020249

CURRAGH RESOURCES INC.

Inter-Office Memorandum

TO: Godfrey McDonald
Vice-President, Metallurgy
Toronto Office

FROM: Gregg A. Jilson
Vice-President, Exploration

AND: Cameron Reed
Geologist
Whitehorse Office

RE: Geology - Drill Hole 89G34

DATE: 05 17 1991

We have reviewed the geology of drill hole 89G34 and the test results you dropped off last Friday. Several very interesting features emerge:

1) There seems to be a change at a depth of 220-230 feet below which Zn and Pb con grades stabilize and recovery improves (though it is still quite variable). The following features correlate with this break:

   a) A change in weathering designation from E (slight weathering, weathering only on fractures) above to F (fresh and unweathered) below.

   b) The downward decreasing abundance of ductile breccia units. These rocks are varieties of massive sulphide that show abundant brecciation textures that appear attributable to ductile flow deformation. This is the type of deformation that, when unannealed, probably causes the high midlings texture described by Carson.

2) There is a second break at 260 feet into good recovery and grade. This change correlates with:

   a) change into disseminated from massive sulphides;

   b) the last major zone of porous sulphide (which is not necessarily independent from a)

Cam has prepared the attached summaries of his rock type and geotechnical logs highlighting features that may be of interest. He has also calculated the RQD for the hole (does not appear to correlate). An explanation of the geotechnical logs is attached for your convenience.

I have also attached two scattergrams of Calculated Head Grade versus drill core assay for Pb and Zn. As you can see the calculated heads appear to be systematically lower for both metals.

I feel that it would be profitable to mount fragments of the ore in bakelite, polish then and have the ore texture categorized using Carson's midlings ratings to follow up on the ductile flow breccia correlation.

We have selected another hole but are in the process of gathering together geological data for it and Cam may need to go to Faro to log it in detail.

Grum Metallurgical Testing – Hole 89G34
Rock Quality Designation

From (Feet)	To (Feet)	Int (Feet)	Recovery Length	Recovery %	RQD Length	RQD %	Degree of Breakage	Degree of Weathering
?	162.5		0.6					
162.5	167.0	4.5	4.9	100	0.0	0	2	D
167.0	172.0	5.0	5.1	100	2.0	39	11	E
172.0	176.5	4.5	3.5	78	1.9	54	8	E
176.5	179.5	3.0	2.0	67	0.4	20	6	E
179.5	181.0	1.5	1.4	93	0.0	0	10	E
181.0	186.0	5.0	2.9	58	0.9	31	11	E
186.0	191.5	5.5	5.2	95	2.1	40	10	E
191.5	196.5	5.0	2.1	42	0.0	0	5	E
196.5	206.5	10.0	11.4	100	3.8	33	9	E
206.5	208.5	2.0	2.0	100	0.0	0	4	E
208.5	212.0	3.5	3.0	86	1.5	50	9	E
212.0	223.0	11.0	11.8	100	9.5	81	11	F
223.0	232.0	9.0	9.4	100	8.6	91	11	F
232.0	237.0	5.0	5.4	100	4.0	74	11	F
237.0	242.0	5.0	5.5	100	2.2	40	9	F
242.0	245.0	3.0	3.8	100	1.0	26	7	F
245.0	250.0	5.0	5.0	100	1.4	28	9	F
250.0	255.0	5.0	5.0	100	0.9	18	7	F
255.0	260.5	5.5	5.2	95	0.8	15	7	F
260.5	262.0	1.5	1.2	80	0.4	33	10	F
262.0	264.5	2.5	2.6	100	0.0	0	6	F
264.5	267.0	2.5	3.0	100	0.8	27	8	F
267.0	271.0	4.0	4.2	100	1.4	33	9	F
271.0	273.5	2.5	1.9	76	0.0	0	4	F
273.5	278.5	5.0	6.4	100	2.8	44	11	F
278.5	281.5	3.0	4.8	100	1.5	31	11	F
281.5	291.5	10.0	8.2	82	8.2	100	12	F
291.5	297.0	5.5	4.2	76	4.2	100	12	F
297.0	300.5	3.5	1.6	46	1.6	100	8	F

GRUM METALLURGICAL TESTING
89G–34 SUMMARY LOG

From	To	Int.	Unit	Texture	Porous	Weathering	Notes
0.0	154.0	154.0	triconed				
154.0	161.8	7.8	till				
161.8	166.7	4.9	phyllite	gouge			fault rock
166.7	169.6	2.9	massive sulph	ductile breccia	locally	moderately in fractures	
169.6	174.9	5.3	disseminated	ductile breccia	nonporous	moderately in fractures	
174.9	187.4	12.5	massive sulph	local breccia	locally	moderately in fractures	
187.4	191.7	4.3	massive sulph	banded	nonporous	moderately in fractures	
191.7	196.5	4.8	massive sulph	fault breccia	porous	minor in fractures	fault rock
196.5	198.1	1.6	disseminated	local breccia	nonporous	minor in fractures	
198.1	201.1	3.0	disseminated	breccia	locally	moderately in fractures	moderately carbonaceous
201.1	203.6	2.5	massive sulph	micro–buckshot	locally	minor in fractures	
203.6	211.7	8.1	disseminated	fault breccia		minor in fractures	moderately carbonaceous
211.7	239.3	27.6	massive sulph	local breccia	locally	minor in fractures	
239.3	240.3	1.0	quartz vein	fractured			
240.3	248.2	7.9	massive sulph	banded	locally	fresh – some local patchy post drilling rust on cut surface.	
248.2	250.5	2.3	disseminated	banded	nonporous	fresh	
250.5	260.1	9.6	massive sulph	thinly banded	porous	fresh	
260.1	269.0	8.9	disseminated	banded	local vugs	fresh	
269.0	275.0	6.0	disseminated	ribbon banded	nonporous	fresh	slightly carbonaceous
275.0	282.1	7.1	disseminated	banded	nonporous	fresh	more py than average
282.1	284.3	2.2	massive sulph	homogenious py	nonporous	fresh	low grade
284.3	300.5	16.2	disseminated	ribbon banded	local vugs	minor in fractures	moderately carbonaceous

MASSIVE SULPHIDE – banded to homogeneous, usually weakly foliated fine grained massive pyrite +/– barite up to 30% with lesser sphalerite and galena. Total sulphide +/– sulphate content is at least 60%, generally greater than 80% and commonly near 100%. Gangue consists of quartz, muscovite, chlorite, barite and carbonates (calcite , dolomite, ankerite). Accessory minerals include pyrrhotite, magnetite, chalcopyrite, arsenopyrite, and marcasite.

DISSEMINATED SULPHIDE – range from light grey to black depending on carbon content. Moderately hard to very hard, well banded, well foliated, locally micaceous pyritic quartzite. Compositional bands usually range from 1mm to 2cm thick. They are light grey to black (carbonaceous facies) fine grained locally micaceous quartzite interbanded with pyritic sulphide and base metal sulphide bands. Pyrite is usually the dominant sulphide species with lesser sphalerite and galena. Locally, base metal sulphide, paticularily light reddish brown sphalerite are dominate. Carbon content ranges from 0 to 1/2% by weight of the rock and generally occurs in thin coatings concentrated on thin cleavage surfaces. Total sulphide content is variable from 15% to 30% and may locally range up to 60%.

APPENDIX III

DESCRIPTION OF ROCK MECHANICS CORE LOGGING TECHNIQUE

The basic parameters measured from the rock core are as follows:

1. Core recovery
2. Rock hardness
3. Degree of fracturing (breakage)
4. Degree of weathering
5. Core size

It is noteworthy that the best data on core competency can be collected by the drill inspector at the drill site before the core becomes broken or data lost from excessive handling, splitting, or drying out.

The data on the various parameters may be tabulated on appropriate recording forms (see Fig. 1) and presented graphically for specific boreholes on geological sections or plans.

A detailed description of each of the parameters recorded is given in the following:

1. CORE RECOVERY AND RQD

   Core recovery is expressed as a percentage of the total length drilled for each core run which is marked by wooden blocks in the core boxes. Recovery gives an indication of the quality of the ground being drilled and the general competency of the rock. Low recovery may also be indicative of faults.

2. RQD (ROCK QUALITY DESIGNATION)

   The RQD is defined as the percentage of core in each run in which the spacing between natural fractures is greater than 10cm (4 in.).

3. HARDNESS

   A simple scheme for classifying soil or rock according to its consistency or hardness is given in Table I. Using this scheme, a reasonble first estimate of the unconfined compressive strength (q_u) of the material may be made. Classifications are based on simple mechanical tests which can be easily performed in the field. By the use of fingers, a pocket knife and geologic pick and with a minimum amount of experience, the complete range of classifications can be established in the field.

TABLE I

QUALITATIVE & QUANTITATIVE EXPRESSIONS FOR CONSISTENCY OF COHESIVE SOIL AND ROCK*

HARDNESS	CONSISTENCY	FIELD IDENTIFICATION	APPROXIMATE RANGE OF UNCONFINED COMPRESSIVE STRENGTH	
			MPa	p.s.i.
S1	very soft soil	Easily penetrated several inches by fist; shows distinct heel marks.	<0.025	<3.5
S2	soft soil	Easily penetrated several inches by thumb; faint heel marks.	0.025 - 0.05	3.5 - 7
S3	firm soil	Can be penetrated by thumb with moderate effort; difficult to cut with hand spade.	0.05 - 0.10	7 - 14
S4	stiff soil	Readily indented by thumb but penetrated only with great effort; cannot be cut with hand spade.	0.1 - 0.2	14 - 28
S5	very stiff soil	Readily indented by thumbnail; requires pneumatic spade for excavation.	0.20 - 0.4	28 - 56
S6	hard soil	Indented with difficulty by thumbnail.	>0.4	>56
R0	extremely soft rock	Indented by thumbnail.	0.2 - 0.7	28 - 100
R1	very soft rock	Crumbles under firm blows with point of geological pick; can be peeled by a pocket knife.	0.7 - 7.0	100 - 1,000
R2	soft rock	Can be peeled by a pocket knife with difficulty; shallow indentations made by firm blow of geological pick.	7.0 - 28	1,000 - 4,000
R3	average rock	Cannot be scraped or peeled with a pocket knife; specimen can be fractured with single firm blow of hammer end of geological pick.	28 - 56	4,000 - 8,000
R4	hard rock	Specimen requires more than one blow with hammer end of geological pick to fracture it.	56 - 112	8,000 - 16,000
R5	very hard rock	Specimen requires many blows of hammer end of geological pick to fracture it.	112 - 224	16,000 - 32,000
R6	extremely hard rock	Specimen can only be chipped with geological pick.	>224	>32,000

*. Modified Rock Hardness Classification

S1 to S6 — Modified after Terzaghi, K. and Peck, R.B., 1967. "Soil Mechanics in Engineering Practice, 2nd Edition, John Wiley and Sons Inc., New York. p.30.

R1 to R5 — Modified after Piteau, D.R., 1970. "Geological Factors Significant to the Stability of Slopes Cut in Rock" in Planning Open Pit Mines, Van Rensburg Ed. Aug. 29-Sept. 4, 1970. Balkema. p.51 and 68.

4. DEGREE OF BREAKAGE

Degree of Breakage is a visual and thus somewhat subjective estimation of the quality of the rock in terms of the number of fractures or breaks. General categories, numerical equivalents and qualifying descriptions are given below. Photographic illustrations of the Degree of Breakage Classifications are given in Fig. 2.

CATEGORY	NUMERICAL EQUIVALENT	MEAN SPACING OF BREAKS OR DIAMETER OF FRAGMENTS (in.)	QUALITY DESCRIPTIONS
A-	1		Mostly fault gouge with/without minor rock fragments
A	2	<½	Gouge and crushed rock
A+	3		Crushed rock with/without minor gouge
B-	4		Crushed rock - no gouge
B	5	½ to 2	Crushed rock - diameter of pieces <2 in.
B+	6		Broken rock - fracture spacing <2 in.
C-	7		Mean spacing 2 to 3 in.
C	8	2 - 4	Mean spacing 3 in.
C+	9		Mean spacing 3 to 4 in.
D-	10		Mean spacing 4 to 6 in.
D	11	4 - 8	Mean spacing 6 in.
D+	12		Mean spacing 6 to 8 in.
E-	13		Mean spacing 8 to 12 in.
E	14	>8	Mean spacing 12 to 14 in.
E+	15		Mean spacing >24 in.

NOTE: Care should be taken to identify all fault/shear zones (Category A). However, for other Degrees of Breakage, the category should be averaged over the length of the core run.

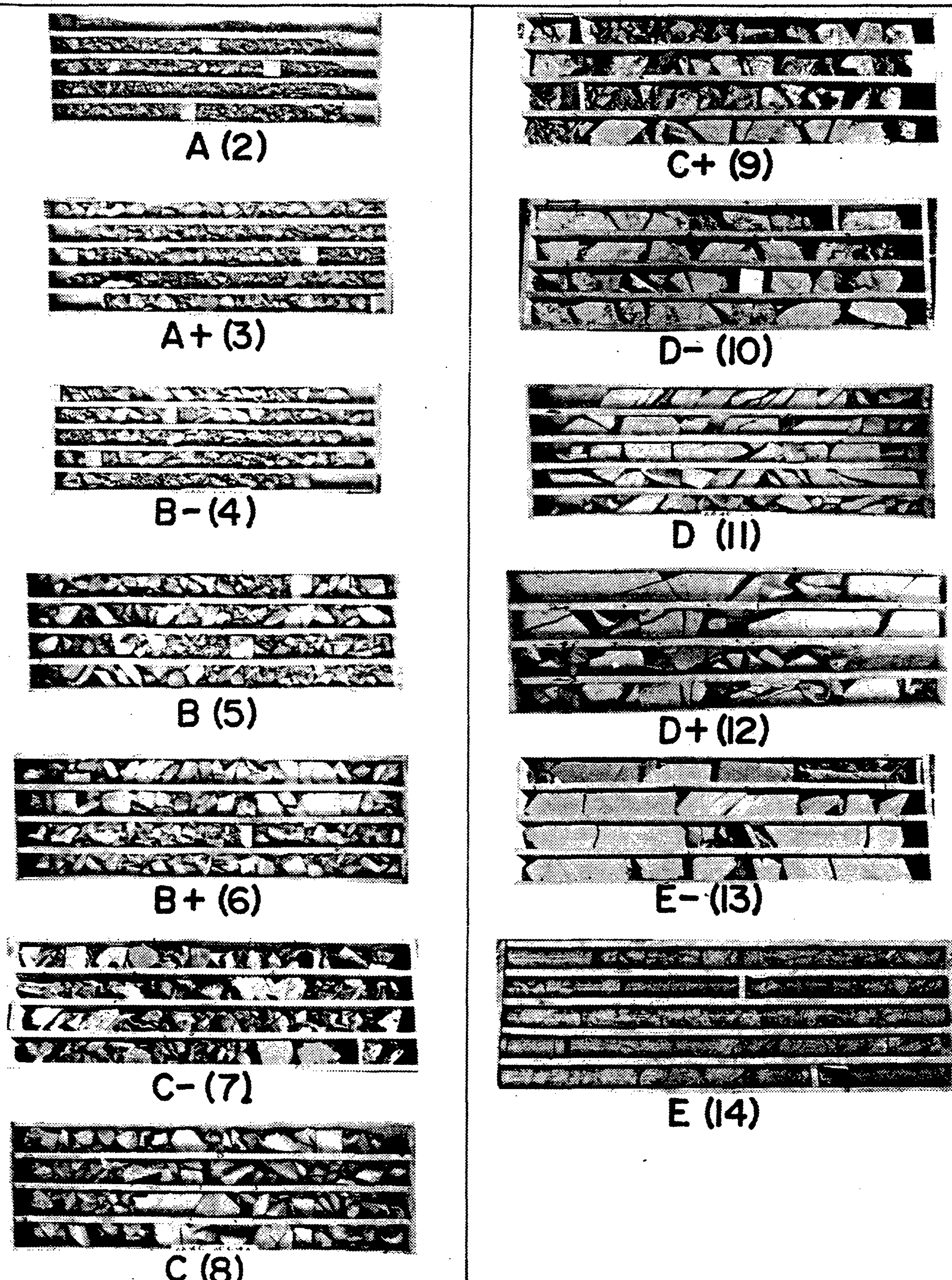


FIG. 2 DEGREE OF BREAKAGE CLASSIFICATION

5. DEGREE OF WEATHERING

The degree of weathering or oxidation of the rock core is used to define the upper boundary of unweathered bedrock and to delineate faults and other zones of intense weathering. The degree of weathering is estimated visually to give a qualitative feel for this parameter. The classification for degree of weathering is as follows:

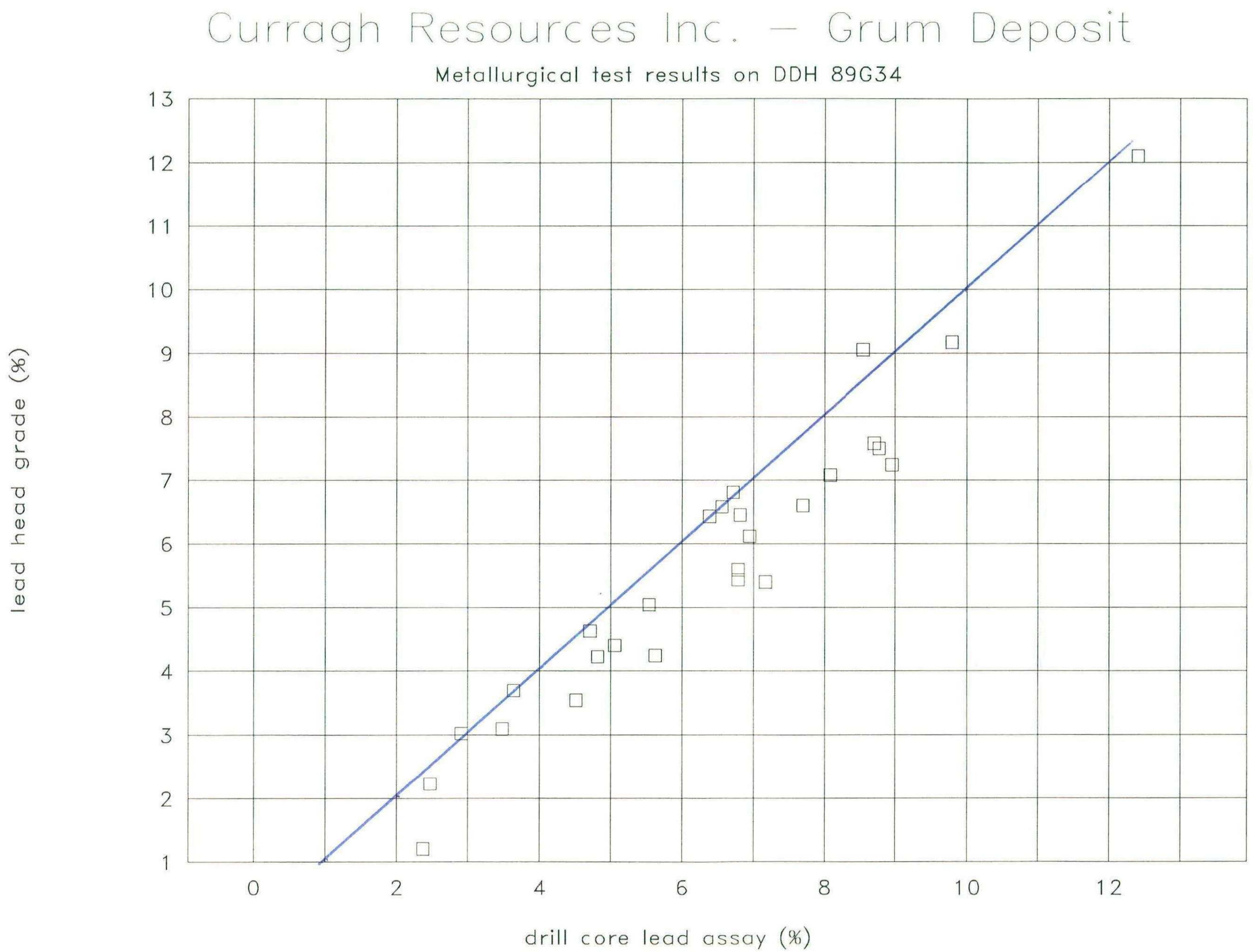
A - Residual Soil - original fabric destroyed.
B - Completely Weathered - original fabric and relict structures remain, but rock is decomposed and friable.
C - Highly Weathered - rock is discoloured and strength is significantly reduced by weathering.
D - Moderately Weathered - rock is discoloured, but rock strength only slightly affected, discontinuities weathered.
E - Slightly weathered - rock strength unchanged - weathering on joints only.
F - Fresh and unweathered.

6. CORE SIZE

Core size has a direct effect on the quality of core recovered. It is generally recognized that larger diameter core will give better core recovery and a better sample of the geological structures. Accordingly, a record of the core size is kept in conjunction with the core competency study to consider these aspects.

7. JOINT FREQUENCY

The number of natural joints or fractures in each core run is used to calculate the joint frequency. In sedimentary rocks, the number of bedding joints/m and number of cross joints/m are recorded separately. Frequency of drill induced breaks or fractures in the core may also be recorded as an index for assessment purposes.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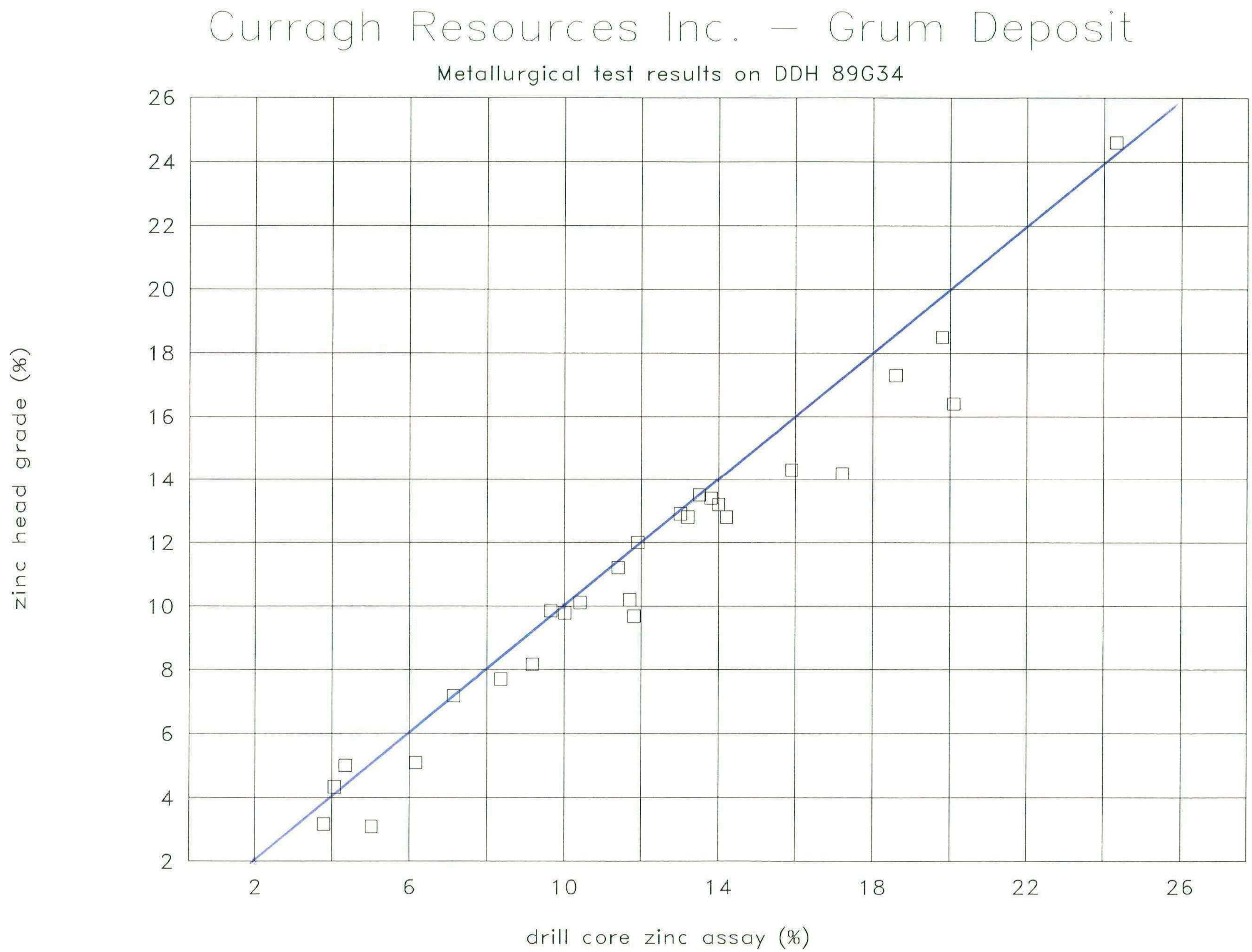
Metallurgical test results on DDH 89G34
lead head grade (%)
drill core lead assay (%)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
2
4
6
8
10
12


Curragh Resources Inc. — Grum Deposit
Metallurgical test results on DDH 89G34
zinc head grade (%)
drill core zinc assay (%)
2
4
6
8
10
12
14
16
18
20
22
24
26
2
6
10
14
18
22
26

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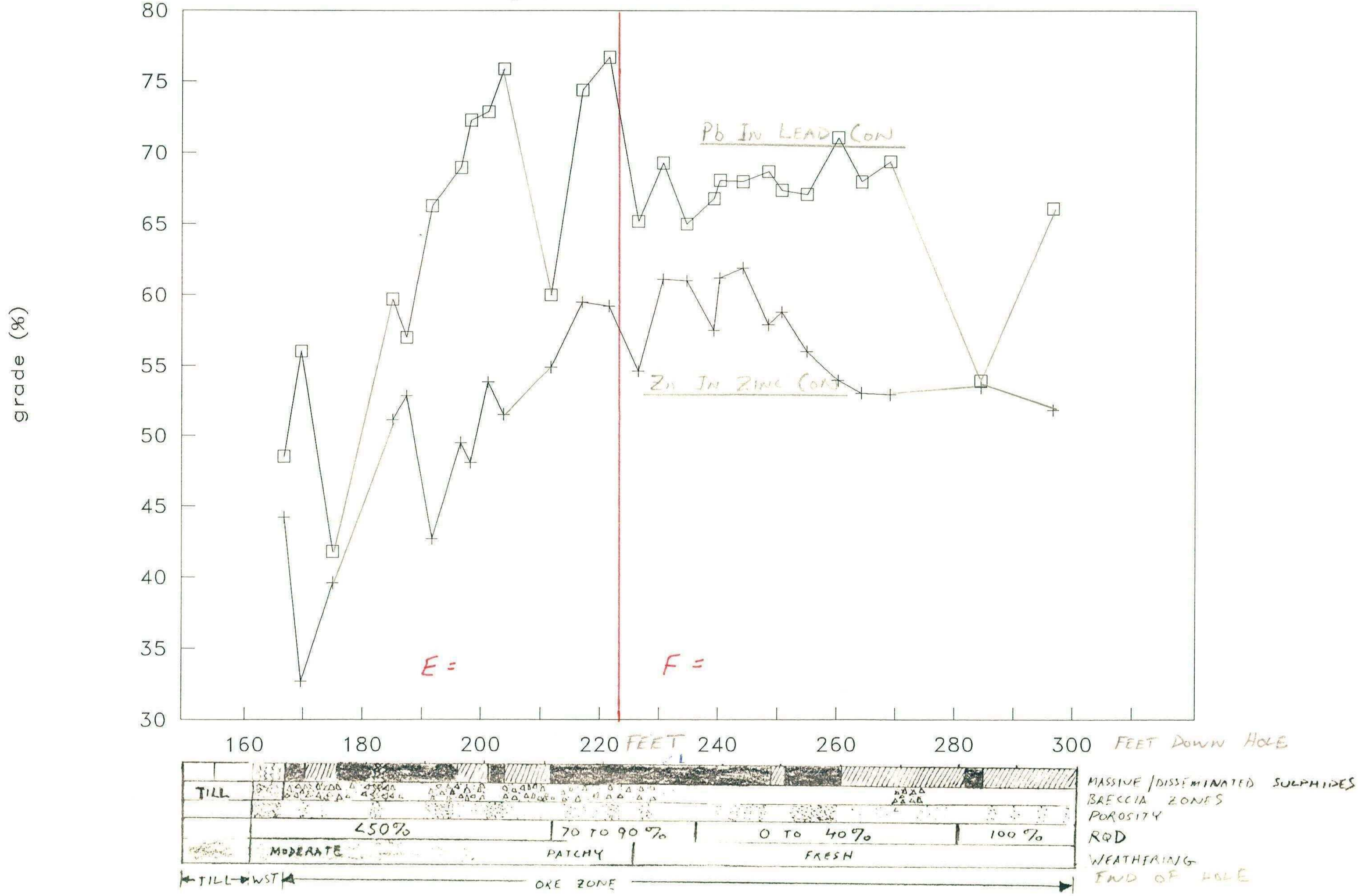
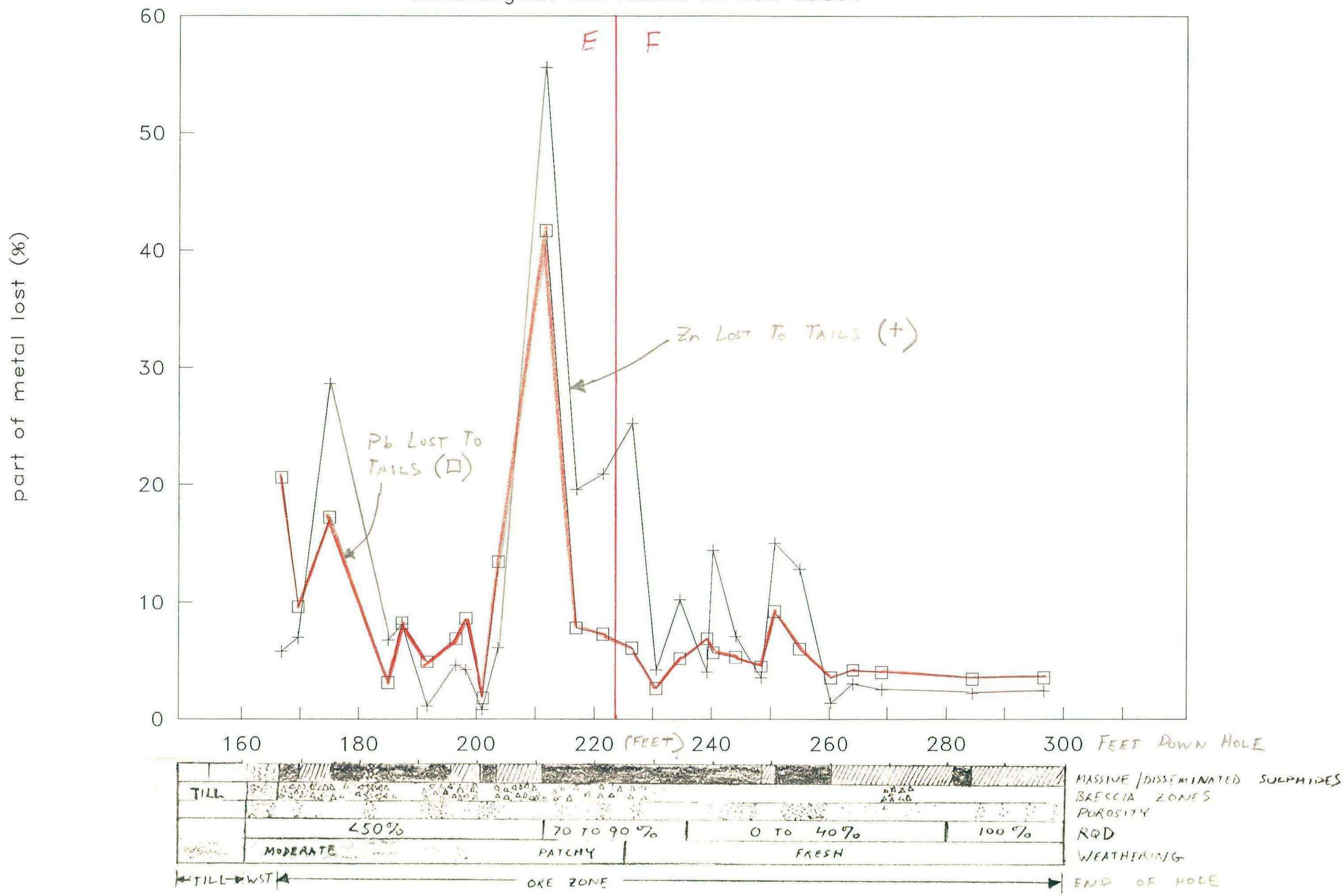
metallurgical test results on DDH 89G34



Curragh Resources Inc. – Grum Deposit

metallurgical test results on DDH 89G34



Curragh Resources Inc. — Grum Deposit

metallurgical test results on DDH 89G34