

April 14, 1966

JUN 1966

Mr. George Peays, District Manager  
J. M. Huber Corporation  
Suite 615, 2401 E. Second Avenue  
Denver, Colorado

CONSERVATION COMMISSION

Dear Sir:

Sample descriptions and drill-stem-test records from your No. 1 Chapman-State, Powder Wash test, are herewith submitted. The formations penetrated and other data are:

J. M. HUBER CORP., NO. 1 CHAPMAN-STATE  
NE SE Sec. 16, T.11N., R.97W.  
Powder Wash Field  
Moffat County, Colorado

Elev. 7064' grd; 7076' KB.  
Comm. March 1, 1966; US March 2, 1966.  
Comp. Drlg & Logging April 11, 1966.  
Csg. 8 5/8" @ 498' w 310 sx.  
Contr. HLM Drlg. Co.

|                                   |                  |                    |
|-----------------------------------|------------------|--------------------|
| Wasatch                           | surface to 5516' | (Schlumb. measure) |
| Top of Tipton Tongue              | 1888'            | "                  |
| Big Water Sand                    | 5290 to 5112'    | "                  |
| Top Ft. Union                     | 5516'            | "                  |
| "A" Sands 6661-84 & 6695          | to 6756'         | "                  |
| "B" Sand                          | 6938 to 6970'    | "                  |
| Stray Sand with Show              | 7134 to 7142'    | "                  |
| Top Big Ft. Union Sands           | 7254'            | "                  |
| Top Allen No. 11 Sand             | 7504'            | "                  |
| "C" Sands 7834-65 & 7880          | to 7907'         | "                  |
| T.D. in Ft. Union, April 11, 1966 | 8784'            | "                  |

Driller's and geograph depths, by which samples were caught and described, the interpretative lithologic log was plotted and Tooke's mud log was prepared, must be corrected down-the-hole to correlate with Schlumberger measures as follows:

|          |               |       |           |           |       |    |            |
|----------|---------------|-------|-----------|-----------|-------|----|------------|
| Geograph | 2100 to 2700' | apply | 10'       | down-hole | corr. | to | correlate. |
| "        | 2700 to 4900' | "     | 15'       | "         | "     | "  | "          |
| "        | 4900 to 6055' | "     | 20'       | "         | "     | "  | "          |
| "        | 6055 to 7350' | "     | 25 to 30' | "         | "     | "  | "          |
| "        | 7350 to 8346' | "     | 20 to 25' | "         | "     | "  | "          |
| "        | 8362 to 8782' | "     | 2 to 3'   | "         | "     | "  | "          |



00290268

Sandstones with indications of hydrocarbons, by either gas increases from Tooke's monitor or sample fluorescence, or both, are described below (intervals are by Schlumberger measure):

- 6468 to 6492' Sd, Coarse, unconsolidated; no fluor; possibly 4 to 8 units gas.
- 6661 to 6684' Ss, with very low perm; some fluor; 34 units gas.
- 6695 to 6756' Ss, very low to better perm; much better fluor; 200 units gas; probably yielded most gas volume to DST # 2. When drlg after DST, mud tanks frothed & froth had a good yellow distillate film.
- 6796 to 6803' Ss, fine, kaolinic; some fluor; Tooke's gas ?
- 6938 to 6970' Ss, very low to no perm; good fluor; Tooke's gas ?
- 7134 to 7142' Ss, very low or no perm; good fluor; 6 or 8 units gas.
- 7834 to 7865' Ss, very low or no perm; no fluor; 22 units gas.
- 7880 to 7907' Ss, very low perm; no fluor; 10 units gas.
- 7922 to 7928' Ss, no perm or fluor; 10 units gas.
- 8002 to 8012' Ss, very low perm; no fluor; 5 units gas.
- 8182 to 8204' Ss, very low or no perm; no fluor; 5 units gas from lower part which maybe from coal only.
- 8280 to 8289' Ss, very low or no perm; weak to no fluor; 10 units gas; coal occurs at the base of this sand.
- 8305 to 8336' Ss, very low to no perm; best perm & fluor occurs in the lower 10' of this sand; 14 units gas.
- 8358 to 8362' Ss, no perm; some fluor; Tooke's gas ?
- 8500 to 8514' Ss, no perm; some spt'd weak or dull fluor; 10 to 12 units gas.
- 8530 to 8568' Ss, kaolinic with very low perm; no fluor; 8 units gas.
- 8706 to 8717' Ss, most with no perm or fluor but 5 to 10% of ss fragments have some perm & good fluor; 22 units gas.
- 8762 to 8769' Ss, softer with probably some perm; no fluor; 18 to 20 units gas.
- 8773 to 8782' Ss, conglomeratic, probably with fair perm; no fluor; 10 to 12 units gas.

Although it is believed that the above described 3 sandstone intervals between 8706 and 8782' have good enough permeabilities to yield some fluid (liquid or gas) to a test, the lack of fluorescence in the sands from 8762 to 8782' and the relatively low resistivities of all 3 strata are somewhat disappointing in the speculation as to their productive possibilities. Of the 3, it is believed that the 8706 to 8717' sand has the best chance to yield gas when perforations are contemplated in the future.

The "A" and "B" sands yielded gas to drill-stem-test. Other zones that probably merit perforations and fracs at the appropriate time are: 7134 to 7142'; the "C" sands between 7834 and 7907'; and the sands between 8280 and 8289' and from 8305 to 8336'.

Very truly yours

*Karl M. Buehler*  
Karl M. Buehler, geologist

SAMPLE DESCRIPTIONS

Samples examined by K. M. Buehler, geologist on location. Depths described are by drill-pipe measure and are not corrected for lag or to Schlumberger measures.

WASATCH at the surface, continuing to 5492' (geolograph depth).  
*5516' Schlumb. measure*

- 630 to 660' Clay shale, maroon-red & pale green-gray.  
-720 Same; few fragments of cream, ostracod ls.  
-750 Same; some coarse, ang-sub ang, unconsolidated sd.  
-780 Cly sh, mar-red, pale grn to v lt gr.  
-830 Same; few frgs of cream, v ostracod ls. Smp to 830' caught @ end of flow line; shaker being by-passed because of high visc mud. Pipe stuck @ 830' while circulating waiting for water to lower viscosity.  
-860 Sh, dk mar & pale grn, mica, slty, 80%; sd, m-crs, a, unconsolidated, 20%; little biotite & muscovite mica.  
-920 Sh, mar & pale grn, 40%; sd, med, a, unconsol, 60%.  
-1010 Sh, mar & pale grn, slty.  
-1040 Sd, med, a, unconsol; few pk feldspars; biotite & muscovite com.  
-1070 Sh, mar & pale grn, slty, w trace of yellow sh too.  
-1100 Sh, as above, 50%; sd, med-crs, a, unconsol, 50%.  
-1130 Sh, mar, yel & pale grn, slty, 70%; sd, med, a, unconsol, 30%.  
-1160 Sh, as above, 90%; sd, 10%; muscovite common.  
-1220 Sd, med, a, unconsol; few pk & gr feldspars; muscovite & biotite common.  
-1300 No cuttings coming over shaker; shale drlg up & going into suspension ?  
-1330 Cly sh, mar & pale grn-gr, 60%; sd, med, a, unconsol, 40%; muscovite & biotite mica abd.  
-1370 Sd, med, sa, unconsol; few pk feldspars; muscov & biot mica abd.  
-1400 Sh, mar-red & lt grn-gr, slty; also little yellow sh too.  
-1430 Sh, mar-red & lt grn-gr, slty.  
-1490 Sh, as above; sd, unconsol, 20%; muscovite mica abd.  
-1580 Sh, mar & pale grn, 75%; sd, med, a, unconsol, 25%; muscovite abd.  
-1670 Sd, med-crs, a, unconsol; few pink feldspars.  
-1700 Sd, as above, 80%; Sh, mar-red & lt grn-gr, slty, 10%.  
-1730 Cly sh, mar-red, yel & lt grn-gr, mottled, slty.  
-1760 Same; Ls, cr & gr, sdy, pellet, fossiliferous, ostracodal, 05%.  
-1780 Sd, med, a, unconsol; few gr min grains; muscovite & biotite abd.  
-1820 Sd, med, a, unconsol; gray mineral grains common.  
-1840 Sd, as above, 60%; Cly sh, mar & lt grn-gr, 40%.  
-1880 Sd, med, a, unconsol; gr mineral grains & muscovite common.  
-1900 Sd, as above, 75%; Sh, mar, lt grn & v lt gr, 25%.

TOP OF TIPTON TONGUE 1850 or 1888' (geolograph measure).  
*1888' Schlumb. measure*

- 1920 Sh, dk brn-gr to blk, fiss, w trace fish scales; ltl gr, mica sltst  
-1940 Sh, dk brn to blk, fiss, w tr fish scales & ostracods; trace calc spk'd sh.  
-1960 Sh, as above, 40%; mar & lt grn-gr sh, 60%.  
-1980 As above; mostly dk gr to blk, fissile shale.  
-2000 Sh, dk brn-gr to dk gr, fissile; trace ostracods.  
-2020 Sh, med gr, mar & lt grn-gr, mica, slty, soft; ltl wh, mica sltst.  
-2040 Sh, med brn-gr, fiss, & mar & lt grn-gr, soft.

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- 2040 to 2060' Shale, med to dk gray, fissile, 70%; maroon sh, 30%.
- 2080 Sh, dk brown fissile; trace fish scales & ostracods.
  - 2100 Sh, med to dk gr & brn, fiss, flaky; tr fish scales & ostracods.
  - 2140 Sd, med-f, a-sa, unconsol; gr min grains & mica common; trace ostracod ls.
  - 2160 Sh, lt to med gr, mar & lt grn-gr; Sd, as above, 25%.
  - 2180 Sh, as above; trace gray, v fine ss. Big shale section starts @ 2148 or 2165'.
  - 2200 Shale, as above.
  - 2220 Sh, mar & lt grn-gr; little yellow shale too.
  - 2300 Sh, mar, Yel, & lt grn-gr.
  - 2340 Sd, med, sa, unconsol; pink feldspars common.
  - 2380 Sh, mar, yel, lt gr & lt grn, mottled, slty.
  - 2400 Sh, as above? PS after trip @ 2384'.
  - 2420 Sh, mar & lt grn-gr; Ss, med-f, sa-sr, sl vcl grained, in clusters, 20%; Ss raveling after trip?
  - 2460 Sh, mar, yel & lt grn-gr; Ss, as above 20%; Ss raveling?
  - 2500 Sh, mar, yel, lt grn to ht gr.
  - 2540 Cly sh, mar, yel, pale grn & pale gr, slty.
  - 2560 Same; Ss, med-f, sa, mica, sl vcl grained, in clusters, sl calc, 20%.
  - 2580 Same; Ss, only 10%.
  - 2600 Sh, mar & lt gr, slty; Ss, v f to med, mica, sl vcl grained, 20%.
  - 2640 Sh, mar, pale grn & pale gr, with little yellow sh too.
  - 2660 Sh, mar, pale gr with little yel sh too; coal, 10%.
  - 2720 Sh, mar-red, v lt gr, with little yellow sh too.
  - 2740 Sh, as above; Ss, v v f, or sltst, wh, sl calc, sl mica, 20%.
  - 2780 Cly sh, mar, yel & v lt gr.
  - 2800 Sh, as above; Ss, f, sa-sr, friable, soft, in clusters, w med perm, 20%; no fluor.
  - 2820 Sh, mar, yel & v lt gr, slty; trace blk, carb shale.
  - 2840 Cly sh, v lt gr; Sh, dk gr-blk, carb, 10%.
  - 2870 Cly sh, v lt gr, slty, w little mar, yel & blk, carb shale.
  - 2885 Sd, crs, sa-sr, unconsol; pk feldspars common. (Sd 2864-74' geolograph).
  - 2900 Cly sh, mar & lt gr; Sd, as above, 20%.
  - 2915 Sd, med-crs, sa-sr, unconsol; few pink feldspars.
  - 2930 Sh, mar, yellow & lt gr.
  - 2960 As above; Sd, crs, sa-sr, unconsol, 20%.
  - 2975 As above; Sd from poor samples?
  - 3005 Sh, mar, yel & v lt gr; Sd, as above, & med-f, sa-sr, in clusters, 25%.
  - 3065 Sh, mar, yel & v lt gr, mottled; little ss as above.
  - 3125 Sh, mar, yel & v lt gr.
  - 3140 Sh, mar, yel & v lt gr, some mica & slty, some mottled.
  - 3155 Sh, mar & lt grn-gr; some yellow mottled shale too.
  - 3170 Sh, mar, yel & v lt gr, mottled, part slty.
  - 3240 Cly sh, mar, yellow & lt grn-gr.
  - 3250 Sh, mar, yel & lt grn-gr, some mottled & slty.
  - 3280 Sh, mar, yel & lt grn-gr.
  - 3300 Sh, mar, Yel & lt grn-gr.
  - 3340 Sh, mar, yel & lt grn-gr.
  - 3365 Sh, as above; little sd, med-crs, sa, free, w few pk feldspars.
  - 3375 Sh, mar, yel & lt grn-gr. (Fast drilling 3315-73').
  - 3390 Cly sh, mar, yel & v lt grn-gr.

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- 3390 to 3400' As above; little wh & pink, mica, v f sltst; few pk ls nodules.  
 -3420 Sh, mar, yel & v v lt gr.  
 -3430 Sh, as above; Ss, wh, f, sa-sr, sl vel grained, sl cly filled, in clusters, w med perm, 20%; no fluor; (this sd maybe from 3315-73' soft interval).  
 -3450 Sh, mar, yel & lt grn-gr.  
 -3480 Sh, mar, yel & lt grn-gr.  
 -3490 Same; ltl ss, wh, f, sa-sr, friable, clean, perm; no fluor.  
 -3500 Sh, mar & lt grn-gr; Ss, wh, f, sa-sr, friable, clean, perm, 05%.  
 -3510 Sh, mar, yel & lt grn-gr. (Above ss from 3458-77' geolograph).  
 -3570 Sh, mar, yel & v lt gr.  
 -3590 Sd, med-crs, sa-sr, unconsol; pk feldspars common. (Sd 3551-68', 3579-84' & 3595-3606' geolograph).  
 -3600 Sh, mar, yel & lt gr, 75%; Sd, as above, 25%.  
 -3610 As above; arkosic sd, 40%; Sh, 60%.  
 -3620 Sh, mar & grn-gr.  
 -3640 Sh, mar, yel & grn-gr.  
 -3650 Same; little wh sltst too.  
 -3670 Sh, mar, yel & grn-gr.  
 -3680 Sd, med-crs, sa, unconsol; few pk feldspars. (Sd 3641-60' geolograph).  
 -3690 Sh, 80%; Sd, as above, 20%.  
 -3720 Sh, mar, yel & lt grn-gr.  
 -3730 Ss, f, sa, mica, friable, perm, & sd, crs, sa-sr, unconsol; few pk feldspars; sd w good perm; no fluor. (Sd 3695-3723' geolograph).  
 -3740 Sh, 50%; Sd, as above, 50%; pk feldspars common; few yel & pink ls nodules.  
 -3750 Sltst & v v f ss, yel, pk to wh, calc, 20%; Sh, 80%; few yel, bf & pk ls nodules.  
 -3760 Sh, mar, yel & v lt gr; Sltst & v v f ss, as above, 10%.  
 -3770 As above; Ls nodules, cr-yel-bf, 05%.  
 -3790 Sh, mar, yel & lt grn-gr; Sltst, wh, yel & pk, calc, mica, 15%; few yel ls nodules.  
 -3800 As above; Sltst, 15%.  
 -3810 Sh, mar, yel & lt gr, 75%; Ss, wh, v f, sa, friable, sl s&p, sl glauc ?, 25%; Ss w med perm but no fluor. (Ss 3782-94' geolograph).  
 -3830 As above; Sltst & v f ss, wh & pk, calc, sl s&p, 20%.  
 -3860 Sh, mar, yel & v lt gr; trace anhydrite blebs in s&p @ 3960'.  
 -3980 Sh, mar, yel & lt grn-gr; trace anhydrite blebs.  
 -4000 Same; trace anhydrite blebs.  
 -4010 Sh, mar, yel & lt gr; few anhy blebs; Sltst, lt gr to wh, v f, s&p, calc, 10%.  
 -4030 Sh, mar, yel & lt gr; Sltst, wh, s&p, calc, 05%.  
 -4040 Same; Sltst, wh, sl s&p, sl glauc, calc, 10%.  
 -4060 Same; Sltst & v v f ss, wh, sl s&p, sl glauc, calc, w no perm, 20%; no fluor. (Sltst & ss 4023-39' geolograph).  
 -4080 Sh, mar, yel & lt gr.  
 -4090 Same; Sltst, wh, sl s&p, sl glauc, calc, w no perm, 10%.  
 -4130 Sh, mar, yel & lt gr.  
 -4150 Same; little sltst, wh, calc cem, dns.  
 -4160 Cly sh, mar, yel & lt grn-gr.  
 -4210 Sh, mar-red, yel & lt gr; Ss, wh, v f, s&p & vel g, part calc, part friable w perm, 05 to 10%.  
 -4220 Sh, same; Ss, gr-wh, v f, sa, s&p, w low perm, 10%.  
 -4230 Sh, mar, yel & lt gr; little ss as above.

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- 4230 to 4240' Sh, same; Sltst or v f ss, gr, s&p, calc, sl f glauc ?, 15%.  
 -4250 As above; Sltst & v f ss, as above, 10%.  
 -4270 Sh, mar, yel & lt gr; Sltst & f ss, wh, s&p, calc, 10 to 20%.  
 -4290 Sh, mar, yel & lt gr; Sltst & v f ss, as above, 05 to 10%.  
 -4300 As above; Sltst & v f ss, lt gr to wh, s&p, sl glauc, calc, 05%.  
 -4320 Sh, mar-red, yel & lt gr; Sltst & v f ss, as above, 10%.  
 -4330 Ss, cr-wh, f, sa, s&p, some calc cem, some w med to good perm;  
 blk min grains common; some med-crs, sa, free sd grains;  
 few coal frgs. (Ss 4281-4310' geolograph).  
 -4350 Sh, as above, 75%; Sd, as above, 25%; ltl gr-blk, carb sh.  
 -4380 Sh, mar, yel & lt grn-gr; ltl gr-blk, carb sh too.  
 -4390 As above; Ss, gr-wh, f-vf, s&p, sl glauc ?, calc cem, w low  
 or no perm, 20%; no fluor.  
 -4400 Sh, 70%; Sd, med-crs, a-sa, unconsol, 30%; few chert pebbles.  
 (Sd 4362-78' geolograph).  
 -4430 Ss, med-f, sa, s&p, calc cem, w low or no perm, & sd, med-crs,  
 sa, free, w few gr & blk chert pebbles, 50%; Sh, 50%; some  
 ss perm; no fluor.  
 -4440 Sh, 70%; Ss, f-vf, s&p, 30%; ltl blk, carb sh.  
 -4450 Sd, crs, a, unconsol; gr to blk chert grains or mineral frgs  
 abundant. (Cgl ss 4405-36' geolograph).  
 -4460 Sd, as above, 50%; Sh, mar, yel & grn-gr, 50%.  
 -4470 Sh, mar, yel & grn-gr, 60%; Sd, as above, 40%.  
 -4480 Sd, med, sa, unconsol; few pk feldspars; gr & blk chert &  
 mineral grains common. (Cgl ss 4460-94' geolograph).  
 -4510 Sd, as above, 50%; Sh, mar-red, yel & lt gr, 50%.  
 -4560 Sh, mar-red, yel & lt grn-gr.  
 -4600 Sh, mar-red, yel & grn-gr; ltl wh, f, a, friable, clean, good  
 perm sd in smp 4570-90', maybe from 4542-61' geolograph.  
 -4610 Same; ltl sd, m-crs, sa, free. (PS after trip @ 4592').  
 -4620 Sh, mar, yel & lt grn-gr; ltl crs free sd maybe from 4598-4605'.  
 -4640 Sh, same; Ss & sltst, gr-wh, v f, vel g, 05 to 10%.  
 -4650 Sh, mar-red, yel & lt grn-gr.  
 -4660 Sh, same; Sltst, gr-wh, mica, vel g & s&p, f glauc, dol, 10%.  
 -4680 Same; Sltst, 05 to 10%.  
 -4700 Same; Sltst, pk, gr to wh, vel g, sl f glauc, calc, 05 to 10%.  
 -4710 Sd, med-crs, sa-sr, unconsol; pk feldspars common. (Sd 4666-  
 4716' geolograph).  
 -4740 Sd, med-crs, sa-sr, unconsol; few pk feldspars; dk gr-blk  
 mineral grains & chert frgs common.  
 -4750 Sd, as above, 50%; Sh, 40%; Sltst, gr-wh to pk, s&p, f glauc,  
 calc, 10%.  
 -4760 Sh, mar, yel & lt grn-gr; Sltst, as above, 10%; few pk ls nodules.  
 -4770 Ss, v f, & sltst, gr-wh, vel g & s&p, sl glauc, part calc  
 cem, some ss w perm, 50%; Sh, as above, 50%; few ls nodules.  
 (Ss 4740-65' geolograph).  
 -4795 Sltst, lt gr, sl s&p, sl glauc, calc & dol, dns, 25%; Sh,  
 mar, yel & lt gr, 75%.  
 -4810 Sltst & v v f ss, pk, gr to wh, sl s&p & vel g, sl glauc,  
 calc, 20%; Sh, as above, 80%.  
 -4820 Sh, mar, yel & lt gr; Sltst & v f ss, as above, 20%.  
 -4830 Sltst, gr-wh, vel g & s&p, f glauc, calc, 40%; Sh, 60%.  
 -4840 As above; Sd, med-crs, sa-sr, free, w dk gr & blk min grains  
 common, 20%. (Sd 4798-4848' geolograph).  
 -4850 Sd, crs, sa-sr, unconsol, cgl; few pk feldspars; dk gr &  
 blk min grains & chert frgs abundant.  
 -4880 Same.  
 -4890 Sd, as above, 80%; Sh, mar, yel & lt gr, 20%.

- 4890 to 4900' sd, as above. (sd 4869-92' geolograph).  
 -4910 sd, med-crs, sa, unconsol; few pk feldspars & dk gr to blk mineral grains.  
 -4920 Same; dk gr to blk mineral grains common.  
 -4930 As above; Sh, 25%; trace coal frgs; Sh, mar, yel & lt gr.  
 -4950 sd, as above, 75%; Sh, 25%.  
 -4960 sd, crs, sa, unconsol; some pk feldspars & gr mineral & chert grains. (sd 4923-53' geolograph).  
 -4990 Sh, mar-red, yel & lt grn-gr.  
 -5050 Sh, as above; Sltst & v v f ss, pk-gr to wh, mica, sl s&p, vcl g, dol, dns, 20%. (sd 4985-5014' geolograph?).  
 (PS, by-passing shaker & catching smp from bucket on flow line 4950 to 5208').  
 -5070 Sh, mar, yel & lt gr; ltl sltst as above.  
 -5080 As above; Sltst & v f ss, gr, s&p, mica, dns, dol, 10%.  
 -5100 As above; Sltst & v f ss, grn-gr to wh, mica, f s&p, sl glauc, dns, dol, 15%.  
 -5110 As above; Sltst or v v f ss, gr to wh, mica, s&p, dol, dns, 05%.  
 -5130 Sh, mar & grn-gr; Sltst & ss, f to v f, grn to wh, sl s&p & vcl g, mica, cly cem & dol, 15%; ltl crs, sa-sr, free sd.  
 -5140 As above; sd, med-crs, sa, free, 20%; trace blk, carb sh.  
 -5150 sd, crs, sa-sr, unconsol; few pk feldspars & gr & blk min grains. (sd 5093-5131' geolograph).  
 -5160 sd, med, sa-sr, unconsol; dk gr & blk min grains abd; ss pyritic.  
 -5170 sd, as above, med to crs, cgl, sl pyritic; blk min grains abd.  
 -5180 Sh, mar, yel & lt gr; Sltst, s&p & vcl g, 20%.  
 -5190 Sh, mar, yel & lt gr; ss, wh, m-f or f, v sl a&p, sl mica, sl calc & dol cem, most all cly filled & cem, 20%; no perm or fluor. (sd 5169-84' geolograph)  
 -5208 Sh, med grn-gr w some med gr sh w blk carb plant frgs common; ltl free sd; Sltst grn-gr, shy, 10%.  
 -5210 Sh, grn-gr; Sltst, lt gr, v f, sl s&p, 05%; sev coal frgs.  
 -5230 As above; no sltst.  
 -5240 sd, med-crs, sa, unconsol; pk feldspars common. (sd 5211-22' geolograph).  
 -5250 sd, crs, sa, unconsol; few pk feldspars & dk gr-blk grains.  
 -5280 Sh, lt grn-gr & lt gr; ltl mar & yel sh too.  
 -5290 Same; rare coal fragment.  
 -5310 Sh, mar, yel & lt grn-gr.

BIG WATER SAND 5273 to 5390' (geolograph measure).

*5290 to 5412' Schlumb. measure*

- 5320 Sh, as above; ss, med, a-sa, loosely cly cem, sl arkosic, 10%; some free sd too.  
 -5330 ss, as above, & sd, med-crs, sa, unconsol; few pk feldspars; ss with good perm.  
 -5340 ss & sd, as above; gr to blk mineral grains common.  
 -5350 sd, med-crs, sa-sr, unconsol; few dk gr-blk mineral grains.  
 -5370 Same; trace blk, rubbery tar & solid hydrocarbon cementing sd; blk mineral grains or chert common.  
 -5390 sd, med to crs, sa, free; dk gr to blk min grains & chert pebbles common; few pk feldspars.  
 -5400 sd, crs to v crs, sa, unconsol, cgl, as above.  
 -5410 sd, as above; few pk feldspars; gr & blk mineral grains common; ltl sltst, gr, v f, s&p, dns, dol cem.  
 -5420 Sh, lt grn-gr; Sltst, as above, 20%.  
 -5430 Sh, 50%; Sltst, lt gr, v f, s&p, f glauc, dol, dns, 50%; trace ss, f, vcl g, cly filled, soft. (sd 5411-18' geolograph).

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- 5430 to 5440' Sh, mar & lt grn-gr; Sltst, as above, 25%.  
 -5450 Sh, mar & lt grn-gr; Sltst, 20%.  
 -5460 Sh, same; Sltst, 10%.  
 -5490 Sh, lt grn-gr & v lt gr; some mar & yel sh too.  
 -5500 Sh, same; Ss, wh, m-f, sa, cly filled & cem, sl s&p, w low perm & no fluor, 10%. (Ss 5485-92' geolograph)

TOP FT. UNION 5492' (geolograph measure)

*5516' Schlumb. measure*

- 5512 As above; Ss only 05%; ltl mar & yellow sh too.  
 -5520 Sh, mar, yel & lt grn-gr.  
 -5530 Sh, same; trace dk gr, splintery sh w few carb plant frgs.  
 -5560 Sh, mar, yel, lt gr & lt grn-gr; Sltst, grn-gr, mica, shy, 05%.  
 -5570 Same; Ss, grn-wh, f-vf, mica, kaolin filled, w no perm, 10%.  
 (Ss 5554-60' geolograph).  
 -5590 Sh, mar, yel & lt grn-gr; med to dk gr sh, 05%.  
 -5600 As above; Sltst, grn-gr, mica, shy, 05%.  
 -5630 Sh, grn-gr; Sh, m gr w few carb plant frgs, 05%; Sltst, 5 to 10%.  
 -5640 Sh, grn-gr; Sltst, grn-gr, mica, shy, sl s&p, 10%.  
 -5650 As above; grn sdy sh or v shy ss, 05%; sev coal frgs.  
 -5670 Sh, grn-gr; med gr, splintery, sl carb sh, 05%.  
 -5680 As above; med-dk gr, sl carb sh, 10%.  
 -5690 As above; Sltst, grn-gr to wh, sl f glauc, calc, 10%; Ss, grn-wh, mica, vcl g, calc, w no perm, 10%.  
 -5700 Sh, grn-gr & m to dk gr, sl carb; Sltst & ss, as above, 20%; no perm or fluor; little maroon sh too.  
 -5710 Sh, grn-gr.  
 -5720 As above; Sltst, grn to wh, s&p, f glauc, calc, 05%.  
 -5730 As above; Sltst & f ss, grn-gr to wh, calc & shy, w no perm, 20%.  
 -5750 As above; Sltst & ss, as above, 10 to 15%.  
 -5760 Sh, 75%; Ss, cr, m-f, sa, sl vcl g, dol & kaol cem, 25%; no perm or fluor. (Ss 5738-60' geolograph).  
 -5770 Ss, grn-gr to wh, calc & kaolinic, sa, unev-sort, w no perm or flu<sup>OR</sup>  
 -5790 Sh, grn-gr.  
 -5800 Sh, same; Sltst & f ss, grn to wh, calc, sl s&p, 40%; most ss w no perm, but some free, med to crs sd may indicate some perm. (Ss 5784-99' geolograph).  
 -5810 Sh, grn-gr & med gr, sl carb.  
 -5820 Sh, red, yel & grn-gr; few coal fragments.  
 -5830 Sh, grn-gr & med to dk gr, quite carb; Sltst, gr to wh, s&p, 10%.  
 -5840 Sh, grn-gr & med gr, satiny; Sltst, lt gr, mica, sl s&p, dns, dol, 40%. (Sltst 5826-36' geolograph).  
 -5850 Sh, grn-gr & dk gr-blk, carb; Sltst, as above, 20%.  
 -5860 Sh, as above.  
 -5870 Sh, as above, 60%; Sltst & v v f ss, gr, arg, dns, 40%; some sltst & ss dirty & sl carbonaceous stained.  
 -5890 Ss, cr-bf to wh, f-vf, sl s&p, calc & dol cem, v kaolinic, dirty, w no perm, 50%; Sh, grn-gr to blk, carb, 50%; ltl ss carb stained.  
 -5900 As above; Sltst & ss, 50%; Sh, grn-gr to blk, v carb, 50%; Ss w no perm; Trace coal.  
 -5910 As above; Ss & sltst, 20%; Sh, 80%; little coal.  
 -5920 Sh, grn-gr & dk gr to blk, carb; Sltst & ss, as above, 10%.  
 -5930 Same; Coal, 05%.  
 -5970 Sh, grn-gr & dk brn-gr to blk, v carb; Coal, 10%.  
 -5990 Sh, grn, brn, dk gr-blk, v carb.  
 -6000 Sh, as above; Coal, 10%.

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- 6000 to 6010' Sh, grn, brn to blk, carb; Coal, 15%.  
 -6030 Same; Coal, 20 to 25%.  
 -6040 Sh, grn, brn to blk, carb; Sltst, gr-cr, dns, dol, 05%.  
 -6060 Sh, grn, gr, brn to blk, v carb; Sltst, cr, gr, brn to wh, dns, sl galuc, calc & dol cem, 50%. (Sltst 6017-32' geolograph).  
 -6063 (circ 1/2 hr) Sh, as above; Coal, 10%.  
 -6063 (circ 3/4 hr) Sh, dk gr to blk, v carb; Coal, 20%.  
 -6063 (circ 1 hr) Sh, dk gr to blk, v carb. (Strapped pipe, 6063' equals 6055' correct. Depths above should be corrected up-hole 8').
- 6066 to 6070 Sh, grn, brn to blk; Coal less than 10%.  
 -6080 As above; Sltst, gr, sl s&p, dns, 05%.  
 -6110 Sh, grn, brn to blk; Coal, 15%.  
 -6130 Sh, grn, brn to blk; trace of coal.  
 -6140 Sh, grn, brn to blk; Coal, 05%. (Coal gas in mud from 6113-23' geolograph).  
 -6145 Sh, as above; Coal, 10%.  
 -6150 Sh, grn, brn to blk; Sltst, shy, 05%; Coal, 05%.  
 -6170 Sh, grn to blk; Sltst, grn, gr to wh, dns, dol, 15 to 20%.  
 -6190 Sh, grn, brn to blk, waxy; few pieces of coal.  
 -6200 Sh, grn, brn to blk, waxy; Sltst, as above, 10%.  
 -6210 As above; Sltst, 20%.  
 -6220 Sh, grn, brn to blk, sl carb.  
 -6230 As above; Coal, 10%.  
 -6250 Sh, grn, brn to blk, waxy, carb.  
 -6260 As above; Coal, 05%.  
 -6270 Same; Coal, 30%.  
 -6280 Sh, grn to blk; Sltst, grn-gr, mica, dol, dns, 20%.  
 -6290 As above; Sltst, 30%.  
 -6300 Sh, blk; Coal, 05%.  
 -6330 Sh, grn, brn to blk, waxy; Sltst, 05%; Coal, 05%.  
 -6380 Sh, grn, brn to blk, waxy, carb.  
 -6400 Sh, grn, brn to blk, w few coal fragments.  
 -6410 Same; little coal.  
 -6420 Sh, grn, dk gr to blk, waxy; Coal, 05%.  
 -6440 As above; only trace coal.  
 -6450 As above; Coal, 05%.  
 -6470 Sh, grn, brn to blk; Coal, 05%; Sltst, grn to wh, mica, 05%; trace ss in smp. (Sd 6438-62' geolograph).  
 -6480 Same; Sd, crs, sa, unconsol, w few gr & pk feldspars, 50%.  
 -6490 As above; Coal, 05%.  
 -6500 As above.  
 -6510 Ss, wh, m-f, sa, v s&p, calc & dol cem w v low to no perm; no fluor. (Ss 6487-97' geolograph).  
 -6520 Sh, as above, 40%; Ss, as above, 60%.  
 -6530 Sh, grn-gr to brn.  
 -6550 Sh, grn, gr, brn to blk; Sltst & f ss, 10%.  
 -6560 As above; Sltst & f ss, wh to grn, calc & dol, 30%.  
 -6570 Sh, grn to gr; Sltst & f ss, as above, 10%.  
 -6580 Sh, grn to blk.  
 -6590 Same; Sltst, gr to cr, calc & dol, dns, s&p, 30%.  
 -6610 Sh, grn, gr to blk, carb; Sltst gr to bf, s&p, dns, dol, 10%.  
 -6640 Sh, grn, brn to blk, carb.  
 -6650 As above; trace of s&p ss.

TOP OF HUBER'S "A" SAND 6639' (geolograph measure).

*6661' bellumb. measure*

- 6660 Ss, wh, f, s&p, calc & dol cem, w v v low or no perm; few ss frgs with spt'd fluor; no free oil in sd.

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- 6660 to 6670' Ss, as above, but little finer; few ss frgs w spt'd fluor but no free oil in sd; 34 units gas kick on mud logging monitor.  
-6680 Ss, as above; more shale.  
-6683 (circ 1 hr) Ss, as above.
- DST No. 1, 6642-6683' (drill measure). Rec gas.  
*6671-6712 Schlumb. measure*
- 6683 to 6690 Ss, f to v f, v s&p, calc & dol cem, w v v low to no perm, 30%; Sh, grn-gr, brn to blk, 70%. Mud tank frothed from gas after DST no. 1.  
-6714 Ss, f to v f, v s&p, kaolinic. (gas increase on Tooke's monitor here; apparently 6683-97' is still ss like that DST'd above.)  
-6717 Ss, fine, sa, v s&p, kaolinic; looser texture w low perm; some ss frgs w slight spt'd fluor.  
-6740 Sh, grn-gr to blk, fiss; few coal fragments.  
-6750 Ss, med, v s&p, kaolinic; 50% of ss w good spt'd fluor; low perm. (200 units gas kick w high ethane & propane). (Ss 6703-48' geolograph).  
-6760 Sh, grn, brn to blk, carb; Coal, 05%.  
-6770 Sh, grn, brn to blk; Ss & sltst, as above, 20%; trace coal.  
-6780 As above; Ss, cr to pink, s&p, calc, m-f, w no perm, 20%; Coal, 05%.  
-6790 Sh, grn, brn to blk, carb; Coal, 05%.  
-6800 Ss, med, a, s&p, friable, kaolinic, 20%; sltst, gr, dns, dol, 05%; Coal, 05%; Sh, 70%. (Ss & coal 6782-92' geolograph).  
-6810 Ss, f to med, sa-sr, kaolinic, 40%; Sh, grn, brn to blk. Increase of ss fluor, so 6782-92' ss probably has some gas too.  
-6820 Sh, grn, brn to blk, sl carb; sltst & ss, as above, 25%; little coal.  
-6830 Sh, 50%; sltst, cr, bf to gr, v calc & dol cem, v sl s&p, dns, 50%.  
-6840 Same; sltst & v f ss, dns, dol, sl s&p.  
-6850 Same; sltst & f ss, 30%; Sh, grn, dk brn to blk, carb, 70%.  
-6860 Sh, grn, brn to blk, carb; Coal, 05%.  
-6870 Sh, as above; Coal, 10%.  
-6890 Sh, dk gr & brn, carb; sltst, gr, v f, v dns, dol, 10%; Coal, less than 05%.  
-6900 As above; Coal, 05%.  
-6910 sltst & v v f ss, gr, dns, dol, s&p, 25%; Sh, 75%; little coal.  
-6915 Sh, lt grn-gr; Coal, 50%. (Coal 6896-6905' geolograph).  
-6920 sltst & v v f ss, gr, dns, dol, 20%; Sh, 60%; Coal, 20%.  
-6930 sltst, gr, dns, s&p, dol, 40%; Sh, grn, dk gr to blk; Coal, 05%.

HUBER'S "B" SAND 6919-50' (geolograph measure).

*6938-70 Schlumb. measure*

- 6940 Ss, cr, med, sa, v s&p, v calc cem, w no perm; good bright spt'd fluor but no free oil in sd; Coal, 25%.  
-6950 Ss, f- vf, s&p, kaolin filled, w v low to no perm; good bright fluor but no free oil in sd.  
-6955 As above; Ss, v f & v kaolin filled; v low or no perm; fluor but no free oil.  
-6959 Sh, grn, brn to blk; Coal, 05%.  
-6959 (circ 1/3 hr) Sh, as above.  
-6959 (circ 1 hr) sltst or slty dol, gr, cr to bf, v dns, 30%; Sh, 70%.

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DST No. 2, 6695-6959' (drill measure). Rec. gas.

*6723-6987' Schlumb. measure*

- 6959 to 6970' Sh, grn-gr to blk; Trace of coal.  
-6980 Ss, f to med, sa, s&p, friable, lightly kaolin cem; med perm; good fluor. (Ss with gas show 6965-72' geolograph).  
-6990 Sh, grn-gr to blk; Coal, 05%.  
-7010 Sltst, cr-wh, dns, dol, 15%; Sh, grn to blk, carb, 80%; Coal, 05%.  
-7030 Sh, grn-gr to blk, carb.  
-7040 Sh, grn-gr to blk, carb; Coal, 05%.  
-7050 Same; only traces of coal.  
-7060 Sh, grn-gr, dk gr to blk; Sltst, v dk gr, v dns, dol, arg, 10%; little coal.  
-7070 As above; Sltst, 20%; Coal, 05%.  
-7090 Sh, grn-gr, dk gr to blk, carb.  
-7100 Sh, grn, dk gr to blk; Coal, 05%.  
-7110 Sh, grn, dk gr to blk, carb.  
-7120 Sh, grn, brn to blk, waxy, carb; Coal, 05%.

STRAY SAND WITH SHOW TOPPED AT 7108 or 7118' (geolograph measure).

*7134' Schlumb. measure*

- 7130 Sd, med to crs, kaolin filled & cem, conglomeritic; apparently no perm because of kaolin fill, but much of the sd drills into crs, sa-sr grains; good fluor but no free oil in sd; only 6 or 8 unit gas increase on Tooke's monitor.  
-7140 Sh, grn, brn to blk, carb; Ss, f, s&p, kaolinic & ss, as above, 10%.  
-7150 Sh, grn, brn to blk, carb; little ss as above (raveling?).  
-7160 Sh, dk gr to blk, carb.  
-7170 As above; Coal, 25%.  
-7180 Sh, grn, brn to blk; Coal, 05%.  
-7190 Sh, brn, waxy, carb; Sltst & f ss, cly filled, 10%; ltl coal.  
-7200 Sh, grn, dk gr, dk brn to blk, carb.  
-7210 Same; Coal, 05%.  
-7220 Sltst, dk gr, v dns, mica, dol, 40%; Sh, dk gr to blk.  
-7225 Same; Coal, 05%.  
-7230 Same; only trace of coal.  
-7250 As above; Sltst, 30%; Sh, 70%.

Top SAND OF BIG FT. UNION SANDY ZONE 7227-7315' (geolograph measure).

*7254-7340' Schlumb. measure*

- 7300 Ss, gr-wh, med, sa, v s&p, kaolin filled & cem, w v low or no perm; no fluor  
-7320 Ss, same; some quite calc cem; no perm; no fluor.  
-7340 Sh, dk gr to blk; Coal, less than 05%.  
-7350 Same; only little coal.  
-7360 Sh, lt grn-gr, brn to blk; few coal fragments.  
-7370 Sh, grn-gr to blk; Coal, 05%; little ss, gr, m-f, s&p, friable, soft, kaolinic, w med-low perm. (7353-57' geolograph interval gave 32 unit gas kick from coal or sand ??).  
-7380 Sh, grn-gr, brn to blk.  
-7390 Ss, wh, med, sa, v s&p, part calc cem, kaolinic, friable; no fluor. (~~Allen # 8~~ sand 7370-7405' geolograph).  
-7400 Ss, wh, m-f, sa, v s&p, part calc cem, part kaolinic, firable; v low perm; no fluor.  
-7410 Ss, wh, v f, sa, v s&p, v calc cem; no perm or fluor.  
-7420 Sh, grn, brn to blk; little ss as above.  
-7430 Sh, as above; Sltst, gr, v f dol, 10%; trace of coal.

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- 7430 to 7440' As above; Sltst, gr, v v f, dol, 20%.
- 7450 Sh, grn to blk; Sltst & v v f ss, grn-gr, dns, mica, dol, 25%; few coal fragments.
- 7460 As above; Trace gr-brn, lithographic, argillaceous ls.
- 7470 Sh, grn-gr, brn to blk; Sltst, as above, 10%; trace coal.
- 7490 Sh, same; Sltst, med gr, s&p, mica, calc cem, dns, 20%; ltl coal.
- 7500 Ss, wh, f, sa, v s&p, v calc cem, w no perm or fluor. (Allen # 11 sand 7484-7624' geolograph).
- 7510 Ss, as above, becoming crsr, less calc cem, looser texture; low perm; no fluor.
- 7530 Ss, med, sa, s&p, kaolinic, loose textured; low perm; no fluor.
- 7560 Ss, med-crs, sa, s&p, congl, kaolinic; prob w perm; no fluor.
- 7580 Ss, med, sa, s&p, kaolinic; few crs sd grains; probably med-low perm; no fluor.
- 7620 Ss, med-f, sa, v s&p, calc & dol cem; w v low or no perm; no fluor.
- 7640 Sh, grn, brn to blk, waxy, sl carb; Trace coal.
- 7650 Sh, as above; Ss, grn, f, v shy, dns, & wh, f, v s&p, dns, calc & dol cem, 25%; no perm or fluor. (ss 7638-42' geolograph).
- 7660 Sh, same; Sltst, med grn-gr, v dns, v dol cem, 50%; Coal, 02%.
- 7670 Ss, gr-wh, v f, v s&p, mica, carb, dns, dol & calc cem; no perm or fluor. (Ss 7658-7721' geolograph).
- 7680 Ss, v f, as above, grading to sltst, med gr, v arg, dns, v dol cem; no perm or fluor.
- 7690 PS, shale caving after trip @ 7683'; little ss as above.
- 7700 Ss, med-f, sa, v s&p, dns, v calc & dol cem; v v low or no perm; no fluor.
- 7720 Ss, med-f, sa, v s&p, dol & kaolinic, friable w looser texture; low perm; no fluor.
- 7730 Ss, as above, friable, kaolinic, prob w some perm; Sh, blk, 20%; little coal.
- 7740 Sh, grn-gr, dk gr to blk.
- 7760 Same; Sh, grn-gr; Sltst, grn-gr, dns, arg, dol, 10%.
- 7770 Ss, grn, v f, s&p, v arg, dns; no perm or fluor.
- 7780 Sh, grn, satiny, slty; Sltst, 10%; Ss, grn-gr to grn-wh, v f, s&p, v kaolinic, dns, w no perm or fluor, 25%.
- 7790 Sh, grn; Ss, wh, v-vf, v s&p, dns, dol cem, 25%; no perm or fluor.
- 7800 Sh, grn, satiny, slty; Sltst & ss, as above, 10%; little coal.
- 7810 Sh, grn, slty, to brn, waxy; Sltst, grn & gr, dns, arg, 10%.
- 7820 Sh, grn, satiny, slty; Sltst, gr, arg, dol, 20%; little v f ss, v s&p, calc; trace ls nodules.

HUBER'S "C" SAND 7808-42' & 7855-83' (geolograph measure).

*7834-65' & 7880-7907' Schlumb. measure*

- 7830 Sltst, grn-gr, s&p, v arg, some sl dol, dns, grading to v f ss, gr, s&p, mica, dns; no perm or fluor.
- 7840 Ss, wh, med, sa, s&p, even size, kaolin filled & cem; v v low or no perm; no fluor. (Tooke has 22 unit gas increase; methane, ethane & trace of propane).
- 7850 Ss, wh, med, sa, s&p, kaolin filled & cem; no apparent perm; no fluor.
- 7860 Sh, grn, slty; Sltst, gr, v f, sl s&p, dns, dol, 30%.
- 7865 Sh, grn, slty; Sltst, gr, s&p, dns, calc & dol, 60%.
- 7870 Same; All Sltst as above.
- 7875 Ss, wh, f, sa, v s&p, sl calc, mostly kaolinic; v v low to no perm; no fluor.
- 7885 Ss, as above; little crsr size & looser texture; v v low perm; no fluor.

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- 7885 to 7886' (circ 2/3 hr) Ss, as above, sl calc, mostly kaolinic; v low perm; no fluor.
- 7886 (circ 1 hr) Ss, as above.  
7837-7912' Schlumb. measure
- DST No. 3, 7811-86'; Open 20 minutes; had very weak blow diminishing to nearly dead. Packers were stuck for 1 hr so came out of hole when pulled free. Rec 420' slightly gas cut mud.
- 7886 to 7900 Sh, dk grn-gr & blk; PS after DST.
- 7910 Sh, grn & blk; Ss, f, s&p, dol, w no perm or fluor, 25%.  
(Ss 7898-7904' geolograph had 10 unit Tooke gas kick).
- 7920 Sh, dk grn to blk; Sltst, dk gr, v f, sl s&p, v dns, v dol, or slty dol, 30%.
- 7930 Same; v f slty dol, 40%.
- 7940 Sh, grn & blk; Slty dol, as above, 20%; several coal frgs.
- 7950 Sh, grn, slty, to blk; Ls, gr to brn, slty, arg, 20%; Sltst, as above, 10%.
- 7960 Ss, gr-wh, f, mica, v s&p, v dol cem, w no perm; no fluor.
- 7970 Sh, grn, gr & brn; Dol, dk gr, arg, v f slty, 15%.
- 7980 Ss, gr-wh, f, v s&p, calc to dol cem, w no perm; no fluor.
- 7990 Sh, grn, brn to blk, waxy; Ss, as above, 35%.
- 7995 Ss, med, sa, s&p, kaolin & dol cem, w v low perm; no fluor; few coal frgs. (Ss 7979-89' geolograph had 5 unit (methane) gas kick from Tooke's monitor).
- 8000 Sh, grn to brn, waxy, part slty; Sltst & v f ss, cr-bf, s&p, calc cem, dns, 30%.
- 8005 Sh, grn to brn; Sltst, v v f, gr, dol, or slty dol, 10%.
- 8010 Sh, grn, brn & v dk gr-blk; Ss, as in 7995' smp, 25%; PS after trip @ 8007' ?
- 8020 Sh, grn to v dk gr; Sltst, med gr, v dns, dol, arg, 50%; PS, by-passing shaker this 10' after trip.
- 8025 Sh, dk grn to blk; Sltst, med gr, dns, dol, arg, 35%.
- 8030 Sh, grn, brn & blk; Ss, v v f, s&p, dns, dol cem, 25%; no perm or fluor; few fragments of brn, lithographic dol.
- 8040 As above; Ss, v f, & sltst, as above, 35%; few frgs brn dol.
- 8045 Sh, grn, brn & blk; Ss, v v f, & sltst, gr to wh, dns, dol cem, 20%; little lith dol.
- 8050 Sh, same; Sltst, gr, v dns, v dol cem, or v slty dol, 30%.
- 8055 Ss, gr-wh, med-f to f, v s&p, dol cem, w no perm or fluor.
- 8060 Sh, grn, dk gr & brn; Sltst, gr, dns, s&p, dol cem, 30%; some ss as above.
- 8065 Sltst, as above, 30%; Ss, gr-wh, f-vf, v s&p, dns, dol cem, 70%; no perm or fluor.
- 8075 Sh, grn & blk, 50%; Ss, v f, as above, 50%; sev coal frgs.
- 8080 Sh, grn & brn, waxy; Ss, as above, & sltst, 30%; few brn, lith ls nodules.
- 8085 Sh, grn & blk; Ss, as above, 10%; Coal, 05%.
- 8090 Sh, grn, brn & blk, waxy; Sltst, wh, v v f, mica, dol cem, 35%; little coal.
- 8095 Sh, grn & blk; Sltst & v f ss, brn to wh, s&p, dns, dol cem, w no perm, 40%.
- 8100 Sh, brn, brn & blk; Sltst & f ss, 10%; Coal, 05%.
- 8105 Sh, grn & blk; Sltst & v f ss, gr to brn, dns, dol cem, 25%.
- 8110 As above; Coal, 30%. (Coal 8101-04' geolograph, w 4 to 6 unit gas increase, methane only, on Tooke's monitor).
- 8115 Sh, grn, brn & dk gr; Dol, gr & brn, arg, slty, 10%; Sltst, 10%.
- 8120 Sh, grn, brn, dk gr to blk; Dol, dk gr, v arg, & brn, lith, 10%.

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- 8120 to 8125' Sh, grn, brn & dk gr; Dol, as above, v arg & v f slty, 10%;  
sltst, 10%.
- 8135 Sh, dk gr to blk, carb; Dol, dk gr, arg & v f slty, 05%;  
few coal fragments.
- 8140 As above; Sltst or v f ss, s&p, dns, dol, 05%.
- 8150 Sh, grn, dk gr to blk; Ss, v f, s&p, brn, v arg, carb, dns,  
20%; few coal & fossil fragments.
- 8155 Sh, grn, dk gr to blk; Ss, gr-wh, v f, s&p, dol, 10%; no perm.
- 8160 FS; all sh caving after trip @ 8157'.
- 8165 Sh, grn, dk gr to blk; Ss, wh, f, s&p, dns, 05%; Coal, 10%.
- 8170 Sh, same; Sltst or v v f ss, wh, s&p, dns, dol, 10%; Tr coal.
- 8175 Sh, brn, dk gr & blk; Coal, 10%; Ss, wh, v f, s&p, dns,  
dol cem, 25%.
- 8180 Sh, grn, brn to blk, waxy; Ss, as above, 10%; Coal, 05%.
- 8185 Ss, gr-wh, v f, v s&p, dol & kaol, w no perm or fluor;  
Coal, 05%.
- 8190 As above; Ss with crsgr grain size; Coal, 05%.
- 8195 Ss, med, sa, s&p, kaolinic, w v v low or no perm; no fluor;  
Coal, 10%. (Coaly ss 8175-85' geolograph, had 4 or 5 units  
gas kick on Tooke's monitor).
- 8200 Sh, grn, dk gr to blk; Coal, 10%; Ss, as above, 10%.
- 8205 Same; Ss, as above, 10%; only little coal.
- 8210 Sh, gr & dk gr; Sltst & ss, as above, 10%; little coal.
- 8215 Sh, brn, dk gr to blk; Coal, less than 05%; Sltst, dk gr,  
arg, dol, dns, 10%.
- 8220 As above; Sltst, dk brn-gr, arg, v carb, 15%; Coal, 10%.  
(Coal 8204-06' geolograph, had 6 unit gas increase).
- 8225 Same; Sltst only 10%; Coal, 10%; Sh, dk gr to blk.  
(Coal 8212-15' geolograph, had 6 unit gas increase).
- 8235 Sh, v dk gr to blk; Sltst & v v f ss, dk gr, s&p, dol, 10%;  
little coal.
- 8245 Sh, grn, brn, v dk gr to blk; trace of coal.
- 8250 Sh, grn, brn & v dk gr; Sltst & v f ss, gr, s&p, arg, dns,  
10%; Trace of coal.
- 8260 As above; Sltst & v f ss, gr, s&p, arg & dol cem, dns, 40%.
- 8265 As above; Sltst, 30%; Coal, 02%.
- 8270 Sh, grn, brn & v dk gr; Sltst, as above, 20%; trace coal.
- 8275 As above; Sltst or v v f ss, 25%, dns, calc & dol cem, s&p;  
Coal, 02%.
- 8277 Ss, wh, f, v s&p, sl dol, mostly kaolin filled, friable, w  
v v low or no perm; no fluor. (Ss 8257-68' geolograph had  
10 unit gas increase). (All gas was methane).
- 8280 Ss, wh, f, v s&p, kaolin filled, friable, w v v low to no  
perm; Ss may have v weak spt'd fluor in few frgs; Coal, 10%.
- 8285 Sh, grn, dk gr to blk; Sltst, dk gr, dns, dol, 10%; Coal, 05%.
- 8290 As above; Sltst, 10%; trace of coal.
- 8295 Sh, v dk gr & blk; Sltst, dk gr, dns, arg, dol, 15%; ltl coal.
- 8300 As above; Ss, wh, v v f, sl s&p, v kaolin cem, sl dol, w  
no perm or fluor, 20%. (Ss 8286-8310' geolograph has 14 unit  
gas increase)
- 8305 Ss, wh, f to vf, sl s&p, v kaolinic, sl dol, w no perm;  
v v faint, if any fluor; few ss frgs float in acid.
- 8310 As above; Ss becoming cleaner & sl friable.
- 8320 Ss, wh, f, sl s&p, v kaolinic, only sl dol, even-sort, mica;  
v v low to no perm; few ss frgs w bright fluor; few calcite  
crystals.
- 8330 Sh, blk; much ss as above; numerous ss frgs w good fluor.
- 8335 Ss, wh, v f, dns, s&p, v calc & dol cem, w no perm or fluor;  
Coal, 10%. (Ss 8327-32' geolograph).

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8335 to 8340' Sh, grn & blk; Sltst, brn-gr, v dns, dol, & ss, as above, 40%;  
Coal, 05%.

-8345 As above; little coal.

-8346 (circ  $\frac{1}{2}$  hr) Ss, wh, v f & m-f, v s&p, kaol & dol cem, w  
no perm, 70%; few ss frgs w bright fluor; Sh, 30%; little  
coal. (Ss w show 8341-45' geolograph measure).

-8346 (circ 1 hr) As above; Coal, 10%; rare ss frg w fluor.

-8346 (circ  $1\frac{1}{2}$  hr) Ss, wh, f, s&p, kaolinic, 25%; Coal, 50%; Sh, 25%.

*8283-8369' Schlumb measure*

DST No. 4, 8260-8346'. Collapsed pipe  $4\frac{1}{2}$  joints above drill  
collars when 8 stands above bottom on  
trip in to DST. No test.

STRAPPED PIPE @ 8346' when ready to renew drilling & corrected  
down-hole 16' to 8362' corrected depth.

8362 to 8370' Sh, grn, brn & blk; Ss, m-f, s&p, kaolinic, 20%; Trace coal.

-8380 As above; Ss, fine, kaolinic, f glauc, w no perm or fluor, 25%;

-8390 Sh, grn to blk; Ss, as above, 10 to 15%.

-8400 Sh, grn to blk; Coal, 10%; Ss, gr-wh, f, s&p, kaolinic, 10%.

-8405 Sh, grn & blk; Sltst, gr to brn, v arg, dns, 30%.

-8410 Sh, same; Sltst, only 10%; Trace dk brn, arg, dns dol or sid.

-8415 Sh, grn to dk brn; Sltst, gr, v f, v arg, dns, 30%; Dol, dk  
brn, v arg, 05%.

-8420 Sltst & sh, as above; little coal.

-8425 Sh, grn to blk; Sltst, bf to gr, s&p, arg & dol, 50%.

-8430 As above; Sltst only 15%; Coal, 03%.

-8445 Sh, grn, brn to blk; Sltst & f ss, gr, s&p, arg & dol, 25%.

-8455 As above; Sltst, 15%; Trace coal. (Strapped pipe; meas OK).

-8465 Sh, grn, brn to blk; Sltst, cr, gr to brn, vf, v dns, 20%;  
little coal.

-8470 As above; Sltst or v v f ss, v dol, or slty dol, bf to brn, 30%.

-8475 Same; Sltst, v f, cr to bf, dol & calc, 30%; little coal.

-8485 Same; Sltst, cr, bf to brn, dol & carb, 60%; Coal, 05%.

-8490 Sltst, v v f, brn to blk, v arg & v v carb; Coal, 05%. *geolograph*

-8492 Sh, brn, brn to blk; Sltst, as above, 35%; Coal, 15%. *(coal 8480-82)*

-8495 Sh, 40%; Sltst, as above, & ss, v v f, s&p, dol, 60%; ltl coal.

-8500 Sh, grn & brn; Dol, brn, v f x, dns, 40%.

-8505 Sh, 50%; Ss, v v f, cr, bf to brn, sl s&p, f glauc, v dns,  
dol cem, 50%; ltl coal; Ss has no perm but few frgs have  
spt'd fluor. (Ss 8497-8511' geolograph). 10 units gas @ top.

-8510 Ss, v v f, wh, bf to brn, sl s&p, glassy, qtzitic, & sltst,  
bf to brn, arg; no perm, few frgs have dull fluor; coal, 10%.

-8515 Ss, wh, bf to brn, v f, ev-sort, sl f glauc, sl s&p, carb;  
ss cly filled w no perm but much ss has spt'd weak fluor;  
coal, 05%.

-8518 Sh, brn; Coal, 50%. (Coal 8511-13' geolograph).

-8520 Sh, grn, brn to blk; Ss, wh, bf to brn, v f, as above, 50%;  
Coal, 05%; no ss perm but few frgs w bright fluor.

-8522 Sh, grn, brn to blk; Coal, 30%.

-8525 Sh, as above, 80%; Ss, wh, vf, s&p, dol, 10%; little coal.

-8530 As above; Ss only 05%.

-8535 Sh, grn to brn; ltl ss as above; ltl coal.

-8540 Sh, brn, brn to blk; Coal, 03%.

-8545 Sh, brn & brn; Coal, 10%; Ss, wh, v f, s&p, dns, w no perm  
or fluor, 10%.

-8550 As above; only ltl coal; little ss as described below.

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- 8550 to 8555' Sh, grn, brn to blk, 75%; Ss, wh, m, sa, v s&p, kaol, w no perm or fluor, 25%; some ss w loose texture; trace siderite cem in ss. (Ss 8530-68' geograph measure).
- 8565 Ss, wh, m-f, v s&p, kaol filled & cem w loose tex; no perm or fluor; some ss v sl sid cem.
- 8575 As above; Ss has loose tex but no apparent perm; few ss frgs with spt'd fluor. (Lower part of 8530-68' ss has 8 units gas).
- 8576 As above; Coal, 50%. (Coal 8568-70' geograph).
- 8580 Sh, grn, brn to blk; Ss, as above, 30%; Coal, 05%.
- 8590 Sh, as above; Dol, gr, bf to brn, v f slty, sl f glauc, arg, dens, or v dol sltst, 25%.
- 8592 Sh, grn & brn, 50%; Coal, 50%. (Coal 8580-86' geograph).
- 8598 Sh, grn & brn; Sltst or v v f ss, wh to cr, glassy, qtzitic, sl f glauc, 10%. (Ss 8590-8611' geograph).
- 8600 Sh, 75%; Ss, v f, wh, cr to brn, v sl s&p, sl f glauc, glassy & qtzitic, w no perm or show, 25%.
- 8608 Ss, cr-wh, f, ev-sort, sl s&p, qtzitic, glassy, w tr dol cem & tr glauc; no perm or fluor.
- 8610 As above; Coal, 20%.
- 8615 Ss, as above, 25%; Coal, 20%; Sh, grn, brn to blk, 55%.
- 8618 Coal, 100%. (Coal 8611-16' geograph).
- 8630 Sh, brn to blk, hard; Coal, 15 to 10%.
- 8640 Sh, bf to brn, hard, some w f sid pellets imbedded; Coal, 10%.
- 8645 Sh, same, hard; Sltst or v v f ss, cr, bf to brn, qtzitic, glassy, 20%; Coal, 05%.
- 8649 Sh, bf to brn; Coal, 40%.
- 8650 Sh, bf to brn; Sltst, cr to bf, arg, hard, 20%; Coal, 10%.
- 8655 As above; Coal, 20%.
- 8660 As above; Coal, 25%; Sltst & v v f ss, cr, bf to brn, arg, glassy, 25%.
- 8663 Sh, brn; Coal, 30%; Sltst, cr, bf to brn, arg, sl f glauc, 30%.
- 8665 As above; few frgs glassy, qtzitic v v f ss.
- 8669 Ss, v v f, wh, cr to bf, sl f glauc, glassy, qtzitic, w no perm or fluor. (Ss 8660-65' geograph).
- 8671 Sltst & ss, as above, 10%; Coal, 90%. (Coal 8665-68' geograph).
- 8675 Sltst & v f ss, cr, bf to brn, qtzitic & glassy, w no perm or fluor, 25%; Coal, 60%; Sh, 15%.
- 8680 Ss, wh to cr, v f, qtzitic & glassy, 20%; Sh, grn-gr & brn, dns, blocky, 80%.
- 8682 Sltst & f ss, as above, 15%; Coal, 20%; Sh, brn, blocky, 65%.
- 8685 Sh, brn, 40%; Coal, 60%. (Coal 8675-78' geograph).
- 8689 As above; Coal, 80%.
- 8690 Sh, grn & brn, 55%; Coal, 30%; Ss, wh to brn, f, qtzitic & glassy, 15%; no perm or show.
- 8695 Coal, 100%. (Coal 8680-86' geograph).
- 8699 Coal, 100%. (Coal 8693-97' geograph).
- 8710 Poor samples after trip @ 8699'. Ss, cr-wh, v f, qtzitic & glassy, 10%; Coal, 30%; Sh, 60%.
- 8715 Ss, wh, cr to bf, f to v f, qtzitic & glassy, 10%; Coal, 90%.
- 8717 Ss, wh, v v f to m-f, most silic, qtzitic or kaolin filled w no perm or fluor; 5 to 10% of ss frgs are clean, friable, w ltl perm & these frgs have good fluor & perm enough to yield fluid. (Ss 8703-14' geograph, has 22 units gas. This sd is 8706-17' Schlumberger measure).
- 8719 Ss, as above; most med-f grained, some s&p; fluor & perm as above.
- 8725 Ss, wh to cr, f to med, part qtzitic & part kaol cem, hard; 99% of ss w no perm; few ss frgs w fluor as above.

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- 8725 to 8730' Poor sample; All coal from bridges after trip @ 8725'.
- 8735 As above; Ss, wh, f to med-f, clean, part qtzitic, some appears to have low perm; few ss frgs w fluor.
  - 8737 Sh, dk brn, blocky, hard, some v sl slty; Sltst, dk brn, v v f, v arg, hard, 15%.
  - 8740 As above; Sltst, cr to dk brn, part v arg & hard, part qtzitic & glassy, 25%.
  - 8745 Ss, wh, m-f, s&p, sl kaolinic, qtzitic & glassy; no perm or fluor. (Ss 8737-49' geolograph; 8740-46' Schlumb meas).
  - 8750 PS after trip @ 8745'; Ss, fine, as above, 25%.
  - 8755 Sh, brn, dk gr to blk, hard; Ss, wh, f, s&p, sl brn spt'd, partly sl kaol cem, part qtzitic, w no perm or fluor, 25%.
  - 8760 As above; Ss only sl s&p, sa-sr, some quite kaolinic & softer than above; Ss w no perm or fluor, 30%.
  - 8765 As above; Ss only 25%.
  - 8770 Ss, wh, m-f to f, sl s&p, some sl brn spt'd, some quite kaol, sa-sr, part qtzitic, 25%; Sh, 75%; no perm or fluor. (Ss 8755-80' geolograph; 20 units gas from softer 8760-67' interval & 10 units gas from softer 8771-80' interval).
  - 8775 Ss, wh, f to med, s&p, sl glauc, kaolinic to qtzitic, w no perm or fluor; Coal, 05%.
  - 8780 Ss, as above, probably some w perm; no fluor. (20 units gas here).
  - 8782 Ss, wh, f to med, sa, s&p; most qtzitic w no perm; some clean, friable & sl congl w blk chert & mineral frgs & this ss has some perm; only rare ss frg w fluor. (This ss from 8771-80' geolograph; 10 units gas from this ss).
  - 8782 (circ  $\frac{1}{2}$  hr) Ss, as above.
  - 8782 (circ 1 hr) Ss, as above; only rare ss frgs w fluor.
  - 8782 (circ 1 $\frac{1}{2}$  hr) Ss, as above; no fluor.
  - 8782 T.D., Schlumbergered April 11, 1966.

DRILL-STEM-TEST RECORDS

- DST No. 1, 6671-6712' Schlumb measure; 6642-6683' drill measure.  
Open 5 min, SI 30 min, Open 1½ hrs, SI 1 hr.  
Gas to surface in 6 min, gauged a maximum of 95 MCF/D  
in 30 min & was constant thereafter. Rec 186' gas cut  
mud. FP 115-124#. SIP 2448-2466#. HP 3619#.
- DST No. 2, 6723-6987' Schlumb measure; 6695-6959' drill measure.  
Open 5 min, SI ½ hr, Open 2 hrs, SI 1 hr.  
Gas to surface in 4 min, gauged 1,076 MCF/D at end of  
2 hrs & was still increasing slowly. Rec 700' gas cut  
mud with just a little distillate at the top of the  
test tool. FP 189-411#. SIP 2588-2466#. HP 3684#.  
(When drlg after DST, mud tanks frothed & froth  
was covered by a yellow distillate film).
- DST No. 3, 7837-7912' Schlumb measure; 7811-7886' drill measure.  
Open 20 min. Had very weak blow diminishing to nearly  
dead (had to slide tool 30' to bottom). Tried to by-  
pass mud to be sure tool was not plugged; found packers  
stuck so jarred them loose in about 1 hour & then came  
out of hole. Recovered 420' of slightly gas cut mud  
which was probably picked up in sliding tool to bottom.  
Charts showed that the tool was open during the 20 min  
time on bottom. FP 198#. SIP (none). HP 4050#.
- DST No. 4, 8283-8369' Schlumb measure; 8260-8346' drill measure.  
When going in hole to test, the weight increased & the  
annulus mud dropped when 8 stands above bottom. Pipe  
became stuck. After pulling several hours the pipe  
jumped & started to move upward. When out of the hole  
with pipe, found that pipe had collapsed 4½ joints  
above the drill collars, leaving a fish of Johnson's  
tool, 20 drill collars and 4½ joints of pipe in hole.  
After fish was recovered drilling was resumed.

Karl M. Buehler  
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