

HYDROGEOLOGY AND GROUND-WATER
CONDITIONS IN THE CHUMSTICK
DRAINAGE BASIN

by

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OFTR 79-1

This Open File Technical Report presents the Results of a hydrologic investigation by the Water Resources Program, Department of Ecology. It is intended as a working document and has received internal review. This report may be circulated to other Agencies and the Public, but it is not a formal Ecology Publication.

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GROUND-WATER FLOW SYSTEM OF THE CHUMSTICK DRAINAGE BASIN

On behalf of the Department of Ecology, I have conducted a preliminary investigation of the ground-water flow system along Chumstick Creek and its tributaries. During 11 days of field investigation in October and November of 1978 and January of 1979, I visited numerous wells and springs. I was assisted during the first 5 days by Mr. Ken Slattery, and during the next 5 days by Ms. Vicki Colgan. At each site we made a water level measurement (depth to water) and an altitude measurement (height above sea level). When possible, we discussed the wells or springs with property owners to supplement information available from drillers' logs (reports giving details of well construction and of the geologic strata encountered). Natural outcrops, road cuts, and stream banks were examined to obtain geologic information on the water-bearing properties of sediments filling the valleys as well as the sedimentary bedrock beneath. In addition, I spent one day in December of 1978 conferring with Dr. John Whetten of the University of Washington and the U.S. Geological Survey. Dr. Whetten furnished me a preliminary (unpublished) bedrock geology map for the Chumstick area.

I present herein my findings and interpretations. Because of the limited scope of this investigation, our understanding of the Chumstick Creek hydrologic system is too elementary and generalized to provide detailed knowledge of individual parcels of private land. Furthermore, we didn't visit every well and spring in the drainage basin. We chose only those easily accessible and sufficiently spaced throughout the basin to get basic information on water levels and geology.

GEOLOGY OF THE DRAINAGE BASIN

The geologic logs from driller's reports, together with outcrop mapping during our field investigations, were used to compile the generalized geologic cross-section illustrated in Figure 1.

Bedrock

Sedimentary bedrock composed largely of sandstone and siltstone has been folded by tectonic forces and cut by streams to form the basic shape of the Chumstick and its tributary valleys. On the steep valley walls the bedrock is exposed in cliffs or thinly veneered with soil anchored by vegetation. The sand and silt grains of the rock are weakly cemented by clay and carbonate, leaving many tiny interstitial pores open to the movement of water. There are many cracks and bedding plane discontinuities (where, say, a sandstone layer adjoins a siltstone layer) along which water may move. The sandstones are able to absorb much of the rain and snow melt that falls on the thin soils and exposed rock of the ridges and valley walls. The bedrock can thus be a useful aquifer.

- EXPLANATION -

▼ WATER TABLE

||| WATER LEVEL IN WELL

→ DIRECTION OF GROUNDWATER FLOW

--- BARRIER TO GROUNDWATER FLOW

W → E

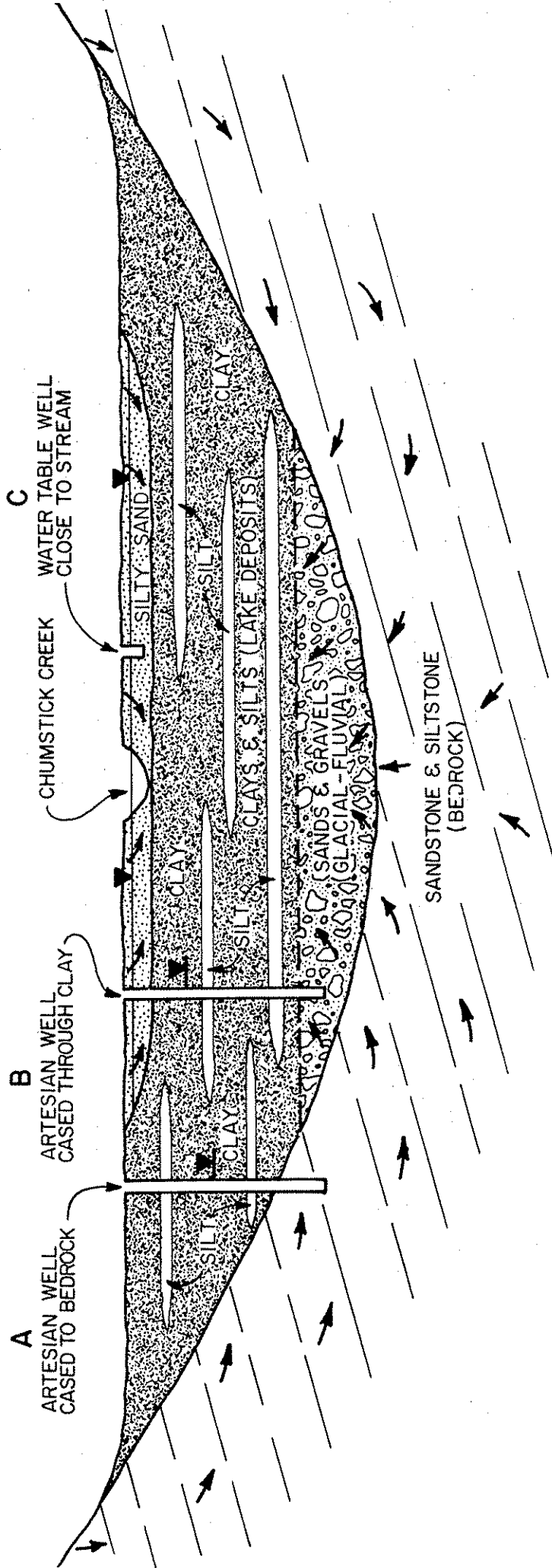


Figure 1. GENERALIZED CROSS-SECTION OF CHUMSTICK VALLEY ILLUSTRATING GROUND-WATER FLOW SYSTEM.

Valley-Fill Deposits

The bedrock floors of the valleys are covered by sediments ranging in thickness from 5 feet or less on the valley margins to 150 feet or more toward the center of the valleys. Under the flat flood-plains of the valley floors where the sediments are thickest, one can characterize up to three successive sets of strata: (1) an uppermost thin deposit (5 to 10 feet thick) of silty sand; (2) beneath the silty sand layer is a series of clay and silt beds (fine-grained) with minor amounts of sand and gravel which, in turn, overlie beds composed entirely of (3) sand and gravel (coarse-grained). This complete sequence of beds is found only in the lower half of the drainage (south of T 26 N) along Chumstick Creek, Eagle Creek, and Spromberg Canyon. In the northern half of the drainage basin, the lowermost sand and gravel strata is missing. The same is true toward the margins of the valleys where the valley-fill deposits are thinner and only the clay and silt beds are found above the bedrock. The origins of these three units are explained in the following text, beginning with the lowermost and therefore oldest set of strata.

The sand and gravel beds of the lowermost valley-fill may have been deposited by glacial meltwater streams significantly larger and swifter than the present creeks, perhaps as large as the present-day Wenatchee River. These deposits are coarse-grained and have large, intergranular pores through which water may easily flow and which provide for a large volume of water storage.

The silts and clays, which overlie the sands and gravels, are probably lake deposits laid down during intervals when the glacial meltwater streams were dammed by ice. A glacier emerged from Tumwater Canyon, covered the Leavenworth Valley, and thereby blocked the mouth of the Chumstick Valley. Wells cased through the clays to the underlying sand and gravels, invariably have artesian "heads"; that is, the water entering the well rises to a level above the top of the aquifer. The relatively impervious silt and clay apparently traps the water in the underlying aquifer, causing hydrostatic pressure buildup.

The uppermost silty-sand unit corresponds to the present-day bedload of Chumstick Creek and its tributaries, suggesting deposition during the time since the last glacial epoch (approximately 12,000 years ago). The silty sands are derived from erosion of the sandstones and shales on the surrounding ridges. Water is obtained from shallow wells in these uppermost sediments, especially close to the creek. This "water table" aquifer supplies water to the creeks throughout the year. There may be more silty-sand strata below, but geologic logs from drillers don't adequately differentiate the various strata.

AQUIFER CHARACTERISTICS

There are essentially three types of aquifers (water-producing zones or beds) being utilized in the Chumstick drainage basin: (1) the shallow water-table aquifer composed of the uppermost silty sand; (2) the lowermost sandy and gravelly sediments lying just above bedrock in the

thicker sections of valley-fill (this is an artesian aquifer); and, (3) the sandstone bedrock, also an artesian aquifer. These aquifers and the wells constructed to utilize them are explained in the following text.

High-rate pumping of shallow wells in the water-table aquifer placed close to the creek (say, within 100 feet) may cause creek water to infiltrate the creek bed and flow toward the well. A cone-shaped depression forms in the water table around the well and spreads outward for a distance dependent on the pumping rate and the hydraulic properties of the sediments. Ground-water flows down the slope or "hydraulic gradient" of this "cone-of-depression". Creek water moves toward the well if the cone reaches near enough to the creek to reverse the "hydraulic gradient" which normally slopes toward the creek. These shallow wells are dug by hand or backhoe rather than by drilling methods and are cased with concrete tile.

Wells drilled to the sand and gravel aquifer of the lowermost valley-fill are cased through the beds of silty sands and the intervening clay and silt beds. The casing extends into the aquifer and water enters the well through the open end of the casing or through perforations in the casing. The pressure in this artesian aquifer causes the water to rise in the well as much as 50 feet above the top of the aquifer, and wells have produced as much as 6 gpm per foot of drawdown.

Wells drilled along the valley margins penetrate the clay and silt valley-fill to water-bearing beds of the sandstone (bedrock) aquifer. This artesian aquifer has water pressures equivalent to those of the sand and gravel aquifer; that is, up to 50 feet or more of water above the top of the aquifer. The bedrock has been found to produce up to 2 gpm per foot of drawdown.

Table 1

Record of Wells, Chumstick Creek Drainage Basin

Explanation:

Well Number:

Wells are designated by symbols that indicate their location according to the rectangular-grid system for subdivision of public land. For example, in the symbol 20/2-11R1 the part before the hyphen indicates successively the township and range (T. 20 N., R. 2 E.) north and east of the base line and Wilamette meridian. The first number after the hyphen indicates the section (11) in which the well is located; the letter denotes the 40-acre subdivision of the section according to the following diagram. The last number is the serial number of the well in the 40-acre subdivision. For example, well 20/2-11R1 is in the SE1/4SE1/4 sec. 11, T. 20 N., R. 2 E., and is the first well in that tract to be listed.

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

Owner or Tenant:

Also include owner's well number, if known.

Altitude:

Altitude of land surface in feet obtained by altimeter survey (A) or interpolated from topographic maps (M). Altimeter readings are accurate to ± 10 feet while map interpolations are accurate to ± 20 feet.

Type of Well:

Dr, Drilled; Dg, Dug.

Openings:

Perf, perforated; Scr, screened; OE, open-end when casing is present but not screened or perforated. Numbers indicate depth intervals of the screened or perforated casing.

Aquifer Character:

C, confined; UC, unconfined.

Table 1 continued

Depth to Water Below Land Surface:

Water-level measurements expressed in feet and decimal fractions of feet were made by the Department of Ecology, Water Resources Investigations Section. Measurements recorded to the nearest whole foot were reported by owner, tenant, or driller; the dates of such measurements are often not known. A flowing well whose static head is known has "+" preceding the water level, indicating static head in feet above land-surface datum. A flowing well whose static head is not known is indicated by "Flows".

Hydraulic Interference with Creek:

Occurs when well is sufficiently close to creek that pumping water from the well would cause creek water to infiltrate the stream bed and move underground toward the well.

Remarks:

D.D. = drawdown; GPM = gallons per minute; Spec. Cap. = Specific capacity, gallons per minute per foot of drawdown.

RECORDS OF WELLS, CHAMSTICK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				
T24N, R17E														
B1	Russel Wise	1380 A	Dr	151	36	OE	C?	sandstone	40.4	11-2-78	1050	230	No	Drillers log on file, minimum artesian head ~ 8 ft. 2 GPM w/ 110' D.D.
B2	Wilson	1370 A	Dr	160					136.9	11-2-78	1950	220	No	
1C1	Ralph Kimmerly	1400 M	Dr	170	160	Perf 150-160	UC	sand, gravel	15.3	8-21-78	3800	250	No	Deep aquifer with overlying 30 GPM clay beds but no evidence of No. D.D. artesian pressure. Drillers log on file.
1C2	David Boyer	1260 M	D	201	36	OE	C?	sandstone	100	8-1-78	1800	100	No	Drillers log on file. No enough info. to determine if artesian. 1 1/2 GPM w/100' D.D.

T24N, R18E

6E1	BURLINGTON N. Rail R.	1212 A	Dr						29.6	11-2-78	800	90	No	
6E2	Gary Kriewald	1213 A	Dr	80	25	OE	C?	sandstone	28.6	11-2-78	500	90	No	Drillers log on file. Possibly artesian but inadequately described by driller. 10 GPM w/ 80' D.D.
6F	Terrance McCauley	1308 A	Dr	200	113	OE	C	limestone?	89.8	11-2-78	2400	230	No	Drillers log on file. Well may be outside Chamstick drainage basin. Artesian head > 10 ft. 4 GPM w/ 55' D.D.

T25N, R17E

12H	Circle C Ranch	1635 A	Dr	135	39	OE	C?	sandstone	48.4	10-17-78	650	75	No	Drillers log on file. Possibly artesian but inadequately described by driller. 10 GPM w/ 65' D.D.
24J	Creech	1400 A	Dg			OE	UC		6.0	10-31-78	200	5	No	3' diameter concrete tile casing
24K	Sterling	1419 A	Dr	77	68	Perf 60-65	C	sand, gravel	1.6	10-31-78	500	20	No	Drillers log on file. Artesian head > 38'. Spac. Cap. = 2.7, 40 GPM

RECORDS OF WELLS, CHAMSTICK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				
30C	Lloyd Burnett	1297 A	Dr	74	72	Perf 67-71 1/2	C	Sand	20.5	11-1-78	75	10	No	Driller's log on file. Artesian head > 15 ft. Spec. Cap. = 1.0 @ 30 GPM
30F1	W. Patrick Burnett	1275 M	Dr	39	39	OE	C	Sandy gravel	5	4-4-77	100	10	No	Driller's log on file. Artesian pressure of 25 ft. Spec. Cap. = 6.0
30F2	W. Patrick Burnett	1275 A							8.2	11-1-78	75	10	No	
30F3	Wayne Mummert	1286 A	Dr						17.5	11-1-78	150	15	No	
30L1	Vincent Brehm	1281 A	Dr	77	77	Perf 55-60	C	gravel	19.1	11-1-78	50	20	No	Driller's log on file. 60 GPM w/0.2 confined by clay strata. Artesian head > 70'. Concrete-tile casing
30L2	Vincent Brehm	1271 A	Dg			OE	UC		11.3	11-1-78	30	10	Possible	Stone casing.
30L3	"	1269 A	Dg			OE	UC		7.5	11-1-78	10	5	Yes	3' Concrete-tile casing.
30L4	Byrd	1265 A	Dg			OE	UC		3.6	11-1-78	15	5	Yes	4' Concrete-tile casing
30L5	Robert Carlson	1253 A	Dg			OE	UC		6.4	11-1-78	40	10	Possible	Along Freund Creek.
30N	Gibbs	1304 A	Dg			OE	UC		5.6	11-2-78	200	10	No	3' OD Concrete-tile casing
30P1	Charles Lemmons	1237 A	Dr	41	41	OE	C	sand, gravel	20	8-28-77	150	5	No	Driller's log on file. Artesian pressure of 10ft. Spec. Cap. = 15.0 @ 30GPM
30P2	Charles Lemmons	1250 A	Dg			OE	UC		4.8	11-2-78	250	30	No	3' OD Concrete-tile casing

T25N, R18E

RECORDS OF WELLS, CHAMSTICK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				
19N2	Louis Brender	1353 A	Dg			OE	UC		9.6	10-31-78	50		Possible	4' OD concrete-tile casing
19N3	Brownlow	1344 A	Dg			OE	UC		8.8	10-31-78	40	10	Possible	3' OD concrete-tile casing
19N4	Terrence Loss	1365 A	Dg			OE	UC		6.1	10-31-78	200	10	No	3' OD concrete-tile casing
19P	Terrence Mylon	1321 A	Dr	62	62	OE	C	gravel	7.2	10-31-78	80	5	No	Drillers log on file. Artesian head > 47 ft. Spec. Cap = 3.0 @ 30 GPM
22P	Edward Reynolds	1656 A	Dr	93	93	OE	C	sand, gravel	13.3	11-1-78	80	5	No	Drillers log on file. Artesian head of > 45 ft. Spec. Cap. = 5.0 @ 50 GPM. Aquifer confined by clay strata.
23D	Victor Logan	1875 A	Dr	175	106	OE		sandstone	—	—	500	40	No	No water level given by driller and well is now brined.
27D	John Schons	1621 A	D	94	94	OE	C	sandy gravel	30	8-6-71	250	20	No	Drillers log on file. Artesian head > 35 feet. Spec. Cap. = 3.0 @ 30 GPM. Aquifer confined by clay strata.
27E	John Schons	1595 A	Dg			OE	UC		6.9	11-1-78	20	5	Yes	4' OD concrete-tile casing.
28G	John Schons	1519 A	Dg			OE	UC		8	Reported by owner	10	3	Yes	
29N1	Royal Hinthorne	1307 A							11.8	11-1-78	150	10	No	
29N2	Royal Hinthorne	1301 A	Dr	42	41	OE	C	Gravel	5.5	11-1-78	50	5	No	Drillers log on file. Artesian head of 25.5 ft. Spec. Cap. = 3.0 @ 30 GPM
29N3	Royal Hinthorne	1303 A	Dg			OE			3.2	11-1-78	30	5	Yes	

T 25 N, R 18 E

RECORDS OF WELLS, CHAMSTICK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				
19C	PECK (INGLEBRIGHT)	1354 A	Dg			OE	UC		12.6	10-31-78	75	15	No	3' OD concrete-tile casing
19C	Eldon VanDeGrafft	1364 A				OE	UC		4.8	10-31-78	50	5	Yes	
19F1	Chamberlain	1362 A	Dg			OE	UC		4.7	10-31-78	30	10	Yes	3' OD Concrete-tile casing
19F2	Delzer	1361 A	Dg			OE	UC		5.2	10-31-78	20	6	Yes	3' OD Concrete-tile casing
19F3	Richard Lyons	1388 A	Dr	74	58	OE	C	Sandstone	24.6	10-30-78	450	10	No	Driller's log on file. Artesian head > 30 ft. Spec. Cap. = 0.3 @ 10 GPM
19F4	Baltera (Guy)	1380 M	Dr	61	61	OE	C	Sand, gravel	5	2-23-77	350	10	No	Driller's log on file. Artesian head > 40 ft. Spec. Cap. = 0.5 @ 15 GPM w/30' D.D.
19F5	Whaley	1380 M	Dr	80	22	OE	C?	Basalt?	30	?	350	10	No	Driller's log on file. May be artesian Spec. Cap. = 5.0 @ 10 GPM
19L1	Cheer	1341 A	Dr						6.0	10-31-78	15	8	?	
19L2	Harold Howard	1332 A	Dg			OE	UC		8.8	11-2-78	100	5		3' OD Concrete-tile casing
19L3	Mary Van de Grafft	1350 A	Dr	~83			C?		8.2	10-31-78	30	10	No	
19L4	James Van de Grafft	1356 A	Dg			OE	UC		5.6	10-31-78	40	5	Yes	
19M1	Louis R. Rowland	1407 A	Dr	100	99	OE	C	Sandstone gravel	58.5	10-31-78	300	60	No	Driller's log on file. Artesian on head > 20 ft. 10 GPM w/ 50 ft. D.D.

T25N, R18E

RECORDS OF WELLS, GRAMSTICK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				
18G1	Michael Burnett	1439 A	Dg			OE	UC		20.0	10-19-78	250	20	No	
18G2	Charles Caldwell	1439 A	Dr						18.6	10-19-78	150	20	No	
18G3	Melford Musgrove	1442 A				OE	UC		23.8	10-19-78	200	25	No	3' OD concrete-tile casing
18G4	Marvin Radech	1422 A							4.7	10-19-78	150	10	No	
18J	Gary Cromwell	1500 M	Dr	110	95	OE	C	Sandstone	50	1977	1700	100	No	Driller's log on file. Artesian head of 50 ft. Spec. Cap. = 2.0 @ 20 GPM w/ 40' D.D.
18K	Russell Hinthorne	1416 A	Dr	82	82	Perf 45-50	C	Sand	3.1	10-30-78	75	5	No	Driller's log on file. Artesian head > 30'. Spec. Cap. = 1.5 @ 40 GPM w/ 60' D.D.
18L	Ireland	1410 A	Dg			OE	UC		6.0	10-19-78	250	10	No	3' OD concrete-tile casing.
18P	Jack Craig	1406 A	Dg			OE	UC		12.9	10-31-78	250	5	No	
18Q	Jack Craig	1403 A	Dr	74	49	OE	C	Sandstone, gravelly	15.6	10-31-78	200	5	No	Driller's log on file. Artesian head > 30 ft. Spec. Cap. = 1.3 @ 15 GPM
18Q	Lloyd Lemons	1377 A	Dg			OE	UC		2.9	10-31-78	40	5	Yes	3' OD concrete-tile casing.
18Q	Charles Hinthorne	1400 A	Dr	39	39	Perf 35-38	C	Sand, gravel	3.3	10-31-78	50	10	No	Driller's log on file. Artesian head of 32 ft. Spec. Cap. = 3.0 @ 5 gpm
19B	Good ho...	1415 A	Dr						55.2	10-31-78	1600	25	No	

T25N, R18E

RECORDS OF WELLS, CUMAMSTOCK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				

T 25 N, R 17 E

24R	George Eldridge	1402 A	Dr	95	33	OE	C	sandstone	10	5-31-75	50	5	No	Driller's log on file. Best aquifer at 60ft. Artesian head 50ft. Spec. Cap. = 1.0, 11GPM w/ 11' D.D.
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T 25 N, R 18 E

6K	Margaret Christenson	1565 A					C		Flows		150	5	No	No access to well. No driller's log on file. Owner claims the well flows.
7G	William Hensinger	1520 A	Dr						17.1	10-19-78	175	15	No?	
7H	Whaley	1604 A	Dg			OE	UC		0.3	10-18-78	75	20	No	3 foot diameter concrete tile casing
7Q	Thomas McGill	1467 A	Dr						9.0	10-19-78	50	5	?	
13N	Stegeman	1999 A	Dg			OE	UC		3.1	11-1-78	40	5	Yes	3 ft. OD concrete-tile casing Near Van Creek.
18B	James Morriss	1650? M	Dr	125	60	OE	C	sandstone	40	1977	900	200-300	No	Driller's log on file. Artesian head >30ft, two aquifers. 15GPM w/ 11' D.D.
18F1	Manfred Nelson	1423 A							5.7	10-19-78	40	5	?	Very close to creek, don't if well is cased.
18F2	Donald Miller	1439 A	Dg			OE	UC		15.8	10-18-78	250	20	No	3ft. OD concrete-tile casing.
18F3	Donald Miller	1431 A							6.7	10-18-78	100	10	No	

RECORDS OF WELLS, CHAMSTICK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				

T25 N, R18 E

30R	John W. Salgado	1297 A	Dr	38	38	OE		sand	5.25	11-1-78	50	10	No	Driller's log on file. > 10ft. artesian head. Spec. Cap. = 1.0 @ 20 GPM
31E	Grant Howard	1347 A	Dr	65	65	OE	?	Sand	26.0	11-1-78	400	30	No	Driller's log on file. Possible artesian head. Spec. Cap. = 1.33 @ 20 GPM.
31M1	Kenneth Shilatty		Dr											
31M2	Oscar Pearson	1193 A	Dr	75	70	OE	C	Gravel	9.8	11-2-78	40	5	No	Driller's log on file. Artesian head probable but log information does not indicate depth of aquifer.
31N	William Guy	1165 A	Dr	33	22	OE	C	Sandstone	8.8	11-2-78	100	10	No	Driller's log on file. Artesian head probable but depth to aquifer was not given.

T26 N, R18 W

8R	Camp CAM REC	2376 A	Dr	77	77	OE	C		Flows	10-17-78	300	50	No	Partial driller's log on file. No geology log.
17C	Ivan Fisk	2303 A	Dr	132.5	130	OE	C	Clay w/ gravel	13.6	10-17-78	150	20	No	Driller's log on file. Well produced only 2.5 GPM and was abandoned.
18J	Brad Silkenson	2099 A	Dr	216	216	Perf 175-215	C	Shale, sandstone	29.2	10-17-78	400	20	No	Driller's log on file. 3 GPM w/ 212' D.D. Artesian head > 10 ft. and possibly > 100 ft.
18J	Widmer	2066 A					C		Flowing	10-17-78	30	10	No	Two wells, both flowing. No log information but undoubtedly is a confined aquifer.
18P	Allen Skewis	1967 A	Dr						1.6	10-17-78	450	30	No	
19B	Snack	1926 A	Dg						7.35	10-17-78	25	7	Yes	

RECORDS OF WELLS, CHAMSTICK CREEK DRAINAGE BASIN

WELL NO.	OWNER	LAND SURFACE ALTITUDE (feet)	TYPE OF WELL	DEPTH OF WELL (feet)	DEPTH OF CASING (feet)	OPENINGS	AQUIFER CHARACTER	CHARACTER OF WATER-BEARING MATERIAL	WATER LEVEL		DISTANCE TO CREEK (feet)	HEIGHT ABOVE CREEK (feet)	HYDRAULIC INTERFERENCE WITH CREEK	REMARKS
									BELOW LAND SURFACE (feet)	DATE				

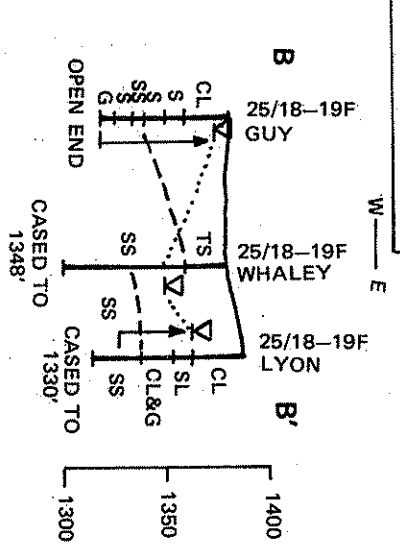
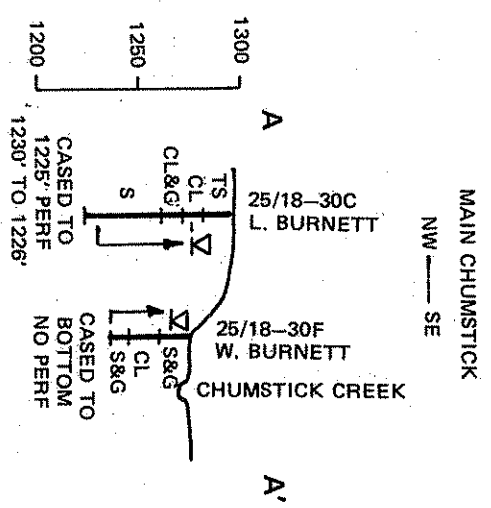
TASN, R18E

19G	Hale	1919 A	Dg			OE	UC		1.2	10-17-78	25	3	Yes	Concrete-tile casing
19K	Walcker	1839 A	Dg			OE	UC		3.4	10-17-78	400	15	No	Concrete-tile casing
19Q	Walcker	1821 A	Dr						9.5	10-17-78	300	5	No	
29N1	Paul Myhre	1778 A	Dr	180	26	OE	?	Sandstone, limestone(?)	66.1	10-18-78	7000	70	No	Driller's log on file. 4 GPM w/ 130' D.D. Artesian head > 8ft.
29N2	Paul Myhre	1728 A	Dg			OE	UC		5.6	10-18-78	400	15	No	Concrete-tile casing.
29P1	Bartel	1749 A	Dg			OE	UC		6.0	10-17-78	150	10	No	4' Concrete-tile casing
29Pa	Adsit	1747 A	Dg			OE	UC		10.6	10-18-78	300	15	No	3' Concrete-tile casing
30A	Norman Rose	1854 A	Dr	107	107	OE	C	Sandstone	69.8	10-17-78	300	80	No	Driller's log on file. Artesian head > 20 feet. 6 GPM w/ 39' (total) D.D.
30B1	Riffle	1798 A	Dr				UC		8.6	10-17-78	70	10	Possible	
30B2	Erickson	1790 A	Dg						7.6	10-17-78	200	10	No	
30J	Robert MacEnstall	1757 A	Dr						24.2	10-17-78	300	30	No	
30R1	Halefein	1689 A	Dg			OE	UC		5.2	10-18-78	450	5	No	Concrete-tile casing

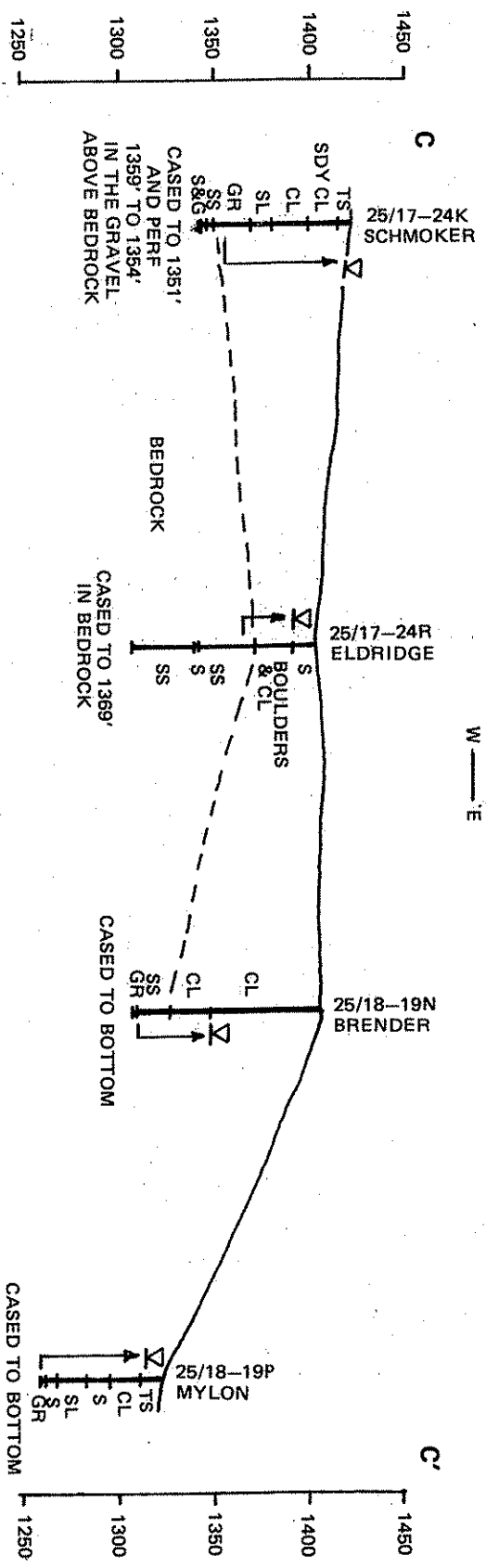
PLATE 1
SECTIONS A-A', B-B', C-C'

LEGEND

- ▽ WATER LEVEL IN WELL
- ↓ HEIGHT OF WATER LEVEL ABOVE POINT WHERE WATER ENTERS THE WELL; DOES NOT REPRESENT ARTESIAN HEAD
- TS - TOPSOIL
- CL - CLAY
- SLT - SILT
- S - SAND
- GR - GRAVEL
- SS - SANDSTONE
- SLTS - SILTSTONE
- PIEZOMETRIC SURFACE
- TOP OF BEDROCK

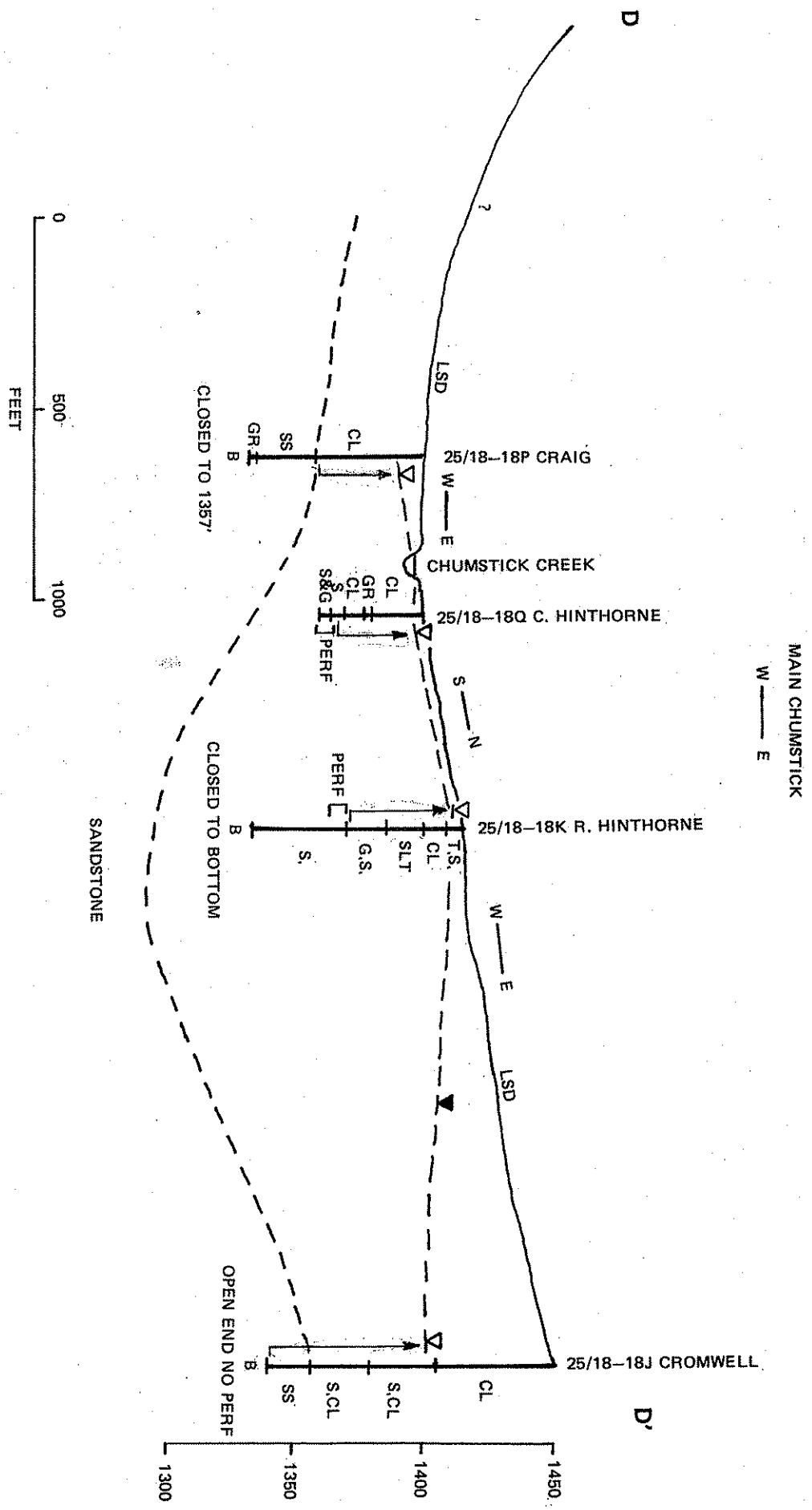


DON'T HAVE ELEVATIONS FOR GUY AND WHALEY AND DON'T HAVE RECENT WL's. LOG FOR WHALEY IS POOR, SHOWS ONLY TOPSOIL ABOVE THE SANDSTONE.



NO HORIZONTAL SCALE

PLATE 2
SECTION D-D'



ARTESIAN PRESSURE IN ALL 4 WELLS, WL FOR CROMWELL IS NOT RELIABLE.
CROMWELL AND CRAIG GET WATER FROM THE BEDROCK.
CROMWELL WELL IS SITUATED UP A SIDE CANYON.

PLATE 3
SECTION E-E

EAGLE CREEK
W — E

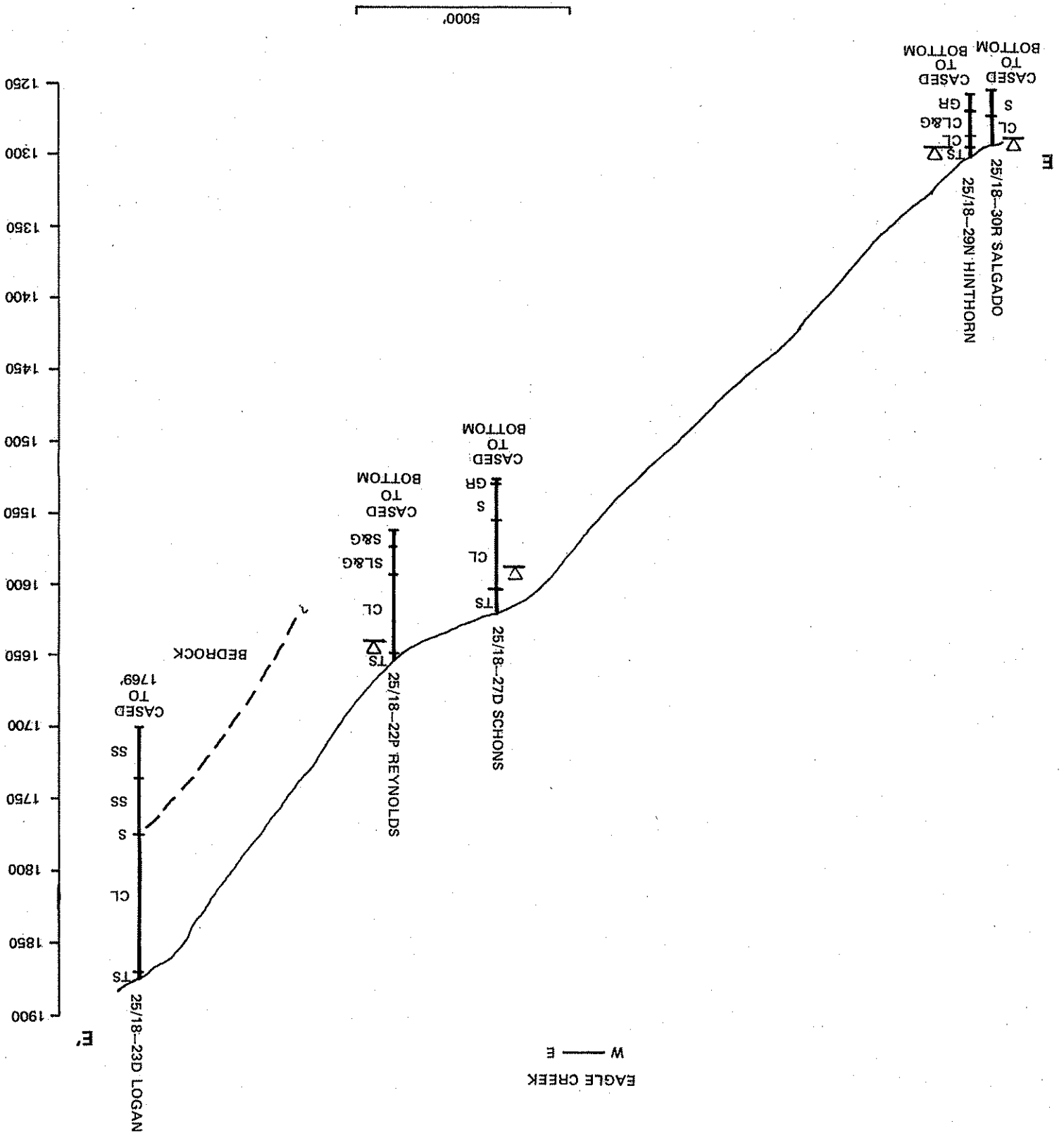


PLATE 4
SECTION F-F'

MAIN CHUMSTICK

N ——— S

NO HORIZONTAL SCALE

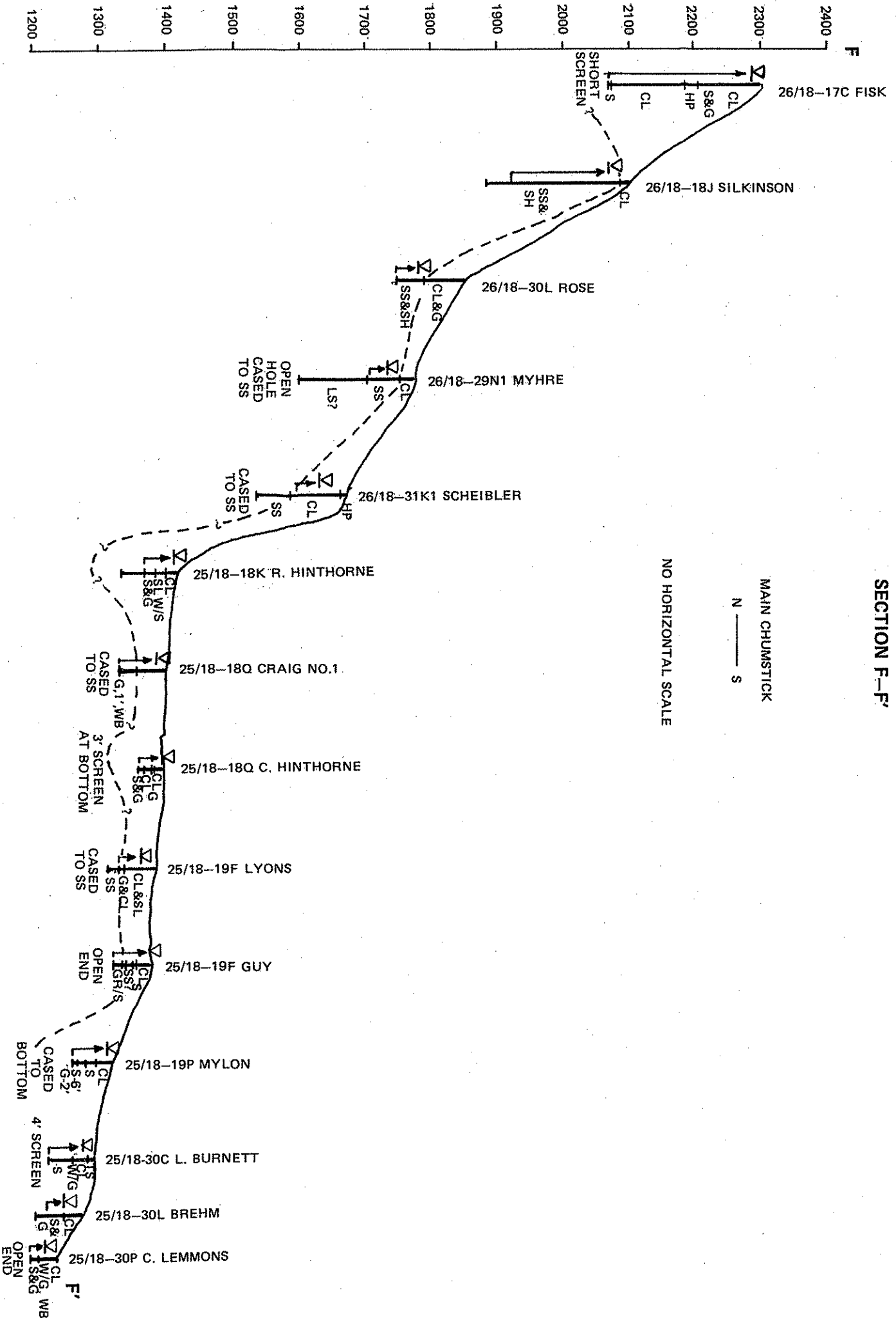


PLATE 5
SECTION G-G'

CHUMSTICK CREEK
JUST NORTH OF LEAVENWORTH

W ——— E

NOTE: KIMMERLY WELL IN VALLEY FILL, WISE & BOYER ARE ON EITHER SIDE OF SAME BURIED VALLEY TRIBUTARY TO CHUMSTICK CREEK.

