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PITEAU ASSOCIATES
GEOTECHNICAL AND
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Our file: 1327

June 23, 1995

Anvil Range Mining Corporation
P.O. Bag 1000
Faro, Y.T.
Y0B 1K0

Attention: Mr. Dick Arndt, P. Eng.
Chief Engineer

Dear Sirs:

Re: Current Groundwater Conditions in the Southeast Walls of the Grum Pit

Piteau Associates Engineering Ltd. has completed a brief review of current monitoring data for wells in the Grum Pit area, and has incorporated information from monitoring well 95-2, which was recently drilled in the southeast corner of the pit, into our interpretation of the mine hydrogeology. Results of our review, and recommendations for additional groundwater control and monitoring in this area of the pit, are presented in the following.

Well 95-2 was designed to investigate the hydrogeology and groundwater conditions immediately north of where the thalweg intersects the south wall of the pit (Fig. 1). Sections presented in our report dated January 20, 1995 have been updated, to reflect information obtained from this new well, and current water level monitoring data.

Two aquifers are interpreted to underlie the east and southeast pit area. An upper aquifer appears to pinch out somewhere between wells 92-3 and 92-1, as indicated on Fig. 2. A basal aquifer, comprised of the bottom few feet of overburden and the weathered bedrock surface, is interpreted to extend throughout the thalweg and possibly the surrounding areas. There is a good hydraulic connection within the basal aquifer, as indicated by the approximate 6m of drawdown that occurred in well 95-2 after well 91-2 was put back into service sometime before May 18 (Table I and Fig. 3). There is likely a good hydraulic connection between the upper and lower aquifers near well 89-1, where the upper and basal aquifer appear to comprise a vertically contiguous aquifer approximately 20m thick. However, the upper and basal aquifers appear to become separated by till towards the centre of the thalweg, as indicated by the log for well 91-3 (see Piteau letter report to Jack Bowers dated April 4, 1991) and the screen installations in wells 92-2 and 92-3 (no logs available).

The upper aquifer may or may not daylight in the ultimate pit wall near well 92-2 (Fig. 2, Section D-D'). However, as the final wall is almost established in this area, a problem related to seepage from the upper aquifer would likely be apparent if it was going to occur. Dewatering achieved by wells 89-1, 91-3 and 92-3 has reduced the hydraulic head in this aquifer to about 1250m, which is apparently sufficient to prevent seepage related problems.

The basal aquifer will eventually be exposed along the east wall, but primarily on the west side of the thalweg (Fig. 2, Sections C-C' and D-D'). The effect of groundwater discharges from the basal aquifer can be minimized by pumping from wells 92-2 and 95-2, which are both located in the deep aquifer along the centre of the thalweg, and from 91-2 located above the east side of the thalweg. Pumping from these wells has currently reduced the heads in this aquifer to less than 1247m, and some additional dewatering will be achieved by continued pumping. However, as this aquifer will eventually be exposed below about 1240m, some seepage into the pit will occur, and the east and southeast walls of the pit should be closely inspected for signs of seepage near the bedrock interface, to determine if a sump should be established to collect groundwater discharge from the base of the overburden wall. If significant seepage does occur, it may also be necessary to construct a filtered buttress at those locations along the toe of the slope where erosion and slumping occur.

As the aquifer is gradually exposed by mining, seepage into the pit will increase and groundwater levels in the aquifer will drop. Well yields will fall off in response to a drop in groundwater levels. To continue the benefits provided by the wells, it may be necessary to install smaller capacity pumps that are compatible with the reduced well yields. If new pumps are to be installed, the potential for seasonal variations in flows should be recognized and allowed for in the pump selection.

Even though the aquifers appear to be depressurizing well in response to pumping and mining, the surrounding sediments are much lower in permeability and are expected to depressurize at a slow rate. Existing slope performance indicates that the soils have sufficient strength to stand in a saturated state. However, if a lens of loose soil is encountered within the generally dense soil mass, some localized slumping could occur. Slopes in the southeast corner of the pit should therefore be inspected frequently for any signs of seepage or slumping.

We trust that this brief reports provides you the information you require at this time. If you would like to discuss the results of the above review, or any other concerns related to groundwater in the mining operation, please do not hesitate to contact us.

Yours very truly,

PITEAU ASSOCIATES ENGINEERING LTD.

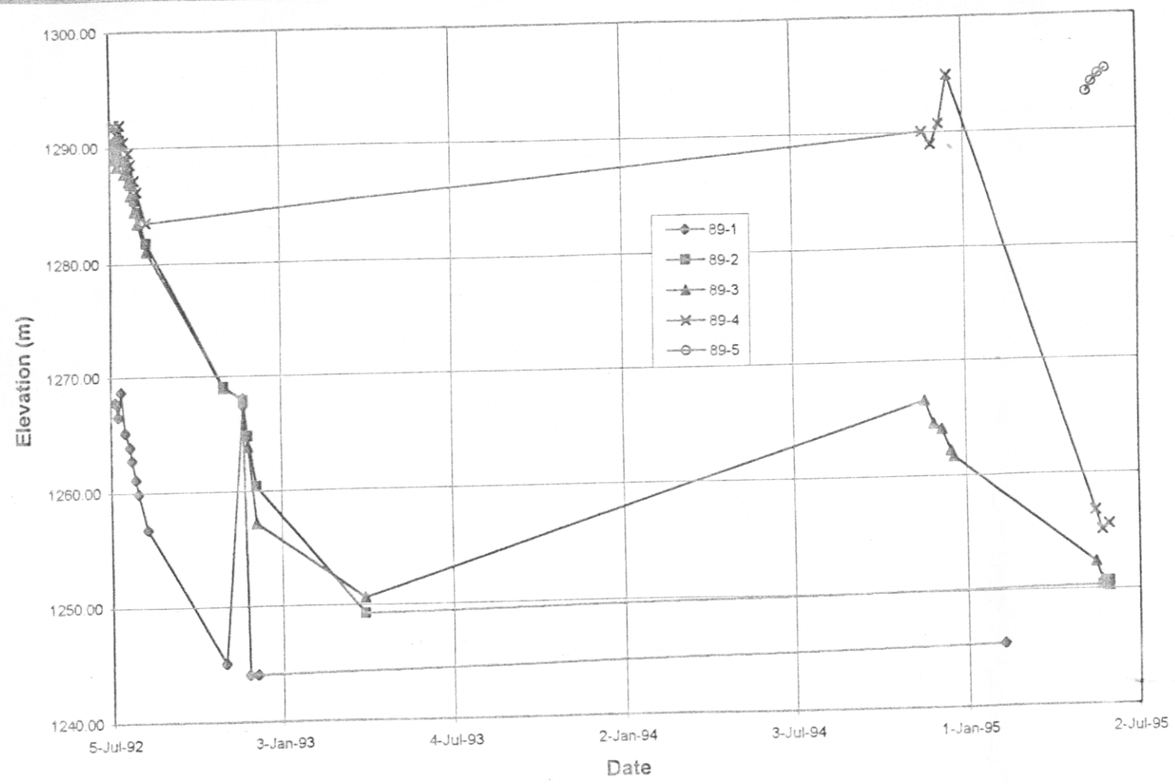
Andrew T. Holmes, P.Eng.

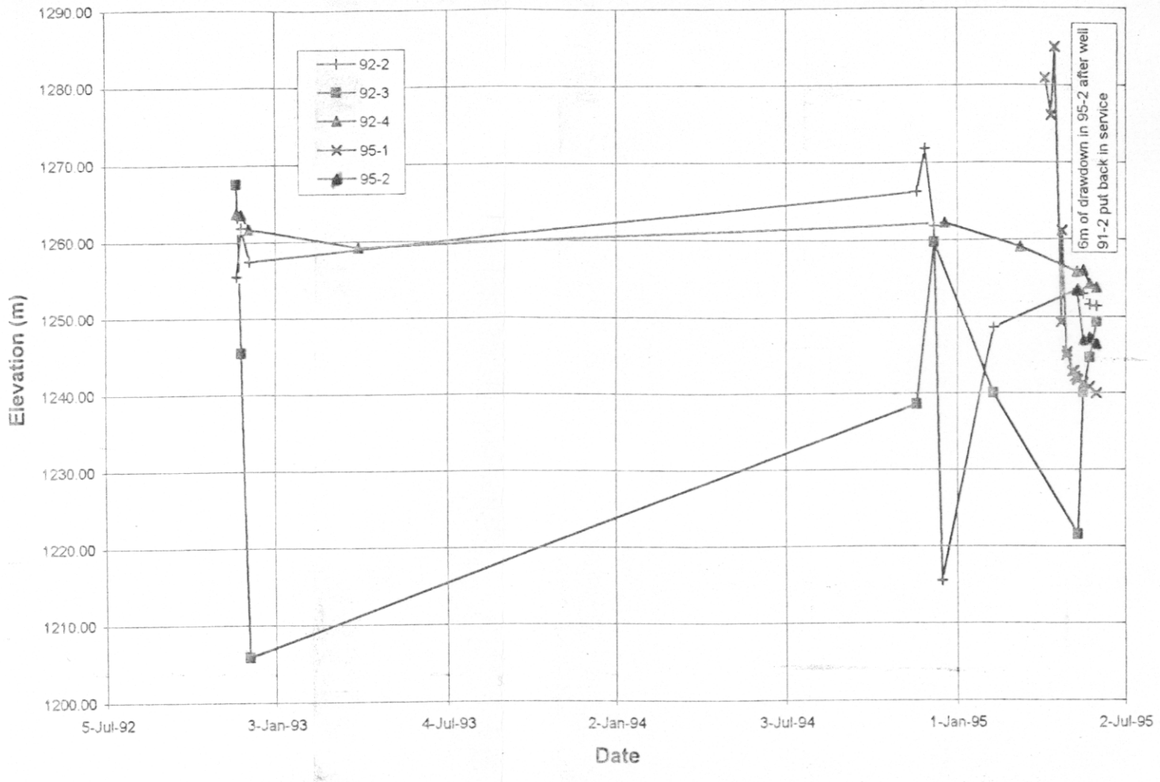
ATH/dlt

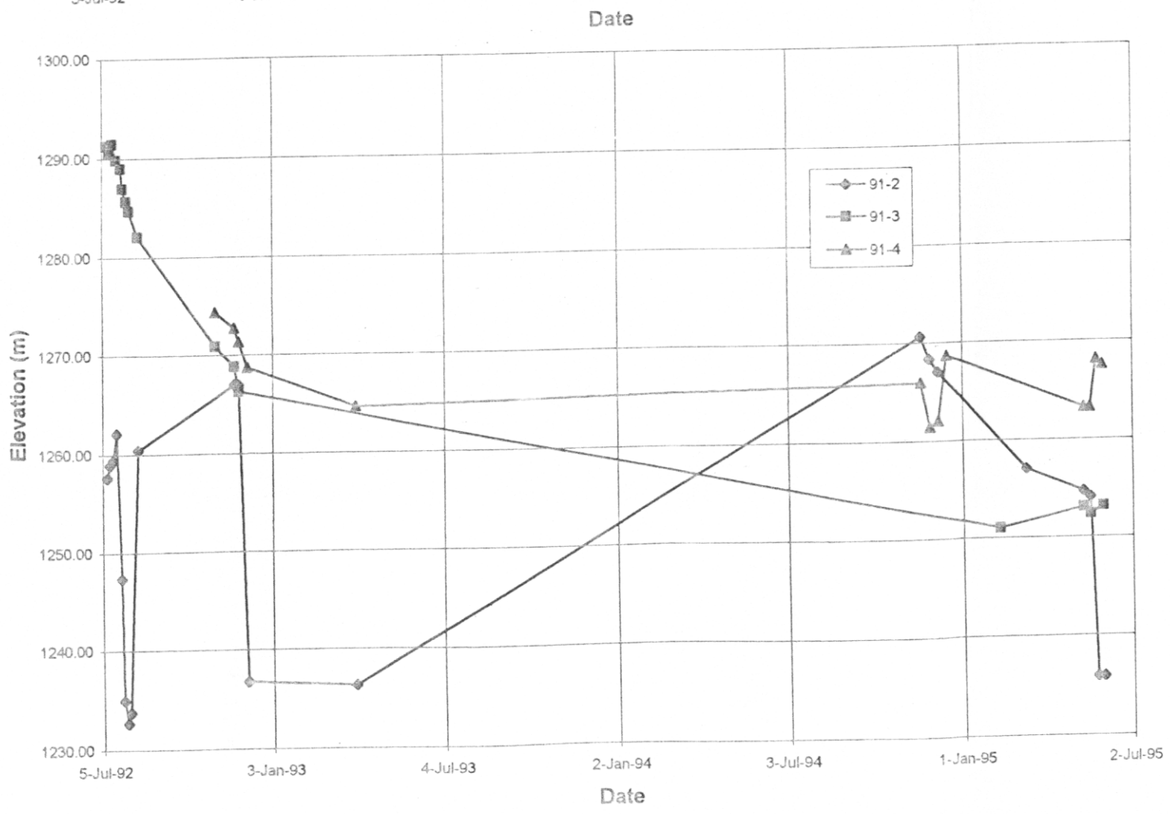
TABLE

TABLE I
SUMMARY OF GRUM PIT WATER LEVELS, 1992 TO 1995

	89-1	89-2	89-3	89-4	89-5	91-2	91-3	91-4	92-1	92-2	92-3	92-4	95-1	95-2
DATUM (m)	1301.67	1301.14	1301.17	1300.74	1302.05	1285.93	1300.37	1305.22	1278.39	1289.71	1289.66	1271.31	1293.08	1253.38
10-Jul-92	1267.78	1290.26	1288.98	1291.90	#N/A	1257.64	1291.26	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
13-Jul-92	1266.56	1289.47	1288.34	1291.14	#N/A	1258.92	1290.49	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
16-Jul-92	1268.69	1290.69	1290.29	1291.90	#N/A	1259.41	1291.44	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
20-Jul-92	1265.19	1288.86	1287.76	1290.47	#N/A	1262.09	1289.82	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
25-Jul-92	1263.97	1288.00	1287.06	1289.58	#N/A	1247.37	1288.97	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
27-Jul-92	1262.78	1286.84	1285.93	1288.58	#N/A	1234.88	1286.93	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
31-Jul-92	1261.10	1285.53	1284.53	1287.21	#N/A	1232.59	1285.65	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
3-Aug-92	1259.89	1284.50	1283.46	1286.23	#N/A	1233.69	1284.67	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
12-Aug-92	1256.75	1281.78	1281.05	1283.58	#N/A	1260.42	1282.02	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2-Nov-92	1245.04	1269.04	1268.92	#N/A	#N/A	#N/A	1270.86	1274.31	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
23-Nov-92	1267.38	1267.85	1268.00	#N/A	#N/A	1266.96	1268.79	1272.70	1266.38	1255.51	1267.53	1263.69	#N/A	#N/A
28-Nov-92	1244.06	1264.80	1263.85	#N/A	#N/A	1266.93	1266.25	1271.32	1265.22	1261.82	1245.43	1263.59	#N/A	#N/A
7-Dec-92	1244.06	1260.38	1257.15	#N/A	#N/A	1236.73	#N/A	1268.71	1258.06	1257.46	1205.84	1261.68	#N/A	#N/A
1-Apr-93	#N/A	1249.23	1250.60	#N/A	#N/A	1236.27	#N/A	1264.62	1247.27	#N/A	#N/A	1259.15	#N/A	#N/A
19-Nov-94	#N/A	#N/A	1266.54	1290.03	#N/A	1270.60	#N/A	1265.92	1267.19	1266.24	1238.56	#N/A	#N/A	#N/A
28-Nov-94	#N/A	#N/A	1264.54	1288.90	#N/A	1268.30	#N/A	1261.42	1264.79	1271.81	#N/A	#N/A	#N/A	#N/A
7-Dec-94	#N/A	#N/A	1264.04	1290.70	#N/A	1267.00	#N/A	1262.02	1264.19	1261.80	1259.70	#N/A	#N/A	#N/A
16-Dec-94	#N/A	#N/A	1262.14	1294.90	#N/A	#N/A	#N/A	1268.62	1264.09	1215.50	#N/A	#N/A	#N/A	#N/A
19-Dec-94	#N/A	#N/A	1261.64	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1262.21	#N/A	#N/A
10-Feb-95	1245.40	#N/A	#N/A	#N/A	#N/A	#N/A	1251.00	#N/A	#N/A	1248.60	1240.00	#N/A	#N/A	#N/A
11-Mar-95	#N/A	#N/A	#N/A	#N/A	#N/A	1257.00	#N/A	#N/A	#N/A	#N/A	#N/A	1259.00	#N/A	#N/A
7-Apr-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1280.88	#N/A
13-Apr-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1276.08	#N/A
17-Apr-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1284.88	#N/A
24-Apr-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1249.28	#N/A
25-Apr-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1261.08	#N/A
30-Apr-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1244.88	#N/A
1-May-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1245.38	#N/A
6-May-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1242.81	#N/A
8-May-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1242.84	#N/A
9-May-95	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	1242.15	#N/A
11-May-95	#N/A	#N/A	#N/A	#N/A	#N/A	1254.67	1253.07	#N/A	#N/A	#N/A	#N/A	1255.76	1241.79	1253.38
12-May-95	#N/A	#N/A	#N/A	#N/A	1293.25	#N/A	#N/A	1263.22	#N/A	1253.52	1221.49	#N/A	1241.67	#N/A
18-May-95	#N/A	#N/A	1252.30	1256.74	1294.09	1254.07	1252.37	1263.22	#N/A	1252.99	1240.11	1255.98	1241.31	1246.83
25-May-95	#N/A	1250.32	1250.76	1255.09	1294.78	1235.85	#N/A	1268.08	#N/A	1251.55	1244.59	1254.20	1240.80	1247.20
1-Jun-95	#N/A	1250.63	1250.26	1255.57	1295.18	1235.84	1253.15	1267.52	#N/A	1251.34	1249.28	1253.73	1239.96	1246.38







ANVIL RANGE MINING CORPORATION

PITEAU ASSOCIATES
GEOTECHNICAL CONSULTANTS
VANCOUVER CALGARY

ASSESSMENT OF AQUIFER DEWATERING GRUM PIT

HYDROGRAPHS FOR PUMPING AND OBSERVATION WELLS

BY: ATH

DATE: JUN 95

APPROVED:

DWG: 3

2600 E

2800 E

3000 E

3200 E

6400 N

6200 N

6000 N

5800 N

SUMP
(Est. 50 to
70 Gpm Inflow)

SUMP
(No Apparent
Inflow)

WATER ACCUMULATION
IN SUMP

1258
BENCH

1264
BENCH

1276
BENCH

THALWEG

CENTRE

APPROXIMATE

A

A'

B

B'

C

C'

D

D'

91-4

89-4

91-3

92-3

92-2

89-2

89-1

89-3

92-1

95-2

91-2

92-4

N

LEGEND

- MONITORING WELL
- PUMPING WELL
- APPROXIMATE BENCH CREST DEC 19, 1994
- APPROXIMATE BENCH TOE DEC 19, 1994
- A — A' HYDROGEOLOGICAL SECTION (See Fig.2)

0 50 100 150 200m

SCALE 1:2000

inches 0 1

centimetres 0 1 2

This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

ANVIL RANGE MINING CORPORATION

PITEAU ASSOCIATES
GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

ASSESSMENT OF
AQUIFER DEWATERING
FOR GRUM PIT

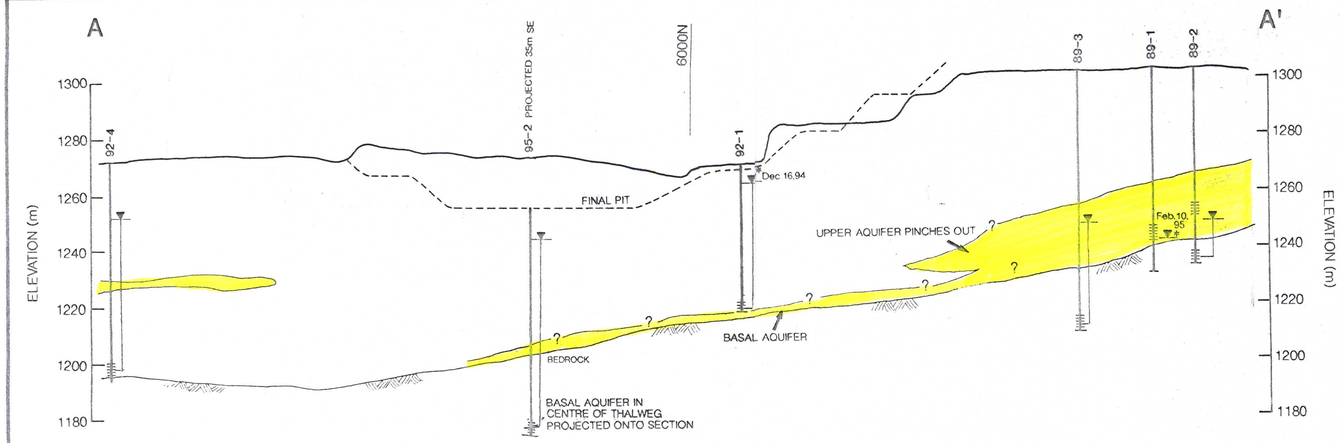
PIT PLAN SHOWING APPROXIMATE
DECEMBER 19, 1994 STATUS

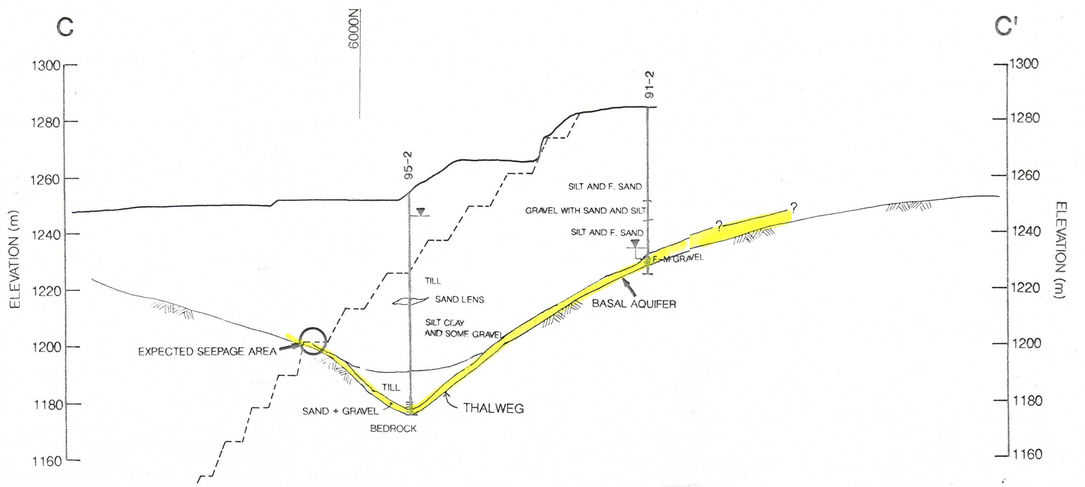
BY ATH/bl

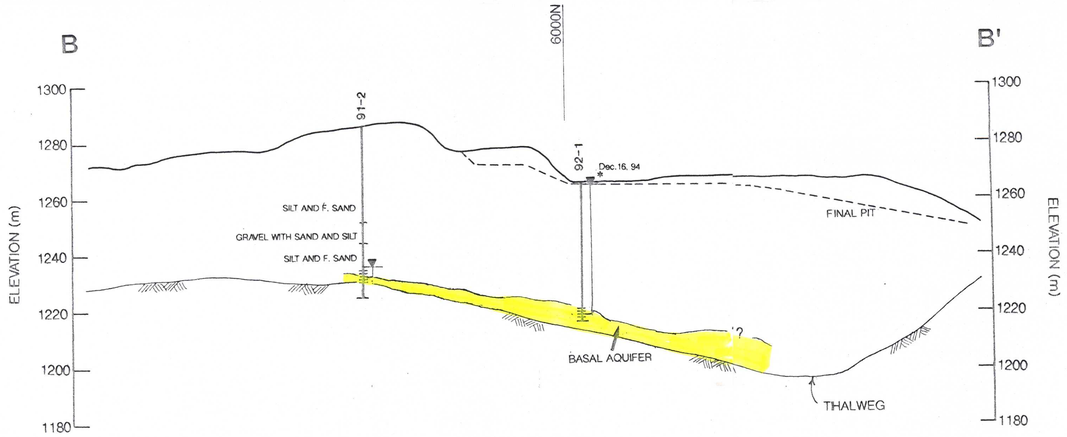
DATE JAN.95

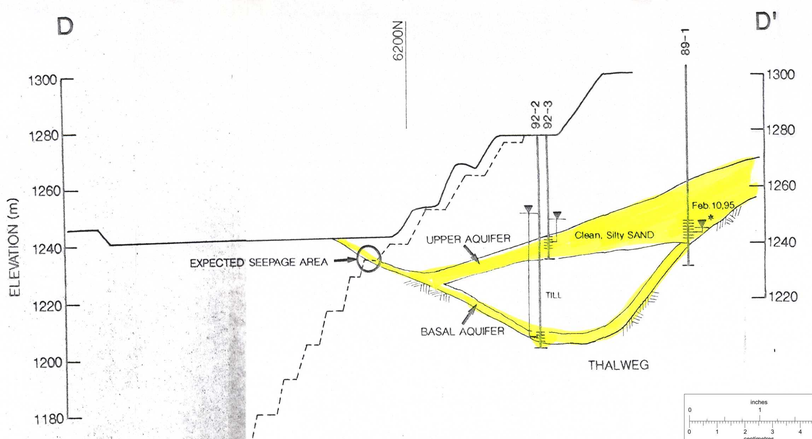
APPROVED

FIG 1









LEGEND

Well showing approximate screened interval, and June 1, 1995 water level unless otherwise indicated.

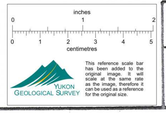
Interpreted aquifer

Present pit profile (May 95)

Ultimate pit profile

SCALE 1:1000

NOTE: See location of sections on Fig. 1



ANVIL RANGE MINING CORPORATION

PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS
VANCOUVER CALGARY

ASSESSMENT OF AQUIFER DEWATERING GRUM PIT

HYDROGEOLOGICAL SECTIONS THROUGH SOUTHEAST PIT WALLS

BY: BDT
DATE: JUN.95
APPROVED:
FIG: 2