Geotechnical Logging Procedure

PURPOSE

To capture geotechnical data from diamond drill core at Rocklands.

SCOPE

This procedure applies to all field assistants employed by or contracted to CuDeco Ltd.

ACTION

Once the core mark-up has been completed, drill core is ready for geotechnical logging. The field assistant is in charge of completing the strength, weathering, recovery, Rock Quality Designation (RQD) and number of defects fields. A rock hammer, scribe, safety glasses and tape measure are required for this procedure.

Rock Strength

Each metre in the geotech log is assigned a rock strength code according to the following codes:

Table 4: Rock Strength Codes

EXPLORER 3 Code	Descriptor
R1	Very Low Rock Strength
R2	Low Rock Strength
R3	Medium Rock Strength
R4	High Rock Strength
R5	Very High Rock Strength

Details of these codes are as follows:

R1 – Very low rock strength: Can be scratched by finger nail and pen knife. Can be peeled by penknife and crumbled by hand. The point of a geological pick makes a 5mm diameter indentation. The core can be broken by a single blow with a geological hammer.
R2 – Low rock strength: Can be scratched by finger nail and pen knife. Can be peeled by penknife and crumbled by hand. The point of a geological pick makes a 5mm diameter indentation. The core can be broken by a single blow with a geological hammer.
R3 – Medium rock strength: Can be scratched by thumb nail only with difficulty but moderately easily with pen knife. The point of a geological pick makes a 2-3 mm diameter indentation. Multiple hammer blows may be required to break core.
R4 – High rock strength: Can be scratched with moderate difficulty with pen knife. The point of a geological pick makes a 1-2 mm diameter indentation. Multiple hammer blows may be required to break core.
R5 – Very High rock strength: Can be scratched with difficulty with pen knife. The point of a geological pick causes only superficial surface damage. Multiple hammer blows are required to break core.

Weathering

Each metre in the geotech log is assigned a weathering code according to the following codes:

Table 5: Weathering Codes

EXPLORER 3 Code	Descriptor
EW	Extremely weathered
HW	Highly weathered
MW	Moderately Weathered
SW	Slightly weathered
FRL	All minerals fresh, limonite staining along joints
FR	Fresh rock

Details of these codes are as follows:

- EW – Extremely weathered: original rock fabric largely obscured: most minerals other than quartz decomposed into clay minerals.
- HW – Highly weathered: original rock fabric obscured: many minerals decomposed into clay minerals.
- MW – Highly weathered: rock fabric visible, some minerals decomposed into clay minerals. Rock often stained by iron oxides/hydroxides throughout fabric.
- SW – Slightly weathered: some feldspar minerals show signs of decomposition, iron oxides/hydroxides staining on joints and in places throughout the rock fabric.
- FRL – Fresh with iron oxide stained joints: All minerals fresh, iron oxide staining along joints.
- FR – Fresh: No iron oxide staining along joints or in rock fabric, but coatings of chlorite, quartz, biotite, calcite, sulphides or clay along joints are common.

Core Recovery

After mark up, core recovery is recorded on a metre basis by measuring the lengths of core between metre marks. Core recovery is measured in centimetres over the length of interval between the metre marks and is recorded for each sample interval.

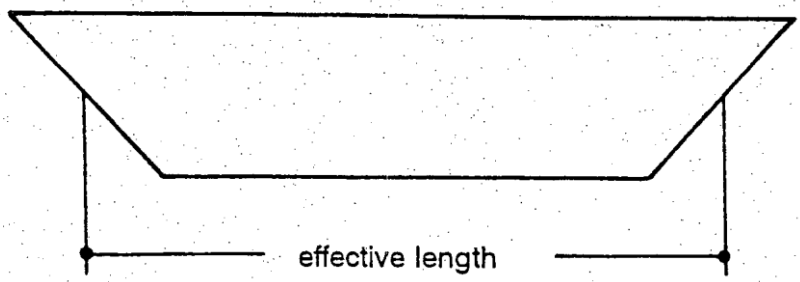
Rock Quality Designation (RQD)

(Section from Kevin Rosengren notes, 1987)

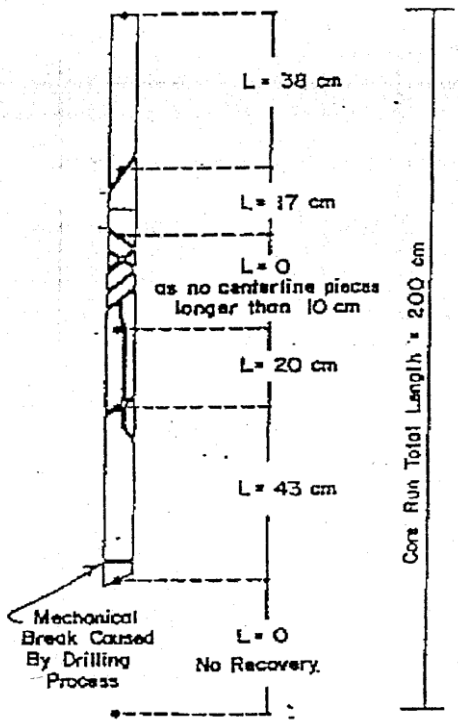
RQD is a modified core recovery in which only pieces of core length greater than 100mm are counted. Thus if the core is recovered in pieces all longer than 100mm the RQD is 100 percent, whereas if every piece is shorter than 100mm the RQD is zero. The RQD gives an overall impression of the degree of jointing and faulting in the rock mass. It is purely an empirical parameter, but is widely used and therefore of value in comparing one rock mass with another. Practical points to be noted include:

- Only natural breaks in the rock mass should be considered. Obvious drilling breaks (fresh surfaces usually at right angles to the core) should not be included. The drillers are instructed to mark any deliberate break in the core (usually with an X), for example to fit into the core tray.
- The core length should be measured from the centre of one break to the next : see below :

Geotechnical Logging Procedure



- Measurements are most easily made by increments of a measuring tape over each piece of core length longer than 10cm. Core losses are automatically accounted for in this method.
- RQD measurements are made over standard metre lengths.
- RQD is calculated as length > 100m/run length or standard metre. Note that the divisor is run length or standard metre, NOT recovered length. This automatically assigns an RQD of zero to any core loss.



$$RQD = \frac{\sum \text{Length of Core Pieces} > 10\,cm\,(4\,in.)}{\text{Total Core Run Length}} \times 100\,\%$$

$$RQD = \frac{38+17+20+43}{200} \times 100\,\%$$

RQD = 59 % (FAIR)

RQD (Rock Quality Designation)	Description of Rock Quality
0 – 25 %	Very Poor
25 – 50 %	Poor
50 – 75 %	Fair
75 – 90 %	Good
90 – 100 %	Excellent

Number of Defects

The number of natural breaks in the core are counted and recorded under the number of defects field. Any planes of weakness (such as joints, shear zones, fractures etc.) that are still connected, but are highly likely to break under a small amount of stress, are included as a natural break.

Geotechnical Logging Procedure

Logging Sheet Example

Below is an example of a hand written geotechnical log. This is from drillhole LMDH007: 60-90m: Oxidised native copper bearing breccia.

Terra Search for Cudeco

Hole ID:		LMDH007		Project:		
From	To	Strength	Weath	Recov	RQD	Number Defects
m	m					
60	61	R1	IW	94	90	4
61	62	↓	↓	80	40	150
62	63	↓	↓	80	0	250
63	64	↓	↓	87	20	200
64	65	R3	MW	98	67	15
65	66	R4	FR	100	100	3
66	67	↓	FR	100	100	2
67	68	↓	MW	100	93	5
68	69	R4	↓	88	66	35
69	70	R2	↓	98	76	35
70	71	R4	↓	78	78	4
71	72	R1	IW	85	75	160
72	73	R2	MW	30	20	100
73	74	R4	↓	100	95	5
74	75	R2	↓	98	66	35
75	76	R3	↓	100	95	9
76	77	R2	↓	98	70	25
77	78	↓	↓	100	90	10
78	79	↓	↓	100	80	10
79	80	↓	IW	95	20	50
80	81	↓	↓	100	76	12
81	82	↓	↓	95	78	13
82	83	↓	↓	90	45	10
83	84	↓	↓	100	94	6
84	85	R4	MW	100	100	3
85	86	↓	↓	~~100~~ 95	82	25
86	87	R2	SW	95	54	45
87	88	R3	MW	96	96	8
88	89	↓	MW	100	98	8
89	90	↓	MW	100	90	22

REASON FOR ISSUE

Edited Procedure