STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES

Alaska Geologic Materials Center *Data Report* No. 355

No. 355: Bristol Bay Native Corp Iron, Titanium, Platinum Kemuk Mountain Prospect; Data on 8,338' of Core from 14 Holes, Nushagak Basin in Southwest Alaska, Dillingham District, Alaska

Received *September, 2008*

CD *available upon request* from DGGS or the AOGCC

All data reports may be downloaded free of charge from the DGGS website.

Kemuk Iron Titanuium-Platinum Prospect, Nushagax Basin, Southwest Alaska
Inventory of Data on CD of 8338' of Core Donated to the Alaska GMC

Database
- Assaytable_sorted
- NewKemukMaster2008
- newkemukmaster2008.ddb
- updated_Kemuk2008_all_data
- updated_Kemuk2008_all_data_AGMS

Geochem
- COA_FA04073517_11573-901955
- CORESAMP#
- FA04073517
- FA05012768
- FA07034555
- Kemuk PGE6_020011
- Kemuk_Requested Assays
- Kemuk_Requested Assays_AmmendedGAB
- KemukAllAssays - June2002
- KemukAu-Pt-PdAll New Samples
- KemukH-7resample
- KemukICP32_a0216037
- KemukICP32_a0216313
- KemukICP32_All New Samples
- KemukMagic02-0006 IM-101 Raw
- KemukMagic02-0028 IM-101 Raw
- KemukMagicAll New Samples
- KemukMasterList
- KemukMasterList+magic
- KemukPGE6_020030
- KemukPMs_VA02001459
- KemukPM's_VA02001401
- KemukWRA_067925

GIS
- Claims
- Drilling
- Geochem
- Geography
- Geology
- Geophysics
- Maps

Kemuk Iron Titanuium-Platinum Prospect, Nushagax Basin, Southwest Alaska
Inventory of Data on CD of 8338' of Core Donated to the Alaska GMC (page 2)

Reports
- Kemuk Pet Reports
  - scans
  - 1 H-2 200
  - 2 H-2 269
  - 3 H-2 320
  - 4 H-2 355
  - 5 H-3 656
  - 6 H-3 663
  - 7 H-3 782
  - 8 H-3 983
  - 9 H-4 322
  - 10 H-4 361
  - 11 H-6 291
  - 12 H-6 291
  - 13 H-8 228.5
  - 14 H-8 387
  - 15 H-8 572
  - 16 H-9 273.5
  - 17 H-9 300.5
  - 18 H-9 860
  - 19 H-9 1267
  - 20 H-9 1378
  - 21 H-9 1977
  - 22 H-10 445.6
  - 23 H-12 375
  - 24 H-12 585
  - 25 H-14 99
  - 26 H-14 338
  - 27 H-15 578.5
  - 28 H-15 630
  - 29 H-16 303
  - 30 H-16 559
  - KemukWR

Sections
- Cu_eastwest
- PGE_eastwest

Drilling - The E. J. Longyear Company of Minneapolis, Minnesota, was again contracted to conduct the core drilling program. Longyear was responsible for furnishing two drill units and the personnel to operate them. In addition, an engineer-geologist was furnished to prepare the diamond drill core for analysis, compile the final assays and lithologic descriptions, and submit recommendations relative to the location of drill sites.

Longyear provided two hydraulic gasoline-powered rigs of its own design (see Plate III, Fig. 2). The smaller unit, the Junior Straitline model, which had been held over from the 1958 work, is capable of drilling to 1,200 feet. The Model 44 unit was designed for depths down to 3,000 feet. The Model 44 rig was equipped with a wire-line core barrel which aided both core recovery and drilling progress.

Rock bits and drilling mud were used to drill through the glacial overburden. When ledge (bedrock beneath the fluvial-glacial fill) was encountered, casing was set, and a diamond core bit installed to core the bedrock. Fresh water replaced the drilling mud when coring operations began.

The rigs operated on a 24-hour-a-day, 7-day-a-week drilling schedule. Three 8-hour work shifts were used; each crew was comprised of a driller and a helper. Longyear provided one drill foreman to supervise the drilling personnel and to oversee the maintenance of the rigs.

Sample analysis - Core was subjected to a three-phase field analysis: determination of magnetic polarity and intensity, visual examination, and measurement of specific gravity for estimation of magnetite content.

Kemuk Drill Production (1959)

Hole	Depth	Overburden	Rig #	Days Drilling	Move Days	Daily Production
H-1	57	57				
H-2	500	196				
H-3	1002	308				
H-4	500	292				
H-5	140	140				
H-6	821	278				
H-7	2000	138	1	22		91
H-8	577	222	2	17		34
H-9	2000	230	1	14	3	143
H-10	532	200	2	8	3	67
H-11	500	159	2	5	2	100
H-12	600	254	2	8	2	75
H-13	668	250	1	6	4	111
H-14	500	91	2	12	4	42
H-15	637	458	1	5	2	127
H-16	601	256	2	9	2	67
H-17	520	298	1	9	5	58
Total Hole	12155	3827		Total Drill Days 115	Total Move days 27	Avg Footage/Day 76

Rig 1 Long 44

Rig 2 Junior Straitline

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CONTACT : ATTN: BILL ELLIS

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Page Number : 1-A
Total Pages : 2
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CERTIFICATE OF ANALYSIS A0110008

SAMPLE	PREP CODE		Au ppb ICP	Pt ppb ICP	Pd ppb ICP	Ag ppm	Al %	As ppm	B ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %
3001	205	226	2	1330	38	0.2	0.46	< 2	10	10	< 0.5	< 2	0.59	0.5	80	95	16	5.01	< 10	< 1	0.09
3002	205	226	< 2	15	< 2	< 0.2	0.58	< 2	< 10	70	< 0.5	< 2	0.79	< 0.5	22	116	7	3.88	< 10	< 1	0.33
3003	205	226	< 2	< 5	4	< 0.2	1.71	< 2	< 10	160	< 0.5	< 2	1.13	0.5	25	38	70	6.56	< 10	< 1	1.16
3004	205	226	< 2	5	6	0.2	0.85	< 2	< 10	60	< 0.5	< 2	0.95	1.5	40	39	11	9.63	< 10	< 1	0.29
3005	205	226	102	5	10	0.2	5.07	2	10	20	0.5	< 2	5.62	< 0.5	11	19	13	2.17	< 10	< 1	0.15
3006	205	226	< 2	10	24	0.2	0.92	< 2	< 10	70	< 0.5	< 2	1.05	1.5	35	41	18	8.60	< 10	< 1	0.41
3007	205	226	< 2	50	58	0.2	0.40	< 2	< 10	10	< 0.5	< 2	0.97	2.0	43	42	8	11.15	< 10	1	0.05
3008	205	226	8	25	18	< 0.2	1.22	< 2	< 10	60	< 0.5	< 2	2.81	1.5	32	45	196	7.41	< 10	< 1	0.16
3009	205	226	22	15	28	0.2	0.57	< 2	< 10	< 10	< 0.5	< 2	2.69	1.0	28	46	715	7.03	< 10	< 1	0.01
3010	205	226	< 2	30	2	< 0.2	0.09	< 2	< 10	< 10	< 0.5	< 2	0.54	< 0.5	21	107	9	1.43	< 10	< 1	< 0.01
3011	205	226	< 2	180	2	< 0.2	0.03	< 2	< 10	< 10	< 0.5	< 2	1.27	0.5	95	93	9	5.20	< 10	< 1	< 0.01
3012	205	226	< 2	< 5	4	< 0.2	0.50	< 2	< 10	< 10	< 0.5	< 2	5.38	1.0	42	286	25	4.39	< 10	< 1	0.04
3013	205	226	< 2	< 5	< 2	< 0.2	1.64	< 2	< 10	70	< 0.5	< 2	1.34	< 0.5	4	25	23	2.58	< 10	< 1	0.30
3014	205	226	< 2	< 5	8	0.2	0.48	< 2	< 10	40	< 0.5	< 2	0.59	1.5	56	350	11	9.88	< 10	< 1	0.17
3015	205	226	< 2	270	4	< 0.2	0.26	< 2	< 10	< 10	< 0.5	< 2	0.50	< 0.5	50	196	10	2.97	< 10	< 1	0.06
3016	205	226	< 2	< 5	4	< 0.2	3.05	< 2	< 10	30	0.5	< 2	0.74	< 0.5	14	95	32	3.33	< 10	< 1	0.19
3017	205	226	< 2	< 5	8	< 0.2	4.11	< 2	< 10	70	0.5	< 2	0.70	< 0.5	20	78	52	4.34	< 10	< 1	0.21
3018	205	226	< 2	< 5	18	< 0.2	2.04	< 2	< 10	110	< 0.5	< 2	2.64	< 0.5	14	27	11	1.56	10	< 1	0.13
3019	205	226	< 2	< 5	< 2	< 0.2	1.36	< 2	< 10	20	< 0.5	< 2	10.10	< 0.5	1	15	23	0.52	< 10	< 1	0.14
3020	205	226	< 2	< 5	6	< 0.2	1.31	< 2	< 10	30	< 0.5	< 2	3.21	< 0.5	9	33	30	1.81	< 10	< 1	0.17
3021	205	226	< 2	< 5	10	< 0.2	1.70	< 2	< 10	40	< 0.5	< 2	5.62	< 0.5	7	39	62	1.61	< 10	< 1	0.19
3022	205	226	16	45	18	0.4	1.49	< 2	< 10	30	< 0.5	2	5.07	4.5	47	90	158	13.65	10	3	0.07
3023	205	226	2	15	18	0.6	1.13	< 2	< 10	30	< 0.5	6	0.85	7.5	76	126	73	>15.00	10	1	0.04
3024	205	226	2	40	42	1.0	1.43	< 2	< 10	40	< 0.5	8	0.68	8.5	87	131	130	>15.00	20	1	0.04
3025	205	226	8	< 5	8	0.4	1.15	< 2	< 10	30	< 0.5	< 2	1.64	3.5	27	522	184	9.78	< 10	< 1	0.20
3026	205	226	10	85	94	0.6	0.64	< 2	< 10	10	< 0.5	< 2	0.72	1.5	41	68	509	11.15	< 10	< 1	0.08
3027	205	226	< 2	25	44	0.2	0.78	< 2	< 10	20	< 0.5	2	1.28	2.0	42	77	46	11.10	< 10	< 1	0.12
3028	205	226	< 2	10	38	0.2	0.40	< 2	< 10	< 10	< 0.5	< 2	0.86	2.0	43	99	40	11.50	< 10	< 1	0.03
3029	205	226	< 2	< 5	28	< 0.2	0.42	< 2	< 10	10	< 0.5	< 2	0.72	2.0	43	56	20	11.35	< 10	1	0.08
3030	205	226	6	15	20	0.2	1.05	< 2	< 10	20	< 0.5	< 2	2.68	1.5	36	27	799	8.18	< 10	< 1	0.12
3031	205	226	< 2	25	40	< 0.2	1.11	< 2	< 10	50	< 0.5	< 2	1.59	1.5	36	32	42	9.33	< 10	< 1	0.19
3032	205	226	8	< 5	36	0.2	1.05	< 2	< 10	40	< 0.5	< 2	1.94	1.5	53	47	730	9.23	< 10	< 1	0.17
3033	205	226	< 2	60	14	0.2	1.24	< 2	< 10	40	< 0.5	< 2	1.53	2.0	35	32	27	9.02	< 10	< 1	0.26
3034	205	226	< 2	110	22	0.2	1.29	< 2	< 10	60	< 0.5	< 2	1.67	1.5	34	27	29	8.77	< 10	< 1	0.29
3035	205	226	< 2	30	22	< 0.2	2.08	< 2	< 10	50	< 0.5	< 2	2.97	1.5	30	12	110	7.74	< 10	< 1	0.28
3036	205	226	4	15	16	< 0.2	2.74	< 2	< 10	80	< 0.5	< 2	3.43	1.0	27	36	245	6.45	< 10	< 1	0.13
3037	205	226	< 2	25	6	< 0.2	0.37	< 2	< 10	20	< 0.5	< 2	1.04	< 0.5	19	77	7	2.46	< 10	< 1	0.13
3038	205	226	< 2	80	4	< 0.2	0.38	< 2	< 10	30	< 0.5	< 2	0.47	< 0.5	21	100	7	1.77	< 10	< 1	0.20
3039	205	226	< 2	35	2	< 0.2	0.23	< 2	< 10	10	< 0.5	< 2	0.72	< 0.5	17	180	10	1.98	< 10	< 1	0.07
3040	205	226	6	15	18	< 0.2	3.06	< 2	< 10	70	< 0.5	< 2	2.54	0.5	25	26	102	7.12	10	< 1	0.14

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CERTIFICATE OF ANALYSIS A0110008

SAMPLE	PREP CODE		La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm	Al2O3 % XRF
3001	205	226	< 10	6.07	645	< 1	0.09	165	50	< 2	< 0.01	< 2	5	49	0.05	< 10	< 10	24	< 10	52	1.96
3002	205	226	< 10	1.66	180	< 1	0.07	42	60	< 2	< 0.01	< 2	6	19	0.12	< 10	< 10	100	< 10	18	2.94
3003	205	226	< 10	1.32	525	1	0.10	16	2130	< 2	0.29	< 2	3	54	0.34	< 10	< 10	251	< 10	78	14.23
3004	205	226	< 10	1.24	275	< 1	0.05	57	80	2	0.01	< 2	8	19	0.24	< 10	< 10	258	< 10	36	-----
3005	205	226	< 10	1.04	315	4	0.72	10	1770	< 2	0.03	< 2	3	173	0.08	< 10	< 10	71	< 10	22	-----
3006	205	226	< 10	1.33	330	< 1	0.07	37	320	2	0.01	< 2	8	24	0.26	< 10	< 10	279	< 10	40	5.29
3007	205	226	< 10	0.83	420	< 1	0.03	45	< 10	2	< 0.01	< 2	8	14	0.36	< 10	< 10	356	< 10	22	4.53
3008	205	226	< 10	0.99	315	< 1	0.07	21	6150	< 2	0.03	< 2	11	120	0.14	< 10	< 10	285	< 10	40	7.75
3009	205	226	< 10	0.69	345	< 1	0.04	25	5430	< 2	0.08	< 2	5	85	0.15	< 10	< 10	316	< 10	28	6.84
3010	205	226	< 10	2.53	250	< 1	0.01	73	60	< 2	< 0.01	< 2	1	10	0.01	< 10	< 10	10	< 10	18	1.52
3011	205	226	< 10	14.30	1065	< 1	0.01	348	130	< 2	0.01	< 2	3	162	< 0.01	< 10	< 10	10	< 10	40	0.60
3012	205	226	< 10	3.03	555	< 1	0.04	79	100	2	< 0.01	< 2	2	97	0.06	< 10	< 10	52	< 10	12	-----
3013	205	226	10	0.23	235	< 1	0.18	4	920	< 2	< 0.01	< 2	< 1	309	0.10	< 10	< 10	70	< 10	26	18.59
3014	205	226	< 10	3.37	555	< 1	0.05	103	30	2	0.01	< 2	6	29	0.20	< 10	< 10	326	< 10	32	3.13
3015	205	226	< 10	6.26	495	< 1	0.03	171	< 10	< 2	0.08	< 2	3	12	0.01	< 10	< 10	11	< 10	26	1.44
3016	205	226	< 10	0.56	315	1	0.12	24	640	2	< 0.01	< 2	14	70	0.14	< 10	< 10	43	< 10	82	-----
3017	205	226	< 10	0.74	560	< 1	0.13	33	700	< 2	< 0.01	< 2	16	96	0.12	< 10	< 10	57	< 10	120	15.86
3018	205	226	< 10	2.31	6390	< 1	0.27	28	660	2	< 0.01	< 2	6	197	0.10	< 10	< 10	18	< 10	68	-----
3019	205	226	10	1.46	750	< 1	0.07	6	440	< 2	0.04	< 2	1	132	0.07	< 10	< 10	16	< 10	18	-----
3020	205	226	< 10	1.32	1635	< 1	0.14	16	600	2	0.02	< 2	5	207	0.14	< 10	< 10	41	< 10	50	-----
3021	205	226	< 10	1.71	1065	1	0.17	13	560	< 2	0.10	< 2	5	356	0.11	< 10	< 10	43	< 10	38	11.83
3022	205	226	< 10	0.62	555	12	0.04	68	1170	12	0.06	< 2	27	827	0.35	< 10	< 10	505	< 10	44	-----
3023	205	226	< 10	0.55	750	11	0.03	83	1270	14	< 0.01	< 2	19	62	0.35	< 10	< 10	748	< 10	40	-----
3024	205	226	< 10	0.73	860	12	0.03	107	720	16	< 0.01	< 2	34	56	0.44	< 10	< 10	767	< 10	50	6.76
3025	205	226	< 10	1.09	620	24	0.15	112	650	26	0.05	< 2	9	100	0.17	< 10	< 10	187	10	172	-----
3026	205	226	< 10	0.99	240	< 1	0.04	33	200	4	0.01	< 2	7	17	0.19	< 10	< 10	408	< 10	28	-----
3027	205	226	< 10	1.00	320	< 1	0.09	33	100	4	0.06	< 2	10	25	0.25	< 10	< 10	406	< 10	42	-----
3028	205	226	< 10	0.73	450	< 1	0.03	41	70	2	0.01	< 2	7	17	0.37	< 10	< 10	369	< 10	28	-----
3029	205	226	< 10	0.75	350	< 1	0.04	41	10	2	0.03	< 2	7	13	0.26	< 10	< 10	352	< 10	16	-----
3030	205	226	< 10	1.02	375	< 1	0.10	22	5340	2	0.12	< 2	7	164	0.17	< 10	< 10	347	< 10	62	-----
3031	205	226	< 10	1.05	410	< 1	0.14	34	610	< 2	0.02	< 2	9	157	0.25	< 10	< 10	327	< 10	54	-----
3032	205	226	< 10	0.96	400	< 1	0.11	43	2860	2	0.41	< 2	8	100	0.21	< 10	< 10	388	< 10	58	-----
3033	205	226	< 10	1.25	410	< 1	0.15	31	520	< 2	0.01	< 2	11	75	0.25	< 10	< 10	372	< 10	46	-----
3034	205	226	< 10	1.29	405	< 1	0.16	35	410	< 2	0.02	< 2	12	91	0.24	< 10	< 10	376	< 10	44	-----
3035	205	226	< 10	1.37	475	< 1	0.27	17	3040	< 2	0.06	< 2	10	177	0.22	< 10	< 10	331	< 10	54	-----
3036	205	226	< 10	0.75	490	1	0.28	22	2750	2	0.37	< 2	3	545	0.14	< 10	< 10	271	< 10	84	-----
3037	205	226	< 10	2.13	225	< 1	0.03	44	90	< 2	0.01	< 2	7	16	0.07	< 10	< 10	54	< 10	14	-----
3038	205	226	< 10	2.86	220	< 1	0.03	62	40	< 2	< 0.01	< 2	3	10	0.04	< 10	< 10	18	< 10	14	-----
3039	205	226	< 10	2.07	205	< 1	0.02	48	20	< 2	0.01	< 2	4	23	0.04	< 10	< 10	29	< 10	16	-----
3040	205	226	< 10	0.61	560	< 1	0.24	20	2620	2	0.02	< 2	4	675	0.17	< 10	< 10	272	< 10	50	-----

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SAMPLE	PREP CODE		CaO % XRF	Cr2O3 % XRF	Fe2O3 % XRF	K2O % XRF	MgO % XRF	MnO % XRF	Na2O % XRF	P2O5 % XRF	SiO2 % XRF	TiO2 % XRF	LOI % XRF	TOTAL %	Ba ppm	Rb ppm	Sr ppm	Nb ppm	Zr ppm	Y ppm
3001	205	226	14.16	0.02	11.09	0.15	19.17	0.16	0.22	0.02	46.81	0.26	5.57	99.59	40	24	86	4	18	8
3002	205	226	20.52	0.02	10.59	0.49	15.01	0.12	0.24	0.04	47.90	0.60	0.65	99.12	130	34	84	6	24	8
3003	205	226	9.12	< 0.01	13.04	2.90	5.20	0.22	3.24	0.58	47.79	1.12	0.82	98.26	630	72	1070	10	90	24
3004	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3005	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3006	205	226	19.11	0.01	19.94	0.64	11.76	0.17	0.27	0.10	40.71	1.54	0.21	99.75	135	38	96	6	30	10
3007	205	226	19.32	< 0.01	23.61	0.09	11.16	0.15	0.05	0.01	39.43	1.61	-0.30	99.66	50	26	66	6	24	8
3008	205	226	20.24	< 0.01	18.20	0.40	8.54	0.17	0.21	1.64	38.76	1.76	1.93	99.60	150	30	214	4	72	18
3009	205	226	22.34	0.02	18.88	0.05	9.39	0.20	0.19	1.45	38.39	1.83	-0.12	99.46	25	24	148	4	60	16
3010	205	226	21.74	0.07	5.34	0.04	18.32	0.10	0.14	0.03	51.21	0.22	1.02	99.75	15	14	76	6	12	8
3011	205	226	7.96	0.06	10.99	0.04	33.23	0.21	< 0.01	0.05	41.04	0.09	5.59	99.86	15	20	204	6	15	6
3012	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3013	205	226	6.40	< 0.01	5.22	3.67	1.68	0.13	4.41	0.23	55.11	0.57	2.21	98.22	1080	70	1110	18	153	24
3014	205	226	16.20	0.04	21.88	0.27	15.21	0.19	0.20	0.03	40.16	1.19	1.12	99.62	100	28	96	6	18	8
3015	205	226	17.14	0.13	7.19	0.10	21.20	0.13	0.18	0.02	47.32	0.16	3.54	98.55	35	20	62	4	12	4
3016	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3017	205	226	2.30	< 0.01	7.05	1.47	1.30	0.10	1.61	0.18	58.72	0.82	10.12	99.53	385	42	354	10	144	24
3018	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3019	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3020	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3021	205	226	18.18	< 0.01	5.63	1.72	4.26	0.33	1.43	0.14	49.93	0.56	5.49	99.50	440	44	518	8	87	20
3022	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3023	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3024	205	226	9.86	< 0.01	46.53	0.19	5.74	0.28	0.06	0.21	23.51	2.78	3.49	99.41	10	38	188	4	42	8
3025	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3026	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3027	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3028	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3029	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3030	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3031	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3032	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3033	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3034	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3035	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3036	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3037	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3038	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3039	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3040	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

CERTIFICATION:

ALS Chemex
Chemex Labs, Inc.
Analytical Chemists * Geochemists * Registered Assayers
994 Glendale Ave., Unit 3, Sparks
Nevada, U.S.A. 89431
PHONE: 775-356-5395 FAX: 775-355-0179

To: ALASKA EARTH SCIENCES

11401 OLIVE LANE
ANCHORAGE, ALASKA
99515, USA

Project : KEMUK
Comments: ATTN: BILL ELLIS

Page Number : 2-A
Total Pages : 2
Certificate Date: 15-JAN-01
Invoice No. : I0110008
P.O. Number :
Account : KET

CERTIFICATE OF ANALYSIS A0110008

SAMPLE	PREP CODE		Au ppb ICP	Pt ppb ICP	Pd ppb ICP	Ag ppm	Al %	As ppm	B ppm	Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe %	Ga ppm	Hg ppm	K %
3041	205	226	6	35	52	< 0.2	2.62	< 2	< 10	40	< 0.5	< 2	3.12	1.0	27	21	152	7.39	10	< 1	0.12
3042	205	226	2	150	< 2	< 0.2	0.35	< 2	< 10	10	< 0.5	< 2	0.74	< 0.5	27	258	5	4.66	< 10	< 1	0.09
3043	205	226	< 2	25	< 2	< 0.2	0.32	< 2	< 10	40	< 0.5	< 2	0.90	< 0.5	25	205	6	2.90	< 10	< 1	0.06
3044	205	226	< 2	10	6	< 0.2	0.73	< 2	< 10	70	< 0.5	< 2	1.12	< 0.5	16	115	52	2.34	< 10	< 1	0.31
3045	205	226	< 2	30	4	< 0.2	0.60	< 2	< 10	60	< 0.5	< 2	0.94	< 0.5	19	158	30	2.31	< 10	< 1	0.28
3046	205	226	< 2	80	6	< 0.2	0.58	< 2	< 10	50	< 0.5	< 2	0.94	< 0.5	22	115	23	2.08	< 10	< 1	0.28
3047	205	226	< 2	40	< 2	< 0.2	0.68	< 2	< 10	10	< 0.5	< 2	1.35	< 0.5	30	154	30	2.68	< 10	< 1	0.03
3048	205	226	< 2	65	< 2	< 0.2	0.41	< 2	< 10	70	< 0.5	< 2	0.55	< 0.5	42	163	20	3.01	< 10	< 1	0.04
3049	205	226	4	5	8	< 0.2	1.32	< 2	< 10	30	< 0.5	< 2	1.95	1.5	28	111	72	7.09	< 10	< 1	0.25
3050	205	226	< 2	< 5	4	< 0.2	3.98	< 2	< 10	100	0.5	< 2	4.37	0.5	14	17	43	4.19	10	< 1	0.35
3051	205	226	< 2	< 5	2	< 0.2	1.27	< 2	< 10	170	< 0.5	< 2	1.36	< 0.5	8	51	49	2.81	< 10	< 1	0.22
3052	205	226	< 2	< 5	10	0.2	1.77	< 2	< 10	20	< 0.5	< 2	7.35	1.5	25	30	102	6.26	< 10	< 1	0.26
3053	205	226	26	10	20	0.2	1.39	< 2	< 10	10	< 0.5	< 2	3.55	1.5	115	17	2410	8.62	< 10	< 1	0.10
3054	205	226	< 2	20	18	< 0.2	1.85	< 2	< 10	40	< 0.5	< 2	6.36	0.5	34	27	38	6.99	< 10	< 1	0.29
3055	205	226	< 2	< 5	2	0.2	0.93	< 2	< 10	50	< 0.5	< 2	1.31	2.0	43	23	22	10.30	< 10	< 1	0.26
3056	205	226	< 2	10	8	0.4	0.60	< 2	< 10	20	< 0.5	< 2	0.66	0.5	79	47	44	>15.00	< 10	< 1	0.10
3057	205	226	18	10	36	0.6	1.08	< 2	< 10	90	< 0.5	< 2	1.38	2.0	51	81	1810	10.60	< 10	< 1	0.39
3058	205	226	12	10	34	0.4	1.08	< 2	< 10	100	< 0.5	< 2	1.25	2.0	74	51	1360	10.70	< 10	< 1	0.43
3059	205	226	< 2	< 5	< 2	< 0.2	0.56	< 2	< 10	30	< 0.5	< 2	0.50	< 0.5	4	32	18	1.82	< 10	< 1	0.11
3060	205	226	< 2	5	4	< 0.2	1.09	< 2	< 10	70	< 0.5	< 2	0.78	0.5	19	140	46	4.75	< 10	< 1	0.14
3061	205	226	< 2	5	2	< 0.2	1.05	2	< 10	70	< 0.5	< 2	0.73	< 0.5	13	144	39	3.77	< 10	< 1	0.12
3062	205	226	8	< 5	< 2	< 0.2	0.49	< 2	< 10	30	< 0.5	< 2	0.76	< 0.5	13	211	8	2.86	< 10	< 1	0.06

CERTIFICATION:____________________

ALS Chemex
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To: ALASKA EARTH SCIENCES

11401 OLIVE LANE
ANCHORAGE, ALASKA
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Project : KEMUK
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Page Number : 2-B
Total Pages : 2
Certificate Date: 15-JAN-01
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P.O. Number :
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CERTIFICATE OF ANALYSIS A0110008

SAMPLE	PREP CODE		La ppm	Mg %	Mn ppm	Mo ppm	Na %	Ni ppm	P ppm	Pb ppm	S %	Sb ppm	Sc ppm	Sr ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Zn ppm	Al2O3 % XRF
3041	205	226	10	0.89	515	< 1	0.14	13	4190	2	0.02	< 2	5	413	0.17	< 10	< 10	313	< 10	64	-----
3042	205	226	< 10	1.86	245	< 1	0.07	54	70	< 2	0.01	< 2	5	19	0.09	< 10	< 10	94	< 10	20	-----
3043	205	226	< 10	2.38	250	< 1	0.07	53	50	< 2	0.01	< 2	5	32	0.05	< 10	< 10	39	< 10	16	-----
3044	205	226	< 10	1.39	185	< 1	0.07	30	710	< 2	0.05	< 2	6	51	0.11	< 10	< 10	67	< 10	20	-----
3045	205	226	< 10	1.86	200	< 1	0.06	45	290	< 2	0.05	< 2	5	25	0.08	< 10	< 10	50	< 10	18	-----
3046	205	226	< 10	2.03	205	< 1	0.06	55	280	< 2	0.03	< 2	5	29	0.07	< 10	< 10	34	< 10	18	-----
3047	205	226	< 10	4.60	370	< 1	0.13	84	90	< 2	0.05	< 2	6	83	0.05	< 10	< 10	35	< 10	20	-----
3048	205	226	< 10	7.11	495	< 1	0.06	146	110	< 2	0.02	< 2	4	45	0.03	< 10	< 10	20	< 10	24	-----
3049	205	226	< 10	1.23	455	4	0.19	50	1130	8	< 0.01	< 2	10	82	0.20	< 10	< 10	201	< 10	54	-----
3050	205	226	10	0.98	950	2	0.32	4	1730	4	0.05	< 2	3	203	0.18	< 10	< 10	132	< 10	90	18.51
3051	205	226	< 10	0.52	295	< 1	0.28	9	880	8	< 0.01	< 2	2	151	0.12	< 10	< 10	109	< 10	34	17.39
3052	205	226	10	1.78	1070	1	0.07	17	2420	< 2	0.72	< 2	4	628	0.15	< 10	< 10	200	< 10	94	-----
3053	205	226	10	1.10	405	2	0.14	33	7710	2	1.15	< 2	9	162	0.17	< 10	< 10	304	< 10	68	-----
3054	205	226	< 10	3.20	910	1	0.29	54	1100	4	2.80	< 2	7	654	0.17	< 10	< 10	138	< 10	80	-----
3055	205	226	< 10	1.30	320	< 1	0.05	91	120	2	0.03	< 2	9	36	0.26	< 10	< 10	277	< 10	54	4.51
3056	205	226	< 10	0.75	1005	< 1	0.05	120	530	12	0.03	< 2	6	35	0.62	< 10	< 10	729	< 10	30	-----
3057	205	226	< 10	1.41	435	< 1	0.10	73	400	4	0.33	< 2	11	40	0.34	< 10	< 10	451	< 10	68	-----
3058	205	226	< 10	1.40	405	< 1	0.09	87	490	4	0.58	< 2	10	38	0.33	< 10	< 10	454	< 10	64	5.76
3059	205	226	10	0.27	160	< 1	0.11	5	450	< 2	0.01	< 2	1	51	0.08	< 10	< 10	51	< 10	14	17.24
3060	205	226	< 10	0.80	300	< 1	0.09	35	550	2	0.06	< 2	7	58	0.15	< 10	< 10	125	< 10	34	-----
3061	205	226	< 10	0.69	310	< 1	0.08	27	360	2	0.03	< 2	7	40	0.13	< 10	< 10	91	< 10	34	-----
3062	205	226	< 10	0.80	170	< 1	0.07	29	140	< 2	0.01	< 2	5	28	0.07	< 10	< 10	65	10	16	-----

CERTIFICATION:____________________

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994 Glendale Ave., Unit 3, Sparks
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To: ALASKA EARTH SCIENCES
11401 OLIVE LANE
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Page Number : 2-C
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Certificate Date: 15-JAN-01
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CERTIFICATE OF ANALYSIS A0110008

SAMPLE	PREP CODE		CaO % XRF	Cr2O3 % XRF	Fe2O3 % XRF	K2O % XRF	MgO % XRF	MnO % XRF	Na2O % XRF	P2O5 % XRF	SiO2 % XRF	TiO2 % XRF	LOI % XRF	TOTAL %	Ba ppm	Rb ppm	Sr ppm	Nb ppm	Zr ppm	Y ppm
3041	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3042	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3043	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3044	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3045	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3046	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3047	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3048	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3049	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3050	205	226	10.96	< 0.01	8.90	1.20	2.68	0.22	4.18	0.46	47.93	0.90	2.45	98.39	305	34	1270	14	111	28
3051	205	226	4.56	0.01	5.35	2.64	1.91	0.10	6.54	0.23	58.01	0.54	1.49	98.77	1025	44	1035	10	99	16
3052	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3053	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3054	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3055	205	226	19.40	< 0.01	20.76	0.36	11.67	0.14	0.19	0.06	41.07	1.27	0.39	99.82	100	32	118	6	27	10
3056	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3057	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3058	205	226	17.78	< 0.01	23.68	0.65	10.62	0.21	0.27	0.14	38.44	1.90	0.24	99.69	175	44	106	2	30	12
3059	205	226	2.78	< 0.01	3.28	4.81	1.00	0.07	4.81	0.12	64.34	0.38	0.67	99.50	595	124	446	24	192	26
3060	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3061	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
3062	205	226	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

CERTIFICATION:________________________

KEMUK DRILL HOLES Summary
(HUMBLE OIL 1958-59)

Hole	Depth	Overburden	# samples-footage	Mineralization	Comments
H-1	57	57	0	?	Lost Hole
H-2	500	196	15-67.5'	5 samples >100ppb Pt high 1330 ppb 4-+5% Mg	Ultramafic to ~350' then Clinopyroxenite to EOH
H-3	1002	308	14-47'	High 108 ppb Pt + Pd also high 102 ppb Au	Magnetite Pyroxenite some cumulate layering
H-4	500	292	4-26'	715 ppm Cu +125 ppb Pt+Pd Highest 7860 ppm P	Fine-grained Pyroxenite
H-5	140	140	0	?	Lost Hole
H-6	821	278	23-119'	4 samples >50 ppb Pt+Pd, high 270 ppb Pt, 8-+5% Mg	Magnetite Clinopyroxinite, Wehr-Cpxt Brx and Peridotite cut by Monzonite
H-7	2000	138	0	not sampled	Magnetite Pyroxenite cut by Andesite dikes
H-8	577	222	13-67.5'	7 samples >50 ppb Pt + Pd high 179 ppb, 10 >10% Fe	Magnetite Pyroxenite and Gabbro some K-spar veins
H-9	2000	230	27-93.5'	6 samples >50 ppb Pt + Pd high 245 ppb highest Cu 5 from 700-2400ppm & P to 7710 ppm,10 >10% fe	Gabbro and Magnetite Pyroxenite local sulfides > 5% K-spar veins
H-10	532	200	15-60.5	7 samples >50 ppb Pt + Pd high 176 ppb, 5 >10% Fe	Pyroxenite cut by Andesite and Gabbro dikes
H-11	500	159	14-54'	9 samples >50 ppb Pt + Pd high 100 ppb	Magnetite Pyroxenite to 164 then nonmagnetic Pyroxenite to EOH
H-12	600	254	15-72'	9 samples >50 ppb Pt + Pd high 159 ppb, Hi P & mod FE, 14 +5% Fe	Magnetic Gabbro cut by Andesite dikes with mafic Pyroxenite inclusions
H-13	668	250	20-100'	3 samples >50 ppb Pt + Pd high 150 ppb	Pyroxenite cut by Monzonite dikes
H-14	500	91	19-91'	9 samples >50 ppb Pt + Pd high 110 ppb	Black Amphibolite and clinopyroxenite
H-15	637	458	21-131'	9 samples >50 ppb Pt + Pd high 595 ppb, 10 > 5% Mg	Serpentenized Dunite/Wehrlite and Olivine Pyroxenite
H-16	601	256	6-31.5'	Trace sulfides noted	Moderate to pervasively silicified and argillized Sediments
H-17	520	298	8-35'	2 samples >50 Pt + Pd high 82 ppb, 6 +10% Fe	Lake Sediments to 385 then oxidized Pyroxenite
Total Hole	**12155**	**3827**	**Overburden**		
Total Core	**8328**				
Total Composite Sample Intervals				**20 representing 1032 feet of core (12%)**	**8 anomalous intervals with > 50 ppb Pt + Pd**
Total Core Intervals Sampled				**191 samples representing 995 feet of core (12%)**	**29 anomalous intervals(15%) with +100 ppb Pt + Pd (high @ 1330 ppb Pt)**

Only 12% of the core has been re-sampled to date - of those samples 38% had anomalous PGE (>50ppb)

Geochemical Notes:

1) Two distinct populations of PGE's (Pt>>Pd and Pt~=Pd)
2) Magnetite pyroxenites tend to have Pt~=Pd
3) Olivine bearing units (hi Mg) tend to have the highest Pt which is >>Pd and very low (depleted) Ni
4) Anomalous PGE generally has elevated Mg% (+5 to 33%MgO)
5) No correlation of anomalous Cu and PGE
6) Anomalous Cu (>100 ppm) averages over 0.25% Phosphorus
7) High Cu and P + elevated Au generally has low Mg (<2%)

Vancouver Petrographics, Attn: J. Vinnell, 8080 Glover Road, Langley B. C. Canada, V1M 3S3
Enclosed are 30 core samples for preparation of standard thin sections
please stain for K-spar the plugs for samples H9-300.5 and H15-578.5

Thin Section shipping list

Hole	Depth	T/S	Note
H-2	200	X	Serpetinite after OCT?
H-2	269	X	Coarse grained hbld? Gabbro
H-2	320	X	Fine-grained biotite-rich unit, dike?
H-2	355	X	Representative coarse-grained clinopyroxenite, med. mag
H-3	656	X	Mgt cpxt, banded, cumulate? Mgt.
H-3	663	X	Calc-epidote alt in mgt pxt. Tr. Py?
H-3	782	X	Bt-rich mgt cpxt
H-3	983	X	Layered mgt and Bt.
H-4	322	X	Fine grained rock, minor fs, gabbro?
H-4	361	X	Gb AA, lighter weathering clots with tiny red min
H-6	291	X	weherlite 0.5 cm cpx xtalls in a srpd oliv matrix
H-6	570	X	Mgt-rich rock, black min with cleavage, hbld? blebby mgt, lt green stuff with no cleavage, after cpx?, biotite
H-8	228.5	X	Rep fine grained host
H-8	387	X	F gr mag-bearing unit, Rep Sample
H-8	572	X	Rep fine grained high mag gabbro from near EOH
H-9	273.5	X	wk por Trach?-andesite wt hrnb lath
H-9	300.5	X Stain	K-spar vein + tan min & dis mag
H-9	860	X	mag pxnt abundant mag & bio
H-9	1267	X	amphbole + py Sph?? Replacments
H-9	1378	X	Mag pyxnt + 20% euhedral mag
H-9	1977	X	f/g pyxnt wt varible bio +5% dis & fract py/cpy
H-10	445.6	X	Gabbro
H-12	375	X	Gabbro
H-12	585	X	Gabbro
H-14	99	X	vfg black amphibolite
H-14	338	X	dis sulfide + muscovite?
H-15	578.5	X Stain	Ksp Qtz Chl dike
H-15	630	X	Olivine Cpxt
H-16	303	X	Perv Sil around K-spar quartz vein
H-16	559	X	Sericite + Quartz veins = cpy

Please send the invoice to Alaska Earth Science, Attn: Bill Ellis, 11401 Olive Lane, Anchorage, Ak. 99515

Kemuk Drill Hole Samples (BBNC 2001)

Sample	Hole	Depth	Note	Pt(ppb)	Pd(ppb)	Au(ppb)	Cu(ppm)	Ni(ppm)	Co(ppm)	Cr(ppm)	Mg(%)
3001	H-2	250.5-251.5	Serpentenized dunite pyroxenite breccia	1330	38	2	16	165	80	95	6.07
3002	H-2	354-55	C/g clinopyroxenite, mod. magnetite	15	<2	<2	7	42	22	116	1.66
3003	H-2	451.5-452.5	F/g biotite granodiorite	<5	4	<2	70	16	25	38	1.32
3004	H-3	661-663	C/g magnetite pyroxenite	5	6	<2	11	57	40	39	1.24
3005	H-3	738-39	Py bearing intermediate andesite dike	5	10	102	13	10	11	19	1.04
3006	H-3	782-83	Biotite-rich magnetite clinopyroxenite	10	24	<2	18	37	35	41	1.33
3007	H-3	981-983	Layered magnetite pyroxenite with Biotite.	50	58	<2	8	45	43	42	0.83
3008	H-4	292-305	F/g Pyroxenite	25	18	8	196	21	32	45	0.99
3009	H-4	442-447	F/g Pyroxenite + trace native Cu	15	28	22	715	25	28	46	0.69
3010	H-6	284-85	Weathered olivine clinopyroxenite	30	2	<2	9	73	21	107	2.53
3011	H-6	291-92	Peridotite (wehrlite)	180	2	<2	9	348	95	93	14.3
3012	H-6	329-31	Talc altered weherlite clinopyroxenite breccia	<5	4	<2	25	79	42	286	3.03
3013	H-6	395-96	Monzonite dike	<5	<2	<2	23	4	4	25	0.23
3014	H-6	625-30	V. c/g magnetite olivine clinopyroxenite	<5	8	<2	11	103	56	350	3.37
3015	H-6	797-98	Interlayered olivine clinopyroxenite and dunite	270	4	<2	10	171	50	196	6.26
3016	H-16	266-76	Pervasive argillic altered leached intruxive	<5	4	<2	32	24	14	95	0.56
3017	H-16	276-86	Pervasive argillic altered leached intruxive	<5	8	<2	52	33	20	78	0.74
3018	H-16	305-307	Silicified and quartz vein altered sediments	<5	18	<2	11	28	14	27	2.31
3019	H-16	309-311.5	Ouartz/K-spar/Biotite vein cutting altered sediments	<5	<2	<2	23	6	1	15	1.46
3020	H-16	512-515	Silicified and hornfelsed sediments +-sericite + trace Cu	<5	6	<2	30	16	9	33	1.32
3021	H-16	555-59	Hornfelsed and veined sediments +-sericite + trace Cu	<5	10	<2	62	13	7	39	1.71
3022	H-17	385-390	Oxidized pyoxenite cuttings	45	18	16	158	68	47	90	0.62
3023	H-17	395-400	Oxidized pyoxenite cuttings	15	18	2	73	83	76	126	0.55
3024	H-17	405-10	Oxidized pyoxenite cuttings	40	42	2	130	107	87	131	0.73
3025	H-17	460-65	Weathered pyroxenite sand cuttings	<5	8	8	184	112	27	522	1.09
3026	H-8	228-235	#226 coarse rejects	85	94	10	509	33	41	68	0.99
3027	H-8	338.5-340	#253 fine reject or pulp	25	44	<2	46	33	42	77	1
3028	H-8	305-310	#244 pulp	10	38	<2	40	41	43	99	0.73
3029	H-8	535-538	#300 coarse rejects	<5	28	<2	20	41	43	56	0.75
3030	H-9	748-802	C-75 composite rejects - Cu noted	15	20	6	799	22	36	27	1.02
3031	H-9	1250-1301	C-85 composite rejects	25	40	<2	42	34	36	32	1.05
3032	H-9	1949-2000	C-99 composite rejects -20 mesh - Cu noted	<5	36	8	730	43	53	47	0.96
3033	H-10	201-250	C-47 composite rejects	60	14	<2	27	31	35	32	1.25
3034	H-10	350-396	C-50 composite rejects	110	22	<2	29	35	34	27	1.29
3035	H-10	495-532	C-53 composite rejects	30	22	<2	110	17	30	12	1.37
3036	H-9	299-350.5	C-63 composite rejects	15	16	4	245	22	27	36	0.75
3037	H-11	159-199.5	C-54 composite rejects	25	6	<2	7	44	19	77	2.13
3038	H-11	303-347	C-57 composite rejects	80	4	<2	7	62	21	100	2.86
3039	H-11	447-500	C-60 composite rejects	35	2	<2	10	48	17	180	2.07
3040	H-12	254-301	C-71 composite rejects	15	18	6	102	20	25	26	0.61

Kemuk Drill Hole Samples (BBNC 2001)

Sample	Hole	Depth	Note	Pt(ppb)	Pd(ppb)	Au(ppb)	Cu(ppm)	Ni(ppm)	Co(ppm)	Cr(ppm)	Mg(%)
3041	H-12	349-401	C-73 composite rejects	35	52	6	152	13	27	21	0.89
3042	H-13	449-497.5	C-107 composite rejects	150	<2	2	5	54	27	258	1.86
3043	H-13	604-668	C-110 composite rejects	25	<2	<2	6	53	25	205	2.38
3044	H-14	91-151	C-112 composite rejects	10	6	<2	52	30	16	115	1.39
3045	H-14	205-251	C-114 composite rejects	30	4	<2	30	45	19	158	1.86
3046	H-14	350-400.5	C-117 composite rejects	80	6	<2	23	55	22	115	2.03
3047	H-15	470-500	C-120 composite rejects	40	<2	<2	30	84	30	154	4.6
3048	H-15	549-637	C-122 composite rejects	65	<2	<2	20	146	42	163	7.11
3049	H-17	460-530	C-111 composite rejects or cuttings	5	8	4	72	50	28	111	1.23
3050	H-9	272.5-273.5	Porphyritic trachytic andesite with hrnblend lath	<5	4	<2	43	4	14	17	0.98
3051	H-9	300-301	K-spar vein with diseminated magnetite	<5	2	<2	49	9	8	51	0.52
3052	H-9	332-335	Propylitic altered gabbro + sulfides	<5	10	<2	102	17	25	30	1.78
3053	H-9	735-736.5	F/g pyroxenite + 5% sulfides	10	20	26	2410	33	115	17	1.1
3054	H-9	848.5-850	Propylitic altered pyroxenite + sulfides	20	18	<2	38	54	34	27	3.2
3055	H-9	858-860	Magnetite pyroxenite abundant magnetite & biotite	<5	2	<2	22	91	43	23	1.3
3056	H-9	1376-1379	Magnetite pyroxenite + 20% euhedral magnetite	10	8	<2	44	120	79	47	0.75
3057	H-9	1971-1975	F/g pyoxenite with strong biotite and +5% sulfides	10	36	18	1810	73	51	81	1.41
3058	H-9	1975-1979	F/g pyoxenite with variable biotite and +5% sulfides	10	34	12	1360	87	74	51	1.4
3059	H-13	335	M/g monzonite or quartz diorite dike	<5	<2	<2	18	5	4	32	0.27
3060	H-13	270-280	Weathered pyroxenite cuttings	5	4	<2	46	35	19	140	0.8
3061	H-13	300-310	Weathered pyroxenite cuttings	5	2	<2	39	27	13	144	0.69
3062	H-13	320-330	Weathered pyroxenite cuttings	<5	<2	8	8	29	13	211	0.8

Sample #	Hole	Depth	T/S	W/R	RECOMMENDATIONS	Note	Au(ppb)	Pt(ppb)	Pd(ppb)
3063	H-2	192-196				VCG CPX Srpd Dunite intrusive ??(~30% rec)	0	45	24
3064	H-2	196-204	H-2-200			VCG Srpd OLV CPXT (~15% rec)	0	110	32
3065	H-2	246-250.5			MAGIC-PULP	VCG Srpd Dun Cpx Brx (very poor recovery or lost cor	0	135	10
3001	H-2	250.5-251.5		WR		VCG Srpd Dun Cpx Brx	2	1330	38
	H-2	269	H-2-269(missing)			Coarse grained hbld? Gabbro dike			
	H-2	320	H-2-320			Fine-grained biotite-rich unit, dike?			
3182	H-2	350-354			NEW SAMPLE	VCG CPXT srpd oliv + bio & mag			
3002	H-2	354-355	H-2-355	WR	MAGIC-PULP	Representative coarse-grained clinopyroxenite, med. n	0	15	0
3183	H-2	355-360			NEW SAMPLE	VCG CPXT black oliv + bio & mag			
3066	H-2	375-380				VCG lt green cpx + amph & patches Bio	0	20	0
3067	H-2	380-385				VCG lt green cpx + amph & patches Bio	0	0	0
3068	H-2	416-421				CG CPX/Amph pyroxenite	0	0	0
3003	H-2	451.5-452.5		WR		f/g Bio granodiorite	0	0	4
3184	H-2	476-482			NEW SAMPLE	VCG oliv cpx wehr clots of bio & mag			
3185	H-2	482-488			NEW SAMPLE	VCG oliv cpx wehr clots of bio & mag			
3069	H-2	488-495				CG CPX/Amph pyroxenite Brx?	0	120	0
3186	H-2	495-500			NEW SAMPLE	VCG oliv cpx wehr clots of bio & mag			
3070	H-3	525-530				m-c/g mag pyroxenite cut by and & gab dikes	0	0	20
3071	H-3	530-535				m-c/g mag pyroxenite cut by and & gab dikes	0	5	24
3072	H-3	577-583				m/g mottled mag pyroxenite with minor gab diking	0	0	6
	H-3	656	H-3-656			Mgt cpxt, banded, cumulate?			
3004	H-3	661-663	H-3-663			c/g mag pyxt epd-carb alt + py	0	5	6
3005	H-3	738-39				Py bearing int And? dike	102	5	10
3006	H-3	782-783	H-3-782	WR		Bt-rich mgt cpxt	0	10	24
3073	H-3	955-960				f-m/g mag pyroxenite with lt grn cpx with large mag clo	0	5	56
3074	H-3	960-965				f-m/g mag pyroxenite with lt grn cpx with large black ar	0	0	22
3075	H-3	965-970				same mag pyroxenite with cpx mag rich zones	0	0	20
3076	H-3	970-975				same mag pyroxenite with cpx mag rich zones	0	0	6
3077	H-3	975-982				mostly f/g mag pyroxenite similar to anomalous sample	0	0	28
3007	H-3	982-983	H-3-983	WR	MAGIC-PULP	Layered mgt and Bt + apt	0	50	58
3078	H-3	983-992				mostly f/g mag pyroxenite similar to anomalous sample	0	10	32
3079	H-3	992-997				f-m/g mag pyroxenite with lt grn cpx with 1' and dike at	0	0	8
3008	H-4	292-305		WR	MAGIC-PULP	F/g Pyxt high apatite	8	25	18
3187	H-4	315-320			NEW SAMPLE	Fine to med grained mag cpxt + 5% feld, mag & apt			
	H-4	322	H-4-322			Fine grained cpxt + mag & apt			
3188	H-4	320-325			NEW SAMPLE	Fine to med grained mag cpxt + 5% feld, mag & apt			
	H-4	361	H-4-361			mag-apt cpxt			
3009	H-4	442-447		WR		F/g Pyxt + tr native Cu	22	15	28
3010	H-6	284-85		WR		Weathered oct?	0	30	2
3080	H-6	285-91				c/g lt green clinopyroxenite with srpd spots	0	15	0
3011	H-6	291-92	H-6-291	WR	MAGIC-PULP	srpd olv + cpx wehrlite	0	180	2
3081	H-6	292-300				Wehrlite with 15-20% euhedreal xtalls in a Srp matrix	0	30	0
3082	H-6	300-305				Wehrlite Clinopyroxenite Brx? VC/g Cpxt around srpd \	0	30	0
3083	H-6	305-310				Wehrlite Clinopyroxenite Brx? VC/g Cpxt around srpd \	0	0	0
3084	H-6	310-318				Wehrlite Clinopyroxenite Brx? VC/g Cpxt around srpd \	0	0	0
3012	H-6	329-31				Talc alteration	0	0	4
3013	H-6	395-96		WR		Monzonite--Dike?	0	0	0
3189	H-6	425-430			NEW SAMPLE	VCG srpd dun/cpx brx intercum oliv cum cpx to 2"			
3190	H-6	430-435			NEW SAMPLE	VCG srpd dun/cpx brx intercum oliv cum cpx to 2"			
3191	H-6	435-440			NEW SAMPLE	VCG cpx cumulate wt fresh intercum oliv cpx to 2"			
3085	H-6	440-446				Oliv Cpx cumulate with patches of massive black olivin	0	75	0
3086	H-6	446-452				Oliv Cpx cumulate with patches of massive black olivin	0	50	0
3192	H-6	560-570	H-6-570		NEW SAMPLE	VC/G cpxt to 2" + black oliv bio mag + hrnb			
3193	H-6	570-580			NEW SAMPLE	VC/G cpxt to 2" + black oliv bio mag + hrnb			
3014	H-6	625-30		WR		vc/g mag olv cpxt?	0	0	8
3087	H-6	790-797			MAGIC-PULP	mostly c/g clinopyroxenite with 4" patches of wherlite w	0	10	0
3015	H-6	797-98		WR		lay olv cpxt wt dun layers	0	270	4
3088	H-6	798-804				mostly c/g lt green clinopyroxenite with srpd olivine pat	0	0	0
3089	H-6	804-810				mostly c/g lt green clinopyroxenite with srpd olivine pat	0	0	0
3090	H-6	810-815				mostly c/g lt green clinopyroxenite with more srpd olivir	0	5	4
3091	H-6	815-821				c/g clinopyroxenite with some black srpd olivine patche	0	0	0
H-7C-1	H-7	151-200				C-1 composite rejects Humble			
H-7C-2	H-7	200-250				C-2 composite rejects Humble			
H-7C-3	H-7	250-296.5				C-3 composite rejects Humble			
H-7C-4	H-7	296.5-336				C-4 composite rejects Humble			
H-7C-5	H-7	336-370				C-5 composite rejects Humble			
H-7C-6	H-7	370-406.25				C-6 composite rejects Humble			
H-7C-7	H-7	406.25-449				C-7 composite rejects Humble			
H-7C-8	H-7	449-500				C-8 composite rejects Humble			
H-7C-9	H-7	500-548.7				C-9 composite rejects Humble			
H-7C-10	H-7	548.7-600				C-10 composite rejects Humble			
H-7C-11	H-7	600-650				C-11 composite rejects Humble			
H-7C-12	H-7	650-699				C-12 composite rejects Humble			
H-7C-13	H-7	699-747				C-13 composite rejects Humble			
H-7C-14	H-7	747-799				C-14 composite rejects Humble			
H-7C-15	H-7	799-849				C-15 composite rejects Humble			
H-7C-16	H-7	849-899				C-16 composite rejects Humble			
H-7C-17	H-7	899-950				C-17 composite rejects Humble			
H-7C-18	H-7	950-1001				C-18 composite rejects Humble			
H-7C-27	H-7	1001-1050.5				C-27 composite rejects Humble			
H-7C-28	H-7	1050.5-1102				C-28 composite rejects Humble			
H-7C-29	H-7	1102-1154				C-29 composite rejects Humble			
H-7C-30	H-7	1154-1200.5				C-30 composite rejects Humble			
H-7C-31	H-7	1200.5-1251				C-31 composite rejects Humble			
H-7C-32	H-7	1251-1302				C-32 composite rejects Humble			
H-7C-33	H-7	1302-1354				C-33 composite rejects Humble			

Sample #	Hole	Depth	T/S	W/R	RECOMMENDATIONS	Note	Au(ppb)	Pt(ppb)	Pd(ppb)
H-7C-34	H-7	1354-1401				C-34 composite rejects Humble			
H-7C-35	H-7	1401-1451.5				C-35 composite rejects Humble			
H-7C-36	H-7	1451.5-1502				C-36 composite rejects Humble			
H-7C-37	H-7	1502-1551				C-37 composite rejects Humble			
H-7C-38	H-7	1551-1602				C-38 composite rejects Humble			
H-7C-39	H-7	1602-1652.5				C-39 composite rejects Humble			
H-7C-40	H-7	1652.5-1701				C-40 composite rejects Humble			
H-7C-41	H-7	1701-15750				C-41 composite rejects Humble			
H-7C-42	H-7	1750-1799				C-42 composite rejects Humble			
H-7C-43	H-7	1799-1851.5				C-43 composite rejects Humble			
H-7C-44	H-7	1851.5-1900.5				C-44 composite rejects Humble			
H-7C-45	H-7	1900.5-1950				C-45 composite rejects Humble			
H-7C-46	H-7	1950-2000				C-46 composite rejects Humble			
3221	H-7	1950-2000				-200 mesh pulp fm Humble Fe analysis			
H-8C-19	H-8	222-251				C-19 composite rejects Humble			
3092	H-8	222-228				f-m/g dark gray magnetite pyroxenite some feox stain a	14	30	44
3026	H-8	228-235				#226 coarse reject	10	85	94
3093	H-8	228-235	H-8-228.5		MAGIC-PULP	f-m/g dark gray magnetite pyroxenite	8	40	56
3094	H-8	235-240				f-m/g dark gray magnetite pyroxenite cut by hornblend	0	0	12
3095	H-8	240-246				f-m/g magnetite pyroxenite	0	15	48
H-8C-20	H-8	251-300				C-20 composite rejects Humble			
H-8C-21	H-8	300-350				C-21 composite rejects Humble			
3028	H-8	305-310				#244 Pulp?	0	10	38
3194	H-8	310-315			NEW SAMPLE	m-c/g mag pyroxenite + bio cut by QF veins			
3195	H-8	315-320			NEW SAMPLE	m-c/g mag pyroxenite cut by 2' QFdike			
3096	H-8	320-325			MAGIC-PULP	f-m/g dark gray magnetite pyroxenite with irregular mag	2	100	48
3097	H-8	325-329				f-m/g dark gray magnetite pyroxenite with irregular mag	0	0	22
3027	H-8	338.5-340				#253fine reject/pulp?	0	25	44
H-8C-22	H-8	350-402				C-22 composite rejects Humble			
	H-8	387	H-8-387			F gr mag-bearing unit, Rep Sample			
H-8C-23	H-8	402-454				C-23 composite rejects Humble			
H-8C-24	H-8	454-500				C-24 composite rejects Humble			
H-8C-25	H-8	500-550				C-25 composite rejects Humble			
3029	H-8	535-538				#300 coarse reject	0	0	28
H-8C-26	H-8	550-576.5				C-26 composite rejects Humble			
3196	H-8	559-566			NEW SAMPLE	m-c/g mag pyroxenite + 3" mas mag + brn/cpy			
	H-8	572	H-8-572			Rep fine grained mag cpxt from near EOH			
3050	H-9	272.5-273.5	H-9-273.5	WR		wk por Trach?-andesite wt hrnb lath	0	0	4
3036	H-9	299-350.5				C-63 composit rejects	4	15	16
3051	H-9	300-301	H-9-300.5	WR	MAGIC-PULP	K-spar vein + tan min & dis mag	0	0	2
3052	H-9	332-335			MAGIC-PULP	Carb/Epd/chl - Prop Alt + py & tr Cpy	0	0	10
3053	H-9	735-736.5			MAGIC-PULP	f/g pyxnt + 5% py + tr Cpy	26	10	20
3030	H-9	748-802				C-75 composit rejects - Cu noted	6	15	20
3054	H-9	848.5-850				Prop alt Chl/Carb/Srp + py & tr Cpy	0	20	18
3055	H-9	858-860	H-9-860	WR		mag pxnt abundant mag & bio	0	0	2
3198	H-9	1240-1245			NEW SAMPLE	m/g mag pxnt + some bio & feld			
3197	H-9	1245-1250			NEW SAMPLE	mag pxnt + abundant bio mod mag			
3098	H-9	1250-1255				Drk gray-green med/gr magnetite pyroxenite	2	145	100
3031	H-9	1250-1301				C-85 composit rejects	0	25	40
3099	H-9	1255-1260				Drk gray-green med/gr magnetite pyroxenite larger ma	0	0	30
3101	H-9	1260-1265				Drk gray-green med/gr magnetite pyroxenite	0	20	40
3102	H-9	1265-1270	H-9-1267		MAGIC-PULP	m/g-c/g mag hrnb cpxt with minor sulfides intergrown a	0	0	4
3103	H-9	1270-1275				Drk gray-green m/g to c/gr magnetite pyroxenite more	0	0	4
3104	H-9	1275-1280				Drk gray-green m/g to c/gr magnetite pyroxenite more	0	0	4
3105	H-9	1280-1285				Drk gray-green m/g to c/gr magnetite pyroxenite more	0	0	4
3106	H-9	1285-1290				finer grained drk gray-green magnetite pyroxenite trace	0	20	54
3107	H-9	1290-1295			MAGIC-PULP	finer grained drk gray-green magnetite pyroxenite biotit	8	85	76
3108	H-9	1295-1301				finer grained drk gray-green magnetite pyroxenite prop	6	0	46
3199	H-9	1301-1305			NEW SAMPLE	fine grained green clinopyroxenite			
3200	H-9	1305-1310			NEW SAMPLE	m/g mag pxnt abundant mag & bio 1" feld vein			
3056	H-9	1376-1379	H-9-1378			Mag pyxnt + 20% euhedral mag	0	10	8
3032	H-9	1949-2000				C-99 composit reject -20 mesh - Cu noted	8	0	36
3057	H-9	1971-1975				f/g pyxnt str bio +5% py/cpy Highest Humble Cu assay	18	10	36
3058	H-9	1975-1979	H-9-1977	WR	MAGIC-PULP	f/g pyxnt wt varible bio +5% dis & fract py/cpy	12	10	34
3033	H-10	201-250				C-47 composit rejects	0	60	14
3119	H-10	203-208				f/g dark gray-green magnetite pyroxenite with rusty spo	0	30	8
3109	H-10	350-355				f/g to m/g dark gray-green magnetite pyroxenite 1' prop	0	45	18
3034	H-10	350-396				C-50 composit rejects	0	110	22
3110	H-10	355-360				f/g to m/g dark gray-green magnetite pyroxenite increa	0	0	6
3111	H-10	360-365				f/g to m/g dark gray-green magnetite pyroxenite increa	0	25	12
3112	H-10	365-370				f/g to m/g dark gray-green magnetite pyroxenite increa	0	20	10
3113	H-10	375-375				c/g with larger cpx and euhedral mag xtalls to 1 cm	0	15	10
3114	H-10	375-380				c/g with larger cpx and euhedral mag xtalls to 1 cm	0	15	10
3115	H-10	380-385				f/g to m/g dark gray-green magnetite pyroxeniteprop al	0	145	22
3116	H-10	385-390			MAGIC-PULP	f/g to m/g dark gray-green magnetite pyroxeniteprop al	0	160	16
3117	H-10	390-395				f/g to m/g dark gray-green magnetite pyroxenite f/g gal	0	45	24
3118	H-10	395-400				m/g to c/g dark gray-green magnetite pyroxenite f/g ga	0	25	18
	H-10	445.6	H-10-445.6			clay/ser alt Gabbro wt apatite			
3201	H-10	444.5-450			NEW SAMPLE	drk grn pyrox amph feld gabbro			
3035	H-10	495-532				C-53 composit rejects	0	30	22
3037	H-11	159-199.5				C-54 composit rejects	0	25	6
3120	H-11	303-308				c/g med to lt green clinopyroxenite ~90% not magnetic	0	50	2
3038	H-11	303-347				C-57 composit rejects	0	80	4
3121	H-11	308-313				c/g med to lt green clinopyroxenite ~90% not magnetic	0	65	0
3122	H-11	313-318				c/g med to lt green clinopyroxenite ~90% not magnetic	0	100	0
3123	H-11	318-323				c/g med to lt green clinopyroxenite ~90% not magnetic	0	50	0

Sample #	Hole	Depth	T/S	W/R	RECOMMENDATIONS	Note	Au(ppb)	Pt(ppb)	Pd(ppb)
3124	H-11	323-328				c/g med to lt green clinopyroxenite ~90% not magnetic	0	20	0
3125	H-11	328-333				c/g med to lt green clinopyroxenite ~90% not magnetic	0	20	0
3126	H-11	333-338				c/g med to lt green clinopyroxenite ~90% not magnetic	0	60	0
3127	H-11	338-343				c/g med to lt green clinopyroxenite ~90% not magnetic	10	100	0
3128	H-11	343-347				c/g med to lt green clinopyroxenite ~90% not magnetic	0	45	0
3202	H-11	347-352			NEW SAMPLE	drk grn m/g pyroxenite + some bio & feld			
3203	H-11	352-357			NEW SAMPLE	drk grn m/g pyroxenite + some bio & feld			
3039	H-11	447-500				C-60 composit rejects	0	35	2
3040	H-12	254-301				C-71 composit rejects	6	15	18
3129	H-12	349-355				m/g magnetic hornblend gabbro CI~60% with patches	4	10	26
3041	H-12	349-401				C-73 composit rejects	6	35	52
3130	H-12	355-360				f/g propalytic altered andesite dike	0	60	80
3131	H-12	360-365				mafic hornblend gabbro with minor epidote carbonate a	0	15	62
3132	H-12	365-370				m/g magnetic hornblend gabbro with increasing mafic i	12	10	54
3133	H-12	370-375				m/g magnetic hornblend gabbro with mafic inclusions p	4	0	58
3134	H-12	375-380	H-12-375		MAGIC-PULP	m/g magnetic hornblend gabbro with increasing mafic i	0	10	32
3135	H-12	380-385				m/g magnetic hornblend gabbro with mafic inclusions 1	0	10	40
3136	H-12	385-390				m/g magnetic hornblend gabbro with mafic inclusions	0	5	24
3137	H-12	390-395				m/g magnetic hornblend gabbro with mafic inclusions 6	16	0	22
3138	H-12	395-401				mafic hornblend gabbro with minor epidote on fractures	2	115	44
3204	H-12	401-406			NEW SAMPLE	horn gabbro epd on fract + cpy & mag clots			
3205	H-12	406-411			NEW SAMPLE	horn gabbro mod mag			
3206	H-12	580-585			NEW SAMPLE	mafic gabbro mod to str magnetic clots of cpx			
	H-12	585	H-12-585			Alt Gabbro			
3207	H-12	585-590			NEW SAMPLE	mafic gabbro mod to str magnetic clots of cpx			
3060	H-13	270-280				cuttings of weathered pyroxenite	0	5	4
3061	H-13	300-310				cuttings of weathered pyroxenite	0	5	2
3062	H-13	320-330				cuttings of weathered pyroxenite	8	0	0
3059	H-13	335		WR	MAGIC-PULP	m/g monz or qtz dir dike	0	0	0
3139	H-13	448-453				c/g med to lt green magnetite clinopyroxenite with f/g ir	0	35	4
3042	H-13	449-497.5				C-107 composit rejects	2	150	0
3140	H-13	453-458				c/g med to lt green magnetite clinopyroxenite with f/g ir	0	0	4
3141	H-13	458-463				c/g med to lt green magnetite clinopyroxenite with f/g ir	0	0	0
3142	H-13	463-468				m/g to c/g clinopyroxenite varible magnetite sparce srp	0	5	0
3143	H-13	468-473				m/g to c/g clinopyroxenite increasing magnetite sparce	0	0	0
3144	H-13	473-478				c/g med to lt green magnetite clinopyroxenite minor bio	0	0	0
3145	H-13	478-483				c/g to vc/g magnetite clinopyroxenite xtalls to 2" less m	0	5	0
3146	H-13	483-488				c/g clinoppyroxenite with talc altered fractures at 485 $	0	40	0
3147	H-13	488-493				c/g clinoppyroxenite with biotite + talc altered fractures	0	0	0
3148	H-13	493-498				c/g clinoppyroxenite with talc altered fractures, 1' f/g di	0	20	0
3149	H-13	498-503				vc/g to pegmatoidal magnetite clinopyroxenite xtalls to	0	65	0
3150	H-13	503-508			MAGIC-PULP	vc/g magnetite clinopyroxenite xtalls to 2" highly varible	0	135	0
3208	H-13	508-513			NEW SAMPLE	vc/g clinopyroxenite xtalls to 2" highly varible magnetite			
3209	H-13	513-518			NEW SAMPLE	vc/g clinopyroxenite xtalls to 2" highly varible magnetite			
3043	H-13	604-668				C-110 composit rejects	0	25	0
3044	H-14	91-151				C-112 composit rejects	0	10	6
3216	H-14	97-103	H-14-99		NEW SAMPLE	f-m/g black hrnb bio cpxt + srpd oliv			
3045	H-14	205-251				C-114 composit rejects	0	30	4
3151	H-14	326-336				vc/g clinopyroxenite with zones of black 0.5 cm Aamph	0	15	8
3152	H-14	336-341	H-14-338		MAGIC-PULP	m/g to vc/g cpxt with patches of srpd olivine (+ tr sulfid	0	65	10
3153	H-14	341-346				m/g to c/g clinopyroxenite biotite common plus srpd pa	0	60	0
3154	H-14	346-351				m/g to c/g clinopyroxenite biotite common plus 3 cm fre	4	100	10
3046	H-14	350-400.5				C-117 composit rejects	0	80	6
3155	H-14	351-357			MAGIC-PULP	m/g to c/g clinopyroxenite (vc/g at 354) srpd olivine pat	0	105	6
3156	H-14	357-362				varible from f/g to c/g cpxt with fe stained srpd olivine p	0	65	10
3157	H-14	362=367				varible from f/g to c/g cpxt with fe stained srpd olivine p	0	90	8
3158	H-14	367-372				varible from f/g to c/g cpxt with fe stained srpd olivine p	0	55	6
3159	H-14	372-377				varible from f/g to c/g cpxt with fe stained srpd olivine p	0	50	0
3160	H-14	377-382				varible from f/g to c/g cpxt with fe stained srpd olivine p	0	30	0
3161	H-14	382-387				varible from f/g to c/g cpxt with fe stained srpd olivine p	0	30	0
3162	H-14	387-392				vc/g cpxt with sparce fe stained srpd olivine patches pl	0	10	0
3163	H-14	392-398				vc/g cpxt with sparce fe stained srpd olivine patches pl	0	0	0
3164	H-14	398-403				vc/g cpxt with sparce fe stained srpd olivine patches pl	0	25	0
3165	H-14	403-411				f/g to m/g amphiobolized pyroxenite f/g sulfide diss in n	0	10	8
3047	H-15	470-500				C-120 composit rejects	0	40	0
3166	H-15	479-490				black to greenish vc/g duniteto wherlite varibly srpd oli	0	5	0
3167	H-15	490-500				black to greenish vc/g duniteto wherlite varibly srpd oli	0	30	0
3168	H-15	500-510				black to greenish vc/g duniteto wherlite varibly srpd oli	0	0	0
3210	H-15	539-549			NEW SAMPLE	m-c/g srpd talk altered clinopyroxenite			
3169	H-15	549-555.5				varible f/g to vc/g clinopyroxenite sheared and crushes	0	10	0
3048	H-15	549-637				C-122 composit rejects	0	65	0
3171	H-15	555.5-565				varible f/g to vc/g clinopyroxenite sheared and crushes	0	25	0
3170	H-15	565-570				varible f/g to vc/g clinopyroxenite sheared and crushes	0	5	0
3172	H-15	570-575				f/g dunite layer fm 570-575 + 90% brn-blk olivine + fine	0	65	0
3173	H-15	575-581			MAGIC-PULP	v/c/g clinopyroxenite xtalls to + 1" 3' feldspar dike at 57	0	70	6
	H-15	578.5	H-15-578.5			Ksp Qtz Chl dike			
3174	H-15	583-588				c/g to v/c/g wherlite brn olivine xtalls + green cps stalls	0	15	0
3214	H-15	588-594.5			NEW SAMPLE	wehrlite cpx/oliv mix varible amts m-c/g hi mag			
3211	H-15	594.5-599			NEW SAMPLE	magnetite wehrlite to cpxt wt dnt layer			
3212	H-15	599-604			NEW SAMPLE	Dunite to c/g cpxt low mag			
3175	H-15	604-614				c/g dunite to wherlite with patches of v/c/g cpx with 2"	0	245	0
3213	H-15	614-618			NEW SAMPLE	c/g clinopyroxenite low mag			
3176	H-15	618-622				v/c/g green clinopyroxenite xtalls to + 1"	0	60	0
3177	H-15	622-627			MAGIC-PULP	v/c/g wherlite to m/g brn-black olivine rich dunite	0	595	4
3178	H-15	627-632	H-15-630			c/g dunite to wherlite wt fresh brn-blk olivine + varible a	0	120	0
3215	H-15	632-637			NEW SAMPLE	f-m/g wehrlite to dunite varibly magneticgray dike at 633-634.5			

Sample #	Hole	Depth	T/S	W/R	RECOMMENDATIONS	Note	Au(ppb)	Pt(ppb)	Pd(ppb)
6625521	H-15	632-637			Assmt ck sample	v/cg cpxt + oliv cut by and dks	<0.001	0.074	0.005
3016	H-16	266-76				perv arg alt leached and bleached Int?	0	0	4
3017	H-16	276-86		WR	MAGIC-PULP	perv arg alt leached and bleached Int?	0	0	8
	H-16	303	H-15-303			Perv Sil around K-spar quartz vein			
3018	H-16	305-307			MAGIC-PULP	str alt sil ti mn stained arg alt seds	0	0	18
3019	H-16	309-311.5				Otz/K-sp/Bio vn in perv sil seds	0	0	0
3020	H-16	512-515				varib sil & hrn +=ser + tr Cpy	0	0	6
3021	H-16	555-59	H-16-559	WR		varib sil & hrn +=ser +hrln otz tr Cpy	0	0	10
3022	H-17	385-390				oxidized pyx cuttings	16	45	18
3179	H-17	390-395				oxidized pyx cuttings	0	10	18
3023	H-17	395-400				oxidized pyx cuttings	2	15	18
3180	H-17	400-405				oxidized pyx cuttings	0	10	12
3024	H-17	405-410		WR		oxidized pyx cuttings	2	40	42
3181	H-17	410-415				oxidized pyx cuttings	0	15	6
3049	H-17	460-530				C-111 composit reject of Cuttings??	4	5	8
3025	H-17	460-65				weathered pyx sand cuttings	8	0	8

KEMUK MOUNTAIN IRON ORE PROSPECT
DILLINGHAM DISTRICT, ALASKA

By William J. Whaley, Jr.
Richard A. Bray

November, 1959

Report for Humble Oil and Refining Co.

EPR # 7393

~~EXPLORATION HEADQUARTERS~~
~~INFORMATION CENTER~~
~~ROOM 3990~~

TEXT

EXXON PRODUCTION RESEARCH
REPORTS SECTION

~~REPORTS SECTION~~

EXXON COMPANY, U.S.A.

MEMORANDUM

TO: P. S. DAVIDSON

FROM: M. N. SLATER

SUBJECT: KEMUK MOUNTAIN PROPERTY - SOUTHWESTERN ALASKA

DATE: SEPTEMBER 27, 1977

At the request of Tom Barrow during our review on 8/3/77, I contacted Edward T. Miller and Richard A. Bray who were project geologists at Kemuk Mountain. I then located and obtained the report entitled "Kemuk Mountain iron ore prospect, Dillingham district, Alaska" by W. J. Whaley and R. A. Bray. B. E. Kilpatrick has reviewed this report and his summary and recommendations are attached.

Bruce recommends no further work on this prospect because of the low grade magnetite mineralization and the paucity of base metal sulfide potential. The core was scrutinized very carefully and any trace amounts of copper mineralization noted were assayed for copper. The highest copper assay was 0.17% Cu. The core was not assayed for nickel, chromite or platinum group metals which characterize well-layered cratonic mafic-ultramafic bodies and are common in alpine ultramafic complexes. The fact that the careful examination of the core revealed no significant sulfide accumulations suggests that little potential exists for the above metals even if the sulfide type was misidentified. Several other magnetite rich, alpine ultramafic complexes are known in southern Alaska and these are also characterized by very low base metal content. Finally Turam and AFMag surveys were conducted over the Kemuk Mountain property in an attempt to locate sulfide concentrations. The results of these surveys were negative but it should be pointed out that the thickness of the overburden (+200') probably rendered these techniques useless.

The attitude of the ultramafic complex remains a point of conjecture but I tend to subscribe to Bruce's interpretation that the layering is steeply west dipping. This layering may be more apparent than real, however, because the Kemuk complex is a Cretaceous alpine type and the "layering" may be the result of tectonics and intrusive episodes rather than true magmatic layering characteristic of the large, Precambrian, cratonic ultramafic complexes (e.g. Bushveld complex, Duluth gabbro, and Stillwater complex).

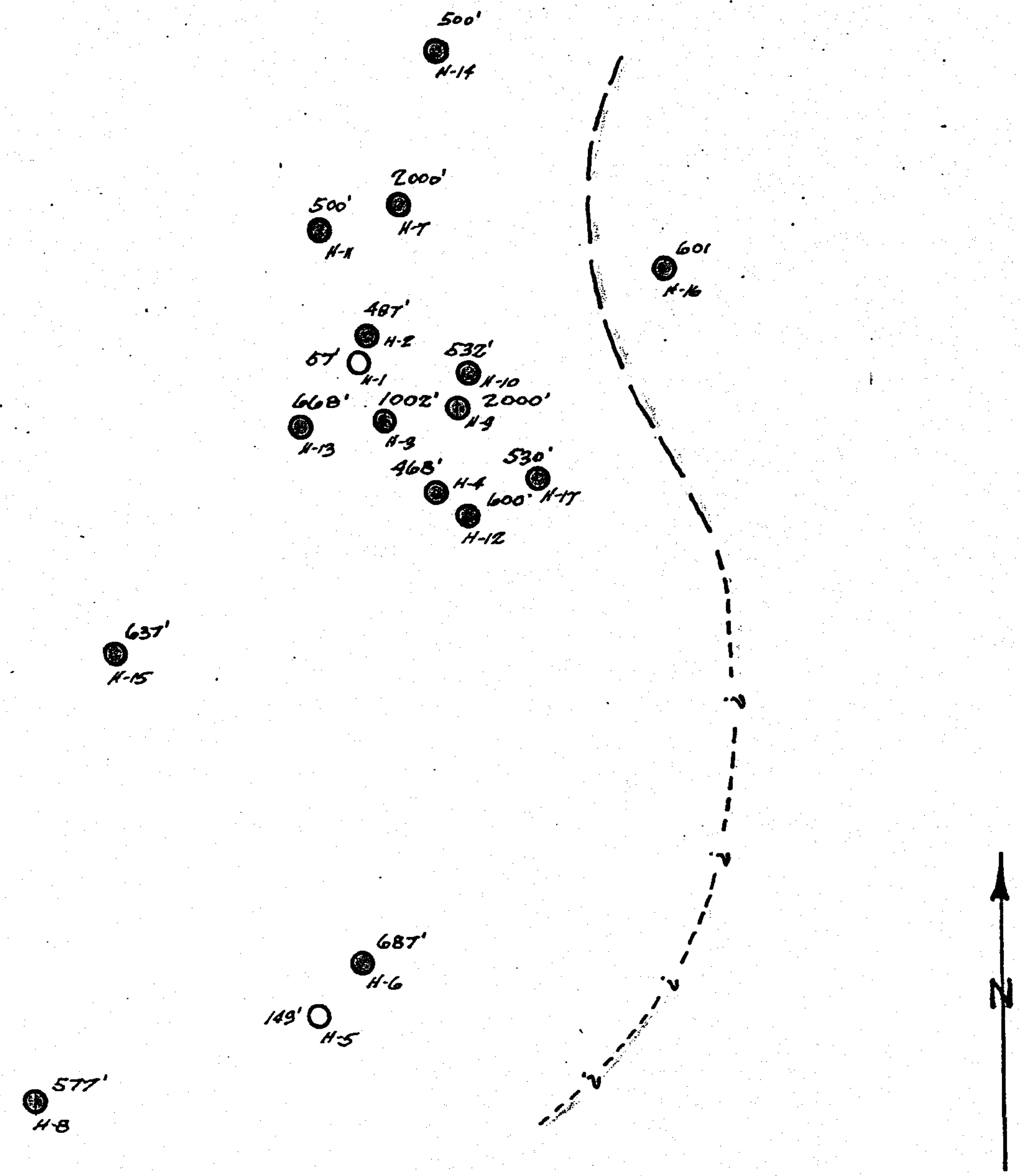
The potential remaining at Kemuk Mountain is finding base metal sulfide accumulations at the base of the ultramafic complex. We consider this a long shot at best because of the low sulfide content drilled to date, the Cretaceous age (rather than Precambrian), the alpine nature (rather than cratonic) and the absence of significant sulfides in other similar ultramafic complexes in southwestern Alaska. We recommend no additional work at Kemuk Mountain.

Mike

Mical N. Slater

MNS:rc
Enclosures

- FIG. 2 -



BEDROCK LITHOLOGY

- AMPHIBOLE-RICH PYROXENITE
- PYROXENITE
- GABBRO
- ARGILLITE

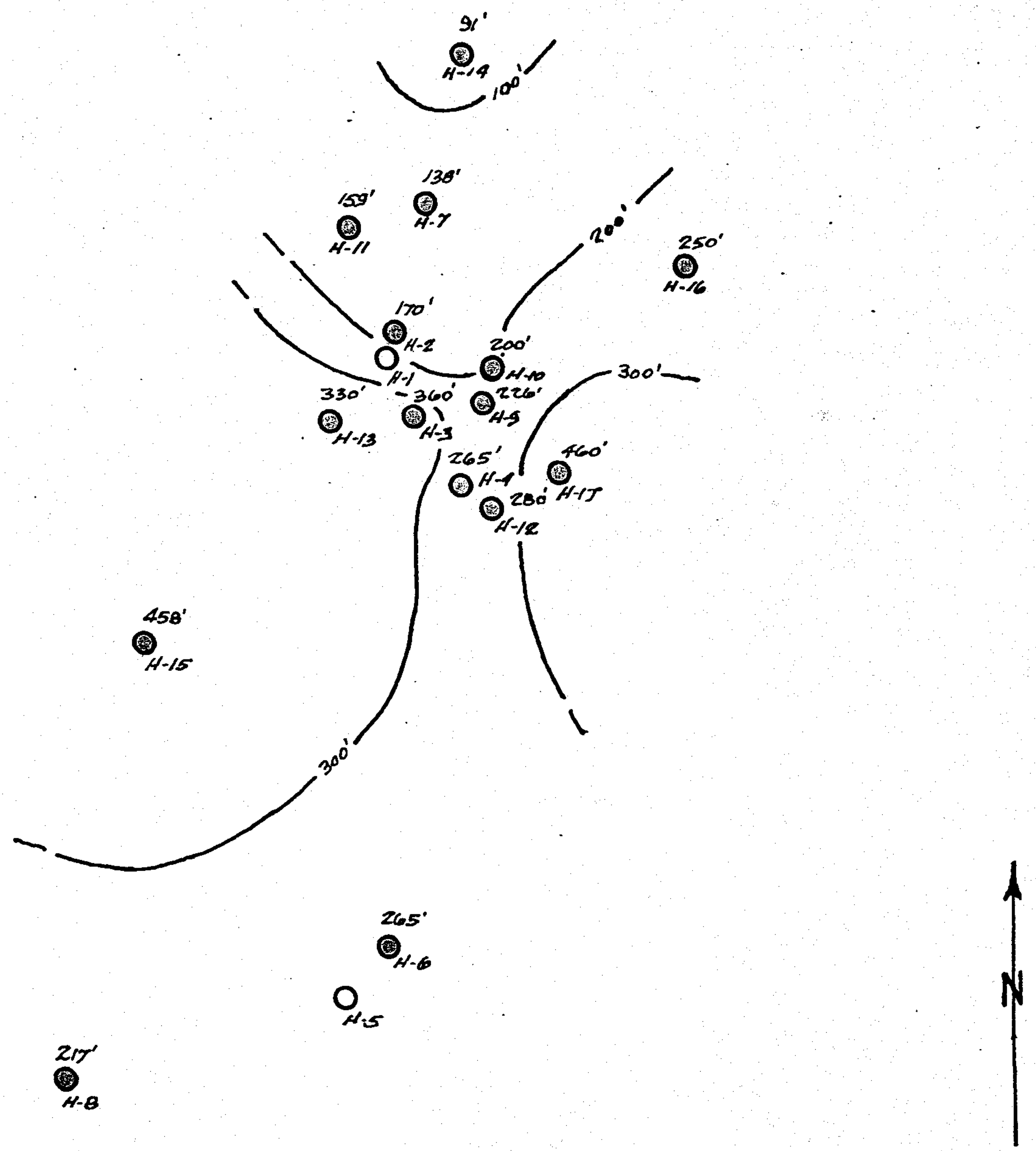
687' T.D.
6 DIAMOND DRILL HOLE

INFERRED CONTACT BETWEEN SEDIMENTS AND ULTRAMAFIC INTRUSIVE

DOMINANT ROCK TYPE IN DRILL HOLES KEMUK MOUNTAIN ALASKA

SCALE: 1 IN. = 5000 FT.

B.E.K. 9/77



265' DEPTH (FT.) TO BEDROCK

H-6 DIAMOND DRILL HOLE

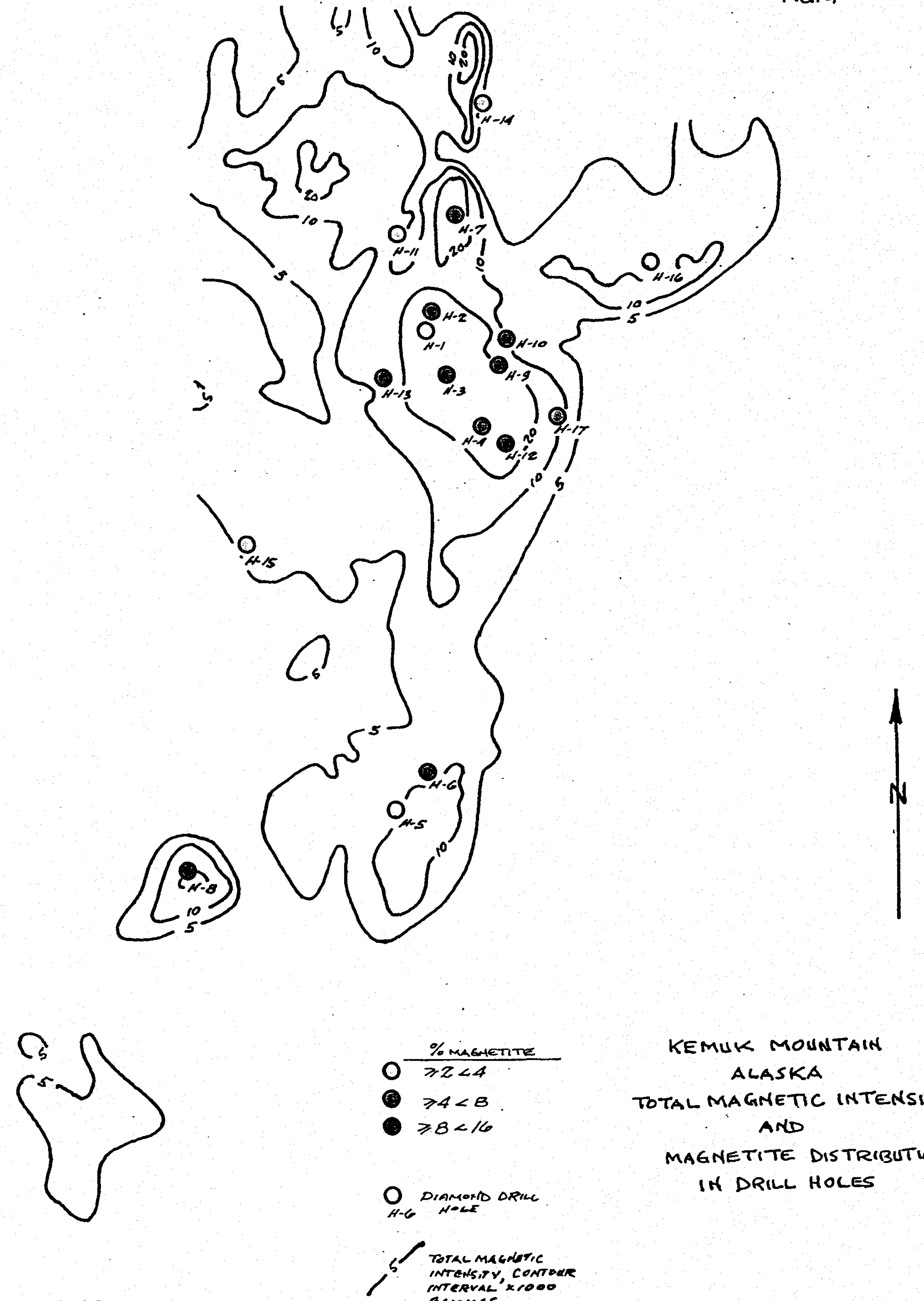
100 ISOPACH LINE, CONTOUR INTERVAL 100 FT.

OVERBURDEN THICKNESS KEMUCK MOUNTAIN ALASKA

SCALE: 1 IN. = 5000 FT.

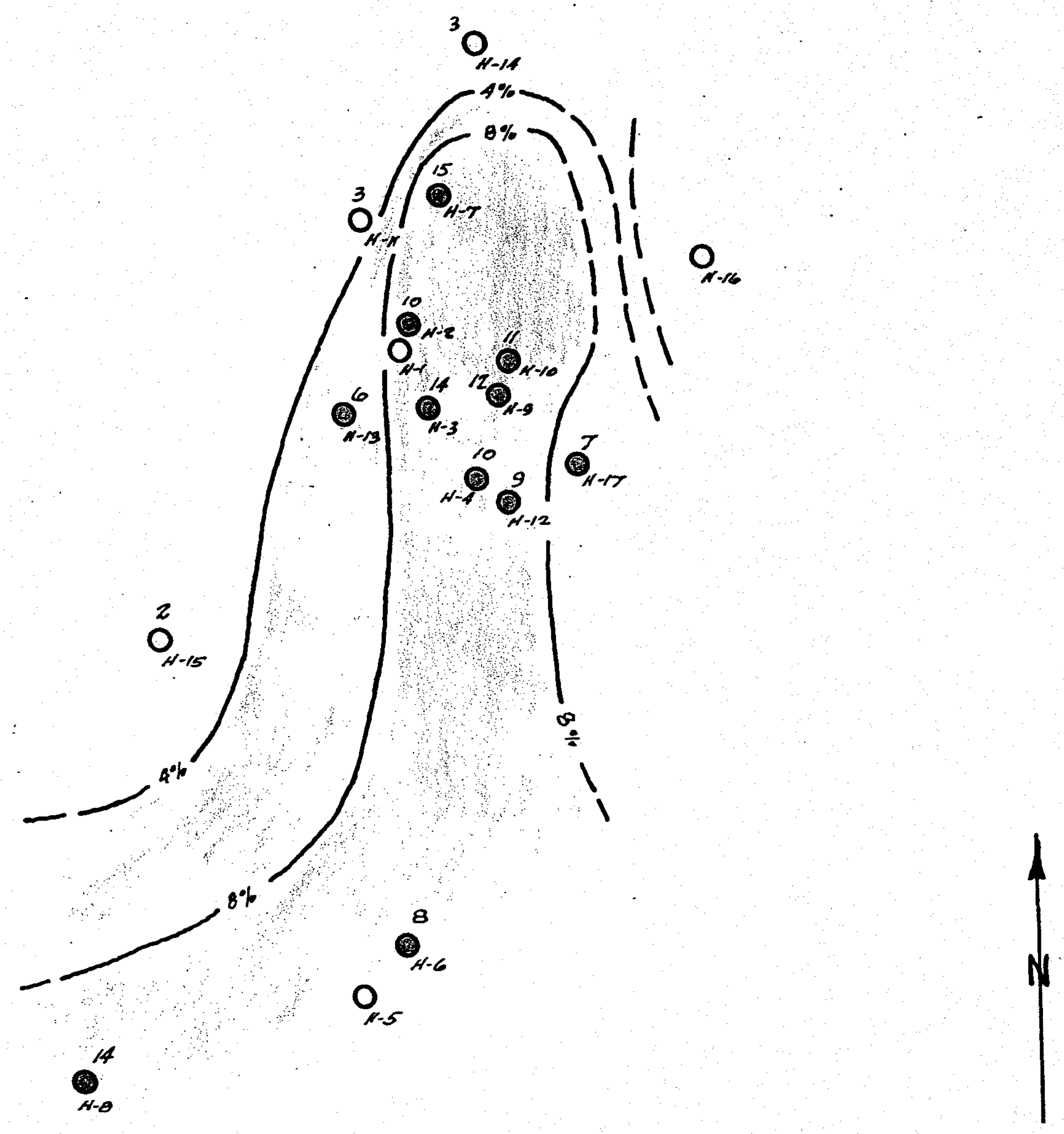
B.E.K. 9/77

- FIG. 4 -



KEMUK MOUNTAIN
ALASKA
TOTAL MAGNETIC INTENSITY
AND
MAGNETITE DISTRIBUTION
IN DRILL HOLES

SCALE: 1 IN. = 5000 FT.
B.E.K. 9/77



% MAGNETITE

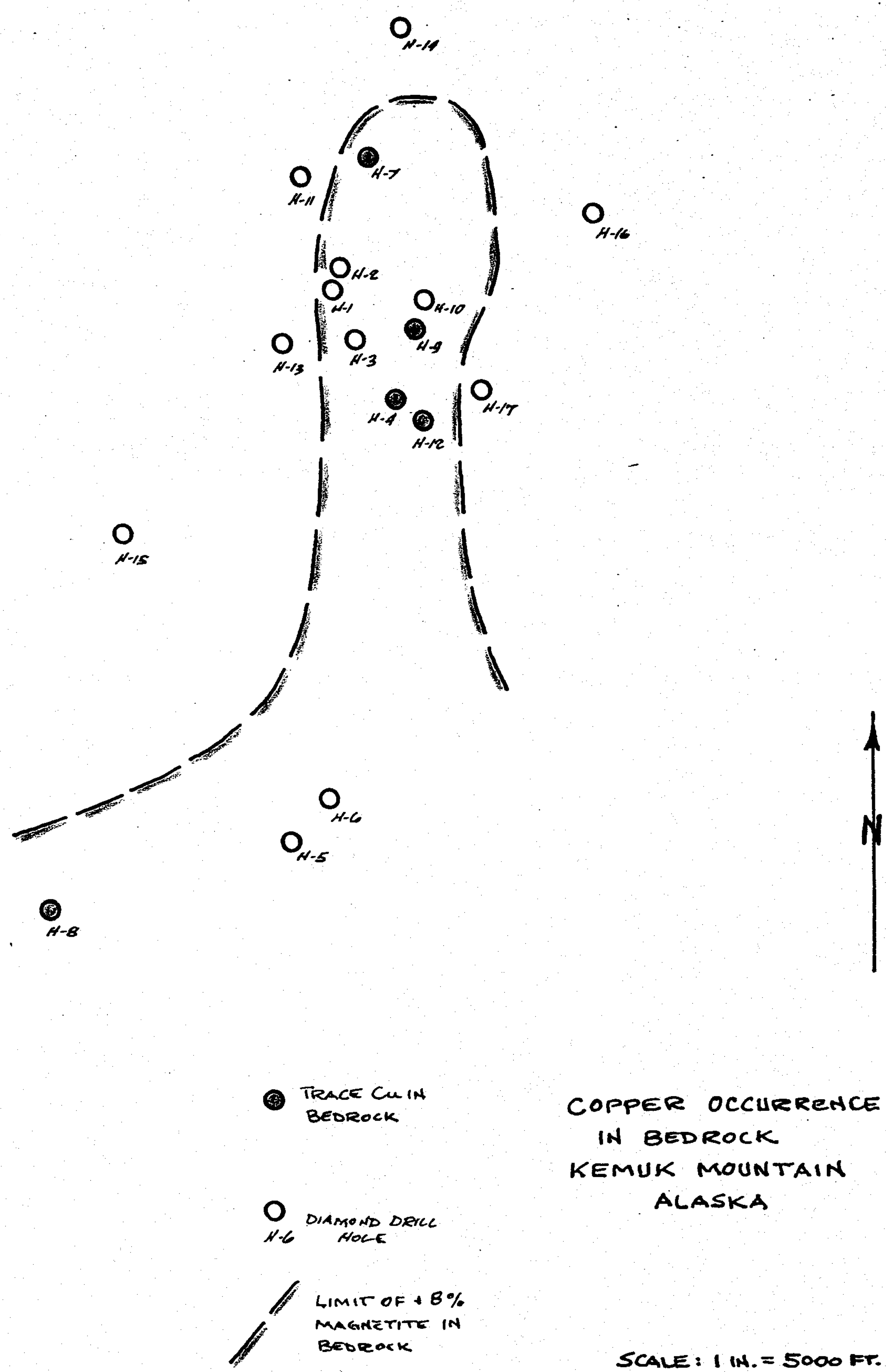
○ ≥2 <4
◉ ≥4 <8
● ≥8 <16

8 % MAGNETITE IN HOLE
○
H-6 DIAMOND DRILL HOLE

MAGNETITE DISTRIBUTION
IN DRILL HOLES
KEMUK MOUNTAIN
ALASKA

SCALE: 1 IN. = 5000 FT.

B.E.K. 9/77



COPPER OCCURRENCE
IN BEDROCK
KEMUK MOUNTAIN
ALASKA

SCALE: 1 IN. = 5000 FT.

B.E.K. 9/77

TABLE OF CONTENTS

ILLUSTRATIONS

ABSTRACT

The Kemuk Mountain iron ore anomaly was discovered in 1957 by aerial magnetometer surveys conducted over the Nushagak Basin in southwestern Alaska. This magnetic anomaly is caused by an ultrabasic igneous complex, not unlike several intrusive bodies discovered along the southeastern coast of Alaska, some of which due to their ready accessibility are being developed by a subsidiary of U.S. Steel Company.

In 1958, 815 lode and placer claims were staked over the anomaly by Humble and ground magnetometer surveys were completed. During the summer months of 1958 and 1959, fourteen of a total of seventeen core tests that were drilled encountered the intrusive. The intrusive is overlain by glacial fill material to depths varying from 90 feet to 460 feet. Magnetite was discovered in percentages of 2 to 35 percent with the greatest concentration in a phase of the intrusive which is classified as magnetite pyroxenite. The magnetite content averages 14.5 to 16.5 percent in the western part of the magnetite pyroxenite mass, and 10.5 to 12 percent in the eastern part. Traces of native copper, chalcopyrite, and sphalerite were noted; however, extensive electromagnetic surveys completed in 1959 failed to detect anomalies which might suggest commercial deposits of copper or other base sulfides.

Laboratory analyses indicated that the relatively low content of magnetite in the ore body would require high concentration ratios that would preclude a commercially competitive mining operation at this time. It is recommended, therefore, that Humble conduct no further exploration work for its own account in the prospect area. There remains one untested possibility of magnetite enrichment, however, along the western margin of the intrusive. Since several iron-ore mining firms have expressed interest in the prospect, every effort should be made to retain the claims until it is learned whether or not the property can be farmed out for additional exploration.

KEMUK MOUNTAIN IRON ORE PROSPECT
DILLINGHAM DISTRICT, ALASKA

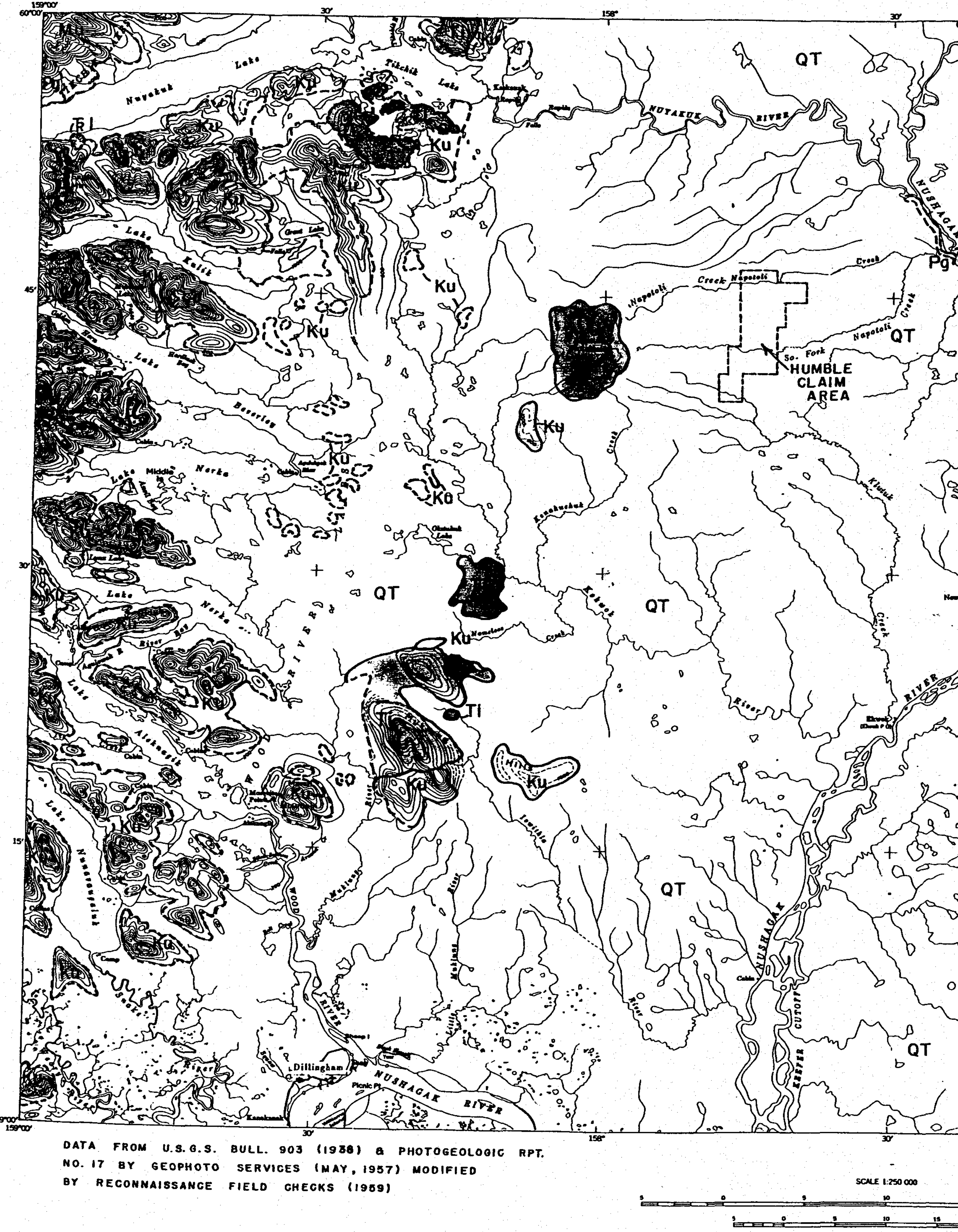
INTRODUCTION

Location of Area and Geologic Setting

The Humble Claim area is located about 55 airline miles northeast of Dillingham, Alaska, at approximately 59° 45' north latitude and 158° 15' west longitude (Plate 1).

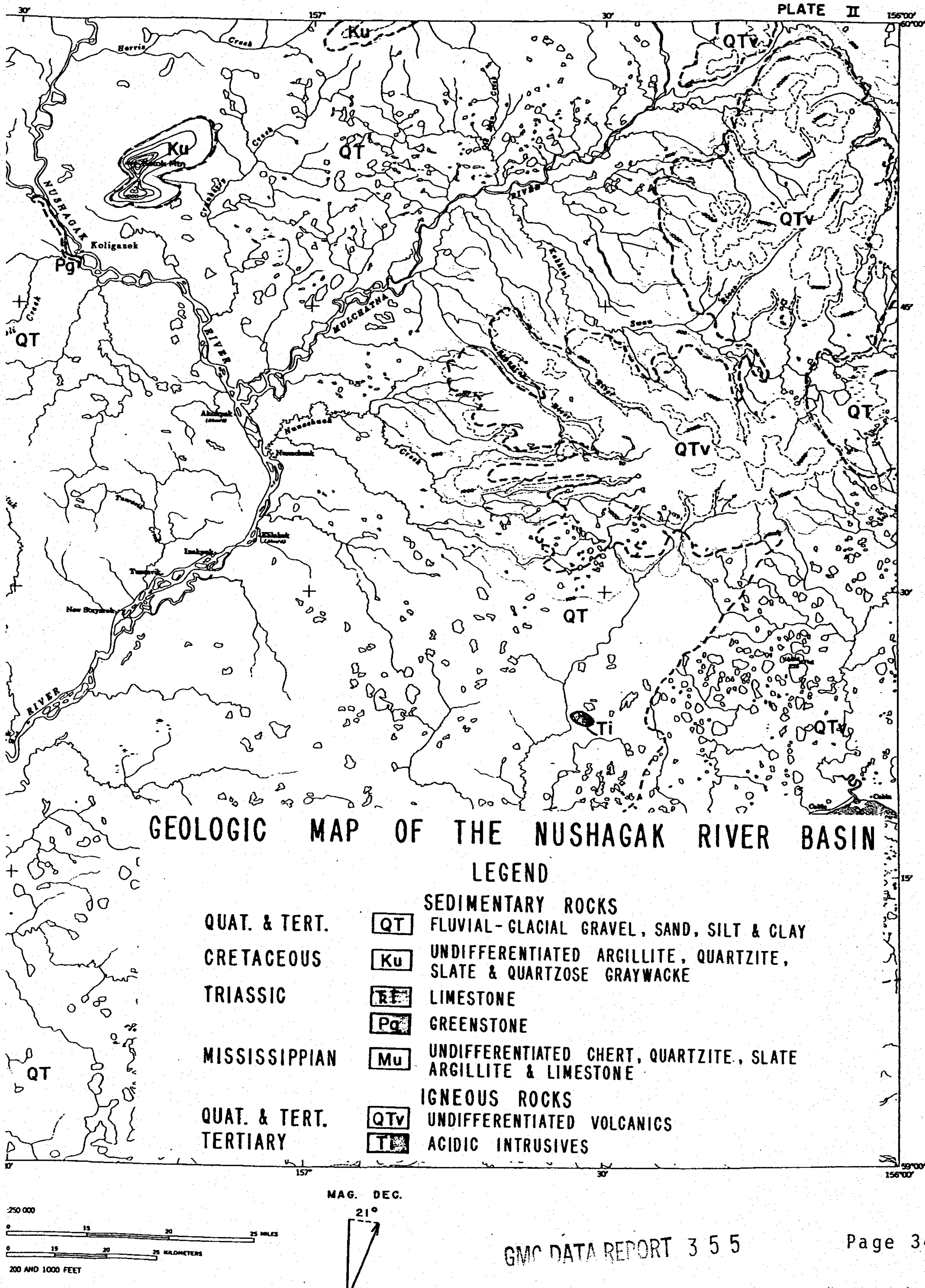
The area lies on a lowland plain of unconsolidated fluvial-glacial sediments deposited as outwash from the Quaternary glaciation of the Tikchik and Wood River Mountains west of the lowland. The ultrabasic intrusive which is the prime concern of this report is buried beneath 90 to 460 feet of these sediments.

The glacial-sculptured Tikchik and Wood River Mountains are formed primarily of Cretaceous sediments, with one area of Mississippian (?) sediments and Permian (?) greenstone in their northern portion, one small patch of Triassic limestone on the south shore of Nuyakuk Lake (Mertie, 1938) and scattered granitic to monzonitic batholiths and stocks which are probably late Cretaceous to early Tertiary in age (Plate II). Cretaceous sediments also crop out northeast of the claim area in Ketok Mountain and in the low, rounded Nushagak Hills. East of the Nushagak and Mulchatna Rivers is an area of Quaternary-Tertiary lavas and tuffs which probably interfinger westward into the lower part of the fluvial-glacial deposits (Geophoto's Alaska Report No. 17, 1957). The nearest outcrops to the claim area are the granitic prominence



DATA FROM U.S.G.S. BULL. 903 (1938) & PHOTOGEOLOGIC RPT. NO. 17 BY GEOPHOTO SERVICES (MAY, 1957) MODIFIED BY RECONNAISSANCE FIELD CHECKS (1959)

PLATE II



GEOLOGIC MAP OF THE NUSHAGAK RIVER BASIN
LEGEND
SEDIMENTARY ROCKS
QUAT. & TERT. QT FLUVIAL-GLACIAL GRAVEL, SAND, SILT & CLAY
CRETACEOUS Ku UNDIFFERENTIATED ARGILLITE, QUARTZITE, SLATE & QUARTZOSE GRAYWACKE
TRIASSIC Tī LIMESTONE
Pg GREENSTONE
MISSISSIPPIAN Mu UNDIFFERENTIATED CHERT, QUARTZITE, SLATE ARGILLITE & LIMESTONE
IGNEOUS ROCKS
QUAT. & TERT. QTv UNDIFFERENTIATED VOLCANICS
TERTIARY Ti ACIDIC INTRUSIVES
Ku
QT
QTv
Pg
Ti
Koliganek
NUSHAGAK
RIVER
MULCHATNA
Nunachuak
Harris
Creek
Koktuli
Swan
New Stuyahok
157°
30'
156°00'
60°00'
45'
30'
15'
59°00'
MAG. DEC.
21°
25 MILES
25 KILOMETERS
200 AND 1000 FEET

which forms Kemuk Mountain, and scattered patches of Permian (?) greenstone along the west bank of the Nushagak River about 12 miles east of the claim area.

The investigated intrusive is a complex of the following genetically related rock types: pyroxenite, magnetite pyroxenite, gabbro, and andesite (see page17 for definitions). Economic interest centers on the magnetite pyroxenite.

Project History or Background

1957 Discovery

The Aero Service Corporation of Philadelphia, Pennsylvania, conducted an aerial magnetometer survey of the Nushagak Basin for Humble in 1957. As a result of this survey, a large magnetic anomaly was discovered near Kemuk Mountain. Preliminary interpretation of this anomaly postulated that a rather extensive magnetite deposit was present and further investigation warranted.

Summary of 1958 Work

In June, 1958, Humble conducted a series of ground magnetometer surveys over, and adjacent to, the main magnetic anomaly. This work confirmed the general outline and intensity of the airborne anomaly and resulted in the decision to initiate a core drill program. In July, 1958, a small crew of civil engineers staked approximately 75 claims over the main magnetic feature. At the same time, a small seismic shot hole rig was flown into the area for the purpose of drilling a core hole. Unfortunately, this rig was unable to penetrate the glacial gravels that were encountered. After this preliminary failure, the project was suspended and all evidence of claim staking was removed.

with electromagnetic equipment was arranged for the purposes of detecting base sulfides, primarily copper, and of implementing the search for more concentrated sources of magnetite.

Initially, three core tests were to be drilled while the geophysical data were being acquired. These tests were located on magnetic anomalies which had not been tested the previous year. Two of these locations, H-7 and H-9, were to be drilled to 2,000 feet to determine if magnetite percentages increased with depth. The electromagnetic results were to be utilized in selecting any subsequent drill locations.

REPORT ON 1959 EXPLORATION

Methods of Operation

Camp

The basic camp equipment was flown by helicopter to the claim area on May 23, 1959, and actual erection of the camp facilities began on that date. The camp was ready to accommodate the 21 drilling and geophysical personnel when they arrived on May 31. The camp was located on a high bluff overlooking the south fork of Napatoli Creek, a tributary of the Nushagak River (see Plate III, Fig. 1). This site was adjacentto the east-central part of the claim block, affording rapid access to any portion of the claim area by helicopter. Living quarters consisted of seventeen 10' X 10' Porta-Kamp units capable of housing 34 men. Two 10' X 20' Porta-Kamp units, placed back to back, formed a 10' X 40' kitchen and dining room facility.

Insulated cots and sleeping bags furnished comfortable sleeping arrangements. Coleman Heatmasters were adequate for providing warmth within

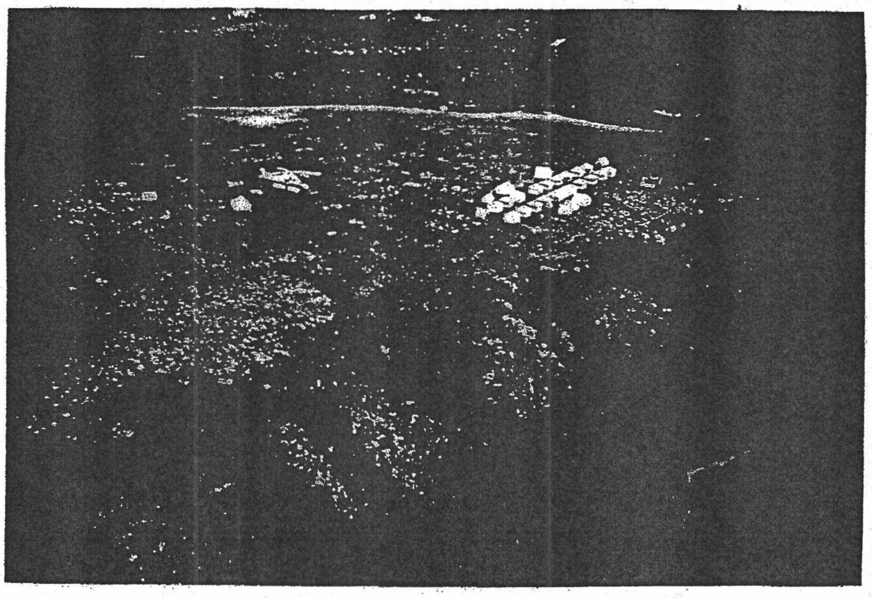


Figure 1. Photograph of the 1959 field camp

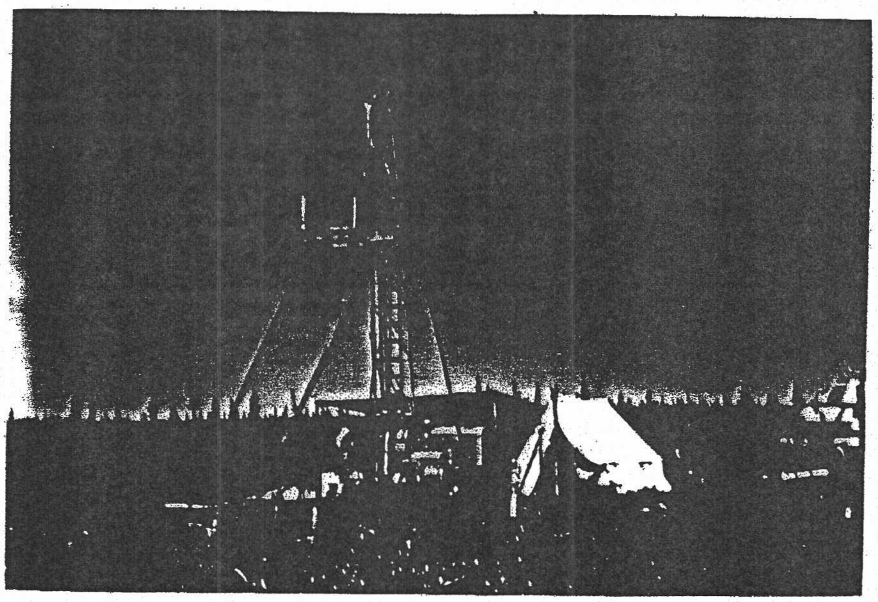


Figure 2. Photograph of Longyear's Model 44 Drill rig on location at the H-13 site.

the tents and for heating water in the shower and kitchen units. Fifteen canvas tents of various dimensions were utilized for general storage, wash-room, toilet, core processing, and generator installations.

Camp personnel consisted of the following men:

1). E. J. Longyear Company (16)

6 drillers
6 helpers
1 drill foreman
1 Sr. counsel (2 weeks in camp)
1 engineer - geologist
1 core splitter

2). Hunting Technical & Exploration Services, Ltd. (6)

3 Jr. operator technicians
1 Sr. operator
1 Jr. geophysicist
1 Sr. geophysicist (2 weeks in camp)

3). Rotor Aids (6)

3 pilots
3 mechanics

4). Universal Services (5)

1 cook
1 assistant cook
3 camp helpers

5). Humble (2)

1 geologist
1 coordinator and project supervisor

Universal Services of Seattle, Washington, furnished the cooks and camp helpers who performed the housekeeping and maintenance duties around the camp.

Outside radio communication was maintained by means of a 100-watt Northern radio-telephone that was leased for the summer. Radio contact between the camp and the drill rigs was accomplished by Motorola FM sets furnished by Humble's Geophysics Research Section. Two gasoline Onan generators of 3 kw capacity furnished electric power for the camp.

Logistics

The major portion of the material and equipment assigned to this project was assembled at Seattle, Washington, and shipped from there to Naknek, Alaska, by an Alaska Freight Lines barge. At Naknek, the cargo was transferred to river barges and shipped up the Nushagak River to the village of Ekwok, located 25 miles south of the campsite. The material was then ferried to the camp area by two Company-owned S-58 helicopters.

The town of Dillingham was the nearest point with scheduled commercial airline service. Incoming passengers, mail and supplies were transported from Anchorage to Dillingham by Northern Consolidated Airlines. They were then transferred to float or amphibian aircraft and flown to a small lake situated 10 miles northeast of the claim area, from which they were brought to the camp by helicopter. The helicopters served as the sole means of transport of personnel and equipment around the claim block.

Upon the completion of the project, the equipment and remaining supplies were loaded aboard a river barge at the village of Koliganek and shipped down the Nushagak River to Dillingham. There the material was received by the Alaska Steamship Company which transported a portion of the cargo to Seward and the remainder to Seattle.

Technical Organization and Equipment

Geophysics - The Hunting Technical and Exploration Services, Ltd., of Toronto, Canada, was contracted to conduct a series of electrical conductivity surveys utilizing the Afmag and Turam methods. Briefly, the Afmag instrument measures the plane of polarization of the audio frequency component of the earth's magnetic field. This varying field is thought to be generated by distant thunderstorms. These audio frequency components are normally polarized in a horizontal plane but are distorted in the presence of a conducting body, such as magnetite, graphite, a base sulfide, or a water course along a fault zone. By measuring such distortions, the Afmag is able to determine the position and size of the conducting body. The Afmag method is generally utilized in a reconnaissance survey.

The Turam unit measures a magnetic field created by passing an alternating current through a large horizontal loop or a grounded cable. A small portable generator is employed to produce the current. The magnetic field is distorted in the presence of a conducting body and components of this distortion are measured by the Turam instrument. This method is used in a detailed survey, since readings must be made at rather small intervals.

In addition to this primary function, Hunting provided a Sharpe A-2 magnetometer and a small Ronka direct-reading refraction seismograph unit for use where warranted.

Hunting's organization consisted of two field crews of two men each and one party chief. The party chief was responsible for interpreting the field observations, planning field procedure and recommending anomalous features for drill locations. One field crew member was classed as a senior operator and was responsible for equipment maintenance and field supervision.

Drilling - The E. J. Longyear Company of Minneapolis, Minnesota, was again contracted to conduct the core drilling program. Longyear was responsible for furnishing two drill units and the personnel to operate them. In addition, an engineer-geologist was furnished to prepare the diamond drill core for analysis, compile the final assays and lithologic descriptions, and submit recommendations relative to the location of drill sites.

Longyear provided two hydraulic gasoline-powered rigs of its own design (see Plate III, Fig. 2). The smaller unit, the Junior Straitline model, which had been held over from the 1958 work, is capable of drilling to 1,200 feet. The Model 44 unit was designed for depths down to 3,000 feet. The Model 44 rig was equipped with a wire-line core barrel which aided both core recovery and drilling progress.

Rock bits and drilling mud were used to drill through the glacial overburden. When ledge (bedrock beneath the fluvial-glacial fill) was encountered, casing was set, and a diamond core bit installed to core the bedrock. Fresh water replaced the drilling mud when coring operations began.

The rigs operated on a 24-hour-a-day, 7-day-a-week drilling schedule. Three 8-hour work shifts were used; each crew was comprised of a driller and a helper. Longyear provided one drill foreman to supervise the drilling personnel and to oversee the maintenance of the rigs.

Sample analysis - Core was subjected to a three-phase field analysis: determination of magnetic polarity and intensity, visual examination, and measurement of specific gravity for estimation of magnetite content.

Magnetic polarity and intensity were readily determined with a Brunton compass. Visual examination was by hand-lens, and the observed mineralogic, textural, and structural features were compiled in lithologic logs (Appendix A). Specific gravities were measured by means of a beam balance and graduated cylinder.

Visual estimation of magnetite content was found to be impractical, and field estimates were based on the specific gravity of the core. Curves for determination of magnetite content from specific gravity were progressively corrected as assay data were received. The later, most accurate curves assumed a specific gravity of 5.1 for magnetite and 3.3 for the average gangue.

After field examination and description, the core was split lengthwise. One-half was shipped to Humble's Research Center in Houston and the remaining portion was sacked according to drill "runs" and shipped to the H. T. Caddy laboratories. Caddy prepared composite samples of 50-foot intervals and assayed them for total iron content. Selected composites and individual samples were subjected to magnetic iron-concentration tests with a Davis magnetic tube. Samples for selected intervals were also assayed for copper, zinc, titania, and cobalt.

A cursory petrographic study was made by Richard Bray of each of the rock types encountered in the intrusive. J. D. Martinez and Alex Frasch of Humble's Research Section measured the magnetic properties of selected samples, and Vernon Porter, also of the Research Section, conducted spectrographic tests on six core samples.

Electric logging - a portion of all the drill holes, with the exception of H-15 and H-17, was logged electrically by means of a Widco logging unit. This unit, built by the Well Instrument Development Corporation of Houston, Texas, was designed for depths to a thousand feet. For our purpose, the instrument was modified so that depths to 2,000 feet could be logged. The Widco unit furnished both a resistivity and self-potential curve. (See electric logs in Pocket).

Results

Geophysical

Magnetics - The magnetic anomaly over the investigated intrusive is one of the world's most intense. As measured by both aerial and ground surveys it ranges over 35,000 gammas above regional values.

The observed anomaly is the resultant of two components: an induced magnetism and a remanent magnetism. The induced magnetism is directly dependent on the magnetite content of the intrusive and its direction is that of the earth's field. The intensity and direction of the remanent magnetism is dependent on the consolidation and post-consolidation history of the intrusive. It is important to consider both the intensity and the direction of the remanent magnetism, for if its contribution to the total magnetism is negligible, the anomaly cannot be explained by the magnetite concentration thus far observed and richer grade ore must be present.

By field determination, the polarity of the remanent magnetism was found to be homogeneous with the north-seeking pole downward, and with no reversals. Laboratory measurements on samples from both the 1958 and

1959 drilling indicate that the remanent magnetism is four to five times as strong as the induced, and the dip of the remanent vector is nearly parallel to that of the induced. There is a possibility, however, that some of the measured samples from the 1958 drilling may have been re-magnetized by a hand-magnet used in logging magnetite content. In addition, J. D. Martinez of Humble's Research Section found that eight samples from drill hole H-9 were axially magnetized, apparently by the drilling. Either of these events would, of course, render the measurements of remanent magnetism unreliable. Even as tempered by these latter findings, the average of the earlier measurements probably should be accepted as fairly accurate in view of their relative consistency. Under the depicted conditions, therefore, a mass containing about 15 percent magnetite could well be accepted as having caused the observed anomaly. The data cannot, however, categorically rule out the possibility of richer ore at depth, or laterally.

Electromagnetics - Two Afmag units, designed for rapid reconnaissance coverage, were employed at the beginning of the project. However, the signal strength of the earth's magnetic field was too weak in the project area for accurate measurement. An attempt was then made to use the Afmag instruments to measure the direction of the artificial field generated in the Turam loop arrangement. This method was not successful due, in part, to the presence of the large magnetic intrusive which distorted the field in such a manner as to make detection of smaller conducting bodies impossible. Approximately thirty-six miles of line were surveyed with the Afmag units in the northern portion of the claim area before this method was abandoned.

One Turam unit was initially furnished by Hunting for the purpose of detailing any promising anomalies detected by the reconnaissance Afmag equipment. When the Afmag method proved unsuccessful, an additional Turam instrument was acquired in order to expedite the electromagnetic coverage of the claim area. The Turam method required rather close and accurately placed intervals of measurement along a grounded cable or rectangular loop arrangement. Therefore, more time was required than originally anticipated to complete the coverage of the project area by the Turam units.

Eighteen anomalies were detected by Turam on the claim block, none of which were graded higher than "weak" or "doubtful" by the Hunting interpreters. It is significant that none of the anomalies were interpreted as being caused by base sulfides.

The probable causes of the "weak" to "doubtful" anomalies were classified into four categories by the Hunting report (1959).

1). Anomalies due to the conductivity of the major magnetic bodies.

2). Anomalies caused by electrolytic action along fault or shear zones.

3). Anomalies caused by conductivity of magnetite bearing "black" sands, deposited off the main magnetite bodies.

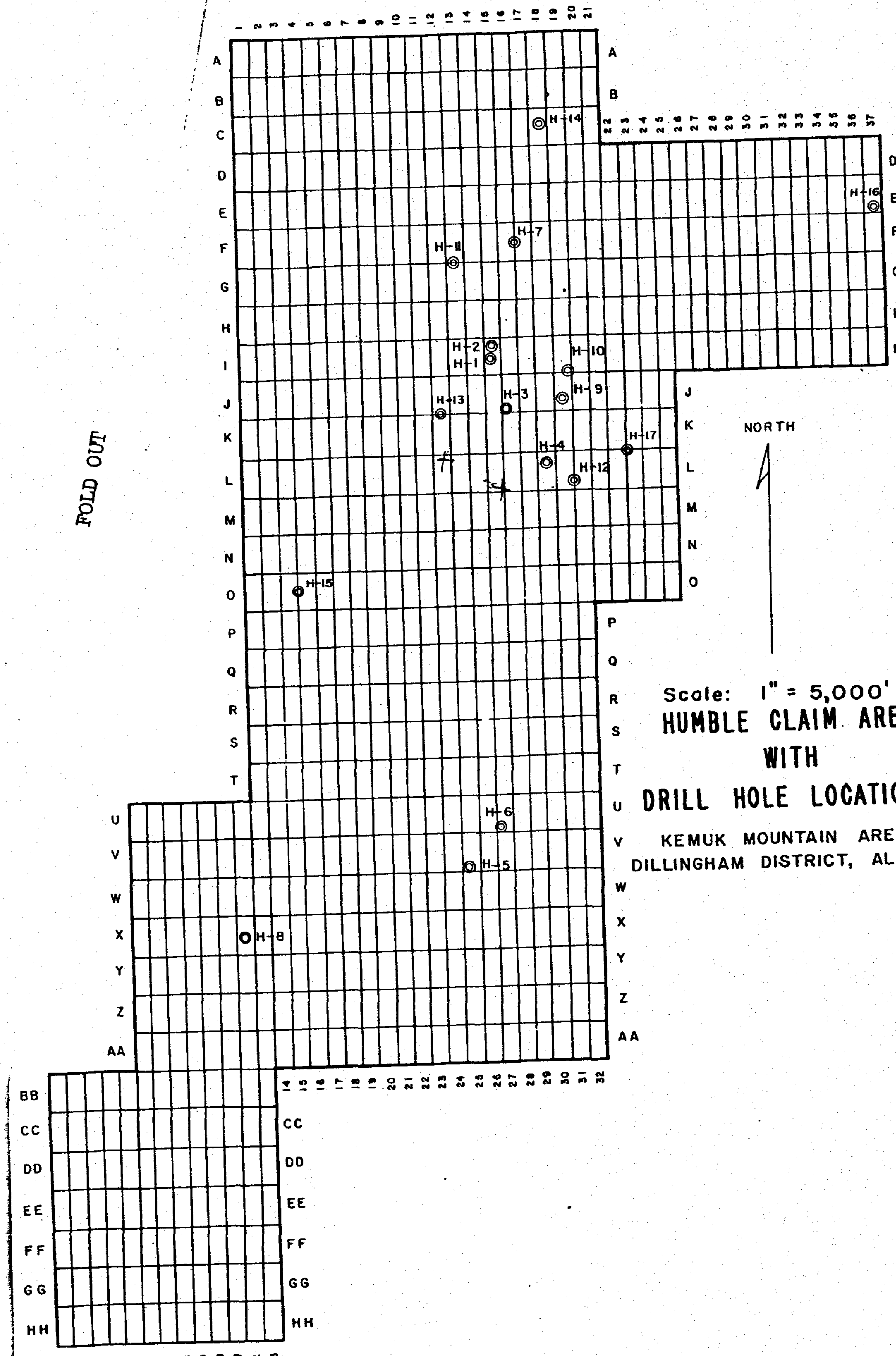
4). Anomalies due to the effects of an increase in the thickness of the overburden.

Drill holes H-10 thru H-16 were located wholly, or in part, on the Turam anomalies. Two grounded cable reconnaissance surveys were extended beyond the western and eastern margins of the claim block for a distance of three miles. This was done in an effort to locate a mineralized contact zone between the intrusive and the country rock. No anomalies were detected on these surveys.

Refraction seismograph - As the drilling program developed, it became apparent that the boundary of the intrusive could not be definitely established by interpretation of the magnetic or electromagnetic results. A refraction seismograph survey was therefore attempted in the hope that, if distinct velocity contrasts existed between the intrusive and the surrounding country rocks, this method could detect them, and a determination of the intrusive boundary could be made. Unfortunately, the small Ronka instrument was designed for single layer, shallow refraction work and was not suitable for the multiple layer problems which were encountered in the project area. This approach was therefore abandoned.

Drilling

Eleven holes, ranging in depth from 500 to 2000 feet, were drilled during the 1959 program. The total footage was 9144.5 feet, 6335.5 feet of which were drilled below the fluvial-glacial overburden. Core recovery was good, averaging more than 75 percent. Depth to bedrock ranged from 90 to 460 feet. A map of the pre-glacial, bedrock surface which is presented in Plate IV-B shows that the magnetite pyroxenite phase of the intrusive tends to form topographic "highs". Elevations shown on the map are sub-datum (zero datum is the collar of drill hole H-2). Significant drill hole intercepts are shown on Plate IX (in pocket) and in Table I.

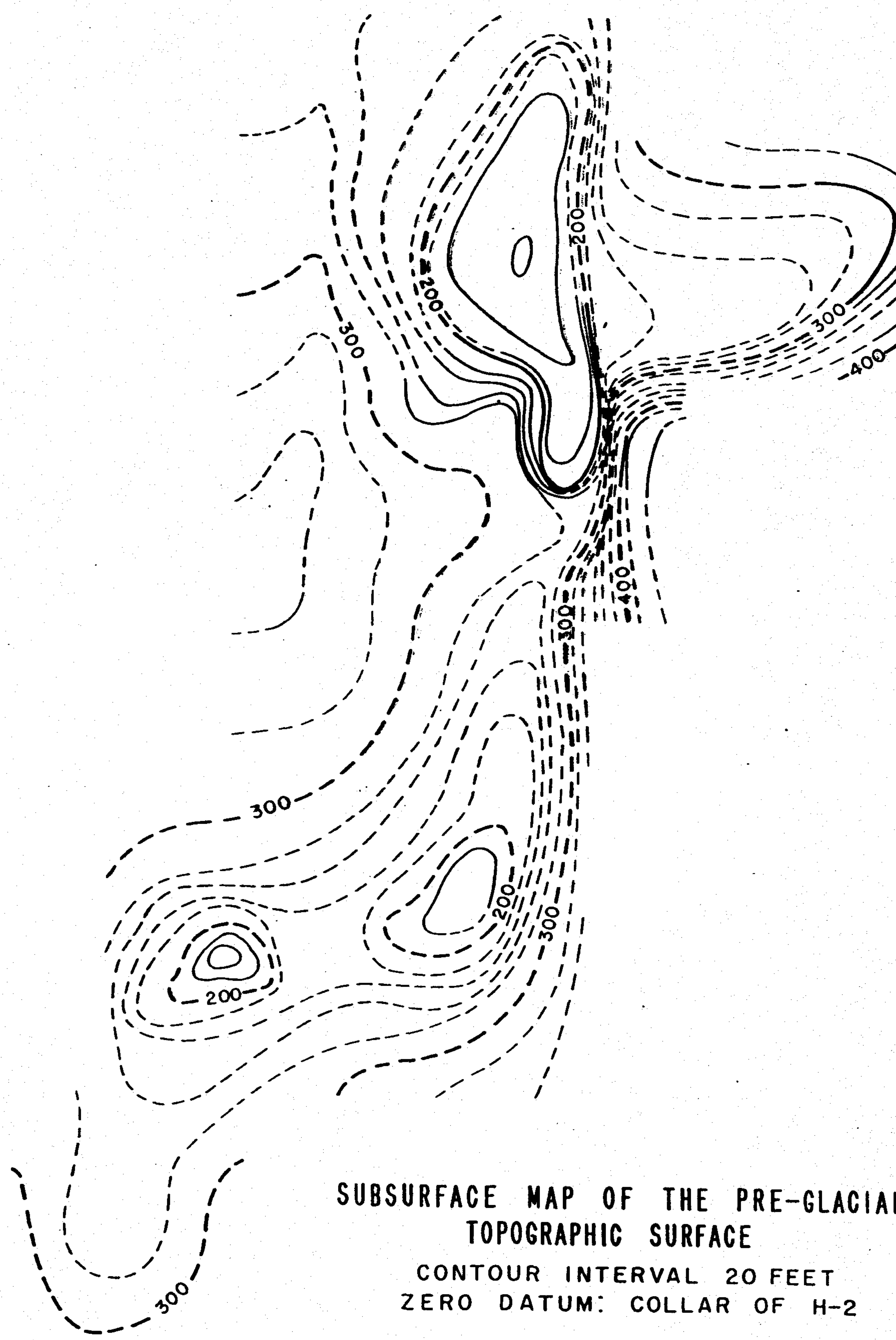


Scale: 1" = 5,000'

HUMBLE CLAIM AREA WITH DRILL HOLE LOCATIONS

KEMUK MOUNTAIN AREA
DILLINGHAM DISTRICT, ALASKA

B



SUBSURFACE MAP OF THE PRE-GLACIAL TOPOGRAPHIC SURFACE

CONTOUR INTERVAL 20 FEET
ZERO DATUM: COLLAR OF H-2

c

TOTAL MAGNETIC INTENSITY ANOMALY

1000 GAMMA UNITS

CONTOUR INTERVAL : 5000 GAMMAS

D

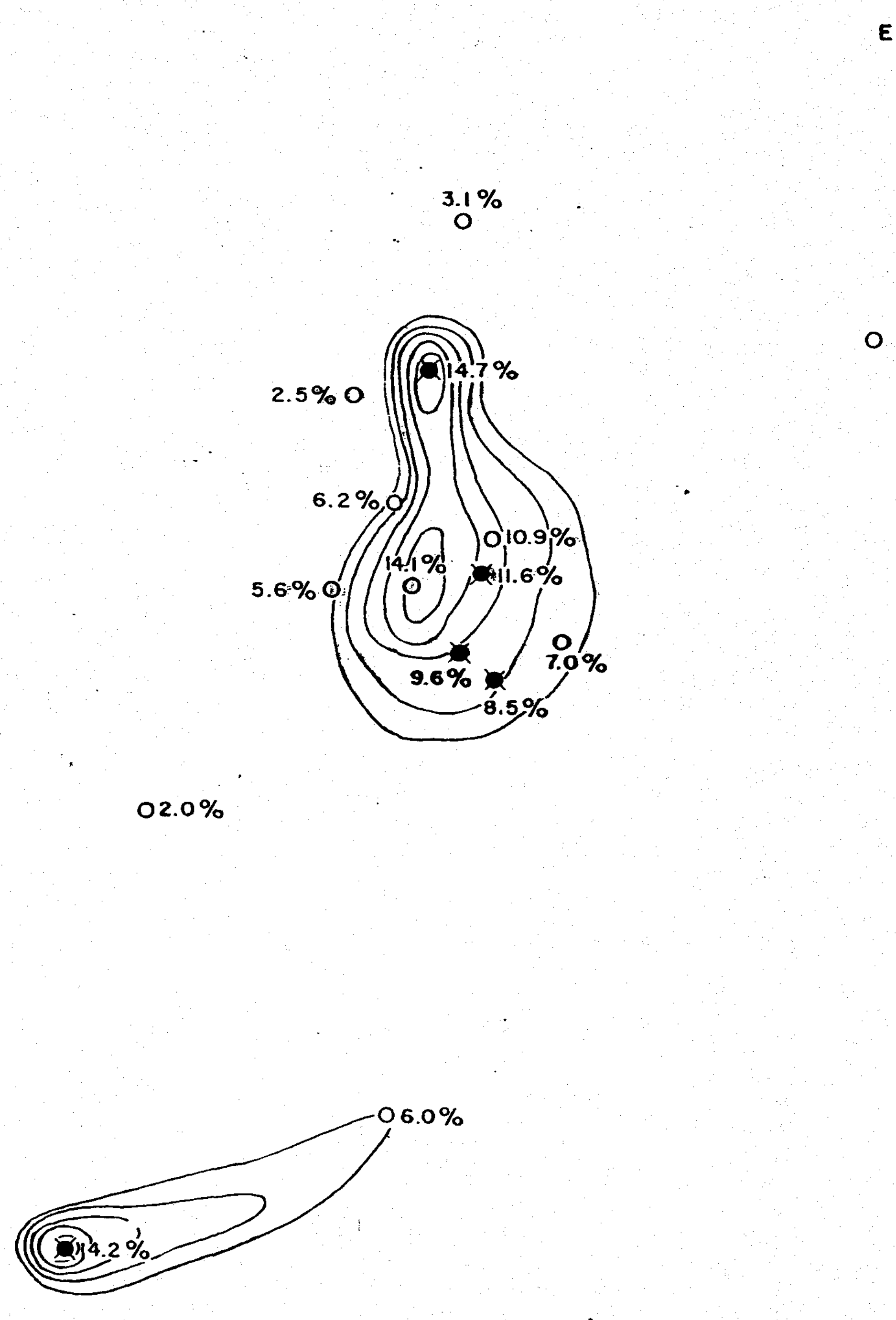
CONDUCTION ANOMALIES INDICATED BY TURAM

LEGEND

) LINE-UP OF ANOMALIES

CONDUCTING ZONE

OVERBURDEN EFFECTS



MAGNETITE AND COPPER OCCURRENCE

MAGNETITE PERCENTAGE AVERAGED FROM LEDGE TO TOTAL DEPTH AND CONTOURED AT AN INTERVAL OF 2% (ABOVE 6%)

● DRILL HOLE WITH TRACES OF COPPER MINERALS

Table I.

DRILLING INTERVAL (FEET)	FEET SAMPLED	PERCENT TOTAL IRON	PERCENT MAGNETIC IRON	PERCENT OF TOTAL IRON AS MAGNETIC IRON	PERCENT MAGNETITE	LITHOLOGY OR CHARACTER OF INTERVAL
375 - 400	25	6.89	2.28	33	3.2	Pyroxenite
375 - 487	112	11.80	7.30	62	10.1	Pyroxenite and magnetite pyroxenite
390 -1002	612	15.23	10.16	67	14.1	Magnetite pyroxenite (Total hole below overburden)
315 - 468	153	13.37	6.95	52	9.6	Magnetite pyroxenite (Amphibole - rich)
583 - 687	104	10.22	(5.6)*	(55)	(7.8)	Pyroxenite & magnetite pyroxenite
151 -2000	1849	15.56	(10.6)	(68)	(14.7)	Magnetite pyroxenite (Total hole below overburden)
222 - 402	180	16.36	(11.5)	(70)	(15.9)	Magnetite pyroxenite
402 - 500	98	12.57	(6.3)	(50)	(8.7)	Gabbro
550 - 576.5	26.5	19.37	(13.9)	(72)	(19.4)	Magnetite pyroxenite
222 - 576.5	354.5	15.76	(10.2)	(65)	(14.2)	Total hole below overburden
230 - 454.5	224.5	11.64	(6.1)	(52)	(8.4)	Gabbro
454.5-1751	1296.5	15.90	(9.9)	(62)	(13.7)	Magnetite pyroxenite (with amphibole-rich zones)
1373 -1380	7	29.65	25.43	86	35.4	Magnetite pyroxenite (Magnetite-rich zone)
1751 -1949	198	13.45	(7.0)	(52)	(9.7)	Gabbro with some pyroxenite
1949 -2000	51	16.15	10.19	63	14.2	Magnetite pyroxenite
230 -2000	1770	14.17	(8.4)	(59)	(11.6)	Total hole below overburden
201 - 532	331	14.24	(7.9)	(55)	(10.9)	Magnetite pyroxenite (Amphibole-rich)
159 - 500	341	5.21	(1.8)	(35)	(2.5)	Pyroxenite (Total hole below overburden)
254 - 600	346	12.20	(6.1)	(50)	(8.5)	Gabbro (Total hole below overburden)
350 - 668	318	7.59	(4.0)	(53)	(5.6)	Pyroxenite and magnetite pyroxenite (Total hole below overburden)
91 - 500	409	6.32	(2.2)	(35)	(3.1)	Pyroxenite (Total hole below overburden)
470 - 637	167	5.38	(1.4)	(25)	(2.0)	Pyroxenite (Total hole below overburden)
460 - 530	70	11.99	5.01	42	7.0	Magnetite pyroxenite (Amphibole rich)

I: Assayed and calculated iron content of significant drill-hole intercepts.

:ntages in parentheses are not directly assay determined but are calculated (see page 14).

Sample Analysis

Field examination - Detailed logs for each drill hole, tabulating drilling data, core recovery, sludge character, core lithology, and structural data, were prepared in the field (Appendix A). Field estimates of magnetite content based on the specific gravity of the core were found to be more reliable than those based on visual examination. The initial field estimates were visual, and thus were stated as percent by volume. Though the specific gravity method later replaced the visual, estimates continued to be stated as percent by volume for consistency. Assays are, of course, weight determined, and are stated as percent by weight. The magnetite percentages listed in the lithologic logs are, therefore, less than the assay results, as percent magnetite by volume is equal to percent magnetite by weight times a factor of about 0.7.

Assays - The complete assay results for the 1959 drilling are presented in Appendix B. In Table I, the iron assay results from both the 1958 and 1959 drilling are grouped and averaged for significant drill hole intercepts. Percentages in parentheses are not directly assay determined, but are calculated from the assayed average total iron content of the intercept in the following manner: 1). All assays for magnetic iron are classified and grouped according to lithology or rock type. 2). An average ratio of magnetic iron content to total iron content is calculated for each lithology. 3). From these ratios, a ratio is calculated for each of the intercepts chosen for Table I according to the lithologies represented in the intercepts. 4). Percent magnetic iron is calculated as this ratio times the average percent total iron in the intercept, and is divided by 0.72 to obtain the percent magnetite (magnetite is 72 percent iron). The table shows the early, pyroxenite phase of the intrusive, which occupies the bulk of the claim block (see Plate IX), to average only 5 to 6 percent total iron with 1 to 1.5 percent magnetic iron or 2 to 2.5 percent magnetite. As described later (page 18), the pyroxenite is cut by a sheet-like mass of magnetite pyroxenite. The sheet of magnetite pyroxenite is the most magnitiferous phase of the igneous complex, and its western portion is richer in magnetite than its eastern. Short intercepts of relatively pure magnetite pyroxenite in the western portion of the sheet average 18 to 20 percent total iron, with 13.5 to 15 percent magnetic iron or 19 to 21 percent magnetite. In mineable thicknesses of 50 feet or more, dilution by later dikelets of gabbro and andesite lowers the averages to 15 to 17 percent total iron, with 10.5 to 12 percent magnetic iron or 14.5 to 16.5 percent magnetite. The eastern portion of the magnetite pyroxenite sheet averages 13.5 to 15 percent total iron, with 7.5 to 8.5 percent magnetic iron or 10.5 to 12 percent magnetite. The gabbro averages 11 to 13 percent total iron, with 5.5 percent to 6.5 percent magnetic iron or 7.5 to 9 percent magnetite. The richest drill hole intercept, at 1,373 to 1,380 feet in H-9, averages 35.4 percent magnetite. Even though diluted by late dikelets, the 26-foot zone at the bottom of H-8 averages 19.4 percent magnetite.

Traces of copper minerals were noted in drill hole H-4 during the 1958 drilling and in drill holes H-7, H-8, H-9, and H-12 during the 1959 drilling. All zones with visible copper minerals were assayed for copper. The best sample from each of these holes assayed as follows:

1). H-4, 439 to 464 feet - 0.05% copper

2). H-7, 1744 to 1759 feet - less than 0.01% copper

3). H-8, 228 to 235 feet - 0.04% copper

4). H-9, 1971 to 1975 feet - 0.17% copper

5). H-12, 254 to 401 feet - less than 0.1% copper

All the copper assays are too low to be of economic interest. Samples from drill hole H-9 with visible sphalerite assayed only 0.01 to 0.025 percent zinc.

Concentration tests - Stipulating that a marketable concentrate of the ore should contain at least 65 percent iron and assuming that only 90 percent of the magnetite is recoverable in the concentrates, sampled portions of the magnetite pyroxenite intrusive would require the following concentration ratios:

1). Average mineable thicknesses in the western part of the intrusive (samples from H-3, H-7, and H-8) would yield an "ore" requiring 6.3 tons of crude to produce one ton of concentrates.

2). The 26-foot zone at the bottom of H-8 would require a 5 to 1 concentration ratio.

3). The seven-foot, magnetite-rich zone at 1373 to 1380 feet in H-9 would require a 2.8 to 1 ratio.

4). "Ore" from the eastern portion of the intrusive (samples from H-4, H-10, H-17, and part of H-9) would require a 9 to 1 concentration ratio.

Representative concentrates from the 1958 drilling (Longyear Report March 1959) were found to contain acceptably low quantities of silica (2 to 3 percent) and phosphorus oxide (0.005 to 0.016 percent), but an objectionable amount of titania (2 to 3 percent).

Electric Logging

An examination of the Widco electric logs obtained from the drill holes revealed the following data:

1). A good correlation existed between the resistivity curves and the magnetite percentages found in the intrusive. Similarly, a close correlation was found between the resistivity curves and the specific gravity of the cores as determined in the field. (See Plate V, Fig. 2).

2). In drill holes where shear zones were encountered, the resistivity curve correlated well with the lithologic log and the specific gravity curve in depicting these zones. (See Plate V, Fig. 1).

Geology and Petrogenesis

The investigated intrusive is a composite of lithologic units which have apparently been derived from a single ultrabasic magma source. Pyroxenite (a coarse-grained igneous rock consisting primarily of the mineral pyroxene with minor magnetite, amphibole, biotite and apatite) is the first intrusive phase and forms the bulk of the intrusive. It is succeeded by magnetite pyroxenite (coarse-grained, consisting primarily of pyroxene and magnetite with minor amphibole, biotite, apatite, and rarely some plagioclase feldspar), gabbro (coarse-grained, consisting primarily of pyroxene and plagioclase feldspar with minor magnetite, amphibole and biotite), and andesite (fine-grained, consisting primarily of plagioclase feldspar, pyroxene and amphibole with minor magnetite). Only the magnetite pyroxenite merits consideration as a possible source of iron ore. Minor traces of copper minerals were noted in all of the rock types but the early pyroxenite.

Figure 1: DRILL HOLE 11

(Pyroxenite with little magnetite) Resistivity lows opposed by specific gravity lows are zones of shearing & crushing.

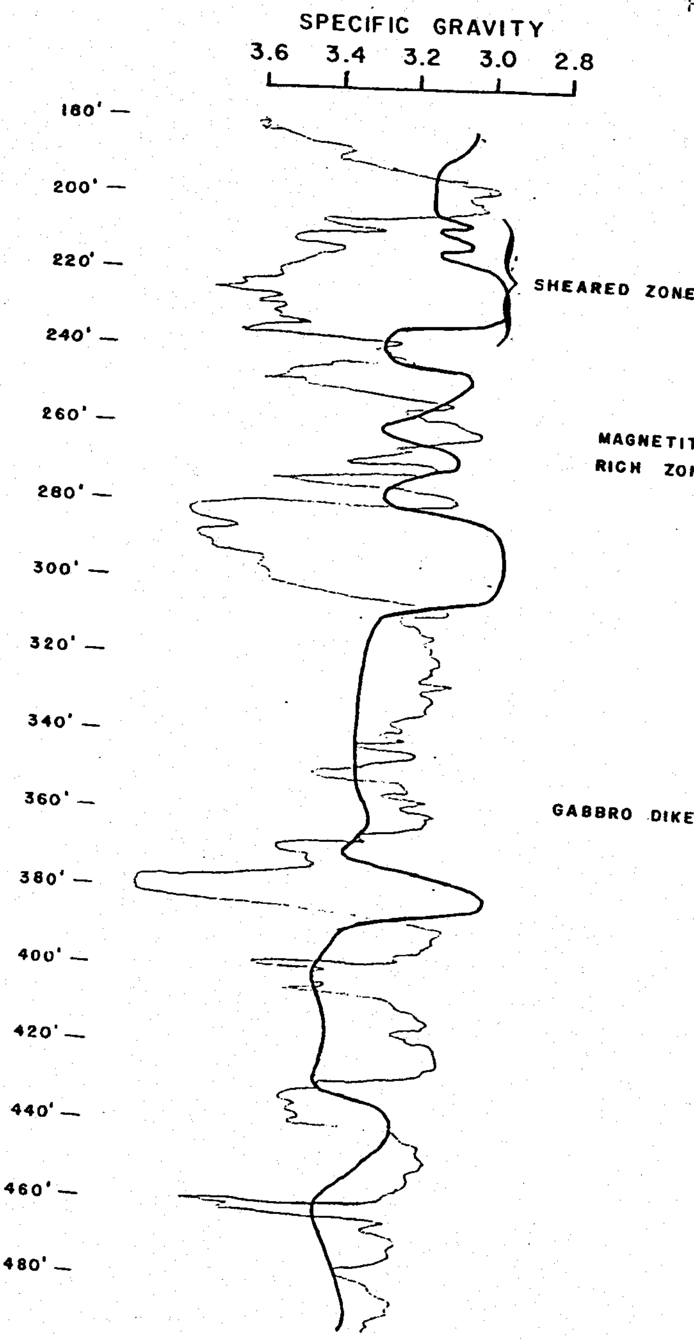
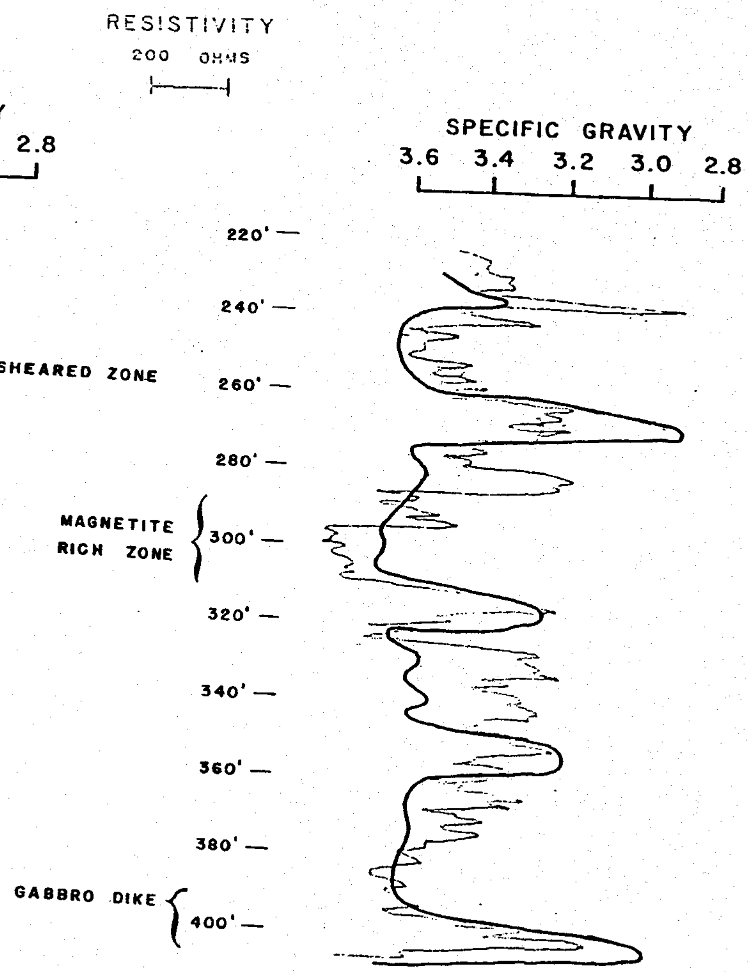


Figure 2: DRILL HOLE 8

(Magnetite pyroxenite with gabbro dikes) Resistivity lows with specific gravity highs are magnetite-enriched zones. Resistivity highs with specific gravity lows are dikes of gabbro or andesite.



TYPICAL RESISTIVITY-SPECIFIC GRAVITY LOGS

Geologic History

The intrusion of the igneous complex, probably in late Cretaceous to early Tertiary, was at considerable depth into siliceous sediments which closely resemble the Cretaceous sediments bordering the Nushagak lowland to the west and to the northeast. The magnetite pyroxenite, which may reflect the habit of intrusion of the whole igneous complex, was probably injected as a nearly horizontal, sheet-like mass. Post-intrusion regional tectonism uplifted, tilted and faulted the mass. It was stripped of its cover of sediments and bared to erosion by late Tertiary. Fluvial sorting of pyroxenite debris may have formed a few sinuous magnitiferous sand deposits on and near the exposed intrusive. Thin patches of very fine-grained sediments encountered in drill holes H-4, H-7, and H-17 bear some resemblance to the tuffs interbedded in the Quaternary-Tertiary volcanic series east of the Nushagak River (Plate II), but may be of loess-type, deposited with the Quaternary fluvial-glacial sediments which have innundated the area.

Size and Structure of the Intrusive

The pyroxenite phase of the intrusive has an areal extent of at least 25 square miles, and occupies the major portion of the claim block. Data are insufficient to delineate its northern, western, or southern limits.

The magnetite pyroxenite is intrusive into the earlier pyroxenite. It is a sheet-like mass which dips steeply to the east or southeast at an angle of at least 45° and possibly more than 60°. The east dip was suggested by Dr. Paterson in his interpretation of the magnetics (February, 1959), and is substantiated by the distribution of hydrous silicates or water-containing silicates (amphibole, biotite, etc.) in the mass. The hydrous silicates, which tend to form in the upper portion of an intrusive, show a gradual increase in concentration toward the east. The top of the sheet must, therefore, be its eastern margin, and its dip must be to the east (see Plate VI). Across the main magnetic high, the magnetite pyroxenite sheet is at least 4,000 feet thick and extends to undetermined depths. It underlies an area of at least four square miles.

Gabbro intrudes both the pyroxenite and the magnetite pyroxenite as steeply dipping dikes as thick as 500 feet. Dikes of andesite are of random attitude and are only a few inches to a few feet in thickness.

Both the magnetic and the electromagnetic data depict a set of parallel faults trending northwest through the claim block. Where intersected by the drill holes, the faults are steeply dipping (average 70°-75°) with essentially horizontal, right-lateral displacement (the north block has moved eastward relative to the south block).

Petrogenesis

Crystallization of the magma - The first magma phase (normal pyroxenite) is characterized by a relatively low total iron content (av. 5 to 6 percent) and by crystallization under reducing conditions which inhibited precipitation of iron oxides (magnetite). Its magmatic crystallization was almost entirely of two types of pyroxene minerals: an early pyroxene which contained one to two percent excess iron and titanium in solid solution and a later, diopsidic or calcium-rich pyroxene. An exsolution or unmixing of the excess iron and titanium from the early pyroxene formed sooty-black patches of an intergrowth of pyroxene and magnetite-ilmenite. The exsolution probably took place during the precipitation of the second, diopsidic pyroxene. This second pyroxene is found in all of the phaneritic or coarse-grained rocks of the igneous complex, confirming their common origin.

The second magma phase (magnetite pyroxenite) probably intruded before the earlier pyroxenite had completely solidified, in a manner similar to that suggested by Ruckmick and Noble (1959) for the Union Bay ultrabasic complex near Ketchikan. Pre-intrusion differentiation increased the total iron content of the magnetite pyroxenite magma to 18 to 20 percent and produced a crystallization environment that was sufficiently oxidizing to to precipitate an average of 20 percent magnetite (see page 15) in the lower portion of the intrusive sheet. The magnetite was apparently later than most of the pyroxene as it occurs in the interstices between the pyroxene crystals. On the other hand, much of it was earlier than the hydrous silicates (amphibole, biotite, etc.) as its concentration decreases with the increasing amount of hydrous silicates in the upper portion of the intrusive.

A change in the differentiation trend of the magma from iron-enrichment to silica-enrichment can be traced through a sequence of rock types transitional from magnetite pyroxenite to gabbro. The transitional sequence shows that the magnetite pyroxenite and gabbro are genetically related, and contact relationships show that the gabbro is the later of the two. The last intrusive phase, andesite, was relatively late, probably after removal of a large part of the cover of sediments. Dikelets of andesite are ubiquitous and effectively lower the average magnetite content of mineable intervals of the magnetite pyroxenite.

Concentration of magnetite - Magnetite content increases toward the western or lower portion of the magnetite pyroxenite intrusive (see page 15). Though the total iron content is high in the eastern portion, almost 50 percent of it is tied up in silicate minerals and is nonrecoverable. As stated above, magnetite crystallized late, in the interstices of a network mesh of earlier crystals. Magnetite-rich zones such as at 1,375 feet in drill hole H-9 are probably lens-like and represent injections of the late, iron-rich residue of the magma along shears in the semi-rigid crystal network. Gravity settling of this iron-rich residue through the crystal mesh may partly explain the concentration of magnetite toward the base of the intrusive.

Several of the drill holes encountered possible magnitiferous sands directly overlying the intrusive. Estimates of the magnetite content of these sands are as high as 70 percent, but they are based on drilling sludges only and their validity is very questionable. These "black sands" may be sufficiently conductive to cause some of the electromagnetic anomalies, but they are considered as too deep and too thin to be of economic interest.

Distribution of copper minerals - Copper minerals were found associated only with the last three phases of the intrusion (magnetite pyroxenite, gabbro, and andesite). Chalcopyrite (sulfide of copper and iron) is both primary, deposited by medium to high temperature hydrothermal solutions, and secondary, deposited by circulating ground water. Native copper is secondary, deposited by cold water under reducing conditions. Unfortunately, there is little tendency for the copper minerals to concentrate. They are finely disseminated in quantities that are far from economic.

Graphic Representation of the Intrusive

The authors' interpretation of the geology of the intrusive is presented in two cross-section views (Plates VI and VII) and one plan view (Plate IX). Since this is an interpretation, its validity should be judged in the light of the data on which it is based. It embodies the following hypotheses, which are listed along with their substantiating data:

1). The intrusive is cut by a parallel set of faults which strike northwest, dip steeply to the south, and have nearly horizontal, right-lateral displacement. The fault locations, trends, and relative displacements are suggested by Dr. Paterson in his interpretation of the magnetics. The indicated dip of the faults and the direction of movement are based on the average attitude of shear planes and striations in core samples from the fault zones. The south dip is indicated by the shape of the electromagnetic fault anomalies.

2). The magnetite pyroxenite is intrusive into the earlier pyroxenite. This is indicated by the contact relationships. The pyroxenite is cut by offshoot dikes from the main magnetite pyroxenite mass.

3). The magnetite pyroxenite intrusive is a sheet-like mass which dips steeply to the east or southeast. This is indicated by the distribution of hydrous silicates and magnetite in the intrusive, and by Dr. Paterson's interpretation of the magnetics.

4). The configuration of the magnetic anomaly is a valid reflection of the lithology of the intrusive and may be used to locate approximately the contact between the pyroxenite and the magnetite pyroxenite. This is indicated by the field and laboratory tests of the magnetic properties of the core samples. Though remanent magnetism contributes substantially to the observed total magnetic anomaly, its polarity and direction are fairly homogeneous, and the configuration of the anomaly is directly dependent on the magnetite content of the intrusive and on the depth of the overburden.

5). The main gabbro dike encountered in H-10, H-9, and H-12 (Plate VI) strikes slightly west of north and dips steeply to the east. The attitude of the dike was measured in portions of the core that were in and adjacent to fault zones. The core was oriented by aligning shear planes parallel to the strike of the fault as indicated by the magnetic and electromagnetic data.

6). The gabbro dike encountered in H-8 (Plate VII) strikes northwest and dips steeply to the west. Orientation was determined by the technique described above.

7). The set of dikes encountered in H-13 (Plate VI) strike north and dip at a low angle to the west. The dip measured in the core is in the opposite direction to that of the dikes of magnetite pyroxenite which are assumed to dip back toward the main parental mass of magnetite pyroxenite.

8). Magnitiferous sands overlie the intrusive as sinuous, lens-like bodies which trend north-south (Plate IX). The sands were encountered in several of the drill holes. The extent and trend of the deposits is shown by the electromagnetic data.

Economic Considerations

Economic Evaluation

Economic evaluation of the Humble prospect involves the following considerations:

1). As a basis for comparison, the combined cost of underground mining and beneficiation of Minnesota iron ore averaged $7.08 per ton in 1957, and the cost of open-pit mining and ore beneficiation averaged $3.68 per ton (Longyear Report, October 1959). As the investigated intrusive lies beneath 90 to 460 feet of overburden, its mining probably would be by underground methods. Ore requiring a concentration ratio of 2 to 1 to produce a marketable concentrate containing 65 percent iron would cost $14.16 per ton of concentrates at Minnesota's underground mining rates. Costs in Alaska, however, could be up to 50 percent higher than those in Minnesota. Although involving higher capital outlay, handling of large tonnages by intense mechanization could appreciably lower the mining and milling costs. Through a mechanization program in the iron mines at Kiruna, Sweden, underground mining is economically replacing open-pit mining.

2). The cost of transporting concentrates from the mill site to the market would be on the order of $2.28 per ton to San Francisco and $4.05 per ton to Tokyo (based upon data from Humble Traffic Department).

3). The selling price of Bessemer-grade concentrates (low phosphorous content, 65 percent iron) is $14.64 per ton at Lake Erie. A somewhat higher price might be expected for similar concentrates from buyers in the Pacific Region. Concentrates from the investigated prospect would command a price premium for their low phosphorous content, but would incur some price penalty for high titanium content.

In the light of the above data, ore from the investigated prospect should contain at least 36 percent magnetic iron (require no more than two tons of crude to produce one ton of concentrates) to be mined profitably at this time. As stated earlier, mineable thicknesses of magnetite pyroxenite in the western portion of the intrusive average 10.5 to 12 percent magnetic iron (require a 6.3-to-1 concentration ratio), but the magnetite content of the intrusive appears to increase westward. The magnetite enrichment may not be sufficient to produce ore of 2-to-1 concentration grade, but it could well produce an ore zone of 3- or 4-to-1 concentration grade along the entire western margin of the intrusive sheet. A long-term view of the iron ore economics of the Pacific Region suggests that such an ore might be mineable at a profit at some time in the future (i.e. 20 years). The western United States and Japan provide a large and steadily increasing demand for iron ore. To meet this demand, deposits are being developed in Chile, Western Canada, and Southeastern Alaska (the Alaskan deposits are ultrabasic intrusives that are strikingly similar to the investigated igneous complex, but they are well exposed and located near tidewater). The estimated total reserves in iron ore deposits which are tributary to the Pacific Region, however, are relatively low. This combination of dwindling reserves and increasing market demands, along with cost-reducing technological advances in mining and milling of iron ore could substantially improve the competitive position of the investigated prospect.

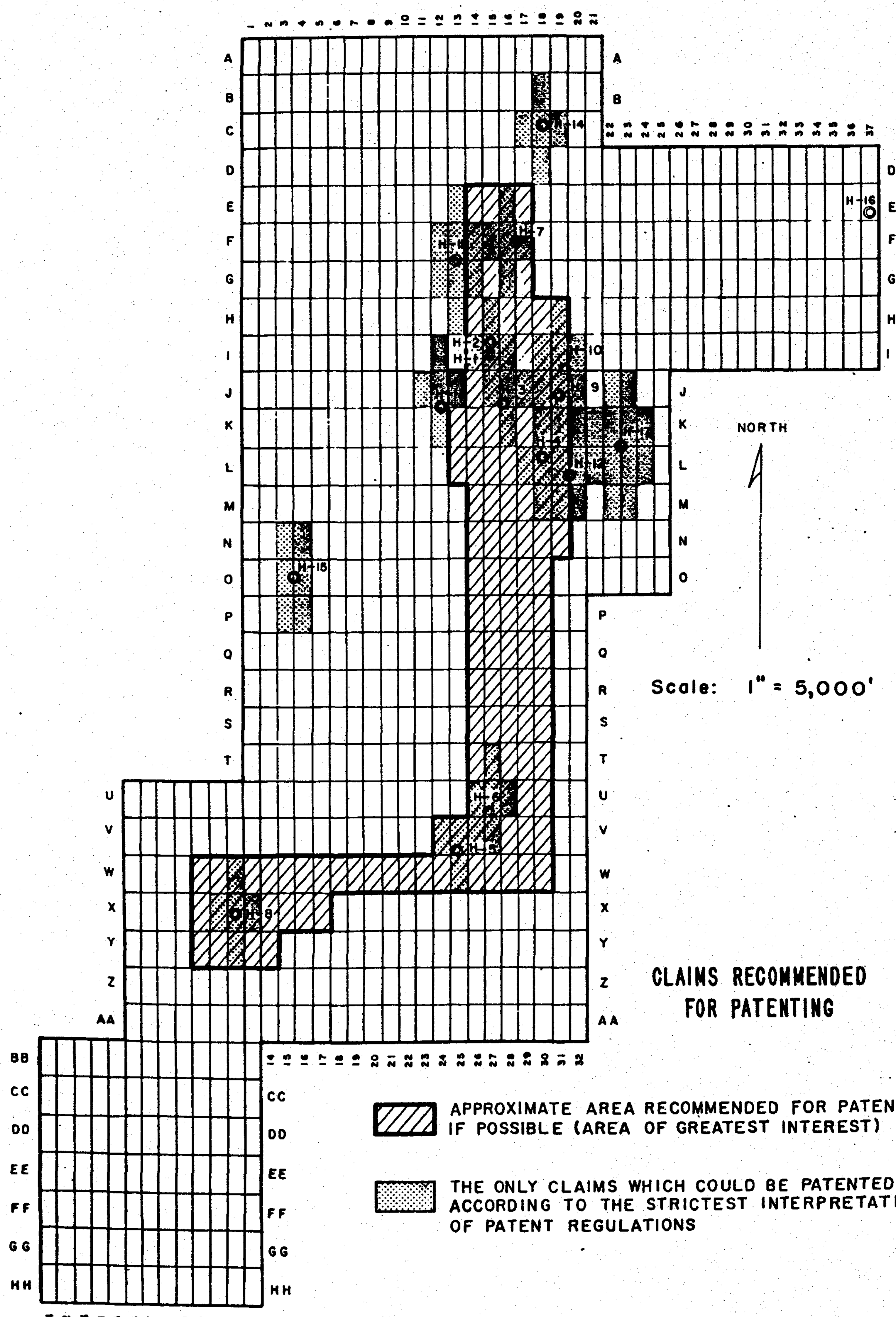
Claim Retention

The money expended in two seasons' work in the prospect area should be applied toward the retention of those claims staked over the area of greatest interest. This action will protect the Company's investment if an outside firm shows an interest in further development of the area. There are two methods by which these claims can be retained:

1). The fulfillment of the work assessment requirement of the Mining Law.

2). Claim patenting.

To fulfill the work assessment requirement, a minimum of $100 must be expended in labor or improvements per claim per year. The Mining Law allows the expenditure for labor or improvements on one claim to apply to the contiguous claims, i.e. those having a common boundary (not a common corner), as long as the expenditure is equal to $100 for each of the claims involved. It must be shown that such expenditure will benefit all claims involved and that they will be developed as a group. Recent changes in the Mining Laws permit geophysical work to be considered as labor and improvements to fulfill the annual work assessment requirement. The alternative, or claim patent procedure, requires that $500 in labor and improvements be expended per claim in order to obtain a patent. According to the strictest interpretation of patent regulations, only those claims which have been drilled and their contiguous claims can be patented (see Plate VIII). If geophysical work is considered as valid claim development, its cost may be included in the expenditure necessary for patenting, and any or all of Humble's 815 claims could be patented. The authors, however, would recommend patenting of only 133 claims in the area of greatest interest (Plate VIII). Based on our interpretation of the Mining law (Charles C. Keeble, personal communication), the first assessment year for Humble's claims



CLAIMS RECOMMENDED FOR PATENTING

APPROXIMATE AREA RECOMMENDED FOR PATENTING IF POSSIBLE (AREA OF GREATEST INTEREST)

THE ONLY CLAIMS WHICH COULD BE PATENTED ACCORDING TO THE STRICTEST INTERPRETATION OF PATENT REGULATIONS began on September 1, 1959, and the Company has until August 31, 1960, to exercise either the work assessment or claim patent option.

SUMMARY

The magnetic anomaly which initiated interest in this project is caused by an igneous mass of magnetite pyroxenite which lies buried beneath 90 to 460 feet of overburden. Though the magnetite pyroxenite is only one phase of a larger igneous complex, it is the only phase that possesses any economic possibilities. The areal extent of the igneous complex is at least 30 square miles, about four square miles of which is magnetite pyroxenite. In two summers of field work, the intrusive has been surveyed by magnetic and electromagnetic methods and sampled by 14 of a total of 17 core drill holes. No sampled portion contained a sufficient concentration of magnetite to be mined economically at this time. Although minor intercepts of the magnetite pyroxenite contain as much as 35 percent magnetite, or 25 percent magnetic iron, mineable thicknesses average only 14.5 percent to 16.5 percent magnetite, or 10.5 to 12 percent magnetic iron. Such an ore would require 6.3 tons of crude to produce one ton of marketable concentrates. Ore of a two-to-one concentration grade is suggested as the minimum that could be profitably mined at this time at a location such as that of the investigated prospect.

Though the magnetite pyroxenite was probably intruded as a relatively horizontal, sheet-like mass, it has been uplifted and tilted by regional tectonism. The mass now dips steeply to the east or southeast, and what had been its bottom is now its western margin. There is apparently some tendency for magnetite enrichment in the lower or western portion of the intrusive. The bottom has not been reached by the drilling, and a possibility of appreciable magnetite enrichment near the bottom is untested. The enrichment may not be sufficient to produce ore of the recommended two-to-one concentration grade, but it could well produce an ore zone of three or four-to-one concentration grade along the entire western margin of the intrusive sheet. Though not of economic grade at this time, a long-term view of the iron ore economics of the Pacific Region suggests that such an ore might be mineable at a profit at some time in the future. There is little evidence for economic occurrences of minerals other than magnetite.

RECOMMENDATIONS

It is recommended that Humble do no further exploration work in the prospect area. The untested possibility of an economic concentration of magnetite near the bottom of the magnetite pyroxenite intrusive may encourage a mining firm to obtain the property for further exploration. It is recommended that any possible future drilling program include at least one 1,000-foot to 2,000-foot drill hole about 500 feet west of H-3 and another deep test about 500 feet west of H-8. Unless the property is turned to another company by August 1960, the money that has been spent on the project should be applied toward the retention of those claims located over the areas of greatest interest. The claims may be held until August 31, 1961, by applying the money to fulfillment of the work assessment requirement or they may be held indefinitely through patenting.

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APPENDIX A

LITHOLOGIC LOGS FOR DRILL HOLES H-7 THRU H-17

DRILL HOLE H-7

Started: June 8, 1959
Completed: June 30, 1959
Elevation (collar reference H-2) = -1 1/2
Located in Claim 16F, 724 feet south of northeast corner and thence 5 feet west.

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						(Zero collar taken on top of platform 2 feet above ground. Used 4-1/4" rock bit to 120', thence 3-3/4" bit to 151'.)
0	10	10				Wind-blown sand and silt (no sample)
10	20	10				Sand mostly 1/16" size or less, minor magnetite.
20	30	10				Sand mostly 1/16" size or less, minor magnetite.
30	40	10				Sand mostly 1/16" size or less, minor magnetite.
40	50	10				Sand mostly 1/16" size or less, minor magnetite.
50	60	10				Sand mostly 1/16" size or less, minor magnetite.
60	70	10				Sand mostly 1/16" size or less, minor magnetite.
70	80	10				Coarse gravel, but mostly fine sand
80	90	10				Sand, fine, gray, few pebbles, mirror magnetite.
90	100	10				Gravelly sand, minor magnetite
100	110	10				Gravelly sand, minor magnetite
110	120	10				Sand, fine, minor magnetite
120	130	10				Sand, fine, minor magnetite
130	138	8				Sand, fine to silt, gray; minor magnetite
138	151	13				138-151 Probably pyroxenite. Rock hard. high magnetite content in sludges, over 50% in panned cuttings (?) (Set NX casing 151' and began coring NX size.)
151	156	5	3.5	70	10 - 15	151-156 Pyroxenite. Fine grained, dark green, broken. Contains 10-15% magnetite by vol. (Set BX casing to 156' will start wire line barrel).
156	158	2	2	100	11 - 13	156-157 Pyroxenite, coarse; some green amphibole; 1" sand at 157' @ 20° to core of gray green andesite with small cavities and some epidote crystals to ¼"

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						long; magnetite av. 11-13 percent by vol.; some apatite in white prisms and streaks.
158	160	2.0	2.0	100	10 - 15	157-180 Pyroxenite, gray-green, fine, with bands to 9" thick; of coarse pyroxenite; several inches of gray andesite @ 167' with some epidote, cutting core @ 0° - 20°; at 171' and 172' are two white bands, each 1/2" thick, of felsic minerals with minor chalcopyrite and pyrite, cutting core @ 80°.
160	160.5	0.5	0.5	100	10 - 15	
160.5	161.5	1	0.75	75	10 - 15	
161.5	167	5.5	5.5	100	10 - 15	
167	169	2.0	2.0	100	10 - 15	
169	181.5	12.5	10.5	85	10 - 15	180-181.5 Andesite banded, cutting core @ 0°-20°; minor magnetite.
181.5	184	2.5	2.5	100	10 - 15	181.5-192 Pyroxenite, coarse; principally diopside and magnetite (10 - 15% by vol.); some bronze mica and some feldspar (late) in small prisms and seams.
184	194	10.0	10.0	100	10 - 15	
194	200.5	6.5	6.5	100	10 - 15	
194	200.5	6.5	6.5	100	10 - 15	192-235 Pyroxenite, fine-medium, with bands of coarse up to two feet thick, cutting core @ 0°-30°; a few small apatite prisms and seams; few thin calcite veinlets largely along joints and fractures (@0°-45° to core), locally with chlorite flakes and minor pyrite; at 226' 1/2" steep, irregular band of felsics and dark green hornblende; principal minerals: diopside and magnetite (10 - 15%) in irregular masses 1/16", or less, to 1", or more, in the coarser bands of pyroxenite.
200.5	205.8	5.3	5.3	100	10 - 15	
205.8	210.5	4.7	4.5	95	10 - 15	
210.5	215	4.5	4.5	100	10 - 15	
215	220	5.0	5.0	100	10 - 15	
220	225.5	5.5	5.3	95	10 - 15	
225.5	235.5	10.0	10.0	100	10	
235.5	238.5	3.0	3.0	100	10	235-255 As above, but generally broken due to greater number of calcite-chlorite-talc-coated joints and fractures; 10 - 15% magnetite in irreg. grains & masses to 1" or less.
238.5	240	1.5	1.5	100	10	
240	240.5	0.5	0.4	90	10	
240.5	241	0.5	0.5	100	10	
241	242.5	1.5	1.3	87	10	
242.5	243	0.5	0.4	90	10	
243	246.5	3.5	2.1	60	10	
246.5	248	1.5	0.5	33	10	
248	249	1.0	0.9	90	10	
249	249.5	0.5	0.45	90	10	
249.5	250	0.5	0.5	100	10	

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
250	252	2.0	1.6	80	10
252	254	2.0	0.7	32	10 - 15
254	257	3.0	3.0	100	7
257	265	8.0	8.0	100	15
265	266	1.0	1.0	100	10
266	268	2.0	1.5	75	10
268	268.3	0.3	0.3	100	10
268.3	270	1.7	1.3	77	6
270	271	1.0	1.0	100	6
271	272.5	1.5	0.9	60	6
272.5	274	1.5	0.3	20	6
274	275	1.0	0.8	80	6
275	275.5	0.5	0.5	100	6
275.5	277.3	1.8	1.8	100	6
277.3	278	0.7	0.7	100	11
278	288	10.0	10.0	100	11
288	293	5.0	5.0	100	11
293	296.5	3.5	3.5	100	8
296.5	307	10.5	10.0	95	11
307	316	9.0	9.0	100	11 - 13

Character of Material

255-256 Andesite banded; (altered sediment?); minor pyrite; minor magnetite.

256-260.5 Pyroxenite, fine with coarse bands; magn. av. 10 to 15% by vol. with 2" of solid magnetite at 257.1'.

260.5-263 Andesite dikelet, cutting core @ 30°-50°, 4" thick; followed by a 26" band of coarse hornblende and biotite phenocrysts in a white, hard matrix of felsics; little magnetite.

263-269 Pyroxenite as from 256-260.5.

269-277.5 Andesite banded, contorted; minor magnetite; with interbanded fine pyroxenite containing 10-15% magnetite; white calcite stringers throughout.

277.5-284 Pyroxenite, fine, some coarse. 11% magnetite; criss-crossed with white veins to 2" thick of felsics with some calcite. Looks like a breccia healed with the white vein material.

284-295 As above, but only a few felsic veinlets; joints @ 30°-45°; some calcite-coated.

295-298.5 Felsic dikelet speckled with biotite flakes and hornblende needles; banding cuts core @ 70°-90°. minor magnetite.

298.5-310 Pyroxenite, coarse; av. 11-13% magnetite. in grains and irreg. masses to 1", or more, long; some bronze mica; one 1/2" felsic band @ 80°-90° to core.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
316	326	10.0	10.0	100	12
326	336	10.0	10.0	100	10
336	340.5	4.5	4.5	100	11
340.5	350.5	10.0	9.0	90	11
350.5	352	1.5	1.5	100	11
352	356	4.0	4.0	100	11
356	358	2.0	1.2	60	11
358	364	8.0	6.0	75	11
364	368	2.0	2.0	100	4
368	370	2.0	1.4	70	10 - 12
370	375	5.0	4.5	90	10
375	380	5.0	5.0	100	10
380	381	1.0	1.0	100	10
381	387	6.0	5.0	83	10
387	389	2.0	1.0	50	10
389	392	3.0	2.0	67	10
392	395.5	3.5	2.1	60	10 - 15
395.5	399.5	4.0	2.3	58	10 - 15
399.5	403.5	4.0	0.9	23	12
403.5	405.5	2.0	2.0	100	12
405.5	406.5	1.0	1.0	100	12
406.5	410.0	3.5	3.5	100	12
410.0	412.0	2.0	2.0	100	12
412	416	4.0	4.0	100	12
416	421.5	5.5	5.5	100	12
421.5	423	1.5	1.5	100	12
423	424	1.0	1.0	100	12
424	425	1.0	1.0	100	6
425	435	10.0	10.0	100	9

Character of Material

310-318 Pyroxenite, fine-medium, banding @ 30° to core; av. 12% magnetite.

318-363 Pyroxenite, coarse, pegmatitic; diopside, 11% magnetite, some bronze mica; 8" with 50% magn. at 331'; 1/2" streak of fine pyrite @ 349' dipping 45°; few thin calcite veins; felsics, locally with hornblende in irreg. patches from 320-328 and in 1" bands dipping 45° at 328' and 342'.

363-366 Felsic band with mica & hornblende, fine, dense; minor pyrite; rude banding @ 45°-90° to core.

366-370 Pyroxenite, coarse; 10-12% magnetite; 4"band of andesite dipping 45° .

370-374 Felsic band, dense, minor magnetite & pyrite, dipping 45°.

374-393 Pyroxenite, coarse, broken 10% magnetite

393-400 Pyroxenite, sugary, friable, brecciated; 10-15% magnetite; fault zone; 1/2" band at 396'of graphitic material, slickensided, shears @ 30° to core.

400-424.7 Pyroxenite, fine-medium, 12% magnetite; 30°-50° joints coated with talc-chlorite and some calcite; tiny apatite crystals at 423'.

424.7-425.3 Andesite banded (45°); minor magnetite.

425.3-430 Pyroxenite as between 400-424.

430-433 Andesite, fine, dark gray-green, dense.

433-435 Dike, medium-grained, green gabbro; cuts core at 30°.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
435	437	2.0	2.0	100	11	435-437.5 Pyroxenite as between 400-424'.
437	440.5	3.5	3.0	85	8	437.5-439 Inclusion of sediment (?) highly altered to coarse epidote crystals; some limey (?) ground mass, and also some areas to 1/4" of dark, soft serpentine; talc along joints and shears.
440.5	449.0	8.5	8.5	100	10 - 15	439-452.5 Pyroxenite, medium-grained to fine; diopside minor apatite, few small books mica, 10-15% magnetite; 1-foot band of coarse magnetite-free pyroxenite with irregular grains and veins of felsics @ 50° to core at 447'; trace pyrite.
449	459	10.0	10.0	100	10 - 15	452.5-455 Pyroxenite, coarse with felsic streaks; minor magnetite.
459	463	4.0	4.0	100	12	
463	468	5.0	5.0	100	12	455-481 Pyroxenite, fine-medium with few 6" bands of coarse pyroxenite and of coarse hornblendic rock up to 1' thick; 12% magnetite; 1" band @ 40° of calcite-felsics-chlorite @ 479'.
468	474	6.0	6.0	100	12	
474	484	10.0	10.0	100	12	
484	494	10.0	10.0	100	10	481-492 Pyroxenite, coarse-grained, darker green, hornblendic; 6" band of laminated andesite @ 483' @ 90° to core.
494	500	6.0	5.5	90	10 - 15	492-551.5 Pyrox., fine, gray, massive 10-15% magnetite; 4" to 8" bands @ 45°-80° to core of banded andesite @ 497' 536', 540, 544, 547; few coarse bands to 2' thick; few calcite veinlets; few thin streaks of hornblende @ 45° dip; in rare sections such as the 6" section @ 526'; magnetite increases to about 17%.
500	501	1.0	0.8	80	10 - 15	
501	510	9.0	9.0	100	10 - 15	
510	513	3.0	3.0	100	10 - 15	
513	522	9.0	9.0	100	10 - 15	
522	526	4.0	4.0	100	15	
526	528	2.0	2.0	100	15	
528	538	10.0	10.0	100	10 - 15	
538	540.7	2.7	2.7	100	10 - 15	
540.7	548.7	8.0	8.0	100	10 - 15	
548.7	551.5	2.8	2.8	100	13	
551.5	554	2.5	2.5	100	10 - 15	551.5-554 Pyroxenite, coarse, hornblendic with felsic patches.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
554	556.5	1.5	1.5	100	10 - 15	554-562 Pyroxenite, fine-medium 10-12% magnetite.
556.5	559	2.5	2.5	100	10 - 15	
559	563	4.0	4.0	100	10 - 15	
563	565	2.0	2.0	100	6	562-564 Andesite, green, chloritic, banded with fine pyrite; @ 45°-60° to core; one thin calcite vein.
565	568	3.0	3.0	100	12	564-574 Pyroxenite, fine-medium; with 12% magnetite, and some bronze mica; few coarser bands.
568	571.5	3.5	3.5	100	12	
571.5	581.5	10.0	10.0	100	6	574-583 Gabbro dike, @ 15°-30° to core; light gray-green, fine-medium grained; made up of feldspar, hornblende & some biotite.
581.5	586.5	5.0	5.0	100	10	583-584 Interlayered, pyroxenite and andesite.
						584-586.5 Pyroxenite, coarse, 10% magnetite.
586.5	589	2.5	2.5	100	8	586.5-587 Andesite, banded @ 20° to core, chloritic.
589	592	3.0	3.0	100	12	587-596 Pyroxenite, fine-medium 12% magnetite.
592	595	3.0	3.0	100	12	
595	600	5.0	5.0	100	7	596-599 Andesite as between 586-587, finely banded, contorted, @ 0°-45° to core; trace pyrite.
						599-600 Pyrox., coarse, 10% magn.; some irregular areas of felsics; some large hornblende crystals.
600	610	10.0	10.0	100	8	600-604 Andesite as between 596-599; @ 0°-45° to core; contorted.
						604-605 Pyrox., med., 10-12% magnetite.
						605-607 Pyrox. and andesite with contact between the two running vertically along the core.
						607-609 Pyrox., amphibole-rich, light green, coarse; some felsics and a 2" band of hornblende-felsics @ 50° to core.
610	616	6.0	6.0	100	10	609-612 Andesite, gray-green, laminated; contorted; contact with pyrox. @ 60°-90° to core.
						612-616 Pyroxenite, med-fine, 12% magnetite.
616	620	4.0	4.0	100	8	616-618 Andesite, gray-green, banded @ 40°; irreg. contact with pyroxenite; felsic bands.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
620	621	1.0	1.0	100	10 - 15	618-626 Pyroxenite, fine-med., broken; chloritic joints; 10-15% magnetite.
621	625	4.0	3.5	90	10 - 15	
625	628	3.0	3.0	100	10 - 15	626-627 Andesite; some epidote & felsics; cuts core at 20°.
628	631	3.0	3.0	100	10 - 15	627-640 Pyroxenite, fine-med., with coarse zones; 10-15% magnetite; local zones of an 1" plus or minus have 30% coarse magnetite; talc-chlorite-coated joints.
631	633	2.0	2.0	100	10 - 15	
633	637	4.0	4.0	100	10 - 15	
637	640	3.0	3.0	100	10 - 15	
640	650	10.0	10.0	100	10 - 15	640-654 As above with generally coarser pyrox; few calcitic bands @ 80° to core; 10-15% magnetite.
650	658	8.0	8.0	100	10 - 15	
658	660	2.0	2.0	100	12	654-672 Pyrox. fine-med., 12% magnetite; one thin calcitic veinlet @ 666' @ 20° to core
660	665	5.0	5.0	100	12	
665	671	6.0	6.0	100	12	
671	681	10.0	10.0	100	10	672-682 Pyroxenite, coarse, 10% magnetite.
681	687	6.0	6.0	100	11	682-685 Andesite, gray-green, @ 45°-60° to core.
687	689	2.0	1.5	75	11	
689	694	5.0	5.0	100	11	685-707 Pyrox., coarse, 10-12% magnetite; few calcite veinlets - some druzy; 4" andesite dike @ 699'.
694	697	3.0	3.0	100	11	
697	699	2.0	1.5	75	11	
699	702	3.0	3.0	100	11	
702	706	4.0	4.5	90	11	
706	712	4.0	4.0	100	7	707-715.5 Andesite, gray-green, with veins of calcite and zeolite (mesolite and stilbite)
712	715	3.0	3.0	100	6	
715	719	4.0	4.0	100	11	715.5-727 Pyroxenite, med. to coarse (av. grain size 5 to 10mm.); deuteric minerals common (biotite & amphibole); fine to med. pyrox. bands at 719-720 & 721-723; chlorite along shears
719	721	2.0	2.0	100	11	
721	723	2.0	1.5	75	11	
723	724	1.0	0.75	75	11	
724	726	2.0	1.8	90	11	
726	727	1.0	1.0	100	11	
727	729	2.0	1.9	95	8	727-728.5 Andesite, with banding @ 45° to core; contact zone of biotite and chlorite.
729	732.7	3.7	3.5	95	12	728.5-738 Pyroxenite, med. to coarse (av. grain size 5mm), with pyroxene, biotite & magnetite; magn. av. 12% by vol.
732.7	738	5.3	5.3	100	12	

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
738	740	2.0	2.0	100	9
740	744	4.0	3.5	90	8
744	747	3.0	2.5	85	9
747	756.5	9.5	9.0	95	10
756.5	760.5	4.0	4.0	100	14
760.5	764.5	4.0	4.0	100	12
764.5	768.0	3.5	3.5	100	10
768	770	2.0	2.0	100	8
770	773.5	3.5	3.5	100	12
773.5	776	2.5	2.5	100	12
776	777	1.0	1.0	100	12
777	779	2.0	1.5	75	12
779	782	3.0	2.5	85	10
782	784	2.0	2.0	100	10
784	788.5	4.5	4.0	90	12
788.5	792	4.5	4.0	90	9
792	796	4.0	3.5	90	9
796	799	3.0	3.0	100	9
799	801	2.0	2.0	100	10
801	802	1.0	1.0	100	10
802	804	2.0	2.0	100	10
804	805	1.0	1.0	100	10
805	806.5	1.5	1.5	100	10
806.5	807.5	1.0	0.5	50	10
807.5	808.5	1.0	1.0	100	10
808.5	812.5	4.0	4.0	100	8
812.5	816	3.5	3.5	100	6

Character of Material

738-741 Pyrox., med. to coarse, sheared & altered; talc & serpentine along shears that av. 45o to core; random stringers of felsics

741-742 Andesite dikelet at 60° to core, saturated by stringers of calcite & highly pyritized.

742-747 Pyrox., like 738-741, highly altered.

747-768.5 Pyrox., med. to fine; 1" veins of felsics & amphibole @ 750' & 752' @ 20° to core and @ 757' @ 60° to core; 3" andesite dikes @ 752.5' & 764' @ 70° to core; magnetite av. 10-15% by vol.

768.5-770.5 Pyrox., fine to med., sheared & altered, high chlorite, pyrite content; calcite veins at 60° to core.

770.5-776.5 Pyrox., fine to med., 10-12% magnetite.

776.5-788 Pyrox. med., with a few patches of magnetite about 1/2" in diam.; random talcose shears; magnetite av. 10-15%.

788-792 Pyrox. fine, 8-10% magnetite; 1" andesite dike @ 790' @ 40° to core.

792-797 Pyrox. med, sheared & altered, magn. av. 9% by vol.; shears filled by talc, chlorite, calcite, & pyrite @ 0°-20° to core.

797-798 Andesite dike @ 30° to core.

798-809 Pyrox., like 792-797, but with more random shearing.

809-816 Andesite, med. gray, flow banded around residual islands of pyrox. @ abt. 10° to core; with stringers of zeolite (chabazite?) and minor calcite.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
816	818	2.0	2.0	100	9
818	821.5	3.5	3.0	90	10
821.5	824	2.5	2.0	80	10
824	825.5	1.5	1.5	100	10
825.5	827.5	2.0	1.5	75	12
827.5	830	2.5	2.0	80	12
830	833	3.0	3.0	100	12
833	837.5	4.5	4.5	100	7
837.5	839	1.5	0.5	33	10
839	849	10.0	2.0	20	9
849	852.5	3.5	3.0	90	6
852.5	856.5	4.0	4.0	100	7
856.5	857.5	1.0	1.0	100	12
857.5	858.5	1.0	1.0	100	12
858.5	861	2.5	2.5	100	12
861	862.5	1.5	1.0	66	11
862.5	864.5	2.0	2.0	100	9
864.5	866.5	2.0	2.0	100	10
866.5	870	3.5	3.5	100	12
870	879	9.0	9.0	100	12
879	889	10.0	10.0	100	13

816-825.5 Pyrox., like 792-97, sheared @ 10°-20° to core; av. 8-10% magnetite.

825.5-834 Pyrox., fine to med.; chlorite-pyrite-filled shears @ 0-45° to core; finely disseminated magnetite av. 12% by vol.

834-837 Andesite dike, med. gray, no flow banding; @ 20° to core; contact alteration of pyrox. apparent @ upper contact only

837-847 Pyrox., fine to med., (broken and rounded by tumbling in core barrel); av. 10-12% magnetite by vol.

847-854 Andesite like 834-837'; irregular, digitate contact with the pyrox.

854-855.5 Pyrox., fine, highly fractured with no mineralization along fractures.

855.5-856.5 Gabbro, fine to med., showing border chilling, tends toward glomers-porphyritic; possibly highly metamorphosed sed. with porphyroblasts.

856.5-865 Pyrox., fine to med., highly fractured (random, unmineralized); andesite dike @ 864.5'-865' is @ 10° to core. Pyrox. av. 12% magn. by vol.

865-890 Pyrox., fine, relatively unfractured; 1" andesite dike @ 869' @ 60° to core; amphibole-filled veinlet @ 870 @ 30° to core; 1" dike of andesite with abundant apatite & amphibole @ 873 @ 10° to core. Fine grained pyrox. av. 10-15% magn. by vol.; a few zones of coarser pyrox. av. 8-10%. 1" felsic veinlet @ 877' @ 10° to core.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
889	899	10.0	10.0	100	10	890-892 Pyrox., med., grain size av. 2-3 mm.; fresh and unfractured, gradational contact with fine grained pyrox. @ 45° to core, av. 10% magnetite.
899	905	6.0	6.0	100	11	892-920 Pyrox. fine, minor fracturing, av. 12-15% magnetite by vol.; zones of med. to coarse pyrox. @ 905'-906.5', 907.5-908', & 914'-915'; av. 8-12% magn. show increase in % of biotite & amphibole (in veinlets at about 40° to core. Andesite dikes, fine, flow-banded, dark gray @ 895.5'-897' @ 20° to core & @ 899' @ 25° to core.
905	907	2.0	2.0	100	10	
907	911.5	4.5	4.0	90	12	
911.5	921	9.5	9.5	100	11	
921	924	3.0	3.0	100	13	920-923 Pyrox., med. to coarse, av. 12% magnetite; 1/2" magnetite seam & 2" amphibole seam at 921' @ 35° to core; 2" zone of coarse pyrox. av. 25% magnetite @ 922' @ 25° to core.
924	931	7.0	7.0	100	12	923-941 Pyrox., fine, av. 10-14% magnetite; talc-chlorite filled shears @ 0°-10° & @ 30-50° to core.
931	933	2.0	2.0	100	11	
933	934.5	1.5	1.0	66	11	
934.5	939	4.5	4.5	100	12	
939	940.5	1.5	1.0	66	12	
940.5	943	2.5	2.0	80	12	941-944 Pyrox., med., randomly sheared, av. 10-12% magnetite with veinlets of biotite.
943	946	3.0	3.0	100	12	944-964 Pyrox., fine, av. 11% magn.; talc-chlorite-filled fractures @ 30-45° to core & chlorite-calcite-pyrite filled fractures @ 60-80° to core; 6" fine grained flow banded andesite dike @ 955.5' @ 65° to core; 1" dike @ 956.5' @ 75° to core, 6" dike @ 957.5' @ 50° to core, 2" dike @ 958' @ 70° to core, 6" dike @ 959' @ 55° to core.
946	950	4.0	4.0	100	11	
950	952.5	2.5	2.5	100	11	
952.5	956	3.5	3.0	85	11	
956	961.5	5.5	5.5	100	10	
961.5	964	2.5	2.5	100	11	
964	968	4.0	4.0	100	12	964-985 Pyrox., fine, av. 12% magnetite, relatively unfractured; 6" band of coarse pyrox. with large apatite crystals, av. 8-10% magn. @ 979'; similar band @ 982'.
968	978	10.0	10.0	100	11	
978	985.5	7.5	7.5	100	11	

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
985.5	994.0	8.5	8.5	100	11
994	999	5.0	5.0	100	12
999	1001	2.0	2.0	100	12
1001	1005	4.0	4.0	100	12
1005	1009	4.0	4.0	100	10
1009	1011	2.0	1.75	85	9
1011	1014	3.0	3.0	100	10
1014	1024	10.0	10.0	100	10
1024	1028	4.0	4.0	100	10
1028	1032.5	4.5	4.5	100	11
1032.5	1036	3.5	3.5	100	10
1036	1041	5.0	5.0	100	11
1041	1045	4.0	4.0	100	11
1045	1048	3.0	3.0	100	11
1048	1049.5	1.5	1.5	100	11
1049.5	1050.5	1.0	1.0	100	11
1050.5	1054	3.5	3.5	100	11
1054	1055	1.0	1.0	100	11
1055	1065	10.0	10.0	100	12
1065	1069	4.0	4.0	100	12
1069	1071	2.0	2.0	100	12
1071	1074	3.0	3.0	100	10
1074	1075.5	1.5	1.5	100	12
1075.5	1082	6.5	6.0	95	11
1082	1089	7.0	7.0	100	11
1089	1094	5.0	5.0	100	12
1094	1102	8.0	7.5	95	12
1102	1110	8.0	8.0	100	12
1110	1111	1.0	1.0	100	12
1111	1115.5	4.5	4.0	90	12

Character of Material

985-1007 Pyrox., fine, av. 12% magnetite, talc-chlorite filled shears @ 25 - 50° to core.

1007-1011 Pyrox., coarse to very coarse, grains av. 8-12 mm. and are as large as 30 mm.; consists of pyroxene, magnetite (5-8% by vol.), amphibole, apatite & biotite.

1011-1032 Pyrox., fine relatively unfractured, av. 12% magnetite; zones of coarse pyrox. @ 1018'-1019' & 1020'-1021', av. 25% amphibole in crystals av. 10 mm. in diameter; 1" amphibole-rich band @ 1025'@ 35° to core.

1032-1055.5 Pyrox., fine, av. 10% magnetite; talc-filled shears @ 0°-30° to core & a few chlorite, pyrite calcite filled shears @ 70°-90° to core; amphibole-rich coarse pyroxenite 1035.5'-1036.5', 2" band of coarse pyrox. @ 1041.5 @45° to core; several 1" veins of felsics @ 1052'-1053' @ 45° to core.

1055.5-1058.5 Pyrox., med, 11% magnetite; highly sheared and altered to talc & serpentine (?); shears @ 0°-30° to core.

1058.5-1091 Pyrox., fine to med., with minor fracturing; magnetite av. 12% by vol.; magnetite-rich zone @ 1062'; felsic veinlet @ 1063' @ 70° to core; 8" chloritized andesite dike @ 1071'-1071.5' @ 45° to core; coarse pyrox. @ 1081'; 2" biotite-rich band @1086' @ 30° to core.

1091-1097 Pyrox., fine, with fracturing @ 0°-25° & 60°-80° to core; av. 13% magnetite by vol.

1097-1115 Pyrox., fine to med., relatively little fracturing, with a few andesite dikelets @ 50° to core; av. 13% magnetite.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
1115.5	1116	0.5	0.5	100	11
1116	1117	1.0	1.0	100	11
1117	1120	3.0	2.5	80	11
1120	1123	3.0	3.0	100	11
1123	1130	7.0	7.0	100	11
1130	1135	5.0	5.0	100	11
1135	1142	7.0	6.5	95	11
1142	1144	2.0	2.0	100	6
1144	1154	10.0	6.0	60	12
1154	1156	2.0	1.5	75	10
1156	1160	4.0	4.0	100	11
1160	1170.5	10.5	10.5	100	12
1170.5	1172	1.5	1.5	100	12
1172	1173	1.0	1.0	100	12
1173	1175	2.0	1.5	75	10
1175	1176	1.0	1.0	100	10
1176	1177	1.0	1.0	100	12
1177	1179	2.0	1.5	75	12
1179	1180	1.0	.5	50	12
1180	1191	11.0	2.0	20	12
1191	1197	6.0	6.0	100	12
1197	1200.5	3.5	3.5	100	12
1200.5	1202.5	2.0	1.5	75	12
1202.5	1205	2.5	2.5	100	10
1205	1215	10.0	10.0	100	10
1215	1222	7.0	7.0	100	10

Character of Material

1115-1143 Pyrox. fine to med., av. 11% magnetite by vol.; fractures and shears @ 0°-20° to core are talc-coated and @ 45°-80° to core are chlorite-serpentine-pyrite filled.

1143-1144 Andesite dike with minor flow banding @30° to core.

1144-1146 Pyrox., fine, av. 12% magnetite.

1146-1148 Pyrox., coarse, (av. 5-10 mm.); av. 11 % magn. by vol.

1148-1168 Pyrox., fine, relatively unfractured, av. 11% magnetite by vol.; sheared, chlontized & serpentinized @ 1154'-1155'; 4" andesite to fine grained diorite dike greenish gray @ 1161.5 @ 20° to core.

1168-1170 Pyrox., coarse with a few interstitial felsic patches; 2" seam of magnetite @ 1169'.

1170-1173.5 Pyrox., fine, with abundant, random fractures; av. 13% magnetite.

1173.5-1176 Pyrox., coarse, like 1168-1170', but with abundant shearing.

1176-1192 Pyrox., fine, highly sheared (chlorite-serpentine-coated); av. 12% magnetite.

1192-1211 Pyrox., fine, with minor fracturing; av. 12% magnetite; 8" light gray andesite dike @ 1203'; 1" dike @ 1204 @ 75° to core; & 2" dike @ 1207' @ 70° to core.

1211-1214.5 Pyrox., medium with abundant, disseminated biotite.

1214.5-1218 Pyrox., coarse, with crystals as large as 30 mm.; a few felsic patches & veinlets; av. 10% magn.

1218-1221.5 Pyrox., med, relatively unfractured, av. 11% magnetite, with a few felsic patches & large amphibole crystals.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1222	1223.5	1.5	1.5	100	12	1221.5-1232.5 Pyrox., fine to med., with abundant, random fractures; av. 12% magnetite; a few amphibole-chlorite veinlets.
1223.5	1225	1.5	1.5	100	12	
1225	1226	1.0	1.0	100	12	
1226	1227	1.0	1.0	100	12	
1227	1228	1.0	1.0	100	12	
1228	1230.5	2.5	2.5	100	12	
1230.5	1232.5	2.0	1.5	75	12	
1232.5	1240	7.5	7.5	100	5	1232.5-1238 Diorite to monzonite, light gray, fine to medium grained; consists of plagioclase & alkali feld-spar, amphibole (occasionally in large crystals--10mm.--and crystal clots) biotite, minor magnetite and quartz; plagioclase & amphibole crystals show some flow align-ment @ 30°-40° to core; dike cuts pyrox. @ 15°.
1240	1242	2.0	2.0	100	12	1238-1242.5 Pyrox., fine to med., highly fractured; av. 12% magnetite.
1242	1244.5	2.5	2.5	100	6	1242.5-1244 Andesite, dark gray, flow banded; intrudes both the pyrox. & the diorite to monzonite.
1244.5	1251	6.5	6.5	100	5	1244-1255 Diorite to monzonite, like 1232.5'-1238', but with some chlorite & pyrite along rare fractures.
1251	1256	5.0	5.0	100	6	
1256	1257.5	1.5	1.0	70	12	1255-1260 Pyroxenite, fine, with abundant chlorite-analcite-filled fractures; av. 12% magnetite by vol.
1257.5	1261.5	4.0	4.0	100	12	1260-1261 Diorite to monzonite, fine, cuts pyrox. @ 25°.
1261.5	1263	1.5	1.5	100	6	1261-1263 Pyrox., fine, highly fractured.
1263	1267	4.0	4.0	100	6	1263-1267 Andesite, dark greenish gray, flow banded; veins of amphibole-chlorite-epidote-pyrite-carbonate are cut by veins of mesolite-carbonate.
1267	1268	1.0	1.0	100	12	1267-1287 Pyrox., fine to med., with abundant, random shears; av. 12% magnetite; coarse phase @ 1268'-1269' & @ 1277'; sheared & chloritized @ 1283.5'-1284.5'.
1268	1269.5	1.5	1.5	100	11	
1269.5	1271	1.5	1.5	100	12	
1271	1272.5	1.5	0.5	30	12	
1272.5	1273	0.5	0.5	100	12	
1273	1274	1.0	1.0	100	12	
1274	1276	2.0	1.0	50	12	
1276	1276.5	0.5	0.5	100	12	
1276.5	1279	2.5	2.5	100	11	
1279	1280.5	1.5	1.5	100	12	

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1280.5	1282	1.5	1.5	100	12	
1282	1284.5	2.5	2.0	80	11	
1284.5	1285.5	1.0	1.0	100	12	
1285.5	1287	1.5	1.5	100	12	
1287	1291.5	4.5	4.0	90	6	1287-1290 Andesite, dark gray, distinctly flow banded, bordered by 2" felsic band at upper contact & 1' band at lower contact (1289'-1290').
1291.5	1293.5	2.0	2.0	100	11	1290-1302.5 Pyrox., fine, with abundant fractures @ 20°-45° to core & some chlorite-calcite filled shears @ 70°-80° to core; 3" andesite dike @ 1299 @ 75° to core; av. 11% magnetite by vol.
1293.5	1296	2.5	2.5	100	11	
1296	1298	2.0	2.0	100	11	
1298	1302	4.0	3.5	90	10	
1302	1312	10.0	10.0	100	8	1302.5-1304 Andesite, like 1287-1290, @ 20° to core. 1304-1306.5 Pyrox., fine to med., unfractured; av. 11% magnetite; 1" felsic band @ 1305.5 @ 25° to core & another @ 1306' @ 35° to core. 1306.5-1308 Andesite, like 1302.5-1304', @ 45° to core. 1308-1316.5 Pyrox., fine, unfractured, av. 12% magn.; 1/4" felsic veinlets @ 10-25° to core.
1312	1314	2.0	2.0	100	12	
1314	1322.5	8.5	8.5	100	11	
1322.5	1323.5	1.0	1.0	100	10	
1323.5	1332	8.5	8.5	100	10	1316.5-1319 Pyrox., coarse, unfractured, av. 11% magn. by vol.; saturated with felsics @ 1318'-1319'. 1319-1333 Pyrox. fine to med., randomly fractured @ 1321'-1322' & 1327'-1329'; av. 10% magnetite; 1/4" felsic veinlets cut core @ 25°; 4" andesite dike @ 1320 @ 80° to core.
1332	1339	7.0	7.0	100	10	1333-1335 Pyrox., coarse, unfractured with patches & veinlets of felsics.
1339	1342	3.0	3.0	100	12	
1342	1344.5	2.5	2.5	100	11	
1344.5	1354	9.5	9.5	100	10	1335-1352.5 Pyrox., fine to med., minor fracturing @ 0°-30° to core; av. 11% magnetite by vol; 1/2" ragged veinlet of magnetite & biotite @ 1339.5 1352.5-1355 Pyrox., coarse to very coarse (crystals as large as 50 mm.); felsic patches; magnetite av8% by vol.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1354	1360.5	6.5	6.5	100	8	1355-1357 Pyrox., fine, unfractured. 1337-1358 Andesite, dark gray-green; cuts core @ 30°. 1358-1361 Pyrox., coarse to very coarse, like 1352.5' to 1355.
1360.5	1368	7.5	7.5	100	9	1361-1362 Pyrox., fine, unfractured; av. 12% magnetite. 1362-1363 Andesite, dark gray, flow banded, 30°to core. 1363-1366 Pyrox., fine to med., unfractured, av. 11% magnetite. 1366-1367 Andesite, like 1362'-1363, @ 15° to core.
1368	1378	10.0	10.0	100	13	1367-1401 Pyrox., fine to med., with minor fracturing @ 1385'-1387', 1388'-1389', 1399'-1400' @ 0°-35° to core; av. 12% magnetite by vol.; 1/4"-1/2" patches & stingers of magnetite @ 1372'; 2" andesite dike @ 1368 @ 80° to core, 3" dike @ 1384' @ 90° to core; patches of coarse pyrox. @ 1389' & 1397'.
1378	1385	7.0	7.0	100	12	
1385	1386.5	1.5	1.5	100	12	
1386.5	1390	3.5	3.5	100	12	
1390	1392	2.0	2.0	100	12	
1392	1401	9.0	8.0	90	12	
1401	1411.5	10.5	4.0	40	6	1401-1409 Andesite, cut by veins of carbonate & pyrite; coarser phase has 5 mm. pseudomorphs of serpentine-chlorite after olivine (?).
1411.5	1415	3.5	3.5	100	11	1409-1417 Pyrox., fine, relatively unfractured; av. 11% magnetite.
1415	1425	10.0	10.0	100	10	1417-1419 Pyrox., med. to coarse, with a few felsic patches; av. 8% magnetite.
1425	1428	3.0	3.0	100	15	1419-1435.5 Pyrox., fine, relatively unfractured, av. 13% magnetite; 2" felsic vein @ 1420' @ 15° to core; 1/4" zeolite-amphibole veinlet @ 1425' @ 10° to core; 1/4"-1/2" magnetite patches @ 1427'.
1428	1434	6.0	6.0	100	13	
1434	1439.5	5.5	5.5	100	10	1435.5-1438 Andesite grayish green; felsics (plagioclase laths mainly) in patches & flow bands; cuts core @ 20°; cuts a 1" felsic band @ 1438 @ 60°.
1439.5	1441	1.5	1.0	70	12	1438-1448 Pyrox., fine, with minor fracturing; av. 12% magn.; 1" andesite dike @ 1439 @ 35° to core, 4" dike @ 1441.5 @ 25° to core.
1441	1445	4.0	3.5	90	12	
1445	1448	3.0	3.0	100	12	

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
1448	1451.5	3.5	3.5	100	12
1451.5	1457	5.5	4.0	75	11
1457	1459.5	2.5	2.5	100	13
1459.5	1463.5	4.0	4.0	100	11
1463.5	1473	9.5	9.5	100	11
1473	1479	6.0	6.0	100	11
1479	1481.5	2.5	2.5	100	13
1481.5	1485	3.5	3.5	100	13
1485	1488	3.0	3.0	100	13
1488	1493	5.0	5.0	100	8
1493	1502	9.0	9.0	100	11
1502	1509	7.0	7.0	100	11
1509	1511.5	2.5	2.5	100	10
1511.5	1515	3.5	3.5	100	10
1515	1519	4.0	3.5	90	11
1519	1520	1.0	1.0	100	11
1520	1522	2.0	2.0	100	11
1522	1525	3.0	3.0	100	11
1525	1528	3.0	3.0	100	10
1528	1530	2.0	2.0	100	11
1530	1536	6.0	6.0	100	11
1536	1538	2.0	2.0	100	11
1538	1540	2.0	2.0	100	11
1540	1542	2.0	1.5	75	11
1542	1544	2.0	2.0	100	11
1544	1546	2.0	2.0	100	11
1546	1547	1.0	1.0	100	11
1547	1551	4.0	4.0	100	11
1551	1556	5.0	5.0	100	11
1556	1560	4.0	4.0	100	10

Character of Material

1448-1452 Pyrox., med., av. 12% magnetite; intruded along lower contact with fine pyrox. @ 1452' by andesite dike @ 10° to core.

1452-1459.5 Pyrox., fine, relatively unfractured; av. 13% magnetite; 1" andesite dike @ 1455.5' @ 90° to core, 2" dike @ 1457' @ 75° to core.

1459.5-1478 Pyrox., fine, saturated by numerous 1/4" to 2' dikes of andesite to trachyandesite; dikes are irregular & random in orientation.

1478-1488.5 Pyrox., fine; fracturing averages 30°-45° to core; magnetite content av. 13%.

1488.5-1491 Andesite to trachyandesite, in a flow-banded dike @ 25° to core.

1491-1506 Pyrox., fine, relatively unfractured, av. 12% magnetite by vol.

1506-1564.5 Pyrox., fine, av. 11% magnetite; with abundant, random fracturing; 1" trachyandesite dikelet @ 1509' @ 30° to core; 1" andesite dikelet @ 1512.5' @ 20° to core; 2" andesite dikelet @ 1513.5' @ 70° to core; 1" dikelet @ 1515 @ 30° to core, 1/2" dikelet @ 1523.5'-1525' @ 5° to core, 1/2" dikelet @ 1526' @ 25° to core; a few chlorite-pyrite filled veinlets @ 1555'-1560'.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1560	1568.5	8.5	8.5	100	11	1564.5-1567.5 Pyrox., coarse to med., with patches of felsics.
1568.5	1572	3.5	3.5	100	12	1567.5-1587.5 Pyrox., fine, with some chlorite-talc filled fractures @ 10°-40° to core; av. 12% magnetite; 2" seam of magnetite @ 1587' @ 80° to core.
1572	1576.5	4.5	4.5	100	12	
1576.5	1579.5	3.0	3.0	100	12	
1579.5	1589.5	10.0	10.0	100	14	
1589.5	1598.	8.5	8.5	100	11	1587.5-1596.5 Pyrox., med. to coarse, unfractured, av. 11% magnetite; felsics in patches & scattered veinlets; 1" andesite dikelet @ 1593 @ 45° to core; 1" chlorite-carbonate-pyrite vein @ 1594 @ 15° to core has oxidized adjacent magnetite to hematite.
1598	1602	4.0	4.0	100	11	1596.5-1616.5 Pyrox., fine, av. 11% magnetite by vol.; minor fracturing @ 20°-45° to core.
1602	1608	6.0	6.0	100	11	
1608	1610.5	2.5	2.5	100	11	
1610.5	1612.5	2.0	2.0	100	11	
1612.5	1617	4.5	4.5	100	11	
1617	1624	7.0	7.0	100	6	1616.5-1620 Andesite, light to med. gray; with some 1 to 2 mm., partly replaced olivine crystals as phenocrysts; cuts the pyroxenite in a multitude of dikelets.
1624	1625	1.0	1.0	100	12	
1625	1629	4.0	4.0	100	12	
1629	1635	6.0	6.0	100	12	1620-1639 Pyrox., fine with minor fracturing @ 40°-50° to core; av. 12% magnetite; 2" andesite dike @ 1635' @ 30° to core.
1635	1639	4.0	4.0	100	12	
1639	1646	7.0	7.0	100	10	1639-1645 Pyrox., med. to coarse, with a few 1/4" - 1/2" felsic patches.
1646	1652.5	6.5	6.5	100	12	
1652.5	1655	3.5	3.0	85	12	
1655	1658	3.0	3.0	100	12	
1658	1660	2.0	2.0	100	12	1645-1662 Pyrox., fine, with a few med. to coarse patches; av. 12% magnetite.
1660	1664.5	4.5	4.5	100	11	
1664.5	1666.5	2.0	2.0	100	10	1662-1666 Pyrox., fine, with talcose shears @ 10°-30° to core and abundant, thin veinlets of epidote, chlorite and minor pyrite @ 45° to core.
1666.5	1669	2.5	2.5	100	12	
1669	1672	3.0	3.0	100	12	
1672	1676.5	4.5	4.5	100	14	1666-1676 Pyrox., fine, with minor fracturing; magnetite av. 13% magn.; 1/2" seam of magnetite @ 1675.5' @ 75° to core.
1676.5	1678	1.5	1.0	70	13	
1678	1680	2.0	2.0	100	12	
1680	1684	4.0	2.0	50	12	1676-1707 Pyrox., fine, with abundant, random fractures; ab. 12% magn.; 5" andesite dikelet @ 1680' @ 90° to core, 2" dikelet @ 1681' @ 50° to core, 2" andesite dikelet @ 1685' @ 40° to core, 1" dikelet @ 1693' @ 80° to core, 1" dikelet @ 1695' @ 70° to core; scattered amphibole-felsic veinlets.
1684	1687	3.0	3.0	100	12	
1687	1688.5	1.5	1.0	70	12	
1688.5	1692	3.5	3.5	100	13	

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
1692.0	1695.0	3.0	3.0	100	13
1695	1697.5	2.5	2.5	100	12
1697.5	1701	3.5	3.5	100	13
1701	1704	3.0	2.5	80	13
1704	1706	2.0	2.0	100	12
1706	1710.5	4.5	4.5	100	6
1710.5	1718	7.5	7.5	100	12
1718	1722	4.0	4.0	100	12
1722	1724.5	2.5	2.5	100	12
1724.5	1729	4.5	4.5	100	12
1729	1730.5	1.5	1.5	100	12
1730.5	1735	4.5	4.5	100	11
1735	1738.5	3.5	3.5	100	12
1738.5	1744	5.5	5.5	100	13
1744	1746.5	2.5	2.5	100	10
1746.5	1750	3.5	3.5	100	11
1750	1752	2.0	2.0	100	13
1752	1756.5	4.5	4.0	90	13
1756.5	1759	2.5	2.5	100	12
1759	1761	2.0	2.0	100	12
1761	1766.5	5.5	5.5	100	12
1766.5	1771	4.5	4.5	100	12
1771	1777	6.0	6.0	100	6
1777	1778	1.0	1.0	100	11
1778	1781	3.0	3.0	100	11
1781	1783.5	2.5	2.5	100	12
1783.5	1785	1.5	1.0	70	12
1785	1786.5	1.5	1.5	100	12
1786.5	1788.5	2.0	2.0	100	11
1788.5	1790.5	2.0	2.0	100	11

Character of Material

1707-1711 Gabbro, med. to fine, light gray; considerable pyrite in veinlets & along fractures; veinlets of carbonate & zeolite @ 45° to core.

1711-1731 Pyroxenite, fine with a few med. to coarse patches, moderate fracturing @ 50°-70° to core; 3" carbonate epidote veinlet @ 1719' @ 90° to core.

1731-1735.5 Pyrox., fine, with an altered zone (to epidote & chlorite) @ 5° to core.

1735.5-1756.5 Pyrox., fine, with moderate, random fracturing; av. 13% magn. by vol.; light to med. gray andesite to trachyandesite dikelets @ 1744.5' @ 45° to core @ 1746.5' @ 20° to core & @ 1749'-1750' @ 40° to core, contain considerable pyrite, disseminated & along fractures, and minute traces of chalcopyrite, also some thin limonite filled veinlets (rare).

1756.5-1759 Pyrox., fine, with minute flakes of native copper disseminated and along fractures (probably less than 0.01%); 4" andesite dikelet @ 1757.5' @ 30° to core contains both pyrite & native copper (trace).

1759-1770.5 Pyrox., fine, with minor fracturing; av. 12% magnetite.

1770.5-1775 Gabbro, light gray, med., cut by dikelets of andesite; both contain serpentine-chlorite pseudomorphs after olivine which are surrounded by reaction coronas; both contain considerable, disseminated pyrite.

1775-1812 Pyrox., fine, with moderate, random fracturing; av. 12% magnetite; 4" andesite dikelet @ 1811' @ 70° to core is dark gray, flow-banded with minor pyrite; 4" andesite dikelet @ 1811.5' @ 65° to core.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1790.5	1793	2.5	2.5	100	11	
1793	1796	3.0	3.0	100	11	
1796	1797	1.0	1.0	100	11	
1797	1799	2.0	2.0	100	11	
1799	1803	4.0	3.5	90	12	
1803	1806	3.0	3.0	100	12	
1806	1810	4.0	4.0	100	11	
1810	1811.5	1.5	1.5	100	10	
1811.5	1812	0.5	0.5	100	11	
1812	1815	3.0	3.0	100	11	1812-1827 Pyrox., fine, as above but with thin, random veinlets of chlorite, carbonate, epidote, & pyrite; av. 11% magnetite; 1' andesite to trachyandesite dikelet @ 1815.5'-1816.5' @ 55° to core contains pyrite disseminated & in veinlets with epidote & carbonates; 3" dikelet @ 1824.5' contains a trace of chalcopyrite along with pyrite, epidote & carbonate.
1815	1820.5	5.5	5.5	100	10	
1820.5	1825	4.5	4.5	100	11	
1825	1828	3.0	3.0	100	11	
1828	1831	3.0	3.0	100	12	1827-1876 Pyrox., fine, with random fracturing; av. 12% magnetite; andesite dikelet @ 1858'-1860' @ 5° to core with pyrite along fractures & along contact with pyrox.; 2" dikelet @ 1863' @ 50° to core; series of 1" dikes @ 1867-1868' cut by stilbite-filled fracture.
1831	1836	5.0	5.0	100	12	
1836	1838	2.0	1.5	75	12	
1838	1839	1.0	1.0	100	12	
1839	1841	2.0	1.5	75	12	
1841	1842.5	1.5	1.5	100	12	
1842.5	1843.5	1.0	1.0	100	12	
1843.5	1844.5	1.0	1.0	100	12	
1844.5	1847	2.5	2.5	100	12	
1847	1848	1.0	1.0	100	12	
1848	1851.5	3.5	3.5	100	12	
1851.5	1856	4.5	4.5	100	12	
1856	1858	2.0	2.0	100	12	
1858	1861	3.0	3.0	100	8	
1861	1865	4.0	4.0	100	12	
1865	1871	6.0	6.0	100	10	
1871	1876	5.0	5.0	100	12	
1876	1886	10.0	10.0	100	11	1876-1880 Pyrox., fine, cut by numerous veinlets of chlorite, carbonate & pyrite, increasing in number approaching the dikelet @ 1880'.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
1886	1888	2.0	2.0	100	11
1888	1890	2.0	2.0	100	11
1890	1891.5	1.5	1.5	100	11
1891.5	1893	1.5	1.5	100	11
1893	1894.5	1.5	1.5	100	11
1894.5	1897.5	3.0	3.0	100	11
1897.5	1900.5	3.0	3.0	100	11
1900.5	1902	1.5	1.0	70	11
1902	1903.5	1.5	1.0	70	11
1903.5	1906.5	3.0	3.0	100	11
1906.5	1907	0.5	0.5	100	10
1907	1910	3.0	3.0	100	10
1910	1911	1.0	1.0	100	10
1911	1912	1.0	1.0	100	11
1912	1916	4.0	3.5	90	11
1916	1919	3.0	3.0	100	11
1919	1922	3.0	3.0	100	11
1922	1923	1.0	1.0	100	11
1923	1928	5.0	5.0	100	6
1928	1933	5.0	5.0	100	12
1933	1935	2.0	2.0	100	12
1935	1939	4.0	4.0	100	14
1939	1940	1.0	1.0	100	12
1940	1942	2.0	2.0	100	12
1942	1943.5	1.5	1.0	70	12
1943.5	1945.5	2.0	1.5	75	12
1945.5	1946.5	1.0	1.0	100	12
1946.5	1948	1.5	1.5	100	12
1948	1950	2.0	1.5	75	12
1950	1950.5	0.5	0.5	100	12
1950.5	1952.5	2.0	1.5	75	12
1952.5	1953	0.5	0.5	100	10
1953	1955.5	2.5	2.5	100	12
1955.5	1956.5	1.0	1.0	100	12
1956.5	1957.5	1.0	0.5	50	12
1957.5	1958.5	1.0	1.0	100	12

Character of Material

1880-1882 Andesite to trachyandesite dikelet, light gray, @ 50° to core, with minor pyrite.

1882-1923.5 Pyrox., fine, fracturing av. 30°-60° to core; av. 11% magnetite; 2" amphibole-felsic vein @ 1908' @ 35° to core.

1923.5-1928 Andesite, light gray, cut by veinlets of carbonate and zeolite (stilbite); bordered by dark gray andesite.

1928-2000 Pyrox., fine, with moderate, random fracturing av. 12% magnetite by vol.; 1" seam of magnetite @ 1938'; 4" andesite to trachyandesite dikelet @ 1954' @ 40° to core contains considerable pyrite; 4" andesite dikelet @ 1978.5' @ 75° to core; 3" andesite dikelet @ 1992' @ 40° to core; 4" andesite dikelet @ 1993' @ 40° to core; 2" dikelet @ 1996' @ 20° to core; group of 1" amphibole-felsic veinlets @ 1996.5'-1998'.

DRILL HOLE H-7 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1958.5	1960.5	2.0	2.0	100	12	
1960.5	1965	4.5	4.0	90	12	
1965	1966	1.0	1.0	100	12	
1966	1968	2.0	2.0	100	12	
1968	1970.5	2.5	1.5	60	12	
1970.5	1972.5	2.0	2.0	100	12	
1972.5	1974	1.5	1.5	100	11	
1974	1977	3.0	3.0	100	12	
1977	1979.5	2.5	2.5	100	10	
1979.5	1982	2.5	2.5	100	12	
1982	1983.5	1.5	1.5	100	12	
1983.5	1987	3.5	3.5	100	11	
1987	1990	3.0	3.0	100	11	
1990	1992	2.0	2.0	100	12	
1992	1996	4.0	4.0	100	10	
1996	1999	3.0	3.0	100	12	
1999	2000	1.0	1.0	100	12	

(BOTTOM OF HOLE)

DRILL HOLE H-8

Started: June 4, 1959
Completed: June 21, 1959
Elevation (collar reference H-2=/64)
Located 825' south of north center line stake of X12; thence 25' east

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
0	8	8	0			(Rock bit 3-7/8") Tundra and peat.
8	40	32	0			Sand with gravel lenses and beds, brown.
40	50	10	0			Gravel, coarse with sand.
50	100	50	0			Sand with gravel layers - some water bearing.
100	120	20	0			Gravel, coarse and sand.
120	217	97	0			Gravel, coarse with sand, cobbles and boulders.
217	222.5	5.5	0			Sludge indicates firm rock with appreciable magnetite. Pyroxenite ledge at 217'. (NX-casing set to 222').
222	224	2	2	100	10	
224	228	4	4	100	11	
228	235	7	7	100	11	
235	245	10	10	100	9	
245	246	1	.75	75	14	
246	251	5	5	100	14	
251	254	3	2.5	80	14	
254	257	3	3	100	14	

<u>222-235.5</u> Pyroxenite, fine grained, grayish green; magnetite av. 11% by vol.; native copper (possibly av. 0.02%) is in thin sheets up to 1" in diam. along random fractures; minor pyrite is finely disseminated; shears at 30°-45° to core are coated by chlorite & serpentine; 1/2"-1" bands of massive chlorite @233'-234' are spotted by pseudomorphs of limonite after pyrite; 1" band of solid magnetite @234.5' @ 90° to core.

<u>235.5-237.5</u> Gabbro, coarse grained (av. 3mm.), with about 60% pyroxene and 30% felsic minerals (partly sericitized plagioclase, apatite & minor carbonate). Felsics are interstitial to the pyroxene. Magnetite av. 7% by vol.

<u>237.5-240</u> Pyroxenite, fine; magnetite av. 14% by vol.

DRILL HOLE H-8

From	To	Distance	Core	% Core Rec.	% Magn.
257	259	2	1	50	10
259	264	5	5	100	9
264	266.5	2.5	2.5	100	6
266.5	271	4.5	4	90	11
271	276	5	5	100	13
276	280	4	4	100	13
280	281	1	1	100	12
281	285.5	4.5	4.5	100	10
285.5	290.5	5	5	100	19
290.5	295.5	5	5	100	16
295.5	300	4.5	4.5	100	18
300	304	4	4	100	16
304	305	1	1	100	17
305	310	5	4.5	90	17
310	315	5	5	100	10
315	320	5	5	100	10
320	325	5	5	100	16
325	329	4	4	100	11
329	333	4	3.5	90	11
333	338	5	5	100	10

Character of Material

240-241.5 Gabbro, like 235.5-237.5; appears to have intruded the pyroxenite, cutting the core @ 25°.

241.5-254.5 Pyroxenite, fine; magnetite av. 15% by vol; random chlorite-pyrite-filled shears; amphibole-rich zone @ 252 contains microlitic cavities lined by zeolites & pyrite; 1" band of magnetite @ 250'.

254.5-263 Pyroxenite, fine, veined & altered; native copper disseminated along fractures (possibly 0.01-0.02%); magnetite av. 10% by vol.; 1/2" chlorite veins @ 30° - 50° to core contain limonite pseudomorphs after pyrite.

263-266 Pyroxenite, fine, saturated by veins of felsics (altered plagioclase, apatite, etc.); av. 8% magnetite by vol.

266-286 Pyroxenite, fine, av. 12% magnetite by vol.; cut by veinlets @ 45°-90° to core of chlorite-calcite-pyrite; group of 1/2" patches of magnetite @ 274' & 277'; patches of felsic @ 282'-284' along with chlorite, calcite, and pyrite.

286-310.5 Pyroxenite, fine; increase in magnetite content is apparent (av. 17% by vol.); 1" bands of magnetite @ 286.5', 290', 297', 307'; 1/2" felsic veinlets @ 295'.

310.5-320 Pyroxenite, fine, with coarse phase @ 310.5-311.5; felsic bands: 1" @ 313' @ 65° to core, 313.5 @50° to core, 314' @ 40° to core, 314.5' @ 30° to core, & @ 315'-317.5'.

320-325 Pyroxenite, fine, with 1" seams of magnetite @321', 323', 324' @ 35° - 50° to core; av. 16% magnetite by vol.

325-349 Pyroxenite, fine, av. 11% magnetite by vol.; chlorite & serpentine in random shears; minor epidote in

DRILL HOLE H-8

From	To	Distance	Core	% Core Rec.	% Magn.
338	340	2	1.5	75	11
340	350	10	10	100	10
350	359	9	9	100	10
359	369	10	10	100	11
369	375	6	6	100	11
375	381.5	6.5	6.5	100	10
381.5	385	3.5	3	85	12
385	387	2	2	100	12
387	392	5	4	80	12
392	397	5	4	80	11
397	402	5	4.5	90	7
402	407	5	5	100	12
407	411	4	3.5	80	8
411	412	1	.75	75	6
412	413	1	1	100	6
413	419.5	6.5	6.5	100	7
419.5	421.5	2	1.5	75	6
421.5	422	0.5	0.25	50	6
422	432	10	10	100	5
432	435.5	3.5	3.5	100	6
435.5	437.5	2	1.5	75	6
437.5	440	2.5	2.5	100	6
440	443	3	3	100	6
443	446	3	3	100	6

Character of Material

thin veinlets; chlorite-calcite-pyrite in 1/4"-1/2" veinlets @ 45°-75° to core, & in 3" vein @ 334'; 2" andesite dike @331' @ 20° to core.

349-370.5 Pyroxenite, fine, with epidote veined coarse phase @349'-350.5'; abundant, random, 1/2" veins of felsics; chlorite-pyrite-calcite-rich zone @ 361'-362.5'; amphibole-rich veins @ 358' @ 30°-50° to core contain pyrite & some chalcopyrite.

370.5-375.5 Pyroxenite, fine to coarse, sheared (random) and chloritized. Coarse phase, 373'-375.5' av. 5 mm. in grain size, av. 11% magnetite by vol., & is veined by chlorite & epidote.

375.5-396 Pyroxenite, fine, av. 12% magnetite; a few veins of chlorite, epidote, calcite & pyrite, felsic-rich band (gabbro) @ 380.5'-381.5' @ 20° to core.

396-403.5 Gabbro, med. to coarse (av. 3 to 5 mm.); av. 50% felsic & 7% magnetite by vol.; 8" felsic band @403. The gabbro cuts the pyroxenite @ 15°-20° to core.

403.5-408 Pyroxenite, fine to coarse, av. 14% magnetite; cut by a few felsic bands; coarse phase @ 405' with patches of chlorite containing limonite pseudomorphs after pyrite.

408-413 Gabbro, med. to coarse, av. 50% felsics; highly sheared (random).

413-416 Gabbro, med., av. 10%-15% felsics.

416-419 Gabbro, coarse (av. 5mm.), av. 35% felsics & 5% magnetite; 3" felsic band @ 418 @ 30° to core; fractures av. 40° to 60° to core.

419-430 Gabbro to pyroxenite, med. to coarse, av. 5-15% felsics & 6% magnetite; 8" felsic patch @ 423'-423.5; chloritized shears @ 45° to core.

430-446.5 Gabbro, med. to coarse (some crystals as large as 15 mm.), av. 30%-60% felsics & 6% magnetite; talcose shears @ 437.5'-438.5' @ 10°-30° to core; miarolitic cavities @ 444' are lined by euhedral plagioclase laths.

DRILL HOLE H-8

From	To	Distance	Core	% Core Rec.	% Magn.
446	454	8	8	100	7
454	455	1	1	100	6
455	460	5	4.5	90	6
460	465	5	5	100	6
465	470	5	5	100	10
470	475	5	5	100	8
475	480	5	5	100	6
480	485	5	5	100	6
485	486	1	1	100	9
486	487	1	.5	50	9
487	489.75	2.75	2.5	90	9
489.75	495	5.25	2	35	9
495	500	5	2	40	9
500	504	4	.5	10	9
504	507	3	1	30	9
507	510	3	2	70	7
510	512.5	2.5	2.5	100	11
512.5	516.5	4	4	100	11
516.5	518.5	2	1	50	12
518.5	523	4.5	4	90	10
523	527	4	3.5	90	10
527	530	3	2	66	10
530	531	1	1	100	
531	534.5	3.5	3.5	100	12
534.5	538	3.5	2.5	75	11
538	538.5	0.5	0.5	100	12
538.5	539.5	1	1	100	12
539.5	545	5.5	5	90	12
545	550	5	4.5	90	12
550	555	5	4	80	12

Character of Material

<u>446.5-453.5</u> Gabbro to pyroxenite, med., av. 5%-20% felsics & 7% magnetite.

<u>453.5-456</u> Gabbro, coarse, av., 50% felsics; band @ 453.5'-454' is rich in amphibole biotite, chlorite & epidote.

<u>456-469</u> Gabbro, med. to coarse, av. 20%-40% felsics & 6% magnetite.

<u>469-474</u> Gabbro, coarse (av. 5-10 mm.), av. 40-60% felsics & 10% mag.

<u>474-484.5</u> Gabbro, med. to coarse, av. 40% felsics, minor fracturing.

<u>484.5-507</u> Pyroxenite, fine, highly altered, cut by numerous dikelet apophyses of gabbro; random shears.

<u>507-515</u> Pyroxenite, fine to med., av. 11% magnetite by vol.; band @ 507-509' is intensely sheared & altered, rich in amphibole, biotite & chlorite.

<u>515-520</u> Pyroxenite, med. to coarse, av. 12% magnetite by vol.; fractures @ 20°-45° to core are limonite stained.

<u>520-531</u> Pyroxenite, fine, veined by felsics & calcite.

<u>531-556</u> Pyroxenite, fine to med., av. 12% magnetite by vol.; 1" magnetite seam @ 531' @ 35° to core is cut by 1" felsic band @ 25° to core; coarse phase @ 535' @ 35° to core; minor random shears containing some pyrite.

DRILL HOLE H-8

From	To	Distance	Core	% Core Rec.	% Magn.
555	557	2	2	100	15
557	559	2	1	50	13
559	566	7	6	90	13
566	569	3	3	100	13
569	572.5	3.5	3.5	100	13
572.5	576.5	4	3.5	90	13

Character of Material

556-557 Pyroxenite, coarse, ave. 16% magnetite.

557-559 Pyroxenite, fine, badly broken.

559-563 Pyroxenite, coarse, av. 15% magnetite; 2-3" band of magnetite @ 561'.

563-576.5 Pyroxenite, fine, av. 13% magnetite; shears and fractures rare, contain chlorite & some pyrite; rare felsic veinlets @ 30° to core.

DRILL HOLE H-9

Started: July 4, 1959
Completed: July 18, 1959
Elevation (collar reference H-2) =/ 56
Located 430' due north of south-end center post of 19J

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
0	10	10				(4-1/4" rock bit & mud) Silt, fine, brown
10	20	10				Silt, fine, brown with minor fine sand
20	40	20				Sand, fine, w/minor silt; minor magnetite
40	70	30				Gravel (pebble to cobble size) with minor sand
70	90	20				Sand, fine
90	100	10				Sand, fine with a few interbeds of gravel (pebble to granule size)
100	150	50				Sand, fine, with a trace of magnetite
150	180	30				Sand, fine to med. with a few interbeds of gravel (pebble to cobble size)
180	190	10				Sand, fine with minor gravel
190	200	10				Sand, fine
200	220	20				Sand, fine with minor gravel
220	230	10				Sand, fine to med; slight increase in magnetite & considerable increase in feldspar & pyroxene fragments (top of ledge @ 226') (NX-3-1/2" - casing to 230')
NX230	234	4	3	75	7	230-236.5 Gabbro, fine to med. consisting of plagioclase, pyroxene & minor magnetite in grains av. less than 1 mm. in size, & biotite in 1/4" patches; magnetite av. 7% by vol.; irregular, randomly scattered patches of fine-grained pyroxenite range from 1/4" to 4" in size; a few, thin, felsic veinlets @ 55° to core contain a trace of pyrite; minor fracturing av. 50° - 60° to core. (BX-2-7/8" casing to 235')
NX234	236.5	2.5	2.5	100	7	

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
236.5	240	3.5	3.5	100	7
240	250	10	10	100	7
250	260	10	10	100	7
260	262	2	2	100	7
262	267	5	5	100	9
267	268.5	1.5	1.5	100	7
268.5	273	4.5	4.5	100	7
273	276.5	3.5	2.5	70	8
276.5	279	2.5	2.5	100	8
279	281	2	1.5	75	8
281	284	3	3	100	7
284	286.5	2.5	2.5	100	7
286.5	288	1.5	1.5	100	10
288	292	4	4	100	7
292	299	7	6	90	7
299	304	5	5	100	8

Character of Material

236.5-262.5 Gabbro, fine to med. like above, relatively unfractured; av. 7% magnetite by vol.; pyrite along fractures; 1" amphibole andesite dikelet @ 237' @ 30° to core; rare 1" patches of pyrox.; a few felsic veinlets (1/2") @ 40° to core.

262.5-265 Pyrox., fine; very irregular contact with the diorite, little evidence of either contact chilling or alteration; probably xenolithic; pyrox. is cut by numerous thin carbonate-zeolite-pyrite veinlets @ ave. of 25° to core; av. 11% magnetite by vol.; includes several 1" patches of magnetite.

265-271 Gabbro, med., with scattered patches of pyrox., 1/4" felsic veinlets av. 30°-50° to core.

271-274 Andesite to trachyandesite, light gray, dike cutting gabbro @ 15°-20°.

274-281.5 Gabbro, fine to med., saturated by irregular patches of pyrox.; intensely fractured from 278.5'-281.5' @ 0°-10° & 40°-50° to core; some 1/4"-1/2" amphibole phenocrysts in the gabbro; a few felsic veinlets @ 30° to core; rock av. 8% magnetite.

281.5-286.5 Gabbro, fine, like above, but with few patches of pyrox.

286.5-288 Andesite or very fine-grained pyroxenite, med. grayish-green; cuts gabbro @ 60° to core.

288-299 Gabbro, fine, relatively unfractured; av. 7% magnetite by vol.; 1" felsic-amphibole veinlet @ 289.5' @ 40° to core; pyrite along fractures.

299-300.5 Pyrox. fine; amphibole in patches & veinlets, av. 9% magnetite.

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
304	306	2	2	100	3
306	310	4	3.5	90	7
310	317	7	7	100	7
317	327	10	10	100	7
327	329	2	2	100	7
329	331	2	2	100	7
331	333.5	2.5	2	80	7
333.5	336	2.5	0.5	20	7
336	340	4	3	75	7
340	340.5	0.5	0.5	100	7
340.5	350.5	10	10	100	8
350.5	356.5	6	6	100	7
356.5	361	4.5	4.5	100	7
361	364.5	3.5	3.5	100	7
364.5	369	4.5	4.5	100	8

Character of Material

300.5-301.5 Felsic dikelet; nearly solid feldspar in large crystals (1" - 2"); cuts core @ 30°-40°.

301.5-303 Gabbro, fine to med., like above; with disseminated pyrite.

303-305 Felsic dikelet highly fractured & altered with considerable carbonate containing 1/4" pseudomorph after pyrite.

305-331.5 Gabbro, fine to med., with a few minor zones of fracturing; pyrite along fractures & disseminated; av. 7% magnetite by vol; scattered 1/4"-1" felsic veinlets cut core @ 0°-20°; felsic zones @ 309' & 327' are highly fractured & mineralized by carbonate, chlorite & limonite (pseudos. after pyrite); miarolitic cavity @ 323.5' contains euhedral crystals of pyrite, epidote, calcite & barite (?); deuteric to hydrothermal alteration of the main gabbro (sericitization & saussuritization (?) of the plagioclase) along thin, scattered stringers which av. 50°-70° to core.

331.5-338 Gabbro, fine, with intense fracturing & minor shearing @ av. of 60°-80° to core; veinlets of carbonate & considerable pyrite.

338-347.5 Gabbro, fine to med. relatively unfractured; av. 7% magnetite; considerable pyrite.

347.5-349.5 Pyrox., fine to med., with patches of amphibole & felsics, cut by 2" dikelet of andesite of very fine pyrox. @ 20° to core; irregular contact with gabbro.

349.5-368.5 Gabbro, fine to med., relatively unfractured; av. 7% magnetite; pyrite along fractures; with a few irregular patches of pyrox.; sheared & altered zone @356.5'; 1/4" to 1" felsic veinlets av. 20°-40° to core; 3" trachyandesite dikelet @ 365.5 @ 60° to core.

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
369	371.5	2.5	2.5	100	11
371.5	372	0.5	0.5	100	11
372	375.5	3.5	3.5	100	11
375.5	378	2.5	2.5	100	7
378	385	7	4	60	7
385	390	5	4.5	90	7
390	398	8	8	100	7
398	404.5	6.5	6	90	7
404.5	414	9.5	9.5	100	7
414	421	7	7	100	7
421	421.5	0.5	0.5	100	7
421.5	431.5	10	10	100	7
431.5	434.5	3	3	100	7
434.5	444.5	10	10	100	7
444.5	454.5	10	10	100	8
454.5	462.5	8	8	100	8
462.5	473	10.5	10.5	100	8
473	483	10	10	100	9
483	486.5	3.5	3.5	100	9
486.5	487	0.5	0.5	100	9
487	497	10	10	100	11
497	504	7	7	100	11
504	513	9	9	100	11

Character of Material

368.5-375.5 Pyrox., fine, av. 11% magnetite; irregular contact with gabbro; lower portion has 1/4" amphibole phenocrysts (possibly a later dike).

375.5-441 Gabbro, fine to med., with minor fracturing; pyrite disseminated & along fractures; magnetite av. 7% by vol., amphibole in scattered phenocrysts & irregular stringers; 1" felsic veinlets @ 0°-20° to core; scattered patches of fine to med.-grained pyroxenite, 1/2"-2" except for 6" @ 403.5', 421', 424' & 436', 4" trachyandesite dikelet @ 404.5' @ 40° to core; dikelets of amphibole andesite (?) 4" @ 399' @ 30° & 1" @ 439.5' @ 30° to core.

441-443 Andesite, grayish-green, with subtle flow-banding; 40° to core.

443-474.5 Gabbro, fine to med., relatively unfractured, with considerable pyrite along the rare fractures & disseminated; av. 8% magnetite; scattered patches of pyrox. (1/2"-4"), with grouping of patches @ 455', 458'-459' & @ 461.5'; rare 1/4" to 1/2" felsic veinlets @ 40° to core; amphibole andesite (?) dikelets: 1" @ 447' @ 40°, 1" @ 449' @ 45°, 1" @ 453.5' @ 70°, 3" @ 463-464' @ 20°, 2" @ 470' @ 10°.

474.5-481.5 Pyrox., fine, saturated by irregular patches of gabbro; av. 9% magnetite by vol.; a few 1/2" felsic veinlets @ 50°-70° to core.

481.5-493 Pyrox., fine, av., 9% magnetite; with scattered 1/8-1/4" patches of felsics; 2" felsic band @ 486' @ 50° to core, 1" band @ 487' @ 80°; altered, fractured zone @ 492.5'.

493-533 Pyrox; fine, relatively unfractured; av. 11% magnetite; some pyrite along fractures; a few scattered

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
513	523	10	10	100	11	patches (1/4"-1/2") of amphibole & felsics; rare 1" pre-intrusion (?) crystals of light green pyroxene, & serpentinized olivine as rounded, corroded phenocrysts; flow-banded, med.-gray andesite @ 503.5'-504.5' @ 40°; 1/2"-1" felsic & amphibole-felsic veinlets av. 40° to core; altered zone @ 506.5'-507' is cut by random 1/4" carbonate veinlets.
523	533	10	10	100	11	
533	536.5	3.5	2.5	70	9	533-537 Pyrox., fine, with limonite-chlorite coated fractures @ 40°-70° to core & talcose shears @ 0°-20° to core with striations @ 60°-70° to core; random carbonate veinlets.
536.5	546.5	10	10	100	11	537-602 Pyrox., fine, relatively unfractured, with a few pegmatitic schlieren with 1/2"-1" crystals of pyroxene, amphibole & plagioclase including euhedral, elongate prisms of apatite scattered 1/4" patches of amphibole & felsics, some pyrite along fractures; 1/2-1" felsic veinlets av. 30°-45° to core; 6" andesite dikelets @ 579' & 580.5' @ 30° to core; pyrox. av. 11% magnetite by vol.
546.5	556.5	10	10	100	11	
556.5	566.5	10	10	100	11	
566.5	573.5	7	7	100	11	
573.5	583.5	10	10	100	11	
583.5	593.5	10	10	100	11	
593.5	603.5	10	10	100	9	602-603.5 Diorite, fine, light to med. gray; fractured and veined by carbonate & limonite.
603.5	605	1.5	1.5	100	10	603.5-608 Pyrox., fine, highly fractured, altered to limonite & chlorite & veined by carbonate; mylonized from 605'-607'; fractures @ 0°-20° & 70°-90° to core.
605	608	3	2	70	10	
608	611	3	3	100	8	608-609.5 Andesite, light to med. gray, with minor flow banding; highly fractured & veined by carbonate; dikelet cuts pyrox. @ 30°. 609.5-611.5 Pyrox., fine, intensely fractured but only slightly altered.

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
611	621	10	10	100	11	611.5-628 Pyrox., fine, av. 11% magnetite by vol.; a few minor zones of alteration & shearing (@ 60°-80° to core); 6" light-gray andesite dikelet @ 614.5' @ 80° to core; trace of pyrite along fractures.
621	630	9	9	100	10	628-630 Pyrox., fine, fractured sheared & altered, cut by several 1" andesite dikelets @ 30°-40° to core & several, thin carbonate veinlets; shears @ 20°-40° to core.
630	631	1	1	100	7	630-631.5 Andesite, light gray, with flow banding, somewhat fractured & altered; cuts core @ 30°.
631	636	5	5	100	10	631.5-636.5 Pyrox., fine, cut by 1/2" to 1" veinlets of felsics @ av. of 30° to core & by several veinlets of carbonate; one 1/2" biotite-felsic veinlet @ 30°.
636	640	4	4	100	8	636.5-638 Andesite, like 630'-631.5', sheared @ 30° to core with striations @ 90°.
640	650	10	10	100	9	638-650 Pyrox., fine with moderate fracturing @ 40°-60° to core; zone of shearing & alteration @ 641.5'; av. 9% magnetite.
650	660	10	10	100	10	650-670 Pyrox., fine, relatively unfractured, with irregular patches of coarse-grained pyrox. @ 660' & @ 663.5'-664.5'; scattered patches of amphibole but felsics rare; 1" dikelet of amphibole andesite @ 666.5'-667' @ 100 to core cut by 1" dikelet of light gray andesite to trachyandesite @ 667-668' @ 60° to core; av. 10% magnetite.
660	670	10	10	100	10	
670	680	10	10	100	10	670-672 Pyrox., coarse, with crystals av. 1/4"-1/2"; av. 10% magnetite by vol.

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
680	687	7	7	100	9	672-707 Pyrox., fine, with minor fracturing & only a few zones of shearing & alteration @ 679.5'-680' & @682'; scattered 1/2" patches of amphibole; felsic veinlets are rare, thin & random; dikelets of light gray massive andesite: 673'-674' @ 80° to core, 685'-686' @ 70°; 2" @ 702.5' @ 70° & @ 705-707' @ 70°; av. 9% magnetite by vol.
687	697	10	10	100	9	
697	707	10	10	100	9	
707	715	8	7	90	9	707-713 Pyrox., fine, with numerous limonite coated fractures & a few carbonate veinlets.
715	715.5	2.5	2.5	100	8	713-716 Pyrox., fine, intensely mylonized & sheared, saturated with carbonate veinlets & highly altered; shears @ 20° to core with striations @ 70°-90°.
717.5	721.5	4	4	100	8	716-721.5 Pyrox., fine, highly fractured with some shears; veinlets of carbonate & epidote particularly @ 720'.
721.5	728	6.5	6.5	100	8	721.5-723.5 Andesite, light gray to med. gray, massive with minor fracturing. 723.5-729 Pyrox., fine, with moderate, random fracturing & scattered 1/2" felsic patches; av. 8% magnetite by vol.
728	738	10	10	100	9	729-732 Andesite, med. gray, massive, with numerous 1/4"-1/2" phenocrysts of pyroxene (?) & serpentine pseudomorphs after olivine, dikelet cuts core @ 40°; is cut by dikelet of light gray, massive andesite @ 729.5'-730.5' @ 80° to core (like 721.5-723.5'). 732-735 Pyrox., fine, with minor fracturing; a few scattered patches of felsics & amphibole; av. 10% magnetite by vol.; pyrite is disseminated & along fractures.

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						735-736.5 Pyrox., fine, like above but with considerable pyrite along fractures & disseminated & with some disseminated chalcopyrite both sulfides appear to be hydrothermal, probably mesothermal; a six-inch core portion @ 735.5'-736' may av. 0.05% chalcopyrite (M.G.H.)
738	748	10	10	100	11	736.5-770.5 Pyrox., fine, with minor fracturing; pyrite is widely disseminated & possibly accompanied by a rare & questionable trace of chalcopyrite; magnetite av. 11% by vol; a few thin, light gray andesite dikelets cut core @ 60°-90°.
748	755	7	7	100	11	
755	760.5	5.5	5.5	100	11	
760.5	770.5	10	10	100	11	
770.5	773.5	3	3	100	7	770.5-773.5 Andesite dikelet, light gray, with scattered 1/4", green serpentine pseudomorphs after olivine, & with some disseminated pyrite, cuts core @65°.
773.5	778.5	5	5	100	10	773.5-806 Pyrox., fine, with moderate random fracturing; a few scattered patches of amphibole & felsics; disseminated pyrite is ubiquitous along with a possible trace of chalcopyrite; a few, thin, random veinlets of carbonate & epidote; zone of shearing & alteration @ 801.5'-802' with shears @ 80° to core; av. 10% magnetite by vol.
778.5	780.5	2	2	100	10	
780.5	786.5	6	6	100	10	
786.5	794	7.6	7.5	100	10	
794	802	8	8	100	10	
802	812	10	10	100	9	
812	822	10	10	100	9	806-817 Pyrox., fine, with considerable felsics in 1 mm. patches; slightly sheared & altered; numerous thin veinlets of carbonate & epidote @ 0°-10° & 60°-90° to core; disseminated pyrite; a few altered dikelets of andesite. 817-822 Pyrox., med., with some shearing; saturated by random veinlets of chlorite, with fewer veinlets of carbonate & epidote; finely disseminated pyrite.
822	832	10	10	100	9	822-837.5 Pyrox., med. to coarse like above but less altered & with fewer veinlets of chlorite; av. 9% magnetite.
832	841	9	8	90	8	

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
841	849	8	8	100	9
849	857	8	8	100	8
857	867	10	10	100	8
867	872	5	5	100	8
872	882	10	10	100	8
882	888	6	6	100	8
888	898	10	10	100	9
898	908	10	10	100	8
908	918	10	10	100	8
918	928	10	10	100	10
928	938	10	10	100	10
938	948	10	10	100	10
948	958	10	10	100	10
958	968	10	10	100	10
968	978	10	10	100	10

Character of Material

837.5-841 Andesite dikelet, light gray, with a few 1/4" phenocrysts of serpentine as pseudos. after olivine; cuts core @ 60°.

841-848 Pyrox., med. to coarse, like 822-837.5' with considerable biotite in scattered 1/4" patches; av. 9% magnetite.

848-850.5 Pyrox., med. to coarse, highly sheared and altered to chlorite & serpentine; considerable carbonate and abundant pyrite in masses as large as 1"; talcose shears av. 20-60° to core.

850.5-873.5 Pyrox., med. to coarse, relatively unfractured & unaltered; with minor pyrite; magnetite av. 9% by vol.; 3" felsic veinlet @ 864.5' @ 35° to core.

873.5-875 Andesite, med. gray, with minor flow-banding; cuts core @ 40°.

875-918.5 Pyrox., med. to coarse, with a few patches of coarse to very coarse, relatively unfractured; magnetite av. 8% by vol.; 3" felsic veinlet @ 909' @ 30° to core; several thin carbonate-epidote veinlets @ 30°-50° to core; some deuteric alteration @ 918'-918.5'.

918.5-958 Pyrox., coarse, with a few patches of med., relatively unfractured; av. 10% magnetite by vol.; scattered 1" felsic-amphibole patches contain euhedral 1/4" prisms of apatite & some pyrite; 2" felsic veinlet @ 929' @ 40° to core contains a blue-green mineral which may be chrysocolla (?); other felsic veinlets: 1" @ 941.5' @ 20° to core, 1" @ 944' @ 40°, 1" @ 949' @ 20°.

958-974 Pyrox., med., unfractured except for altered zones (to chlorite) @ 958'-960' & 973'-974 @ the contacts with the coarse-grained phase; av. 10% magnetite; considerable disseminated biotite.

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
978	988	10	10	100	9	974-989 Pyrox., coarse, relatively unfractured; av. 9% magnetite by vol.; like 918.5'-958'.
988	994	6	6	100	9	989-1029 Pyrox., med to coarse, relatively unfractured except for minor zone @ 998'; ave. 9% magnetite by vol.; dikelets: med. gray, flow-banded andesite @ 991.5'-992.5' @ 40° to core, 4" amphibole andesite dikelet @1014' @ 10°-20°, 2" amphibole andesite dikelet @ 1019.5' @ 20°.
994	1004	10	10	100	9	
1004	1014	10	10	100	9	
1014	1024	10	10	100	9	
1024	1034	10	9	90	7	1029-1031.5 Andesite, med. gray, moderately fractured. 1031.5-1034.5 Pyrox., coarse, intensely sheared, mylonized & altered, cut by numerous carbonate-epidote veinlets.
1034	1044	10	10	100	9	1034.5-1040 Pyrox., coarse, unmylonized but sheared @ av. of 30°-60° to core; zone from 1038-1039.5' is saturated by veinlets of chlorite & a few epidote-carbonate veinlets.
1044	1049	5	4	80		
1049	1059	10	10	100	9	1040-1079.5 Pyrox., coarse, with a few med. patches; relatively unfractured except for zones @ 1045.5', 1058.5', & 1066'-1067'; magnetite av. 9% by vol.; rare 1/2"-1" felsic veinlets av. 40° to core.
1059	1066.5	7.5	7.5	100	9	
1066.5	1076.5	10	10	100	9	
1076.5	1083.5	7	7	100	9	
1083.5	1093.5	10	10	100	9	1079.5-1093 Pyrox., med., moderately sheared @ 0°-20° to core with striations @ 20°-30° to core; several zones saturated by veinlets of chlorite & patches of epidote; no visible pyrite.
1093.5	1103.5	10	10	100	10	1093-1121 Pyrox., coarse, unfractured; av. 10% magnetite by vol.; 2" felsic veinlet @ 1120' @ 40° to core.
1103.5	1113.5	10	10	100	10	
1113.5	1123.5	10	10	100	10	1121-1153.5 Pyrox., med., with a few zones of coarse pyrox. & a few ragged groupings of magnetite granules; magnetite av. 11% by vol.; med. gray, flow-banded andesite dikelet @ 1148-1148.5' @ 40° to core.
1123.5	1133.5	10	10	100	11	
1133.5	1142.5	9	9	100	11	
1142.5	1146.5	4	4	100	11	
1146.5	1152.5	6	6	100	11	

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1152.5	1154.5	2	2	100	11	1153.5-1160 Pyrox., fine, with minor fracturing @ 40°-50° to core; cuts med.-grained pyrox. @ 40° to core; av. 13% magnetite by vol.
1154.5	1156	1.5	1.5	100	13	
1156	1166	10	10	100	12	
1166	1176	10	10	100	12	1160-1168 Pyrox., med., with minor fracturing; av. 11% magnetite; has an obviously higher biotite-amphibole content than the adjacent fine-grained pyrox.; 1" amphibole-andesite dikelets @1164' & 1165' cut core @ 10°-20°.
1176	1186	10	10	100	13	1168-1192 Pyrox., fine, relatively unfractured; av. 13% magnetite byvol.
1186	1196	10	10	100	13	
1196	1199	3	3	100	12	1192-1234 Pyrox., med. to fine, moderately to intensely fractured with zones of shearing & alteration @ 1195.5'-1196', 1205', 1208'-1209', 1220.5'-1222', 1223', 1226'-1226.5' & 1231'; felsic veinlets @ 1213'-1214' @ 70° to core & @ 1216'-1216.5' @ 70°; med. gray andesite dikelet @ 1224.5'-1225' @ 70°.
1199	1209	10	9.5	95	12	
1209	1219	10	9.5	95	12	
1219	1223	4	4	100	12	
1223	1226.5	3.5	3.5	100	11	
1226.5	1230	3.5	3.5	100	12	
1230	1240	10	10	100	11	1234-1264 Pyrox., fine with med. to coarse patches; relatively unfractured; av. 11% magnetite by vol.; 4" felsic veinlet @ 1257' @ 40° to core.
1240	1250	10	10	100	11	
1250	1260	10	10	100	12	
1260	1270	10	10	100	12	1264-1285.5 Pyrox., coarse to med., with minor zones of shearing & alteration @ 1268'-1269', 1278.5', 1281.5'-1282', 1283'-1284'; several 1/4" to 1/2" patches of sphalerite @ 1266' associated with a 2" patch of amphibole; the main part of the sphalerite is included within the amphibole, possibly partly replacing it, but stringers and islands are visible in the adjacent pyroxene; the amphibole also contains euhedral crystals of apatite and subhedral crystals of magnetite; med. gray andesite dikelet @ 1282'-1283' cuts core @ 30°; pyrox. av. 13% magnetite by vol.
1270	1280	10	10	100	14	
1280	1284	4	3	75	13	
1284	1286	2	2	100	13	
1286	1295.5	9.5	9.5	100	13	1285.5-1294 Pyrox., fine, with moderate fracturing; av. 13% magnetite by vol.

RILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
1295.5	1296.5	1	1	100	11
1296.5	1299	2.5	1	40	10
1299	1301.5	2.5	1	40	11
1301.5	1305	3.5	2.5	75	11
1305	1315	10	7.5	75	11
1315	1317.5	2.5	2.5	100	10
1317.5	1327.5	10	10	100	12
1327.5	1334.5	7	7	100	12
1334.5	1343	8.5	8.5	100	12
1343	1353	10	10	100	12
1353	1363	10	10	100	12
1363	1373	10	10	100	14
1373	1380	7	6	90	25
1380	1383	3	3	100	15
1383	1393	10	10	100	14
1393	1403	10	3.5	35	11
1403	1414	11	11	100	12
1414	1424	10	10	100	12
1424	1430	6	6	100	12
1430	1435	5	5	100	12
1435	1436.5	1.5	1.5	100	12
1436.5	1445.5	9	9	100	12

Character of Material

1294-1308 Pyrox., fine, highly sheared & altered; cut by several dikelets of altered, flow-banded andesite; shears @ 10°-30° to core; numerous thin veinlets of carbonate along with some epidote & chlorite.

1308-1314 Pyrox., fine, relatively unfractured; av. 11% magnetite by vol.; a few felsic veinlets @ 25° to core.

1314-1318 Pyrox., fine, moderately sheared & altered; veined by epidote & carbonate; shears @ 0°-30° with striations @ 60°-70° to core.

1318-1370.5 Pyrox., fine, with a few zones of minor shearing & alteration; av. 12% magnetite by vol.; rare 1/2" felsic veinlets av. 70° to core; 4" dikelet of distinctly flow-banded andesite @ 1332'.

1370.5-1389.5 Pyrox., fine, with numerous magnetite-enriched zones; the magnetite occurs in patchy to lens-shaped groupings of 1-2 mm., equant crystals which may be in part earlier than the associated pyroxene; magnetite-enriched zones @ 1370.5', 1372.5-1377.5', 1378.5', 1383', 1385.5', 1388'; med. gray, massive andesite in dikelet @ 1380.5'-1381.5' @ 40° to core; magnetite-enriched zones av. 32% magnetite by vol. & 45% by wt.; normal pyrox. between enriched lens av. 11% magnetite by vol.

1389.5-1407.5 Pyrox., med., relatively unfractured; av. 12% magnetite by vol.; magnetite-enriched zone @ 1407'.

1407.5-1493 Pyrox., fine, relatively unfractured except for zones of shearing & slight alteration @ 1417.5'-1418', 1428.5-1432', 1435.5'-1437, 1445.5', 1448.5'-1450', 1453'-1454', 1456', 1460.5', 1473.5', 1480', 1483', & @ 1486', shears av. 20°-30° to core;

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
1445.5	1450	4.5	4.5	100	15	magnetite av. 12% by vol.; zones of slight magnetite-enrichment @ 1411.5'-1413.5', 1439', 1447'-1449', 1451', 1456'-1457.5'; several flow-banded andesite dikelets av. 10°-20° to core; 10" felsic veinlet @ 1483' @ 50° to core.
1450	1454	4	4	100	12	
1454	1456.5	2.5	2.5	100	12	
1456.5	1461	4.5	4.5	100	16	
1461	1467	6	6	100	12	
1467	1473.5	6.5	6	90	12	
1473.5	1480.5	7	7	100	12	
1480.5	1486.5	6	6	100	12	
1486.5	1496.5	10	10	100	10	1493-1510 Pyrox., med. to coarse, with a few patches of fine; relatively unfractured; av. 9% magnetite by vol.
1496.5	1506.5	10	10	100	9	
1506.5	1516	9.5	9.5	100	10	1510-1542.5 Pyrox., fine, unfractured except for zone @ 1525'-1526'; av. 10% magnetite by vol., magnetite-enriched zone @ 1534'-1537'; felsic dikelet @ 1519'-1520.5' cuts core @ 20°; zone @ 1522.5'-1523' is rich in olivine (?), chlorite, biotite & serpentine, may be a dikelet or an inclusion; several 1" flow-banded andesite dikelets @ 1538'-1541' cut core @ 0°-10°.
1516	1526	10	10	100	10	
1526	1534.5	8.5	8.5	100	10	
1534.5	1539	4.5	4.5	100	14	
1539	1549	10	5	50	13	
1549	1554	5	5	100	14	1542.5-1559 Pyrox., fine, with moderate fracturing & minor shearing; av. 12% magnetite by vol.; magnetite-enriched zones @ 1552' & 1553.5' av. 15% magnetite by vol., andesite dikelet @ 1549'-1550' has distinct flow-banding @ 40° to core.
1554	1558	4	3.5	90	12	
1558	1559.5	1.5	1.5	100	12	
1559.5	1569	9.5	9	95	11	1559-1572 Pyrox., fine, unfractured except @ 1568.5' and 1570'; magnetite av. 11% by vol.; scattered 1/4" to 1" patches of amphibole and felsics (about 3-5%).
1569	1574	5	4.5	90	11	
1574	1578	4	2.5	80	11	1572-1582 Pyrox., fine, with intense fracturing @ av. of 10°-30° to core; 3" med. gray andesite dikelet @ 1579' @ 40° to core.
1578	1580	2	2	100	11	
1580	1582	2	1.5	75	11	
1582	1592	10	10	100	11	1582-1598.5 Pyrox., fine to med., relatively unfractured, av. 11% magnetite by vol, 1" flow-banded andesite dikelets cut core @ 0°-10°; several 2" massive, med. to dark gray andesite dikelets cut core @ 40°; several 1/2" felsic veinlets cut core @ 40°.
1592	1602	10	10	100	11	

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
1602	1612	10	10	100	11
1612	1622	10	10	100	11
1622	1632	10	10	100	11
1632	1636	4	4	100	12
1636	1638.5	2.5	2.5	100	13
1638.5	1642	3.5	3	85	13
1642	1645	3	3	100	13
1645	1653	8	8	100	13
1653	1661	8	8	100	13
1661	1671	10	10	100	11
1671	1681	10	10	100	12
1681	1685	4	4	100	12
1685	1695	10	10	100	12
1695	1706	11	11	100	12
1706	1709	3	3	100	12
1709	1712	3	3	100	12
1712	1715.5	3.5	3.5	100	12
1715.5	1719.5	4	4	100	11

Character of Material

1598.5-1601.5 Pyrox., med.; intensely randomly fractured.

1601.5-1628.5 Pyrox., med. to coarse, relatively unfractured; with scattered 1/2-1" patches of amphibole and felsics; a few 1/2" felsic veinlets @ 40° to core; 5" amphibole-biotite-andesite dikelets @ 1624' and 1628' cut core @ 30°; pyrox., av. 11% magnetite by vol. with zone of enrichment @ 1624.5'-1625.5'.

1628.5-1665 Pyrox., fine, moderately fractured except for zones of intense fracturing and shearing @ 1635'-1636', 1638'-1638.5, 1642, 1645', 1653.5'; shears @ 10°-30° to core contain some pyrite; zone @ 1658'-1659.5' is saturated by random veinlets of carbonate; dikelets: amphibole andesite @ 1633.5'-1634.5' @ 45° to core; 4" @ 1635.5' @ 30°, 2" @ 1638' @ 10°, @ 1646'-1647.5' @ 30°; av. 13% magnetite by vol. with a few minor zones of magnetite enrichment.

1665-1666.5 Pyrox., fine, to andesite with 1/4" phenocrysts of magnetite-pyroxene intergrowth; the phenocrysts are rounded & embayed by magmatic reaction & the magnetite is largely converted to hematite; the border phase of the dikelet tends toward amphibole andesite; the dikelet cuts the pyrox. @ 30° to core.

1666.5-1707 Pyrox., fine, with minor fracturing; scattered 1/4"-1" patches of amphibole & apatite; minor pyrite along fractures; several 1" dikelets of sinuously flow-banded andesite to fine pyrox. @ 10° to core; av. 12% magnetite.

1707-1734 Pyrox., fine, with numerous zones of shearing but slight associated alteration; shears @ av. of 20° to core; 6" med. gray, massive andesite dikelet

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
1719.5	1721	1.5	1.5	100	12
1721	1726	5	2	40	12
1726	1729	3	2	70	12
1729	1731	2	1.5	75	12
1731	1741	10	10	100	12
1741	1751	10	10	100	12
1751	1761	10	10	100	11
1761	1766	5	5	100	12
1766	1769	3	3	100	12
1769	1772	3	2.5	80	12
1772	1773	1	1	100	12
1773	1783	10	10	100	9
1783	1785.5	2.5	2	80	8
1785.5	1788.5	3	3	100	8
1788.5	1799	10.5	10.5	100	8
1799	1809	10	10	100	8
1809	1819	10	10	100	10
1819	1827.5	8.5	8.5	100	10
1827.5	1833	5.5	5.5	100	10
1833	1843	10	10	100	10
1843	1853	10	10	100	10
1853	1863	10	10	100	10
1863	1870	7	7	100	9

Character of Material

@ 1717.5' @ 60° to core is spotted by 1/8" glomeroporphritic, felsic clots.

1734-1749.5 Pyrox., fine, relatively unfractured; with scattered 1/8" amphibole phenocrysts; av. 12% magnetite by vol.

1749.5-1753 Amphibole andesite dikelet, cutting core @ 20°; 1/8" amphibole phenocrysts constitute about 20% of the rock.

1753-1774 Pyrox., fine, with 1/8"-1/4" patches of felsics & amphibole (less than 5%); av. 12% magnetite by vol.; several 1/4"-1" felsic veinlets @ 40° to core.

1774-1780.5 Gabbro, fine to med., with irregular patches of pyroxenite; felsic veinlet @ 1779.5'-1780.5' @ 60° to core has several 1/2" random offshoot veinlets.

1780.5-1788 Amphibole andesite in a series of 1" dikelets cutting both the pyrox. & the gabbro @ av. of 10°-40° to core; moderate fracturing.

1788-1799.5 Gabbro, fine to med., av. abt. 30% felsics, with a few irregular patches of pyrox.; scattered 1/8" amphibole crystals; some disseminated pyrite; av. 8% magnetite by vol.

1799.5-1806 Amphibole andesite; 1/8" amphibole phenocrysts av. abt. 30%; dikelet cuts gabbro @ 20°.

1806-1864 Gabbro, fine to med., along with nearly an equal amount of pyrox., fine-grained, as irregular patches & lenses; some of the pyrox. intercepts are over 2' in length; both are relatively unfractured except for zones @ 1843' & 1853-1854.5' where fractures and shears av. 10°-20° to core and contain some zeolites, hematite, pyrite & chlorite; 1/4" amphibole phenocrysts are ubiquitous throughout both the prox. & the gabbro, even cutting across contacts; the pyrox. av. 12% magnetite by vol. & the gabbro 8%; some disseminated pyrite.

DRILL HOLE H-9

From	To	Distance	Core	% Core Rec.	% Magn.
1870	1876	6	6	100	9
1876	1882.5	6.5	6.5	100	9
1882.5	1893	10.5	10.5	100	8
1893	1901	8	8	100	8
1901	1905	4	4	100	8
1905	1911	6	6	100	8
1911	1916.5	5.5	5.5	100	8
1916.5	1926.5	10	10	100	10
1926.5	1936	9.5	9.5	100	10
1936	1939	3	3	100	10
1939	1949	10	10	100	10
1949	1959	10	10	100	11
1959	1963	4	4	100	11
1963	1968	5	5	100	11
1968	1971	3	3	100	13
1971	1975	4	4	100	13
1975	1985	10	10	100	13
1985	1987.5	2.5	2.5	100	13
1987.5	1992	4.5	4.5	100	13
1992	1996	4	4	100	13
1996	2000	4	4	100	13

Character of Material

1864-1883 Gabbro & pyrox. as above, but highly sheared, fractured & altered; med. gray andesite dikelets @ 1874.5'-1877.5 @ 40° & @ 1880'-1881' @ 50° to core are also sheared & altered; zone is saturated by veinlets of carbonate & zeolites; euhedral crystals of mesolite, stilbite, calcite & analcite indicate open fracture filling; considerable hematite is present; shears av. 20°-40° to core & striations av. 70°-90°.

1883-1920 Gabbro, fine to med., relatively unfractured; a few patches of fine to med. grained pyrox.; several 1"-1' dikelets of amphibole andesite cut core @ 20°-40°; dikelet of med. gray, massive andesite @ 1918'-1919' cuts core @ 40°; gabbro av. 8% magnetite by vol.; trace of disseminated pyrite.

1920-1951 Gabbro & pyrox., alternating in about equal proportions, the pyrox. occuring as irregular islands in the gabbro; minor fracturing, but a few zones are vdned by carbonate & altered; several 2" amphibole andesite dikelets cut core @ 10°-30°; far fewer amphibole phenocrysts in this interval than above; minor disseminated pyrite.

1951-1966 Pyrox., fine, with several 1'-2' gabbro dikelets cutting core @ 40°; minor fracturing; med. gray, massive andesite dikelet @ 1964'-1965.5' cuts core @ 30°.

1966-2000 Pyrox., fine, with moderate fracturing @ av. of 60°-90° to core; a considerable amount of pyrite is finely disseminated & somewhat concentrated along fractures along with a minute traceof chalcopyrite; magnetite av. 13% by vol.; rare 1/2" felsic-amphibole veinlets av. 50° to core; a few scattered biotite patches are apparent, but amphibole appears rare (in contrast to the above pyrox.)

DRILL HOLE H-10

Started: June 24, 1959
Completed: July 1, 1959
Elevation (collar reference H-2) = /35
Located 75' due north of southeast corner of Claim 191

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
0	10	10				(3-7/8" rock bit & mud)
10	30	20				Silt, brown & sand, fine; minor magnetite.
30	40	10				Sand, fine to med. with some gravel (pebbles). Gravel (pebbles to granules) with a few sand lenses.
40	60	20				Gravel (pebbles with a few cobbles).
60	80	20				Sand, fine, with a few gravel interbeds (granular).
80	110	30				Sand, coarse to very coarse, with some gravel.
110	140	30				Sand, fine to med., with some gravel.
140	150	10				Sand, fine, with minor magnetite and a trace of pyrite.
150	170	20				Gravel (pebbles) with minor sand.
170	190	20				Sand, med., with gravel interbeds (granule to pebble size); minor magnetite.
190	200	10				Sand, fine; fragments of weathered to fresh pyroxenite; distinct increase in magnetite content. (BX-2-7/8" casing set to 200'. Drilling continued with BX bit).
BX 200	205	5	4	80	7	200-205 Pyrox., fine, with limonite along fractures @10°-30° to core; av. 7% magnetite by vol.
BX 205	215	10	10	100	7	205-215 Pyrox., fine, with some limonite along a few random fractures; av. 7% magnetite by vol; 2" amphibolite dikelet @ 206.5' @ 50° to core, amphibole also disseminated in 1/2" - 1" patches in the pyrox.; 1/4" - 1/2" felsic veinlets @ 10°-20° & @ 70°-80° to core.

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
215	216	1	1	100	7	(AX casing set to 215'. Drilling continued with AX bit). 215-251 Pyrox., fine to med., with intense, random fracturing; av. 7% magnetite by vol.; amphibole in scattered patches; 4" andesite dikelets @ 226', 228' & 241.5' @ 70° to core; group of 1/4" - 1/2" felsic veinlets @ 231'-233' & felsic veinlets & patches @ 242.5'-245'.
216	218	2	0.5	25	7	
218	221	3	0.5	15	7	
221	228	7	6.5	90	8	
228	230.5	2.5	1.5	60	7	
230.5	235	4.5	4	90	7	
235	237	2	1.5	75	7	
237	240	3	1	30	7	
240	242	2	1.5	75	7	
242	245	3	2.5	80	7	
245	246	1	1	100	7	
246	247	1	0.5	50	7	
247	248	1	0.5	50	7	
248	250	2	1.5	75	7	
250	251	1	0.5	50	7	
251	261	10	10	100	8	251-274 Pyrox., fine to med., with minor fracturing; av. 8% magnetite; scattered 1/4" patches of amphibole, 1" amphibole veinlet @ 266' @30° to core; amphibole andesite dikelets: 1" @ 255' @ 30° to core, 2" @ 257.5' @ 50° to core, 4" @ 264' @ 40° to core; 6" andesite dikelets @ 260' & @ 272.5'; 1/2" felsic veinlets @ 254' @ 50° to core, @ 256.5' @ 40° to core, 268.5' @ 30° to core & @ 273.5' @ 45° to core.
261	262.5	1.5	1.5	100	11	
262.5	272	9.5	9.5	100	9	
272	273	1	1	100	6	
273	278	5	5	100	6	274-283 Andesite to fine diorite, with 1/4" - 1/2" phenocrysts of epidote (?) & serpentine pseudomorphs after olivine.
278	286	8	8	100	7	
286	296	10	10	100	7	283-314.5 Pyrox., fine with a few med. to coarse patches, relatively unfractured; amphibole in patches and in veinlets: 1" @ 289.5' @ 20° to core, 1" @ 290.5' @ 10° to core; 2" amphibole andesite dikelets @ 303.5' @ 40° to core & @ 305' @ 80° to core; light gray andesite dikelets: 1" @ 298', @ 40°, 2" @ 300' @ 20°, 10" @ 302'-303' @ 80°, 2" @ 304' @ 70°; 2" felsic veinlet @ 303' @ 40°; av. 7% magnetite.
296	303.5	7.5	7.5	100	7	
303.5	311.5	8	8	100	7	
311.5	314	2.5	1.5	60	8	

DRILL HOLE H-10 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
314	320.5	6.5	6.5	100	6
320.5	325	4.5	1.5	30	6
325	331	6	6	100	7
331	337	6	6	100	6
337	342	5	5	100	7
342	346	4	3.5	90	10
346	350	4	3.5	90	8
350	353	3	3	100	8
353	355	2	2	100	10
355	362	7	7	100	8
362	365	3	3	100	8
365	366	1	1	100	9
366	376	10	10	100	8
376	386	10	10	100	7
386	396	10	10	100	8
396	406	10	10	100	7
406	416	10	10	100	7
416	424	8	8	100	11

Character of Material

314.5-317 Andesite, with flow-banding, @ 35° to core.
317-333.5 Pyrox. med., with minor fracturing, with a diorite dikelets & a few felsic veinlets.
333.5-335 Andesite, like 314.5-317, @ 40° to core.
335-342 Pyrox. fine to med., with minor fracturing; minor amphibole, av. 8% magnetite; 2" andesite dikelet @ 336' @ 80° & 6" dikelet @ 336.5' @ 80°.

342-360 Pyrox. fine to med., with intense random fracturing; av. 9% magnetite; only a few scattered patches of amphibole; 2" amphibole andesite dikelet @ 348' @ 50°; 3" felsic veinlet @ 352' @ 30°; a few random stringers of carbonate & zeolite.
360-361 Andesite, dark to med. gray, @ 30° to core.
361-374 Pyrox. fine with a few med. patches; minor amphibole; av. 8% magnetite; relatively unfractured; amphibole andesite dikelet @ 367.5' @ 40°.

374-390 Pyrox. med. to coarse, relatively unfractured; av. 7% magnetite; amphibole in 1/2" - 1" patches & in 1"-2" veinlets @ 381.5', 383.5' @ 40°, 384' @ 20°, 385.5 @ 50°, 386' @ 15°, 1/2" felsic veinlet @ 385' @ 20°.
390-393 Pyrox. fine, unfractured; av. 8% magnetite; rare amphibole; in sharp contact with the overlying coarse pyrox; 3" amphibole andesite dikelet with felsic patches @ 390' @ 40°.
393-396 Andesite, med. gray, with flow banding, with 6" intercept of coarse pyrox. @ 394', dike intrudes pyrox. @ 60° to core.

396-423.5 Pyrox. fine to med., relatively unfractured, av. 7% magnetite; amphibole in patches & veinlets; 6" andesite dikelets @ 396.5' @ 40°, 6" dikelet @ 397.5 @ 30°; felsic veinlets; 1" @ 400.5' @ 20°, 1/2" @ 408.5 @ 30°, 1" @ 420.5' @ 20°; limonite along fractures @ 421'-423'; several 1/2" seams of magnetite @ 417.5'-418.5'.

DRILL HOLE H-10 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
424	425	1	1	100	6	423.5-427 Andesite, dark greenish-gray, massive; numerous veinlets of carbonate @ 0°-30° to core, cuts core @ 20°.
425	425.5	0.5	0.5	100	6	
425.5	434.5	9	3	30	7	
434.5	439	4.5	4	90	7	427-438.5 Pyrox, fine to med., fractured and highly altered; numerous carbonate veinlets @ 10°-40° to core cut equally numerous, random veinlets of epidote; 4" zone of solid carbonate & epidote @ 438.5' @ 50° to core; 1/4" veinlet of rhodochrosite (?) @ 433.5' @ 10°.
439	439.5	0.5	0.5	100	6	438.5-444.5 Andesite; cut by veinlets of carbonate & epidote; a few talcose shears @ 10°-20° to core; intercept of highly altered med. pyrox. @ 440.5'-441.5'.
439.5	442	2.5	2	80	6	
442	443	1	0.5	50	6	
443	446	3	2.5	80	6	
446	448	2	1.5	75	6	444.5-460.5 Gabbro, med.; numerous random fractures with some limonite; no carbonate-epidote veinlets.
448	449	1	0.5	50	6	
449	450	1	0.5	50	6	
450	452	2	0.5	25	6	
452	455	3	1	30	6	
455	457	2	0.5	25	6	
457	458	1	0.5	50	6	
458	460	2	2	100	6	
460	462	2	1	50	15	460.5-462 Magnitiferous gabbro, fine, with some early, subhedral, elongate prisms of ilmenite (?); pseudomorphs of limonite after pyrite (?) & numerous voids possibly caused by limonite removal; av. 15% magnetite by vol.
462	464.5	2.5	2	80	6	462-471.5 Diorite, like 444.5'-460.5'.
464.5	467	2.5	2.5	100	6	
467	468	1	1	100	6	
468	471.5	3.5	3	85	6	
471.5	475	3.5	3	85	6	471.5-474 Andesite, med. to dark greenish-gray; cut by dikelet of med. gabbro @ 472' @ 20°; a few veinlets of carbonate.

DRILL HOLE H-10 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
475	479	4	2	50	7	474-485.5 Pyrox. fine to med., intensely sheared & altered with talc. serpentine & limonite along the shears; saturated by post-shear veinlets of carbonate; shears & veinlets av. 10°-20° to core.
479	481	2	1	50	7	
481	482	1	1	100	7	
482	485	3	2.5	80	7	
485	490	5	5	100	8	485.5-499 Pyrox. fine to med., with minor fracturing; av. 8% magnetite; a few patches of amphibole & a few of felsics; 1" andesite dikelet @ 486.5' @ 70° to core; 10" dikelet @ 490' @ 70°; a few veinlets of carbonate. 499-503.5 Amphibole andesite, dark greenish-gray with amphibole phenocrysts av. 1-3 mm; cuts pyrox. @ 10° to core; cut by 14" dikelet of med. grained gabbro @ 500.5'-501.5' @ 60° to core.
490	495	5	4.5	90	8	
495	505	10	10	100	6	
505	512	7	7	100	7	503.5-512 Pyrox., fine to med., with minor fracturing; av. 7% magnetite by vol.; a few 1/2" felsic veinlets av. 70° to core; 2" med. grained gabbro dikelet @ 510' @ 70°.
512	518	6	6	100	6	512-518.5 Andesite dikelet cutting pyrox @ 30° to core; intercepts of med. pyrox. @ 514'-515' & 516'-516.5'.
518	525	7	6	90	7	518.5-523 Pyrox. fine to med. with patches of felsics; av. 7% magnetite.
525	531	6	4	70	6	523-528 Andesite, like 512-518.5' cuts the overlying pyrox. @ 30° to core & cuts the underlying med. to coarse, grained gabbro @ 10°.
531	532	1	0.5	50	6	528-532 Gabbro, med. to coarse, like 444.5'-460.5', some limonite along fractures.

DRILL HOLE H-11

Started: July 3, 1959
Completed: July 8, 1959
Elevation (collar reference H-2) = + 20
Located 12 feet east of south end center post of claim 13E

From	To	Distance	Core	% Core Rec.	% Magn.
0	60	60			
60	70	10			
70	90	20			
90	100	10			
100	120	20			
120	140	20			
140	150	10			
X 159	161	2	0.5	25	10
X 161	163	2	1	50	10
X 163	164	1	0.5	50	10
X 164	168	4	3	75	5
X 168	175	7	4	60	5
X 175	180	5	4	80	5

Character of Material

3-7/8" rock bit & mud.

Gravel (pebble to cobble size) mainly of graywacke, chert & basalt; minor magnetite.
Gravel (pebble size) with some sand interbeds.
Sand, fine to med., with a few interbeds of gravel (pebble to cobble).
Sand, fine
Sand, med., to coarse
Sand, fine to med., minor magnetite
Sand, fine, distinct increase in magnetite content; questionable trace of pyroxenite.
(BX-2-7/8" casing set to 159'. Drilling continued with BX bit).

159-164 Pyrox., fine, av. 10% magnetite by vol., relatively fresh with some limonite & chlorite along a few random fractures; med. greenish-gray in color.

164-180 Pyrox., coarse to very coarse, intensely mylonized & altered, pale green in color in zones of greatest crushing; shears @ 0°-30° to core; sooty, black patches av. 5-10 mm. in diam. are a fine, reticulate intergrowth of magnetite in pyroxene; the magnetite is partly converted to hematite; scattered books of biotite av. 3-8 mm.; crystals of med. green pyroxene av. 10-15 mm. are in places mylonized to a fine powder; the rock av. 5% magnetite. (BX-casing set to 180'. Drilling continued with AX bit).

DRILL HOLE H-11

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
180	182	2	1.5	75	6	180-194 Pyrox., coarse to very coarse, as above but only moderately mylonized; shears av. 10°-20° to core & decrease in number in lower core portion; av. 6% magnetite. 194-206 Pyrox., coarse to very coarse, relatively unsheared & unfractured; the pyroxene-magnetite intergrowth appears to be mainly interstitial to the magnetite-free pyroxene, but a few patches exhibit the subhedral crystal form of the host pyroxene & must be relatively early in the crystallization sequence; the rock av. 6% magnetite by vol.
182	184.5	2.5	2	80	6	
184.5	188	3.5	3	85	6	
188	191	3	3	100	6	
191	199.5	8.5	8	90	6	
199.5	206	6.5	6	90	6	
206	211	5	3	60	5	206-209 Pyrox., coarse, intensely sheared & mylonized, shears av. 10°-30° to core. 209-211 Pyrox., coarse, as above, but only moderately sheared; av. 6% magnetite by vol.
211	214	3	2	70	6	211-213 Pyrox., coarse, like 206-209', intensely mylonized.
214	216	2	1.5	75	5	213-215 Pyrox., coarse, only moderately mylonized & sheared; av. 5% magnetite; considerable conversion of magnetite to hematite.
216	218	2	2	100	5	215-235.5 Pyrox., coarse, intensely mylonized & sheared in several zones such as @ 225.5' the pyroxene is crushed to a fine light green powder, streaked by black and red from magnetite and hematite; shears av. 25° to core.
218	220	2	1.5	75	5	
220	222.5	2.5	2	80	5	
222.5	226.5	4	3	75	5	
226.5	233	6.5	4	60	5	
233	237	4	4	100	5	235.5-243 Pyrox., coarse, moderate to slight mylonization & shearing; magnetite-pyroxene in patches up to 1" in diam., magnetite rich zone @ 239.5; magnetite av. 6% by vol.
237	240	3	2.5	80	7	
240	245	5	4.5	90	6	
245	247.5	2.5	2	80	6	243-246 Pyrox., coarse, as above but with increased mylonization & shearing.

DRILL HOLE H-11

From	To	Distance	Core	% Core Rec.	% Magn.
247.5	250.5	3	2	70	6
250.5	255.	4.5	4	90	6
255	256	1	1	100	5
256	257	1	1	100	6
257	264	7	7	100	6
264	268	4	3	75	6
268	274	6	5.5	90	6
274	275	1	1	100	5
275	282	7	5	70	5
282	290	8	2.5	30	5
290	296	6	3	50	5
296	303	7	2.5	35	5
303	308	5	5	100	6
308	315.5	7.5	7	90	6
315.5	319	3.5	3.5	100	6
319	322	3	3	100	6
322	331	9	9	100	6
331	335	4	4	100	6
335	337	2	2	100	6
337	340	3	3	100	7
340	345	5	5	100	6
345	355	10	10	100	6
355	365	10	10	100	6
365	368	3	3	100	7
368	376	8	5	60	6
376	381	5	3	60	5
381	382	1	0.5	50	5
382	392	10	10	100	7
392	400	8	8	100	8
400	403	3	2	70	8
403	406.5	3.5	3.5	100	8
406.5	416	9.5	9.5	100	7

Character of Material

246-280 Pyrox., coarse, relatively unmylonized except for zones @ 255-256', 267.5-268.5' & @ 274.5-275'; 1/4" carbonate-biotite veinlet @ 255.5' @ 10° to core; magnetite in intergrowth with pyroxene av. 6% by vol.

280-304 Pyrox., coarse, intensely mylonized & sheared; talcose shears av. 0°-20° to core; magnetite av. 5% by vol.; considerable hematite.

304-372.5 Pyrox., coarse to very coarse; relatively unmylonized; rare shears are @ 10°-30° to core, striations on the shear face are near horizontal (@ 75°-90° to core); 3" patch of biotite @ 321'; 1" diorite (fine-grained) dikelet @ 319.5' @ 30° to core, 2" andesite dikelet @366.5' @ 40° to core; magnetite-pyroxene intergrowth in patches av. 1/2"-1" in diam.; magnetite-rich zones (groupings of the patches) @ 327', 339', 340.5'-341', 346'-346.5', 347.5' 351.5', 353.5-354.5, 357', 368', 370'; very coarse pyrox. @ 365'-366' & @ 370-371.5' with crystals as large as 2"; av. 6% magnetite.

372.5-382 Pyrox., coarse, intensely mylonized & sheared; with a few thin carbonate veinlets; minor magnetite

382-396 Pyrox., coarse, relatively unfractured; almost entirely pyroxene & magnetite-pyroxene intergrowth with less biotite than above; av. 7% magnetite by vol.

396-407 Pyrox., very coarse, relatively unfractured except @ 398-399' where fracturing av. 50°-80° to core; magnetite-pyroxene intergrowth in 1"-2" patches, group of patches @ 397'; av. 7% magnetite.

DRILL HOLE H-11

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
416	425	9	9	100	7	407-425.5 Pyrox., coarse, relatively unfractured; patches of magnetite-pyroxene av. 1/2"; magnetite av. 7% by vol.
425	427.5	2.5	2	80	5	425.5-438 Pyrox., coarse, intensely sheared with a slight mylonization; shears av. 20°-40° to core, striations on shear surface av. 70°-80° to core; 1/2" biotite veinlet @ 430.5' @ 20° to core; 1/2"biotite-carbonate-epidote veinlet @ 431' @ 30° to core.
427.5	429	1.5	1.5	100	5	
429	432	3	3	100	5	
432	434.5	2.5	1.5	60	5	
434.5	438	3.5	3	90	5	
438	447	9	9	100	6	438-456 Pyrox., coarse; rare fractures av. 40°-50° to core; magnetite intergrowth with pyroxene except @ 447.5-448' where it is in 1/4", pyroxene-free patches; magnetite av. 7%.
447	455	8	8	100	7	
455	463	8	6	75	7	456-460 Pyrox., coarse, highly fractured & altered; veinlets of carbonate, chlorite & a trace of pyrite; one portion is brecciated & healed by carbonate; magnetite in 1/2" stringer @ 458' @ 40° to core is pyroxene free; lower chloritized contact with unaltered pyrox. is @ 50° to core; av. 7% magnetite.
463	471.5	8.5	8.5	100	6	460-471.5 Pyrox., coarse, with a few shears & fractures av. 40°-60° to core; magnetite-rich zone @ 463'; magnetite av. 6% by vol.
471.5	474	2.5	2	80	5	471.5-473 Pyrox., coarse, intensely sheared @ av. of 20°-40° to core.
474	484	10	10	100	6	473-482 Pyrox., coarse, with moderate shearing and fracturing; a few biotite-carbonate veinlets alter adjacent magnetite-pyroxene to chlorite-hematite; av. 6% magnetite. 482-500 Pyrox., very coarse, with crystals as large as 2"; moderate fracturing; av. 6% magnetite by vol.
484	490	6	6	100	6	
490	492	2	1.5	75	6	
492	493	1	1	100	6	
493	500	7	3	45	6	

DRILL HOLE H-12

Started: July 10, 1959
Completed: July 18, 1959
Elevation (collar reference H-2) = ⁄ 80
Located 20 L Claim, 400 feet due north from southwest corner

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
0	10	10				0-10 Tundra and loess.
10	248	238				10-248 Glacial drift. Sands, gravels.
248	254	6				248-250 Drill cuttings contain jasper, small fragments of andesite, light colored diorite, green material like basalt, few grains of quartz, some black sands, minor magnetite. 252-254 Drill cuttings contain considerable plagioclase, some quartz, no jasper, minor magnetite, drilling hard rock. (BX casing set @ 254' after penetrating 2' of hard solid diorite. This was false bedrock. Subsequent drilling to 280' passed through a variety of rocks including sediments. Hence the material above 280' is classified as boulders, either on top of the pyroxenite or as drag in a large fault zone. Bedrock or ledge is presumed to be at 280'. The boulder zone is 28' thick.)
254	263	9	2.5	30		254-270 Mixed boulders or cobbles, hard fresh m.g. diorite, altered pyroxenite, with magnetite, fresh diorite, pyroxenite, quartzite or chert with pyrite, andesite, c.g. basalt dark green, light gray diorite, andesite, qtzt., andesite, pyroxenite with considerable magnetite, dark gabbro m.g.
263	263.5	0.5	0.25	50		
263.5	266	2.5	1	40		
266	267	1.0	0.1	10		
267	270	3	0.5	17		
270	275	5	1	20		270-275 Sandstone, pale gray, soft, fine grained, wind blown loess. Very porous and very light weight. Contains small grains of mica. Could be a tuff.

DRILL HOLE H-12 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
275	280	5	1	20		275-280 Mixed rocks, pyroxenite with considerable magnetite, bedded qtzt. or chert, all boulders.
280	284	4	3.5	87	6	280-318 Gabbro, 30-50% felsic. Gray, hard, medium grained. Contains a small amount of f.g. pyrite and several areas of disseminated copper from 281 to 290. Copper is in small particles in pin point size and in flakes 1/8" in size. Best concentrations at 287', 289', 290'. Rock contains some magnetite quite uniformly distributed. Rock hard and solid but shows some acid effects. Fracturing at 30° to core. At 305', there is a fracture & some broken core and from 307-310' core is broken, serpentized and indicative of much circulating acid water, contains limonite and hematite. At 312 1/2' there is a 3" andesite dike cutting core at 45'. The gabbro contains bands of increased amts. of felsic material at 312' and 314.5'. At 315' 1/4" dikelet of andesite @ 35° to core.
284	286	2	2	100	6	
286	288	2	2	100	6	
288	292	4	4	100	6	
292	296	4	4	100	7	
296	301	5	5	100	7	
301	304	3	3	100	6	
304	307	3	3	100	6	
307	308	1	0.5	50	6	
308	310	2	2	100	6	
310	313	3	3	100	6	
313	317	4	4	100	6	
317	318.5	1.5	1.5	100	7	
317	318.5	1.5	1.5	100	7	
318.5	321.5	3	3	100	5	318-319 Andesite dike, dark green @ 30° to core. Has absorbed small inclusion of gabbro incompletely.
321.5	324	2.5	2.5	100	6	319-323 Gabbro, same as last. 323-323 1/2 Fault zone. Very altered leached broken core. May be along a dikelet. Kaolinized.
324	327	3	3	100	6	323 1/2- 336 Gabbro same as last with perhaps a more uniform distribution of felsic minerals (+ - 40%). Fracturing @ 30° to core. Although fractured rock has not been altered much, there is an increase in quantity of pyrite to 327. 336-337 Contact, gabbro and pyroxenite, follows core irregularly.
327	330	3	3	100	7	
330	332	2	2	100	6	
332	337	5	5	100	6	
337	339	2	2	100	8	337-341 Gabbro same as last. At 340 1/2 small amt. fine native copper near zone of increased amt. of felsic minerals.
339	346.5	7.5	7.5	100	6	

DRILL HOLE H-12 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
346.5	349	2.5	2.5	100	7	341-341 3/4 Andesite dike, showing flow lines. 341 3/4-355 Gabbro, same as last. Core is more altered, is softer, is leached, fractured, and contains more magnetite.
349	352	3	3	100	6	
352	354	2	3	100	6	
354	355	1	1	100	6	
355	357	2	1	50	9	355-360 Pyroxenite, soft, broken, crumply, m. to f.g., may be fault zone.
357	359	2	1.5	75	9	
359	363	4	4	100	6	360-383 Gabbro, m.g., speckled dark green with blueish-gray plagioclase, ≁ - 40% felsic min. Contains inclusions of pyroxenite. Small amts. of native copper @ 365'. Increased amt. of felsic minerals at 364'-370'. At 370' is a 1/4" dikelet of andesite cutting core @ 30°. Numerous small inclusions of pyroxenite 1" to 2" in size to 377', some of which contains small amts. of pyrite & increased amts. of magnetite. At 380-380 1/2 is an inclusion of pyroxenite.
363	373	10	10	100	8	
373	383	10	10	100	8	
383	390	7	7	100	6	383-384 Andesite dike, gray, contains magnetite in fine grains.
390	393	3	3	100	6	384-399 Gabbro, medium grained, contains ≁ - 40 to 50% felsic minerals, although quantity varies locally. At 386', 1/2" andesite dike cutting core @ 10°; another @ 388' @ 25°; another dike 2" wide cutting core @ 40°. Felsic minerals decrease @ 399. Pyrite occurs locally in scattered, minor amounts, less than 3%.
393	394	1	1	100	6	
394	397.5	3.5	3.5	100	6	
397.5	401	3.5	3	85	8	399-401 Pyroxenite cut by gabbro dike, contains small amt. of magnetite.
01	407	6	6	100	6	401-468 Gabbro, felsic min. ≁ - 25 to 30%. Cut by andesite dike, more or less vertical, in and out of drill core; considerable m. to f.g. magnetite reaching in spots 10% by volume. At 418 to 418 1/2' dike of andesite cuts core @ 30°. From 420' to 442' hard solid core. At 442 1/2' is a possible fault zone? Quite uniform 70-75% mafic minerals; minor amts.
07	412	5	5	100	6	
12	417	5	5	100	6	
17	427	10	10	100	6	
27	435	8	8	100	7	
35	438	3	3	100	7	

DRILL HOLE H-12

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
438	442.5	4.5	4.5	100	7	of pyrite, some limonite residual from pyrite @ 444'. Core continues uniform to 468. Fracture @ 450 with epidote. Several 1 to 3-inch dikelets of andesite @ 453', 457', 459' and 468', cut core at 30°. Very minor pyrite. Contains a few small xenoliths of pyroxenite.
442.5	449	6.5	6.5	100	6	
449	451	2	2	100	6	
451	456	5	4	80	6	
456	465	9	9	100	6	
465	475	10	10	100	7	468-481 Same as last. Contains small inclusions or xenoliths of pyroxenite. Considerable f.g. magnetite locally more than 10%. 481-482 Andesite dike cutting 30° across core; shows banding, f.g., gray green.
475	482	7	7	100	8	
482	491	9	9	100	8	482-504 Gabbro - same as 401-481. Contains more inclusions, small, of pyroxenite. Several thin 1/16" veinlets of calcite, accompanying inclusion. Contains scattered minor amounts of pyrite. Appears more dioritic.
491	499	8	8	100	7	
499	500	1	1	100	8	
500	506	1	6	100	6	
506	507.5	1.5	1.5	100	5	504-513 1/2 Contact, andesite dike and gabbro - follows core for 10 feet, practically vertical (∠ - 80°). Dike portion contains little magnetite. Dike contains more calcite, slightly vuggy, shows flow banding. 513 1/2 - 515 1/2 Gabbro, m.g., greenish gray contains magnetite - 7% by vol. 515 1/2 - 517 Andesite dike- fresh, hard, no magnetite calcite veinlet @ contact.
507.5	517	9.5	9.5	100	5	
517	525	8	8	100	6	517-549 Gabbro, same as last. At 520 1/2 to 521 1/2 dike of andesite contains veinlets of calcite, but no magnetite. Rock is softer, chloritized and fractured along the core. One fracture contains a coating of hematite for a length of 3 feet. Core shows an increase of pyroxenite zenoliths.
525	535	10	10	100	7	
535	545	10	10	100	8	

RILL HOLE H-12 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						There are fractures showing slickensides most of which have a steep dip and very flat, horizontal movement. Becomes coarser grained from 530' and perhaps an increased amount of magnetite. Core is fractured at 40° to core. Some are filled with carbonate veinlets. At 546 1/2 there is a 1/2" dike of andesite (contains magnetite) cutting core @ 25° f.g., dark green. At 547 1/2' there is a long (2') rib 1/2" wide of earlier crystallized pyroxenite containing more magnetite than younger gabbro. Minor fracturing @ 30°.
5	552	7	7	100	9	549-552 Mixed zone of gabbro and pyroxenite with pyrox. containing much more magnetite. The zenoliths of pyrox. show a maximum length of +- 6", with irregular contacts.
2	562	10	10	100	6	552-556.5 Gabbro, m. to c.g., hard solid core. One or two fractures healed with calcite. At 555' band of pyroxenite (3/4") @ 30° to core. Locally, 1" long crystals of amphibole. 556.5-559.5 Two parallel dikes of andesite. Separated by 3" of gabbro. Two of 4 contacts @ 30°- other 2 not present. Dike pale greenish gray, f.g. shows slight banding. 559.5-561 Gabbro, same as last, m. to c.g., with few minor fractures @ 25°, some fractures (young) cut both gabbro & dikes.
[illegible]	570	8	8	100	8	561-565 Large inclusion of pyroxenite, m.g. to f.g., 12% magnetite intruded by gabbro. At contact zone 2 veinlets cut across contact @ 30° & 45°. At 562' core is broken. At 563' a dike of gabbro separates the pyroxenite. Gabbro - andesite contact @ 45°, andesite-pyroxenite contact @ 35° to core. Similar situation @ 565' with both dips @ 45° to core. Following andesite is 2" of gabbro. 565-567 Andesite dike, f.g., greenish gray hard, no magnetite.

DRILL HOLE H-12 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						567-570 Gabbro; contact with above is ∠ - 15° to core, wavy. Gabbro is coarser grained, contains less magnetite. At 568' to 569' pyroxenite containing considerable 12% magnetite.
570	580	10	10	100	7	570-573 Pyroxenite, dark green, hard, f.g., contains considerable f.g. magnetite. Contact @ 570 @ 10° to core and @ 573 is 20° to core.
580	590	10	10	100	7	
590	600	10	10	100	8	573-600 Gabbro, same as last, coarse grained to medium. Contains xenoliths of pyroxenite, small, 1" to 2" size. At 575' to 576' is andesite dike showing flow banding, cuts core @ 45°. At 583 to 584 xenolith of pyroxenite containing 12% magnetite. Very slight amount of fracturing @ 45° and at 15° to core. The last 10 feet contains an increased amount of pyroxenite xenoliths perhaps 20-25%.

DRILL HOLE H-13

Started: July 23, 1959
Completed: July 29, 1959
Elevation (collar reference H-2) = ≁ 55'
Located 12' east and 15' north of the south-end center post of claim 12J.

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						(4 1/2" rock bit & mud)
0	20	20				Silt, brown, lignitic.
20	40	20				Sand, fine to med.; minor magnetite.
40	100	60				Gravel, granule to pebble, with minor interbeds of sand.
100	140	40				Sand, fine, with minor gravel, pebble size.
140	150	10				Gravel, granule size, with fine sand.
150	190	40				Sand, fine to med.
190	210	20				Sand, fine to med., with minor gravel, granule.
210	220	10				Sand, fine to med.; slight increase in magnetite content.
220	250	30				Sand, fine to med., with a few interbeds of gravel, granule to pebble size.
250	260	10				Sand, fine to med.; distinct increase in magnetite & in pyroxene content.
260	330	70				Sludge is almost entirely of sub-angular to sub-rounded grains of pyroxene & magnetite (at least 30%). Pyroxenite ledge may be as high as 250'-260'. If so, the drilling ease indicates extreme weathering and/or fracturing. The interval 250'-330' may be of pre-glacial, fluvial sediments derived primarily from the pyroxenite mass. Some concentration of magnetite would thus be expected (suggested by Mayer Hansen). (NX-casing set to 330')

DRILL HOLE H-13 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
X330	335	5	2	40	3	330-335 Diorite to monzonite, equigranular to porphyritic; 1-2 mm subhedral to euhedral phenocrysts of plagioclase in a fine to very fine-grained groundmass of alkali feldspar, plagioclase and minor amphibole, biotite, chlorite and magnetite; fracturing is moderate. (BX-casing set to 335')
335	336	1	1	100	3	335-339 Diorite to monzonite, like above but with scattered 1/2" - 2" island patches of fine-grained pyroxenite; chlorite-filled fractures av. 30° to core.
336	339	3	1.5	50	3	
339	343	4	0.5	10	5	339-369 Pyrox., fine, with a few 6" to 1' dikelets of diorite to monzonite; the rock is intensely, randomly fractured & moderately altered to chlorite & some limonite; a few shears av. 0°-20° to core; av. 5% magnetite by vol.
343	346	3	2.5	80	5	
346	348	2	1	50	5	
348	350	2	1	50	5	
350	355	5	2	40	5	
355	358	3	0.5	20	5	
358	360	2	1	50	5	
360	362	2	1.5	75	5	
362	365	3	2	70	5	
365	369	4	2.5	60	5	
369	371	2	1.5	75	4	369-372.5 Pyrox. to diorite, fine, with 10-20% finely disseminated felsics; moderate fracturing @ 30°-40° to core.
371	378	7	6.5	90	5	372.5-391 Pyrox., fine, like 339-369 but with moderate fracturing & alteration; zones of intense fracturing & alteration (mainly to chlorite) @ 377.5'-378.5', 380'-384', 389'-391'; 6" diorite to monzonite dikelet @ 376' cuts core @ 70°; a few ragged, 1/4" to 1/2", interstitial concentrations of magnetite are partly converted to limonite; magnetite av. 5% by vol.
378	380	2	1.5	75	5	
380	384	4	4	100	5	
384	391	7	7	100	5	

DRILL HOLE H-13 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
391	395	4	4	100	11
395	400	5	5	100	11
400	407	7	7	100	10
407	409	2	1.5	75	9
409	415	6	6	100	10
415	421	6	6	100	9
421	426	5	5	100	5
426	432	6	6	100	5
432	440	8	8	100	5
440	444	4	4	100	5
444	449	5	5	100	4
449	455	6	6	100	6
455	461	6	6	100	6
461	467	6	6	100	6
467	470	3	3	100	6
470	475.5	5.5	5.5	100	5
475.5	485	9.5	9.5	100	4
485	488	3	3	100	4
488	494	6	5.5	90	4
494	497.5	3.5	3.5	100	4
497.5	505	7.5	7.5	100	4
505	515	10	10	100	4
515	519	4	4	100	4
519	524.5	5.5	5.5	100	4
524.5	535	10.5	10.5	100	4
535	540	5	5	100	4

Character of Material

391-419 Pyrox., fine, with minor fracturing, except for zone of intense mylonization & alteration @ 406.5'-409.5' and @ 410.5'-412.5'; magnetite av. 11% by vol.; a few ragged, 1/2" patches of magnetite @ 413' & 417'; diorite to monzonite dikelet @ 409.5'-410.5' cuts core @ 30°.

419-447.5 Pyrox, coarse to med., with a few zones of fine grained pyrox.; the majority of the magnetite is in intergrowth patches with pyroxene, but in the finer-grained phases the magnetite is in pyroxene-free, ragged, interstitial granules; magnetite averages 4% by volume where it occurs in intergrowth, and 7-8% by vol. where it is free; intercept of very coarse-grained pyrox. (crystals as large as 3") @ 427'-433'; zones of alteration & moderate fracturing @ 421-422', 426', 438.5', & 444'; minute trace of disseminated pyrite.

447.5-449.5 Pyrox., fine, porphyritic, dikelet; contains rounded, magmatic corroded, 1/4" phenocrysts of pyroxene, serpentine pseudomorphs after olivine, & epidote; cuts core @ 30°.

449.5-474 Pyrox., fine to med., with zones of minor shearing & chloritization @ 452', 454.5'-456', 459'; free magnetite av. 6% by vol.; intergrowth patches are rare.

474-540 Pyrox., coarse, with minor fracturing except for zones of shearing & alteration @ 474'-475.5', 485', 487.5', 493.5', 497', 522', 526.5', 529', 538', 539.5'; shears av. 30° to core; magnetite in 1/4"-1" intergrowth patches av. 4% by vol.; gabbro dikelet @ 497-498' cuts core @ 20°.

DRILL HOLE H-13 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
540	550	10	10	100	6	540-546 Pyrox., fine to med., relatively unfractured; with free magnetite in 1/8" to 1/2" patches; av. 7% magnetite by vol. 546-550 Pyrox., very coarse, unfractured; magnetite in rare 1/2" to 1" intergrowth patches av. only 3% by vol.
550	554	4	2	50	4	550-570 Pyrox., coarse, with magnetite in 1/2" intergrowth patches av. 4% by vol.; zones of moderate shearing & alteration @ 550'-554', 559', 565'-567'; shearing av. 20° to core with striations av. 70°; dark gray andesite dikelet @ 566'-566.5' cuts core @ 60°.
554	564	10	10	100	4	
564	566	2	2	100	4	
566	566.5	0.5	0.5	100	4	
566.5	574	7.5	7.5	100	4	
574	581	7	7	100	5	570-577 Pyrox., med., with rare 1/8" patches of free magnetite, av. 5% of the rock by vol.; fractured & altered zone @ 573.5'-574'.
581	591	10	10	100	4	577-621 Pyrox., coarse, with magnetite in intergrowth patches as large as 2"; magnetite av. 4% by vol.; zones of shearing & alteration @ 580.5'-581', 593.5', 598'-600', 601', 607', 617'-617.5', 619'; shears av. 20° to core & striations av. 80°; dark gray andesite dikelet @ 592'-593' cuts core @ 50°.
591	594	3	2.5	80	4	
594	604	10	10	100	4	
604	607.5	3.5	3.5	100	4	
607.5	614	6.5	6.5	100	4	
614	617	3	3	100	4	
617	622	5	5	100	4	
622	624	2	1.5	75	4	621-629 Pyrox., coarse, as above but moderately to intensely sheared, mylonized & altered; talcose shears av. 0°-25° to core & striations av. 80°-90°.
624	626	2	1.5	75	4	
626	627.5	1.5	1.5	100	4	
627.5	635	7.5	7.5	100	4	629-642 Pyrox.; coarse, relatively unfractured; magnetite, mainly in intergrowth with pyroxene av. 4% by vol.; rare trace of disseminated pyrite.
635	641	6	6	100	4	
641	644	3	3	100	4	642-653 Pyrox., coarse, as above but moderately sheared & highly altered; shears av. 30° to core; numerous thin, random carbonate veinlets @ 648.5'-652.5'; dikelet of gabbro @ 644'-645'.
644	644.5	0.5	0.5	100	4	
644.5	648.5	4	4	100	4	
648.5	650	1.5	1.5	100	4	
650	652.5	2.5	2.5	100	4	

DRILL HOLE H-13 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
652.5	658	5.5	5.5	100	4	653-661 Pyrox., coarse, with magnetite in intergrowth patches av. 4% by vol.; relatively unfractured except for sheared & altered zones @ 657'-658' & 659'-661'; 3" felsic veinlet @ 660.5' cuts core @ 30°.
658	661	3	2.5	80	4	
661	664	3	2.5	80	3	661-665 Diorite to monzonite dikelet, fine-grained, light to med. gray; chloritized along fractures @ av. of 70° to core; dikelet cuts pyrox. @ 30°.
664	668	4	4	100	4	665-668 Pyrox., med., relatively unfractured; some free magnetite, but the majority is in 1/4"-1/2" patches of intergrowth; magnetite av.4% by vol.

DRILL HOLE H-14

Started: July 23, 1959
Completed: August 4, 1959
Elevation (collar reference H-2) = -58'
Located 600' south and 200' west of northeast corner of 18C

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						(3-7/8" rock bit and mud)
0	10	10				Gravel, pebble to granule size.
10	20	10				Gravel, pebble to granule with a few cobbles.
						(Strong artesian water flow encountered @ 34'. Rotary drilling abandoned and hole proceeded by washing and driving 4" casing. No sludges were collected from 20-74'.
74	80	6				Gravel, pebble to cobble size
80	90	10				Gravel, granule size, with a few interbeds of sand, fine to medium; slight increase in magnetite.
						(Pyroxenite ledge @ 91'). (BX-casing set to 90').
BX 91	92.5	1.5	1.0	70	4	91-101 Pyrox., med., with minor fracturing; magnetite is in 1/8"-1/4" sooty-black patches of intergrowth with pyroxene, av. 4% by vol.; considerable biotite in 1/8" disseminated patches; dikelet of amphibole andesite @ 95.5-96'; several miarolitic cavities are lined by euhedral pyroxene crystals.
BX 92.5	94	1.5	0.5	30	4	
BX 94	95	1.0	0.5	50	4	
BX 95	96.5	1.5	1.0	70	4	
BX 96.5	98.5	2.0	1.0	70	5	
BX 98.5	100	1.5	1.0	50	4	
BX100	101	1.0	0.5	50	4	
						(AX-casing set to 100').

DRILL HOLE H-14 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
101	102	1	0.5	50	6
102	103	1	1	100	5
103	107.5	4.5	4.5	100	4
107.5	111	3.5	3.5	100	4
111	114	3	2.5	80	4
114	116.5	2.5	2	80	4
116.5	120	3.5	3	90	4
120	122	2	2	100	6
122	123	1	0.5	50	4
123	131	9	2.5	30	4
131	134	3	1	30	6
134	136	2	1.5	75	6
136	137	1	1	100	4
137	140	3	2.5	80	4
140	141	1	0.5	50	4
141	142	1	1	100	4
142	144.5	2.5	2	80	4
144.5	148	3.5	3	85	4
148	151	3	3	100	4
151	154.5	3.5	3.5	100	4
154.5	157	2.5	2.5	100	4
157	158.5	1.5	1.5	100	4
158.5	162.5	4	4	100	4
162.5	168	5.5	5.5	100	4

Character of Material

101-102.5 Amphibole andesite, with considerable amphibole & biotite as phenocrysts; av. 6% magnetite by vol.; is a dikelet cutting core @ 20°.

102.5-120 Pyrox., med., with zones of fracturing & slight alteration @ 110', 114', 119', a few thin carbonate veinlets @ 110' & 119' cut core @ 0°-10°, magnetite in intergrowth with pyroxene av. 4% by vol; biotite in a few ragged veinlets as well as widely disseminated.

120-122 Amphibole andesite, porphyritic; dikelet cuts the core @ 20°; 1/4"-1/8" amphibole phenocrysts av. 30% of rock; magnetite av. 6% by vol.

122-131 Pyrox., med., like 102.5'-120'; moderate fracturing @ 0°-40° to core.

131-136.5 Andesite, near fine-grained pyroxenite, amphibole in phenocrysts; av. 6% magnetite by vol.; dikelet cuts core @ 20°; highly fractured & partly mylonized throughout.

136.5-159 Pyrox., med., moderately to intensely fractured with minor shearing av. 10°-30° to core; moderate chloritization & a few associated veinlets of carbonate & epidote; magnetite in intergrowth with pyroxene av. 4% by vol.; a few patches ofamphibole-biotite-felsics.

159-182 Pyrox., med. like above but relatively unfractured or altered except for zones @ 165'-166', 170'-

DRILL HOLE H-14 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
168	170.5	2.5	2.5	100	4
170.5	175.5	5	5	100	4
175.5	178.5	3	3	100	4
178.5	182.5	4	4	100	4
182.5	183.5	1	0.5	50	4
183.5	184.5	1	0.5	50	4
184.5	188.5	4	2	50	4
188.5	190.5	2	2	100	4
190.5	195	4.5	2.5	55	4
195	205	10	9.5	95	4
205	214	9	9	100	4
214	216	2	1.5	75	4
216	221	5	3.5	70	4
221	224	3	1.5	50	4
224	233.5	9.5	9.5	100	5
233.5	237.5	4	4	100	5
237.5	240	2.5	2	80	5
240	243	3	3	100	4
243	244	1	1	100	3
244	247	3	1	30	4
247	249	2	1.5	75	4
249	251	2	2	100	4
251	253	2	1.5	75	4
253	255	2	2	100	3
255	256.5	1.5	1	70	4
256.5	257.5	1	1	100	3
257.5	261.5	4	1	25	4
261.5	264	2.5	2	80	4
264	273.5	9.5	7.5	80	4
273.5	278	4.5	4	90	4
278	280.5	2.5	2.5	100	4

Character of Material

170.5', 173', 178'; magnetite in intergrowth with pyroxene av. 4% by vol., is partly altered to hematite; several 1" dikelets of fine-grained pyrox. to andesite cut core @ av. of 20°; biotite-amphibole-felsic veinlet @ 162.5'-163.5' cuts core @ 30°.

182-224 Pyrox. med., with moderate fracturing & a few zones that are highly chloritized & veined by carbonate; minor shearing; 1" magnetite-pyroxene intergrowth patches are either highly corroded, partly resorbed single crystals or glomeroporphyritic groupings of smaller grains; magnetite av. 4% by vol.; dikelets of andesite cut core @ av. of 20°; some disseminated pyrite.

224-239 Pyrox., med., relatively unfractured; 4" groups of magnetite-pyroxene intergrowth patches @ 227', 228.5', 229', 230', and 237' contains considerable biotite; magnetite av. 5% by vol.

239-259.5 Pyrox., med., like above but highly fractured & altered with several zones of intense shearing & mylonization; shears av. 20°-30° to core with striations av. 70°; minor pyrite is disseminated & along fractures.

259.5-282 Pyrox., med., relatively unfractured; magnetite in intergrowth av. 4% by vol.

DRILL HOLE H-14 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
280.5	285	4.5	3	70	4	282-300 Pyrox., med., intensely sheared, mylonized & altered, several zones are crushed to a light green powder.
285	286	1	0.5	50	4	
286	290	4	1	25	4	
290	293	3	0.5	20	4	
293	295	2	1	50	3	
295	297	2	1	50	4	
297	300	3	0.5	20	3	
300	301	1	1	100	6	300-304 Amphibole andesite,porphyritic; dikelet cuts core @ 10°; a few 1/8"-1/4" patches of amphibole; av. 6% magnetite by vol.
301	306	5	4.5	90	5	
306	306.5	0.5	0.5	100	6	304-312 Pyrox., med., highly fractured but only slightly altered; dikelet of amphibole andesite @ 306'-307'.
306.5	312	5.5	1	20	4	
312	314	2	1.5	75	4	312-343 Pyrox; med., like above but intensely sheared & altered; talcose shears @ 0°-40° to core (av. 15°) with striations @ 75° to 90° (av. 85°); 1/4"-1/2" grains of magnetite-pyroxene intergrowth @ 338' display the subhedral crystal form of the host pyroxene & are definitely earlier than surrounding magnetite-free pyroxene; magnetite is largely converted to hematite @ 314'-317'; mylonized zone @ 325.5'-326' contains porphyroblastic groups of zeolite crystals; several dikelets of andesite av. 10° to core.
314	317.5	3.5	3	85	3	
317.5	319.5	2	0.5	25	4	
319.5	326	6.5	5	75	4	
326	336	10	3	30	4	
336	338	2	1.5	75	4	
338	339.5	1.5	1.5	100	4	
339.5	341	1.5	1.5	100	4	
341	343	2	1.5	75	4	
343	345.5	2.5	2.5	100	4	343-355 Pyrox., med., like above but with minor fracturing & no shearing; av. 4% magnetite by vol.; andesite dikelets @ 347'-347.5' & 349'-349.5' cut core @ 20°, have a reaction border of amphibole.
345.5	348	2.5	2.5	100	5	
348	350	2	2	100	5	
350	353.5	3.5	3	85	4	
353.5	359	5.5	2.5	50	4	355-405 Pyrox., med., moderately to highly fractured & altered; magnetite in 1" groups of patches of pyroxene-magnetite intergrowth av. 4% of the pyrox., by vol.; the intergrowth patches invariably contain 10%-30% biotite;
359	362	3	1	30	4	
362	367	5	5	100	4	
367	373	6	6	100	4	

DRILL HOLE H-14 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
373	382	9	4.5	50	4	fractures av. 40°-50° to core; dikelets of andesite @ 361.5'-363.5' & 366.5'-367.5' cut core @ 20°; zones of more intense chloritization @ 372'-388' and 395'-398'.
382	387	5	2.5	50	4	
387	392	5	2.5	50	4	
392	398	6	4.5	75	4	
398	400.5	2.5	1.5	60	4	
400.5	406	5.5	2	40	4	
406	411	5	4.5	90	6	405-421 Amphibole andesite near pyroxenite, porphyritic, moderately fractured and altered; included intercepts of pyrox. @ 408', 412'-414', 416.5'-417', and 417.5'; a few carbonate veinlets with minor pyrite cut core @ 30°-40°; dikelet cuts core @ 15°.
411	415	4	2.5	60	6	
415	417	2	2	100	6	
417	422	5	3.5	70	5	
422	423.5	1.5	1.5	100	4	421-436 Pyrox., med., with minor fracturing and alteration; magnetite in intergrowth av. 4% by vol.; amphibole andesite dikelets @ 429'-430' and 430.5'-431.5' cut core @ 10°-20°.
423.5	431.5	8	8	100	5	
431.5	436	4.5	3	70	4	
436	439	3	2.5	80	6	436-439 Amphibole andesite dikelet, like 405'-421'; cuts core @ 20°.
439	445	6	4	70	4	439-484 Pyrox., med., with moderate to intense fracturing (@ 30°-50° to core) and a few zones of minor shearing (@ 10°-25° to core); groups of patches of pyroxene magnetite intergrowths are as large as 2"; magnetite av. 4% of the pyrox. by vol.; amphibole andesite dikelet @ 451.5'-453' cuts core @ 10°.
445	446	1	0.5	50	4	
446	449	3	1.5	50	4	
449	455	6	4	70	5	
455	458	3	3	100	4	
458	463	5	2	40	4	
463	467	4	3	75	4	
467	474	7	4.5	65	4	
474	479	5	4	80	4	
479	484	5	4	80	4	
484	486	2	2	100	6	484-486.5 Amphibole andesite dikelet @ 484'-485' cuts core @ 20° & is in turn cut by dikelet of med. gray, massive andesite which cuts core @ 40°.

DRILL HOLE H-14 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
486	495	9	7.5	80	4
495	500	5	5	100	4

Character of Material

486.5-500 Pyrox., med., relatively unfractured but moderately chloritized with a few veinlets of carbonate; dikelets of porphyritic amphibole andesite @ 491'-493.5' and 499'-500' cut core @ 10°; av. 4% magnetite by vol.

DRILL HOLE H-15

Started: July 31, 1959
Completed: August 4, 1959
Elevation (collar reference H-2) = + 114
Located 660' south of northeast corner of claim 30

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						(4-1/4" rock bit and mud)
0	20	20				No sludges taken.
20	50	30				Sand, fine to very fine, light brown, minor magnetite.
50	60	10				Sand, fine, with minor interbeds of coarse sand.
60	80	20				Sand, fine to med., with a few interbeds of gravel, granule-to-pebble size.
80	140	60				Gravel, granule-to-pebble size, with minor sand.
140	200	60				Silt, brown, with minor sand; slightly lignitic.
200	250	50				Silt and fine sand
250	270	20				Sand, fine
270	300	30				Sand, medium.
300	330	30				Sand, fine to medium, with minor gravel, granule.
330	350	20				Silt, light gray, with interbeds of gravel, granule.
350	410	60				Sand, fine to med., with minor gravel, slight increase in magnetite content.
410	430	20				Sand, med., with interbeds of gravel, granule to cobble
430	440	10				Silt to fine sand, light to medium brown
440	470	30				Sand, fine; considerable increase in pyroxene and magnetite content. (Pyroxenite ledge @ 458') (BX-casing set to 470')
470	472	2	0.5	25	5	470-517.5 Pyroxenite, coarse to very coarse; intensely
472	477	5	3.0	60	4	fractured and altered with thin, random veinlets of
477	479	2	1.0	50	4	carbonate and chlorite; magnetite is in reticulate
479	485.5	6.5	1.5	25	4	intergrowth with pyroxene; zones @ 471.5-472.5 and
485.5	486	0.5	0.5	100	6	485.5-486.5' are nearly solid pyroxene-magnetite inter-
486	490	4	1.0	25	4	growth(?); the pyrox. av. 4% magnetite by vol.; kao-
490	500	10	3.0	30	4	linized felsic veinlet @ 489.5-490'; fracturing is
500	510	10	5.0	50	4	random.

DRILL HOLE H-15 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.
510	515	5	0.5	10	4
515	518	3	1.5	50	4
518	523	5	2.5	50	6
523	528	5	1.0	20	4
528	533	5	0.5	10	4
533	538	5	2.0	40	4
538	541	3	1.0	30	4
541	545	4	3.5	90	4
545	549	4	1.5	40	4
549	552	3	2.5	85	4
552	556.5	4.5	2.5	55	4
556.5	560	3.5	1.5	45	4
560	565	5	3.0	60	4
565	568	3.0	3.0	100	4
568	570	2	1.0	50	4
570	572.5	2.5	2.0	80	6
572.5	575	2.5	1.5	60	6
575	578.5	3.5	1.5	40	4
578.5	581	2.5	1.5	60	4
581	583	2	2.0	100	5
583	587	4	3.5	85	4
587	592.5	5.5	5.5	100	4
592.5	597.5	5	4.5	90	4
597.5	602.5	5	5.0	100	5
602.5	604	1.5	1.5	100	5
604	613	9	9.0	100	4
613	614	1	1.0	100	4
614	618	4	4.0	100	4
618	622	4	4.0	100	4
622	632	10	10.0	100	6

Character of Material

517.5-522 Andesite dikelet, dark to med. gray, massive; altered with zeolite along fractures.

522-570.5 Pyroxenite, coarse to very coarse, intensely fractured and altered, like 470-517.5'--no apparent shearing; fewer carbonate veinlets but zones @ 549'-551.5' and 561'-567 are intensely chloritized; @ 570'-571.5' carbonate veinlets saturate the pyroxenite, following the pyroxene cleavage; magnetite in intergrowth with pyroxene are 4% by vol.; zone of intergrowth @ 522-523'.

570.5-574.5 Pyroxene-magnetite intergrowth with a few included patches of magnetite-free pyroxene; much of the silicate in intergrowth may be amphibole and biotite rather than pyroxene.

574.5-585.5 Pyroxene, coarse, intensely fractured but only moderately altered (chloritized; av. 4% magnetite by volume (in intergrowth)); andesite dikelet, med. gray, massive @ 581-582.5' cuts core @ 30°; felsic veinlet @ 578.5-579' cuts core @ 50°; rare trace of pyrite along fractures.

585.5-598 Pyrox., med. to coarse, relatively unfractured; magnetite in intergrowth av. 4% by vol.; intergrowth occurs in irregular patches and in veinlets)?) cutting core @ 40°-70°.

598-606 Pyrox., very coarse-grained (crystals up to 2"), relatively unfractured; abundant pyroxene-magnetite intergrowth (several 1'core intercepts; pyrox. av. 5% magnetite by vol.

606-623 Pyrox., very coarse, relatively unfractured; less pyroxene-magnetite intergrowth than above; magnetite 4% by vol.

DRILL HOLE H-15 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
632	637	5	5	100	5	623-632 Pyroxene-magnetite intergrowth with scattered patches of magnetite-free pyroxene; probably av. about 6%.magnetite by vol.; relatively unfractured. 632-634 Andesite, med. gray massive, dikelet cuts core @ 40° 634-637 Pyroxene, coarse, with moderate fracturing but only slight alteration; pyroxene-magnetite intergrowth zone @ 634'-635'; pyroxene av. 5% by vol.

DRILL HOLE H-16

Started: August 6, 1959
Completed: August 15, 1959
Elevation (collar reference H-2) = - 49'
Located 120' west and 50' north of south end center post of claim 37E

From	To	Distance	Core	% Core Rec.	Character of Material
0	20	20			(3 7/8" rock bit & mud)
20	30	10			Silt, brown to gray.
30	70	40			Silt & fine sand with minor gravel, pebble size.
70	130	60			Gravel, granule to pebble, with minor sand.
130	150	20			Sand, fine to med., with minor gravel, pebble to cobble size.
150	180	30			Sand, fine & gravel, pebble
180	210	30			Sand, fine; minor magnetite
210	248	38			Sand, fine with minor gravel, cobble size; distinct increase in magnetite content (at least 20% by vol.).
248	260	12			Like above but with decrease in magnetite content.
					Silt, light yellowish-brown with only a trace of magnetite. (The argillite, first encountered @ 250', is too weathered to support casing. The casing was thus lowered to 467' by drilling and reaming.)
256	261	5	0.5	10	256-298.5 Argillite, highly fractured & altered (weathered); light green to tan to white in color; bedding lamination av. 10° to core is largely mashed by alteration; the numerous, random fractures are limonite coated.
261	266	5	0.5	10	
266	271	5	1.5	30	
271	276	5	0.5	10	
276	281	5	0.5	10	
281	286	5	0.5	10	
286	291	5	0.5	10	
291	296	5	0.5	10	
296	297	1	0.5	50	

DRILL HOLE H-16

From	To	Distance	Core	% Core Rec.
297	300	3	2	70
300	301	1	0.5	50
301	303	2	0.5	25
303	305.5	2.5	2	80
305.5	307.5	2	1.5	75
307.5	309	1.5	0.5	30
309	311	2	2	100
311	312	1	0.5	50
312	314	2	0.5	25
314	316	2	0.5	25
316	318	2	0.5	25
318	323	5	1	20
323	325	2	0.5	25
325	329	4	0.5	12
329	332	3	0.5	16
332	335	3	1	30
335	340	5	1	20
340	345	5	0.5	10
345	350	5	0.5	10
350	355	5	0.5	10
355	360	5	0.5	10
360	364	4	0.5	12
364	370	6	0.5	8
370	372	2	0.5	25
372	376	4	0.5	12
376	382	6	1	16

Character of Material

298.5-305.5 Argillite, siliceous; moderate fracturing but only slight alteration; two main sets of fractures @ 0°-15° & 60°-70° to core; alternate reddish-brown and light gray laminations av. 10° to core; reddish-brown laminations are probably predominantly argillaceous material, possibly with some hematite; light gray laminations are probably quartzose; the argillite is also cut by numerous random, quartzose veinlets & stringers of several generations, some of which appear chalcedonic; fractures are chlorite-coated.

305.5-308.5 Argillite; siliceous, highly fractured & altered to a light tan color.

308.5-312 Predominantly quartzose veinlets; light gray, unfractured & unaltered; a few islands of reddish-brown argillite.

312-382 Argillite, siliceous, intensely fractured but only slightly altered; laminated reddish-brown to olive-green & light gray; laminations av. 10% to core; quartzose veinlets are abundant (although with the poor core recovery the hard, quartzose intercepts may be selectively recovered in preference to the argillaceous intercepts); limonite & chlorite along fractures; rare trace of pyrite; a few thin veinlets of carbonate & a few of stilbite.

DRILL HOLE H-16

From	To	Distance	Core	% Core Rec.
382	384	2	0.5	25
384	389	5	1	20
389	392	3	1	30
392	396	4	1	25
396	401	5	1.5	30
401	406	5	0.5	10
406	411	5	0.5	10
411	416	5	1	20
416	417.5	1.5	1	70
417.5	424	6.5	1	15
424	426	2	0.5	25
426	431	5	0.5	10
431	436	5	0.5	10
436	441	5	0.5	10
441	446	5	1	20
446	451	5	0.5	10
451	453	2	0.5	25
453	460	7	0.5	7
460	467	7	0.5	7
467	467.5	0.5	0.5	100
467.5	472	4.5	4.5	100
472	476	4	4	100
476	483.5	7.5	3	40
483.5	485	1.5	1.5	100
485	489	4	4	100
489	495	6	6	100
495	503	8	7.5	95
503	513	10	6	60
513	515	2	1	50
515	521	6	5.5	90
521	527	6	2	30
527	530.5	3.5	3.5	100
530.5	539.5	9	1	10
539.5	543.5	4	4	100

Character of Material

382-389 Basalt or fine-grained pyroxenite (?) dikelet; highly fractured & chloritized; contacts with sediments not visible.

389-467 Argillite, siliceous, intensely fractured; dark brown to gray, laminated; laminations av. 10°-30° to core; fewer quartzose veinlets than above; numerous veinlets & stringers of stilbite @ 0°-40° to core & a few veinlets of carbonate; andesite dikelet @ 406'-406.5'; considerable chlorite along fractures; relatively chloritized zone @ 451'-461'.
(AX-casing set @ 467')

467-504 Argillite, siliceous, reddish-brown to med. gray & quartzited (?) light gray; bedding @ 15°-20° to core; quartzite (?) zones predominate; the argillaceous zones are cut by quartzose stringers usually emanating from the quartzite bands but occasionally of a later generation, cutting both; rock is relatively unfractured except for zone @ 479'-483.5; rare trace of disseminated pyrite.

504-546.5 Argillite, siliceous & quartzite (?); relatively unfractured & unaltered except for zones @ 504'-505', 508'-515', 519'-527', & 530'-539'; alteration is primarily to chlorite & limonite; some zones are slightly calcareous & zones @ 518' & @ 543'-544' show partial recrystallization to light brown crystals of dolomite or siderite; bedding @ 20°-25°.

DRILL HOLE H-16

From	To	Distance	Core	% Core Rec.
543.5	547.5	4	4	100
547.5	555.5	8	3	40
555.5	558.5	3	1	30
558.5	562	3.5	3	85
562	568	6	6	100
568	577	9	8	90
577	587	10	7.5	75
587	591	4	0.5	12
591	595	4	3.5	90
595	601	6	6	100

Character of Material

546.5-560.5 Limestone, dense, siliceous, light gray to greenish-gray with several minor included zones of siliceous argillite; considerable recrystallization to light brown dolomite or siderite in 1/8" to 1/4" grains.

560.5-601 Argillite, dark reddish-brown, & quartzite, light gray in alternating beds cutting core @ 15°-20°; interval is predominantly quartzite; a few random veinlets of carbonate & of zeolite; rare trace of pyrite; minor to moderate, unmineralized fracturing; 1" andesite dikelet @ 560.5' is @ 35° to core & @ 50° to the bedding of the sediments.

DRILL HOLE H-17

Started: August 9, 1959
Completed: August 18, 1959
Elevation (collar reference H-2) = ≁ 37'
Located at the southwest corner of claim 23K

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
						(4 1/2" rock bit & mud)
0	10	10				No sample.
10	70	60				Silt, brown & sand, fine; slightly lignitic.
70	110	40				Sand, fine with minor magnetite.
110	180	70				Sand, fine with a few interbeds of gravel (granule).
180	225	45				Silt, light to med. brown with minor sand, fine.
225	240	15				Sand, fine; considerable increase in pyroxene, feldspar & magnetite content. (NX-casing set to 240', but lowered with progressive drilling as initial set proved to be false ledge).
240	251	11	2	20		240-255 Boulders & cobbles of pyroxenite, diorite, monzonite, andesite & basalt.
251	255	4	0.5	12		
255	257	2	0.5	25		255-260 Cobbles & pebbles of andesite & pyroxenite.
257	260	3	0.5	16		
260	265	5	1.5	30		260-270 Boulders of pyroxenite, fine grained.
265	270	5				
270	275	5	1	20		270-280 Boulder of pyroxenite & pebbles of all the above rock types.
275	280	5	1	20		

DRILL HOLE H-17 Cont'd

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
280	282	2	0.25	12		280-286 Pebbles of chert & basalt.
282	286	4	0.25	6		
286	287	1	0.25	25		286-298 Pebbles & cobbles of basalt, porphyritic & all of the above rock types.
287	289	2	0.25	12		
289	295	6	0.25	4		
295	298	3				
298	298.5	0.5	0.1	20		298-308 Silt to fine sand, light brown to light gray (represented only in the sludges) with a few included cobbles & pebbles of andesite, pyroxenite & diorite (recovered as core)
298.5	303	4.5	0.1	2		
303	308	5				
308	313	5	1	20		308-325 Silt to fine sand, light brown to light gray; increase in magnetite content.
313	315	2				
315	320	5				
320	325	5				
325	330	5	0.25	5		325-350 Silt to fine sand (sludges) with misc. cobbles & pebbles (core)
330	335	5	0.1	2		
335	340	5	0.1	2		
340	345	5				
345	350	5				
350	355	5	1.5	30		350-375 Silt to fine sand with scattered pebbles & granules mainly of intensely weathered pyroxenite. Several zones are highly carbonaceous, near peat. Sub-angular grains of magnetite prob. av. about 15% by vol. Sludges show extreme concentration of magnetite to 50-70%, or about 4 times its true percentage.
355	360	5				
360	365	5	0.5	10		
365	370	5	1.5	30		
370	375	5				
375	380	10	6	60		375-382 Silt, carbonaceous, near peat, dark reddish-brown to black in color; compaction laminations & few red bands of more ferruginous silt cut core @ 90°; some plant fragments visible.

DRILL HOLE H-17

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
380	385	5	4	80		382-389 Silt & fine sand with a few visible fragments of pyroxenite & rare pebbles of diorite & pyroxenite; greenish-gray but increasingly reddish (more ferruginous?) with depth.
385	390	5	2.5	50		
390	395	5	1	20		389-410 Silt, sand & pebbles, poorly sorted & poorly consolidated, reddish-brown, highly ferruginous & somewhat carbonaceous; identifiable sand grains & pebbles are predominantly pyroxenite.
395	400	5	2.5	50		
400	405	5	3	60		
405	410	5	1	20		
410	415	5	0.25	5		410-425 Cobbles of pyroxenite & a fine-grained sandstone consisting of grains of pyroxene in a calcareous-argillaceous matrix.
415	420	5	0.25	5		
420	425	5	0.1	2		
425	430	5				425-460 Sludges are mainly of pyroxene with about 10% magnetite. Probably indicate fluvial sediments primarily derived from the pyroxenite, with pyroxenite ledge @ 460'.
430	435	5				
435	440	5				
440	445	5				
445	450	5				
450	455	5				
455	460	5				
460	470	10	0.5	5	7	460-480 Pyroxenite to diorite, fine to med.-grained, with scattered euhedral to subhedral crystals of plagioclase & amphibole. (BX-casing set to 480')
470	480	10	0.1	1	7	
480	485	5	0.1	2	7	480-495 Pyroxenite, fine, limonite-coated fractures av. 30° to core; magnetite av. 7% by vol.
485	490	5				
490	495	5				
495	500	5	0.1	2	7	495-520 Pyroxenite, fine, with scattered patches of amphibole & biotite; magnetite av. 7% by vol. (AX-casing set to 520')
500	505	5				
510	515	5				
515	520	5	0.1	2	7	

DRILL HOLE H-17

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
380	385	5	4	80		382-389 Silt & fine sand with a few visible fragments of pyroxenite & rare pebbles of diorite & pyroxenite; greenish-gray but increasingly reddish (more ferruginous?) with depth.
385	390	5	2.5	50		
390	395	5	1	20		389-410 Silt, sand & pebbles, poorly sorted & poorly consolidated, reddish-brown, highly ferruginous & somewhat carbonaceous; identifiable sand grains & pebbles are predominantly pyroxenite.
395	400	5	2.5	50		
400	405	5	3	60		
405	410	5	1	20		
410	415	5	0.25	5		410-425 Cobbles of pyroxenite & a fine-grained sandstone consisting of grains of pyroxene in a calcareous-argillaceous matrix.
415	420	5	0.25	5		
420	425	5	0.1	2		
425	430	5				425-460 Sludges are mainly of pyroxene with about 10% magnetite. Probably indicate fluvial sediments primarily derived from the pyroxenite, with pyroxenite ledge @ 460'.
430	435	5				
435	440	5				
440	445	5				
445	450	5				
450	455	5				
455	460	5				
460	470	10	0.5	5	7	460-480 Pyroxenite to diorite, fine to med.-grained, with scattered euhedral to subhedral crystals of plagioclase & amphibole. (BX-casing set to 480')
470	480	10	0.1	1	7	
480	485	5	0.1	2	7	480-495 Pyroxenite, fine, limonite-coated fractures av. 30° to core; magnetite av. 7% by vol.
485	490	5				
490	495	5				
495	500	5	0.1	2	7	495-520 Pyroxenite, fine, with scattered patches of amphibole & biotite; magnetite av. 7% by vol. (AX-casing set to 520')
500	505	5				
510	515	5				
515	520	5	0.1	2	7	

DRILL HOLE H-17

From	To	Distance	Core	% Core Rec.	% Magn.	Character of Material
520	530	10	2	20	7	520-530 Pyrox., fine, moderate to intense fracturing with a few talcose shears @ av. of 30° to core; considerable amphibole & biotite; magnetite av. 7% by vol.

A P P E N D I X B

ASSAY AND CONCENTRATION TEST RESULTS FROM

H. T. CADDY LABORATORY

B. C. [illegible] Co.

HUMBLE ALASKA PROJECT

DRILL HOLE NO. 7

Composite No.	Footage From	Footage To	% Total Iron	% Magn. Fe
C-1	151	200	17.35	
C-2	200	250	16.79	12.38
C-3	250	296.5	15.75	
C-4	296.5	336	14.23	
C-5	336	370	13.27	
C-6	370	406.25	16.31	
C-7	406.25	449	15.83	
C-8	449	500	14.71	
C-9	500	548.7	15.88	
C-10	548.7	600	13.11	
C-11	600	650	14.55	8.67
C-12	650	699	15.11	
C-13	699	747	12.63	
C-14	747	799	16.07	
C-15	799	849	15.19	
C-16	849	899	15.91	
C-17	899	950	17.11	
C-18	950	1001	17.43	
C-27	1001	1050.5	16.02	
C-28	1050.5	1102	16.58	
C-29	1102	1154	16.58	
C-30	1154	1200.5	17.22	
C-31	1200.5	1251	13.31	
C-32	1251	1302	14.67	
C-33	1302	1354	15.30	
C-34	1354	1401	15.78	
C-35	1401	1451.5	15.15	

E. J. LONGYEAR CO.
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 7

Composite No.	Footage From	Footage To	% Total Iron	% Magn. Fe
C-36	1451.5	1502	15.30	
C-37	1502	1551	15.78	
C-38	1551	1602	15.22	
C-39	1602	1652.5	14.67	
C-40	1652.5	1701	15.78	
C-41	1701	1750	15.46	
C-42	1750	1799	16.42	
C-43	1799	1851.5	16.26	
C-44	1851.5	1900.5	16.18	
C-45	1900.5	1950	16.02	
C-46	1950	2000	16.42	11.10

END OF HOLE

Sample No.				
9	181.5	184	18.54	13.93
18	235.5	238.5	18.06	14.04

E. J. Longyear Co.
Humble Alaska Project

Drill Hole No. 7 - Copper assays

Sample No.	Footage From	Footage To	% Copper
506	1744	1746.5	less than .01
507	1746.5	1750	" " .01
508	1750	1752	" " .01
509	1752	1756.5	" " .01
600	1756.5	1759	" " .01
623	1820.5	1825	" " .01

Drill Hole 7 - Magnetic iron determinations made on Davis Tube Tester. Samples were stage ground to pass 200 mesh.

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
LAB. NO. 1280 - Sample No. 9 - From 181.5' to 184':				
1280-A-1	-200M Crude	100.00	18.54	13.93
2	Magnetic concentrate	21.05	66.18	
3	Non-mag. tails	78.95	5.84	
LAB. NO. 1281 - Sample No. 18 - From 235.5' to 238.5':				
1281-A-1	-200M Crude	100.00	18.06	14.04
2	Magnetic Concentrate	21.39	65.62	
3	Non-mag. tails	78.61	5.12	
Composite No. C-2 from 200' to 250' - Lab. No. 1318:				
1318-A-1	-200M Crude	100.00	16.79	12.38
2	Magnetic concentrate	18.94	65.38	
3	Non-magnetic tails	81.06	5.44	
Composite No. C-11 from 600' to 650' - Lab. No. 1319:				
1319-A-1	-200M Crude	100.00	14.55	8.67
2	Magnetic concentrate	13.32	65.06	
3	Non-mag. tails	86.68	6.79	
Composite No. C-46 from 1950' to 2000' - Lab. No. 1320:				
1320-A-1	-200M Crude	100.00	16.42	11.10
2	Magnetic concentrate	16.73	66.34	
3	Non-mag. tails	83.27	6.39	

E. J. Longyear Co.
Humble Alaska Project

DRILL HOLE NO. 8

Composite No.	Footage From	Footage To	% Total Iron	% Magn. Fe
C-19	222	251	16.79	
C-20	251	300	16.84	12.14
C-21	300	350	15.99	
C-22	350	402	15.83	
C-23	402	454	13.19	
C-24	454	500	11.96	
C-25	500	550	16.10	10.88
C-26	550	576.5	19.37	

End of Hole

Sample No.				
229	222	224	20.51	15.69
243	300	304	18.28	14.50
253	338.5	340	17.08	12.08
257-A	381.5	385	18.52	14.27
272	435.5	437.5	15.80	8.06
300	535	538	18.49	14.24

E. J. Longyear Co.
Humble Alaska Project

Drill Hole 8 – Copper assays

Sample No.	Footage From	Footage To	% Copper
224	222	224	.02
225	224	228	.01
226	228	235	.04
227	235	245	Less than .01
228	245	246	Less than .01
229	246	251	Less than .01
230	251	254	Less than .01
231	254	257	Less than .01
232	257	259	Less than .01
233	259	264	.02
234	264	266.5	.01
235	266.5	271	.03

[illegible]
Humble Alaska Project

Virginia, Minnesota

Drill Hole 8 - Magnetic iron determinations made on Davis Tube Tester. Samples were stage ground to pass 200 mesh.

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
Sample No. 229 from 222' to 224'; Lab. No. 1296:				
1296-A-1	-200M Crude	100.00	20.51	15.69
2	Magnetic concentrate	23.66	66.33	
3	Non-mag. tails	76.34	6.31	
Sample No. 243 from 300' to 304'; Lab. No. 1297:				
1297-A-1	-200M Crude	100.00	18.28	14.50
2	Magnetic concentrate	22.34	64.90	
3	Non-mag. tails	77.66	4.87	
Sample No. 253 from 338.5' to 340'; Lab. No. 1298:				
1298-A-1	-200M Crude	100.00	17.08	12.08
2	Magnetic concentrate	17.68	68.33	
3	Non-mag. tails	82.32	6.07	
Sample No. 257-A from 381.5' to 385'; Lab. No. 1299:				
1299-A-1	-200M Crude	100.00	18.52	14.27
2	Magnetic concentrate	21.64	65.93	
3	Non-mag. tails	78.36	5.43	
Sample No. 272 from 435.5' to 437.5'; Lab. No. 1300:				
1300-A-1	-200M Crude	100.00	15.80	8.06
2	Magnetic concentrate	11.85	68.01	
3	Non-mag. tails	88.15	8.78	
Sample No. 300 from 535' to 538'; Lab. No. 1301:				
1301-A-1	-200M Crude	100.00	18.49	14.24
2	Magnetic concentrate	21.63	65.84	
3	Non-Mag. tails	78.37	5.42	
Composite No. C-20 from 251' to 300' - Lab. No. 1321:				
1321-A-1	-200M Crude	100.00	16.84	12.14
2	Magnetic concentrate	18.34	66.18	
3	Non-mag. tails	81.66	5.76	
Composite No. C-25 from 500' to 550' - Lab. No. 1322:				
1322-A-1	-200M Crude	100.00	16.10	10.88
2	Magnetic concentrate	16.29	66.82	
3	Non-mag. tails	83.71	6.23	

E. J. LONGYEAR CO.
HUMBLE ALASKA PROJECT
DRILL HOLE NO. 9 - Total Iron Assays

Composite No.	Footage From	Footage To	% Total Fe	% Magn. Fe
C-61	230	250	11.86	
C-62	250	299	11.70	6.09
C-63	299	350.5	10.10	
C-64	350.5	398	11.54	
C-65	398	454.5	12.98	
C-66	454.5	497	13.79	
C-67	497	546.5	14.43	
C-68	546.5	603.5	14.27	
C-69	603.5	650	13.63	
C-70	650	697	14.27	8.02
C-74	697	748	14.19	
C-75 ?Cu	748	802	14.75	
C-76	802	849	13.79	
C-77	849	898	14.19	
C-78	898	948	13.06	
C-79	948	1004	12.74	
C-80	1004	1049	12.82	
C-81	1049	1103.5	11.83	
C-82	1103.5	1152.5	15.83	
C-83	1152.5	1199	15.51	
C-84	1199	1250	15.67	
C-85	1250	1301.5	15.51	
C-86	1301.5	1353	14.55	
C-87	1353	1403	18.30	
C-88	1403	1450	15.35	
C-89	1450	1496.5	15.83	
C-90	1496.5	1549	14.55	

E. J. LONGYEAR CO.
HUMBLE ALASKA PROJECT
DRILL HOLE NO. 9 - Iron Assays

Composite No.	Footage From	Footage To	% Total Fe	% Magn. Fe
C-91	1549	1602	15.19	
C-92	1602	1653	15.35	
C-93	1653	1706	16.31	
C-94	1706	1751	16.28	
C-95	1751	1799	14.63	
C-96	1799	1853	14.23	
C-97	1853	1901	12.78	
C-98	1901	1949	12.15	
C-99 ✓	1949	2000	16.15	10.19

Hole bottomed @ 2000'.

Sample No.	From	To	% Total Fe	% Magn. Fe
974	1363	1373	18.62	13.09
975	1373	1380	29.65	25.43

E. J. Longyear Company
Humble Alaska Project

DRILL HOLE NO. 9: Magnetic iron determinations made on Davis Tube Tester. Samples were stage ground to pass 200 mesh.

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
Composite No. C-62 from 250' to 299' - Lab. No. 1323:				
1323-A-1	-200M Crude	100.00	11.70	6.09
2	Magnetic concentrate	9.55	63.79	
3	Non-mag. tails	90.45	6.20	
Composite No. C-70 from 650' to 697' - Lab. No. 1324:				
1324-A-1	-200M Crude	100.00	14.27	8.02
2	Magnetic concentrate	12.00	66.80	
3	Non-mag. tails	88.00	7.11	
Composite No. C-99 from 1949' to 2000' - Lab. No. 1325:				
1325-A-1	-200M Crude	100.00	16.15	10.19
2	Magnetic concentrate	15.29	66.66	
3	Non-mag. tails	84.71	7.03	
Sample No. 974 from 1363' to 1373' - Lab. No. 1330:				
1330-A-1	-200M Crude	100.00	18.62	13.09
2	Magnetic concentrate	19.55	66.98	
3	Non-mag. tails	80.45	6.87	
Sample No. 975 from 1373' to 1380' - Lab. No. 1331:				
1331-A-1	-200M Crude	100.00	29.65	25.43
2	Magnetic concentrate	38.43	66.18	
3	Non-mag. tails	61.57	6.85	

S. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 9 - Copper assays

Composite No.	Footage From	Footage To	% Copper
C-61	230	250	.01
C-62	250	299	.01
C-63	299	350.5	.01
C-64	350.5	398	less than .01

Sample No.	From	To	% Copper
831	593.5	603.5	less than .01
832	603.5	605	" " .01
833	605	608	" " .01
834	608	611	" " .01
835	611	621	" " .01
892	728	738	.05
893	738	748	.04
894	748	755	.03
895	755	760.5	.01
896	760.5	770.5	.05
897	770.5	773.5	.01
898	773.5	778.5	.09
899	778.5	780.5	.15
900	780.5	786.5	.13
901	786.5	794	.06
902	794	802	.06
903	802	812	.04

Continued on Sheet 2

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 9 - Copper Assays

Sample No.	Footage From	Footage To	% Copper
1064	1963	1968	.06
1065	1968	1971	.08
1066	1971	1975	.17
1067	1975	1985	.06
1068	1985	1987.5	.04
1069	1987.5	1992	.06
1070	1992	1996	.08
1071	1996	2000	.09

Hole bottomed @ 2000'.

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 9 - Zinc Assays

Sample No.	Footage From	To	% Zinc (by Textor)	% Zinc (by Lerch)
957	1260	1270	.010	.01
958	1270	1280	.010	.01
959	1280	1284	.010	.01
960	1284	1286	.025	.01

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT
DRILL HOLE NO. 10 - Assays

Composite No.	Footage From	Footage To	% Total Fe	% Magn. Fe
C-47 ✓	201	250	15.19	8.73
C-48	250	303.5	14.07	
C-49	303.5	350	14.71	
C-50 ✓	350	396	14.87	
C-51	396	450	13.27	
C-52	450	495	13.67	6.29
C-53 ✓	495	532	13.91	

Hole bottomed @ 532'.

Sample No.	From	To	% Total Fe	% Magn. Fe
536	303;5	311.5	14.79	7.71
549	362	365	15.59	10.25
556	406	416	14.55	8.55
580	475	479	15.91	7.60

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT
DRILL HOLE NO. 10 - Magnetic iron determinations made on Davis tube tester.
Samples were stage ground to pass 200 mesh.

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe

SAMPLE NO. 536 - from 303.5' to 311.5' - Lab. No. 1313:

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
1313-A-1	-200M Crude	100.00	14.79	7.71
2	Magnetic concentrate	11.43	67.46	
3	Non-mag. tailings	88.57	7.99	

SAMPLE NO. 549 - from 362' to 365' - Lab. no. 1314:

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
1314-A-1	-200M Crude	100.00	15.59	10.25
2	Magnetic concentrate	15.42	66.50	
3	Non-magnetic tails	84.58	6.31	

SAMPLE NO. 556 - from 406' to 416' - Lab. No. 1315:

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
1315-A-1	-200M Crude	100.00	14.55	8.55
2	Magnetic concentrate	12.74	67.14	
3	Non-magnetic tails	87.26	6.87	

SAMPLE NO. 580 - from 475' to 479' - Lab. No. 1316:

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
1316-A-1	-200M Crude	100.00	15.91	7.60
2	Magnetic concentrate	11.08	68.58	
3	Non-magnetic tails	88.92	9.35	

COMPOSITE NO. C-47 from 201' to 250' - Lab. No. 1326:

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
1326-A-1	-200M Crude	100.00	15.19	8.73
2	Magnetic concentrate	13.00	67.14	
3	Non-mag. tails	87.00	7.43	

COMPOSITE NO. C-52 from 450' to 495' - Lab. No. 1327:

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
1327-A-1	-200M Crude	100.00	13.67	6.29
2	Magnetic concentrate	9.41	66.80	
3	Non-mag. tails	90.59	8.15	

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT
DRILL HOLE NO. 11 - Assays

Composite No.	Footage From	Footage To	% Total Fe	% Magn. Fe
C-54 ✓	159	199.5	6.23	
C-55	199.5	250.5	5.20	
C-56	250.5	303	4.72	
C-57 ✓	303	347	5.04	
C-58	347	400	4.80	
C-59	400	447	5.04	
C-60 ✓	447	500	5.44	

Hole bottomed @ 500'.

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT
DRILL HOLE NO. 12 - Assays

Composite No.	Footage From	To	% Total Fe	% Magn. Fe	% Copper	% TiO_2	% Cobalt
C-71 ✓	254	301	11.85	6.84	<.01		
C-72	301	349	12.33		<.01		
C-73 ✓	349	401	12.97		<.01		
C-100	401	451	11.91				
C-101	451	500	12.63				
C-102	500	552	11.90				
C-103	552	600	11.83	5.41			

Hole bottomed @ 600'.

Sample No.	From	To	% Total Fe	% Magn. Fe	% Copper	% TiO_2	% Cobalt
855	280	284			<.01		
856	284	286			<.01		
857	286	288			<.01		
858	288	292			<.01		
874	337	339			<.01	1.77	Nil
875	339	346.5			<.01	1.80	Nil
883	363	373			<.01		

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 12: Magnetic iron determinations made on Davis tube tester. Samples were stage ground to pass 200 mesh.

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
COMPOSITE NO. C-71 from 254' to 301' - Lab. No. 1328:				
1328-A-1	-200M Crude	100.00	11.85	6.84
2	Magnetic concentrate	10.58	64.66	
3	Non-mag. tails	89.42	5.60	
COMPOSITE NO. C-103 from 552' to 600' - Lab. No. 1329:				
1329-A-1	-200M Crude	100.00	11.83	5.41
2	Magnetic concentrate	8.70	62.19	
3	Non-mag. tails	91.30	7.03	

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E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 13: Iron assays

Composite No.	Footage From	Footage To	% Total Fe
C-104	332	350	4.76
C-105	350	400	8.72
C-106	400	449	9.67
C-107 ✓	449	497.5	7.97
C-108	497.5	550	6.64
C-109	550	604	6.60
C-110 ✓	604	668	5.96

Hole bottomed @ 668'.

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 14 - Iron assays.

Composite No.	Footage From	Footage To	% Total Fe
C-112 ✓	91	151	6.16
C-113	151	205	5.20
C-114 ✓	205	251	6.00
C-115	251	300	6.56
C-116	300	350	7.92
C-117 ✓	350	400.5	5.60
C-118	400.5	449	7.20
C-119	449	500	5.92

Hole bottomed @ 500'.

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 15 - Iron assays.

Composite No.	Footage From	Footage To	% Total Fe
C-120 ✓	470	500	5.44
C-121	500	549	4.96
C-122 ✓	549	637	5.62

Hole bottomed @ 637'.

DAVIS TUBE TESTS @ -200 Mesh

Sample No.	Footage		CRUDE		MAGNETIC CONC.		NON-MAG. TAI	
	From	To	% Total Fe	% Magn.Fe	% Wt.	% Total Fe	% Wt.	% Total
1324	614	618	5.96	1.17	1.84	63.71	98.16	4.
1326	622	632	8.00	1.03	3.22	32.02(1)	96.78	7.

(1) Chemist's note: "TiO_2 present in large amount".)

GMC DATA REPORT 355

E. J. LONGYEAR COMPANY
HUMBLE ALASKA PROJECT

DRILL HOLE NO. 17: Iron assays

Composite No.	Footage From	Footage To	% Total Fe	% Magn. Fe
C-111	460	530	11.99	5.01

Hole bottomed @ 530'.

Sample No.	From	To	% Total Fe	
H-1	460	485	10.00	
H-4	495	500	9.43	
H-9	520	530	11.83	

Magnetic iron determination by Davis tube tester @ -200M grind:

Lab. No.	Product	% Wt.	% Total Fe	% Magn. Fe
COMPOSITE NO. C-111 from 460' to 530' - Lab. No. 1335:				
1335-A-1	-200M Crude	100.00	11.99	5.01
2	Magnetic concentrate	7.36	68.13	
3	Non-mag. tails	92.64	7.53	

GMC DATA REPORT 3 5 5

Report # 00901

Widco* WELL LOG

COMPANY	HUMBLE OIL & REFINING CO.
AREA	KEMUK IRON ORE PROJECT
WELL	B-11
COUNTY	STATE ALASKA
COORDINATES:	F,0, 23
N	
S	
ELEVATION:	
D.F.	
K.B.	
G.L.	

COMPANY — HUMBLE
WELL — B-11
LOCATION — F,0, 23

	Run No. 1	Run No. 2
Date	7-8-59	7-8-59
First Reading	495'	474'
Last Reading	180'	180'
Footage Logged	315'	294'
Bottom (Driller)	500'	500'
Casing (From Log)	180'	179'
Casing (Driller)	180'	180'
Casing Size	2"	2"
Bit Size:		
Bit Size:		
	Res.	S.P.

MUD	Run No. 1	Run No. 2
Nature		
Density		
Viscosity	@ °F	@ °F
Resistivity	@ °F	@ °F
Res. @ BHT	@ °F	@ °F
pH		
Circ. Temp.		
B.H. Temp.		
Logged by	Whaley	
Witnessed by	Bray	

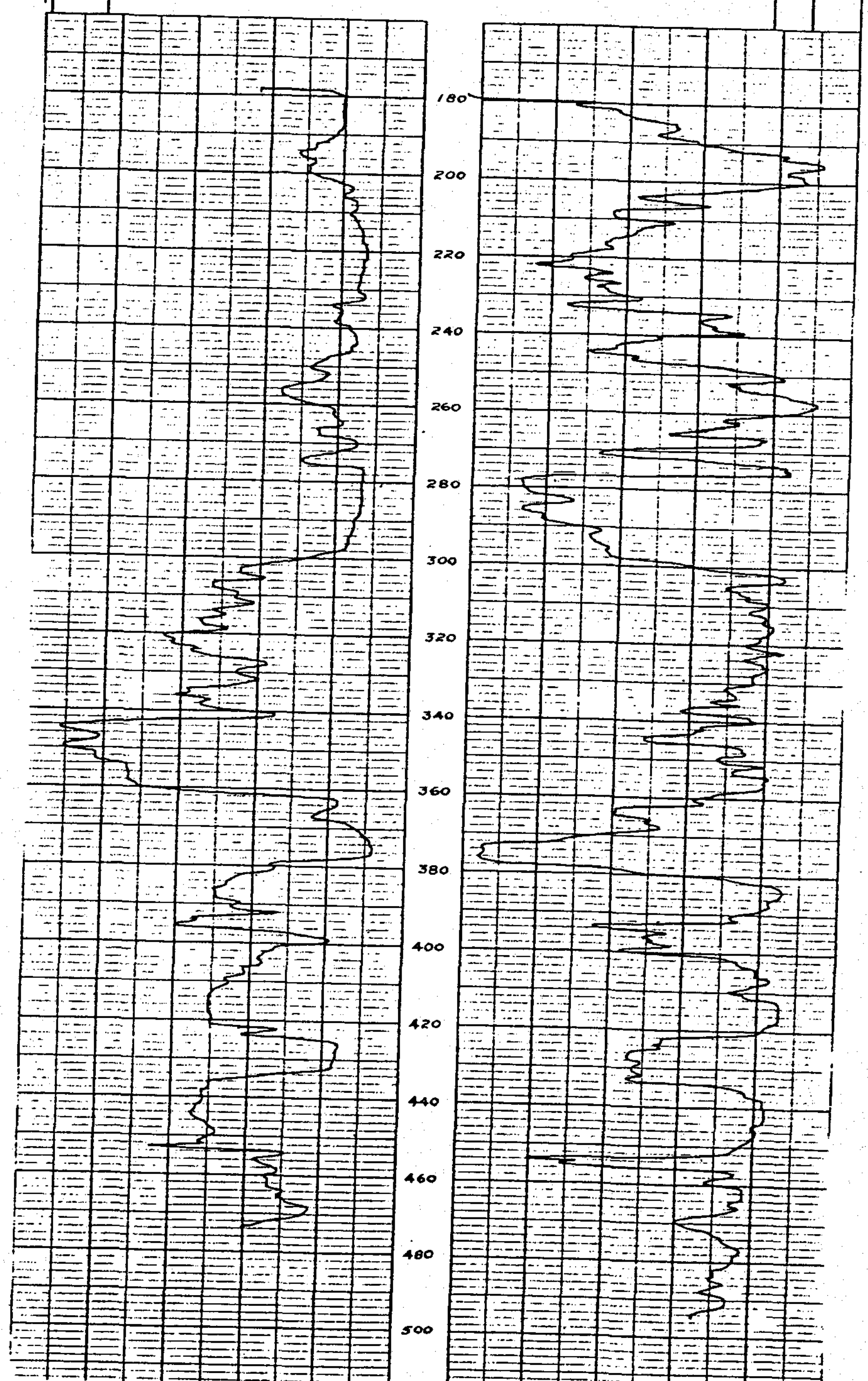
REMARKS Logged hole in fresh drilling mud; no difficulty encountered with hole caving.

*Reg. U.S. Pat. Off.

FO-13

50 m.v.

200 ohms



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GMC DATA REPORT 355

Report #00901

Widco* WELL LOG

COMPANY [illegible] · WELL [illegible] · LOCATION [illegible]

COMPANY: HUMBLE OIL & REFINING COMPANY

AREA: [illegible] IRON ORE PROJECT

WELL: [illegible]

COUNTY: ______ STATE: ALASKA

COORDINATES: [illegible]
N. ______
S. ______
ELEVATION: ______
D.F. ______
K.B. ______
G.L. ______

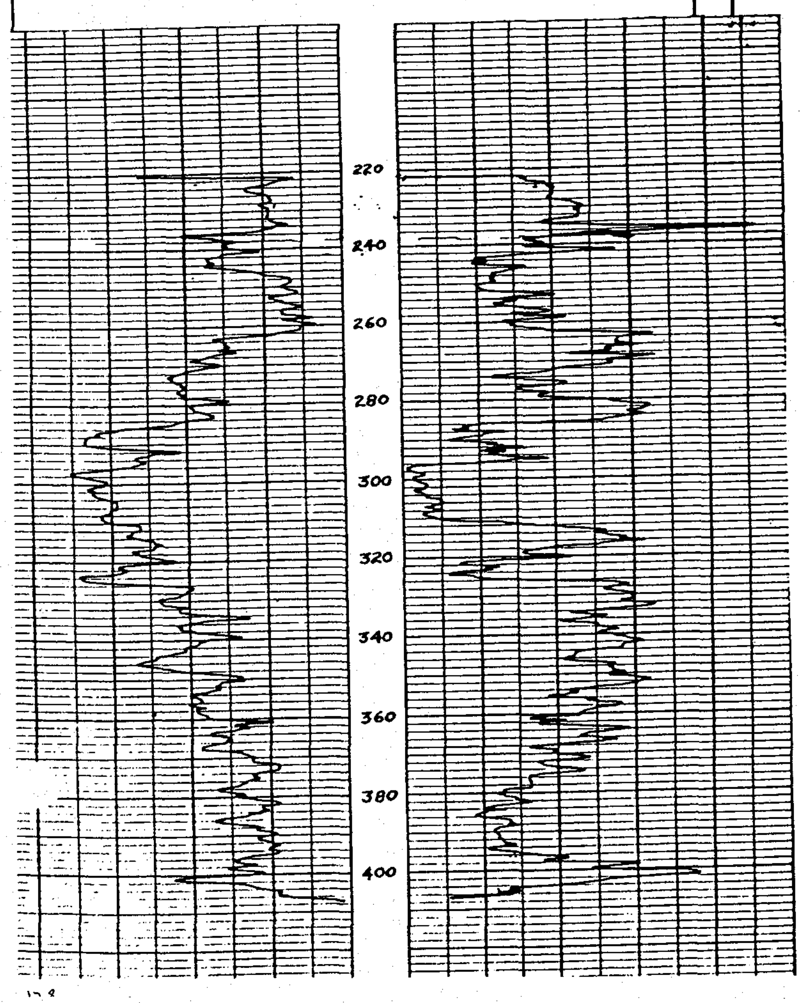
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	6-[illegible]-59	6-[illegible]-59	Nature		
First Reading	407'	407'	Density		
Last Reading	[illegible]'	[illegible]'	Viscosity	@ °F	@ °F
Footage Logged	[illegible]'	[illegible]'	Resistivity	@ °F	@ °F
Bottom (Driller)	576'	576'	Res. @ BHT	@ °F	@ °F
Casing (From Log)	[illegible]'	[illegible]'	pH		
Casing (Driller)	[illegible]'	[illegible]'	Circ. Temp.		
Casing Size			B.H. Temp.		
Bit Size					
Bit Size					
			Logged by	W. J. [illegible]	
			Witnessed by	[illegible]	

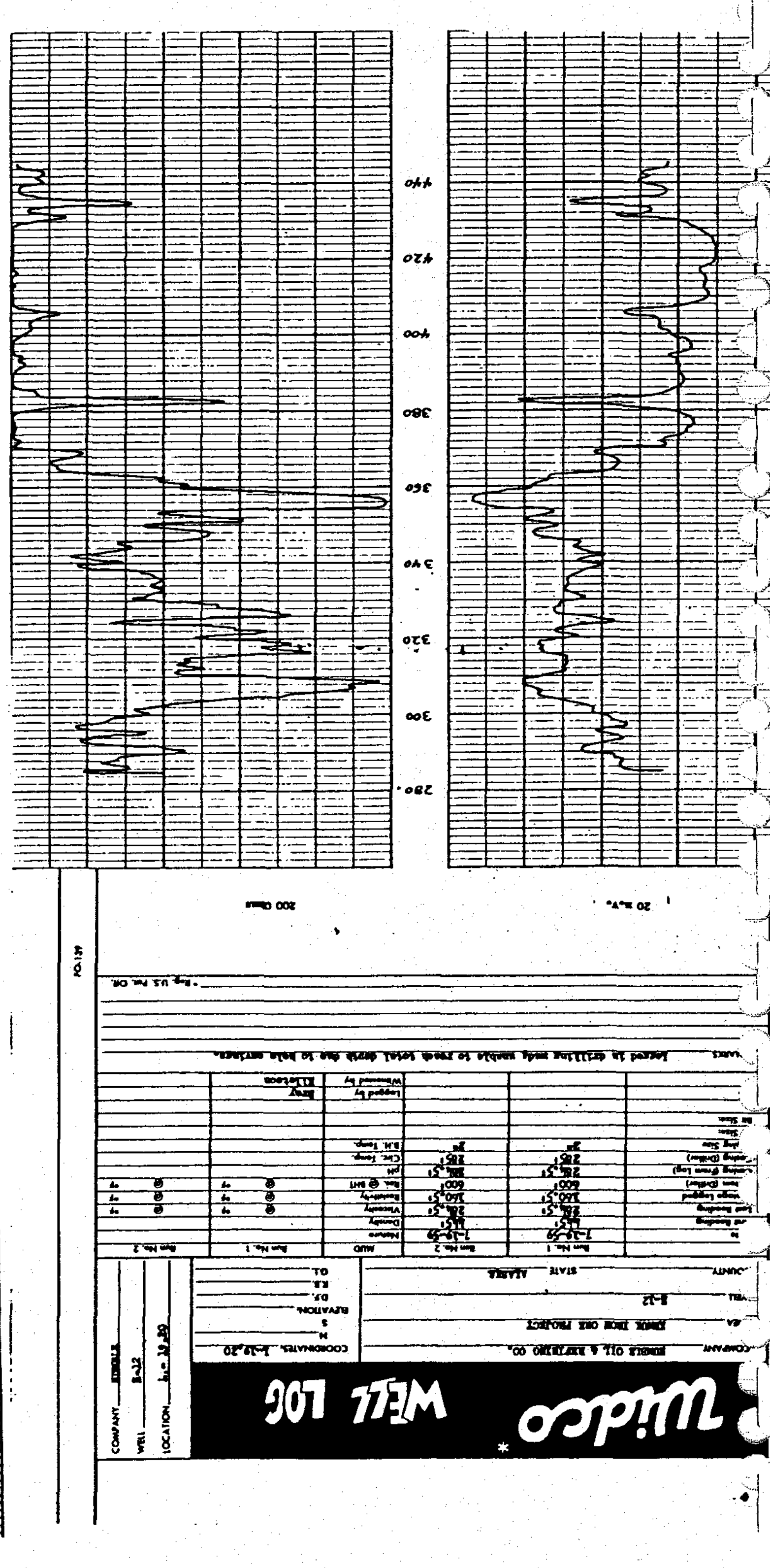
REMARKS: Logged in fresh water. Unable to log below 407' due to side wall hole caving.

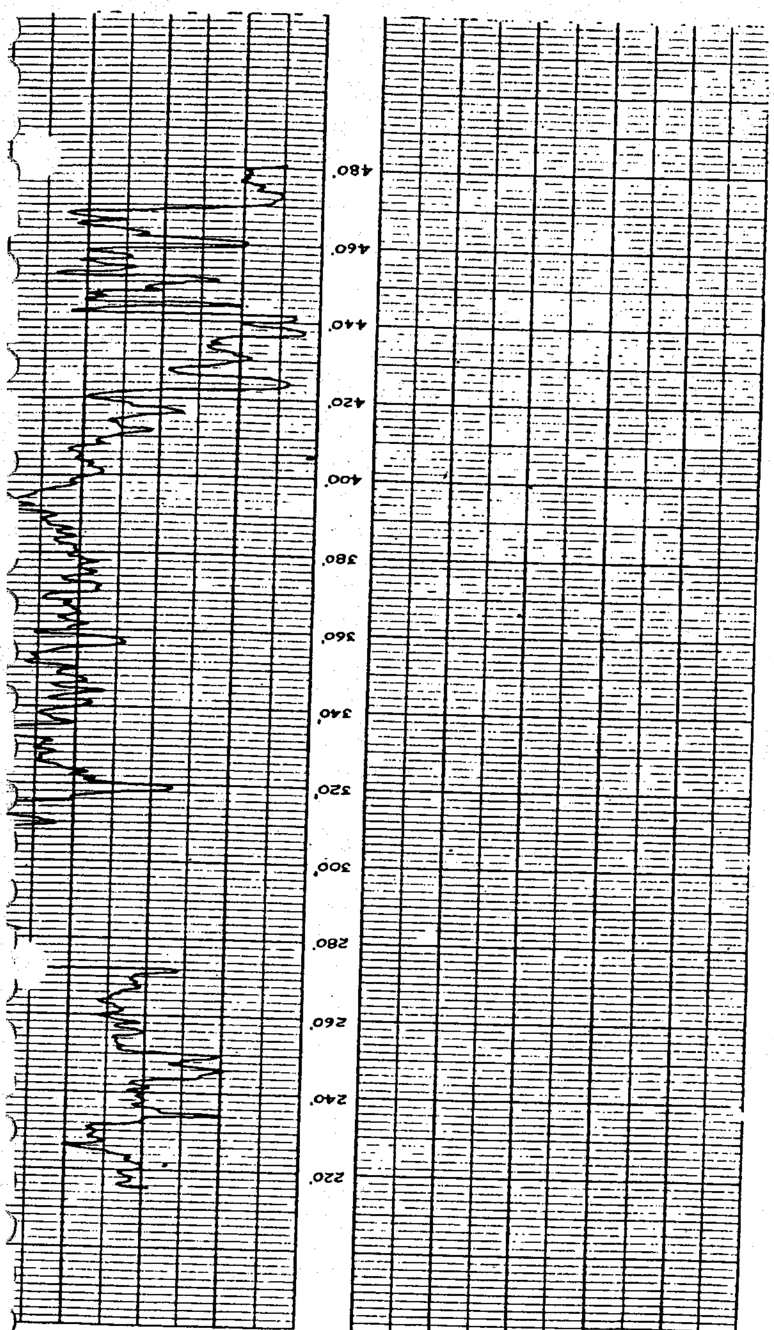
* Reg. U.S. Pat. Off.

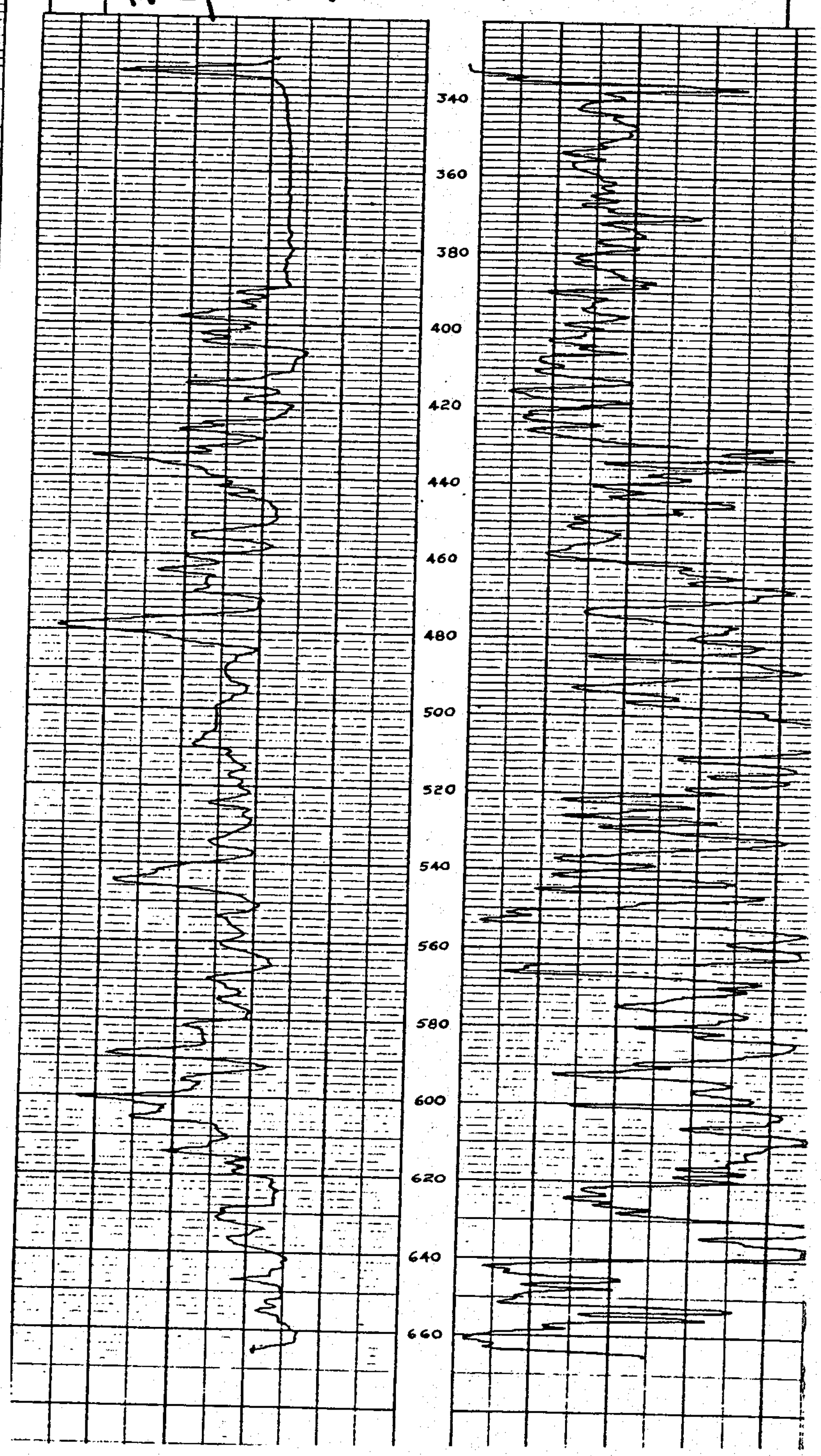
FO-139

20 m.v. 200 ohms









Widco* WELL LOG

COMPANY HUMBLE OIL & REFINING CO.
AREA KEMUK IRON ORE PROJECT
WELL K-33
COUNTY ______ STATE ALASKA
COORDINATES J,K-32
N
S
ELEVATION
D.F.
K.B.
G.L.

COMPANY HUMBLE
WELL K-33
LOCATION J,K-32

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	7-29-59	7-29-59	Nature		
First Reading	665'	665'	Density		
Last Reading	332'	332'	Viscosity	@ °F	@ °F
Footage Logged	333'	333'	Resistivity	@ °F	@ °F
Bottom (Driller)	[illegible]	668'	Res. @ BHT	@ °F	@ °F
Casing (From Log)	333'	333'	pH		
Casing (Driller)	335'	335'	Circ. Temp.		
Casing Size			B.H. Temp.		
Bit Size					
Bit Size					
			Logged by	Whaley	
			Witnessed by	Elliott	

REMARKS Logged to total depth with no difficulty using new 15/16" mandrel. Logged in fresh water.

* Reg. U.S. Pat. Off.

PO-159

Report # 00901

Widco* WELL LOG

COMPANY HUMBLE OIL & REFINING CO.
AREA KEMUK IRON ORE PROJECT
WELL K-10
COUNTY ______ STATE ALASKA
COORDINATES I-19,20
N
S
ELEVATION
D.F.
K.B.
G.L.

WELL K-10
LOCATION I-19,20

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	7-1-59		Nature		
First Reading	215'		Density		
Last Reading	481'		Viscosity	@ °F	@
Footage Logged	266'		Resistivity	@ °F	@
Bottom (Driller)	525'		Res. @ BHT	@ °F	@
Casing (From Log)	215'		pH		
Casing (Driller)	215'		Circ. Temp.		
Casing Size	2"		B.H. Temp.		
Bit Size					
Bit Size					
			Logged by	Whaley	
			Witnessed by	Bray	

REMARKS Unable to reach total depth due to caving in hole. Lost mandrel in hole at 488' after logging resistivity curve; therefore unable to obtain S.P. log. Logged in fresh water.

* Reg. U.S. Pat. Off.

Report # 00901

031

COUNTY ______ STATE ALASKA

E.B. ______
G.L. ______

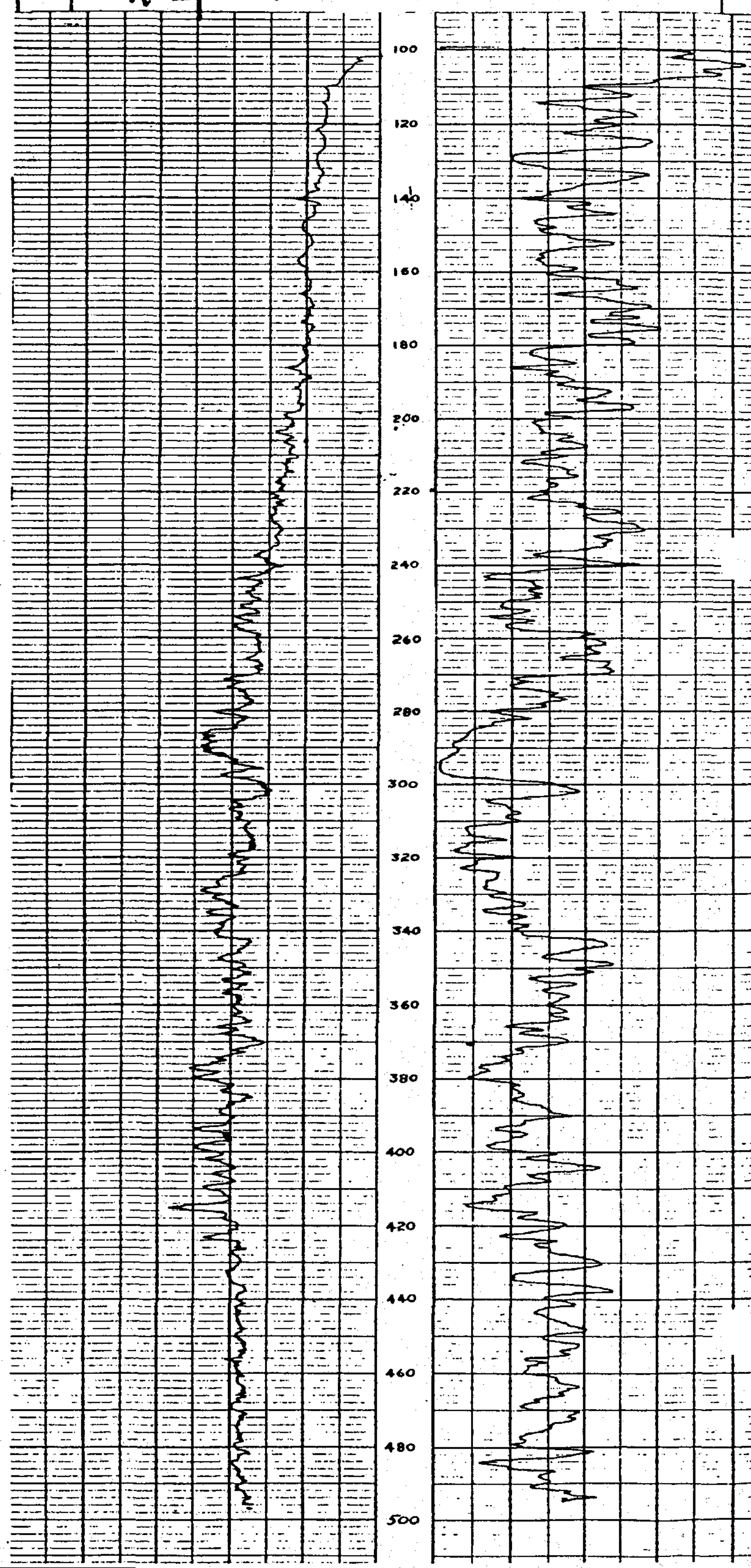
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	[illegible]-59	[illegible]-59	Nature		
First Reading	495'	495'	Density		
Last Reading	100'	100'	Viscosity	@ °F	@ °F
Footage Logged	395'	395'	Resistivity	@ °F	@ °F
Bottom (Driller)	500'	500'	Res. @ BHT	@ °F	@ °F
Casing (From Log)	100'	100'	pH		
Casing (Driller)	100'	100'	Circ. Temp.		
Casing Size			B.H. Temp.		
Bit Size					
Bit Size					
			Logged by	Whaley	
			Witnessed by	Bray	

REMARKS Logged in drilling mud with 15/16" mandrel.

* Reg. U.S. Pat. Off.

FO-139

20 m.v. Report # 00901 200 Ohms



Widco* WELL LOG

COMPANY HUMBLE

WELL B-36

LOCATION B-37

COMPANY HUMBLE OIL & REFINING CO.

KENUK IRON ORE PROJECT

WELL B-36

COUNTY ______ STATE ALASKA

COORDINATES B-37
N ______
S ______
ELEVATION ______
D.F. ______
K.B. ______
G.L. ______

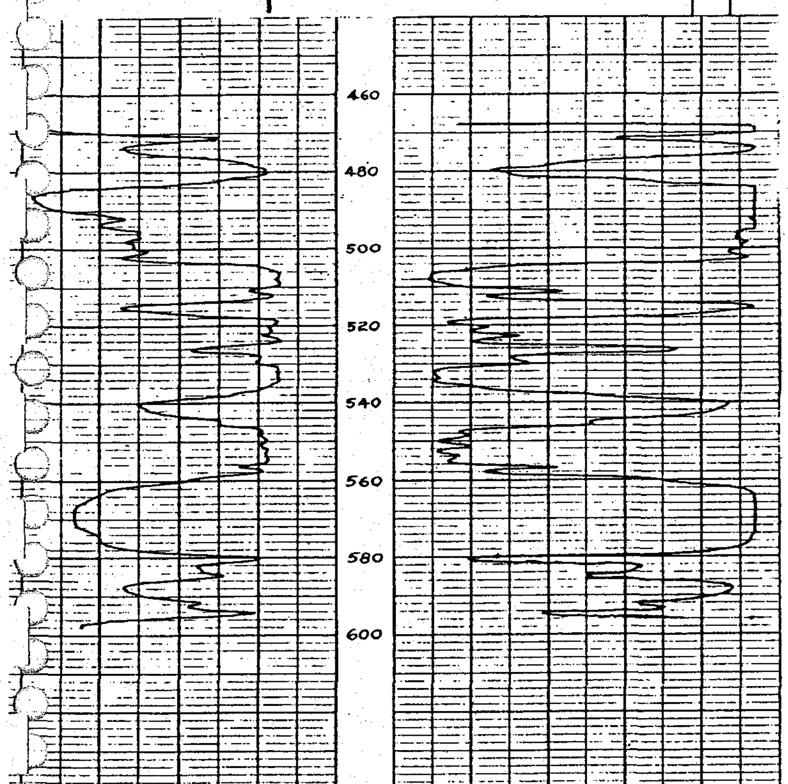
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
	8-16-59	8-16-59	Nature		
First Reading	596'	597'	Density		
Last Reading	667'	667'	Viscosity	@ °F	@ °F
Footage Logged	129'	130'	Resistivity	@ °F	@ °F
Bottom (Driller)	600'	600'	Res. @ BHT	@ °F	@ °F
Casing (From Log)	667.5'	667.5'	pH		
Casing (Driller)	667'	667'	Circ. Temp.		
Casing Size			B.H. Temp.		
Bit Size					
Bit Size					
			Logged by	Whaley	
			Witnessed by	Bray	

REMARKS Logged in fresh drilling mud with 15/16" mandrel.

* Reg. U.S. Pat. Off.

FO-139

20 m.v. Report # 00901 200 Ohms



Report # 00901

Widco* WELL LOG

COMPANY	HUMBLE OIL & REFINING CO.	COORDINATES	J - 19
AREA	KEMUK IRON ORE PROJECT	N	
WELL	K-9	S	
COUNTY		ELEVATION:	
STATE	ALASKA	D.F.	
		K.B.	
		G.L.	

LOCATION J - 19 WELL K-9 COMPANY HUMBLE

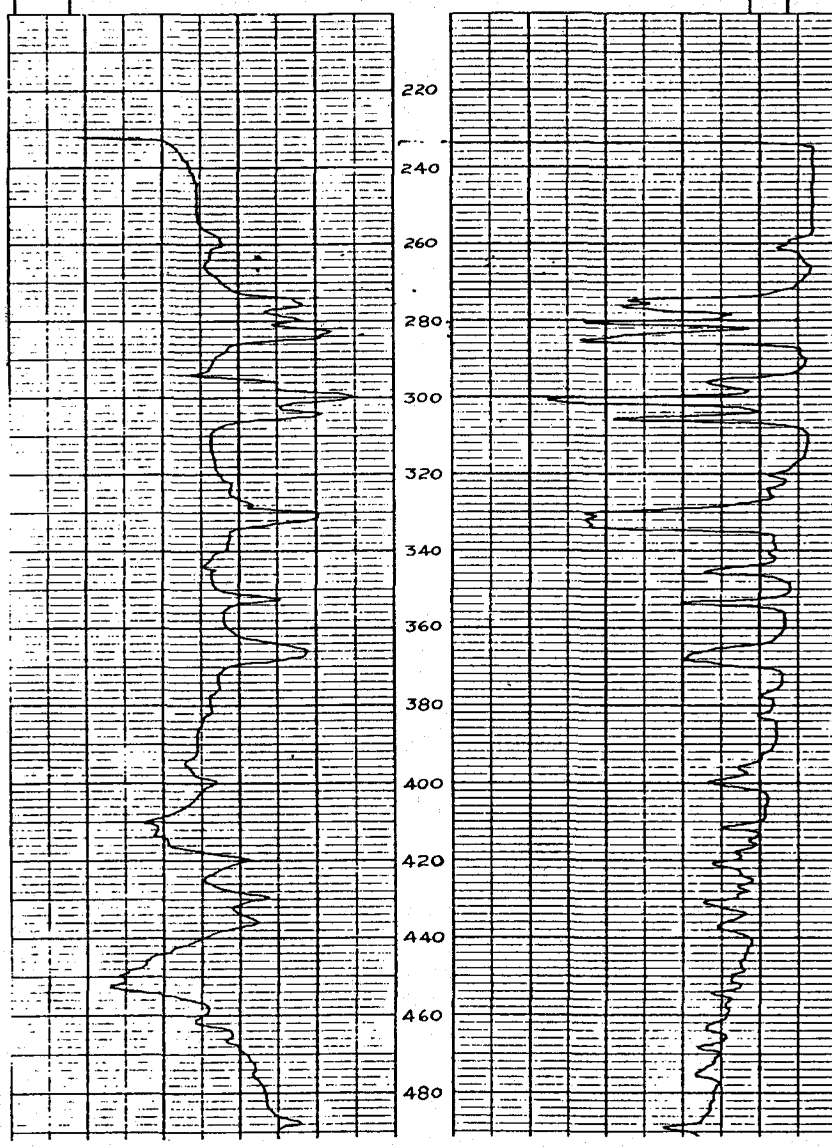
	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	7-29-59	7-29-59	Nature		
First Reading	1485'	1485'	Density		
Last Reading	235'	235'	Viscosity	@ °F	@ °F
Footage Logged	1250'	1250'	Resistivity	@ °F	@ °F
Bottom (Driller)	2000'	2000'	Res. @ BHT	@ °F	@ °F
Casing (From Log)	234'	234'	pH		
Casing (Driller)	235'	235'	Circ. Temp.		
Casing Size	3"	3"	B.H. Temp.		
Bit Size:					
Bit Size:					
			Logged by	Bray	
			Witnessed by	Elliott	

REMARKS: Logged in fresh water; unable to reach total depth due to hole cavings.

* Reg. U.S. Pat. Off.

FO-139

20 m.v. 200 Ohms



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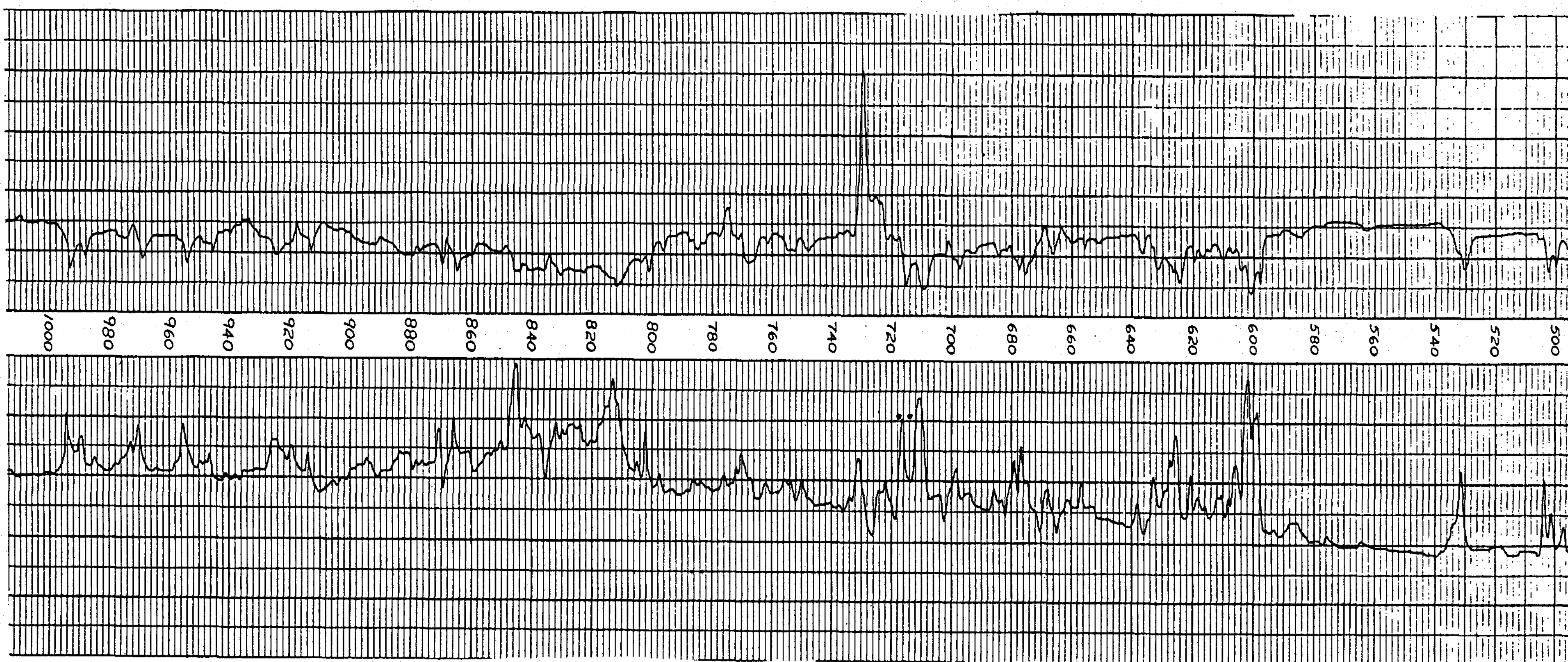
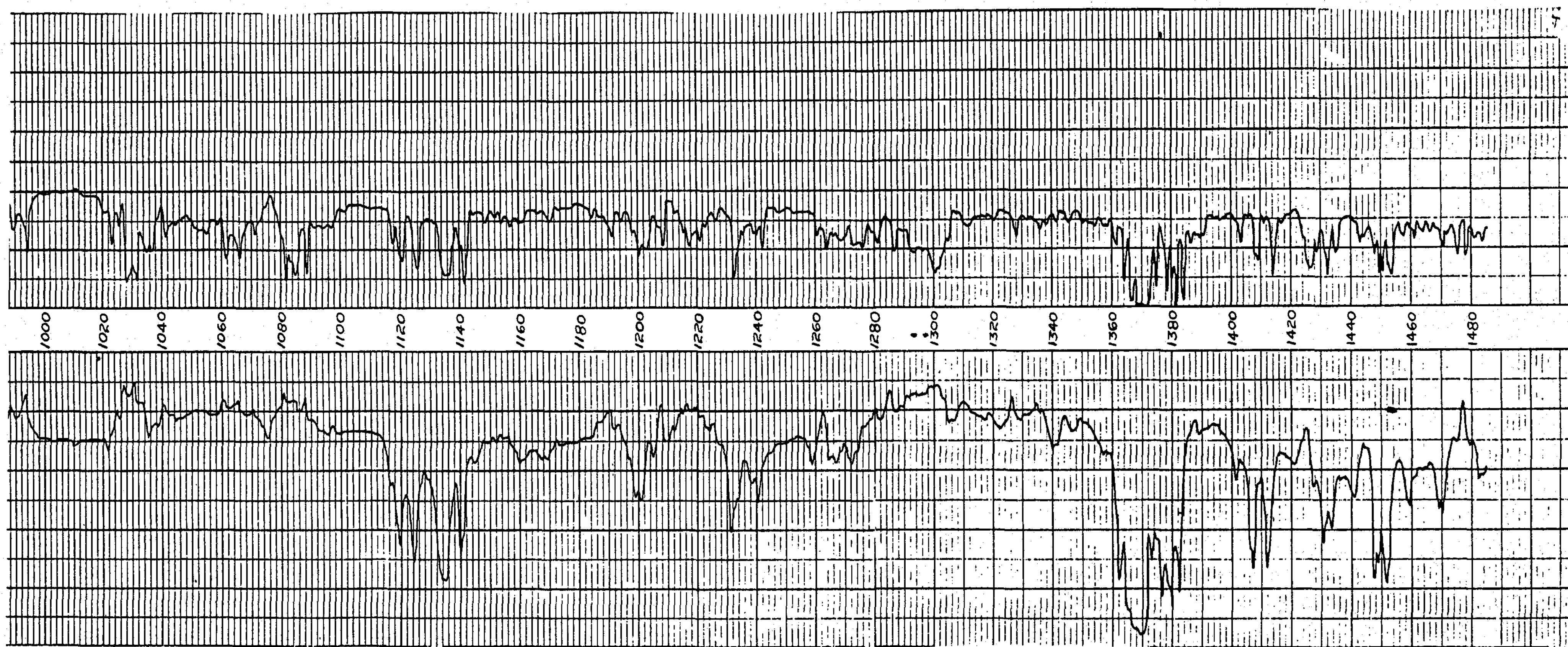
GMC DATA REPORT 355



GMC DATA REPORT 3 5 5



GMC DATA REPORT 3 5 5

Report # 0090T

Widco* WELL LOG

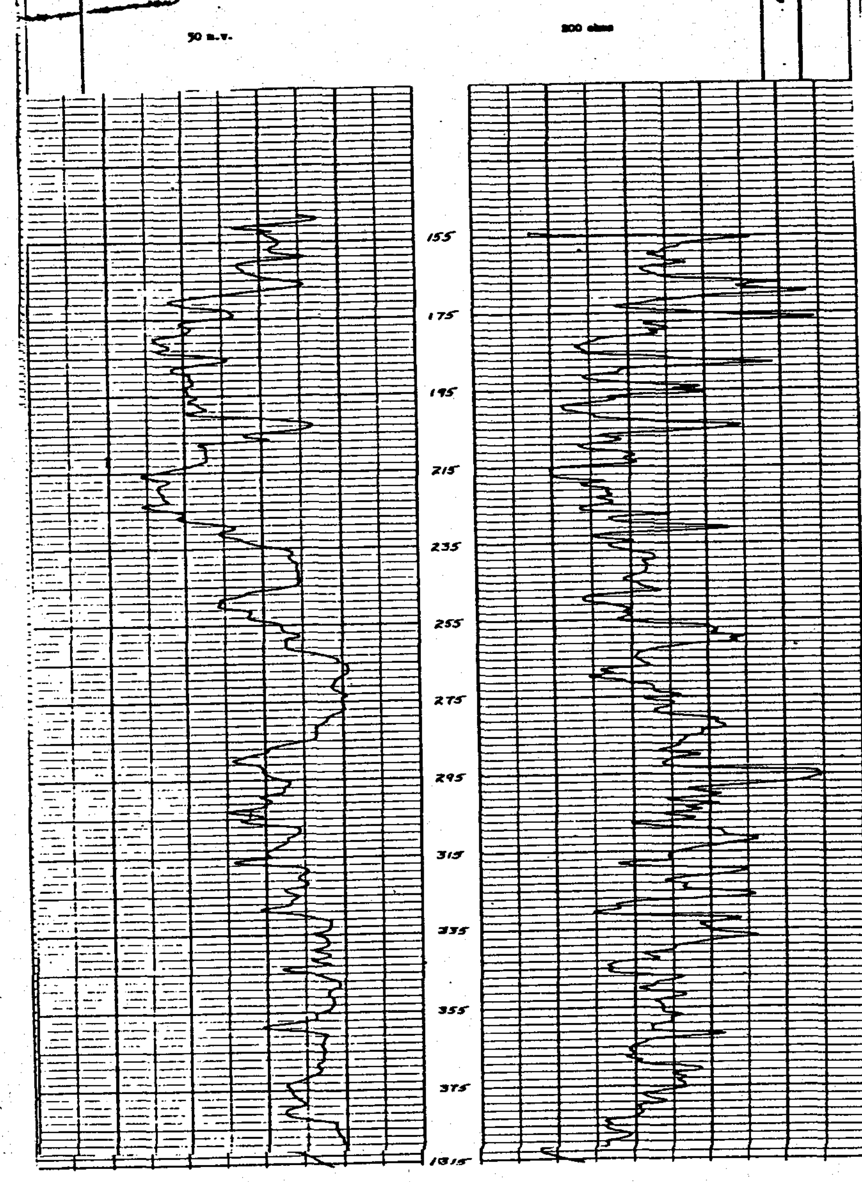
COMPANY	[illegible]
AREA	[illegible]
WELL	X-7
COUNTY	
STATE	ALASKA
COORDINATES	F-16
N	
S	
ELEVATION	
D.F.	
K.B.	
G.L.	

COMPANY [illegible] — WELL X-7 — LOCATION F-16

	Run No. 1	Run No. 2	MUD	Run No. 1	Run No. 2
Date	7-1-59	7-1-59	Nature		
First Reading	2000'	2000'	Density		
Last Reading	155'	155'	Viscosity	@ °F	@ °F
Footage Logged	1845'	1845'	Resistivity	@ °F	@ °F
Bottom (Driller)	2000'	2000'	Res. @ BHT	@ °F	@ °F
Casing (From Log)	155'	155'	pH		
Casing (Driller)	155'	155'	Circ. Temp.		
Casing Size			B.H. Temp.		
Bit Size					
Bit Size					
			Logged by	[illegible]	
			Witnessed by	[illegible]	

REMARKS Logged in fresh water.

* Reg. U.S. Pat. Off.



GMC DATA REPORT 355

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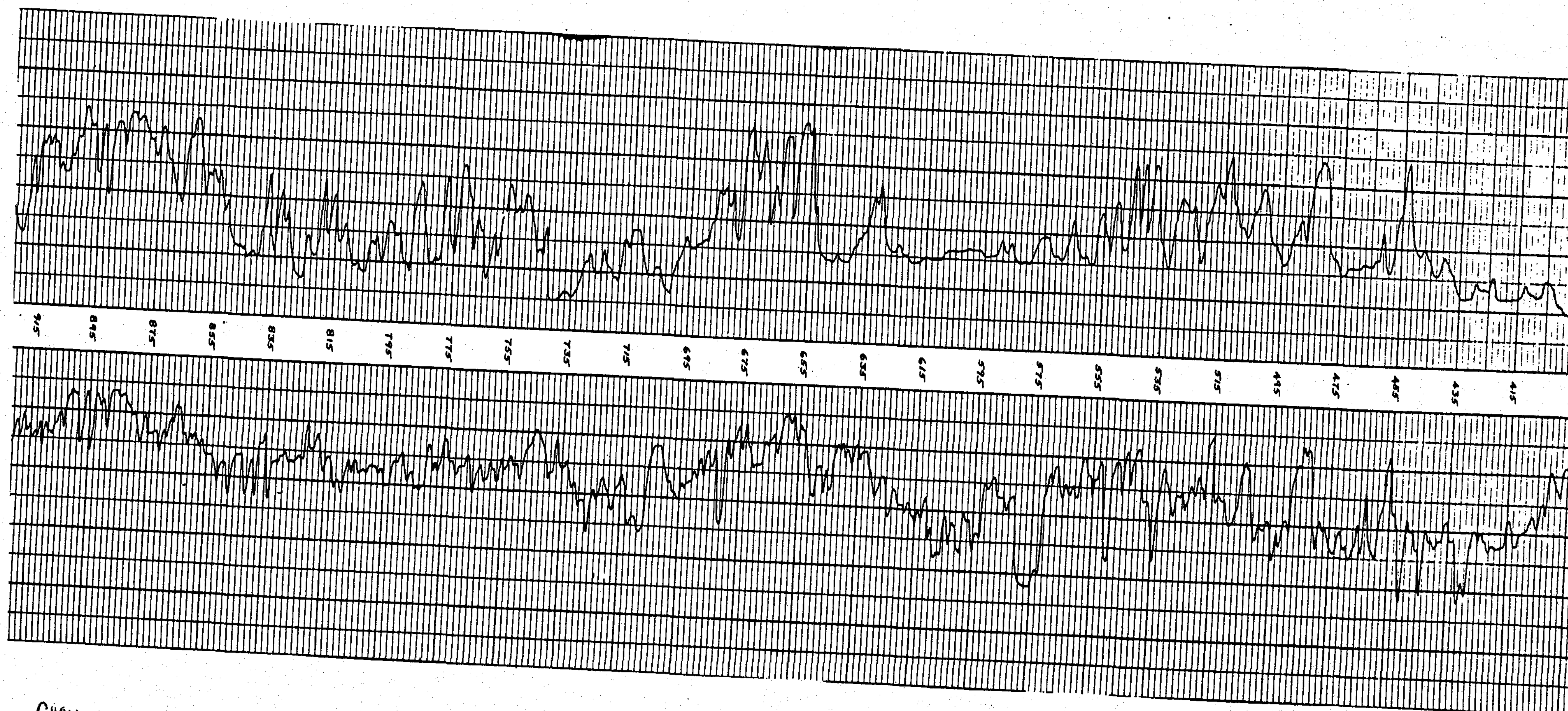
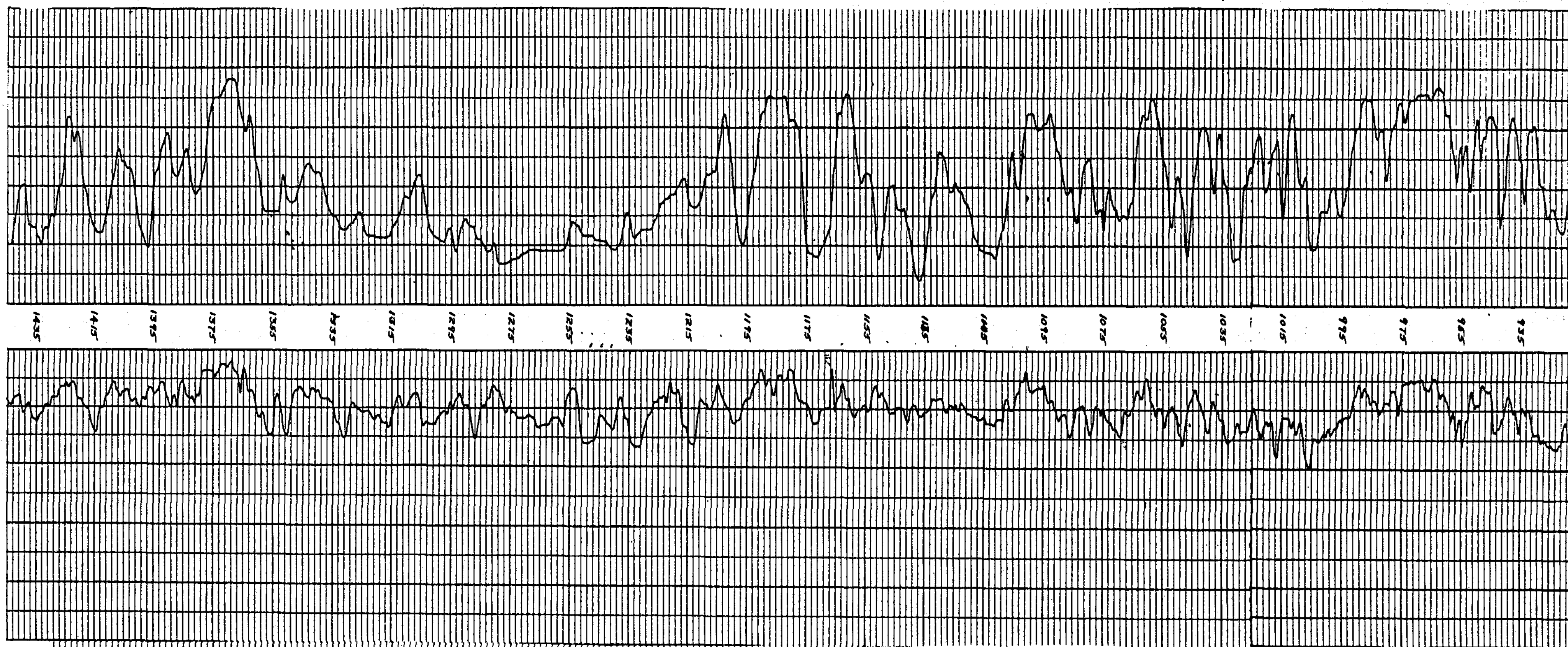
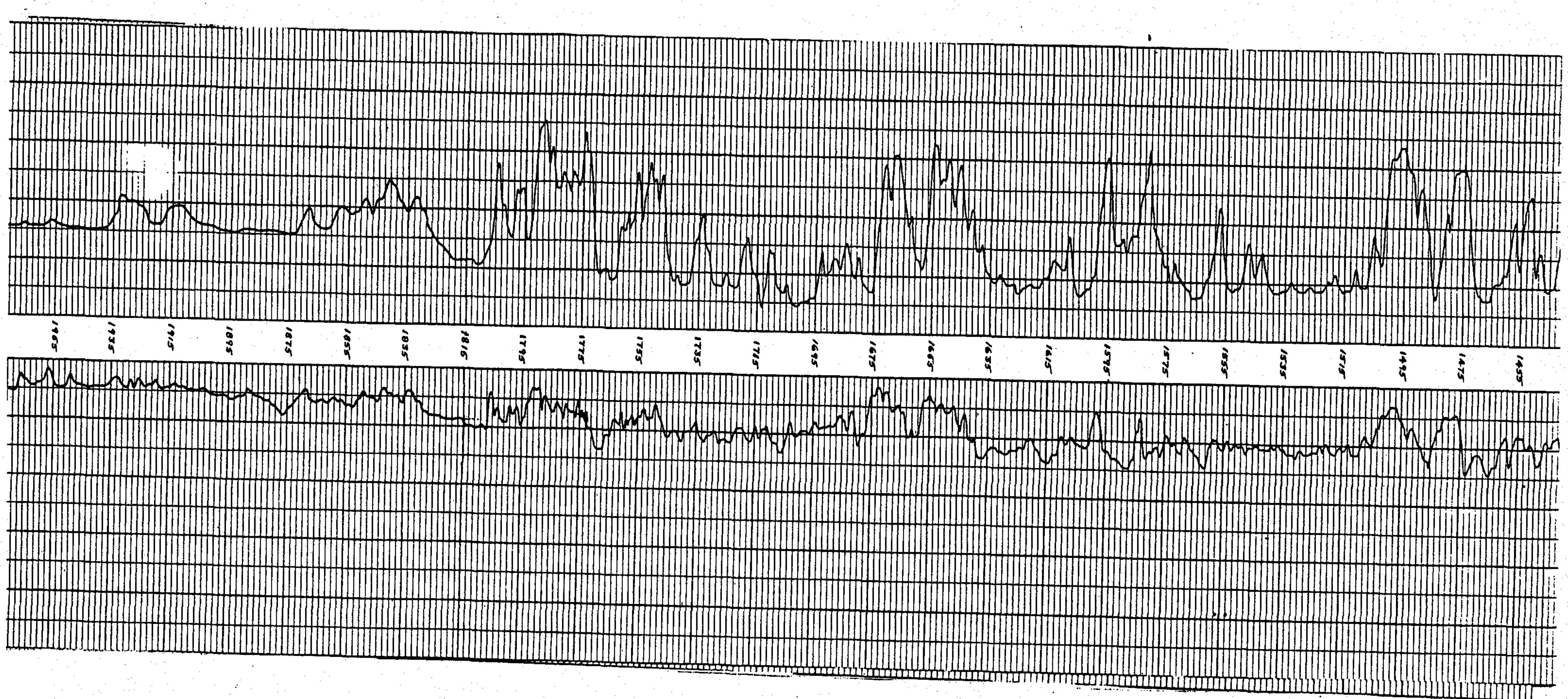


GMC DATA REPORT 355





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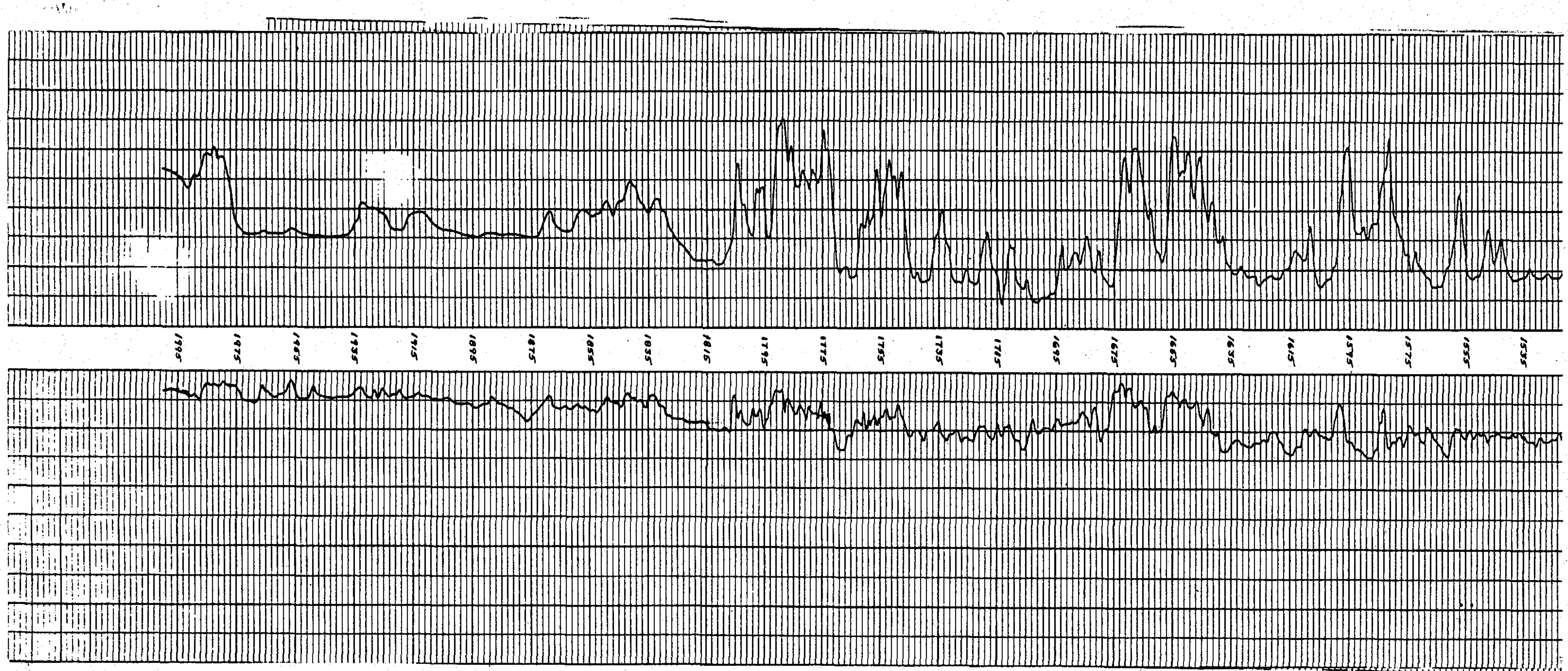
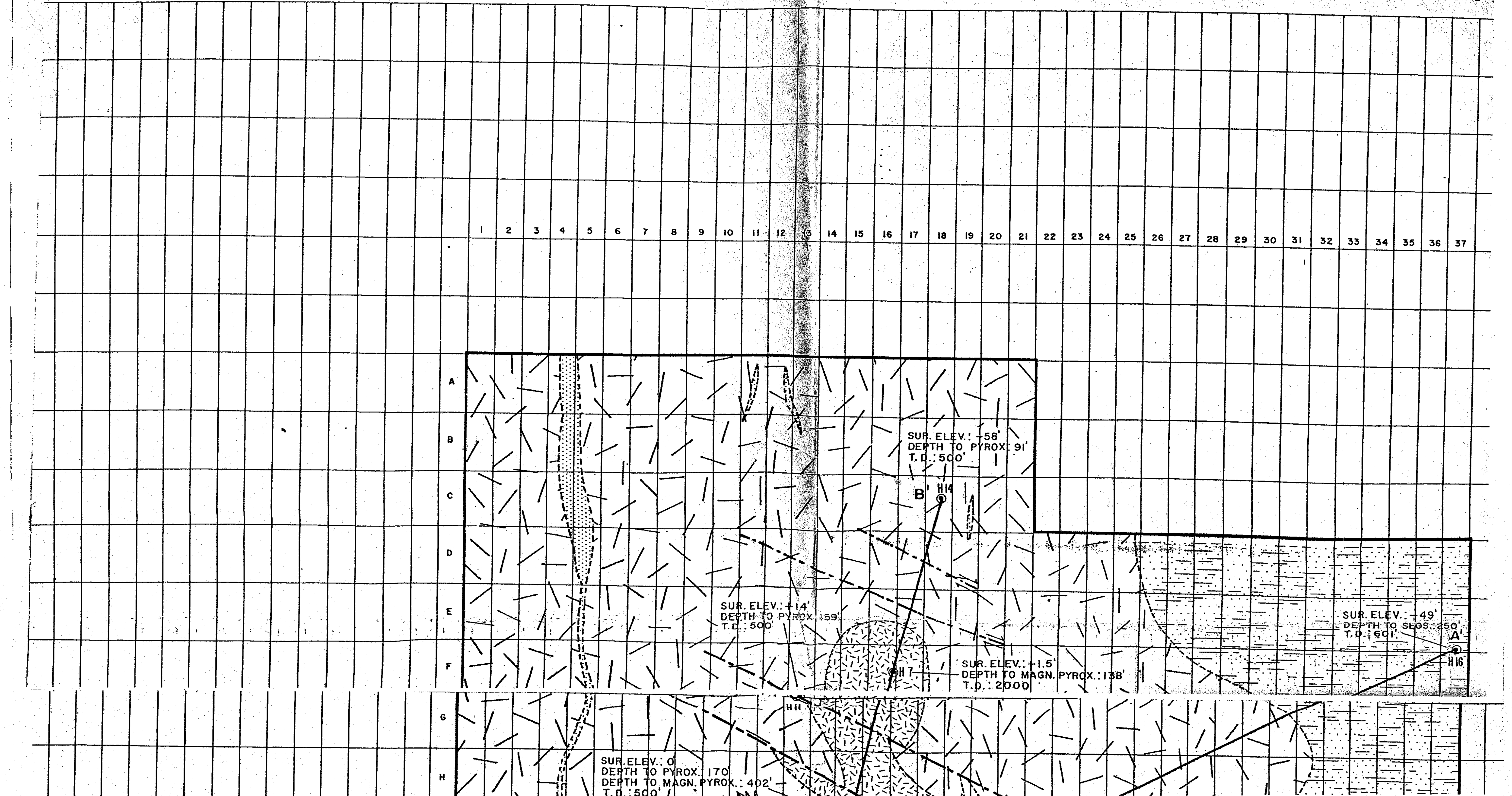
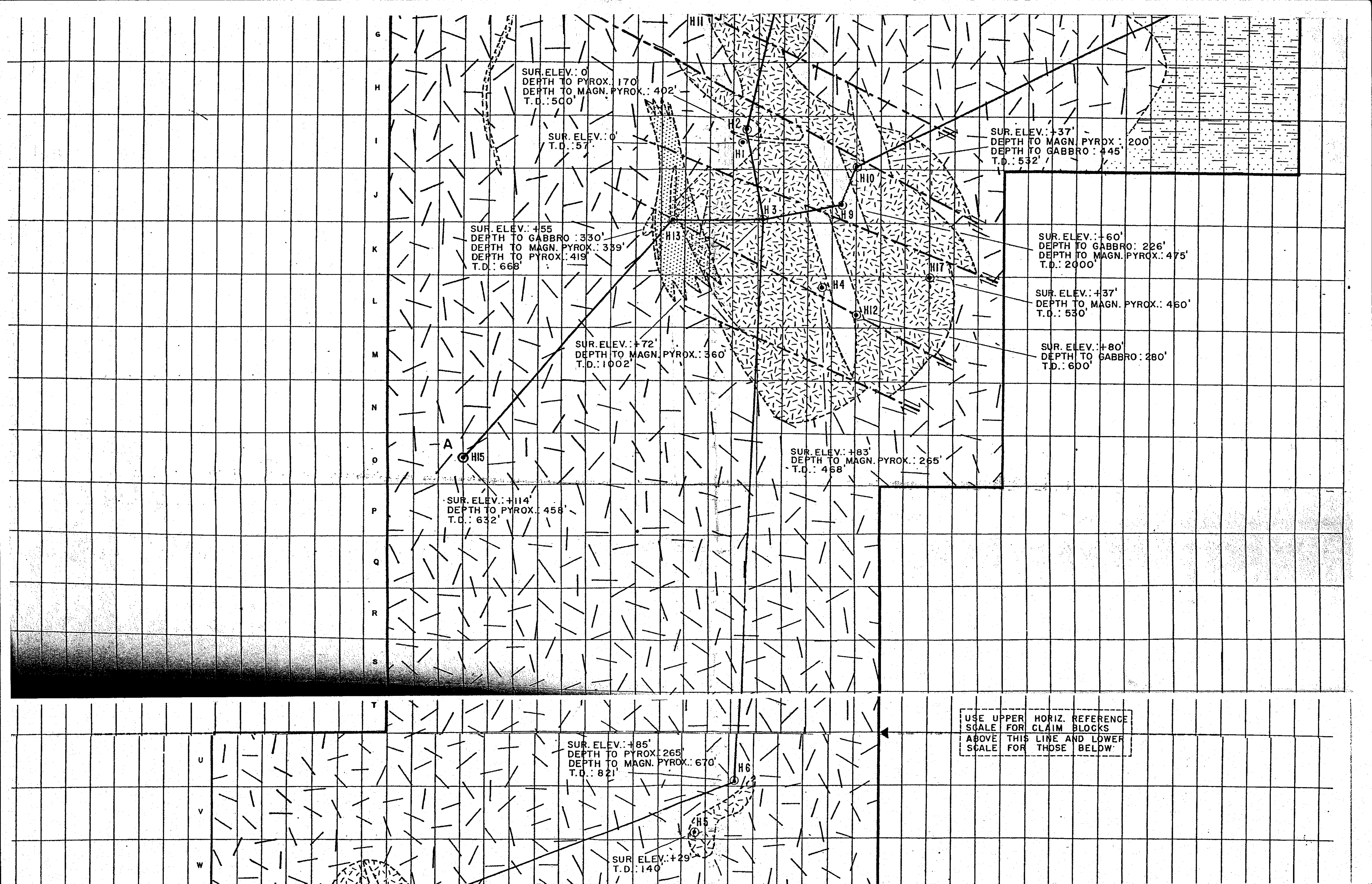
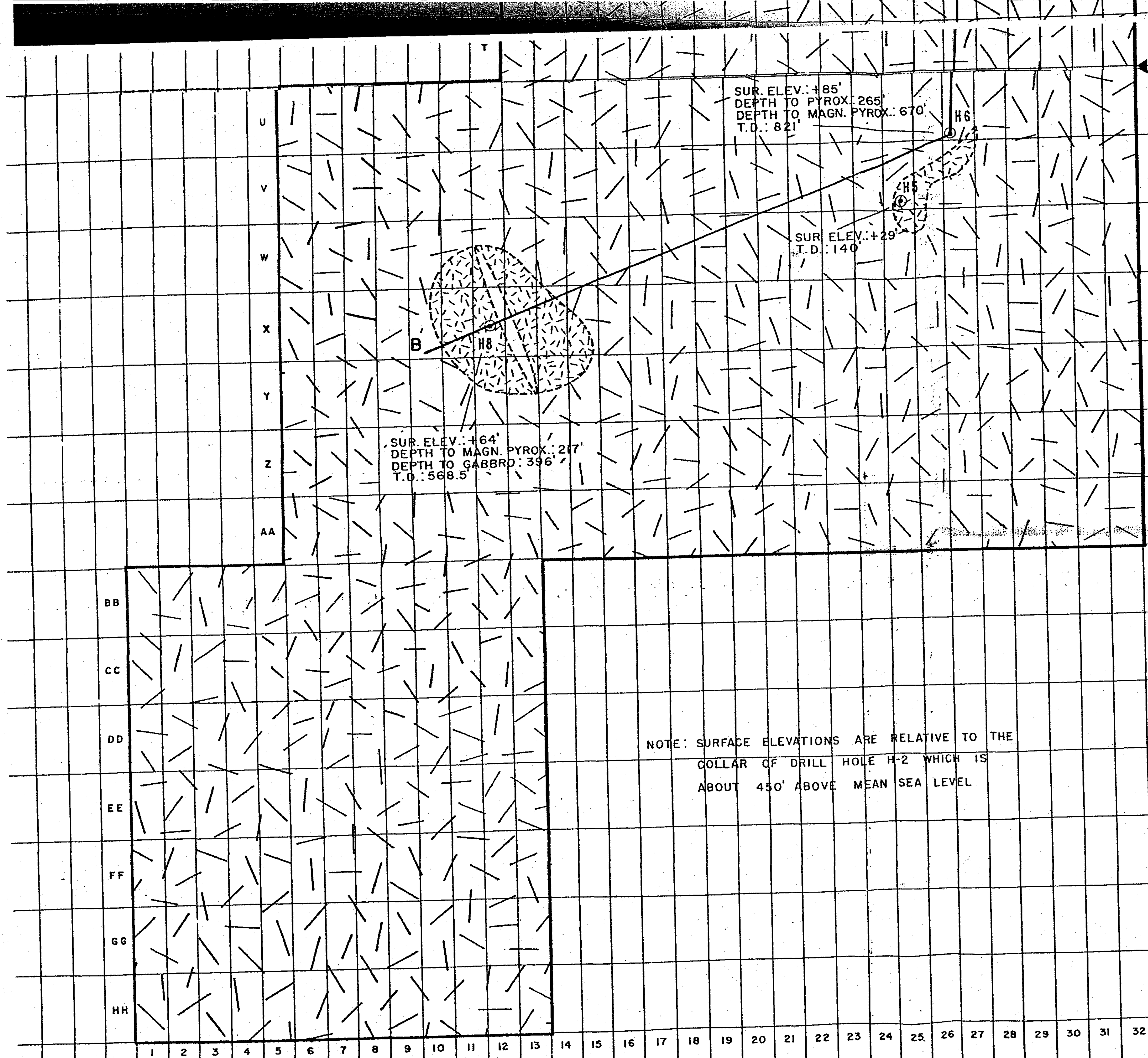


GMC DATA REPORT 3 5 5

PLATE


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
A
B
C
D
E
F
G
H
SUR. ELEV.: -58'
DEPTH TO PYROX. 91'
T.D.: 500'
B'
H14
SUR. ELEV.: +14'
DEPTH TO PYROX. 59'
T.D.: 500
H7
SUR. ELEV.: -1.5'
DEPTH TO MAGN. PYROX.: 138'
T.D.: 2000
SUR. ELEV.: -49'
DEPTH TO SEDS.: 250'
T.D.: 601'
A'
H16
H11
SUR. ELEV.: 0
DEPTH TO PYROX.: 170
DEPTH TO MAGN. PYROX.: 402'
T.D.: 500'


G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
H11
SUR. ELEV.: 0'
DEPTH TO PYROX.: 170'
DEPTH TO MAGN. PYROX.: 402'
T.D.: 500'
SUR. ELEV.: 0'
T.D.: 57'
H2
H1
H10
H3
H9
H13
H4
H17
H12
SUR. ELEV.: +37'
DEPTH TO MAGN. PYROX.: 200'
DEPTH TO GABBRO: 445'
T.D.: 532'
SUR. ELEV.: +55
DEPTH TO GABBRO: 330'
DEPTH TO MAGN. PYROX.: 339'
DEPTH TO PYROX.: 419'
T.D.: 668'
SUR. ELEV.: +60'
DEPTH TO GABBRO: 226'
DEPTH TO MAGN. PYROX.: 475'
T.D.: 2000'
SUR. ELEV.: +37'
DEPTH TO MAGN. PYROX.: 460'
T.D.: 530'
SUR. ELEV.: +72'
DEPTH TO MAGN. PYROX.: 360'
T.D.: 1002'
SUR. ELEV.: +80'
DEPTH TO GABBRO: 280'
T.D.: 600'
A
H15
SUR. ELEV.: +83'
DEPTH TO MAGN. PYROX.: 265'
T.D.: 468'
SUR. ELEV.: +114'
DEPTH TO PYROX.: 458'
T.D.: 632'
USE UPPER HORIZ. REFERENCE SCALE FOR CLAIM BLOCKS ABOVE THIS LINE AND LOWER SCALE FOR THOSE BELOW
SUR. ELEV.: +85'
DEPTH TO PYROX.: 265'
DEPTH TO MAGN. PYROX.: 670'
T.D.: 821'
H6
H5
SUR. ELEV.: +29'
T.D.: 140'



USE UPPER HORIZ. REFERENCE SCALE FOR CLAIM BLOCKS ABOVE THIS LINE AND LOWER SCALE FOR THOSE BELOW

PRE-GLACIAL GEOLOGY OF THE CLAIM AREA WITH SIGNIFICANT DRILL HOLE INTERCEPTS

AN INTERPRETATION BASED ON DRILL HOLE, MAGNETIC AND ELECTROMAGNETIC DATA

SCALE 1" = 2000'

600'

1320'

DECLINATION-21°

LEGEND

- MAGNETITE PYROXENITE
- PYROXENITE
- GABBRO
- MAGNITIFEROUS FLUVIAL SAND DEPOSIT (?)
- CRETACEOUS (?) SILICEOUS ARGILLITE, QUARTZITE, AND LIMESTONE

WITH REPORT ON
KEMUK MOUNTAIN IRON ORE PROSPECT
DILLINGHAM DISTRICT, ALASKA
W. J. WHALEY & R. A. BRAY