LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-40

Elevation: 8,290

Date Drilled: 10/22-10/23/79

Location: SENW7, T51N, R8E

Method: mud

Gamma: 125 cps.

Depth (m)	Description
0- 6	Quartz-monzonitic/granitic debris with quartz, plagioclase, biotite, some k-spar and dark lithic fragments (probably metamorphic rock). Size distribution is 85% granule, 10% sand, 5% fines. Grains are sub-rounded. Unit is a slightly sandy alluvial gravel.
6-12	Composition unchanged, size distribution is 60% sand, 30% fines, 10% granules. Unit is a gravely, clayey sand.
12-21	Composition unchanged. Size distribution is granules 60%, sand 30%, fines 10%. Unit is a sandy gravel.
21-42	Composition unchanged. Size distribution is 80% sand, 10% granules, 10% fines. Unit is gravely sand.
42-90	Composition unchanged. Unit is alluvial sand, with minor fines @63-65m.

Comments: Hole 40 was drilled on the middle of an alluvial fan. Some hard drilling was encountered in the upper gravel, but after 21m the section is mostly sandy alluvium and drilled easily.

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-39

Elevation: 8,150 Date Drilled: 10/10/79

Location: NWSW28, T15S, R78W Method: mud

Gamma: 140 cps.

Depth (m)	Description
0-21	Quartz-monzonitic/granitic debris, with quartz, plagioclase, biotite, k-spar and some limonite. Size distribution is 75% granules, 15% fines and 10% sand. Cuttings are angular to subangular. Rhyolite fragments are present (≈5%) @20m. Unit is a variably sandy boulder till.
21-33	Composition unchanged. Size distribution is 50% medium to coarse sand, 30% granules, 20% fines. Unit is bouldery outwash sand.
33-90	Composition unchanged. Size distribution is 50% fines, sand 40-50%, granules 0-10%. Unit is clayey alluvial sand.

Comments: Hole 39 was drilled adjacent to a probable lateral moraine on the old Chalk Creek flood plain. After penetrating boulder till @21m, the remaining section encountered was outwash and alluvium.

LITHOLOGIC LOG

CT

Project: Mt. Princeton

Hole 640-38

Elevation: 8,090

Date Drilled: 10/23-10/24/79

Location: NESE20, T15S, R78W

Method: mud

Gamma: 125 cps.

Depth (m)	Description
0-12	Slightly decomposed quartz-monzonitic/granitic debris, with quartz, plagioclase, biotite, some dark lithic fragments, epidote, k-spar, chlorite, and limonite. Size distribution is 80% granules, 10% medium grained sand, 10% fines, with sand increasing to 30% @12m. Unit is glacial outwash gravel.
12-21	Composition unchanged. Size distribution is 85% medium and coarse sand, 10% fines and <5% granules. Unit is alluvial sand.
21-27	Outwash gravel similar to 0-12m.
27-30	Alluvial sand similar to 12-21m.
30-42	Outwash gravel similar to 0-12m.
42-90	Alluvial sand similar to 12-21m, with clayey layers @60m.

Comments: Hole 38 was drilled on an old Chalk Creek stream terrace. The section is outwash and alluvium.

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-37

Elevation: 8,005

Date Drilled: 10/11-10/13/79

Location: SESE17, T15S, R78W

Method: mud

Gamma: 130 cps.

Depth (m)	Description
0- 6	Quartz-monzonitic/granitic debris with quartz, plagioclase, biotite, some chlorite and k-spar. Grains are subangular-subrounded. Size distribution is 75% granules, 20% sand, 5% fines. Unit is sandy bouldery outwash.
6-12	Composition unchanged. Unit is >95% coarse to medium sand, angular to subangular grains, and is an alluvial sand.
12-18	Mostly granitic debris, with size distribution of 60% coarse to medium sand, 40% granules. Unit is a sandy outwash gravel.
18-24	Unit is granitic, medium to coarse grained alluvial sand.
24-57	Composition is same as 0-6m. Grains are 80% granules, 15% sand, 5% fines and subangular to subrounded, with some dark metamorphic fragments at 36m, and sandy layers at 45m. Unit is sandy bouldery outwash.
57-132	Unit is similar to 18-24m, with variation in fines (5-25%) and granules (0-20%). It is a granitic, medium grained alluvial sand with clay/gravel layers.

Comments: Hole 37 was drilled on an old stream terrace of Chalk Creek. The entire hole was drilled in glacial outwash and alluvium.

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-36

Elevation: 8,120

Date Drilled: 10/7/79

Location: SE8 T15S R78W

Method: mud

Gamma: 120 cps.

Depth (m)	Description
0-24	Decomposed quartz monzonitic/granitic debris, with quartz, k-spar, biotite, plagioclase and dark lithic fragments. Size ranges from silt to granule. Fines are ≈10%, granules range from 30% to 60% with medium-coarse sand as the remainder.
24-36	Composition unchanged; fines ≈50%, granules <5%.
36-84	Same as 0-24m.
84-90	Composition unchanged; fines 20%, medium to coarse sand 80%.

Comments: Surface to toal depth is in Qal derived from Mt. Princeton Batholith. 24-36m and 84-90m are probably braided stream sand channels. As with #35 and #34, water was encountered at 33m.

CT

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-35

Elevation: 8,150

Date Drilled: 10/6/79

Location: NE8 T15S R78W

Method: mud

Gamma: 130 cps.

Depth (m)	Description
0-33	Decomposed quartz monzonitic/granitic debris consisting of quartz, plag, chloritized biotite, k-spar and limonite. Dominant size is medium-coarse sand (70%), with 10% fines. Size range is silt-granule. Dark lithic fragments (metamorphic rock) are present throughout the cuttings.
33-36	Composition unchanged; granules absent--nearly 100% coarse sand.
36-92	Same as 0-33m.

Comments: Surface to total depth is in Qal derived from Mt. Princeton Batholith, with a sand lens at 33-36m. Water table was reported by drillers as 100'(33m).

CT

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-34

Elevation: 8,100

Date Drilled: 10/5/79

Location: NE5, T15S, R78W

Method: mud

Gamma: 130 cps

Depth (m)	Description
0-33	Mixed granitic/quartz monzonitic debris with quartz, biotite, k-spar, limonite and some dark lithic fragments. Dominant size is coarse sand (≈80%), with <5% fines and a range from silt to granule. Mineral composition varies, but quartz is always highest %.
33-37	Composition unchanged; fines 80%, coarse sand 20%.
37-93	Same as 0-33m, with few pieces of rhyolite.

Comments: 0-33m is Qal derived from the Mt. Princeton Batholith. A hard layer encountered @80' (24m) by drillers is probably a stream gravel. Water table is @33m. 33-37m is a sand/silt alluvial unit. 37-93m is same as 0-33m.

CT

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-33

Elevation: 8,720

Date Drilled: 10/8/79

Location: NW11, T51N, R7E

Method: mud

Gamma: 130 cps

Depth (m)	Description
0-66	Quartz monzonite debris, with quartz, biotite, plagioclase and scattered granitic chips. Dominant size is coarse sand, with a range from clay to granule. Gravel layers were encountered at 10m (with some rhyolite chips) and 45m, evidenced by high %'s of granules.
66-72	Initial increase in grain size, then a shift to exclusively coarse sand with fines increasing to bottom hole. Composition was quartz-monzonitic.

Comments: 0-66m is Qal and minor outwash. Drilling was fairly fast with few slow spots--probably gravel layers. 66m-72m is either cobbly outwash or bouldery till. The initial increase, then steady decrease, in grain size is best explained by a progressively duller bit grinding through a larger boulder. The hole was stopped at 240.

CT

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-32

Elevation: 8,680

Date Drilled: 10/9-10/10/79

Location: NE36, T15S, R79W

Method: mud

Gamma: 125 cps

Depth (m)	Description
0-27	Quartz monzonitic/granitic debris, with quartz, k-spar, biotite, plagioclase and metamorphic rock fragments. Granules and coarse sand are dominant (70%), with 15-20% fines, range is from clay to granule. At 3m there is a 1/2m zone of red clay.
27-30	Increase in grain size; almost exclusively angular granules with some coarse sand.
30-37	Decreasing grain size with depth to bottom hole.

Comments: Surface to total depth was in glacial till and glacial outwash. Drilling was very hard, slow; the sides were washing and shifting boulders, made connections difficult. Since the hole was washing so badly, cuttings may not correspond very accurately with lithology.

TELEX 45-556

AMAX EXPLORATION, INC.
A SUBSIDIARY OF AMAX INC.
4704 HARLAN STREET • DENVER, COLORADO 80212 • (303) 433-6151

October 30, 1978

Mr. George Chisman
P. O. Box K
Buena Vista, Colorado 81211

Dear George:

The glacial-fluvial sediments in drill hole 640-28 extend from the surface to a depth of 216 meters (675 feet). Based upon our temperature measurements it appears that we encountered water and/or lost circulation zone at the following depths:

70 - 90 meters	(220-280 feet)
115-120 meters	(360-375 feet)
185-195 meters	(579-590 feet)
210-225 meters	(657-704 feet)

The hole is cased to a depth of 240 feet and open below that. The zone between 115 and 120 meters looks better than the rest, but may well be related to clay zones rather than water bearing zones. It does not appear to be promising as a water well.

If I had to select a site for a water well I would pick one along Merriam Creek somewhere above Frontier Camp.

Sincerely,

H. D. Pilkington/c

H. D. Pilkington

HDP/c

AMAX EXPLORATION, INC.
4704 HARLAN STREET • DENVER, COLORADO 80212

INTER-OFFICE MEMORANDUM

SUBJECT: Site Cleanup - Mt. Princeton, Colorado DATE October 16, 1978

TO: Larry Hall

FROM: H. D. Pilkington

Pursuant to the terms of the Notice of Intent from the Canyon City BLM office, drill hole 640-28 has been cleaned up as of October 13, 1978 and is now ready for abandonment. Please initiate the Notice of Completion and perhaps you should give the BLM a phone call today.

H. D. Pilkington

HDP/c

LITHOLOGIC LOG

CT

Project: Mt. Princeton

Hole 640-30

Elevation: 8,350

Date Drilled: 10/17-10/21/79

Location: NENE25, T15S, R79W

Method: Mud

Gamma: 120 cps

Depth (m)	Description
0- 9	Quartz-monzonitic debris, with quartz, biotite, plagioclase, some chlorite and k-spar. Size distribution is 70% granules, 20% sand and 10% fines. Unit is a sandy gravely boulder till.
9- 12	Unit is probably a glacial lacustrine clay.
12- 33	Unit is boulder till similar to 0-9m, with sand lenses and clay scattered throughout.
33- 64	Composition unchanged. Size distribution is 80% medium to coarse sand, 15% granules, 5% fines. Unit is a slightly gravely alluvial sand.
64-124	Unit is a variably sandy boulder till.

Comments: Hole 30 was drilled upstream of a terminal moraine across Chalk Creek. Most of the section is boulder till, with some sand and clay layers that probably represent formation of a glacial lake behind a moraine dam.

CT

LITHOLOGIC LOG

Project: Mt. Princeton

Hole 640-29

Elevation: 8,400

Date Drilled: 10/24/79

Location: NENE 24, T15S

Method: Mud

Gamma: 85 cps

Depth (m)	Description
27	Slightly decomposed quartz-monzonitic debris with quartz, biotite, plagioclase, some limonite, epidote and chlorite. Size distribution is 45% granules, 35% medium to coarse sand and 20% fines. Grains are subangular to subrounded. Unit is a sandy outwash gravel.
27-87	Composition unchanged. Size distribution is 50% medium to coarse sand, 30% fines, 20% granules. Granules vary to 5% @45m. 0.5-1m gravel layers were encountered from 78-87m. Unit is gravely alluvial sand.

Comments: Hole 29 was drilled on Chaffee County Road 322 right-of-way. The entire section is sandy outwash and alluvium.

Hall

LITHOLOGIC LOG (640-28)
Mt. Princeton Project

SE¼NW¼ Sec 13 T15S R79W

ELEVATION: 8,880'

DATE DRILLED: 10/14/77

Depth (m)	DESCRIPTION
0 - 3	Qal-clayey/silty gravel (reworked glacial till) - brownish red; very poorly indurated orthobreccia; range (diam.)<.1 mm->32 mm, ave. 2-3 mm; very poorly sorted; 25% pebbles and/or boulders of quartz monzonite and feldspar, ave. size .5-1 mm, very angular-subangular; 35% clay/silt.
3 - 104	Qal-clayey/silty gravel (reworked glacial till) - consists of gray, light gray, and buff colored layers of reworked glacial till whose thickness range from six inches to>six feet. Poorly indurated with the amt. of lithification increasing with depth, it may be considered an orthobreccia. As is characteristic with glacial till, all layers are very poorly sorted to poorly sorted. The matrix consists of clay/silt varying in content from 5% to 45% in the various layers with the framework consisting of varying amts. of sand, pebbles, and boulders. The boulders and pebbles vary in content from 5-40%. They consist mostly of quartz monzonite with minor amts. of a white welded crystalline tuff. Their sizes range from 3 mm->30 mm and they range in angularity from very angular to subrounded. The sand varies from 20-50% of the unit. Quartz monzonite and feldspar are the major constituents with qtz, bio and hb as minor constituents. The plagioclase in many cases shows strong hydrothermal alteration to kaolinite. The bio also shows alteration to limonite/hematite as well as clay. Hornblende, if present, shows strong chloritization. The texture may range from very fine to very coarse with an ave. diam. of .5-1 mm. Usually, the grains are subangular but range from very angular to subangular. Theave. layer usually consists of 20-30% qtz. monzonite boulders and pebbles, 60% sandconsisting mostly of qtz. monz and feldspar with minor amts. of qtz, bio and hb. The matrix usually consists of 20-30% clay/silt.
104 - 116	Qal-clayey/silty gravel (reworked galcial till) - except interfingering with thin layers of red, buff, and gray clay.
116 - 168	Qal-clayey/silty gravel (reworked glacial till) - repeat except interfingered with buff-reddish buff clay layers.
168 - 216	Qal-clay-buff-reddish brown interfingered with Qal clayey/silty gravel.

LITHOLOGIC LOG

Mt. Princeton Project

SW¼NW¼ Sec 13 T15S R79W

ELEVATION: 8,880'

DATE DRILLED: 10/14/77

Depth (m)	DESCRIPTION
216 - 247	Dry Union Formation - sandy gravel; buff to light gray; angular to subangular; fine grained sand to fine grained pebbles; poorly sorted; consists mostly of qtz monzonite with feldspar, qtz, and bio as minor constituents; sand comprises ≃ 10-15% of the samples and consists mostly of feldspar.
247 - 253	Dry Union Formation - gravely sand; light gray to buff; fine grained sand to cobbles; poorly sorted. The sand consists mostly of kspar and plagioclase with 20-30% qtz monzonite and minor amts of bio and qtz. Much of the qtz monzonite shows hematitic and limonitic alteration of the mafic constituents. The pebbles and cobbles are mostly qtz monzonite and are probably subangular to subrounded. Thepebbles comprise 15-20% of the samples.
253 - 366	Dry Union Formation - sandy gravel; repeat except consists mostly of qtz monzonite pebbles and cobbles with the last 12' (4 m) having a calcareous cement.
366 - 372	Dry Union Formation - sandy gravel; light gray-buff; angular to subangular; poorly sorted. The gravel is angular to subangular and consists of pebbles and cobbles. Limonitic and hematitic stained qtz monzonite is the main constituent with some gray and cream colored quartzite. The sand comprises ≃10% of the whole, is subangular, and has an ave. diam. of 1 mm. Feldspar and qtz monzonite are the major components with bio, qtz, and chert as minor.
1220 - 1280 372 - 427	Dry Union Formation - gravely sand; light gray to buff; angular to subangular; silt to pebbles; poorly sorted; calcareous cement. The sand is angular to subangular with an ave. diam. of .5 mm-1 mm. It consists mainly of feldspar with minor amts of qtz, bio, chert and gray qtzite. The pebbles make up ≃10-15% of the whole, are probably subangular, and consist mostly of qtz monzonite with some gray qtzite. Calcareous cement from 390-402 m.
427 - 463	Dry Union Formation - repeat, an increase in the amt. of cream and gray quartzite pebbles, probably as intercalated conglomerate layers.
463 - 491	Dry Union Formation - conglomerate with 35% qtzite fragments, some of which have very brilliant hematitic staining.
491 - 521	Dry Union Formation - conglomerate, cream, gray and red quartzite make up approximately 50% of the pebbles and cobbles.

Energy
Development
Caywood

LITHOLOGIC LOG

Mt. Princeton Project

ELEVATION: 8,880'

SW¼NW¼ Sec 13 T15S R79W

DATE DRILLED: 10/14/77

Depth (m)	DESCRIPTION
521 - 610	Dry Union Formation - silicified siltstone; gray; microcrystalline; hematitic and limonitic staining prominant; contains embayed qtz grains.

AMAX EXPLORATION, INC.

Sample Number	Depth (feet)	Bulk Conductivity $\left(\frac{\text{millicalories}}{\text{cm-sec-}^\circ\text{C}}\right)$
844-15 (K)	220	6.14
844-27 (K)	275	3.24
844-35 (K)	220	4.34
844-37 (K)	150	3.70
844-38 (K)	200	4.37
844-58 (TiVK)	370 = 11	2.04
640-28	370 = 113 m	5.09
640-28	440 = 134 m	8.06
640-28	1030 = 314 m	5.65
640-28	1550 = 473 m	7.16
640-28	1860 = 567 m	6.96
844- 2 (K)	170	5.37
844-18 (K)	220	5.25
844-21 (K)	310	3.60
844-30 (K)	250	4.42
844-33 (K)	220	3.42
844-51 (K)	470	5.43
844-59 (K)	490	8.10
640-28	260 = 79 m	10.29
640-28	630 = 192 m	6.40
640-28	1370 = 418 m	6.22
640-28	1730 = 527 m	7.39