209.7	209.7-219.4 221.0-221.3				some pipe vesicles
	Priest Rapids (Rosalia)	221.3	65.2	221.3-221.9 232.9-233.2 249.6-250.2	221.9-225.5 233.2-238.3 250.2-255.1 258.5-262.1				
	Quincy Interbed	277.4	.3						
	Upper Roza	277.7	41.7	277.7-278.9	278.9-285.6				
	Lower Roza	296.6	22.9	296.6-299.0	299.0-310.9 317.0-317.9 318.8-319.4				

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Wanapum Basalt	Squaw Creek Interbed	319.4	1.5						
	Frenchman Springs 1	320.9	60.3	320.9-321.5	321.5-333.1	333.1-337.7			
	Frenchman Springs 2	381.3	37.2	381.3-384.3	384.3-385.2				
	Frenchman Springs 3	418.5	13.1	418.5-419.1 (b)	419.1-423.1	423.1-425.2			
	Frenchman Springs 4	431.6	82.3	431.6-434.6	438.6-452.3 461.5-467.9	452.3-457.2			
	Vantage Interbed	513.9	8.5						
Grande Ronde Basalt	Grande Ronde 1	522.4	28.9	522.4-523.6	523.6-533.7				
	Grande Ronde 2	551.4	47.5	551.4-553.5	553.5-556.3 563.6-576.7				
	Grande Ronde 3	598.9	14.3	598.9-600.1	600.1-605.0				
	Grande Ronde 4	613.2	71.3	613.2-616.9	616.9-622.1 649.5-650.7 653.8-659.3	637.6-639.8			
	Grande Ronde 5	684.6	32.9	684.6-690.4	693.7-698.0 699.8-705.9	690.4-693.7 698.0-699.8 705.9-709.3	714.7-715.1		
	Grande Ronde 6	717.5	23.8	717.5-719.0	719.0-721.1				
	Grande Ronde 7	741.3	55.5	741.3-748.0	756.2-762.3 762.9-769.6				
	Grande Ronde 8	796.7	64.0	796.7-805.9 (b)			856.5-858.0		
	Grande Ronde 9	860.7	17.7	860.7-861.7	861.7-863.8	863.8-866.8	867.5-869.6		
	Grande Ronde 10	878.4	82.6	878.4-879.0	880.2-880.8	882.0-886.0 891.2-894.0 896.4-920.5	885.7-890.3 904.9-907.7 914.7-921.4		

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 11	961.0	42.7	961.0-962.5	962.5-970.5 956.5-961.9 1002.8-1003.7	998.2-1000.6	927.8-960.4 963.5-963.8 971.1-972.3 977.8-986.3		
	Grande Ronde 12	1003.7	89.0	1003.7-1012.8	1012.8-1015.0	1015.0-1017.4	1017.1-1019.5 1022.0-1046.1 1076.8-1091.8		
	Grande Ronde 13	1092.7	4.0	1092.7-1095.7					
	Grande Ronde 14	1096.7	42.7	1096.7-1098.2 (b)		1113.4-1116.5	1114.6-1130.2 1133.2-1139.0		
	Grande Ronde 15	1139.3	5.5		1139.3-1140.6		1141.8-1143.6		
	Grande Ronde 16	1144.8	18.9	1144.8-1150.6	1150.6-1154.0		1157.9-1158.8		
	Grande Ronde 17	1163.7	4.6	1164.0-1164.6	1164.6-1165.5 1168.0-1168.3				
	Grande Ronde 18	1168.3	34.7	1168.3-1176.8	1176.8-1177.4 1179.9-1182.0 1184.4-1193.9				
	Grande Ronde 19	1203.0	28.9	1203.0-1206.4 1221.3-1224.1 (b)	1206.4-1207.9	1207.9-1211.3	1230.2-1231.7	1222.2	
	Grande Ronde 20	1232.0	16.1	1232.0-1232.9	1232.9-1237.2				
	Grande Ronde 21	1237.2	25.3	1237.5-1249.7	1249.7-1259.6 1251.2-1258.5 1262.2-1266.1		1271.0-1273.4		
	Grande Ronde 22	1273.4	12.2	1273.4-1275.3	1375.3-1278.0				
	Grande Ronde 23	1285.6	27.7	1285.6-1286.2	1286.2-1296.0				
	Grande Ronde 24	1313.4	9.4	1313.4-1315.2	1322.5-1322.8				

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 25	1322.8	61.9	1322.8-1327.7 (b)	1329.5-1332.6 1333.5-1359.4 1384.4-1384.7		1332.6-1334.1 1335.0-1381.0		
	Grande Ronde 26	1384.7	9.1	1384.7-1387.1	1387.1-1388.0				
	Grande Ronde 27	1393.8	36.0	1393.8-1394.7	1394.7-1399.0	1399.0-1407.9			
	Grande Ronde 28	1429.8	63.7	1429.8-1434.7					
	Grande Ronde 29	1493.5	8.2	1493.5-1493.8	1493.8-1496.6		1497.8-1500.5		
	Grande Ronde 30	1501.7	18.0	1501.7-1502.3	1502.3-1502.9 1507.2-1509.1	1502.9-1503.8	1510.9-1518.5		
	Grande Ronde 31	1519.7	4.9+	1519.7-1520.3	1522.5-1524.6				
	TD-1524.6								
	*units include basalt members, flows, flow lobes and sedimentary interbeds								

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Ground surface elevation = 877.8 All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)			DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom			
Saddle Mountains Basalt	Elephant Mountain	0	14.0						
	Pomona	14.0	37.8						
	Umatilla	51.8	67.7						
	Mabton Interbed	119.5	25.3						
Wanapum Basalt	Priest Rapids (Lolo)	144.8	55.8						
	Priest Rapids (Rosalia)	200.5	18.3						
	Roza	218.8	45.7						
	Squaw Creek Interbed	264.6	10.4						
	Frenchman Springs 1	274.9	30.2						
	Frenchman Springs 2	305.1	22.6						
	Frenchman Springs 3	327.7	9.4						
	Frenchman Springs 4	337.1	6.1						
	Frenchman Springs 5	343.2	10.4						
	Frenchman Springs 6	353.6	9.4						
	Frenchman Springs 7	363.0	16.8						
	Frenchman Springs 8	379.8	18.3						
	Frenchman Springs 9	398.1	33.5						
Frenchman Spring 10	431.6	48.8							

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
	Frenchman Springs 11	480.4	22.9						
Grande Ronde Basalt	Grande Ronde 1	503.2	13.4						
	Grande Ronde 2	516.6	30.8						
	Grande Ronde 3	547.4	51.8						
	Grande Ronde 4	599.2	67.7						
	Grande Ronde 5	666.9	25.0						
	Grande Ronde 6	691.9	40.8						
	Grande Ronde 7	732.7	36.3						
	Grande Ronde 8	769.0	32.0						
	Grande Ronde 9	801.0	64.6						
	Grande Ronde 10	865.6	27.7						
	Grande Ronde 11	893.4	21.3						
	Grande Ronde 12	914.7	72.8						
	Grande Ronde 13	987.5	45.7						
	Grande Ronde 14	1033.3	8.8						
	Grande Ronde 15	1042.1	12.5						
	Grande Ronde 16	1054.6	83.5						
	Grande Ronde 17	1138.1	47.2						
	Grande Ronde 18	1185.4	75.3						
	Grande Ronde 19	1260.6	24.7						
	Grande Ronde 20	1285.3	45.7						

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 21	1331.1	58.8						
	Grande Ronde 22	1389.9	60.3						
	Grande Ronde 23	1450.2	21.0						
	Grande Ronde 24	1471.3	33.2						
	Grande Ronde 25	1504.5	19.5						
	Grande Ronde 26	1524.0	12.2						
	Grande Ronde 27	1536.2	79.2						
	Grande Ronde 28	1615.4	36.6						
	Grande Ronde 29	1652.0	152.4						
	Grande Ronde 30	1804.4	91.4						
	Grande Ronde 31	1895.8	42.7						
	Grande Ronde 32	1938.5	67.0						
	Grande Ronde 33	2005.6	24.4						
	Grande Ronde 34	2030.0	18.3						
	Grande Ronde 35	2048.2	4.3						
	Grande Ronde 36	2052.5	39.3						
	Grande Ronde 37	2091.8	68.0						
	Grande Ronde 38	2159.8	91.4						
	Grande Ronde 39	2251.2	55.5						
	Grande Ronde 40	2306.7	25.0						
	Grande Ronde 41	2331.7	50.0						

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA(b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 42	2381.7	110.0						
	Grande Ronde 43	2491.7	41.1						
	Grande Ronde 44	2532.9	54.9						
	Grande Ronde 45	2587.7	85.3						
	Grande Ronde 46	2673.1	33.5						
	Grande Ronde 47	2706.6	39.6						
	Grande Ronde 48	2746.2	27.4						
	Grande Ronde 49	2773.7	54.9						
	Grande Ronde 50	2828.5	59.4						
	Grande Ronde 51	2888.0	111.2						
	Grande Ronde 52	2999.2	45.7						
	Grande Ronde 53	3044.9	57.9						
	Grande Ronde 54	3102.9	64.0						
	Grande Ronde 55	3166.9	35.0						
	Grande Ronde 56	3201.9	45.7+						
		TD-3247.6							
	*units include basalt members, flows, flow lobes and sedimentary interbeds								

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Ground surface elevation = 120.1 All numbers within table are drilled depths or thicknesses in meters.

BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	INTERVAL OF FLOW TOP OR BOTTOM RUBBLE OR BRECCIA(b)		VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
				top - bottom	top - bottom					
Saddle Mountains Basalt	Upper Elephant Mountain	start of core 109.4	10.0							
	Lower Elephant Mountain	119.5	30.3	119.5-128.6 (b)		132.0-132.6 133.5-135.6				
	Rattlesnake Ridge Interbed	149.8	5.6							
	Pomona	155.4	58.2	155.4-160.3	160.3-161.2	161.2-166.4				
	Selah Interbed	213.7	17.1							
	Asotin	230.7	65.2	230.7-232.9 289.2-293.8 (b)	232.9-241.7 270.3-276.1 276.7-278.9					
	Mabton Interbed	296.0	31.1							
Wanapum Basalt	Priest Rapids (Lolo)	327.0	38.4	327.0-327.6	327.6-328.2	328.2-333.7				
	Priest Rapids (Rosalia) Lobe	365.4	28.9	365.4-367.0 371.8-372.1 376.7-377.3	367.0-369.7 372.1-374.6 377.3-384.3	374.6-376.1				
	Roza	394.4	60.0	394.4-400.0	400.0-407.8	407.8-411.8	415.4-416.3	423.4		
	Frenchman Springs 1	454.4	32.0	454.4-455.6	455.6-457.8					
	Frenchman Springs 2	486.5	15.8	486.5-487.1 488.3-489.2	487.1-488.3 489.2-490.1 491.6-492.2 492.5-494.4 502.0-502.3					

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BASALT FORMA- TION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS	
Wanapum Basalt	Frenchman Springs 3	502.3	8.8	502.3-502.9	502.9-504.7					
	Frenchman Springs 4	511.1	16.4	511.1-515.7 (b)						
	Frenchman Springs 5	527.6	7.6	527.6-528.8	528.8-530.9					
	Frenchman Springs 6	535.2	10.0	535.2-535.5	535.5-538.6					
	Frenchman Springs 7	545.3	13.7	545.3-545.6	545.6-551.1					
	Frenchman Springs 8	559.0	16.4	559.0-561.7	561.7-563.3	565.4-566.3				
	Frenchman Springs 9	575.5	11.6	575.5-576.1	576.1-577.6 578.5-579.1		582.5			
	Frenchman Springs 10	587.0	51.5	587.0-591.6 592.6-592.9	591.6-592.8 592.9-598.3 600.4-602.9	598.3-600.4	582.5			
	Frenchman Springs 11	638.5	16.1	638.5-640.4	640.4-641.9 653.5-653.8		650.7-651.0			
	Grande Ronde Basalt	Grande Ronde 1	654.7	12.8	654.7-655.0	655.0-658.4 665.4-667.5				
		Grande Ronde 2	667.5	54.2	667.5-669.3	669.3-670.2 671.8-677.3 681.8-683.7 692.5-697.7 698.6-699.5 700.1-705.3	683.7-685.5	696.5-698.0 698.6-702.2		
Grande Ronde 3		721.8	18.0	721.8-723.0	723.0-729.1 737.0-738.2					
Grande Ronde 4		739.7	78.9	739.7-744.3 744.3-745.5 (b) 747.1-755.9	773.9-785.2 818.4-818.7		801.6-807.4			
Grande Ronde 5		818.7	13.4	818.7-819.3	819.3-819.6					

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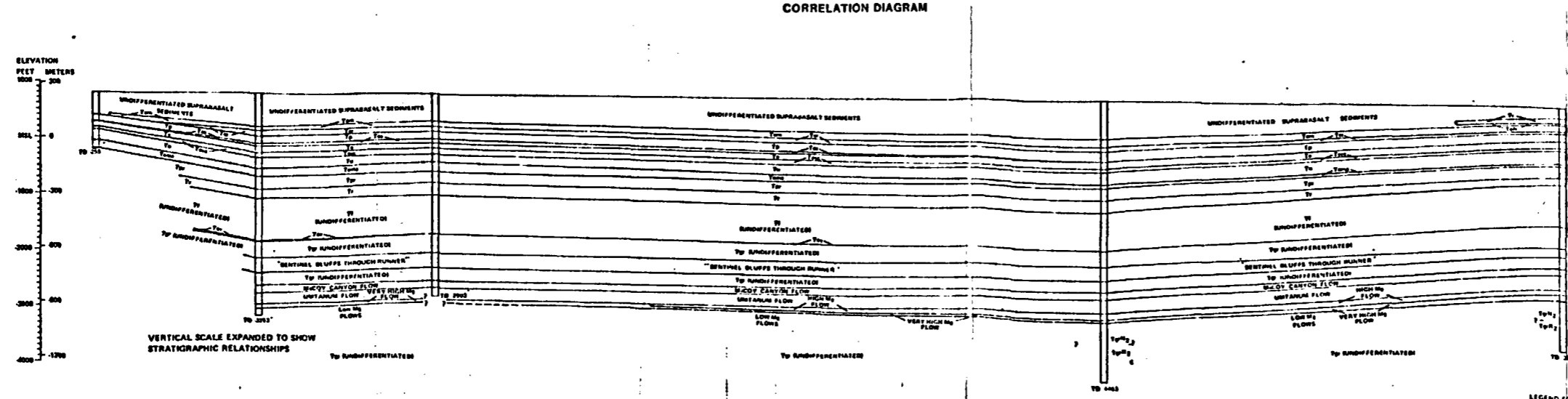
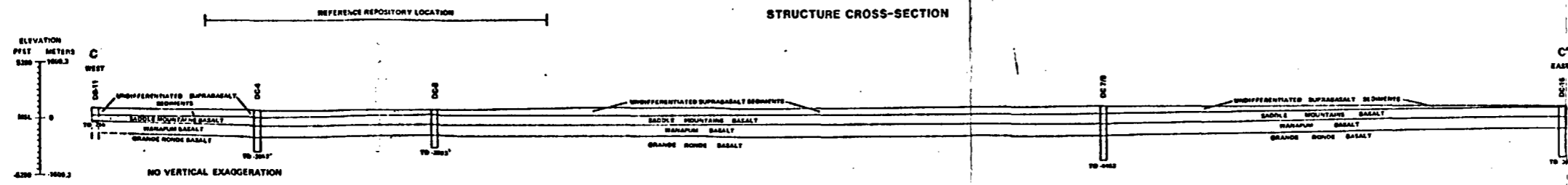
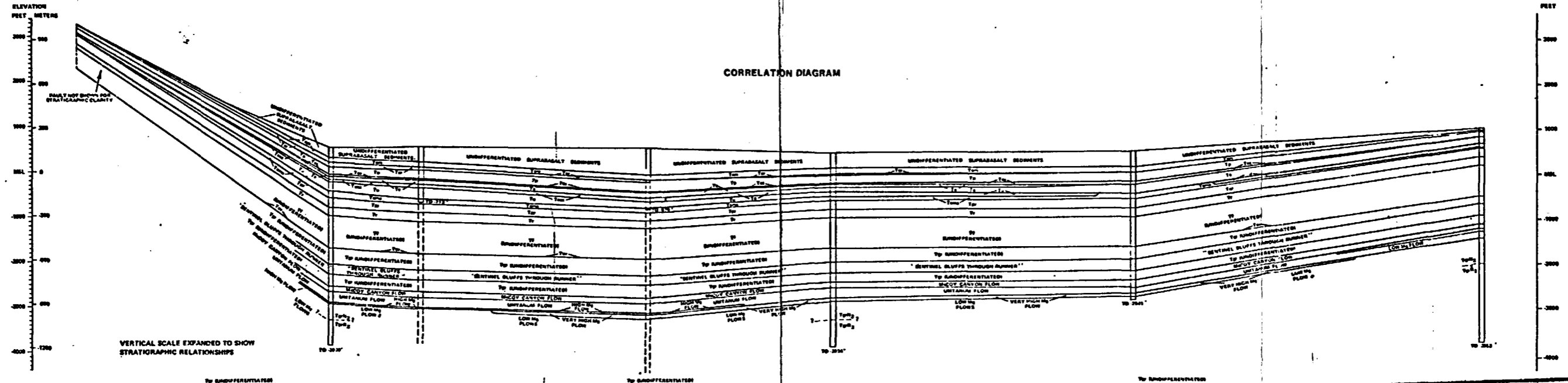
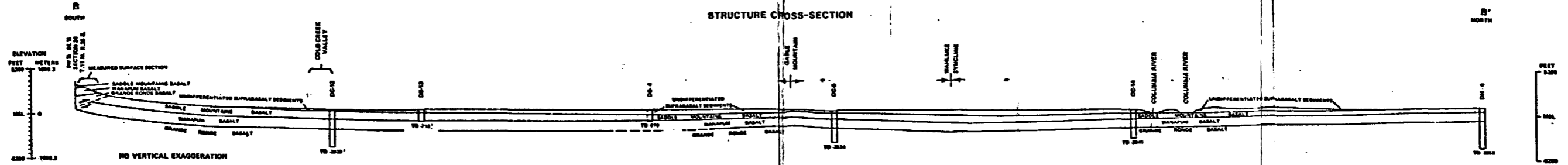
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BASALT FORMATION	STRATIGRAPHIC UNITS*	CONTACT (top of unit)	THICKNESS	RUBBLE OR BRECCIA (b) top - bottom	VESICLE ZONE top - bottom	VUGGY ZONE top - bottom	DISKING	TECTONIC FRACTURES	COMMENTS
Grande Ronde Basalt	Grande Ronde 6	832.1	28.9	832.1-832.7	832.7-834.2 846.4-847.0	834.2-839.7	844.3 850.4-851.0 855.0-855.6 858.9-859.5		
	Grande Ronde 7	861.1	22.2	861.1-861.7	861.7-870.8		869.6		
	Grande Ronde 8	883.3	53.0	883.3-883.6 894.9-901.0	883.6-886.3 888.2-888.8 891.5-894.9 909.5-914.1 916.8-921.4	907.1-909.5 914.1-916.2	902.2-913.8 914.4-916.8 920.5	923.5- 923.8	
	Grande Ronde 9	936.3	39.4	936.3-946.7 (b) 948.2-950.4 (b) 952.2-955.8 (b) 975.4-975.7 (b) vesicular			937.3-937.9 956.5-967.1 969.0-971.4 972.3-973.2	972.0	
	Grande Ronde 10	975.7	9.1	975.7-979.9 (b)			980.5-983.6		
	Grande Ronde 11	984.8	15.2	984.8-985.1	985.1-986.9 997.9-1000.0				
	Grande Ronde 12	1000.0	8.5	1000.0-1001.6 1002.5-1005.2 (b)	1001.6-1002.2				
	Grande Ronde 13	1008.6	7.9+	1008.6-1009.2	1009.2-1009.5 1011.3-1014.4				
	TD-1016.5								

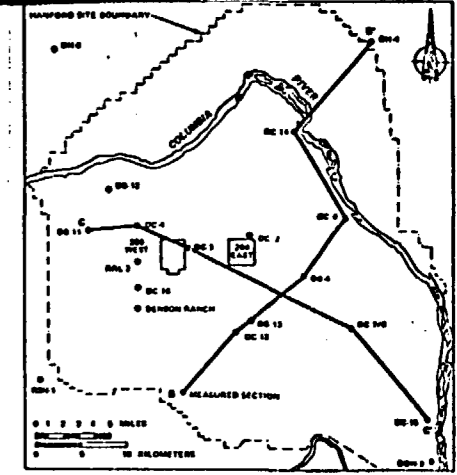
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BY		DATE		RICHLAND WASHINGTON 3824	
BY		DATE		DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHART AND STRUCTURE CROSS SECTIONS	
BY		DATE		SCALE AS NOTED	
BY		DATE		INDEX NO.	
BY		DATE		DRAWING NO.	
BY		DATE		SHEET NO.	
BY		DATE		RSU 88-10-C35	

LEGEND FOR SYMBOLS ON SHEET 8 OF 8





**DESCRIPTION OF UNITS**

**SUPRABASALT SEDIMENTS**  
 SUPRABASALT SEDIMENTS INCLUDE PRINCIPALLY THE HANFORD AND RINGOLD FORMATIONS BUT ALSO INCLUDE OVERLYING THE CLINE DEPOSITS. THE HANFORD FORMATION CONSISTS OF SAND AND GRAVEL DEPOSITS OF QUATERNARY CALISTOPIAN FLOODS. THE RINGOLD FORMATION CONSISTS OF SILT, SAND AND CONGLOMERATE DEPOSITED IN A LATE TERTIARY FLUVIAL AND LACUSTRINE ENVIRONMENT. HOLOCENE DEPOSITS CONSIST OF DUNE SAND, LOESS, COLLUVIUM AND ALLUVIUM.

**ELLENSBURG FORMATION**  
 SEDIMENTARY BEDS OF THE ELLENSBURG FORMATION ARE INTERCALATED WITH AND OVERLIE THE FLOWS OF THE COLUMBIA RIVER BASALT GROUP IN THE WESTERN AND CENTRAL COLUMBIA PLATEAU OF WASHINGTON. ELLENSBURG BEDS LYING BETWEEN COLUMBIA RIVER BASALT FLOWS ARE REFERRED TO AS INTERBEDS AND HAVE INFORMAL MEMBER STATUS. EACH OF THE INTERBEDS OCCURRING IN THE PASCO BASIN ARE DESCRIBED BELOW.

**LEVEY INTERBED**  
 THE LEVEY INTERBED LIES BETWEEN THE ICE HARBOR AND ELEPHANT MOUNTAIN MEMBERS OF THE SADDLE MOUNTAINS BASALT AND IS THE YOUNGEST ELLENSBURG UNIT IN THE PASCO BASIN. IT CONSISTS OF TUFFACEOUS SILT OR SILTSTONE.

**RATTLESNAKE RIDGE INTERBED**  
 THE RATTLESNAKE RIDGE INTERBED COMPRISES THREE FACIES BASED ON LITHOLOGY AND FLUXURE. THE FIRST FACIES OCCURS IN THE CENTRAL COLD CREEK SYNCLINE AREA AND GENERALLY CONSISTS OF THREE UNITS: (A) A LOWER CLAY OR TUFFACEOUS SANDSTONE, (B) A MIDDLE, MICACEOUS-ARKOSIC AND/OR TUFFACEOUS SANDSTONE, AND (C) AN UPPER TUFFACEOUS SILTSTONE OR TUFFACEOUS SANDSTONE. THE SECOND FACIES IS A SINGLE TUFFACEOUS SANDSTONE TO SILTSTONE UNIT AND OCCURS WHERE THE INTERBED IS RELATIVELY THIN. THE THIRD FACIES OCCURS ON THE NORTHWESTERN MARGIN OF THE PASCO BASIN AND IS A CONGLOMERATE WITH PLUTONIC AND METAMORPHIC CLASTS.

**SELAH INTERBED**  
 THE SELAH INTERBED IS A VARIABLE MIXTURE OF SILTY OR SANDY, VITRIC TUFF, ARKOSIC SANDS, TUFFACEOUS CLAYS, AND LOCAL, THIN STRINGERS OF PREDOMINANTLY BASALTIC GRAVEL. THE UPPER PORTION OF THE SELAH INTERBED IS A VITRIC TUFF COMMONLY FUSED TO A PERLITIC VITRIC TUFF BY THE OVERLYING POMONA MEMBER.

**COLD CREEK INTERBED**  
 THE COLD CREEK INTERBED IS THE SEQUENCE OF ELLENSBURG UNITS THAT OCCUR STRATIGRAPHICALLY BETWEEN THE ESQUATZEL AND UMATILLA MEMBERS OF THE SADDLE MOUNTAINS BASALT. THREE SEPARATE UNITS OF THE INTERBED ARE IDENTIFIED ON THE BASIS OF BOUNDING FLOWS. THESE INTERVALS ARE THE UMATILLA-ESQUATZEL, UMATILLA-ASOTIN, AND ASOTIN-ESQUATZEL INTERVALS.

**ASOTIN-ESQUATZEL INTERVAL**  
 THE ASOTIN-ESQUATZEL INTERVAL CONSISTS OF TUFFS AND CLAY LAYERS, ARKOSIC TO QUARTZOSE SANDSTONES, AND BASALTIC CONGLOMERATES.

**UMATILLA-ESQUATZEL INTERVAL**  
 THE UMATILLA-ESQUATZEL INTERVAL EXHIBITS TWO TEXTURAL FACIES: (1) A FINER GRAINED, TUFFACEOUS SANDSTONE FACIES, AND (2) A COARSER SANDSTONE AND CONGLOMERATE FACIES WITH TUFFACEOUS SILTSTONE AND CLAYS.

**UMATILLA-ASOTIN INTERVAL**  
 THE UMATILLA-ASOTIN INTERVAL IS COMPOSED CHIEFLY OF TUFFACEOUS SILTSTONES AND TUFFACEOUS CLAYSTONES.

**MABTON INTERBED**  
 THE MABTON INTERBED LIES BETWEEN THE SADDLE MOUNTAINS BASALT AND ABOVE THE WANAPUM BASALT. FROM TOP TO BOTTOM, THE INTERBED CONSISTS OF: (1) A WELL INDURATED, LAPILLI TUFFSTONE, LOCALLY BAKED; (2) A FINE GRAINED, TUFFACEOUS, CLAYEY QUARTZITIC SANDSTONE; (3) A QUARTZITIC TO ARKOSIC SANDSTONE WITH INTERLAYERED TUFFACEOUS SANDSTONES AND SILTSTONES; AND (4) A THIN, DISCONTINUOUS, BASAL, SILTY CLAY.

**VANTAGE INTERBED**  
 THE VANTAGE INTERBED IS COMPRISED OF SEDIMENTS LYING BETWEEN THE WANAPUM BASALT AND THE GRANDE RONDE BASALT. SAPROLITE COMMONLY OCCURS AT THE TOP OF GRANDE RONDE BASALT IN AREAS WHERE NO SEDIMENTS WERE DEPOSITED. THE THICKER SEQUENCES OF VANTAGE CONSIST OF ARKOSIC SANDSTONE, LOCALLY CONTAINING THIN CLAY STRINGERS WITH A CLAY CAP. THE THINNER SEQUENCES OF VANTAGE CONSIST OF CLAYS WHICH ARE ALTERED TUFFS.

**SADDLE MOUNTAINS BASALT**  
 THE SADDLE MOUNTAINS BASALT CONSISTS OF SEVEN MEMBERS IN THE PASCO BASIN: (1) UMATILLA, (2) WILBUR CREEK, (3) ASOTIN, (4) ESQUATZEL, (5) POMONA, (6) ELEPHANT MOUNTAIN, AND (7) ICE HARBOR.

**ICE HARBOR MEMBER**  
 THE ICE HARBOR MEMBER IS THE YOUNGEST MEMBER OF THE SADDLE MOUNTAINS BASALT AND CONSISTS OF THREE FLOWS: (1) WARTZINGER FLOW, (2) HUNTINGER FLOW, AND (3) HUNTINGER FLOW. THE FLOWS ARE FINE TO MEDIUM GRAINED WITH OLIVINE PHENOCRYSTS AND PHENOCRYSTS OF OLIVINE, PLAGIOCLASE, AND CLINOPYROXENE. OLIVINE OCCURS PRIMARILY IN THE WARTZINGER AND HUNTINGER FLOWS, WHEREAS THE GOOSE ISLAND FLOW CONTAINS OLIVINE PHENOCRYSTS OF PYROXENE AND PLAGIOCLASE.

**ELEPHANT MOUNTAIN MEMBER**  
 THE ELEPHANT MOUNTAIN MEMBER CONSISTS OF TWO SEPARATE FLOWS: THE ELEPHANT MOUNTAIN FLOW, AND THE WARD GAP FLOW. THE TEXTURE OF THE FLOWS IS MEDIUM TO FINE GRAINED WITH ABUNDANT MICROPHENOCRYSTS OF PLAGIOCLASE.

**POMONA MEMBER**  
 THE POMONA MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOBES. THE TEXTURE IS RELATIVELY UNIFORM, TYPICALLY FINE GRAINED TO GLASSY WITH WEDGE-SHAPED PLAGIOCLASE PHENOCRYSTS AND SPARSE OLIVINE.

**ESQUATZEL MEMBER**  
 THE ESQUATZEL MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOBES THAT OCCUR LOCALLY WITH A VITRIC TUFF BETWEEN THEM. THE MEMBER IS COMMONLY PLAGIOCLASE PHYRIC TO CLINOPYROXENIC AND CONTAINS MICROPHENOCRYSTS OF CLINOPYROXENE, HOWEVER, SOME LOCALITIES LACK PHENOCRYSTS.

**ASOTIN MEMBER**  
 THE ASOTIN MEMBER OCCURS IN THE PASCO BASIN AS A SINGLE FLOW, THE HUNTINGER FLOW. THE TEXTURE OF THE HUNTINGER FLOW RANGES FROM FINE GRAINED AND GLASSY TO OPHITIC. THE FLOW HAS ABUNDANT OLIVINE, BUT PLAGIOCLASE IS SPARSE.

**WILBUR CREEK MEMBER**  
 THE WILBUR CREEK MEMBER IN THE PASCO BASIN CONSISTS OF ONE FLOW, THE WAHLUKE FLOW. IT IS TYPICALLY FINE GRAINED TO GLASSY AND APHYRIC WITH SPARSE MICROPHENOCRYSTS OF PLAGIOCLASE.

**UMATILLA MEMBER**  
 THE UMATILLA MEMBER CONSISTS OF TWO FLOWS, THE YOUNGER FLOW IS THE SILLUSI FLOW AND THE OLDER FLOW IS THE UMATILLA FLOW. BOTH FLOWS ARE FINE GRAINED TO GLASSY WITH MICROPHENOCRYSTS OF PLAGIOCLASE AND OLIVINE. THE FLOWS ARE PREDOMINANTLY ENTALTAURE WITH A RELATIVELY THIN BASAL COLONNADE.

**WANAPUM BASALT**  
 THE WANAPUM BASALT IN THE PASCO BASIN CONSISTS OF THREE MEMBERS: (1) FRENCHMAN SPRINGS, (2) ROZA, AND (3) PRIEST RAPIDS.

**PRIEST RAPIDS MEMBER**  
 THE PRIEST RAPIDS MEMBER CONSISTS OF TWO DISTINCT FLOWS. AN OLDER FLOW (ROZALIA, CHEMICAL TYPE) IS TYPICALLY COARSE GRAINED, SPARSE OLIVINE, PLAGIOCLASE PHENOCRYSTS. THE YOUNGER FLOW (LOLD CHEMICAL TYPE) HAS SMALL OLIVINE PHENOCRYSTS (H:MM) AND RARE OLIVINE PHENOCRYSTS OF PLAGIOCLASE.

**ROZA MEMBER**  
 THE ROZA MEMBER CONSISTS OF ONE OR TWO FLOWS OR FLOW LOBES. IN HAND SPECIMEN IT IS CHARACTERIZED BY THE PRESENCE OF SINGLE PLAGIOCLASE PHENOCRYSTS UP TO 1.0 CM IN SIZE SET IN A FINE GRAINED GROUND MASS.

**FRENCHMAN SPRINGS MEMBER**  
 THE FRENCHMAN SPRINGS MEMBER IS THE OLDEST MEMBER OF THE WANAPUM BASALT AND CONSIST OF APPROXIMATELY THREE TO TWELVE FLOWS. THE FLOWS ARE ALL MEDIUM TO FINE GRAINED AND CONTAIN PLAGIOCLASE PHENOCRYSTS. THE FLOWS ARE COMMONLY GROUPED INTO "PHYRIC" AND "APHYRIC" UNITS.

**GRANDE RONDE BASALT**  
 THE GRANDE RONDE BASALT IS A THICK SEQUENCE OF AT LEAST 56 BASALT FLOWS WHICH UNDERLIE THE SADDLE MOUNTAINS AND WANAPUM BASALTS. THESE FLOWS ARE TYPICALLY FINE GRAINED AND APHYRIC OR SPARSELY MICROPHYRIC. WITH FEW CONSISTANT TEXTURAL DIFFERENCES AMONG THEM, CHANGING BASALT FLOWS ARE CORRELATED IN PRINCIPAL ON THE BASIS OF MAGNETOSTRATIGRAPHIC UNITS (M1, M2, R2, AND R3) DETERMINED BY REVERSALS IN THE PALEOMAGNETIC POLARITY OF THE FLOWS. FLOWS RECOGNIZED WITHIN PASCO BASIN ARE OF THE R2 AND R3 MAGNETOSTRATIGRAPHIC UNITS. TWO MAJOR SEQUENCES OF FLOWS DISTINGUISHED ON THE BASIS OF CHEMICAL COMPOSITION HAVE BEEN RECOGNIZED WITHIN THE PASCO BASIN: (1) THE SCHWANA SEQUENCE, CONSISTING ALMOST ENTIRELY OF FLOWS WITH RELATIVELY LOW Mg CONTENT (LOW Mg CHEMICAL TYPE), AND (2) THE SENTINEL BLUFFS SEQUENCE, CONSISTING ENTIRELY OF FLOWS WITH HIGHER Mg CONTENT (HIGH Mg CHEMICAL TYPE). THE SCHWANA SEQUENCE LIES STRATIGRAPHICALLY BELOW THE SENTINEL BLUFFS SEQUENCE. THE CONTACT BETWEEN THESE TWO SEQUENCES IS KNOWN AS THE M2 HORIZON.

**SENTINEL BLUFFS SEQUENCE**  
 THE SENTINEL BLUFFS SEQUENCE CONSISTS OF 7 TO 10 FLOWS ALL OF HIGH Mg CHEMICAL TYPE AND ALL WITHIN THE R2 MAGNETOSTRATIGRAPHIC UNIT. THE M2C0 CANYON FLOW IS THE LOWEST FLOW IN THE SENTINEL BLUFFS SEQUENCE. WITHIN THE SENTINEL BLUFFS SEQUENCE, TWO C0 HORIZONS OCCUR. THE LOWER HORIZON IS MARKED BY A LOWER C0 CONTENT RELATIVE TO THE 3 TO 4 FLOWS OVERLYING IT. THE UPPER C0 HORIZON IS DEFINED BY A SINGLE FLOW OF RELATIVELY LOW C0.

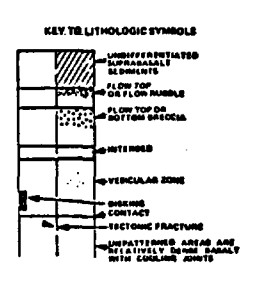
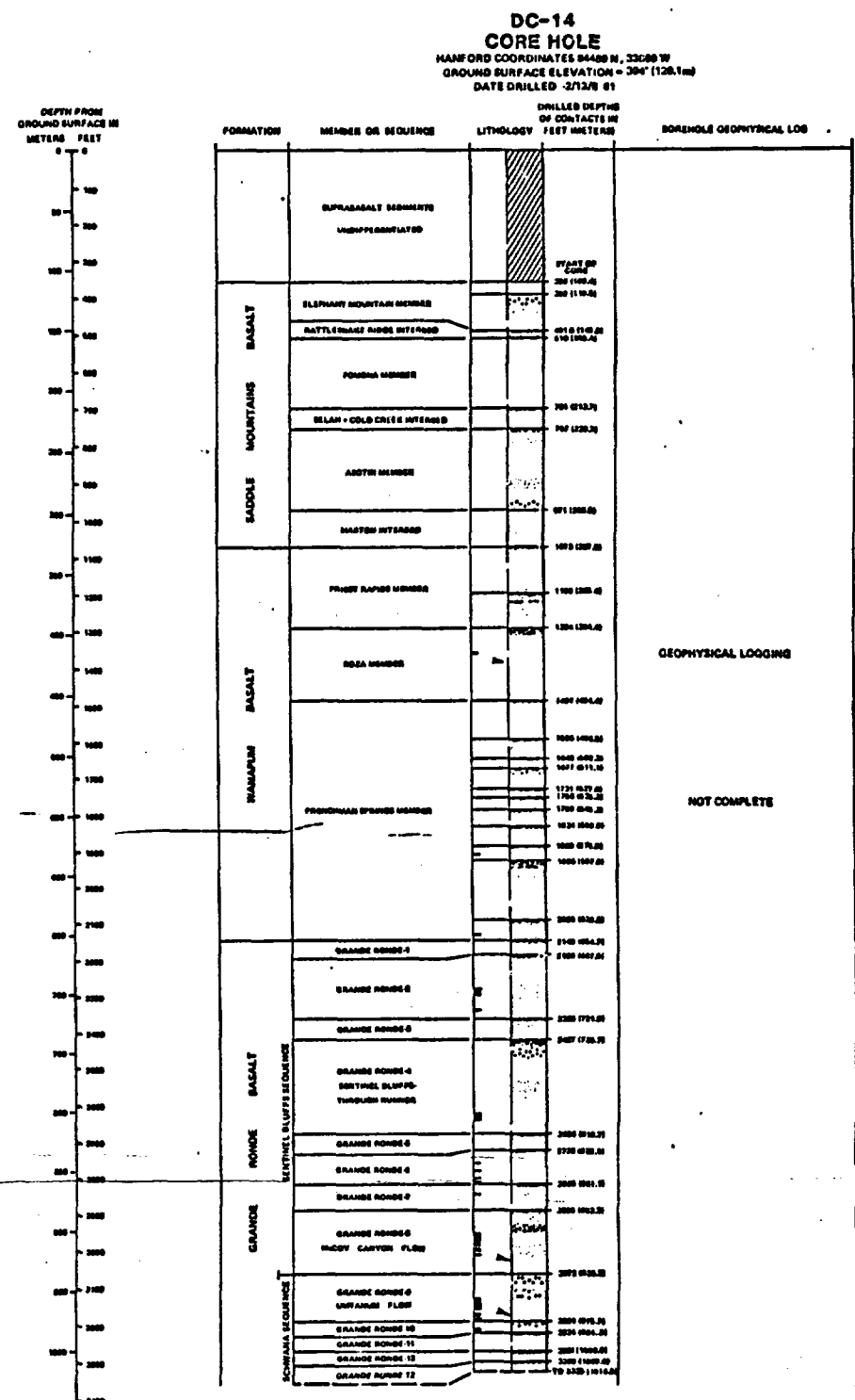
**SCHWANA SEQUENCE**  
 THE SCHWANA SEQUENCE CONSISTS OF DOMINANTLY LOW Mg FLOWS. THREE FLOWS NEAR THE TOP OF THE SEQUENCE ARE NOTABLE EXCEPTIONS. THE LOWERMOST OF THESE THREE FLOWS IS A FLOW OF VERY HIGH Mg CHEMICAL TYPE WHICH OCCURS TWO TO FOUR FLOWS BELOW THE M2 HORIZON. THE OTHER TWO FLOWS ARE OF HIGH Mg CHEMICAL TYPE AND ARE INTERCALATED WITH THE LOW Mg FLOWS IN THE UPPER PART OF THE SCHWANA SEQUENCE. THE UMATANUM FLOW IS A THICK, LATERALLY EXTENSIVE FLOW RECOGNIZED BY ITS DISTINCTIVE CHEMICAL COMPOSITION AND PALEOMAGNETIC PROPERTIES. THE UPPERMOST FLOW IN THE SCHWANA SEQUENCE EXCEPT AT TWO LOCALITIES (DN-4 AND UMATANUM FLOW) NEAR PRIEST RAPIDS (UAM) WHERE A SINGLE RELATIVELY THIN FLOW OF LOW TO INTERMEDIATE Mg CHEMICAL TYPE OVERLIES THE UMATANUM FLOW.

**ADDITIONAL INFORMATION ON STRATIGRAPHY OF THE COLUMBIA RIVER BASALT GROUP MAY BE FOUND IN THE FOLLOWING PUBLICATIONS:**

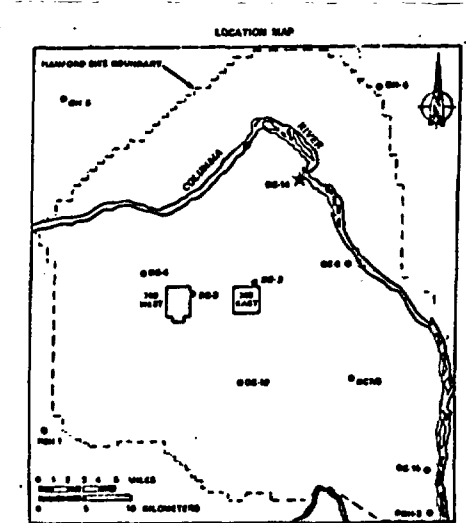
Myers, C. W., Price, S. M., Coppens, J. A., Cochran, M. P., Cramer, W. J., Dunder, R. L., Evers, R. C., Frank, K. R., Holmer, G. E., Jones, M. G., Kuntz, J. R., Landon, R. D., Ledgerwood, R. K., Little, J. T., Long, P. E., Mitchell, T. M., Price, E. H., Reed, S. P., and Talmadge, A. M., 1978, Geologic Studies of the Columbia Plateau, a status report. RNO-BWI-ST-4, Rockwell Hanford Operations, Richland, Washington.

Reed, S. P., and Focht, K. R., Chapter 3 - Wanapum and Saddle Mountains Basalts of the Cold Creek syncline area, Long, P. E., and Landon, R. D., Chapter 4 - Stratigraphy of the Grande Ronde Basalt, and Meek, D. A., Chapter 5 - Basaltic Conege Studes, all in 1981, Subsurface geology of the Cold Creek syncline. Myers, C. W., and Price, S. M., editors, RNO-BWI-ST-14, Rockwell Hanford Operations, Richland, Washington.

Swenson, D. A., Wright, T. L., Hooper, P. R., and Bentley, R. D., 1978, Revisions in stratigraphic nomenclature of the Columbia River Basalt Group. U. S. Geological Survey Bulletin 1457-G.



**EXPLANATION**  
 GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN OTHER NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.



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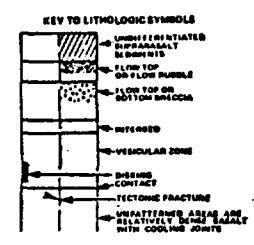
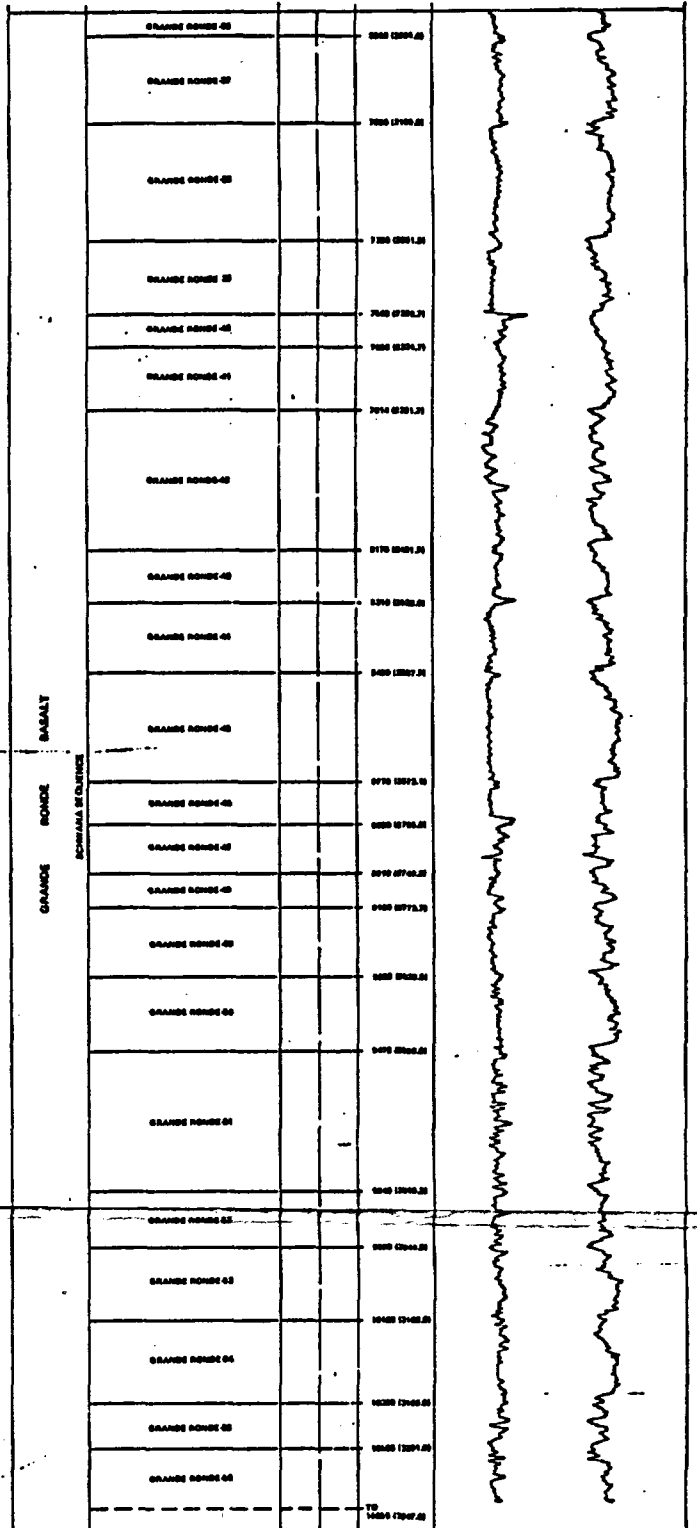
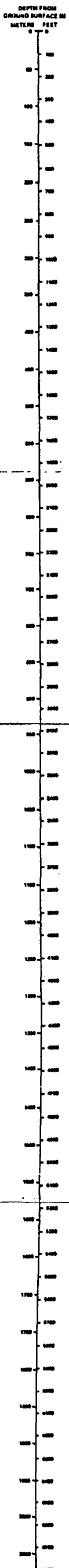
DRAWING APPROVED	DATE	U.S. DEPARTMENT OF ENERGY
APPROVED		OPERATIONS OFFICE
		ROCKWELL HANFORD OPERATIONS
		DEPT. BOREHOLE STRATIGRAPHY
		CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE	VERTICAL: 1" = 50'	PLATE NO.
DATE		INDEX NO.
CLASSIFICATION		SHEET NO. 7 OF 8

ASD-BWI-DF-038

**RSH-1  
ROTARY BOREHOLE**  
NO HANFORD COORDINATES  
GROUND SURFACE ELEVATION = 289' (87.8m)  
DATE DRILLED 7/7/57 - 4/8/58

BOREHOLE GEOPHYSICAL LOG

FORMATION	MEMBER OR SEQUENCE	DEPTH OF CONTACTS IN FEET METERS	LITHOLOGY	NATURAL GAMMA	SOUND TRANSMIT TIME	
SADDLE MOUNTAIN BASALT	ELEPHANT MOUNTAIN MEMBER	42 (12.8)				
	POUNDA MEMBER	110 (33.6)				
	UMATELLA MEMBER	300 (91.4)				
WAMAPUM BASALT	MASTON INTERBED	478 (145.3)				
	PRIEST RAPIDS MEMBER	500 (152.4)				
	ROSA MEMBER	710 (216.3)				
	ROMAN CREEK MTF MEMBER	800 (243.8)				
	FRENCHMAN SPRINGS MEMBER		1000 (304.8)			
			1075 (327.2)			
			1100 (335.3)			
			1140 (347.6)			
			1160 (353.1)			
			1200 (365.8)			
SENTINEL BLUFF SEQUENCE	GRANDE RONDE 1	1400 (426.7)				
	GRANDE RONDE 2	1450 (442.1)				
	GRANDE RONDE 3	1500 (457.2)				
	GRANDE RONDE 4	1550 (472.3)				
	GRANDE RONDE 5	1600 (487.4)				
	GRANDE RONDE 6	1650 (502.5)				
	GRANDE RONDE 7	1700 (517.6)				
	GRANDE RONDE 8	1750 (532.7)				
	GRANDE RONDE 9	1800 (547.8)				
	GRANDE RONDE 10	1850 (562.9)				
	GRANDE RONDE 11	1900 (578.0)				
GRANDE RONDE BASALT	GRANDE RONDE 12	1950 (593.1)				
	GRANDE RONDE 13	2000 (608.2)				
	GRANDE RONDE 14	2050 (623.3)				
	GRANDE RONDE 15	2100 (638.4)				
	GRANDE RONDE 16	2150 (653.5)				
	GRANDE RONDE 17	2200 (668.6)				
	GRANDE RONDE 18	2250 (683.7)				
	GRANDE RONDE 19	2300 (698.8)				
	GRANDE RONDE 20	2350 (713.9)				
	GRANDE RONDE 21	2400 (729.0)				
SCYTHIAN SEQUENCE	GRANDE RONDE 22	2450 (744.1)				
	GRANDE RONDE 23	2500 (759.2)				
	GRANDE RONDE 24	2550 (774.3)				
	GRANDE RONDE 25	2600 (789.4)				
	GRANDE RONDE 26	2650 (804.5)				
	GRANDE RONDE 27	2700 (819.6)				
	GRANDE RONDE 28	2750 (834.7)				
	GRANDE RONDE 29	2800 (849.8)				
	GRANDE RONDE 30	2850 (864.9)				
	GRANDE RONDE 31	2900 (880.0)				

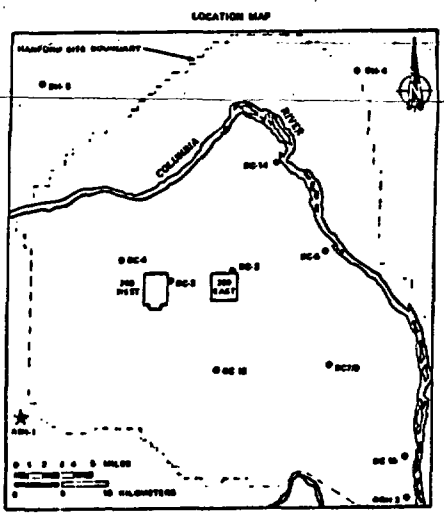


**EXPLANATION**

GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN DC-4. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

\* LITHOLOGIC INFORMATION IS NOT AVAILABLE FOR RSH-1 BECAUSE HOLE WAS CONSTRUCTED BY ROTARY DRILLING. HENCE, CORE SAMPLES WERE NOT AVAILABLE. FLOW CONTACTS WERE PICKED ON THE BASIS OF GEOPHYSICAL LOGS AND CHEMICAL ANALYSES.

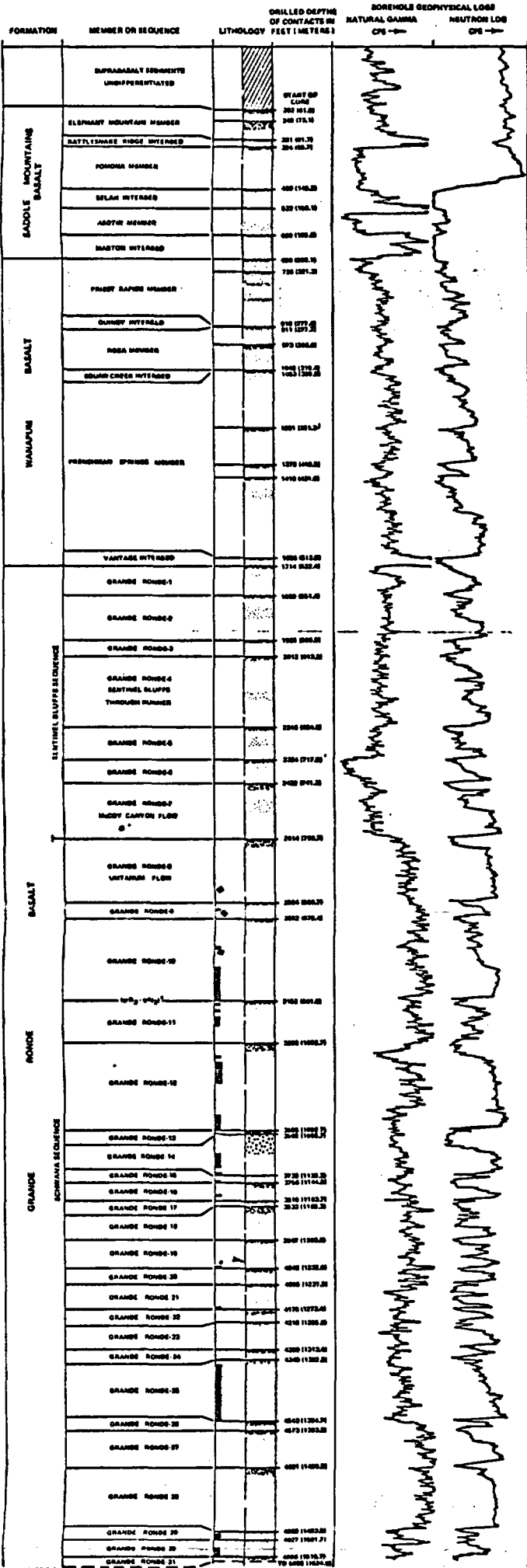
SEE SHEET 7 OF 8 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS



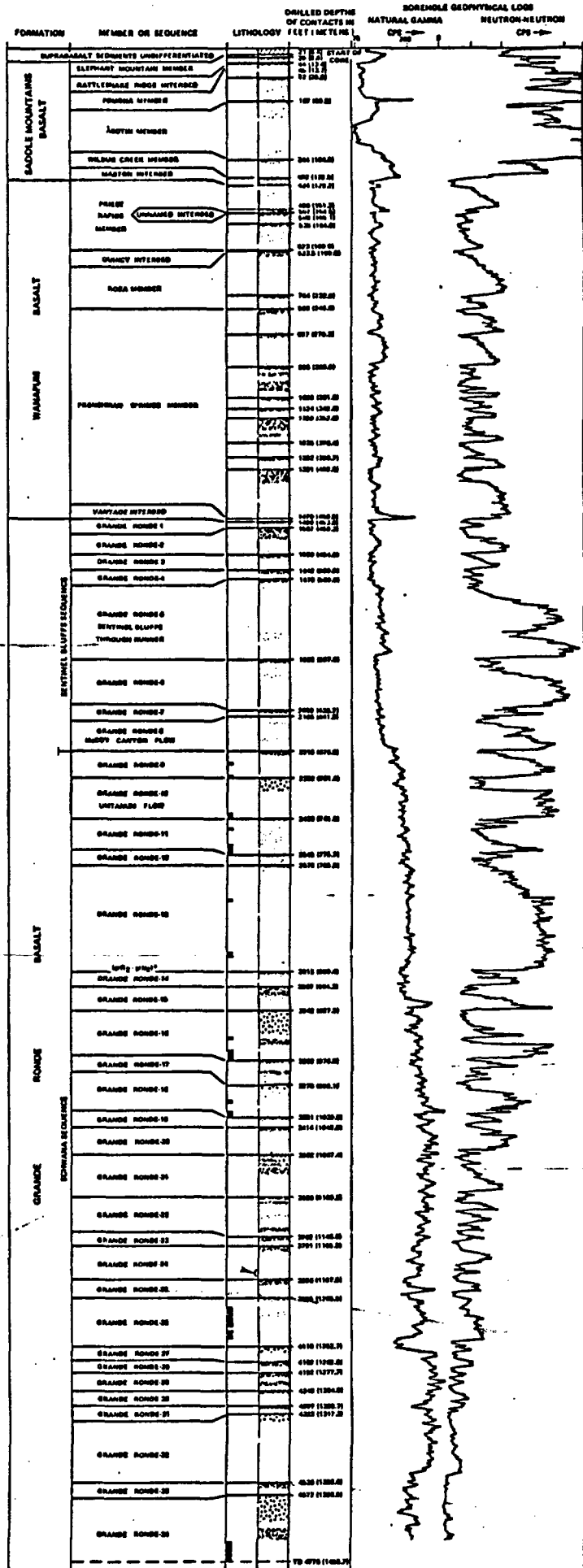
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DRAWING APP'D	DATE	U.S. DEPARTMENT OF ENR FGW SPECIAL OPERATIONS OFFICE
APPROVED	DATE	
R. L. Brown J. L. Brown J. L. Brown		ROCKWELL HANFORD OPERATIONS HANFORD, WASHINGTON 99304
DEPARTMENT OF ENERGY OFFICE OF ENVIRONMENTAL RESTORATION WASHINGTON, D.C. 20545		DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE	DATE	WORK NO.
CLASSIFICATION	DATE	PROJECT NO.
RSD-BW-DC-03		SHEET NO. 1 OF 1

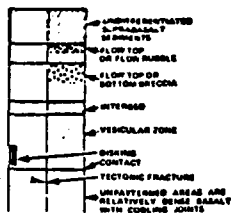
**DH-5  
COREHOLE**  
NO HANFORD COORDINATES  
GROUND SURFACE ELEVATION = 932' (284.1m)  
DATE DRILLED 7/27/71 - 2/11/72



**DH-4  
COREHOLE**  
NO HANFORD COORDINATES  
GROUND SURFACE ELEVATION = 928' (282.4m)  
DATE DRILLED 7/27/71 - 2/22/72



KEY TO LITHOLOGIC SYMBOLS

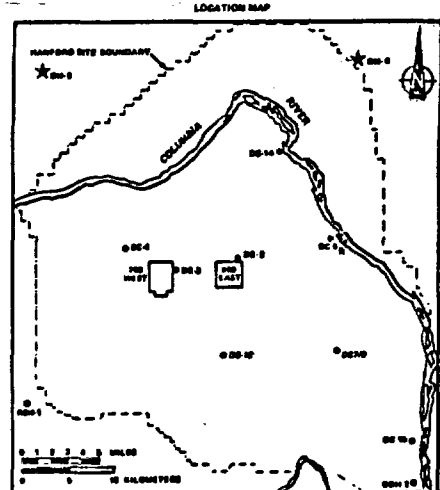


**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE-12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE-12 IN DH-5. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC SYMBOLS

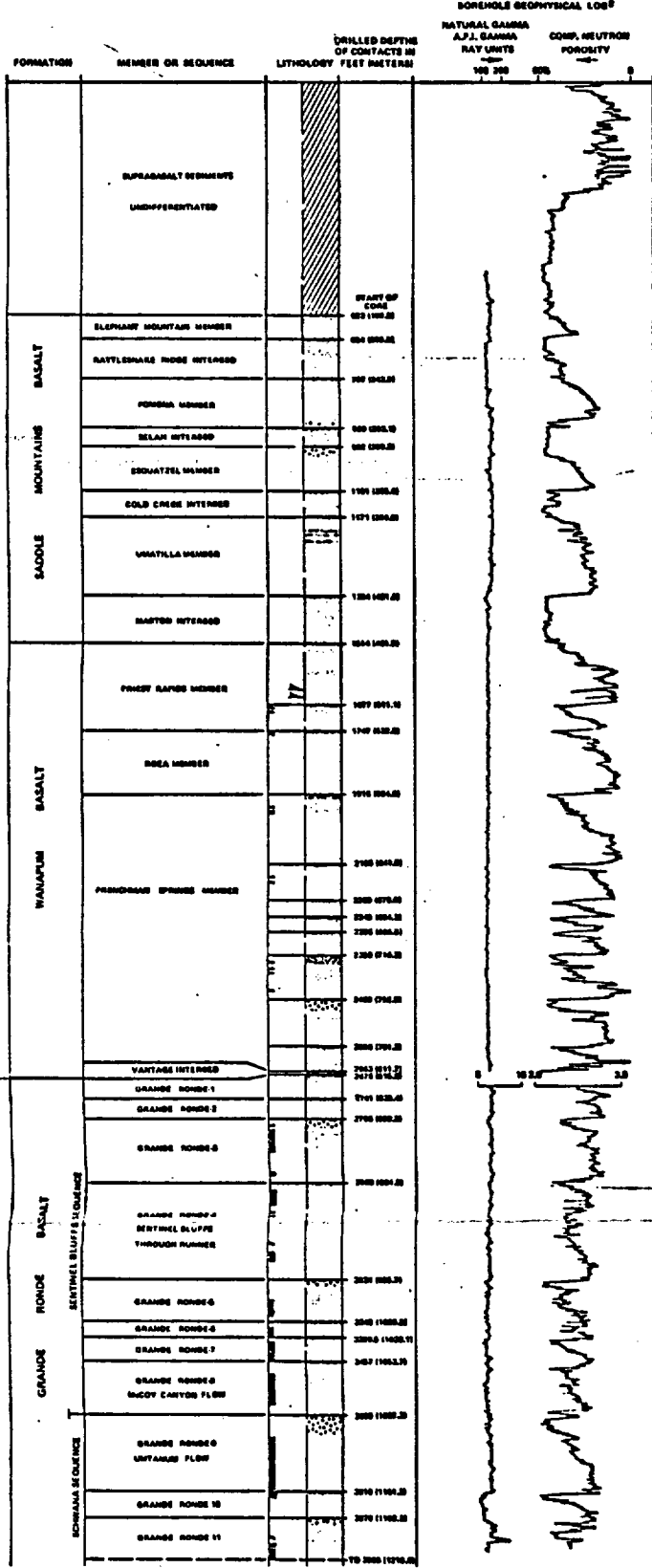
\*N.B. \*N.B. DENOTES THE STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANDE RONDE FLOWS (BELOW) SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.

**INFORMATION  
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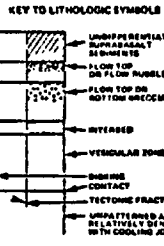
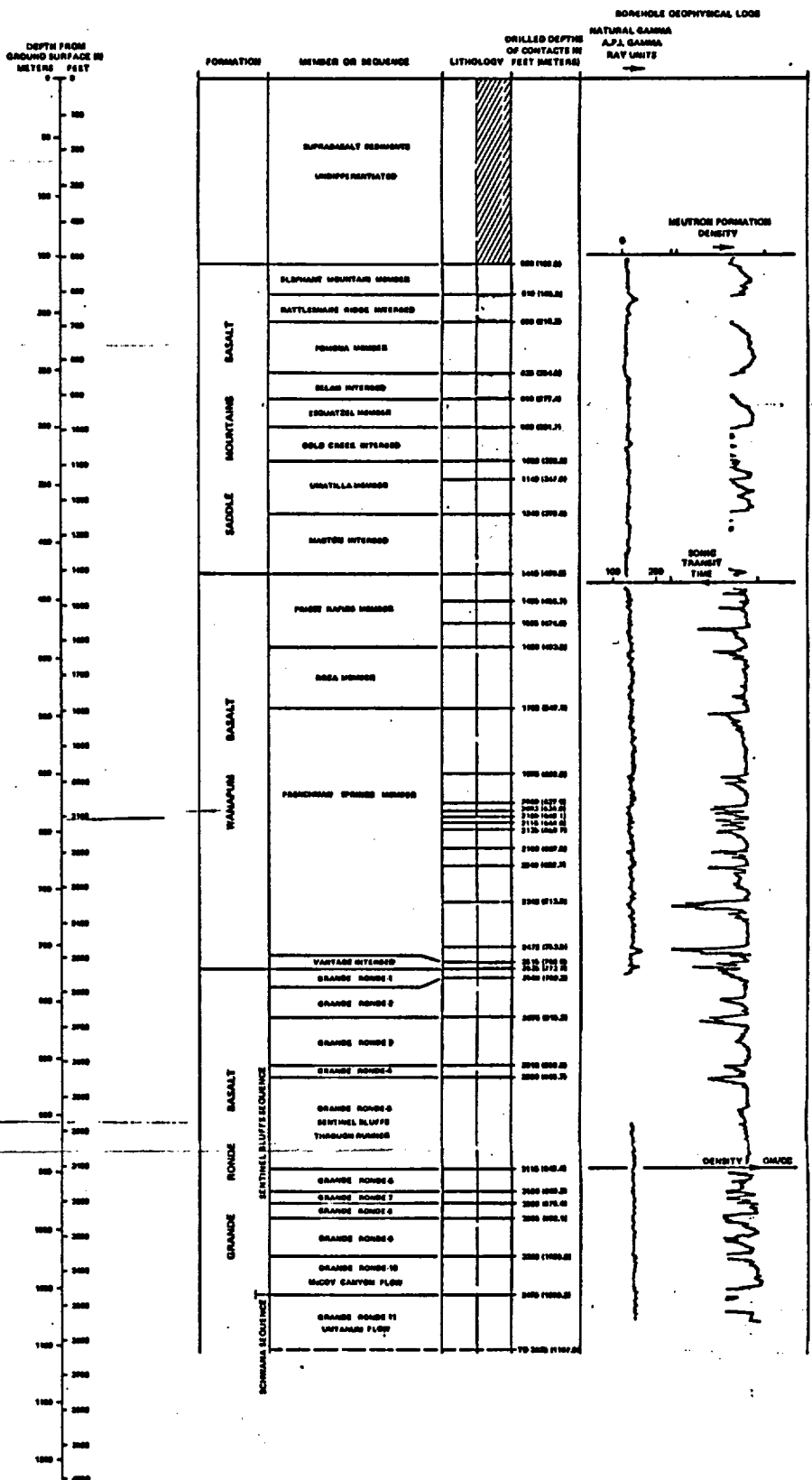


DRAWING APP'D	DATE	U.S. DEPARTMENT OF ENERGY NICKEL AND DIMETHYL SULFIDE ROCKWELL HANFORD OPERATIONS ADLAND, INDEPENDENT 1020
APP'D FOR QUALITY CONTROL	DATE	
DATE TIME MADE		DEPT BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
DRIVER		
CLASSIFICATION		RSO-SW-DP-036

**DC-4  
COREHOLE**  
HANFORD COORDINATES 48386 N, 86208 W  
GROUND SURFACE ELEVATION = 748' (227.1m)  
DATE DRILLED 8/26/78 - 11/20/78

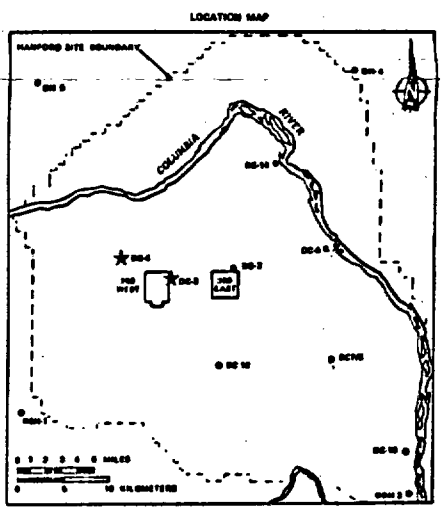


**DC-3  
ROTARY HOLE**  
HANFORD COORDINATES 43862 N, 78158 W  
GROUND SURFACE ELEVATION = 737' (223.1m)  
DATE DRILLED 8/77 - 10/77



**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN SHS. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

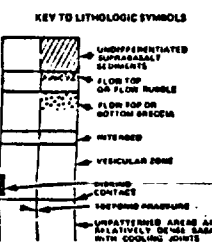
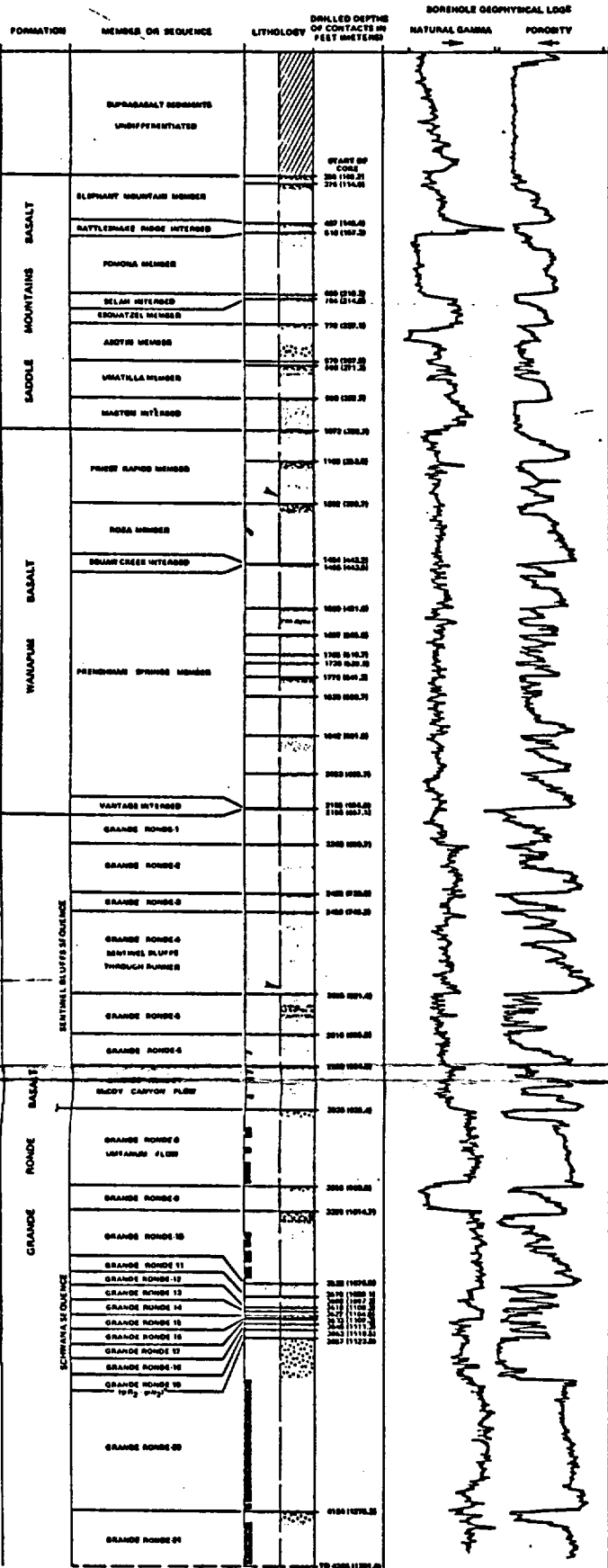
SEE SHEET 1 OF 5 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS



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DRAWING APPD	DATE	U.S. DEPARTMENT OF ENERGY HIGHLAND OPERATIONS DIVISION ROCKWELL HANFORD OPERATIONS HIGHLAND, WASHINGTON 98924
APPD FOR QUALITY CONTROL	DATE	
APPD	DATE	DEEP BOREHOLE STRATIGRAPHY CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
APPD	DATE	
APPD	DATE	SCALE: HORIZONTAL 1" = 100' VERTICAL 1" = 100'
APPD	DATE	
APPD	DATE	PROJECT NO. RSD-570-DP-008
APPD	DATE	SHEET NO. 4 OF 5

**DC-8  
CORE-8**  
HANFORD COORDINATES 84137 N, 17721 W  
GROUND SURFACE ELEVATION = 402' (122.8m)  
DATE DRILLED 12/6/77 4/24/78



**EXPLANATION**

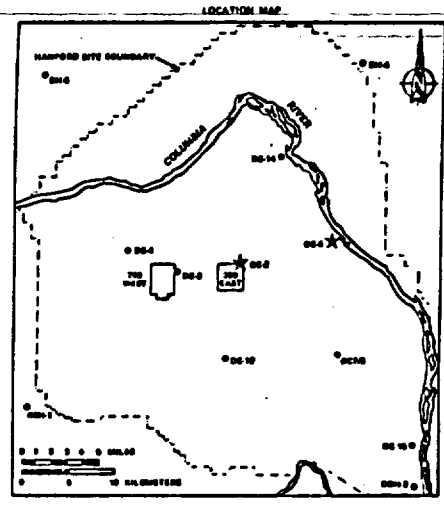
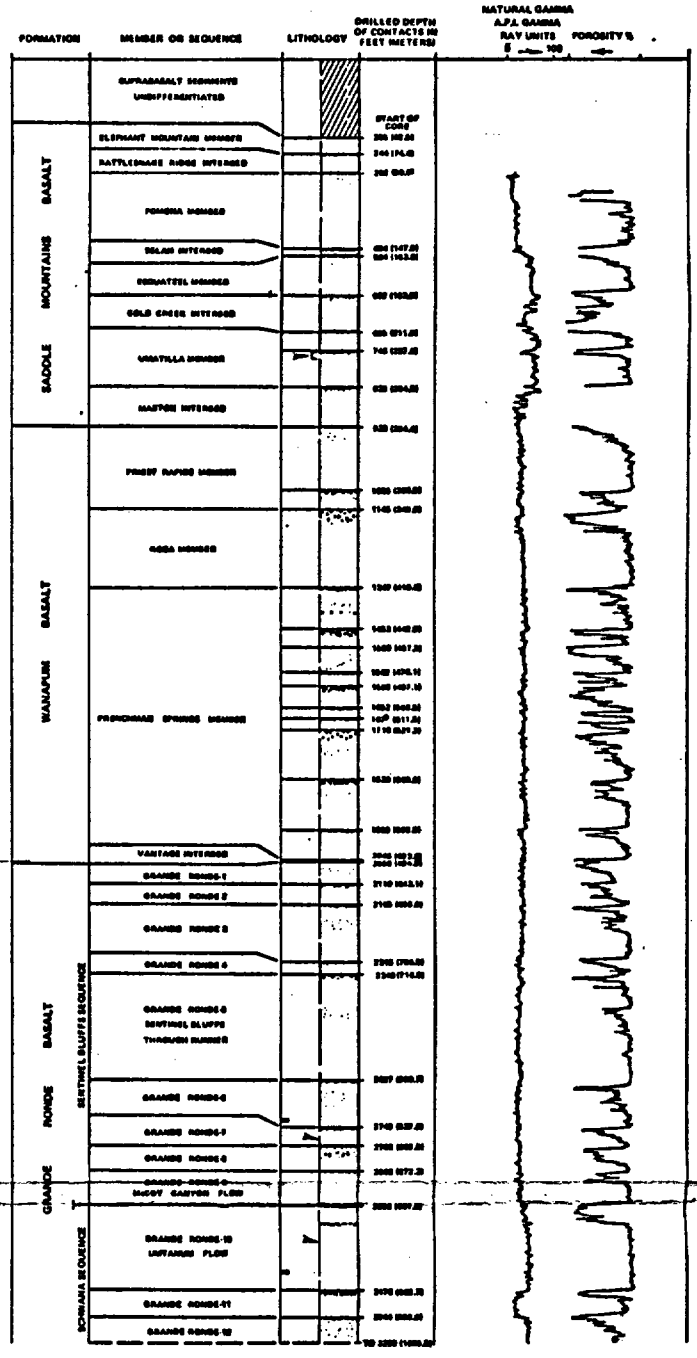
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE 12 IN DC 8 IS NOT NECESSARILY THE SAME AS GRANDE RONDE 12 IN DC 15 NAMED FLOW, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS

\*1070 1382.20 NOTES THE STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANDE RONDE FLOWS (BELOW). SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.

**INFORMATION  
COPY**  
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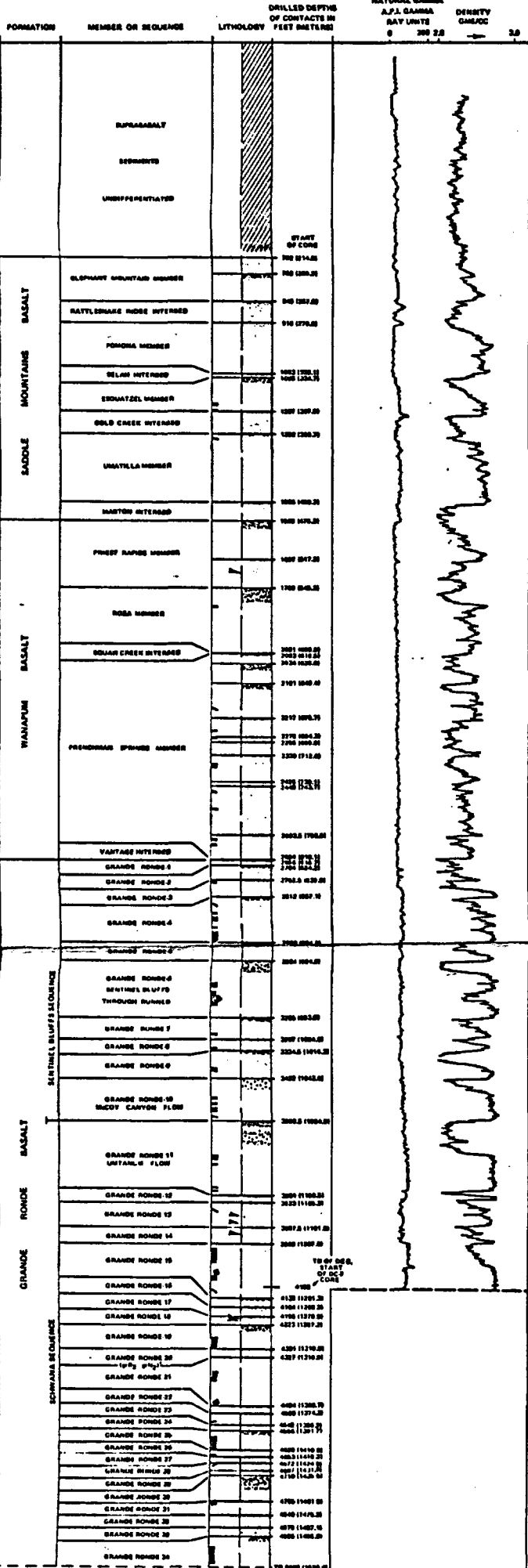
**DC-2  
CORE-2**  
HANFORD COORDINATES 87867 N, 8253 W  
GROUND SURFACE ELEVATION = 577' (174.3m)  
DATE DRILLED 5/07/77 4/26/77



DRAWING APPR AND FOR QUALITY A ASSURANCE	DATE	U.S. DEPARTMENT OF ENERGY WINDLAND OPERATIONS OFFICE ROCKWELL HANFORD OPERATIONS MICHIGAN, WASHINGTON 98300
APPD		DEEP BOREHOLE STRATIGRAPHY CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
DATE THIS APPR DRAWN		SCALE VERTICAL 1" = 100' HORIZONTAL 1" = 100'
CLASSIFICATION		SHEET NO. 3 OF 9

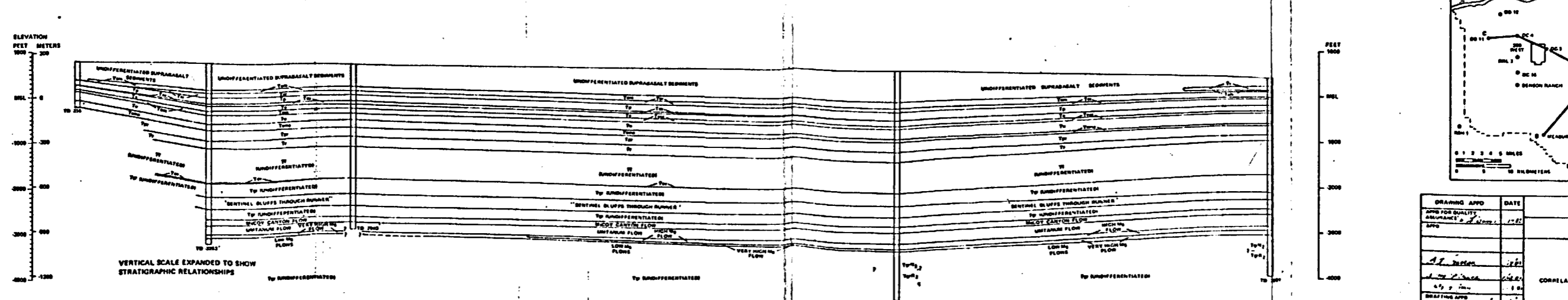
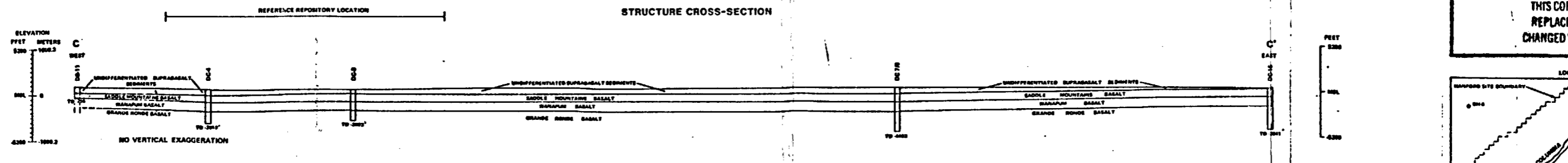
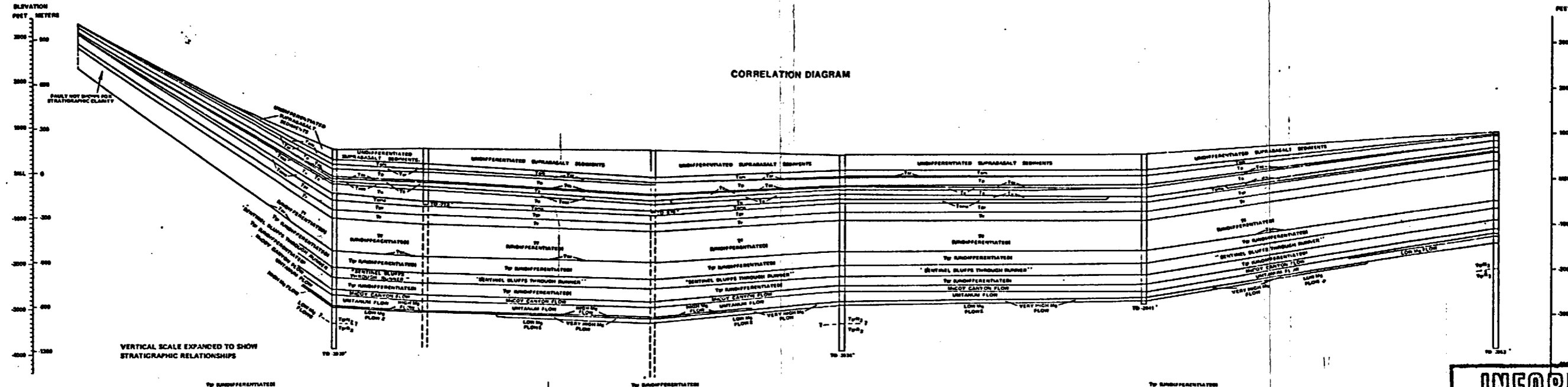
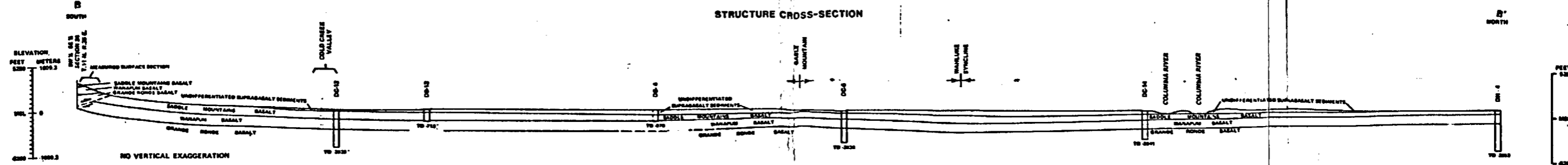
**DC-8**  
(EXTENDED IN DEPTH IN DC-7)  
**COREHOLE**  
DC-8 HANFORD COORDINATES 14966 N, 14882 W  
GROUND SURFACE ELEVATION = 548' (168.1m)  
DATE DRILLED 3/778 - 8/778  
DC-7 HANFORD COORDINATES 14801 N, 14831 W  
GROUND SURFACE ELEVATION = 548' (168.4m)  
DATE DRILLED 10/19/77 - 12/1/77  
3/19/80 - 6/9/80

BOREHOLE GEOPHYSICAL LOG  
NATURAL GAMMA  
A.P.I. GAMMA  
RAY UNITS  
DENSITY  
G/CM<sup>3</sup>

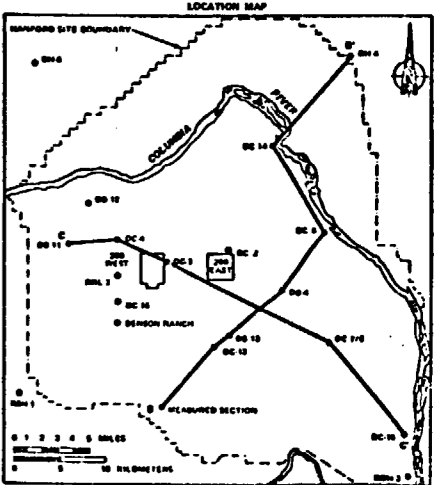








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DRAWING APPROVED	DATE	U.S. DEPARTMENT OF ENERGY
APPROVED FOR QUALITY ASSURANCE	1/18/78	REGULATORY OPERATIONS OFFICE
BY		ROCKWELL HANFORD OPERATIONS
		HIGHLAND DIVISION 8033
DRAWING APPROVED		DEPT. BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS-SECTIONS
DRAWN BY	SCALE AS NOTED	DATE 10/86
CLASSIFICATION	BY	INDEX NO.
		100
		RSO 841 OF C35

LEGEND FOR SYMBOLS ON SHEET 8 OF 8



**DESCRIPTION OF UNITS**

**SUPRABASALT SEDIMENTS**  
 SUPRABASALT SEDIMENTS INCLUDE PRINCIPALLY THE HANFORD AND RINGOLD FORMATIONS BUT ALSO INCLUDE THE TERTIARY AND QUATERNARY DEPOSITS OF SAND AND GRAVEL DEPOSITS OF QUATERNARY CATASTROPHIC FLOODS. THE RINGOLD FORMATION CONSISTS OF SILT, SAND AND CONGLOMERATE DEPOSITED IN A LATE TERTIARY FLUVIAL AND LAKE ENVIRONMENT. HOLOCENE DEPOSITS CONSIST OF DUNE SAND, LOESS, COLLUVIUM AND ALLUVIUM.

**ELLENSBURG FORMATION**  
 SEDIMENTARY BEDS OF THE ELLENSBURG FORMATION ARE INTERCALATED WITH AND OVERLIE THE FLOWS OF THE COLUMBIA RIVER BASALT GROUP IN THE WESTERN AND CENTRAL COLUMBIA PLATEAU OF WASHINGTON. ELLENSBURG BEDS LYING BETWEEN COLUMBIA RIVER BASALT FLOWS ARE REFERRED TO AS INTERBEDS AND HAVE INFORMAL MEMPHIS STATUS. EACH OF THE INTERBEDS OCCURRING IN THE PASCO BASIN ARE DESCRIBED BELOW.

**LEVEY INTERBED**  
 THE LEVEY INTERBED LIES BETWEEN THE ICE HARBOR AND ELEPHANT MOUNTAIN MEMBERS OF THE SADDLE MOUNTAINS BASALT AND IS THE YOUNGEST ELLENSBURG UNIT IN THE PASCO BASIN. IT CONSISTS OF TUFFACEOUS SILT OR SILTSTONE.

**RATTLESNAKE RIDGE INTERBED**  
 THE RATTLESNAKE RIDGE INTERBED COMPRISES THREE FACIES BASED ON LITHOLOGY AND TEXTURE. THE FIRST FACIES OCCURS IN THE CENTRAL COLD CREEK SYNCLINE AREA AND USUALLY CONSISTS OF THREE UNITS: (A) A LOWER CLAY OR TUFFACEOUS SANDSTONE, (B) A MIDDLE, MICACEOUS ARKOSIC AND/OR TUFFACEOUS SANDSTONE, AND (C) AN UPPER, TUFFACEOUS SILTSTONE OR TUFFACEOUS SANDSTONE. THE SECOND FACIES IS A SINGLE TUFFACEOUS SANDSTONE TO SILTSTONE UNIT AND OCCURS WHERE THE INTERBED IS RELATIVELY THIN. THE THIRD FACIES OCCURS ON THE NORTHWESTERN MARGIN OF THE PASCO BASIN AND IS A CONGLOMERATE WITH PLUTONIC AND METAMORPHIC CLASTS.

**SELAH INTERBED**  
 THE SELAH INTERBED IS A VARIABLE MIXTURE OF SILTY OR SANDY, VITRIC TUFF, ARKOSIC SANDS, TUFFACEOUS CLAYS, AND LOCALLY THIN STRINGS OF PREDOMINANTLY BASALTIC GRAVELS. THE UPPER PORTION OF THE SELAH INTERBED IS A VITRIC TUFF COMMONLY FUSED TO A PERLITIC VITRIC TUFF BY THE OVERLYING POMONA MEMBER.

**COLD CREEK INTERBED**  
 THE COLD CREEK INTERBED IS THE SEQUENCE OF ELLENSBURG UNITS THAT OCCURS STRATIGRAPHICALLY BETWEEN THE ESQUATZEL AND UMATILLA MEMBERS OF THE SADDLE MOUNTAINS BASALT. THREE SEPARATE UNITS OF THE INTERBED ARE IDENTIFIED ON THE BASIS OF BOUNDING FLOWS. THESE INTERVALS ARE THE UMATILLA-ESQUATZEL, UMATILLA-ASOTIN, AND ASOTIN-ESQUATZEL INTERVALS.

**ASOTIN-ESQUATZEL INTERVAL**  
 THE ASOTIN-ESQUATZEL INTERVAL CONSISTS OF TUFFS AND CLAY LAYERS, ARKOSIC TO QUARTZOSE SANDSTONES, AND BASALTIC CONGLOMERATES.

**UMATILLA-ESQUATZEL INTERVAL**  
 THE UMATILLA-ESQUATZEL INTERVAL EXHIBITS TWO TEXTURAL FACIES: (1) A FINER GRAINED, TUFFACEOUS SANDSTONE FACIES, AND (2) A COARSER SANDSTONE AND CONGLOMERATE FACIES WITH TUFFACEOUS SILTSTONE AND CLAYS.

**UMATILLA-ASOTIN INTERVAL**  
 THE UMATILLA-ASOTIN INTERVAL IS COMPOSED CHIEFLY OF TUFFACEOUS SILTSTONES AND TUFFACEOUS CLAYSTONES.

**MABTON INTERBED**  
 THE MABTON INTERBED LIES BETWEEN THE SADDLE MOUNTAINS BASALT AND ABOVE THE WANAPUM BASALT. FROM TOP TO BOTTOM, THE INTERBED CONSISTS OF: (1) A WELL INDURATED, LAPILLI TURFSTONE, LOCALLY HARD; (2) A FINE GRAINED, QUARTZITIC SANDSTONE; (3) A QUARTZITIC TO ARKOSIC SANDSTONE WITH INTERLAYERED TUFFACEOUS SANDSTONES AND SILTSTONES; AND (4) A THIN, DISCONTINUOUS, BASAL SILTY CLAY.

**VANTAGE INTERBED**  
 THE VANTAGE INTERBED IS COMPRISED OF SEDIMENTS LYING BETWEEN THE WANAPUM BASALT AND THE GRANDE RONDE BASALT. SAPROLITE COMMONLY OCCURS AT THE TOP OF GRANDE RONDE BASALT IN AREAS WHERE NO SEDIMENTS WERE DEPOSITED. THE THICKER SEQUENCES OF VANTAGE CONSIST OF ARKOSIC SANDSTONE LOCALLY CONTAINING THIN CLAY STRINGERS WITH A CLAY CAP. THE THINNER SEQUENCES OF VANTAGE CONSIST OF CLAYS WHICH ARE ALTERED TUFFS.

**SADDLE MOUNTAINS BASALT**  
 THE SADDLE MOUNTAINS BASALT CONSISTS OF SEVEN MEMBERS IN THE PASCO BASIN: (1) UMATILLA, (2) WILBUR CREEK, (3) ASOTIN, (4) ESQUATZEL, (5) POMONA, (6) ELEPHANT MOUNTAIN, AND (7) ICE HARBOR.

**ICE HARBOR MEMBER**  
 THE ICE HARBOR MEMBER IS THE YOUNGEST MEMBER OF THE SADDLE MOUNTAINS BASALT AND CONSISTS OF THREE FLOWS: (1) BASIN CITY, (2) MARTINDALE, AND (3) GOOSE ISLAND. THE FLOWS ARE FINE TO MEDIUM GRAINED WITH GLOMEROCRYSTS AND PHENOCRYSTS OF OLIVINE, PLAGIOCLASE, AND CLINGYROXENE. OLIVINE OCCURS PRIMARILY IN THE MARTINDALE AND BASIN CITY FLOWS, WHEREAS THE GOOSE ISLAND FLOW CONTAINS GLOMEROCRYSTS OF PYROXENE AND PLAGIOCLASE.

**ELEPHANT MOUNTAIN MEMBER**  
 THE ELEPHANT MOUNTAIN MEMBER CONSISTS OF TWO SEPARATE FLOWS: THE ELEPHANT MOUNTAIN FLOW AND THE WARD GAP FLOW. THE UPPER OF THE FLOWS IS MEDIUM TO FINE GRAINED WITH ABUNDANT MICROPHENOCRYSTS OF PLAGIOCLASE.

**POMONA MEMBER**  
 THE POMONA MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOBES. THE TEXTURE IS RELATIVELY UNIFORM, TYPICALLY FINE GRAINED TO GLASSY WITH WEDGE-SHAPED PLAGIOCLASE PHENOCRYSTS AND SPARSE OLIVINE.

**ESQUATZEL MEMBER**  
 THE ESQUATZEL MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOBES THAT OCCUR LOCALLY WITH A VITRIC TUFF BETWEEN THEM. THE MEMBER IS COMMONLY PLAGIOCLASE-PHYRIC TO GLOMEROPHYRIC AND CONTAINS MICROPHENOCRYSTS OF CLINGYROXENE. HOWEVER, SOME LOCALITIES LACK PHENOCRYSTS.

**ASOTIN MEMBER**  
 THE ASOTIN MEMBER OCCURS IN THE PASCO BASIN AS A SINGLE FLOW. THE HUNTZINGER FLOW. THE TEXTURE OF THE HUNTZINGER FLOW RANGES FROM FINE GRAINED AND GLASSY TO PHYRIC. THE FLOW HAS ABUNDANT OLIVINE, BUT PLAGIOCLASE IS SPARSE.

**WILBUR CREEK MEMBER**  
 THE WILBUR CREEK MEMBER IN THE PASCO BASIN CONSISTS OF ONE FLOW. THE WAMLUKE FLOW. IT IS TYPICALLY FINE GRAINED TO GLASSY AND APHYRIC WITH SPARSE MICROPHENOCRYSTS OF PLAGIOCLASE.

**UMATILLA MEMBER**  
 THE UMATILLA MEMBER CONSISTS OF TWO FLOWS. THE YOUNGER FLOW IS THE BILKIE FLOW AND THE OLDER FLOW IS THE UMATILLA FLOW. BOTH FLOWS ARE FINE GRAINED TO GLASSY WITH RARE MICROPHENOCRYSTS OF PLAGIOCLASE AND OLIVINE. THE FLOWS ARE PREDOMINANTLY ENTABLATURE WITH A RELATIVELY THIN BASAL COLONNADE.

**WANAPUM BASALT**  
 THE WANAPUM BASALT IN THE PASCO BASIN CONSISTS OF THREE MEMBERS: (1) FRENCHMAN SPRINGS, (2) ROZA, AND (3) PRIEST RAPIDS.

**PRIEST RAPIDS MEMBER**  
 THE PRIEST RAPIDS MEMBER CONSISTS OF TWO DISTINCT FLOWS. AN OLDER FLOW (ROZALIA CHEMICAL TYPE) IS TYPICALLY COARSE GRAINED WITH RARE OLIVINE AND PLAGIOCLASE PHENOCRYSTS. THE YOUNGER FLOW (LOW CHEMICAL TYPE) HAS SMALL OLIVINE PHENOCRYSTS (PSM) AND RARE GLOMEROCRYSTS OF PLAGIOCLASE.

**ROZA MEMBER**  
 THE ROZA MEMBER CONSISTS OF ONE OR TWO FLOWS OR FLOW LOBES. IN HAND SPECIMEN, IT IS CHARACTERIZED BY THE PRESENCE OF SINGLE PLAGIOCLASE PHENOCRYSTS UP TO 1.5 CM IN SIZE SET IN A FINE GRAINED GROUND MASS.

**FRENCHMAN SPRINGS MEMBER**  
 THE FRENCHMAN SPRINGS MEMBER IS THE OLDEST MEMBER OF THE WANAPUM BASALT AND CONSIST OF APPROXIMATELY THREE TO TWELVE FLOWS. THE FLOWS ARE ALL MEDIUM TO FINE GRAINED AND CONTAIN PLAGIOCLASE PHENOCRYSTS. THE FLOWS ARE COMMONLY GROUPED INTO "PHYRIC" AND "APHYRIC" UNITS.

**GRANDE RONDE BASALT**  
 THE GRANDE RONDE BASALT IS A THICK SEQUENCE OF AT LEAST 56 BASALT FLOWS WHICH UNDERLIE THE SADDLE MOUNTAINS AND WANAPUM BASALTS. THESE FLOWS ARE TYPICALLY FINE GRAINED AND APHYRIC OR SPARSELY MICROPHYRIC WITH FEW PERSISTENT, 10-15 MICRA IN SIZE, ABUNDANT, 10-15 MICRA IN SIZE, BASALT FLOWS ARE CHIEFLY LITHOLOGICALLY UNIFORM IN THE PASCO BASIN. MAIN LITHOLOGIC UNITS (M1, M2, AND M3) DEFINED BY REVERSALS IN THE PALEOMAGNETIC POLARITY OF THE FLOWS. FLOWS RECORDED WITHIN THE PASCO BASIN ARE OF THE M2 AND M3 MAGNETOSTRATIGRAPHIC UNITS. TWO MAJOR SEQUENCES OF FLOWS DISTINGUISHED ON THE BASIS OF CHEMICAL COMPOSITION HAVE BEEN RECOGNIZED WITHIN THE PASCO BASIN: (1) THE SCHWANA SEQUENCE, CONSISTING ALMOST ENTIRELY OF FLOWS WITH LOW M<sub>2</sub> CHEMICAL TYPE, AND (2) THE SENTINEL BLUFFS SEQUENCE, CONSISTING ENTIRELY OF FLOWS WITH HIGHER M<sub>2</sub> CHEMICAL TYPE. THE SCHWANA SEQUENCE LIES STRATIGRAPHICALLY BELOW THE SENTINEL BLUFFS SEQUENCE. THE CONTACT BETWEEN THESE TWO SEQUENCES IS KNOWN AS THE M<sub>3</sub> HORIZON.

**SENTINEL BLUFFS SEQUENCE**  
 THE SENTINEL BLUFFS SEQUENCE CONSISTS OF 7 TO 10 FLOWS ALL OF HIGH M<sub>2</sub> CHEMICAL TYPE AND ALL WITHIN THE M2 MAGNETOSTRATIGRAPHIC UNIT. THE MCOY CANYON FLOW IS THE LOWEST FLOW IN THE SENTINEL BLUFFS SEQUENCE. WITHIN THE SENTINEL BLUFFS SEQUENCE, TWO C<sub>1</sub> HORIZONS OCCUR. THE LOWER HORIZON IS MARKED BY A LOWER C<sub>1</sub> CONTENT RELATIVE TO THE 3 TO 4 FLOWS OVERLYING IT. THE UPPER C<sub>1</sub> HORIZON IS DEFINED BY A SINGLE FLOW OF RELATIVELY LOW C<sub>1</sub>.

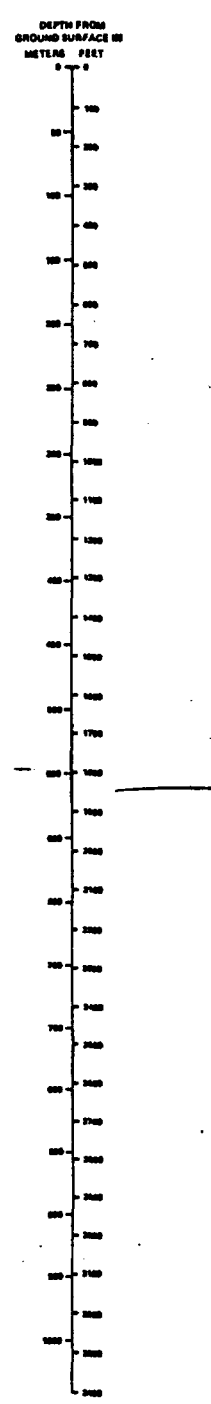
**SCHWANA SEQUENCE**  
 THE SCHWANA SEQUENCE CONSISTS OF DOMINANTLY LOW M<sub>2</sub> FLOWS. THREE FLOWS NEAR THE TOP OF THE SEQUENCE ARE NOTABLE EXCEPTIONS. THE OLDEST OF THESE THREE FLOWS IS A FLOW OF VERY HIGH M<sub>2</sub> CHEMICAL TYPE WHICH OCCURS TWO TO FOUR FLOWS BELOW THE M<sub>3</sub> HORIZON. THE OTHER TWO FLOWS ARE OF HIGH M<sub>2</sub> CHEMICAL TYPE AND ARE INTERCALATED WITH THE LOW M<sub>2</sub> FLOWS IN THE UPPER PART OF THE SCHWANA SEQUENCE. THE UMATANUM FLOW IS A THICK, LATERALLY EXTENSIVE FLOW RECOGNIZED BY ITS DISTINCTIVE CHEMICAL COMPOSITION AND PALEOMAGNETIC PROPERTIES. IT IS THE UPPERMOST FLOW IN THE SCHWANA SEQUENCE EXCEPT AT TWO LOCALITIES (D-4 AND UMATANUM HILLS). NEAR PRIEST RAPIDS DAM WHERE A SINGLE RELATIVELY THIN FLOW OF LOW TO INTERMEDIATE M<sub>2</sub> CHEMICAL TYPE OVERLIES THE UMATANUM FLOW.

**ADDITIONAL INFORMATION ON STRATIGRAPHY OF THE COLUMBIA RIVER BASALT GROUP MAY BE FOUND IN THE FOLLOWING PUBLICATIONS:**

Myers, C. W., Price, S. M., Coppens, J. A., Cochran, M. P., Cramer, W. J., Davidson, N. J., Edwards, R. C., Focht, R. W., Holman, G. E., Jones, M. G., Lamb, J. R., Lambert, R. D., Langford, R. K., Lisle, J. T., Long, P. E., Mitchell, T. H., Price, S. M., Riedel, S. P., and Tallman, A. M., 1978, Geologic studies of the Columbia Plateau, a status report, RHO-DW-157-4, Rockwell Hanford Operations, Richland, Washington.

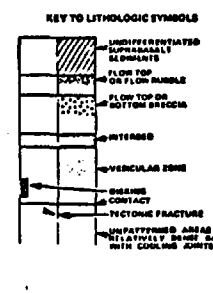
Riedel, S. P., and Focht, R. R., Chapter 3 - Wanapum and Saddle Mountains Basalts, the Cold Creek Syncline, Long, P. E., and Lambert, R. D., Chapter 4 - Stratigraphy of the Grande Ronde Basalt, and Moosh, D. J., Chapter 6 - Borehole Geologic Studies, all in 1981, Subsurface geology of the Cold Creek Syncline, Myers, C. W., and Price, S. M., editors, RHO-DW-157-14, Rockwell Hanford Operations, Richland, Washington.

Dunson, D. A., Wright, T. L., Cooper, P. R., and Bentley, R. D., 1979, Revisions in stratigraphic nomenclature of the Columbia River Basalt Group: U. S. Geological Survey Bulletin 1457-D.

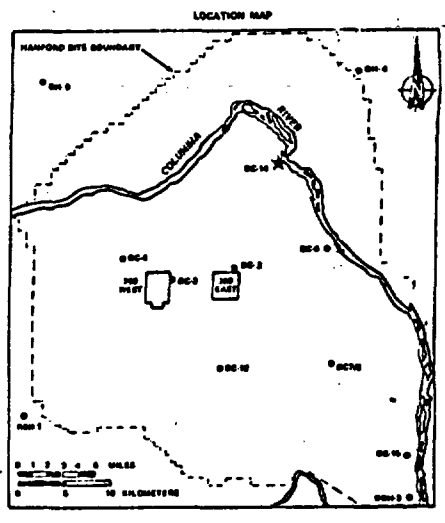


**DC-14 CORE HOLE**  
 HANFORD COORDINATES 84400 N, 33000 W  
 GROUND SURFACE ELEVATION = 304' (126.1m)  
 DATE DRILLED - 2/12/81

FORMATION	MEMBER OR SEQUENCE	LITHOLOGY	DRILLED DEPTH OF CONTACTS IN FEET METERS	BOREHOLE GEOPHYSICAL LOGS
SADDLE MOUNTAINS BASALT	SUPRABASALT SEDIMENTS UNDIFFERENTIATED		0-200	GEOPHYSICAL LOGGING NOT COMPLETE
	ICE HARBOR MEMBER		200-210	
	RATTLESNAKE RIDGE INTERBED		210-215	
	POMONA MEMBER		215-220	
	SELAH - COLD CREEK INTERBED		220-225	
	ASOTIN MEMBER		225-230	
	MABTON INTERBED		230-235	
WANAPUM BASALT	FRENCHMAN SPRINGS MEMBER		235-240	
	ROZA MEMBER		240-245	
	PRIEST RAPIDS MEMBER		245-250	
	UMATILLA-ASOTIN INTERVAL		250-255	
	UMATILLA-ESQUATZEL INTERVAL		255-260	
	ESQUATZEL MEMBER		260-265	
	ASOTIN MEMBER		265-270	
	WILBUR CREEK MEMBER		270-275	
	UMATILLA MEMBER		275-280	
	GRANDE RONDE BASALT		280-285	
	SENTINEL BLUFFS SEQUENCE		285-290	
	GRANDE RONDE 1		290-295	
	GRANDE RONDE 2		295-300	
GRANDE RONDE 3		300-305		
GRANDE RONDE 4		305-310		
GRANDE RONDE 5		310-315		
GRANDE RONDE 6		315-320		
GRANDE RONDE 7		320-325		
GRANDE RONDE 8		325-330		
GRANDE RONDE 9		330-335		
GRANDE RONDE 10		335-340		
GRANDE RONDE 11		340-345		
GRANDE RONDE 12		345-350		
GRANDE RONDE 13		350-355		



**EXPLANATION**  
 GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN DWA. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.



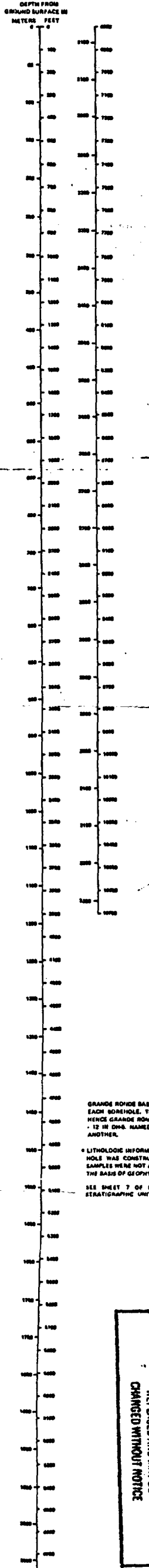
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DRAWING APP	DATE	U.S. DEPARTMENT OF ENERGY	
APP		ROCKWELL HANFORD OPERATIONS	
		ROCKWELL HANFORD OPERATIONS	
		DEEP BOREHOLE STRATIGRAPHY CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS	
SCALE	VERTICAL 1" = 200'	HOLE NO.	APP
CLASSIFICATION		APP	
		RSD-SW-02-038	7 9

**RSH-1**  
**ROTARY BOREHOLE**  
 NO HANFORD COORDINATES  
 GROUND SURFACE ELEVATION = 2887 (877.8m)  
 DATE DRILLED 7/7/57 - 4/4/58

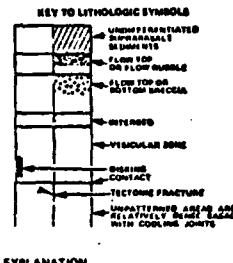
BOREHOLE GEOPHYSICAL LOG

FORMATION	MEMBER OR SEQUENCE	LITHOLOGY	DRILLED DEPTHS OF CONTACTS IN FEET (METERS)	NATURAL GAMMA		SOUND TRANSMIT TIME	
				100	50	100	50
SADDLE MOUNTAINS BASALT	ELEPHANT MOUNTAIN MEMBER		45 1144.7				
	POWERS MEMBER		175 814.2				
	SHAYELLA MEMBER						
	NASTON INTERBED		202 1116.0				
WAMUMUM BASALT	FRILEY RAPIDS MEMBER		242 1088.0				
	ROSA MEMBER		715 1016.0				
	BOGAN CREEK INTERBED		825 1004.0				
			857 1000.0				
			1075 1007.0				
			1100 1003.0				
			1120 1003.0				
			1150 1003.0				
			1194 1003.0				
			1245 1003.0				
SCUMANA SEQUENCE	GRANDE RONDE 1		1285 1003.0				
	GRANDE RONDE 2		1305 1003.0				
	GRANDE RONDE 3		1705 1007.0				
	GRANDE RONDE 4		1805 1003.0				
	GRANDE RONDE 5		2105 1003.0				
	GRANDE RONDE 6		2205 1003.0				
	GRANDE RONDE 7		2305 1003.0				
	GRANDE RONDE 8		2405 1003.0				
	GRANDE RONDE 9		2505 1003.0				
	GRANDE RONDE 10		2605 1003.0				
	GRANDE RONDE 11		2705 1003.0				
	GRANDE RONDE 12		2805 1003.0				
	GRANDE RONDE 13		2905 1003.0				
	GRANDE RONDE 14		3005 1003.0				
	GRANDE RONDE 15		3105 1003.0				
	GRANDE RONDE 16		3205 1003.0				
	GRANDE RONDE 17		3305 1003.0				
	GRANDE RONDE 18		3405 1003.0				
	GRANDE RONDE 19		3505 1003.0				
	GRANDE RONDE 20		3605 1003.0				
GRANDE RONDE 21		3705 1003.0					
GRANDE RONDE 22		3805 1003.0					
GRANDE RONDE 23		3905 1003.0					
GRANDE RONDE 24		4005 1003.0					
GRANDE RONDE 25		4105 1003.0					
GRANDE RONDE 26		4205 1003.0					
GRANDE RONDE 27		4305 1003.0					
GRANDE RONDE 28		4405 1003.0					
GRANDE RONDE 29		4505 1003.0					
GRANDE RONDE 30		4605 1003.0					
GRANDE RONDE 31		4705 1003.0					
GRANDE RONDE 32		4805 1003.0					
GRANDE RONDE 33		4905 1003.0					
GRANDE RONDE 34		5005 1003.0					
GRANDE RONDE 35		5105 1003.0					
GRANDE RONDE 36		5205 1003.0					
GRANDE RONDE 37		5305 1003.0					
GRANDE RONDE 38		5405 1003.0					
GRANDE RONDE 39		5505 1003.0					
GRANDE RONDE 40		5605 1003.0					
GRANDE RONDE 41		5705 1003.0					
GRANDE RONDE 42		5805 1003.0					
GRANDE RONDE 43		5905 1003.0					
GRANDE RONDE 44		6005 1003.0					
GRANDE RONDE 45		6105 1003.0					
GRANDE RONDE 46		6205 1003.0					
GRANDE RONDE 47		6305 1003.0					
GRANDE RONDE 48		6405 1003.0					
GRANDE RONDE 49		6505 1003.0					
GRANDE RONDE 50		6605 1003.0					
GRANDE RONDE 51		6705 1003.0					
GRANDE RONDE 52		6805 1003.0					
GRANDE RONDE 53		6905 1003.0					
GRANDE RONDE 54		7005 1003.0					
GRANDE RONDE 55		7105 1003.0					
GRANDE RONDE 56		7205 1003.0					
GRANDE RONDE 57		7305 1003.0					
GRANDE RONDE 58		7405 1003.0					
GRANDE RONDE 59		7505 1003.0					
GRANDE RONDE 60		7605 1003.0					
GRANDE RONDE 61		7705 1003.0					
GRANDE RONDE 62		7805 1003.0					
GRANDE RONDE 63		7905 1003.0					
GRANDE RONDE 64		8005 1003.0					
GRANDE RONDE 65		8105 1003.0					
GRANDE RONDE 66		8205 1003.0					
GRANDE RONDE 67		8305 1003.0					
GRANDE RONDE 68		8405 1003.0					
GRANDE RONDE 69		8505 1003.0					
GRANDE RONDE 70		8605 1003.0					
GRANDE RONDE 71		8705 1003.0					
GRANDE RONDE 72		8805 1003.0					
GRANDE RONDE 73		8905 1003.0					
GRANDE RONDE 74		9005 1003.0					
GRANDE RONDE 75		9105 1003.0					
GRANDE RONDE 76		9205 1003.0					
GRANDE RONDE 77		9305 1003.0					
GRANDE RONDE 78		9405 1003.0					
GRANDE RONDE 79		9505 1003.0					
GRANDE RONDE 80		9605 1003.0					
GRANDE RONDE 81		9705 1003.0					
GRANDE RONDE 82		9805 1003.0					
GRANDE RONDE 83		9905 1003.0					
GRANDE RONDE 84		10005 1003.0					
GRANDE RONDE 85		10105 1003.0					
GRANDE RONDE 86		10205 1003.0					
GRANDE RONDE 87		10305 1003.0					
GRANDE RONDE 88		10405 1003.0					
GRANDE RONDE 89		10505 1003.0					
GRANDE RONDE 90		10605 1003.0					
GRANDE RONDE 91		10705 1003.0					
GRANDE RONDE 92		10805 1003.0					
GRANDE RONDE 93		10905 1003.0					
GRANDE RONDE 94		11005 1003.0					
GRANDE RONDE 95		11105 1003.0					
GRANDE RONDE 96		11205 1003.0					
GRANDE RONDE 97		11305 1003.0					
GRANDE RONDE 98		11405 1003.0					
GRANDE RONDE 99		11505 1003.0					
GRANDE RONDE 100		11605 1003.0					



CONTINUED

FORMATION	MEMBER OR SEQUENCE	LITHOLOGY	DRILLED DEPTHS OF CONTACTS IN FEET (METERS)
GRANDE RONDE BASALT	GRANDE RONDE 26		665 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 27		675 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 28		685 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 29		695 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 30		705 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 31		715 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 32		725 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 33		735 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 34		745 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 35		755 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 36		765 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 37		775 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 38		785 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 39		795 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 40		805 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 41		815 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 42		825 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 43		835 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 44		845 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 45		855 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 46		865 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 47		875 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 48		885 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 49		895 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 50		905 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 51		915 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 52		925 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 53		935 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 54		945 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 55		955 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 56		965 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 57		975 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 58		985 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 59		995 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 60		1005 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 61		1015 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 62		1025 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 63		1035 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 64		1045 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 65		1055 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 66		1065 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 67		1075 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 68		1085 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 69		1095 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 70		1105 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 71		1115 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 72		1125 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 73		1135 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 74		1145 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 75		1155 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 76		1165 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 77		1175 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 78		1185 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 79		1195 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 80		1205 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 81		1215 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 82		1225 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 83		1235 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 84		1245 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 85		1255 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 86		1265 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 87		1275 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 88		1285 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 89		1295 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 90		1305 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 91		1315 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 92		1325 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 93		1335 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 94		1345 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 95		1355 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 96		1365 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 97		1375 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 98		1385 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 99		1395 1003.0
GRANDE RONDE BASALT	GRANDE RONDE 100		1405 1003.0

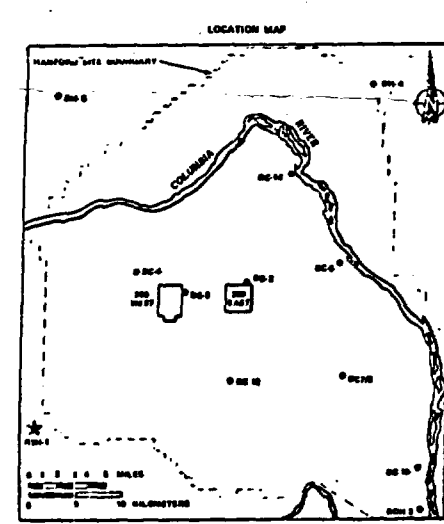


EXPLANATION

GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC 14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN DMS. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

LITHOLOGIC INFORMATION IS NOT AVAILABLE FOR RSH 1 BECAUSE HOLE WAS CONSTRUCTED BY ROTARY DRILLING. HENCE, CORE SAMPLES WERE NOT AVAILABLE. FLOW CONTACTS WERE PIERCED ON THE BASIS OF GEOPHYSICAL LOGS AND CHEMICAL ANALYSES.

SEE SHEET 7 OF 8 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS



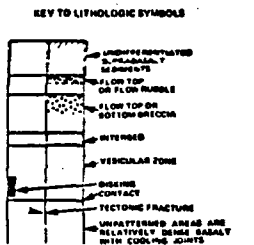
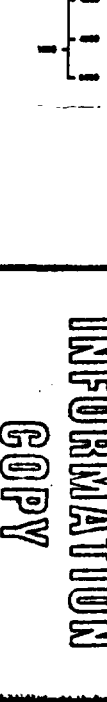
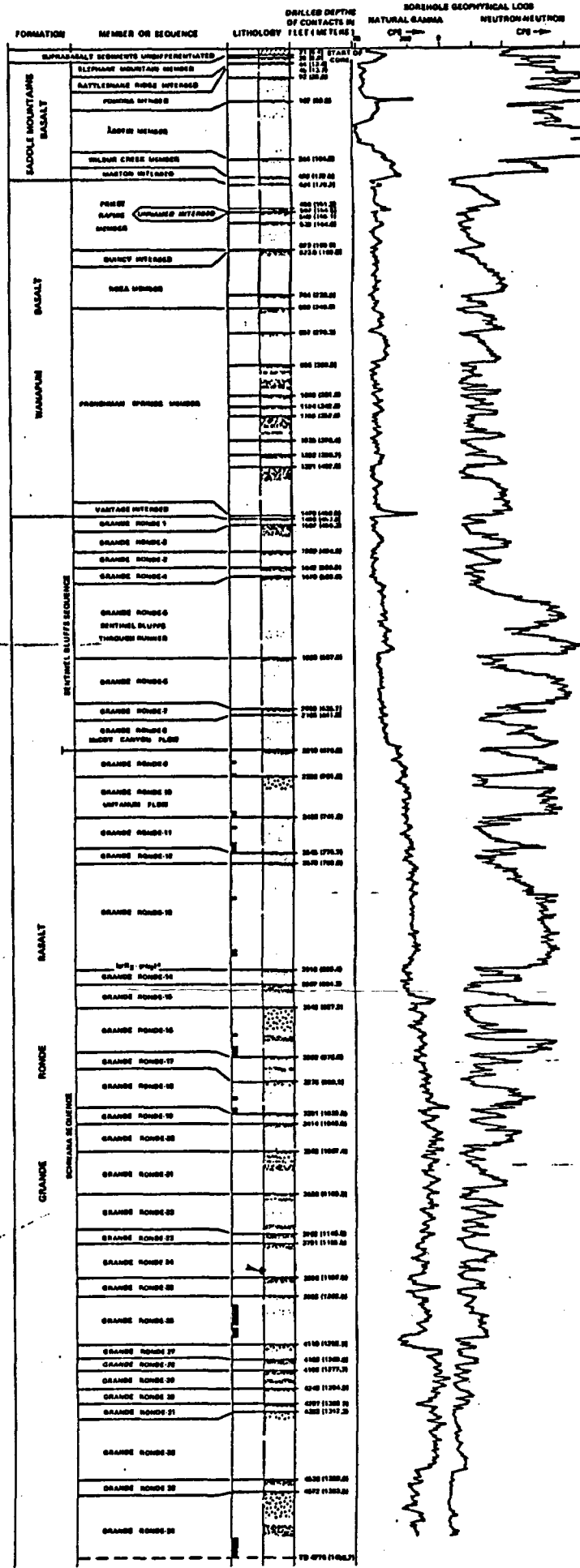
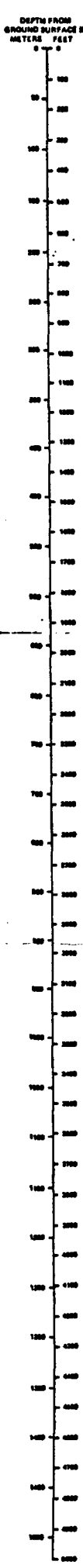
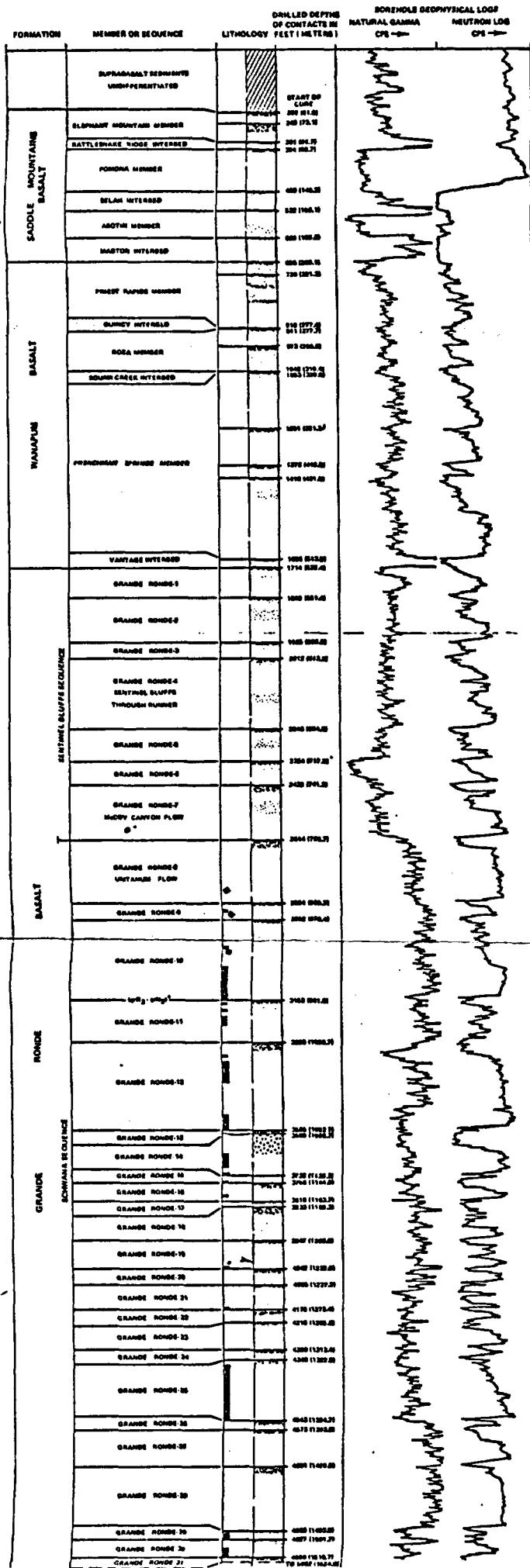
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DRAWING APPR	DATE	U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE ROCKWELL HANFORD OPERATIONS PULMAN, WASHINGTON 99124
APPD FOR QUALITY ASSURANCE	DATE	
APPD		DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE	DATE	PROJECT NO.
DATE	DATE	SHEET NO.
DATE	DATE	9

**DH-5  
COREHOLE**  
NO HANFORD COORDINATES  
GROUND SURFACE ELEVATION = 822' (204.1m)  
DATE DRILLED 7/27/71 - 2/11/72

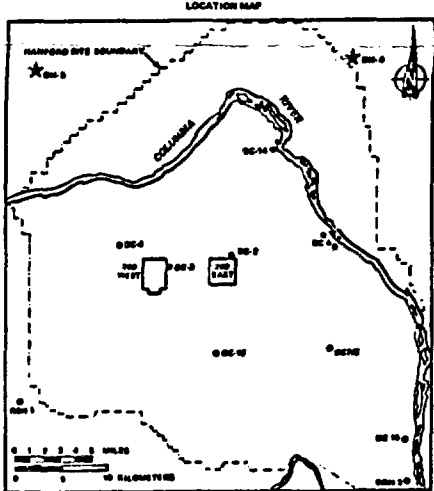
**DH-4  
COREHOLE**  
NO HANFORD COORDINATES  
GROUND SURFACE ELEVATION = 828' (208.4m)  
DATE DRILLED 7/8/71 - 2/22/72



**EXPLANATION**  
GRANITE RONDÉ BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANITE RONDÉ 12 IN DH-5 IS NOT NECESSARILY THE SAME AS GRANITE RONDÉ 12 IN DH-4. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS  
\*Gr<sub>12</sub> (Gr<sub>12</sub>) DENOTES THE STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANITE RONDÉ 12 FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANITE RONDÉ 12 FLOWS (BELOW). SEE THE DESCRIPTION OF GRANITE RONDÉ UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETIC STRATIGRAPHY OF GRANITE RONDÉ BASALT.

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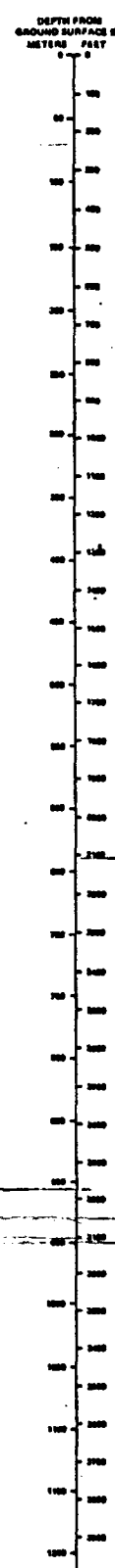
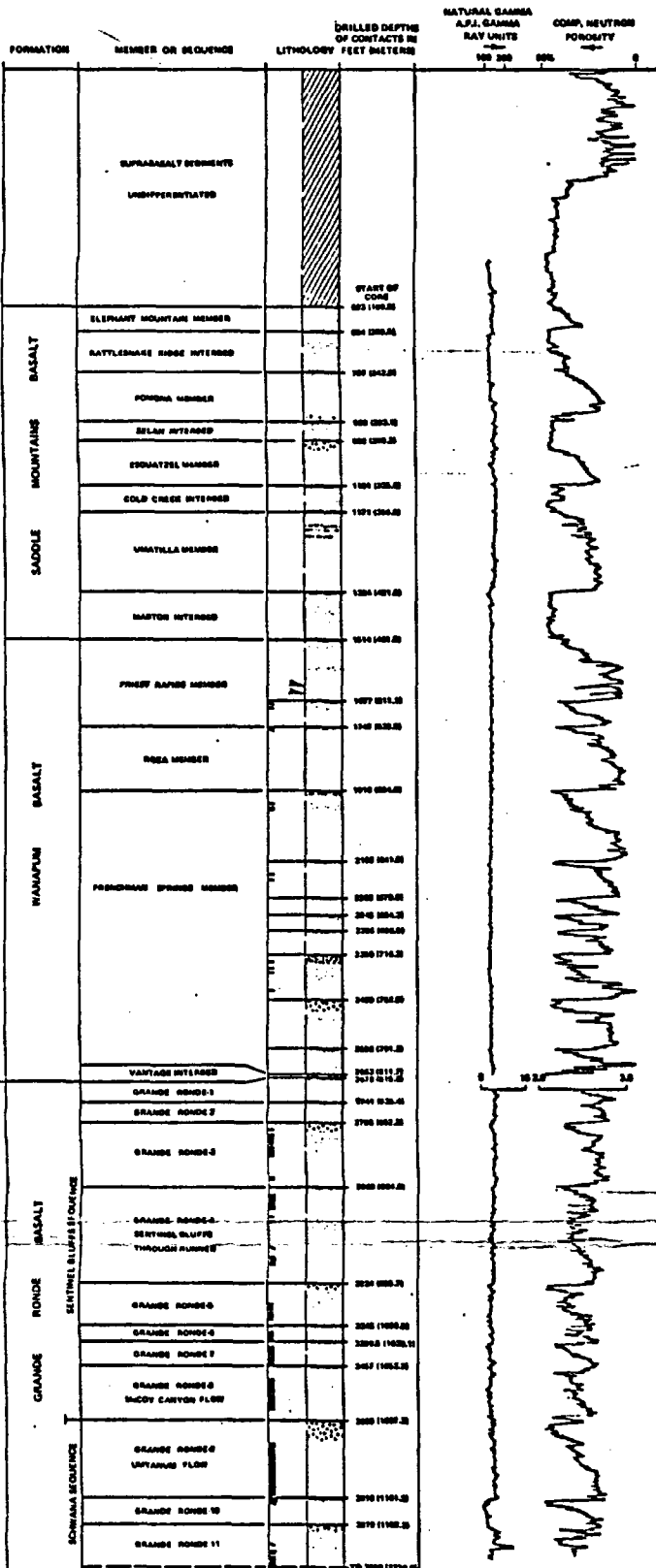


DRIVING APPD	DATE	U.S. DEPARTMENT OF ENERGY ROCKWELL HANFORD OPERATIONS RICHLAND, WASHINGTON 99352
APPROVED		
DRAWING APPD		DEEP BOREHOLE STRATIGRAPHY CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
DRAWING APPD		
SCALE	VERTICAL 1" = 20'	PLANT NO.
CLASSIFICATION		PROJECT NO.

**DC-4  
COREHOLE**

HANFORD COORDINATES 42202 N, 82008 W  
GROUND SURFACE ELEVATION = 748' (227.1m)  
DATE DRILLED 8/26/78 - 11/20/78

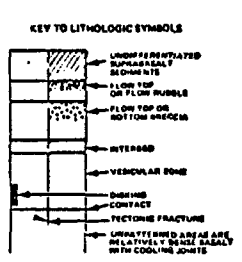
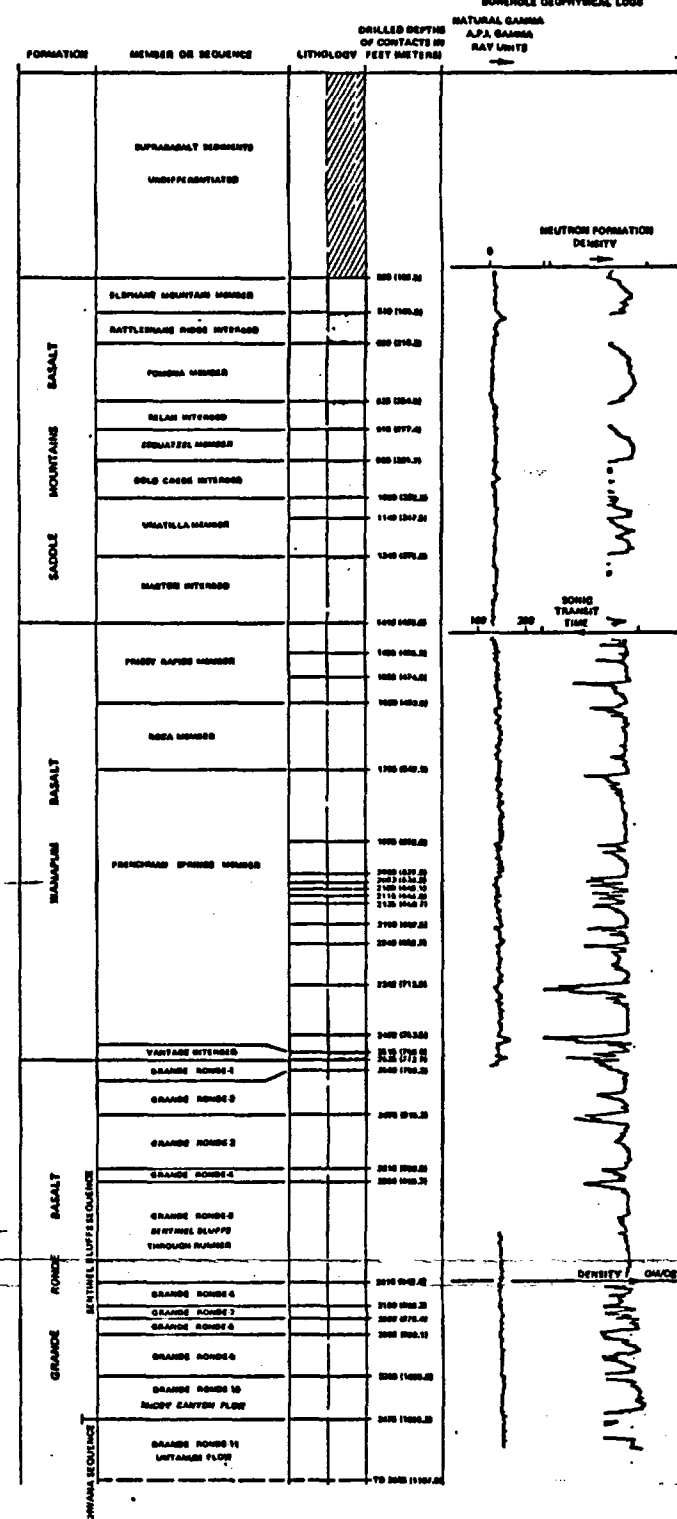
**BOREHOLE GEOPHYSICAL LOG**



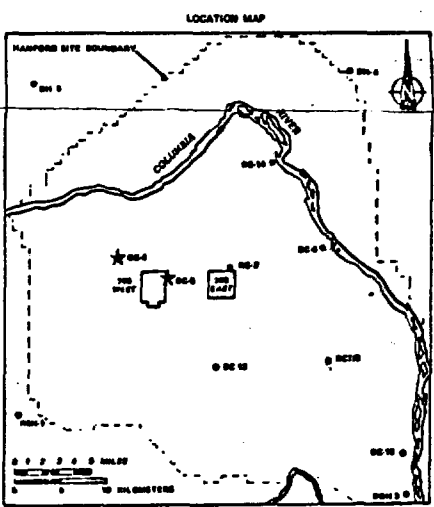
**DC-3  
ROTARY HOLE**

HANFORD COORDINATES 42802 N, 79108 W  
GROUND SURFACE ELEVATION = 732' (222.1m)  
DATE DRILLED 8/27/77 - 10/6/77

**BOREHOLE GEOPHYSICAL LOGS**



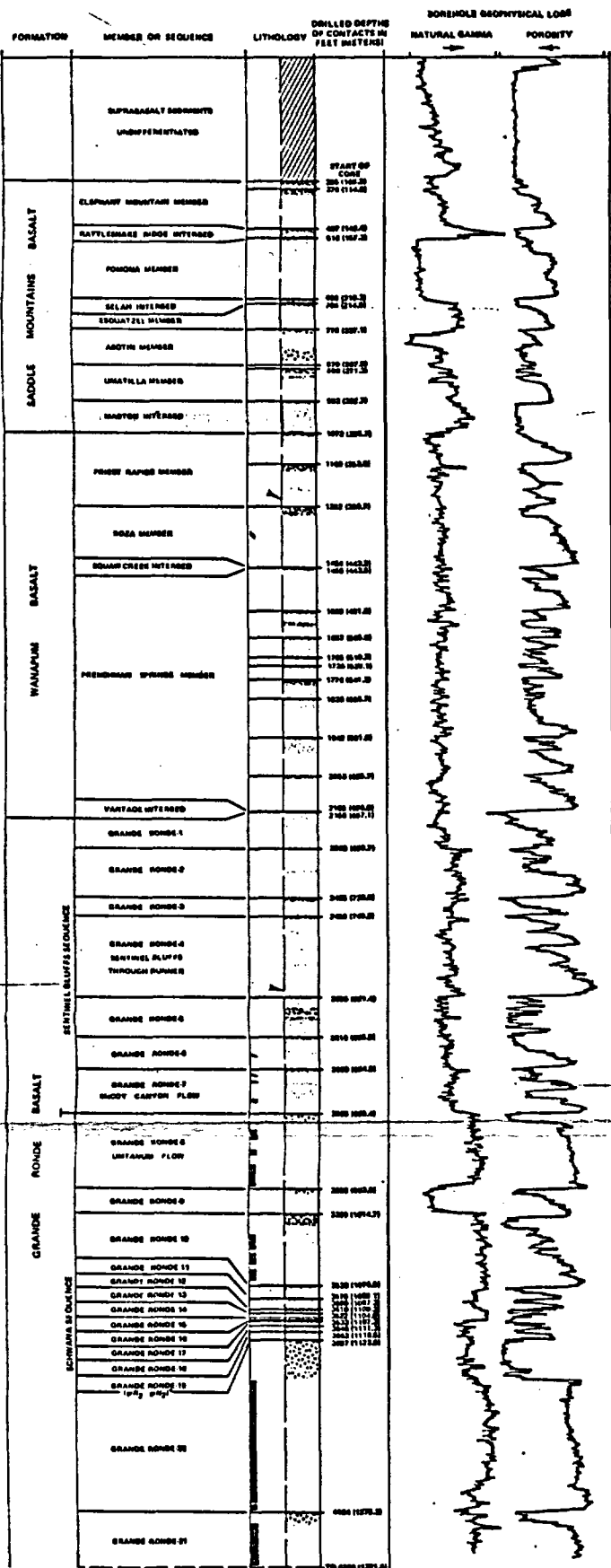
**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE 12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE 12 IN U-14. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.



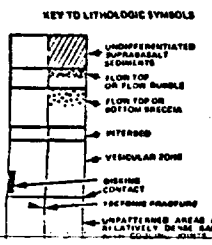
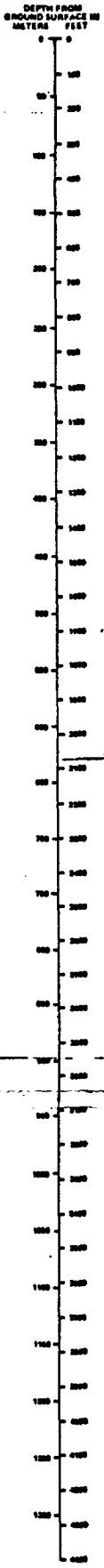
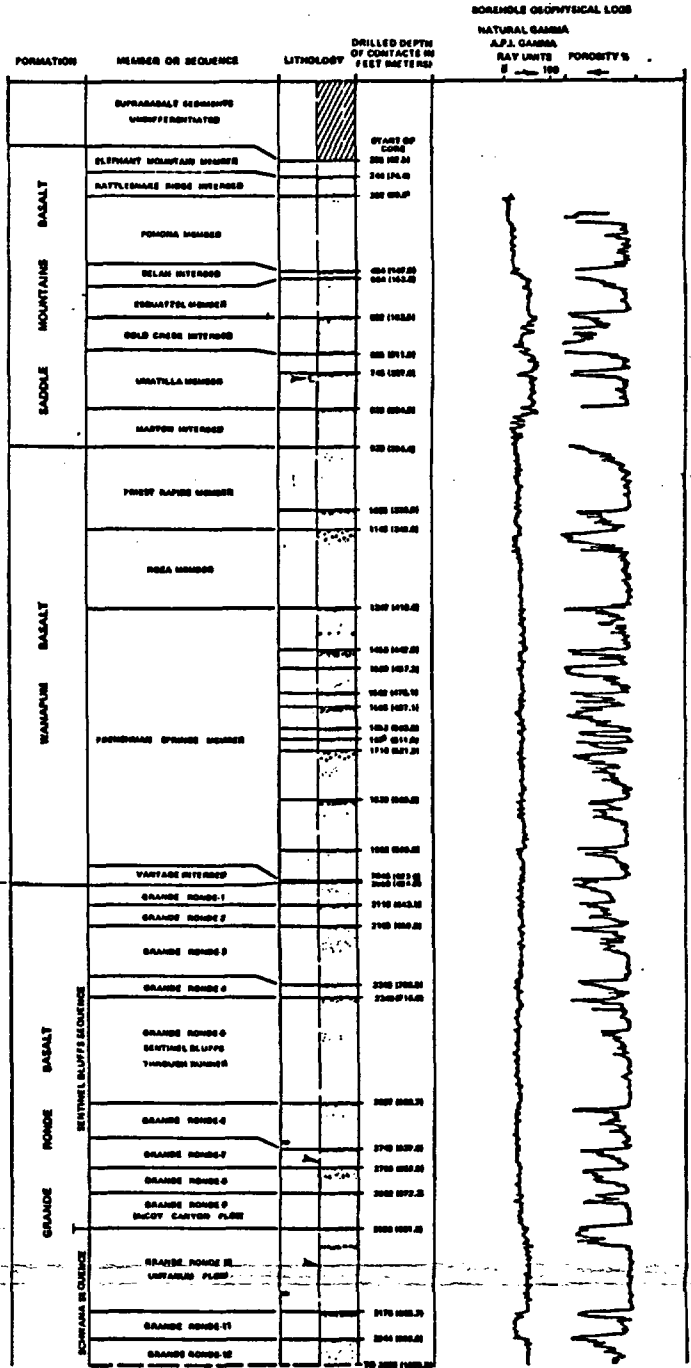
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DRAWING APPD	DATE	U.S. DEPARTMENT OF ENERGY HIGHLAND OPERATIONS OFFICE ROCKWELL HANFORD OPERATIONS HIGHLAND, HANFORD, ID 83426
APPD		
DEEP BOREHOLE STRATIGRAPHY CORRELATION CHARTS AND STRUCTURE CASES SECTIONS		
SCALE	AS SHOWN	
CLASSIFICATION	SECRET	

**DC-6  
COREHOLE**  
HANFORD COORDINATES 54127 N, 17771 W  
GROUND SURFACE ELEVATION = 462' (142.3m)  
DATE DRILLED 12/8/77 - 8/24/78



**DC-2  
COREHOLE**  
HANFORD COORDINATES 47847 N, 48283 W  
GROUND SURFACE ELEVATION = 572' (174.3m)  
DATE DRILLED 8/77 - 8/28/77

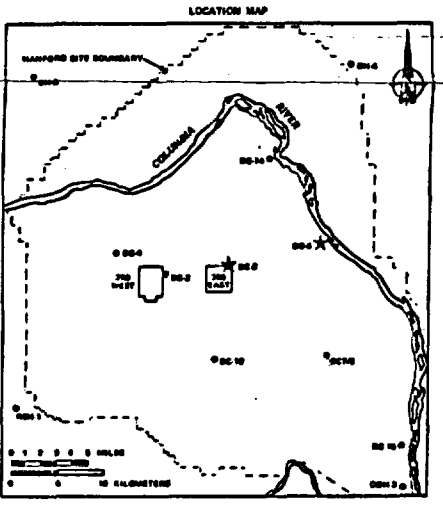


**EXPLANATION**

GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE 12 IN DC 16 IS NOT NECESSARILY THE SAME AS GRANDE RONDE 12 IN DC 6. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS.

SPR and SPT denotes the STRATIGRAPHIC HORIZON CONTACTS BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (EARLY) AND PALEOMAGNETICALLY REVERSED GRANDE RONDE FLOWS (LATE). SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.



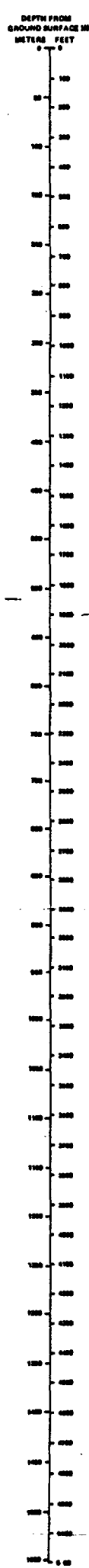
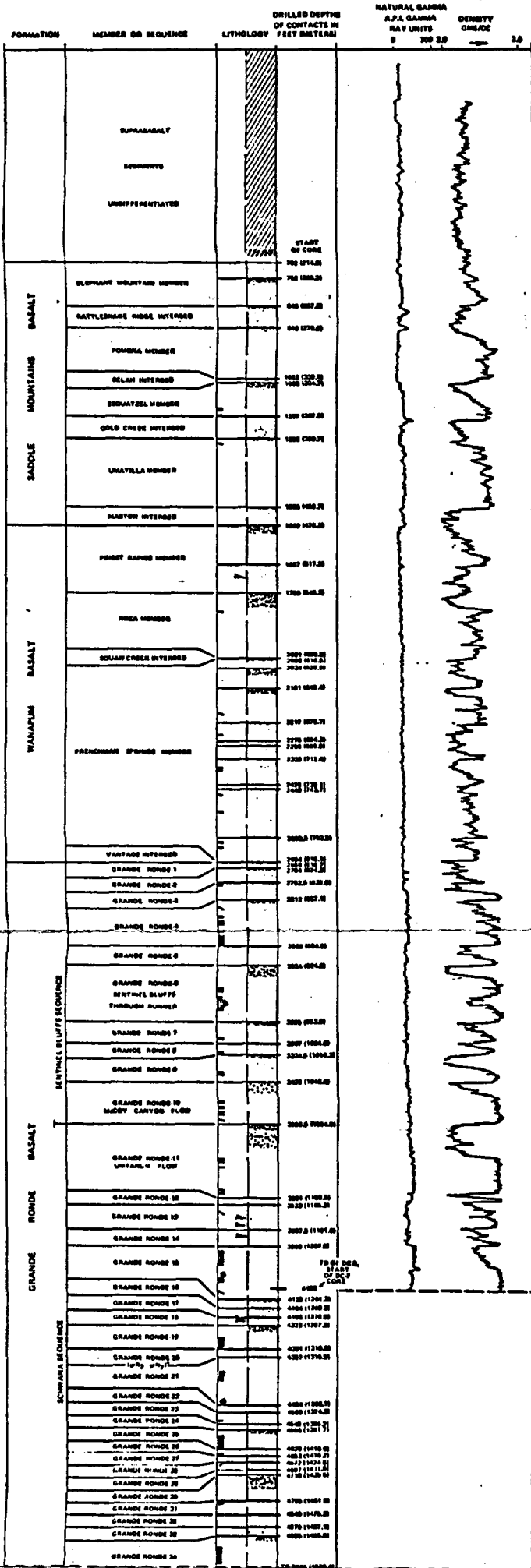
**INFORMATION COPY**  
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DRAWING APPD	DATE	U.S. DEPARTMENT OF ENERGY	
APPROVED FOR QUALITY	DATE	HIGHLAND OPERATIONS DIVISION	
APPROVED	DATE	ROCKWELL HANFORD OPERATIONS	
		HIGHLAND, WASHINGTON 99280	
DC-6 DC-2 DC-16 DC-17 DC-18 DC-19 DC-20 DC-21 DC-22 DC-23 DC-24 DC-25 DC-26 DC-27 DC-28 DC-29 DC-30 DC-31 DC-32 DC-33 DC-34 DC-35 DC-36 DC-37 DC-38 DC-39 DC-40 DC-41 DC-42 DC-43 DC-44 DC-45 DC-46 DC-47 DC-48 DC-49 DC-50 DC-51 DC-52 DC-53 DC-54 DC-55 DC-56 DC-57 DC-58 DC-59 DC-60 DC-61 DC-62 DC-63 DC-64 DC-65 DC-66 DC-67 DC-68 DC-69 DC-70 DC-71 DC-72 DC-73 DC-74 DC-75 DC-76 DC-77 DC-78 DC-79 DC-80 DC-81 DC-82 DC-83 DC-84 DC-85 DC-86 DC-87 DC-88 DC-89 DC-90 DC-91 DC-92 DC-93 DC-94 DC-95 DC-96 DC-97 DC-98 DC-99 DC-100		DESP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS	
SCALE	VERTICAL: 1" = 100'	PLAN: AS SHOWN	INDEX: SEE SHEET 7 OF 9
CLASSIFICATION	SECRET	FORM NO. 100-10	REV. 10-77
RSD-BW-DP-03		3	9

**DC-8  
(EXTENDED IN DEPTH IN DC-7)  
COREHOLE**

DC-8 HANFORD COORDINATES 14856 N, 14823 W  
GROUND SURFACE ELEVATION = 548' (166.1m)  
DATE DRILLED 3/1/78 - 8/8/78  
DC-7 HANFORD COORDINATES 14851 N, 14821 W  
GROUND SURFACE ELEVATION = 548' (166.4m)  
DATE DRILLED 10/18/77 - 12/2/77  
2/19/80 - 6/3/80

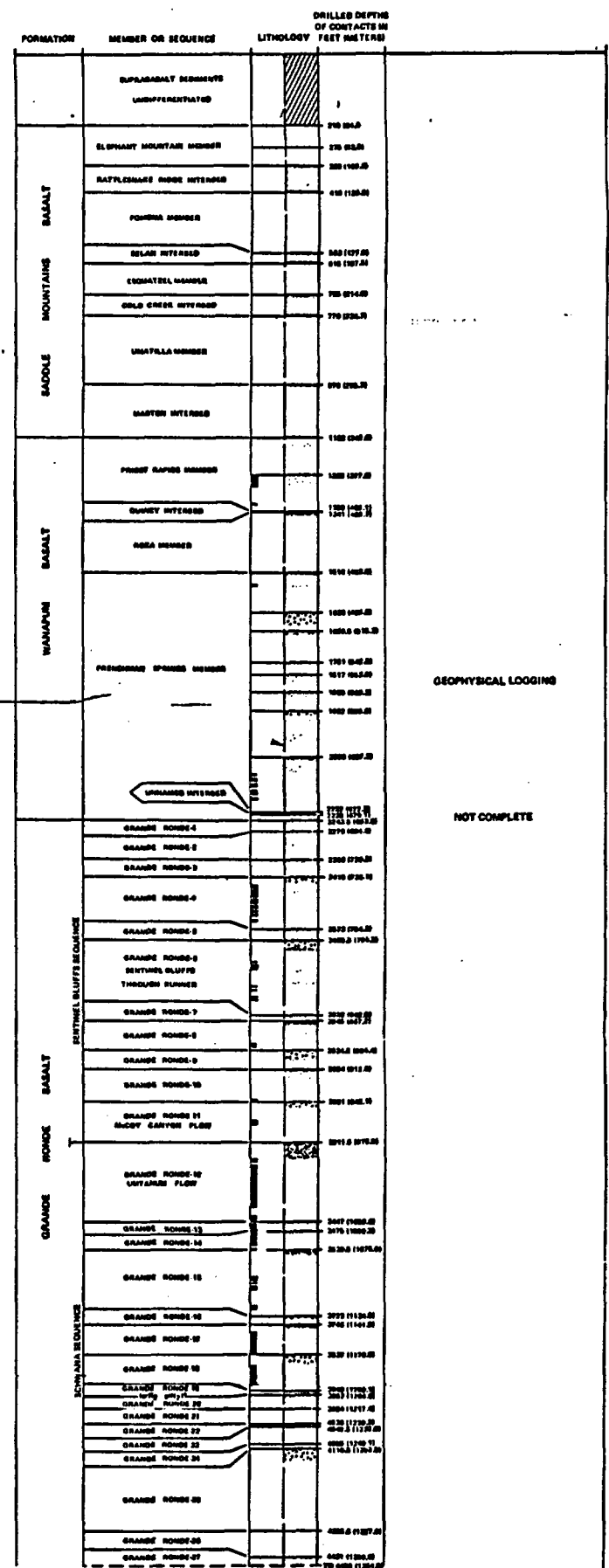
BOREHOLE GEOPHYSICAL LOG



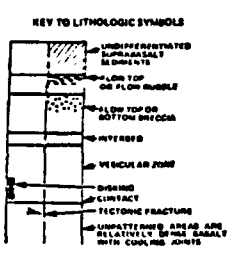
**DC-12  
COREHOLE**

HANFORD COORDINATES 10126 N, 8387 W  
GROUND SURFACE ELEVATION = 516' (157.3m)  
DATE DRILLED - COMPLETED 6/28/81

BOREHOLE GEOPHYSICAL LOG

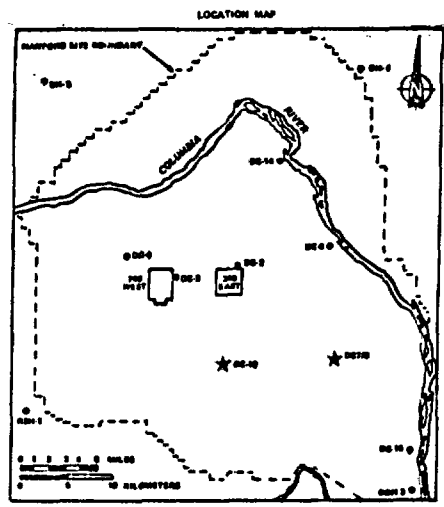


GEOPHYSICAL LOGGING  
NOT COMPLETE



**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE 12 IN DC 14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE 12 IN DC 8. NAMES FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.  
SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS  
A symbol denotes the STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANDE RONDE FLOWS (BELOW). SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.

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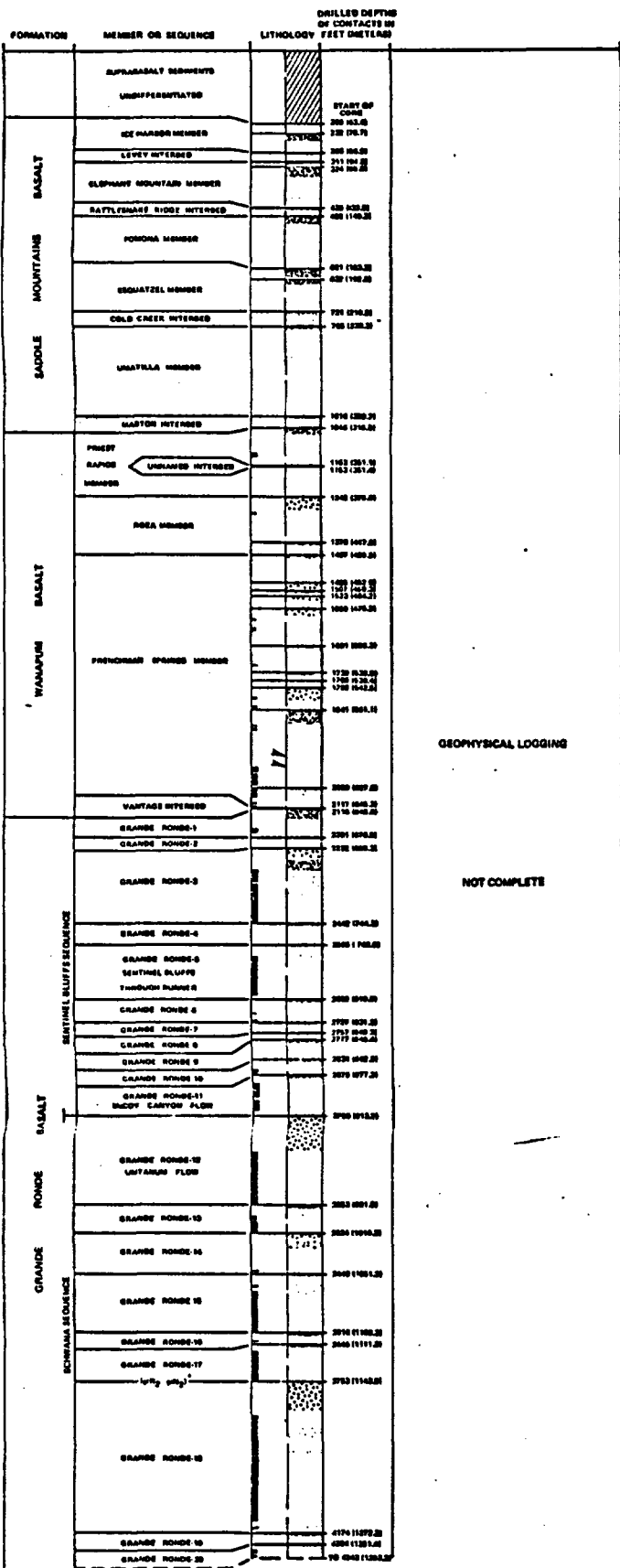


DRAWING APPROVED	DATE	U.S. DEPARTMENT OF ENERGY SOLID AND OPERATIONS DIVISION BOZEMAN, MONTANA 59717
DATE FOR QUALITY ASSURANCE	DATE	
DATE FOR QUALITY ASSURANCE	DATE	DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
DATE FOR QUALITY ASSURANCE	DATE	
SCALE	VERTICAL 1" = 100'	BLDG NO.
SCALE	HORIZONTAL 1" = 100'	ROOM NO.
DATE	DATE	PROJECT NO.
DATE	DATE	PROJECT NO.



**DC-15  
COREHOLE**  
HANFORD COORDINATE 151345, 14098 E  
GROUND SURFACE ELEVATION = 402' (122.5m)  
DATE DRILLED - 8/11/81

BOREHOLE GEOPHYSICAL LOGS







**DESCRIPTION OF UNITS**

**SUPRABASALT SEDIMENTS**  
 SUPRABASALT SEDIMENTS INCLUDE PRINCIPALLY THE HANFORD AND RINGOLD FORMATIONS BUT ALSO INCLUDE THE MIDDLE CREEK SYNCLINE AREA AND OVERLIE THE FLOWS OF THE COLUMBIA RIVER BASALT GROUP IN THE WESTERN AND CENTRAL COLUMBIA PLATEAU OF WASHINGTON. ELLENSBURG BEDS LYING BETWEEN COLUMBIA RIVER BASALT FLOWS ARE REFERRED TO AS INTERBEDS AND HAVE INFORMAL MEMBER STATUS. EACH OF THE INTERBEDS OCCURRING IN THE PASCO BASIN ARE DESCRIBED BELOW.

**ELLENSBURG FORMATION**  
 SEDIMENTARY BEDS OF THE ELLENSBURG FORMATION ARE INTERCALATED WITH AND OVERLIE THE FLOWS OF THE COLUMBIA RIVER BASALT GROUP IN THE WESTERN AND CENTRAL COLUMBIA PLATEAU OF WASHINGTON. ELLENSBURG BEDS LYING BETWEEN COLUMBIA RIVER BASALT FLOWS ARE REFERRED TO AS INTERBEDS AND HAVE INFORMAL MEMBER STATUS. EACH OF THE INTERBEDS OCCURRING IN THE PASCO BASIN ARE DESCRIBED BELOW.

**LEVEY INTERBED**  
 THE LEVEY INTERBED, LIES BETWEEN THE ICE HARBOR AND ELEPHANT MOUNTAIN MEMBERS OF THE SADDLE MOUNTAINS BASALT AND IS THE YOUNGEST ELLENSBURG UNIT IN THE PASCO BASIN. IT CONSISTS OF TUFFACEOUS SILT OR SILTSTONE.

**RATTLESNAKE RIDGE INTERBED**  
 THE RATTLESNAKE RIDGE INTERBED COMPRISES THREE FACIES BASED ON LITHOLOGY AND TEXTURE. THE FIRST FACIES OCCURS IN THE CENTRAL CREEK SYNCLINE AREA AND USUALLY CONSISTS OF THREE UNITS: (A) A LOWER CLAY OR TUFFACEOUS SANDSTONE, (B) A MIDDLE, MICACEOUS-ARKOSIC AND/OR TUFFACEOUS SANDSTONE, AND (C) AN UPPER TUFFACEOUS SILTSTONE OR TUFFACEOUS SANDSTONE. THE SECOND FACIES IS A SINGLE TUFFACEOUS SANDSTONE SILTSTONE UNIT AND OCCURS WHERE THE INTERBED IS RELATIVELY THIN. THE THIRD FACIES OCCURS ON THE NORTHWESTERN MARGIN OF THE PASCO BASIN AND IS A CONGLOMERATE WITH PLUTONIC AND METAMORPHIC CLASTS.

**SELAH INTERBED**  
 THE SELAH INTERBED IS A VARIABLE MIXTURE OF SILTY OR SANDY, VITRIC TUFF, ARKOSIC SANDS, TUFFACEOUS CLAYS, AND LOCALLY THIN STRINGERS OF PREDOMINANTLY BASALTIC GRAVELS. THE UPPER PORTION OF THE SELAH INTERBED IS A VITRIC TUFF COMMONLY FUSED TO A RELICT VITRIC TUFF BY THE OVERLYING POMONA MEMBER.

**COLD CREEK INTERBED**  
 THE COLD CREEK INTERBED IS THE SEQUENCE OF ELLENSBURG UNITS THAT OCCURS STRATIGRAPHICALLY BETWEEN THE ESQUATZEL AND UMATILLA MEMBERS OF THE SADDLE MOUNTAINS BASALT. THREE SEPARATE UNITS OF THE INTERBED ARE IDENTIFIED ON THE BASIS OF SOUNDING FLOWS. THESE UNITS ARE THE UMATILLA-ESQUATZEL, UMATILLA-ASOTIN, AND ASOTIN-ESQUATZEL INTERVALS.

**ASOTIN-ESQUATZEL INTERVAL**  
 THE ASOTIN-ESQUATZEL INTERVAL CONSISTS OF TUFFS AND CLAY LAYERS, ARKOSIC TO QUARTZOSE SANDSTONES, AND BASALTIC CONGLOMERATES.

**UMATILLA-ESQUATZEL INTERVAL**  
 THE UMATILLA-ESQUATZEL INTERVAL EXHIBITS TWO TEXTURAL FACIES: (1) A FINE GRAINED, TUFFACEOUS SANDSTONE FACIES, AND (2) A COARSER SANDSTONE AND CONGLOMERATE FACIES WITH TUFFACEOUS SILTSTONE AND CLAYS.

**UMATILLA-ASOTIN INTERVAL**  
 THE UMATILLA-ASOTIN INTERVAL IS COMPOSED CHIEFLY OF TUFFACEOUS SILTSTONES AND TUFFACEOUS CLAYSTONES.

**MABTON INTERBED**  
 THE MABTON INTERBED LIES BETWEEN THE SADDLE MOUNTAINS BASALT AND ABOVE THE WANAPUM BASALT. FROM TOP TO BOTTOM, THE INTERBED CONSISTS OF: (1) A WELL INDURATED, LAPILLI TUFFS, LOCALLY BAKED; (2) A FINE GRAINED, TUFFACEOUS CLAYEY QUARTZITIC SANDSTONE; (3) A QUARTZITIC TO ARKOSIC SANDSTONE WITH INTERCALATED TUFFACEOUS SANDSTONES AND SILTSTONES, AND (4) A THIN, DISCONTINUOUS, BASAL, SILTY CLAY.

**VANTAGE INTERBED**  
 THE VANTAGE INTERBED IS COMPRISED OF SEDIMENTS LYING BETWEEN THE WANAPUM BASALT AND THE GRANDE RONDE BASALT. SAPROLITE COMMONLY OCCURS AT THE TOP OF GRANDE RONDE BASALT AREAS WHERE NO SEDIMENTS WERE DEPOSITED. THE THICKER SEQUENCES OF VANTAGE CONSIST OF ARKOSIC SANDSTONE LOCALLY CONTAINING THIN CLAY STRINGERS WITH A CLAY CAP. THE THINNER SEQUENCES OF VANTAGE CONSIST OF CLAYS WHICH ARE ALTERED TUFFS.

**SADDLE MOUNTAINS BASALT**  
 THE SADDLE MOUNTAINS BASALT CONSISTS OF SEVEN MEMBERS IN THE PASCO BASIN: (1) UMATILLA, (2) WILBUR CREEK, (3) ASOTIN, (4) ESQUATZEL, (5) POMONA, (6) ELEPHANT MOUNTAIN, AND (7) ICE HARBOR.

**ICE HARBOR MEMBER**  
 THE ICE HARBOR MEMBER IS THE YOUNGEST MEMBER OF THE SADDLE MOUNTAINS BASALT AND CONSISTS OF THREE FLOWS: (1) BASIN CITY, (2) MARTINDALE, AND (3) GOOSE ISLAND. THE FLOWS ARE FINE TO MEDIUM GRAINED WITH GLOMEROCRYSTS AND PHENOCRYSTS OF OLIVINE, PLAGIOCLASE, AND CLINOPYROXENE. OLIVINE OCCURS PRIMARILY IN THE MARTINDALE AND BASIN CITY FLOWS, WHEREAS THE GOOSE ISLAND FLOW CONTAINS GLOMEROCRYSTS OF PYROXENE AND PLAGIOCLASE.

**ELEPHANT MOUNTAIN MEMBER**  
 THE ELEPHANT MOUNTAIN MEMBER CONSISTS OF TWO SEPARATE FLOWS: THE ELEPHANT MOUNTAIN FLOW AND THE WARD GAP FLOW. THE TEXTURE OF THE FLOWS IS MEDIUM TO FINE GRAINED WITH ABUNDANT MICROPHENOCRYSTS OF PLAGIOCLASE.

**POMONA MEMBER**  
 THE POMONA MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOBES. THE TEXTURE IS RELATIVELY UNIFORM, TYPICALLY FINE GRAINED TO GLASSY WITH WEDGE-SHAPED PLAGIOCLASE PHENOCRYSTS AND SPARSE OLIVINE.

**ESQUATZEL MEMBER**  
 THE ESQUATZEL MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOBES THAT OCCUR LOCALLY WITH A VITRIC TUFF BETWEEN THEM. THE MEMBER IS COMMONLY PLAGIOCLASE-PHYRIC TO OLIVINE-PHYRIC AND CONTAINS MICROPHENOCRYSTS OF CLINOPYROXENE. HOWEVER, SOME LOCALITIES LACK PHENOCRYSTS.

**ASOTIN MEMBER**  
 THE ASOTIN MEMBER OCCURS IN THE PASCO BASIN AS A SINGLE FLOW. THE HUNTZINGER FLOW. THE TEXTURE OF THE HUNTZINGER FLOW RANGES FROM FINE GRAINED AND GLASSY TO OPHITIC. THE FLOW HAS ABUNDANT OLIVINE, BUT PLAGIOCLASE IS SPARSE.

**WILBUR CREEK MEMBER**  
 THE WILBUR CREEK MEMBER IN THE PASCO BASIN CONSISTS OF ONE FLOW. THE WAHLRU FLOW. IT IS TYPICALLY FINE GRAINED TO GLASSY AND APHYRIC WITH SPARSE MICROPHENOCRYSTS OF PLAGIOCLASE.

**UMATILLA MEMBER**  
 THE UMATILLA MEMBER CONSISTS OF TWO FLOWS. THE YOUNGER FLOW IS THE BILLUSI FLOW AND THE OLDER FLOW IS THE UMATILLA FLOW. BOTH FLOWS ARE FINE GRAINED TO GLASSY WITH RARE MICROPHENOCRYSTS OF PLAGIOCLASE AND OLIVINE. THE FLOWS ARE PREDOMINANTLY ENTABLATURE WITH A RELATIVELY THIN BASAL COLONNADE.

**WANAPUM BASALT**  
 THE WANAPUM BASALT IN THE PASCO BASIN CONSISTS OF THREE MEMBERS: (1) FRENCHMAN SPRINGS, (2) ROZA, AND (3) PRIEST RAPIDS.

**PRIEST RAPIDS MEMBER**  
 THE PRIEST RAPIDS MEMBER CONSISTS OF TWO DISTINCT FLOWS. AN OLDER FLOW (ROZALIA CHEMICAL TYPE) IS TYPICALLY COARSE GRAINED WITH RARE OLIVINE AND PLAGIOCLASE PHENOCRYSTS. THE YOUNGER FLOW (LOW  $M_0$  CHEMICAL TYPE) HAS SMALL OLIVINE PHENOCRYSTS (5-5MM) AND RARE GLOMEROCRYSTS OF PLAGIOCLASE.

**ROZA MEMBER**  
 THE ROZA MEMBER CONSISTS OF ONE OR TWO FLOWS OR FLOW LOBES. IN HAND SPECIMEN, IT IS CHARACTERIZED BY THE PRESENCE OF SINGLE PLAGIOCLASE PHENOCRYSTS UP TO 1.5 CM IN SIZE SET IN A FINE-GRAINED GROUND MASS.

**FRENCHMAN SPRINGS MEMBER**  
 THE FRENCHMAN SPRINGS MEMBER IS THE OLDEST MEMBER OF THE WANAPUM BASALT AND CONSIST OF APPROXIMATELY THREE TO TWELVE FLOWS. THE FLOWS ARE ALL MEDIUM TO FINE GRAINED AND CONTAIN PLAGIOCLASE PHENOCRYSTS. THE FLOWS ARE COMMONLY GROUPED INTO "PHYRIC" AND "APHYRIC" UNITS.

**GRANDE RONDE BASALT**  
 THE GRANDE RONDE BASALT IS A THICK SEQUENCE OF AT LEAST 56 BASALT FLOWS WHICH INTERLIE THE SADDLE MOUNTAINS AND WANAPUM BASALTS. THESE FLOWS ARE TYPICALLY FINE GRAINED AND APHYRIC OR SPARSILY MICROPHYRIC WITH FEW CONSPICUOUS PHENOCRYSTS. THE FLOWS ARE DIVIDED INTO TWO MAJOR SEQUENCES: (1) THE SCHWANA SEQUENCE, WHICH IS CHARACTERIZED BY A LOW  $M_0$  CHEMICAL TYPE AND (2) THE SENTINEL BLUFFS SEQUENCE, WHICH IS CHARACTERIZED BY A HIGH  $M_0$  CHEMICAL TYPE. THE CONTACT BETWEEN THESE TWO SEQUENCES IS KNOWN AS THE  $M_0$  HORIZON.

**SENTINEL BLUFFS SEQUENCE**  
 THE SENTINEL BLUFFS SEQUENCE CONSISTS OF 7 TO 16 FLOWS ALL OF HIGH  $M_0$  CHEMICAL TYPE AND ALL WITHIN THE  $N_2$  MAGNETOSTRATIGRAPHIC UNIT. THE MCDON CANYON FLOW IS THE LOWERMOST FLOW IN THE SENTINEL BLUFFS SEQUENCE. WITHIN THE SENTINEL BLUFFS SEQUENCE, TWO  $C_0$  HORIZONS OCCUR. THE LOWER HORIZON IS MARKED BY A LOWER  $C_0$  CONTENT RELATIVE TO THE 3 TO 4 FLOWS OVERLYING IT. THE UPPER  $C_0$  HORIZON IS DEFINED BY A SINGLE FLOW OF RELATIVELY LOW  $C_0$ .

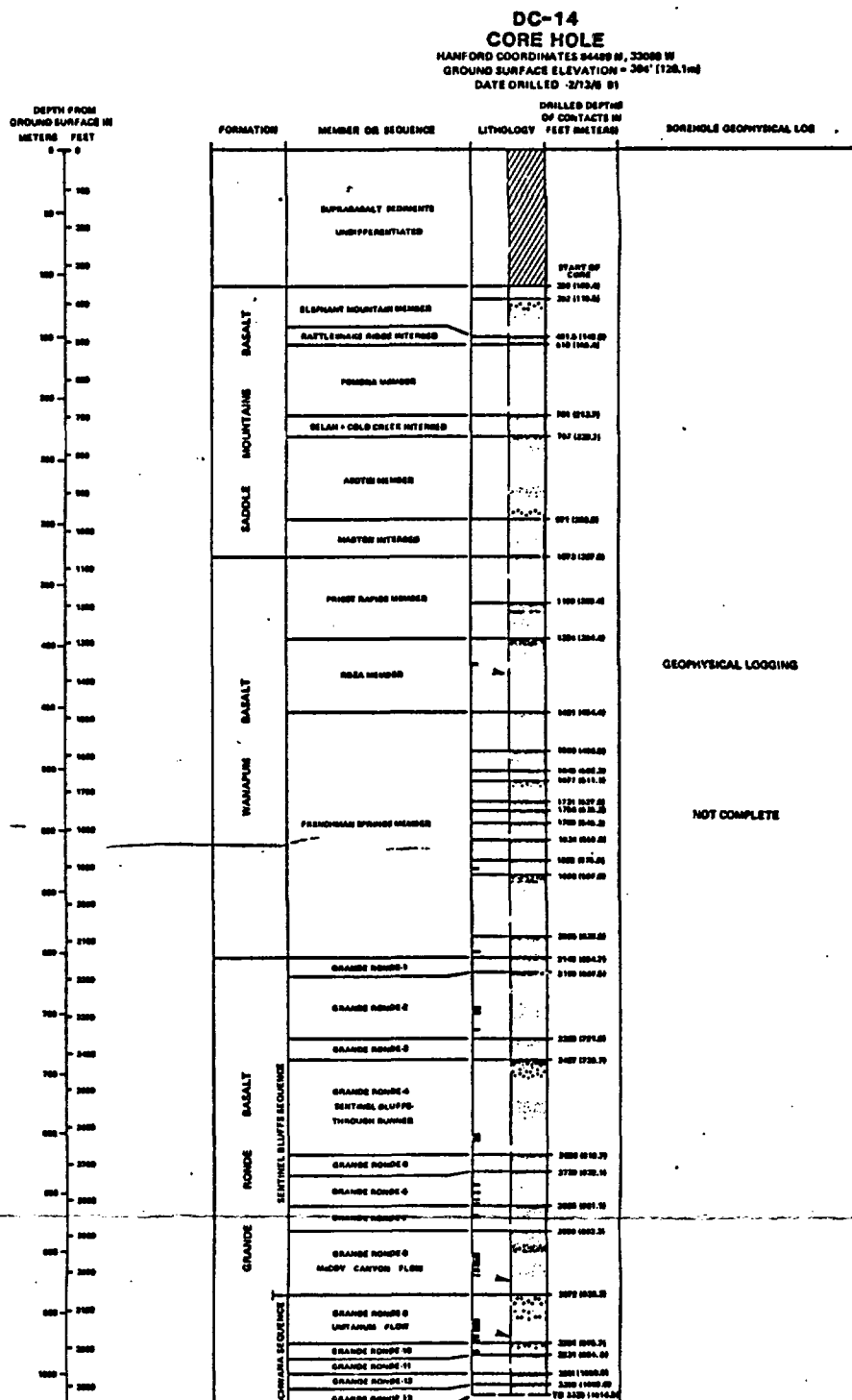
**SCHWANA SEQUENCE**  
 THE SCHWANA SEQUENCE CONSISTS OF DOMINANTLY LOW  $M_0$  FLOWS. THREE FLOWS NEAR THE TOP OF THE SEQUENCE ARE NOTABLE EXCEPTIONS. THE LOWERMOST OF THESE THREE FLOWS IS A VERY HIGH  $M_0$  FLOW WHICH OCCURS TWO TO FOUR FLOWS BELOW THE  $M_0$  HORIZON. THE OTHER TWO FLOWS ARE OF HIGH  $M_0$  CHEMICAL TYPE AND ARE INTERCALATED WITH THE LOW  $M_0$  FLOWS IN THE UPPER PART OF THE SCHWANA SEQUENCE. THE UMATANUM FLOW IS A THICK, LATERALLY EXTENSIVE FLOW RECOGNIZED BY ITS DISTINCTIVE CHEMICAL COMPOSITION AND PALEOMAGNETIC PROPERTIES. IT IS THE UPPERMOST FLOW IN THE SCHWANA SEQUENCE AT TWO LOCALITIES (ONE IN THE UMATANUM RIDGE NEAR PRIEST RAPIDS DAM) WHERE A SINGLE RELATIVELY THIN FLOW OF LOW-TO INTERMEDIATE  $M_0$  CHEMICAL TYPE OVERLIES THE UMATANUM FLOW.

**ADDITIONAL INFORMATION ON STRATIGRAPHY OF THE COLUMBIA RIVER BASALT GROUP MAY BE FOUND IN THE FOLLOWING PUBLICATIONS:**

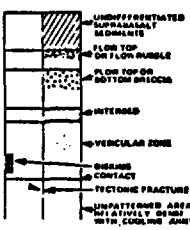
Myer, C. W., Price, S. M., Cappano, J. A., Cochran, M. P., Criner, W. J., Davidson, N. J., Edwards, R. C., Facht, R. R., Holmes, G. E., Jones, M. G., Kumb, J. R., Landon, R. D., Leupers, R. K., Lutz, J. T., Long, P. E., Muehlen, T. R., Price, E. H., Riedel, S. P., and Tallman, A. M., 1979, Geologic studies of the Columbia Plateau, a status report. RMD-BWI-ST-4, Rockwell Hanford Operations, Richland, Washington.

Riedel, S. P., and Facht, R. R., Chapter 3 - Wanapum and Saddle Mountains Basalts of the Cold Creek syncline area, Long, P. E., and Landon, R. D., Chapter 4 - Stratigraphy of the Grande Ronde Basalt, and Mose, D. J., Chapter 6 - Borehole Geologic Studies, all in 1981, Subsurface geology of the Cold Creek syncline; Myer, C. W., and Price, S. M., editors. RMD-BWI-ST-14, Rockwell Hanford Operations, Richland, Washington.

Svensen, D. A., Wright, T. L., Hesser, P. R., and Bentley, R. D., 1979, Revisions in stratigraphic nomenclature of the Columbia River Basalt Group; U. S. Geological Survey Bulletin 1457-G.



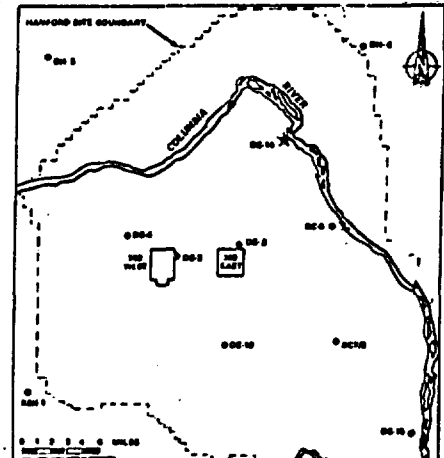
**KEY TO LITHOLOGIC SYMBOLS**



**EXPLANATION**

GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC 14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN OTHER NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

**LOCATION MAP**



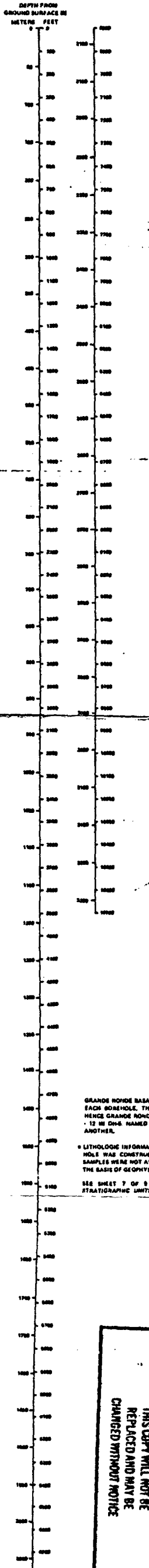
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DRAWING APP'D	DATE	U.S. DEPARTMENT OF ENERGY	
APPROVED	1980	NICKLAKE OPERATIONS OFFICE	
DATE		ROCKWELL HANFORD OPERATIONS	
		RICHLAND, WASHINGTON 99352	
		DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS	
SCALE	VERTICAL 1" = 100'	DATE	1980
DESIGNED BY		PROJECT NO.	
		RD-BWI-09-038	

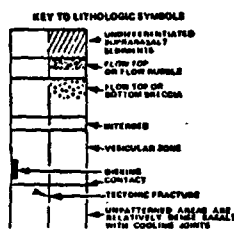
**RSH-1  
ROTARY BOREHOLE**  
NO HANFORD COORDINATES  
GROUND SURFACE ELEVATION = 2987' (877.8m)  
DATE DRILLED 7/7/57 - 4/6/58

BOREHOLE GEOPHYSICAL LOG

FORMATION	MEMBER OR SEQUENCE	LITHOLOGY	DRILLED DEPTH OF CONTACTS IN FEET (METERS)	NATURAL GAMMA	SOUND TRANSMIT TIME
SADDLE MOUNTAINS BASALT	ELEPHANT MOUNTAIN MEMBER		48 1142.7		
	PONDELA MEMBER		170 814.0		
	USATILLA MEMBER		202 1110.0		
WAMAPUN BASALT	MARTON HT LENS		205 1104.0		
	PIRETT RAPIDS MEMBER		250 1020.0		
	ROSA MEMBER		270 874.0		
	ROBERT CRANE MEMBER		280 804.0		
			285 874.0		
			300 804.0		
			305 874.0		
			310 804.0		
			315 874.0		
			320 804.0		
GRANDE RONDE BASALT	GRANDE RONDE-1		325 804.0		
	GRANDE RONDE-2		330 804.0		
	GRANDE RONDE-3		335 804.0		
	GRANDE RONDE-4		340 804.0		
	GRANDE RONDE-5		345 804.0		
	GRANDE RONDE-6		350 804.0		
	GRANDE RONDE-7		355 804.0		
	GRANDE RONDE-8		360 804.0		
	GRANDE RONDE-9		365 804.0		
	GRANDE RONDE-10		370 804.0		
	GRANDE RONDE-11		375 804.0		
	GRANDE RONDE-12		380 804.0		
	GRANDE RONDE-13		385 804.0		
	GRANDE RONDE-14		390 804.0		
	GRANDE RONDE-15		395 804.0		
	GRANDE RONDE-16		400 804.0		
	GRANDE RONDE-17		405 804.0		
	GRANDE RONDE-18		410 804.0		
	GRANDE RONDE-19		415 804.0		
	GRANDE RONDE-20		420 804.0		



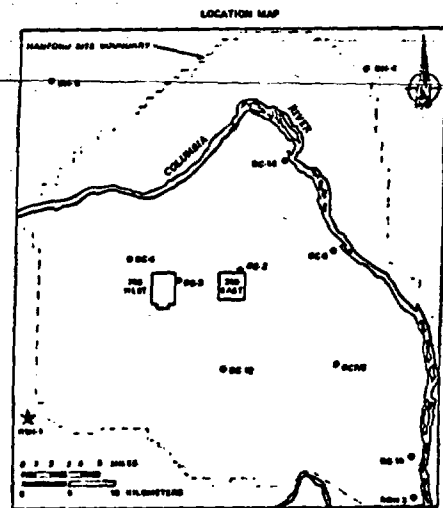
FORMATION	MEMBER OR SEQUENCE	LITHOLOGY	DRILLED DEPTH OF CONTACTS IN FEET (METERS)	NATURAL GAMMA	SOUND TRANSMIT TIME
GRANDE RONDE BASALT	GRANDE RONDE-21		425 804.0		
	GRANDE RONDE-22		430 804.0		
	GRANDE RONDE-23		435 804.0		
	GRANDE RONDE-24		440 804.0		
	GRANDE RONDE-25		445 804.0		
	GRANDE RONDE-26		450 804.0		
	GRANDE RONDE-27		455 804.0		
	GRANDE RONDE-28		460 804.0		
	GRANDE RONDE-29		465 804.0		
	GRANDE RONDE-30		470 804.0		
	GRANDE RONDE-31		475 804.0		
	GRANDE RONDE-32		480 804.0		
	GRANDE RONDE-33		485 804.0		
	GRANDE RONDE-34		490 804.0		
	GRANDE RONDE-35		495 804.0		
	GRANDE RONDE-36		500 804.0		
	GRANDE RONDE-37		505 804.0		
	GRANDE RONDE-38		510 804.0		
	GRANDE RONDE-39		515 804.0		



**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN DC-6. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

\* LITHOLOGIC INFORMATION IS NOT AVAILABLE FOR RSH-1 BECAUSE HOLE WAS CONSTRUCTED BY ROTARY DRILLING. HENCE, CORE SAMPLES WERE NOT AVAILABLE. FLOW CONTACTS WERE PICKED ON THE BASIS OF GEOPHYSICAL LOGS AND CHEMICAL ANALYSES.

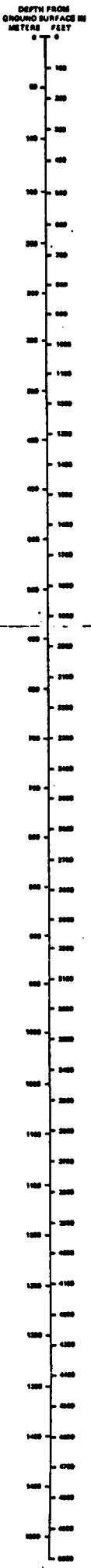
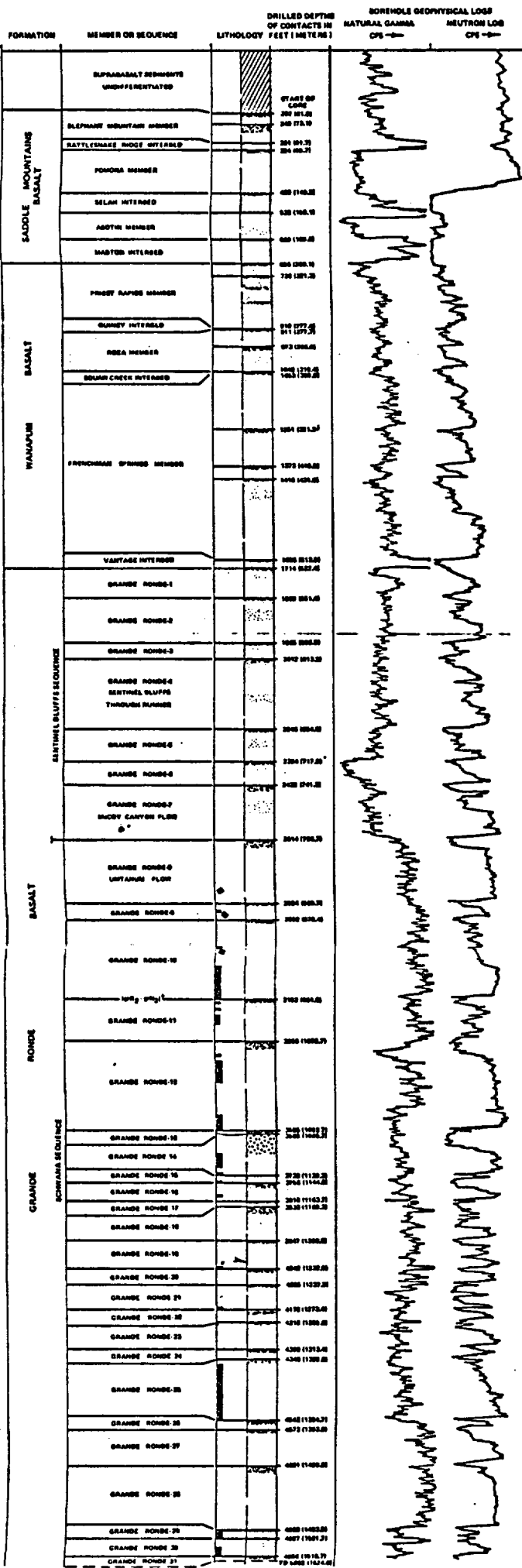
SEE SHEET 7 OF 8 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS



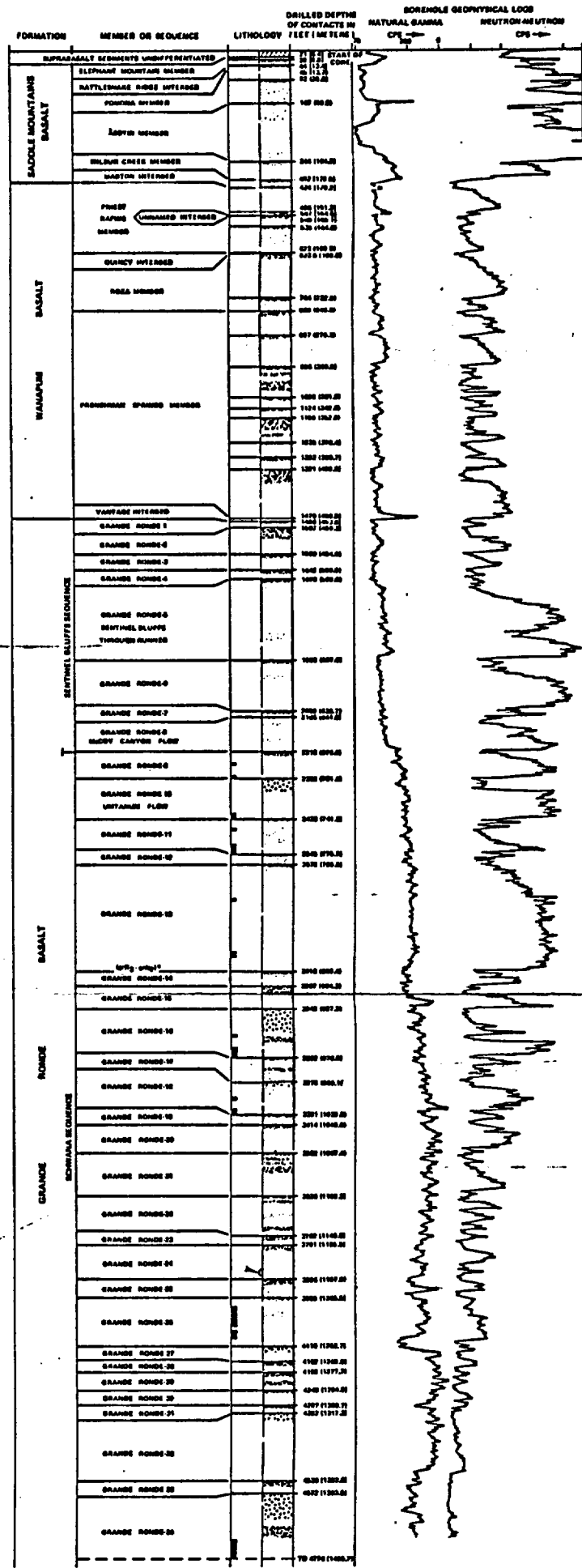
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DRAWING APPROVED	DATE	U.S. DEPARTMENT OF ENERGY RESEARCH OPERATIONS DIVISION
APPROVED FOR PRINTING	DATE	
APPROVED FOR PUBLICATION		ROCKWELL HANFORD OPERATIONS P.O. BOX 29, HANFORD, WA 99301-0029
DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS		
DRILLER	SCALE	PLATE NO.
DRILLING UNIT	VERTICAL SCALE	PLATE NO.
DRILLING METHOD	DRILLING NO.	PLATE NO.
DRILLING NO.	DRILLING NO.	DRILLING NO.

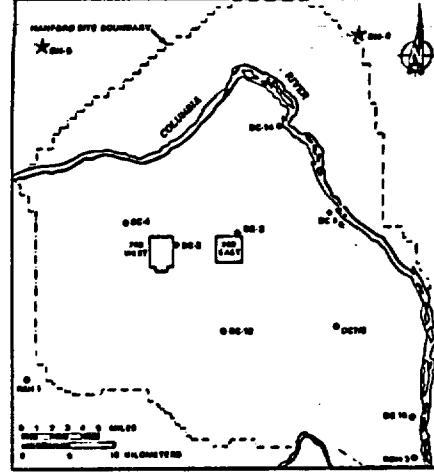
**DH-5  
COREHOLE**  
NO MANFORD COORDINATES  
GROUND SURFACE ELEVATION = 829' (264.1m)  
DATE DRILLED 7/27/71 - 2/11/72



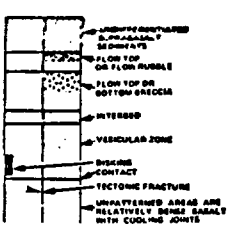
**DH-4  
COREHOLE**  
NO MANFORD COORDINATES  
GROUND SURFACE ELEVATION = 829' (264.1m)  
DATE DRILLED 7/27/71 - 2/22/72



LOCATION MAP



KEY TO LITHOLOGIC SYMBOLS



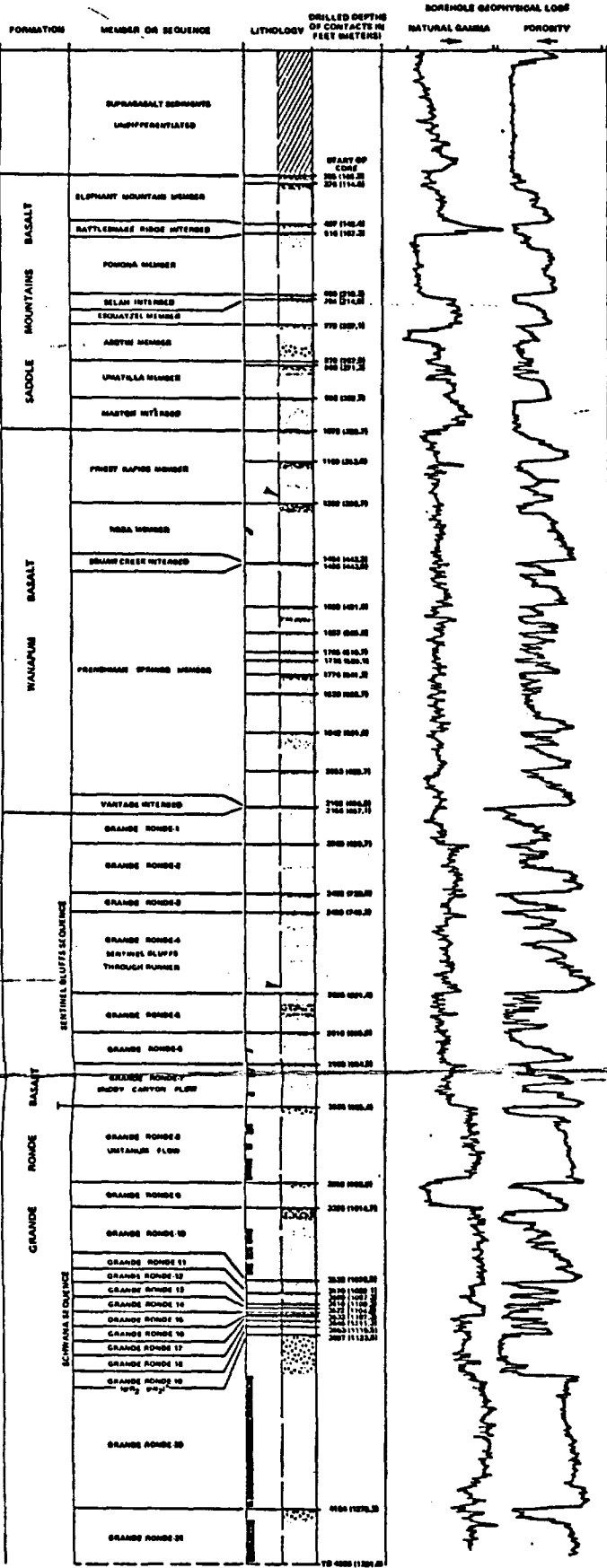
**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DH-4 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN DH-5. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.  
SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS  
\*cpk → denotes the stratigraphic horizon (contact) between paleomagnetically normal GRANDE RONDE FLOWS (above) and paleomagnetically reversed GRANDE RONDE FLOWS (below). SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.

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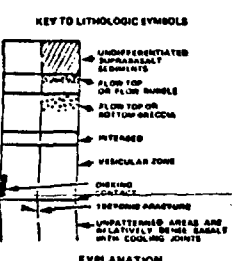
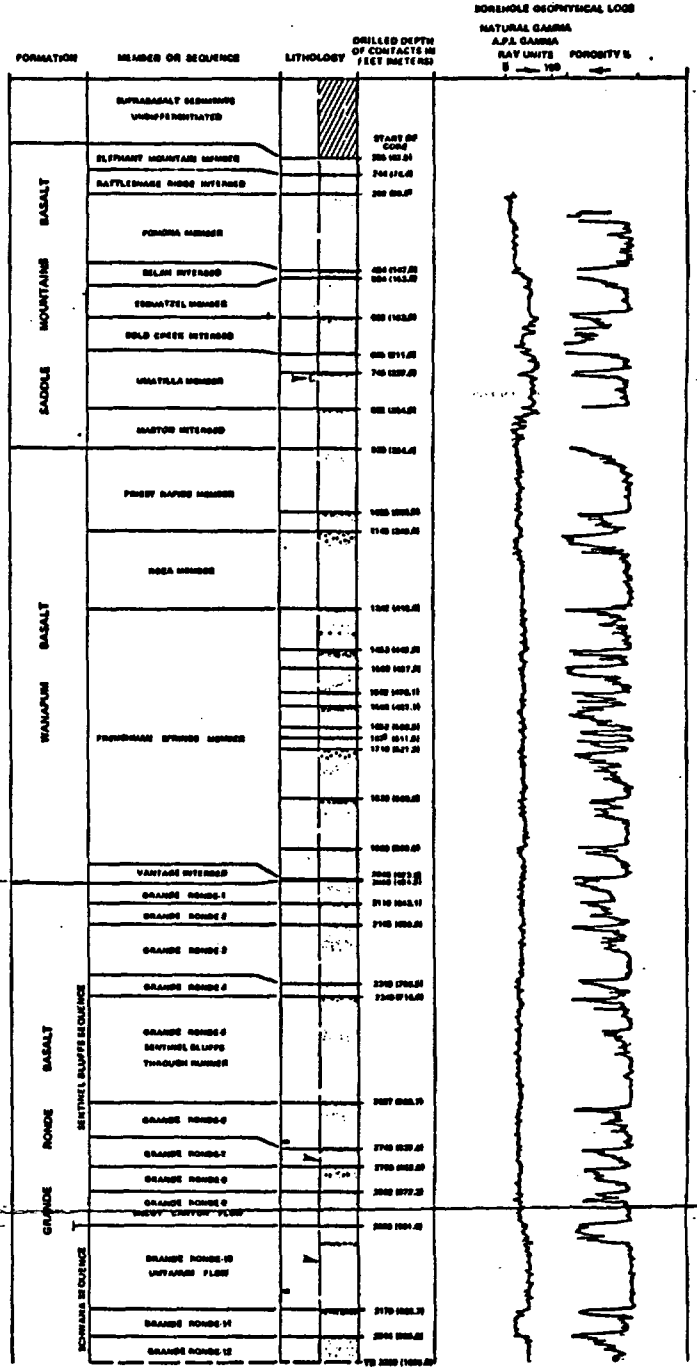
DRAWING APP'D	DATE	U.S. DEPARTMENT OF ENERGY OIL AND OPERATIONS OFFICE ROCKWELL MANFORD OPERATIONS ROCKWELL, MANFORD 10000
APPROVED QUALITY	DATE	
DATE	DATE	DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
DATE	DATE	
SCALE	VERTICAL: 1" = 200' HORIZONTAL: AS SHOWN	PLATE NO.
DATE	DATE	WELL NO.
DATE	DATE	WELL NO.
DATE	DATE	WELL NO.



**DC-8  
COREHOLE**  
MANFORD COORDINATES 64127 N, 17721 W  
GROUND SURFACE ELEVATION = 402' (122.5m)  
DATE DRILLED 12/6/77 - 6/24/78



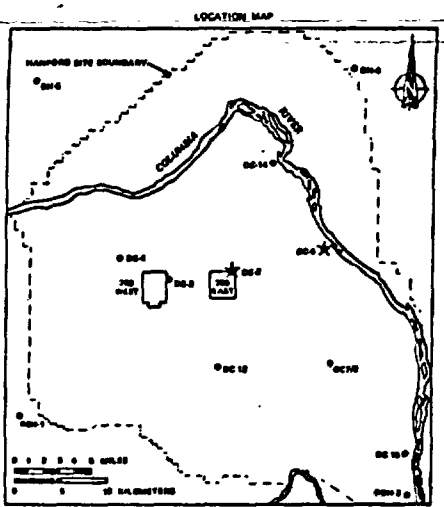
**DC-2  
COREHOLE**  
MANFORD COORDINATES 47947 N, 46363 W  
GROUND SURFACE ELEVATION = 377' (114.9m)  
DATE DRILLED 5/8/77 - 5/28/77



**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE 12 IN DC 14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE 12 IN THIS BOREHOLE. HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS  
\*1079 072 DENOTES THE STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANDE RONDE FLOWS (BELOW). SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.

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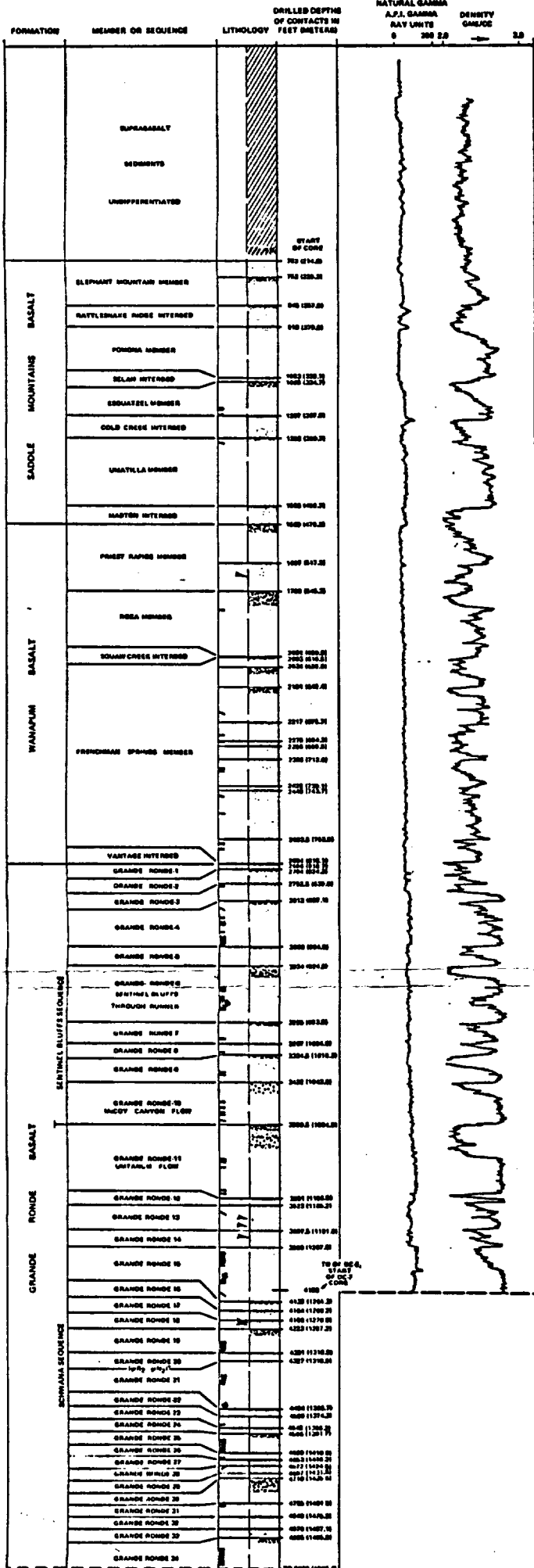
DRAWING APPR APPV FOR QUALITY APPROVED	DATE 12/1/78	U.S. DEPARTMENT OF ENERGY NICKEL OPERATIONS OFFICE ROCKWELL MANFORD OPERATIONS NICKEL, MANFORD, MISSO
DRAWING APPR DATE 12/1/78		DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE 1" = 100'	BLANK NO.	REVISION NO.
CLASSIFICATION	DRAWING NO.	RSD-SW-09-025



**DC-8  
(EXTENDED IN DEPTH IN DC-7)  
CORE HOLE**

DC-8 HANFORD COORDINATES 14858 N, 14852 W  
GROUND SURFACE ELEVATION = 548' (166.1m)  
DATE DRILLED 3/1/78 - 8/8/78  
DC-7 HANFORD COORDINATES 14861 N, 14851 W  
GROUND SURFACE ELEVATION = 548' (166.4m)  
DATE DRILLED 10/18/77 - 12/2/77  
3/19/80 - 6/9/80

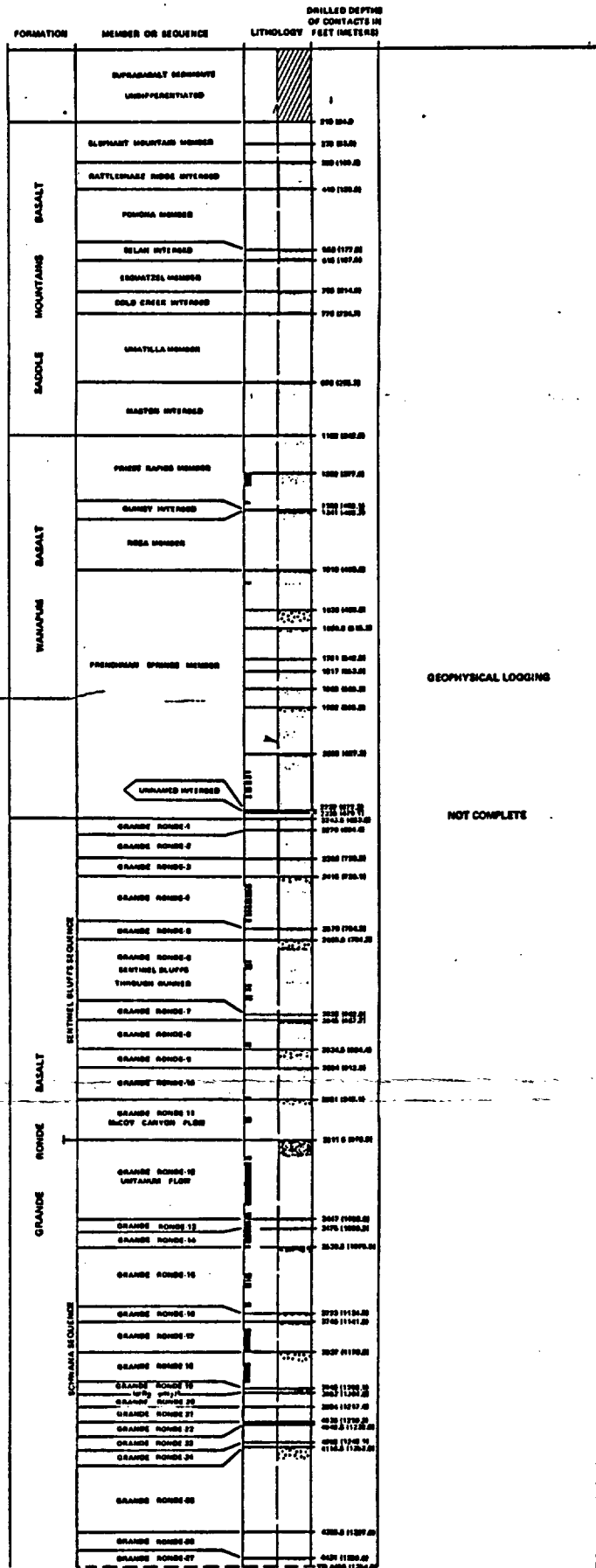
BOROHOLE GEOPHYSICAL LOG  
NATURAL GAMMA  
A.F.I. GAMMA  
RAY UNITS  
DENSITY  
GAMMA  
CORRECTION  
CORRECTION



**DC-12  
CORE HOLE**

HANFORD COORDINATES 10126 N, 6387 W  
GROUND SURFACE ELEVATION = 518' (157.3m)  
DATE DRILLED - COMPLETED 5/26/81

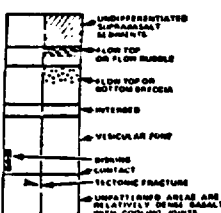
BOROHOLE GEOPHYSICAL LOG



GEOPHYSICAL LOGGING

NOT COMPLETE

**KEY TO LITHOLOGIC SYMBOLS**



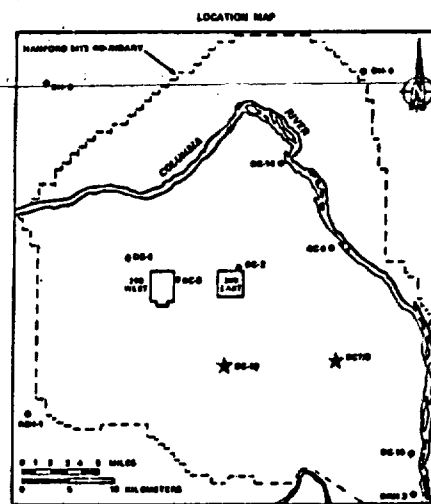
**EXPLANATION**

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SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS

100% denotes the STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANDERONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANDERONDE FLOWS (BELOW). SEE DESCRIPTION OF GRANDERONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDERONDE BASALT.

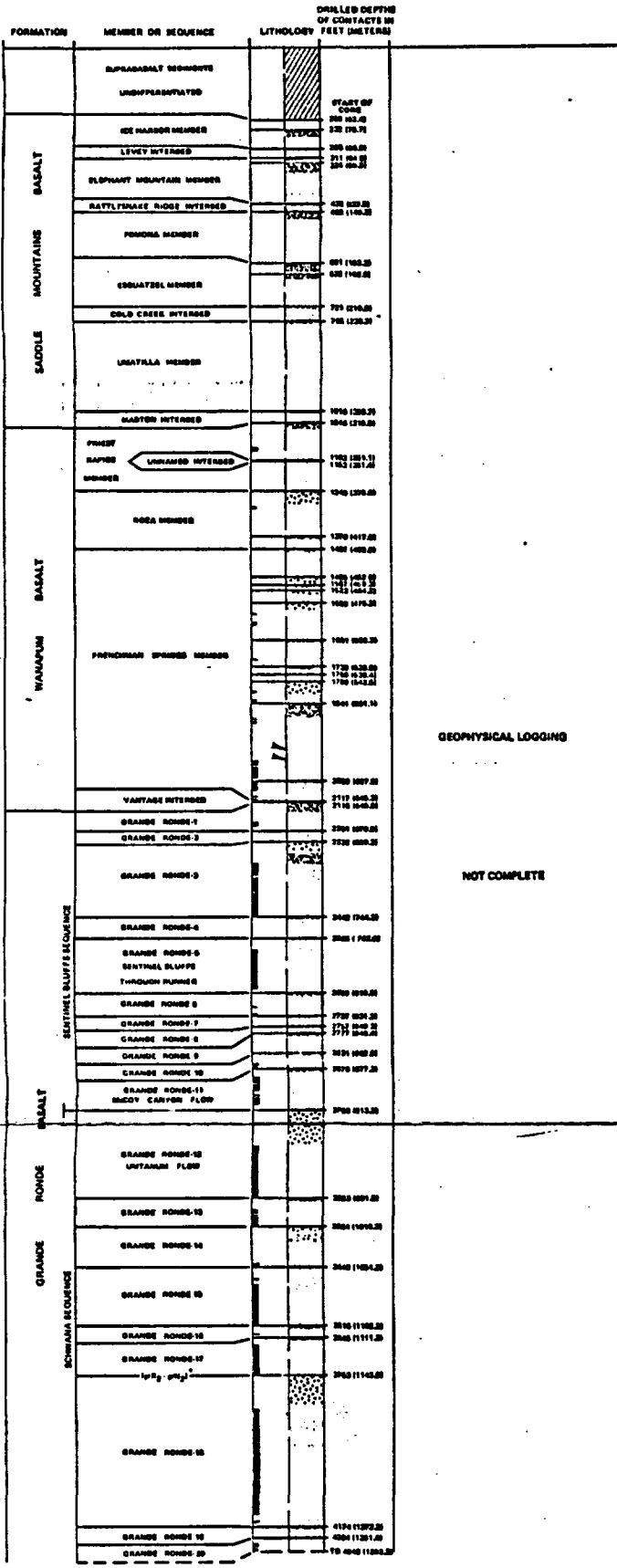
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COPY**  
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DRAWING APPR APR 27 1981 APR 27 1981	DATE APR 27 1981	U.S. DEPARTMENT OF ENERGY ROCKWELL HANFORD OPERATIONS HOLLAND, WASHINGTON 98501
DESIGNED BY CHECKED BY DATE 12-18-80		DEPT BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE VERTICAL 1" = 50' HORIZONTAL 1" = 100'	PLS NO. SHEET NO.	MODE NO. JOB NO.
CLASSIFICATION BY		RSD-89W-DP-028

**DC-15  
COREHOLE**  
MANFORD COORDINATE 36134 E, 14980 E  
GROUND SURFACE ELEVATION = 402' (122.3m)  
DATE DRILLED - 8/11/81

BOREHOLE GEOPHYSICAL LOG

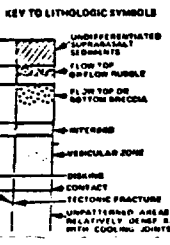
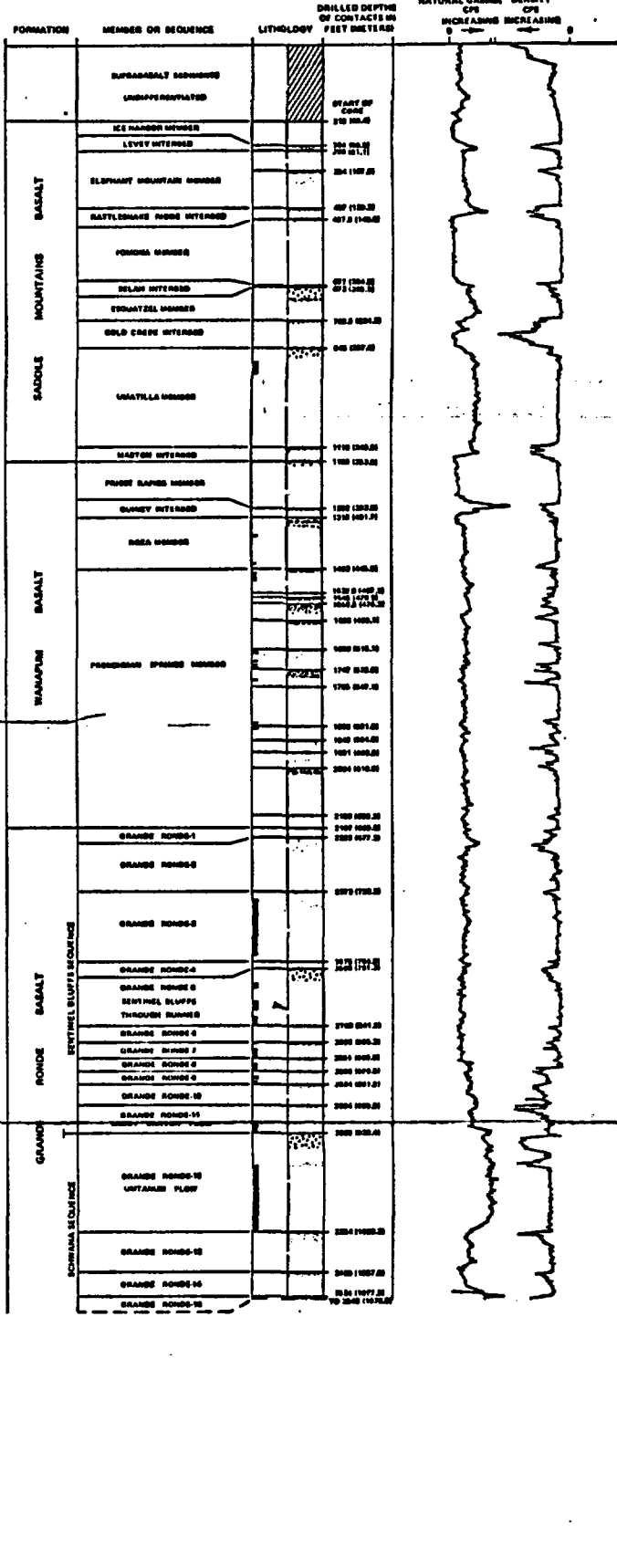


GEOPHYSICAL LOGGING

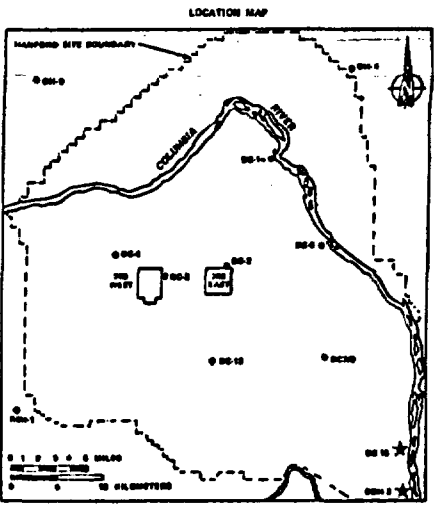
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**DDH-3  
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DATE DRILLED - 8/21/78 - 8/17/79

BOREHOLE GEOPHYSICAL LOG



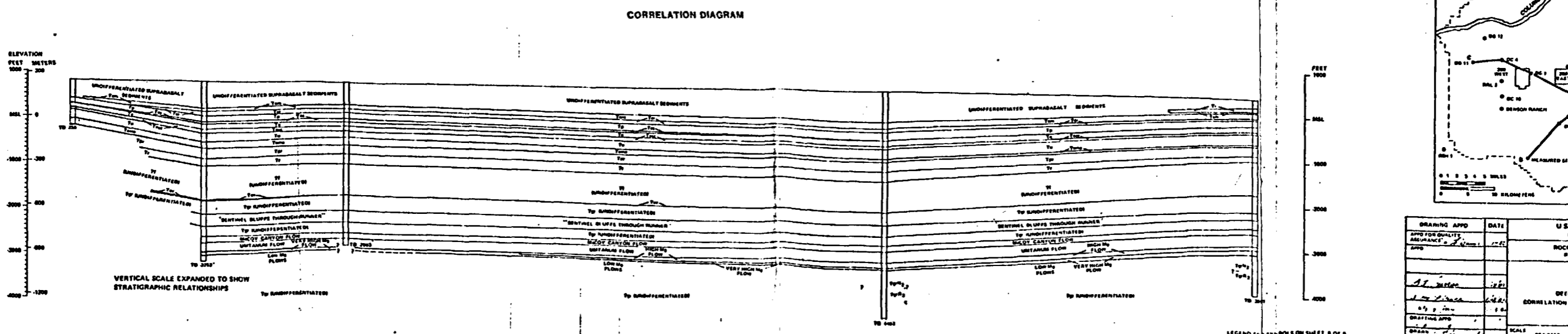
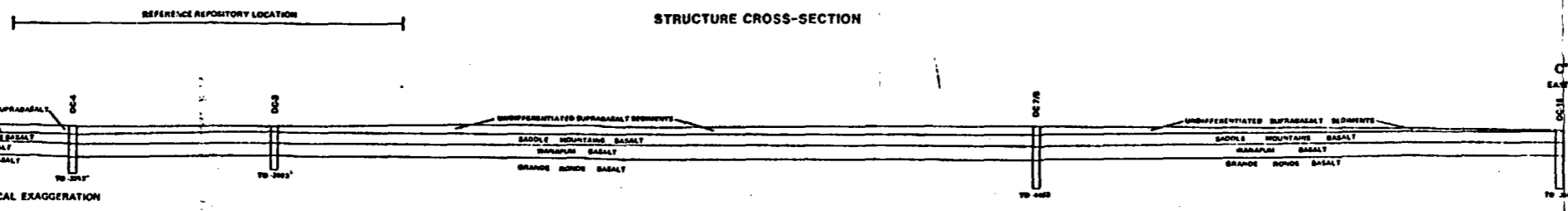
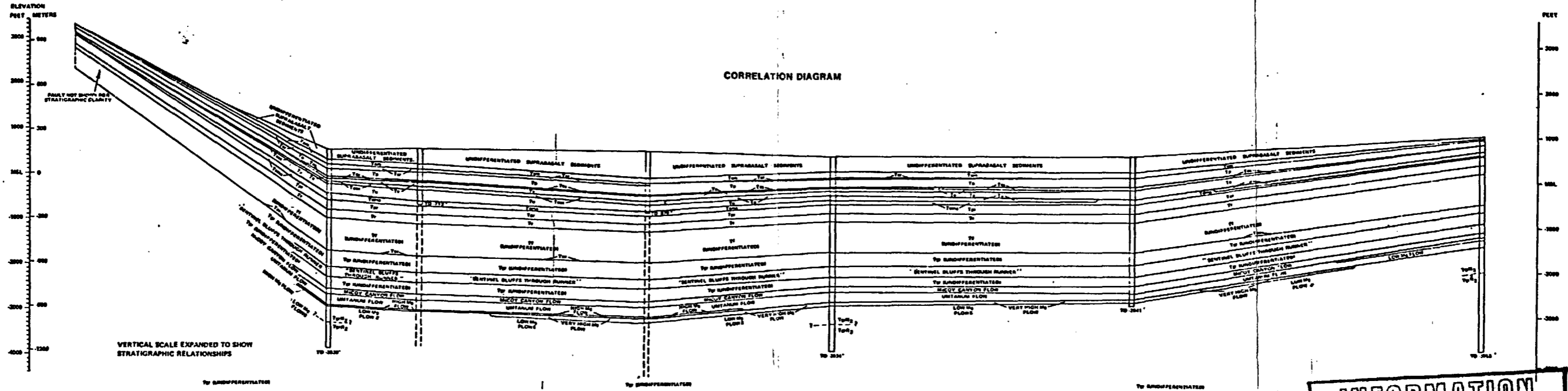
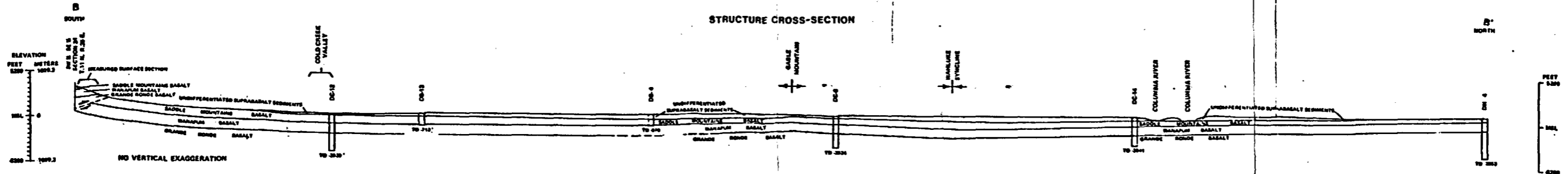
**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DDH 14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN DDH 15. HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.  
SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS  
A symbol denotes the STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANDE RONDE FLOWS (BELOW). SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.



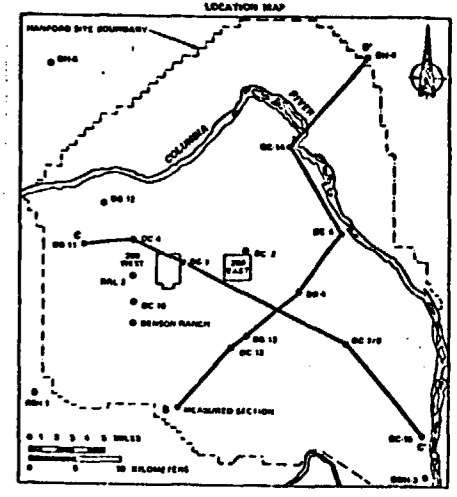
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APPROVED FOR QUALITY ASSURANCE	10/2/81	HIGHLAND OPERATIONS OFFICE	
APPROVED	10/2/81	ROCKWELL MANFORD OPERATIONS	
		HIGHLAND, WASHINGTON STATE	
DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS			
DRY TIME APPR	10/2/81	SCALE	FLUID NO.
DRY TIME APPR	10/2/81	FLUID NO.	000
DRY TIME APPR	10/2/81	DRYING NO.	000
DRY TIME APPR	10/2/81	DRYING NO.	000
RSD-51W-OP-026			



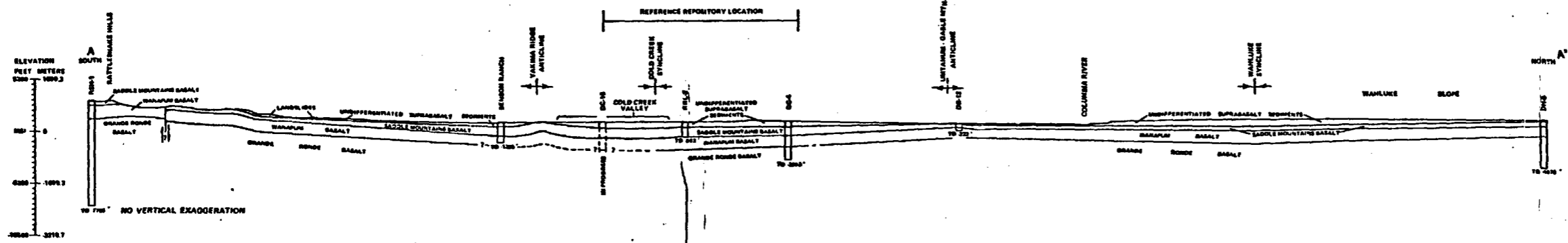
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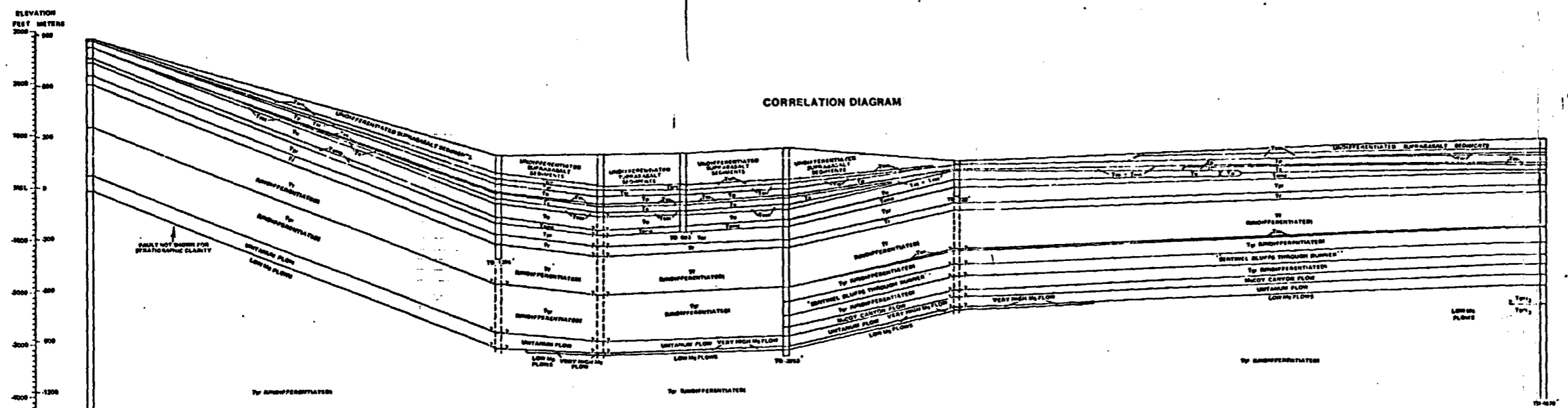
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APPD FOR QUALITY ASSURANCE		NORTHWEST OPERATIONS OFFICE	
APPD		ROCKWELL MANFORD OPERATIONS	
		ROCKWELL MANFORD OPERATIONS	
		DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS	
SCALE	DESIGNED	BY	DATE
BY	DATE	BY	DATE

LEGEND FOR SYMBOLS ON SHEET B OF B

**STRUCTURE CROSS-SECTION**



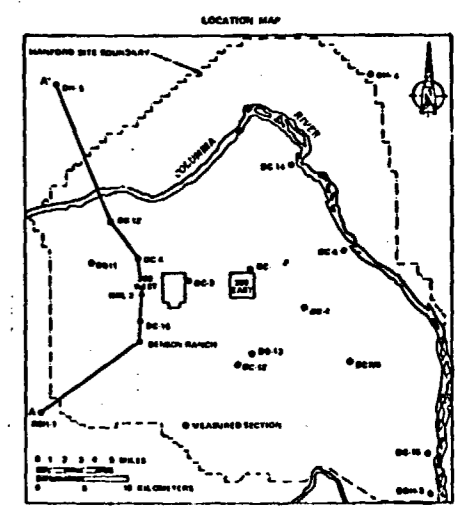
**CORRELATION DIAGRAM**



**LEGEND**

- T0 - TOTAL DEPTH
- T1 - ICE HARBOR MEMBER
- T2 - LEVEY INTERBED
- T3 - ELEPHANT MOUNTAIN MEMBER
- T4 - BATTLESHANK RIDGE INTERBED
- T5 - PONOMA MEMBER
- T6 - DELAN INTERBED
- T7 - SCHATZEL MEMBER
- T8 - COLD CREEK INTERBED
- T9 - AZOTH MEMBER
- T10 - WILBUR CREEK MEMBER
- T11 - URATILLA MEMBER
- T12 - MASTON INTERBED
- T13 - PRIEST RAPIDS MEMBER
- T14 - CONYCH INTERBED
- T15 - BOZA MEMBER
- T16 - FRENCHMAN SPRINGS MEMBER
- T17 - WANTAGE INTERBED
- T18 - GRANITE RONDE BASALT UNDIFFERENTIATED
- T19 - BENTON BLUFFS THROUGH RUNNER
- T20 - BENTON BLUFFS THROUGH RUNNER
- T21 - MUDY CANYON FLOW
- T22 - UNTANIAN FLOW
- T23 - HIGH M<sub>2</sub> FLOW
- T24 - VERY HIGH M<sub>2</sub> FLOW
- T25 - LOW M<sub>2</sub> FLOW
- T26 - PALEOMAGNETICALLY NORMAL
- T27 - PALEOMAGNETICALLY REVERSED
- T28 - GRANITE RONDE FLOW

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DRAWING APPRO. DATE		U.S. DEPARTMENT OF ENERGY	
APPRO. FOR QUALITY		RICHLAND OPERATIONS OFFICE	
DRAWN BY		ROCKWELL MANFORD OPERATIONS	
CLASSIFICATION		RICHLAND, WASHINGTON 99352	
DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS			
DRAWING APPRO.	SCALE	AS NOTED	BLDG NO.
DRAWN BY	DRAWING NO.	RSD 8W1 DP 035	INDEX NO.
CLASSIFICATION	BY		PAGE NO.
			3

**DESCRIPTION OF UNITS**

**SUPRABASALT SEDIMENTS**

SUPRABASALT SEDIMENTS INCLUDE PRIMARILY THE HANFORD AND RINGOLD FORMATIONS BUT ALSO INCLUDE OVERLYING TUFFACEOUS SILTSTONES. THE HANFORD FORMATION CONSISTS OF SAND AND GRAVEL DEPOSITS OF QUATERNARY CATASTROPHIC FLOODS. THE RINGOLD FORMATION CONSISTS OF SILT, SAND AND CONGLOMERATE DEPOSITED IN A LATE TERTIARY FLUVIAL AND LAKE ENVIRONMENT. HOLOCENE DEPOSITS CONSIST OF DUNE SAND, LOESS, COLLUVIUM AND ALLUVIUM.

**ELLENSBURG FORMATION**

SEDIMENTARY BEDS OF THE ELLENSBURG FORMATION ARE INTERCALATED WITH AND OVERLIE THE FLOWS OF THE COLUMBIA RIVER BASALT GROUP IN THE WESTERN AND CENTRAL COLUMBIA PLATEAU OF WASHINGTON. ELLENSBURG BEDS LYING BETWEEN COLUMBIA RIVER BASALT FLOWS ARE REFERRED TO AS INTERBEDS AND HAVE INFORMAL MEMBER STATUS. EACH OF THE INTERBEDS OCCURRING IN THE PASCO BASIN ARE DESCRIBED BELOW.

**LEVEY INTERBED**

THE LEVEY INTERBED LIES BETWEEN THE ICE HARBOR AND ELEPHANT MOUNTAIN MEMBERS OF THE SADDLE MOUNTAINS BASALT AND IS THE YOUNGEST ELLENSBURG UNIT IN THE PASCO BASIN. IT CONSISTS OF TUFFACEOUS SILT OR SILTSTONE.

**RATTLESNAKE RIDGE INTERBED**

THE RATTLESNAKE RIDGE INTERBED COMPRISES THREE FACIES BASED ON LITHOLOGY AND TEXTURE. THE FIRST FACIES IN THE CENTRAL CREEK SYNCLINE AREA AND GENERALLY CONSISTS OF THREE UNITS: (A) A LOWER CLAY OR TUFFACEOUS SANDSTONE, (B) A MIDDLE, MICACEOUS-ARKOSIC AND/OR TUFFACEOUS SANDSTONE, AND (C) AN UPPER TUFFACEOUS SILTSTONE OR TUFFACEOUS SANDSTONE. THE SECOND FACIES IS A SINGLE TUFFACEOUS SANDSTONE TO SILTSTONE UNIT AND OCCURS WHERE THE INTERBED IS RELATIVELY THIN. THE THIRD FACIES OCCURS ON THE NORTHWESTERN MARGIN OF THE PASCO BASIN AND IS A CONGLOMERATE WITH PLUTONIC AND METAMORPHIC CLASTS.

**SELAH INTERBED**

THE SELAH INTERBED IS A VARIABLE MIXTURE OF SILTY OR SANDY, VITRIC TUFF, ARKOSIC SANDS, TUFFACEOUS CLAYS, AND LOCALLY THIN STRINGERS OF PREDOMINANTLY BASALTIC GRAVELS. THE UPPER PORTION OF THE SELAH INTERBED IS A VITRIC TUFF COMMONLY FUSED TO A PERLITIC VITRIC TUFF BY THE OVERLYING POMONA MEMBER.

**COLD CREEK INTERBED**

THE COLD CREEK INTERBED IS THE SEQUENCE OF ELLENSBURG UNITS THAT OCCURS STRATIGRAPHICALLY BETWEEN THE ESQUATZEL AND UMATILLA MEMBERS OF THE SADDLE MOUNTAINS BASALT. THREE SEPARATE UNITS OF THE INTERBED ARE IDENTIFIED ON THE BASIS OF BOUNDING FLOWS. THESE INTERVALS ARE THE UMATILLA-ESQUATZEL, UMATILLA-ASOTIN, AND ASOTIN-ESQUATZEL INTERVALS.

**ASOTIN-ESQUATZEL INTERVAL**

THE ASOTIN-ESQUATZEL INTERVAL CONSISTS OF TUFFS AND CLAY LAYERS, ARKOSIC TO QUARTZOSE SANDSTONES, AND BASALTIC CONGLOMERATES.

**UMATILLA-ESQUATZEL INTERVAL**

THE UMATILLA-ESQUATZEL INTERVAL EXHIBITS TWO TEXTURAL FACIES: (1) A FINE GRAINED, TUFFACEOUS SANDSTONE FACIES, AND (2) A COARSER SANDSTONE AND CONGLOMERATE FACIES WITH TUFFACEOUS SILTSTONE AND CLAYS.

**UMATILLA-ASOTIN INTERVAL**

THE UMATILLA-ASOTIN INTERVAL IS COMPOSED CHIEFLY OF TUFFACEOUS SILTSTONES AND TUFFACEOUS CLAYSTONES.

**MABTON INTERBED**

THE MABTON INTERBED LIES BETWEEN THE SADDLE MOUNTAINS BASALT AND ABOVE THE WANAPUM BASALT. FROM TOP TO BOTTOM, THE INTERBED CONSISTS OF: (1) A WELL INDURATED, LAPILLI TUFFSTONE, LOCALLY BAKED; (2) A QUARTZITIC TO ARKOSIC SANDSTONE WITH INTERLAYERED TUFFACEOUS SANDSTONES AND SILTSTONES; AND (4) A THIN, DISCONTINUOUS, BASAL, SILTY CLAY.

**VANTAGE INTERBED**

THE VANTAGE INTERBED IS COMPRISED OF SEDIMENTS LYING BETWEEN THE WANAPUM BASALT AND THE GRANDE RONDE BASALT. SAPIOLITE COMMONLY OCCURS AT THE TOP OF GRANDE RONDE BASALT IN AREAS WHERE NO SEDIMENTS WERE DEPOSITED. THE THICKER SEQUENCES OF VANTAGE CONSIST OF ARKOSIC SANDSTONE LOCALLY CONTAINING THIN CLAY STRINGERS WITH A CLAY CAP. THE THINNER SEQUENCES OF VANTAGE CONSIST OF CLAYS WHICH ARE ALTERED TUFFS.

**SADDLE MOUNTAINS BASALT**

THE SADDLE MOUNTAINS BASALT CONSISTS OF SEVEN MEMBERS IN THE PASCO BASIN: (1) UMATILLA, (2) WILBUR CREEK, (3) ASOTIN, (4) ESQUATZEL, (5) POMONA, (6) ELEPHANT MOUNTAIN, AND (7) ICE HARBOR.

**ICE HARBOR MEMBER**

THE ICE HARBOR MEMBER IS THE YOUNGEST MEMBER OF THE SADDLE MOUNTAINS BASALT AND CONSISTS OF THREE FLOWS: (1) BASIN CITY, (2) MARTINDALE, AND (3) GOOSE ISLAND. THE FLOWS ARE FINE TO MEDIUM GRAINED WITH OLIVINE, MICROPHENOCRYSTS AND PHENOCRYSTS OF OLIVINE, PLAGIOCLASE, AND CLINOPYROXENE. OLIVINE OCCURS PRIMARILY IN THE MARTINDALE AND BASIN CITY FLOWS, WHEREAS THE GOOSE ISLAND FLOW CONTAINS OLIVINE AND PHENOCRYSTS OF PYROXENE AND PLAGIOCLASE.

**ELEPHANT MOUNTAIN MEMBER**

THE ELEPHANT MOUNTAIN MEMBER CONSISTS OF TWO SEPARATE FLOWS: THE ELEPHANT MOUNTAIN FLOW AND THE WILD CLAY FLOW. THE FLOW IS MEDIUM TO FINE GRAINED WITH ABUNDANT MICROPHENOCRYSTS OF PLAGIOCLASE.

**POMONA MEMBER**

THE POMONA MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOSES. THE TEXTURE IS RELATIVELY UNIFORM, TYPICALLY FINE GRAINED TO GLASSY WITH WEDGE-SHAPED PLAGIOCLASE PHENOCRYSTS AND SPARSE OLIVINE.

**ESQUATZEL MEMBER**

THE ESQUATZEL MEMBER CONSISTS OF ONE TO TWO FLOWS OR FLOW LOSES THAT OCCUR LOCALLY WITH A VITRIC TUFF BETWEEN THEM. THE MEMBER IS COMMONLY PLAGIOCLASE-PHYRIC TO CLINO-PHYRIC AND CONTAINS MICROPHENOCRYSTS OF CLINOPYROXENE. HOWEVER, SOME LOCALITIES LACK PHENOCRYSTS.

**ASOTIN MEMBER**

THE ASOTIN MEMBER OCCURS IN THE PASCO BASIN AS A SINGLE FLOW. THE HUNTZINGER FLOW THE TEXTURE OF THE HUNTZINGER FLOW RANGES FROM FINE GRAINED AND GLASSY TO OPHITIC. THE FLOW HAS ABUNDANT OLIVINE, BUT PLAGIOCLASE IS SPARSE.

**WILBUR CREEK MEMBER**

THE WILBUR CREEK MEMBER IN THE PASCO BASIN CONSISTS OF ONE FLOW, THE WAHLBUR FLOW. IT IS TYPICALLY FINE GRAINED TO GLASSY AND APHYRIC WITH SPARSE MICRO-PHENOCRYSTS OF PLAGIOCLASE.

**UMATILLA MEMBER**

THE UMATILLA MEMBER CONSISTS OF TWO FLOWS. THE YOUNGER FLOW IS THE SILLUBI FLOW AND THE OLDER FLOW IS THE UMATILLA FLOW. THE UMATILLA FLOW IS MEDIUM TO GLASSY WITH RARE MICROPHENOCRYSTS OF PLAGIOCLASE AND OLIVINE. THE FLOWS ARE PREDOMINANTLY ENTABLATURE WITH A RELATIVELY THIN BASAL COLONNADA.

**WANAPUM BASALT**

THE WANAPUM BASALT IN THE PASCO BASIN CONSISTS OF THREE MEMBERS: (1) FRENCHMAN SPRINGS, (2) ROZA, AND (3) PRIEST RAPIDS.

**PRIEST RAPIDS MEMBER**

THE PRIEST RAPIDS MEMBER CONSISTS OF TWO DISTINCT FLOWS. AN OLDER FLOW (ROZALIA CHEMICAL TYPE) IS TYPICALLY COARSE GRAINED WITH RARE OLIVINE AND PLAGIOCLASE PHENOCRYSTS. THE YOUNGER FLOW (LOW  $Mg$  CHEMICAL TYPE) HAS SMALL OLIVINE PHENOCRYSTS (0.1MM) AND RARE OLIVINE PHENOCRYSTS OF PLAGIOCLASE.

**ROZA MEMBER**

THE ROZA MEMBER CONSISTS OF ONE OR TWO FLOWS OR FLOW LOSES. IN HAND SPECIMEN, IT IS CHARACTERIZED BY THE PRESENCE OF SINGLE PLAGIOCLASE PHENOCRYSTS UP TO 1.5 CM IN SIZE SET IN A FINE GRAINED GROUND MASE.

**FRENCHMAN SPRINGS MEMBER**

THE FRENCHMAN SPRINGS MEMBER IS THE OLDEST MEMBER OF THE WANAPUM BASALT AND CONSIST OF APPROXIMATELY THREE TO TWELVE FLOWS. THE FLOWS ARE ALL MEDIUM TO FINE GRAINED AND CONTAIN PLAGIOCLASE PHENOCRYSTS. THE FLOWS ARE COMMONLY GROUPED INTO "PHYRIC" AND "APHYRIC" UNITS.

**GRANDE RONDE BASALT**

THE GRANDE RONDE BASALT IS A THICK SEQUENCE OF AT LEAST 10 BASALT FLOWS WHICH UNDERLIE THE SADDLE MOUNTAINS AND WANAPUM BASALTS. THESE FLOWS ARE TYPICALLY FINE GRAINED AND APHYRIC OR SPARSELY MICROPHYRIC WITH FEW CONDENSATION TEXTURAL FEATURES. THE HANFORD BASALT FLOWS ARE CHARACTERIZED BY REVERSALS IN THE POLARITY OF THE FLOWS. THE FLOWS ARE RECOGNIZED WITHIN THE PASCO BASIN ON THE BASIS OF CHEMICAL COMPOSITION. TWO MAJOR SEQUENCES OF FLOWS DISTINGUISHED ON THE BASIS OF CHEMICAL COMPOSITION HAVE BEEN RECOGNIZED WITHIN THE PASCO BASIN: (1) THE SCHWANA SEQUENCE, CONSISTING ALMOST ENTIRELY OF FLOWS WITH RELATIVELY LOW  $Mg$  CONTENT (LOW  $Mg$  CHEMICAL TYPE), AND (2) THE SENTINEL BLUFFS SEQUENCE, CONSISTING ENTIRELY OF FLOWS WITH HIGHER  $Mg$  CONTENT (HIGH  $Mg$  CHEMICAL TYPE). THE SCHWANA SEQUENCE LIES STRATIGRAPHICALLY BELOW THE SENTINEL BLUFFS SEQUENCE. THE CONTACT BETWEEN THESE TWO SEQUENCES IS KNOWN AS THE  $M_2$  HORIZON.

**SENTINEL BLUFFS SEQUENCE**

THE SENTINEL BLUFFS SEQUENCE CONSISTS OF 7 TO 10 FLOWS ALL OF HIGH  $Mg$  CHEMICAL TYPE AND ALL WITHIN THE  $N_2$  MAGNETOSTRATIGRAPHIC UNIT. THE MCGOY CANYON FLOW IS THE LOWERMOST FLOW IN THE SENTINEL BLUFFS SEQUENCE. WITHIN THE SENTINEL BLUFFS SEQUENCE, TWO  $C_2$  HORIZONS OCCUR. THE LOWER HORIZON IS MARKED BY A LOWER  $C_2$  CONTENT RELATIVE TO THE 3 TO 4 FLOWS OVERLYING IT. THE UPPER  $C_2$  HORIZON IS DEFINED BY A SINGLE FLOW OF RELATIVELY LOW  $C_2$ .

**SCHWANA SEQUENCE**

THE SCHWANA SEQUENCE CONSISTS OF DOMINANTLY LOW  $Mg$  FLOWS. THREE FLOWS NEAR THE TOP OF THE SEQUENCE ARE NOTABLE EXCEPTIONS. THE LOWERMOST OF THESE THREE FLOWS IS THE UMATILLA FLOW. THE OTHER TWO FLOWS ARE OF HIGH  $Mg$  CHEMICAL TYPE AND ARE INTERCALATED WITH THE LOW  $Mg$  FLOWS IN THE UPPER PART OF THE SCHWANA SEQUENCE. THE UMATILLA FLOW IS A THICK, LATERALLY EXTENSIVE FLOW RECOGNIZED BY ITS DISTINCTIVE CHEMICAL COMPOSITION AND PALEOMAGNETIC PROPERTIES. IT IS THE LOWERMOST FLOW IN THE SCHWANA SEQUENCE EXCEPT AT TWO LOCALITIES (DAM AND UMATANUM RIDGE NEAR PRIEST RAPIDS DAM) WHERE A SINGLE RELATIVELY THIN FLOW OF LOW- TO INTERMEDIATE  $Mg$  CHEMICAL TYPE OVERLIES THE UMATANUM FLOW.

**ADDITIONAL INFORMATION ON STRATIGRAPHY OF THE COLUMBIA RIVER BASALT GROUP MAY BE FOUND IN THE FOLLOWING PUBLICATIONS:**

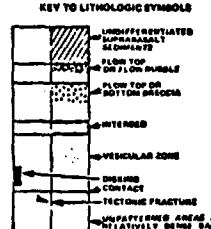
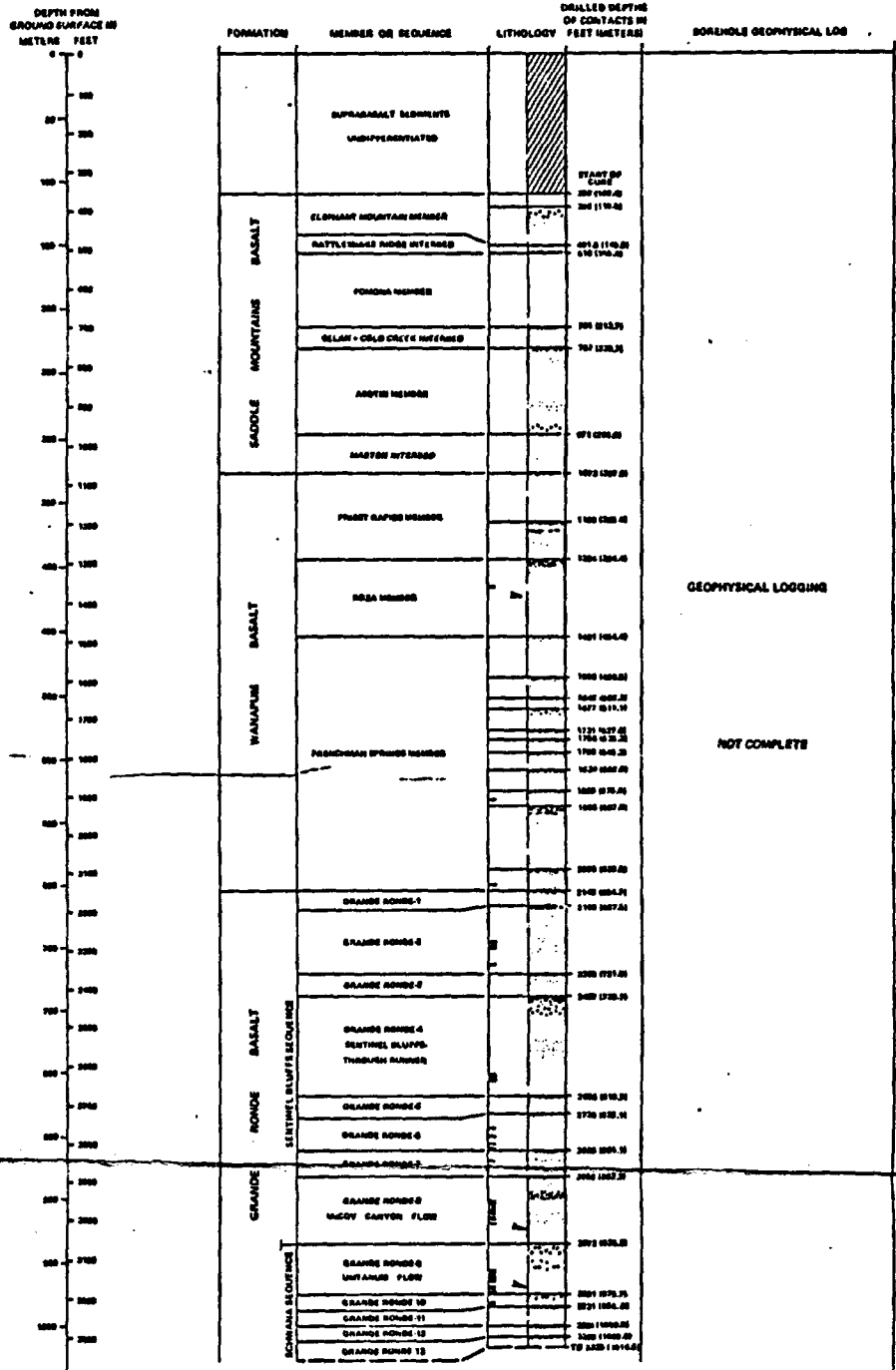
Nyers, C. W., Priest, S. M., Cappano, J. A., Cochran, M. P., Chymer, W. J., Davidson, N. J., Edwards, R. C., Focht, K. R., Holmes, G. E., Jones, M. G., Kunk, J. R., London, R. D., Lutz, R. L., Lutz, J. T., Long, P. E., Mitchell, T. H., Pugh, E. R., Reade, S. J., and Talmann, A. M., 1979, Geologic studies of the Columbia Plateau, a status report. RHO BWT-4, Rockwell Hanford Operations, Richland, Washington.

Reade, S. J., and Focht, K. R., Chapter 3 - Wanapum and Saddle Mountains Basalts of the Cold Creek syncline area. Long, P. E., and London, R. D., Chapter 4 - Stratigraphy of the Grande Ronde Basalt, and Moser, D. J., Chapter 5 - Basaltic Geologic Studies, all in 1981, Subsurface geology of the Cold Creek syncline: Myers, C. W., and Priest, S. M., editors, RHO BWT-14, Rockwell Hanford Operations, Richland, Washington.

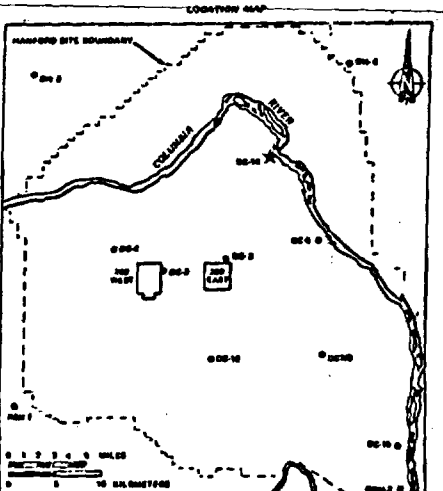
Swenson, D. A., Wright, T. L., Moser, P. R., and Bentley, R. D., 1979, Revisions to stratigraphic nomenclature of the Columbia River Basalt Group: U. S. Geological Survey Bulletin 1457-G.

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**DC-14 CORE HOLE**  
 HANFORD COORDINATES 84488 N, 23088 W  
 GROUND SURFACE ELEVATION = 394' (126.1m)  
 DATE DRILLED - 2/12/81



**EXPLANATION**  
 GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC-14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN OTHER NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

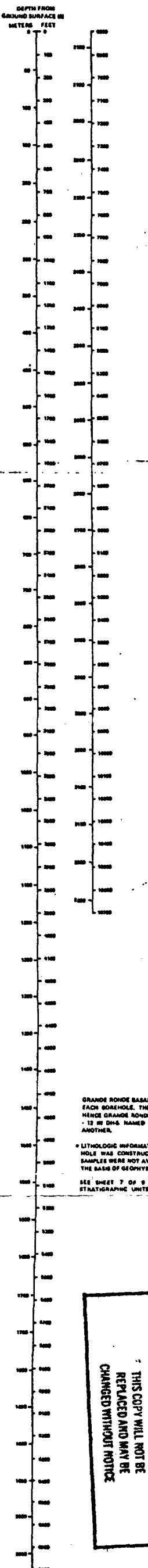


DRAWING APPR. DATE	U.S. DEPARTMENT OF ENERGY
APPROVED FOR QUALITY CONTROL	ROCKWELL HANFORD OPERATIONS
APPROVED FOR RELEASE	DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE: VERTICAL 1" = 200' HORIZONTAL 1" = 100'	ISSUED BY: RSO BWT-DP-038

**RSH-1  
ROTARY BOREHOLE**  
NO HANFORD COORDINATES  
GROUND SURFACE ELEVATION = 2908' (877.8m)  
DATE DRILLED 7/7/57 - 4/8/58

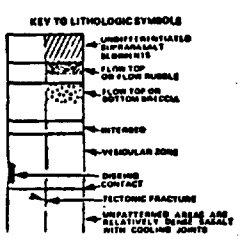
BOREHOLE GEOPHYSICAL LOG

FORMATION	MEMBER OR SEQUENCE	LITHOLOGY	DRILLED DEPTH OF CONTACTS IN FEET METERS	NATURAL GAMMA LOG	SONIC TRANSMIT TIME
SADDLE MOUNTAIN BASALT	ELPHANT MOUNTAIN MEMBER		45114.0		
	POUNDA MEMBER		178 81.8		
	UMATILLA MEMBER				
	MASTON MEMBER		28 116.2		
WANAPOUM BASALT	FRISBY RAPIDS MEMBER		478 114.8		
	RODA MEMBER		64 258.2		
	RODA MEMBER		712 218.2		
	RODA MEMBER		802 204.2		
	RODA MEMBER		852 174.2		
	RODA MEMBER		902 158.2		
	RODA MEMBER		952 142.2		
	RODA MEMBER		1002 126.2		
	RODA MEMBER		1052 110.2		
	RODA MEMBER		1102 94.2		
CENTRAL PLAINS SEQUENCE	GRANDE RONDE 1		1152 88.2		
	GRANDE RONDE 2		1202 72.2		
	GRANDE RONDE 3		1252 56.2		
	GRANDE RONDE 4	ENTRINE BLUFFS THROUGH RUNOFF		1302 40.2	
	GRANDE RONDE 5		1352 24.2		
	GRANDE RONDE 6		1402 8.2		
	GRANDE RONDE 7		1452 -2.2		
	GRANDE RONDE 8	BOY CANYON FLOW		1502 -16.2	
	GRANDE RONDE 9	LAITANDE FLOW		1552 -30.2	
	GRANDE RONDE 10		1602 -44.2		
	GRANDE RONDE 11		1652 -58.2		
	GRANDE RONDE 12		1702 -72.2		
	GRANDE RONDE 13		1752 -86.2		
	GRANDE RONDE 14		1802 -100.2		
	GRANDE RONDE 15		1852 -114.2		
	GRANDE RONDE 16		1902 -128.2		
	GRANDE RONDE 17		1952 -142.2		
	GRANDE RONDE 18		2002 -156.2		
	GRANDE RONDE 19		2052 -170.2		
	GRANDE RONDE 20		2102 -184.2		
SCHEMATA SEQUENCE	GRANDE RONDE 21		2152 -198.2		
	GRANDE RONDE 22		2202 -212.2		
	GRANDE RONDE 23		2252 -226.2		
	GRANDE RONDE 24		2302 -240.2		
	GRANDE RONDE 25		2352 -254.2		
	GRANDE RONDE 26		2402 -268.2		
	GRANDE RONDE 27		2452 -282.2		
	GRANDE RONDE 28		2502 -296.2		
	GRANDE RONDE 29		2552 -310.2		
	GRANDE RONDE 30		2602 -324.2		



CONTINUED

FORMATION	MEMBER OR SEQUENCE	LITHOLOGY	DRILLED DEPTH OF CONTACTS IN FEET METERS	NATURAL GAMMA LOG	SONIC TRANSMIT TIME
SCHEMATA SEQUENCE	GRANDE RONDE 31		2652 -338.2		
	GRANDE RONDE 32		2702 -352.2		
	GRANDE RONDE 33		2752 -366.2		
	GRANDE RONDE 34		2802 -380.2		
	GRANDE RONDE 35		2852 -394.2		
	GRANDE RONDE 36		2902 -408.2		
	GRANDE RONDE 37		2952 -422.2		
	GRANDE RONDE 38		3002 -436.2		
	GRANDE RONDE 39		3052 -450.2		
	GRANDE RONDE 40		3102 -464.2		

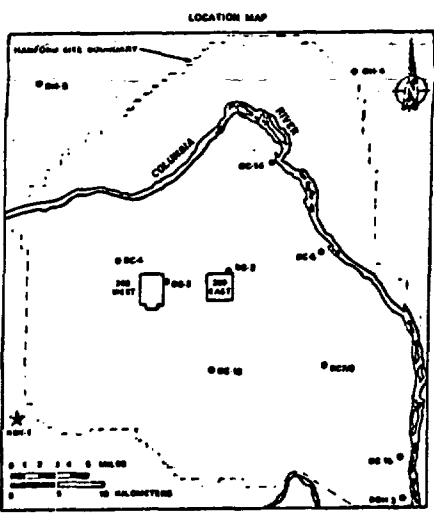


**EXPLANATION**

GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DC-18 IS NOT NEARLY THE SAME AS GRANDE RONDE - 12 IN DC-8. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

\* LITHOLOGIC INFORMATION IS NOT AVAILABLE FOR RSH-1 BECAUSE HOLE WAS CONSTRUCTED BY ROTARY DRILLING. HENCE, CORE SAMPLES WERE NOT AVAILABLE. FLOW CONTACTS WERE PEECED ON THE BASIS OF GEOPHYSICAL LOGS AND CHEMICAL ANALYSES.

SEE SHEET 7 OF 8 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS

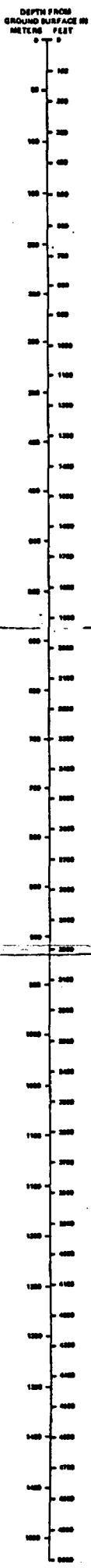
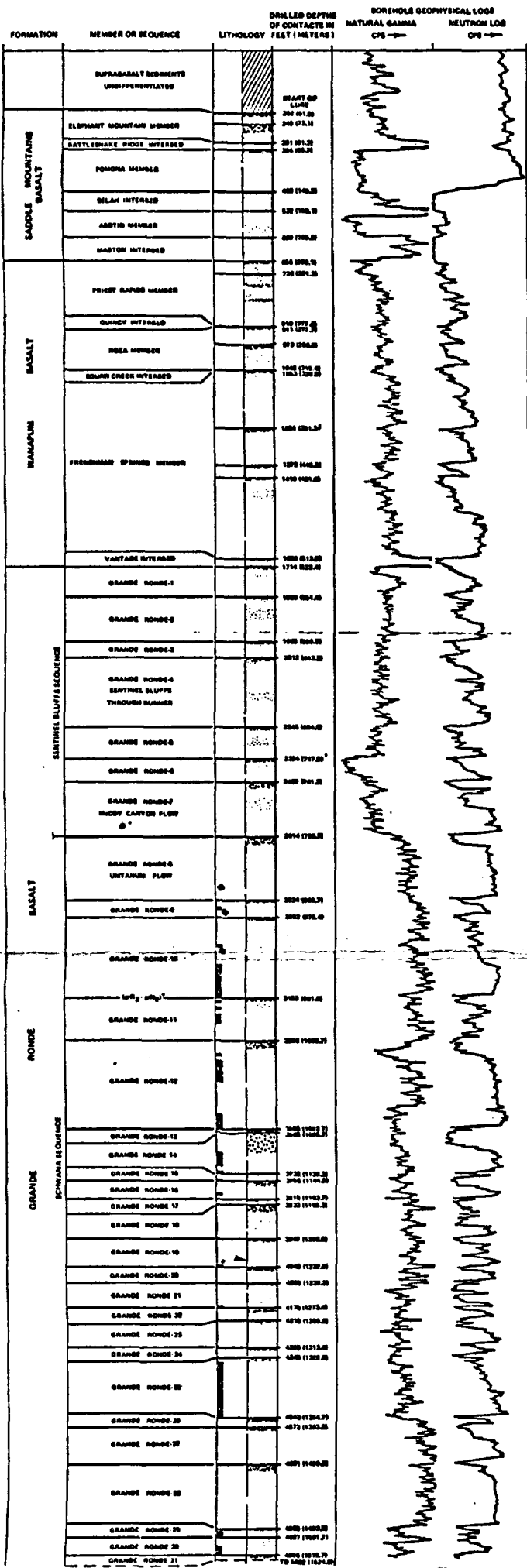


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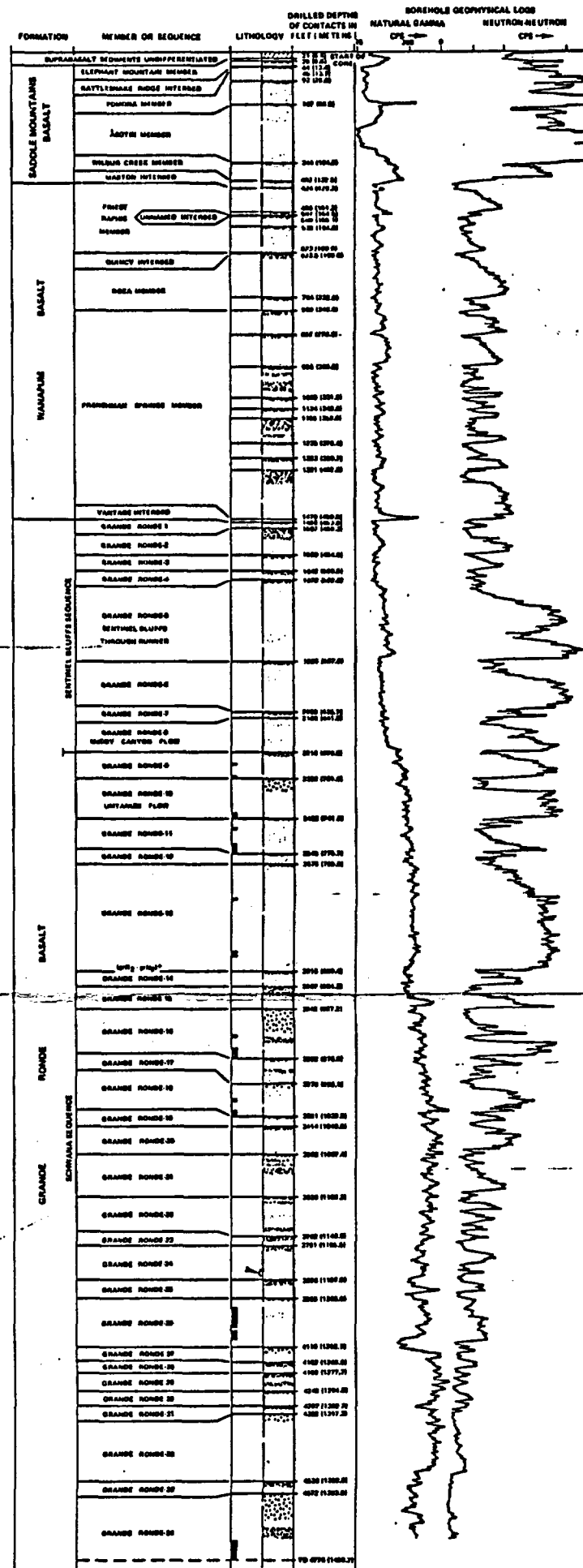
THIS COPY WILL NOT BE REPLACED AND MAY BE CHANGED WITHOUT NOTICE

<b>DRAWING AND DATE</b>	<b>U.S. DEPARTMENT OF ENERGY</b>
APP'D: <i>[Signature]</i>	ROCKWELL HANFORD OPERATIONS
DATE: 10/2/57	ROCKWELL HANFORD OPERATIONS
BY: <i>[Signature]</i>	DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE: 1" = 100'	DRWING NO. RSD-DW-OP-036
DATE: 10/2/57	SHEET NO. 5

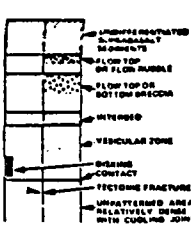
**DH-5  
COREHOLE**  
NO MANFORD COORDINATES  
GROUND SURFACE ELEVATION = 922' (284.1m)  
DATE DRILLED 7/27/71 - 2/11/72



**DH-4  
COREHOLE**  
NO MANFORD COORDINATES  
GROUND SURFACE ELEVATION = 922' (284.1m)  
DATE DRILLED 7/8/71 - 2/22/72



**KEY TO LITHOLOGIC SYMBOLS**

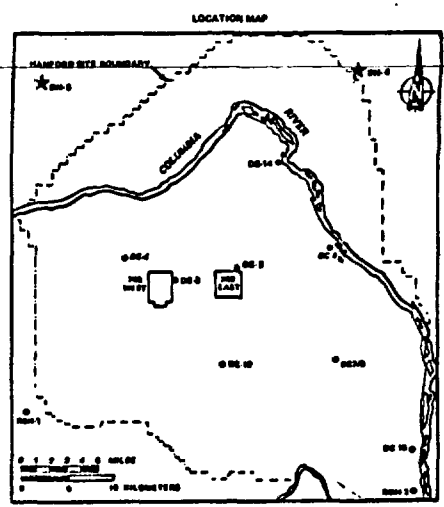


**EXPLANATION**  
GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE - 12 IN DH-5 IS NOT NECESSARILY THE SAME AS GRANDE RONDE - 12 IN DH-4. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS

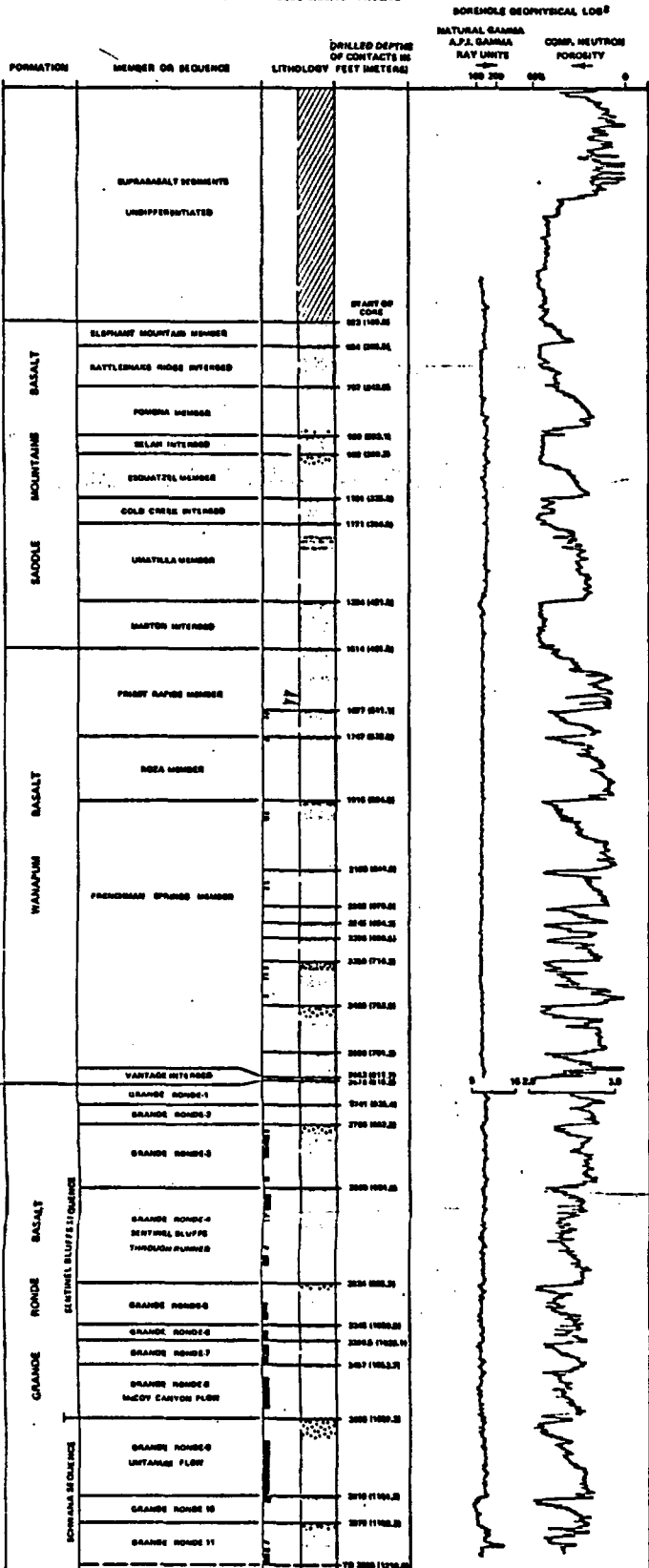
\*wsp\* DENOTES THE STRATIGRAPHIC HORIZON (CONTACT) BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSE GRANDE RONDE FLOWS (BELOW). SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.

**INFORMATION COPY**  
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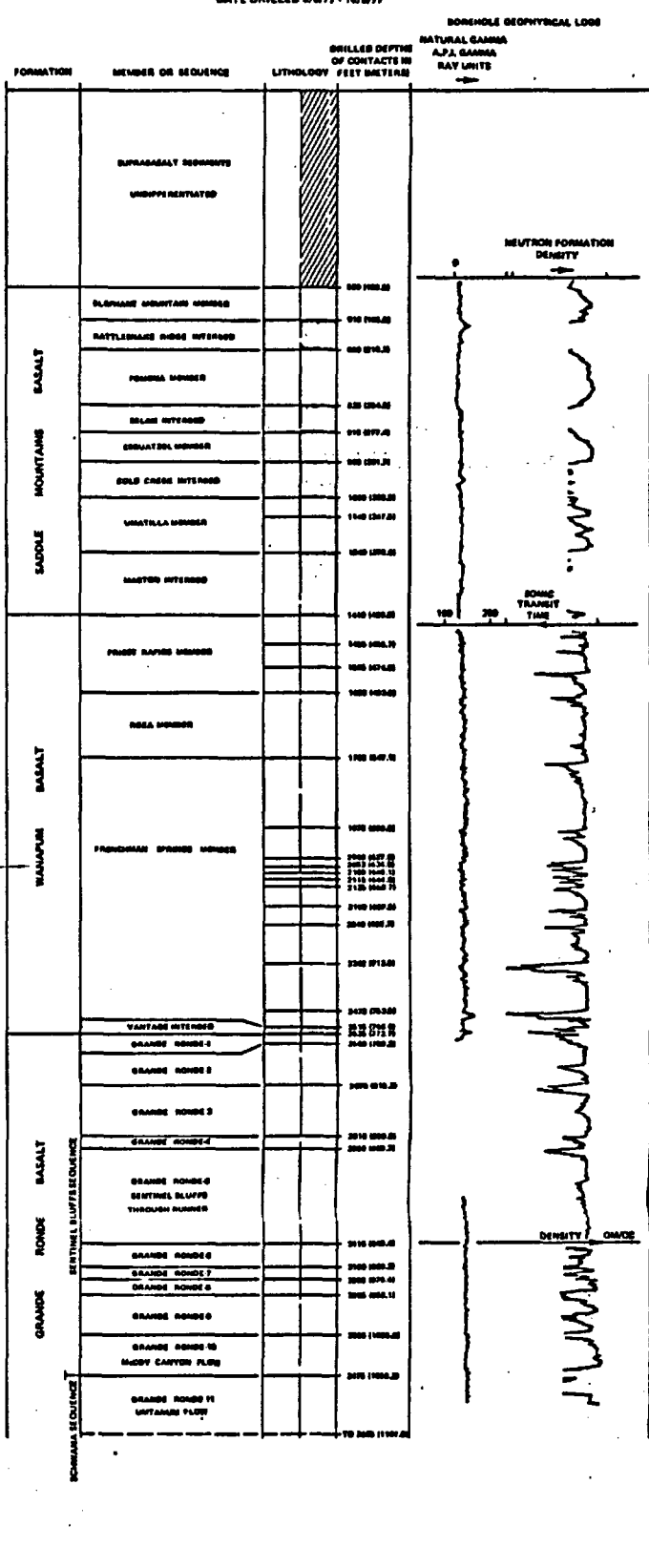


DRAWING APPR. DATE	U.S. DEPARTMENT OF ENERGY
APPROVED FOR QUALITY CONTROL	DEVELOPMENT AND OPERATIONS OFFICE
DATE	ROCKWELL MANFORD OPERATIONS
	RIKLAND, WASHINGTON 98148
	DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
SCALE: VERTICAL 1" = 200'	GRID NO.
HORIZONTAL 1" = 100'	GRID NO.
DATE	PROJECT NO.
CLASSIFICATION	RD-571-DP-028

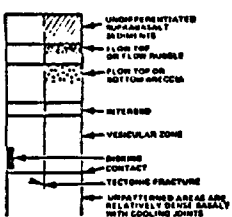
**DC-4  
COREHOLE**  
HANFORD COORDINATES 48386 N, 86308 W  
GROUND SURFACE ELEVATION = 746' (227.1m)  
DATE DRILLED 8/25/78 - 11/20/78



**DC-3  
ROTARY HOLE**  
HANFORD COORDINATES 43802 N, 79126 W  
GROUND SURFACE ELEVATION = 727' (223.1m)  
DATE DRILLED 8/77 - 10/77



KEY TO LITHOLOGIC SYMBOLS

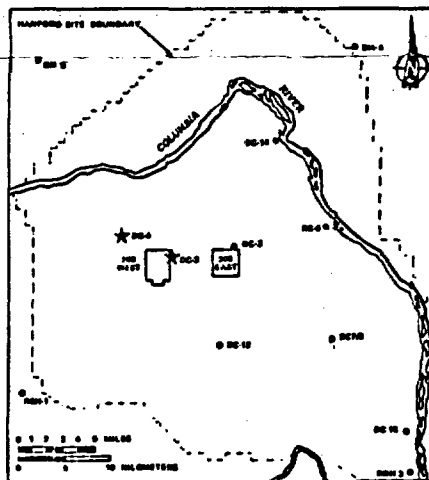


EXPLANATION

GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE 12 IN DC-4 IS NOT NECESSARILY THE SAME AS GRANDE RONDE 12 IN LHM. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS

LOCATION MAP

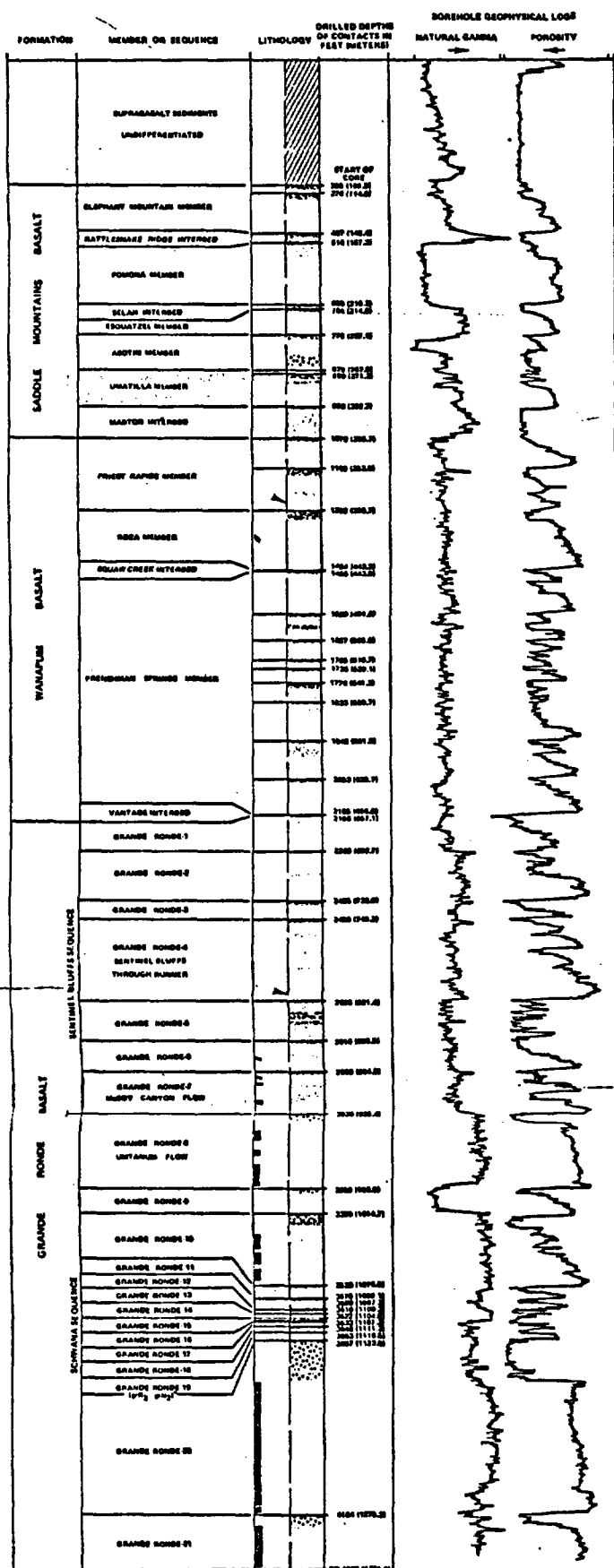


**INFORMATION**  
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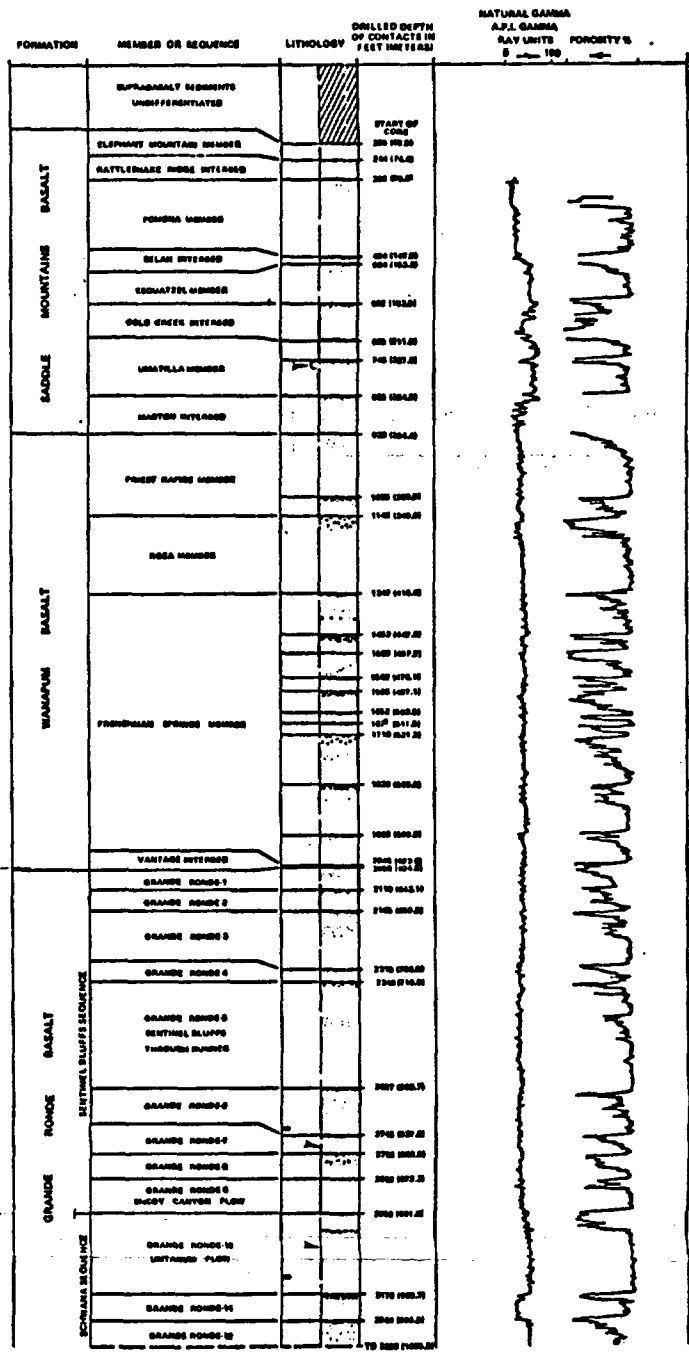
DRAWING APPROVED	DATE	U.S. DEPARTMENT OF ENERGY	
APPROVED FOR QUALITY CONTROL	DATE	ROCKWELL HANFORD OPERATIONS	
DRAWING NO.		RSD-DW-DC-05	
CLASSIFICATION		SECRET	



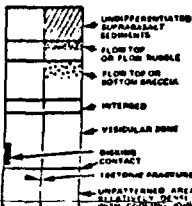
**DC-6  
COREHOLE**  
HANFORD COORDINATES 84127 N, 17721 W  
GROUND SURFACE ELEVATION = 462' (132.3m)  
DATE DRILLED 12/8/77 - 5/24/78



**DC-2  
COREHOLE**  
HANFORD COORDINATES 82947 N, 48253 W  
GROUND SURFACE ELEVATION = 572' (174.3m)  
DATE DRILLED 5/8/77 - 9/29/77



**KEY TO LITHOLOGIC SYMBOLS**

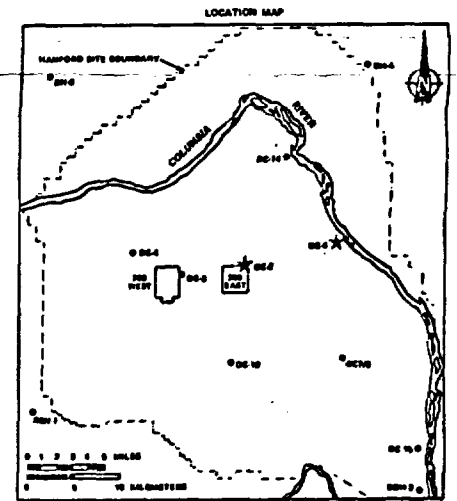


**EXPLANATION**

GRANDE RONDE BASALT FLOWS ARE NUMBERED FROM THE TOP OF THE FORMATION IN EACH BOREHOLE. THE NUMBERING OF FLOWS IS SPECIFIC TO EACH BOREHOLE AND HENCE GRANDE RONDE 12 IN DC 14 IS NOT NECESSARILY THE SAME AS GRANDE RONDE 12 IN DC 6. NAMED FLOWS, HOWEVER, ARE EQUIVALENT FROM ONE BOREHOLE TO ANOTHER.

SEE SHEET 7 OF 9 FOR LITHOLOGIC DESCRIPTION OF STRATIGRAPHIC UNITS

W-2 (W-1) DENOTES THE STRATIGRAPHIC HORIZON (CONTACTS BETWEEN PALEOMAGNETICALLY NORMAL GRANDE RONDE FLOWS (ABOVE) AND PALEOMAGNETICALLY REVERSED GRANDE RONDE FLOWS (BELOW) SEE DESCRIPTION OF GRANDE RONDE UNITS ON SHEET 7 OF 9 FOR ADDITIONAL INFORMATION ON MAGNETOSTRATIGRAPHY OF GRANDE RONDE BASALT.



**INFORMATION COPY**  
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DRAWING APP'D	DATE	U.S. DEPARTMENT OF ENERGY OILFIELD OPERATIONS OFFICE ROCKWELL HANFORD OPERATIONS ROCKWELL, HANFORD 93301
APP'D FOR QUALITY ASSURANCE	DATE	
APP'D	DATE	DEEP BOREHOLE STRATIGRAPHIC CORRELATION CHARTS AND STRUCTURE CROSS SECTIONS
APP'D	DATE	
SCALE	DATE	INDEX NO.
CLASSIFICATION	DATE	SHEET NO.
RSD-SW-DC-035		3



**THIS PAGE IS AN  
OVERSIZED DRAWING OR  
FIGURE,**

**THAT CAN BE VIEWED AT THE  
RECORD TITLED:**

**"600 AREA BOREHOLE LOCATION  
MAP HANFORD SITE, PLATE 1"**

**WITHIN THIS PACKAGE**

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**D-01**