UNITED STATES

DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

AVAILABILITY OF PETROGRAPHIC THIN-SECTION SLIDES FROM THE FORTRESS MOUNTAIN FORMATION, CENTRAL NORTH SLOPE, ALASKA

by

Arthur L. Bowsher and Irvin L. Tailleur

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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A set of forty-eight thin-sections of rock samples from the Fortress Mountain Formation, central North Slope, Alaska is available for study. The thin-sections are prepared from random outcrop samples of sandstones of the Fortress Mountain Formation collected by C. M. Molenaar, R. M. Egbert, and L. F. Krystinik during the period from July 23 to August 21, 1980 (Figure 1). The samples are judged by them to be typical examples of the Fortress Mountain Formation sandstones and conglomerates. Thin-sections were made from thirty-nine sandstones for study of general petrographic characteristics, provenance and factors that might affect reservoir potential. Thirty-six of these are from the area between the Chandler and the Nuka Rivers. Three are from the Kukpowruk River area to the far west in the North Slope. Petrographic discussions based on the study of the thin-sections are presented by Molenaar, C. M., Egbert, R. M., and Krystinik, L. F., 1981, in their report Depositional facies, petrography, and reservoir potential of the Fortress Mountain Formation (Lower Cretaceous), central North Slope, Alaska: Open-File Report 81-967, U.S. Geological Survey, p. 1-32, tables 1-4, and figures 1-9. Tables 3 and 4 from that report, attached, summarize the parameters of each of the thirty-nine thin-sections (tables 1 and 2).

The forty-eight thin-sections in the set include nine not referred to in table 1 or 2. These are as follows:

Sample No.	Sec.	T.	R.	Remarks
*80AMK-132A	31	9S	22W	Sandstone pebble from the Fortress Mountain Formation.
80AMK-132B	31	9S	22W	Igneous pebble from the Fortress Mountain Formation.
80AMK-144	8	8S	26W	Igneous pebble from the Fortress Mountain Formation.
80AMK-146A	7	8S	26W	Jurassic or Triassic volcanic.
80AMK-147	7	8S	26W	Sandstone from Okpikruak Formation.
80AMK-164A	31	9S	15W	Sandstone pebble from the Fortress Mountain Formation.
80AMK-164B	31	9S	15W	Igneous pebble from the Fortress Mountain Formation.
80AMK-180	22	5S	25W	Sandstone from the Torok Formation.
80AMK-191A	18	10S	45W	Quartzite pebble from the Fortress Mountain Formation.

* U.S.G.S. sample code: 1980 season; Alaska; Molenaar, K.

This set will be sent out on three-week loan. Loans will be made in the order that requests are received. The slides may be retained for study by the U.S. Geological Survey for up to three weeks between successive loans. There are no facilities for systematic on-site examination of the slides in Menlo Park, California.

Requests for loan should be directed to:

Irvin L. Tailleur
Office of National Petroleum Reserve in Alaska
U.S. Geological Survey, MS 87
345 Middlefield Road
Menlo Park, California 94025

Attached:

Figure 1 - Index map of primary area of investigation (Molenaar, Egbert, and Krystinik, 1981, Fig. 2).

Table 1 - Percentage of total constituents and grain size of Fortress Mountain Formation sandstone samples (Molenaar, Egbert, and Krystinik, 1981, Table 3).

Explanation for Table 1 (Molenaar, Egbert, and Krystinik, 1981, Explanation for Table 3).

Table 2 - Mean framework modes of Fortress Mountain Formation sandstones. (Molenaar, Egbert, and Krystinik, 1981, Table 4).

Explanation for Table 2 (Molenaar, Egbert, and Krystinik, 1981, Explanation for Table 4).

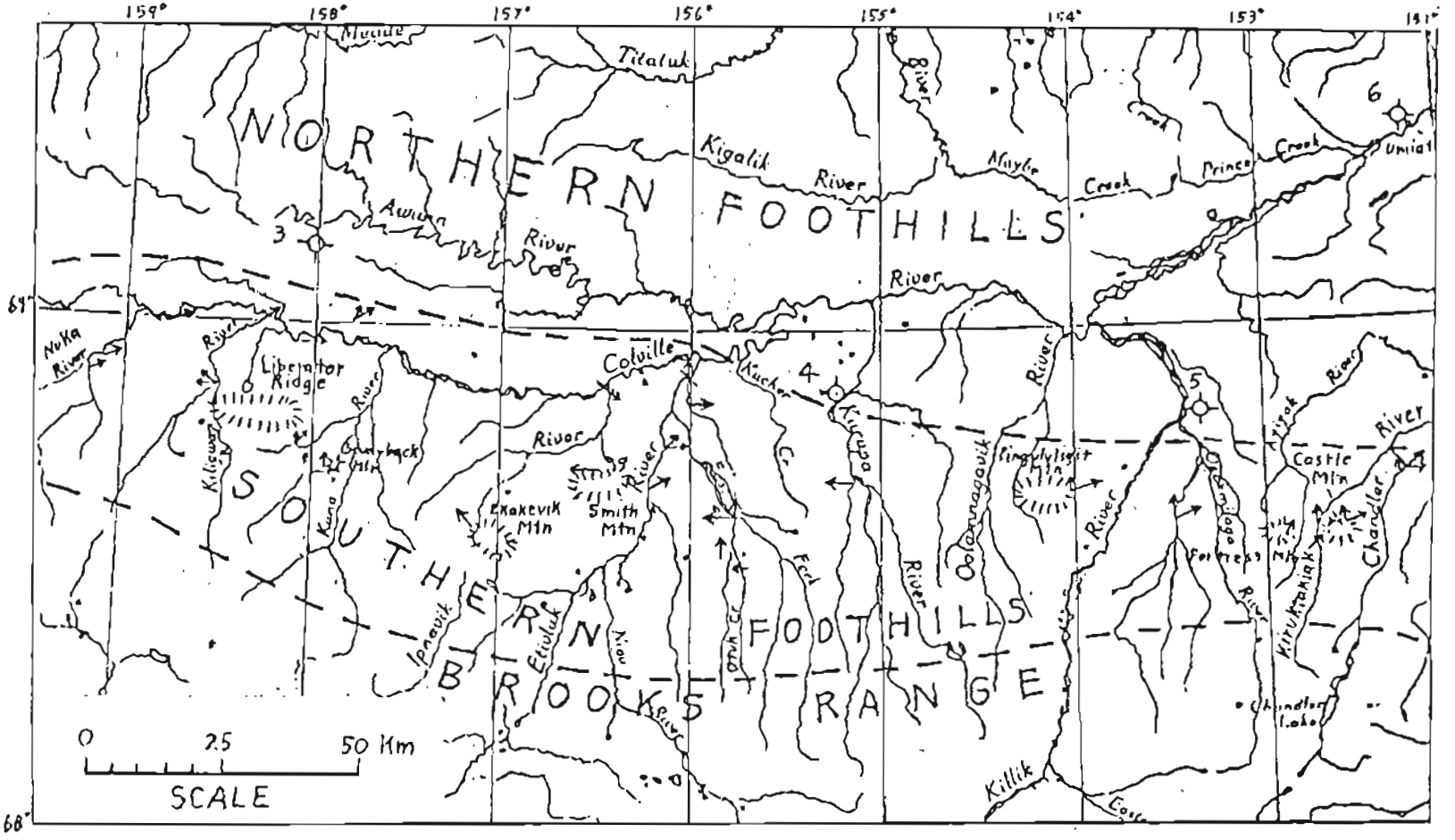

Figure 1.- Index map of primary area of investigation. Arrows indicate paleocurrent directions determined from outcrops of Fortress Mountain Formation; longest arrow of each group indicates predominant direction or most reliable data. Wells shown are (3) Awuna No. 1, (4) Texaco West Kurupa No. 1, (5) Texaco East Kurupa No. 1, and (6) Seabee No. 1. (Molenaar, Egbert, and Krystinik, 1981, fig. 2.)

Table 1. Percentages of total constituents and grain size of Fortress Mountain Formation sandstone samples.

	Sample No. 80AMX-	Location Sec.	T.	R.	Q_m	Q_p	C_q	Q_{zt}	P	K	Slt	Ac	Lms	V	M	Accm	Cal	Q	Cl	Por	Grain Size
	101B	1	9S	2W	5	5	13	2	5	0	3	46	2	2	0	0	7	0	7	3	C
	101C	1	9S	2W	5	1	32	2	5	0	1	25	2	4	1	1	17	0	2	1	C
	104A	15	10S	3W	0	0	32	1	2	1	2	29	1	18	1	1	1	8	2	1	C
	113	20	10S	3W	2	Tr	26	1	3	0	1	16	0	39	0	0	0	1	11	0	C
	118A	35	9S	7W	10	1	19	0	11	0	0	17	5	15	0	Tr	15	0	7	0	M
	124	12	10S	5W	8	2	21	2	7	3	1	30	0	20	Tr	1	0	4	0	1	M
	125	9	10S	4W	3	1	14	1	8	0	1	22	2	38	0	0	2	1	6	1	C
	136	5	10S	22W	3	2	14	4	3	0	2	41	Tr	21	2	Tr	3	1	3	0	C
	137D	16	10S	22W	12	4	10	17	2	0	10	32	1	7	1	1	1	Tr	2	0	C
	152	1	9S	19W	5	1	8	3	8	0	2	32	2	27	Tr	2	3	0	6	0	M
	153B	1	9S	20W	7	2	12	6	4	0	2	31	3	20	1	1	2	1	8	0	M
	154	30	8S	19W	6	1	16	3	9	0	6	30	2	10	1	0	10	Tr	6	0	C
	156	19	6S	17W	26	2	9	Tr	11	3	1	16	3	3	2	1	15	1	5	1	F
	157A	18	6S	17W	10	2	14	2	6	0	2	21	2	13	2	1	4	Tr	19	1	C
	158	24	7S	18W	19	4	7	1	7	Tr	1	11	3	9	3	3	7	0	23	1	F
Eastern Samples	159A	25	9S	17W	8	3	4	3	6	1	3	29	Tr	22	1	2	8	Tr	10	0	M
	159B	25	9S	17W	4	1	10	2	4	4	1	27	5	21	0	0	12	0	8	1	C
	160A	3	9S	14W	3	Tr	15	1	9	Tr	1	21	1	34	0	4	1	0	10	0	C
	161	35	9S	14W	3	1	17	4	4	2	1	23	0	36	0	0	5	0	4	0	C
	166A	2	8S	28W	10	5	5	2	9	4	1	19	1	19	2	5	2	0	14	2	M
	167A	13	8S	28W	3	4	12	7	7	Tr	4	22	2	29	Tr	2	2	0	6	Tr	C
	169	35	6S	28W	4	1	7	2	9	0	1	15	1	27	1	Tr	28	0	3	1	M
	172	29	5S	27W	20	2	1	0	6	0	0	7	39	5	2	2	0	0	9	7	F
	173	25	7S	29W	3	6	9	2	8	3	2	30	0	28	1	2	0	0	6	Tr	C
	175	30	10S	16W	8	1	4	2	9	Tr	2	26	3	21	Tr	3	0	0	20	Tr	M
	176	31	6S	19W	25	4	11	0	7	0	1	20	1	3	2	1	1	0	18	6	F
	177	7	7S	25W	4	2	19	2	4	0	2	29	1	23	1	Tr	8	0	4	1	C
	181	3	7S	20W	12	3	9	1	9	1	Tr	15	7	9	2	1	28	0	3	0	M
	182	13	6S	31W	27	3	10	0	8	0	1	12	14	3	0	2	9	0	8	3	F
	184	20	5S	29W	29	1	4	0	6	0	1	9	16	2	3	4	20	0	4	1	F
	186	8	10S	22W	4	1	6	0	3	2	3	41	1	10	1	Tr	22	2	4	0	M
	187B	8	10S	22W	9	4	12	0	7	2	3	24	0	15	1	1	0	4	15	3	M
	189	8	10S	22W	12	2	8	0	9	0	3	23	0	11	2	7	1	2	19	1	F
	193	14	9S	10W	4	1	22	0	3	0	3	23	0	32	Tr	2	8	0	0	2	C
	196	34	8S	9W	4	2	12	1	5	0	2	14	1	43	0	1	7	0	8	Tr	C
	197	23	9S	7W	8	2	13	Tr	8	1	1	21	0	28	1	2	0	2	6	6	C
Average					9	2	13	2	6	1	2	23	3	19	1	2	7	1	8	1	
Western Samples	190	1	9S	46W	24	4	4	0	1	0	Tr	6	33	3	2	6	12	0	5	0	F
	191B	18	10S	45W	18	7	11	0	8	0	0	8	11	5	6	3	16	0	7	0	M
	192A	35	10S	50W	20	11	7	0	3	2	1	4	11	5	6	2	28	0	0	0	M
Average					21	7	7	0	4	1	Tr	6	18	4	5	4	19	0	4	0	

(Molenaar, Egbert, and Krystinik, 1981, Table 3.)

EXPLANATION FOR TABLE 1

Ac -- Argillaceous-carbonaceous fragments, includes all gradations from claystone to shale to fragments of organic debris.

Accm -- Accessory minerals, in order of decreasing abundance include magnetite, pyrite, muscovite, pyroxene, olivine, biotite, and garnet.

Cal -- Calcite cement, usually sparry, often replacing framework grains.

Cl -- Phyllosilicate cement, mostly chlorite, occurring as linings on framework grains and also as radial pore fillings.

Cq -- Chert, includes dense, nearly isotropic varieties to well crystallized aggregates. Some contain euhedral calcite rhombs (probably from silicified limestones); others contain no inclusions.

K -- K-feldspar, probably orthoclase.

Lms -- Limestone fragments, includes many varieties ranging from rounded calcite clasts (probably from recyrstallized limestone) to bioclastic, microgranular and micritic types.

M -- Metamorphic rock fragments, mostly quartz-mica tectonites.

P -- Plagioclase, highly altered, usually showing albite twinning.

Por -- Pore space.

Q -- Quartz cement, occurring as overgrowths on quartz grains and as microgranular pore fillings.

Q_m -- Monocrystalline quartz

Q_p -- Polycrystalline quartz, mostly displaying stretched and sutured internal grain contacts, probably of metamorphic origin.

Q_{zt} -- Quartzite, composed mostly of monocrystalline quartz, chert, and mica. The quartzite fragments are probably derived from the Kanayut Group.

Slt -- Siltstone fragments.

Tr -- Trace amounts.

V -- Volcanic rock fragments, mostly mafic varieties with laths of feldspar in parallel or subparallel alignment set in a chlorite or isotropic to nearly isotropic groundmass. Also includes minor amounts of mafic hypabyssal grains.

(Molenaar, Egbert, and Krystinik, 1981, Explanation for Table 3.)

Table 2. Mean framework modes of Fortress Mountain Formation sandstones.

	Sample No. 80AMK-	Location Sec.	T.	R.	Q_t	F	L	Q_m	F	L_t	Q_p	L_v	L_s	Q_m	F	K	C/Q	P/F	V/L
	101B	1	9S	2W	29	6	65	6	6	88	26	4	70	53	47	0	0.78	1.0	0.03
	101C	1	9S	2W	52	7	41	7	7	86	53	7	40	50	50	0	.87	1.0	.13
	104A	15	10S	3W	39	3	58	0	3	97	40	23	37	13	63	24	.99	.71	.32
	113	20	10S	3W	32	3	65	2	3	95	32	47	21	36	64	0	.95	1.0	.69
	118A	35	9S	7W	38	15	47	12	15	73	35	26	39	46	50	4	.68	.92	.36
	124	12	10S	5W	35	11	54	9	11	80	33	26	41	45	37	18	.75	.68	.36
	125	9	10S	4W	21	9	70	4	9	87	20	48	32	28	72	0	.83	1.0	.58
	136	5	10S	22W	24	3	73	3	3	94	23	27	50	53	47	0	.87	1.0	.32
	137D	16	10S	22W	45	2	53	13	2	85	38	9	53	84	16	0	.71	1.0	.13
	152	1	9S	19W	19	9	72	5	9	86	16	36	48	36	64	0	.73	1.0	.43
	153B	1	9S	20W	30	4	66	8	4	88	26	26	48	66	34	0	.75	1.0	.35
	154	30	8S	19W	31	11	58	7	11	82	29	16	55	39	59	2	.78	.96	.20
	156	19	6S	17W	49	18	33	34	18	48	31	15	54	66	27	7	.31	.80	.13
	157A	18	6S	17W	38	8	54	13	8	79	32	25	43	63	37	0	.66	1.0	.30
	158	24	7S	18W	47	11	42	28	11	60	.31	31	38	72	27	1	.39	.96	.34
Eastern Samples	159A	25	9S	17W	23	9	68	10	9	81	16	35	50	53	43	4	.56	.91	.40
	159B	25	9S	17W	23	9	68	6	9	85	21	31	48	37	33	30	.76	.52	.40
	160A	3	9S	14W	22	11	67	4	11	85	21	47	32	26	72	2	.83	.97	.57
	161	35	9S	14W	28	7	65	4	7	90	27	44	29	34	41	25	.87	.62	.59
	166A	2	8S	28W	28	18	54	13	18	69	21	40	39	43	39	18	.51	.69	.47
	167A	13	8S	28W	28	8	64	4	8	88	28	37	35	32	66	2	.87	.96	.51
	169	35	6S	28W	20	14	66	5	14	81	19	49	32	28	72	0	.74	1.0	.60
	172	29	5S	27W	28	8	64	24	8	68	6	10	84	76	24	0	.14	1.0	.07
	173	25	7S	29W	22	13	65	3	13	84	22	35	43	21	56	23	.85	.71	.43
	175	30	10S	16W	18	12	70	11	12	77	10	34	56	48	51	1	.43	.97	.36
	176	31	6S	19W	54	9	37	34	9	57	35	12	53	79	21	0	.37	1.0	.11
	177	7	7S	25W	31	4	65	4	4	92	29	31	40	50	50	0	.87	1.0	.41
	181	3	7S	20W	37	14	49	17	14	69	28	25	47	56	41	3	.52	.92	.28
	182	13	6S	31W	52	10	38	35	10	55	31	7	62	78	22	0	.32	1.0	.11
	184	20	5S	29W	48	9	43	41	9	50	13	14	73	82	18	0	.14	1.0	.08
	186	8	10S	22W	15	7	78	6	7	87	10	18	72	48	34	18	.59	.67	.18
	187B	8	10S	22W	32	12	56	12	12	76	27	28	45	50	37	13	.64	.74	.35
	189	8	10S	22W	31	13	56	17	13	70	20	25	55	56	44	0	.46	1.0	.28
	193	14	9S	10W	31	3	66	4	3	93	29	40	31	59	41	0	.86	1.0	.54
	196	34	8S	9W	22	6	72	4	6	90	20	57	23	42	58	0	.80	1.0	.70
	197	23	9S	7W	27	12	61	10	12	78	22	44	34	45	47	8	.65	.86	.55
Average					32	9	59	12	9	79	26	28	46	50	44	6	.66	.90	.35
Western Samples	190	1	9S	46W	41	1	58	31	1	68	14	10	76	97	3	0	.23	1.0	.07
	191B	18	10S	45W	49	10	41	25	10	65	37	23	40	71	29	0	.49	.0	.16
	192A	35	10S	50W	54	7	39	29	7	64	40	26	34	80	12	8	.47	.61	.32
Average					51	6	43	30	6	64	34	22	44	83	14	3	.40	.87	.18

(Molenaar, Egbert, and Krystinik, 1981, Table 4.)

EXPLANATION FOR TABLE 2

C/Q -- Ratio of polycrystalline quartzose fragments (mostly chert) to total quartzose fragments.

F -- Total feldspar.

K -- K-feldspar.

L -- Unstable lithic fragments, includes argillaceous-carbonaceous, siltstone, metamorphic, and volcanic fragments.

L_s -- Unstable sedimentary rock fragments.

L_t -- Total lithic fragments, includes unstable lithic fragments and polycrystalline quartz, quartzite, and chert.

L_v -- Volcanic and metavolcanic rock fragments.

P -- Plagioclase.

P/F -- Ratio of plagioclase to total feldspar.

Q_m -- Monocrystalline quartz.

Q_p -- Polycrystalline quartz, quartzite, and chert.

Q_t -- Monocrystalline and polycrystalline quartz, chert, and quartzite.

V/L -- Ratio of volcanic to total unstable lithic fragments.

(Molenaar, Egbert, Krystinik, 1981, Explanation for Table 4.)