G9108 DOCUMENTATION

COORDINATE SYSTEM

The Grum 9108 geological interpretation uses the same coordinate system as the earlier G8705 model. The grid system is tied to survey control station 1404 (earlier named VG4) located on the Blind Creek road between the Grum and Vangorda areas. Table 1 lists the UTM and Grum local coordinates for this survey station.

Table 1. Coordinates for 1404 (VG4)

UTM	Northing	6,904,623.172
	Easting	593,847.979
	elevation	1,300.062
GRUM LOCAL	Northing	5,000.000
	Easting	3,500.000
	elevation	1,300.062

The local Grum coordinate grid is an orthogonal grid oriented parallel to the exploration cross and long sections. It is also parallel to the current PC-MINE model blocks. Local north (for this grid) is rotated 47.7741667 degrees (0.833816 radians) counterclockwise from UTM north.

Horizontal and vertical units for the local grid are metres. UTM coordinates for Station 1404 were established as part of the 1979 Anvil District orthophoto survey completed by Northwest Surveys. Elevations in both the local and UTM coordinate grids correspond exactly to the elevation datum established in this 1979 Anvil District orthophoto survey.

Conversion between Grum Local and Anvil District UTM coordinate systems can be completed using the following equations:

$$Nutm = No + Sh * (Nlocal * \cos(x) + Elocal * \sin(x))$$
$$Eutm = Eo + Sh * (Elocal * \cos(x) - Nlocal * \sin(x))$$

where No = 6,898,674.069
Eo = 595,197.633
Sh = 0.99959853
x = 47.7741667 degrees (0.833816 radians).

These equations have been incorporated into the spreadsheet GRIDS. The Sh scaling factor is averaged for the elevations typically encountered on the Vangorda Plateau.

GRUM MODEL PROPERTY DEFINITION

The plan size, plan location, and block size of the Grum G9108 model have been slightly modified from the earlier G8705 model. These changes were made to allow the G9108 rows and columns to correlate exactly with the exploration drill grid pattern. Table 2 lists the new overall coordinate information for the G9108 location.

Table 2. GRUM G9108 Model Coordinates

Lower Left Corner	UTM	Northing	6,903,971.02
		Easting	592,684.25
	LOCAL	Northing	5,423.67
		Easting	2,234.37
Lower Right Corner	UTM	Northing	6,904,687.28
		Easting	593,334.31
	LOCAL	Northing	5,423.67
		Easting	3,202.11
Upper Left Corner	UTM	Northing	6,905,081.97
		Easting	591,460.15
	LOCAL	Northing	7,077.55
		Easting	2,234.37

Upper Right Corner	UTM	Northing	6,905,798.23
		Easting	592,110.21
	LOCAL	Northing	7,077.55
		Easting	3,202.11

Row Length = 15.17325 m (109 rows total)
Column Length = 7.62 m (127 columns total)

Column centres for the G9108 model correspond exactly to the long section lines. The cross section lines pass along the margins between two rows. The correspondence between the model blocks and the cross and long sections is listed in Tables 4 and 3 respectively.

Table 3. Location of Grum Long Sections

Section	Local Easting	Model Column
12 S	2,245.8	2
10 S	2,306.8	10
08 S	2,367.8	18
06 S	2,428.7	26
04 S	2,489.7	34
02 S	2,550.6	42
00 B/L	2,611.6	50
02 N	2,672.6	58
04 N	2,733.5	66
06 N	2,794.5	74
08 N	2,855.4	82
10 N	2,916.4	90
12 N	2,977.3	98
14 N	3,038.3	106

16 N	3,099.3	114
18 N	3,160.2	122

Even long sections are spaced every 60.96 metres (200 feet)

Table 4. Location of Grum Cross Sections		
Section	Local Northing	Model Rows
42 W	5,423.7	109/Model Edge
44 W	5,484.3	105/106
46 W	5,545.0	101/102
48 W	5,605.7	97/98
50 W	5,666.4	93/94
52 W	5,727.1	89/90
54 W	5,787.8	85/86
56 W	5,848.5	81/82
58 W	5,910.0	77/78
60 W	5,969.9	73/74
62 W	6,030.6	69/70
64 W	6,091.3	65/66
66 W	6,152.0	61/62
68 W	6,212.7	57/58
70 W	6,273.4	53/54
72 W	6,334.1	49/50
74 W	6,394.7	45/46
76 W	6,455.4	41/42
78 W	6,516.1	37/38
80 W	6,576.8	33/34
82 W	6,637.5	29/30

84 W	6,698.2	25/26
86 W	6,758.9	21/22
88 W	6,819.6	17/18
90 W	6,880.3	13/14
92 W	6,941.0	9/10
94 W	7,001.7	5/6
96 W	7,062.4	1/2

Even cross sections are spaced every 60.693 metres (199.1 feet).

The elevation at the top of the model is 1336.0m. Bench height is 6.0m. There are 70 benches in the model. A printout of the property definition is included at the end of this documentation.

The Champ zone has not been modelled in the G9108 and G9009 models.

ROCK TYPE MODEL

Geology for the rock type model was derived from the earlier Simpson-Adamson Grum cross section interpretation (Simpson and Adamson, 1982). The Simpson-Adamson model interpreted the geology for the even cross sections (spaced every 60.693 metres). The G9108 model extends from cross sections 61W through 87W. This corresponds to rows 20-71 in the model.

Simpson-Adamson ore outlines for the even cross sections (spaced every 199.1 feet) were modified slightly to take into account the results from the 1987-1989 drilling programs in the Grum area. The resulting ore outlines were then digitized using PC-MINE software. The rock type assigned to each polygon was based on the earlier Simpson-Adamson rock type.

The rock type model was not modified to respect geological information from the 1991 drill program. A new geological interpretation over the entire Grum deposit was in progress at the time of this model construction. G9108 is an interim model which differs from the previous G9009 in that it utilizes the 1991 drillcore assays and the block elevations of the model correspond to planned toes and crests.

Rock types have been modified to correspond to the new lithostratigraphic code. A printout of the rock codes is included at the end of this documentation.

Each of the even cross sections corresponds to four rows in the G9108 model. Therefore the polygons digitized on an even section were loaded into two rows on each side of the cross section. Elevations for the ore polygons were adjusted when loading them into the rock type model to account for the overall 11 degree plunge of the deposit towards model north. The amount of plunge correction for each row was calculated using simple trigonometry. Table 5 lists the corrections for each of the four rows adjacent to an even section.

Table 5. Elevation Correction for Model Rows		
Row	Distance to section	Elevation Correction
Row 4 (most NW)	22.759875	-4.42
Row 3	7.586625	-1.47
Even Cross Section	0.0	0.0
Row 2	-7.586625	1.47
Row 1 (most SE)	-22.759875	4.42

This elevation change for each row was completed to reduce the "choppiness" in long section and plan by following the structural grain of the Grum deposit. Cross-cutting faults are obviously not adequately modelled using this procedure. A more detailed geologic interpretation is required to properly include both fault and fold geologic information.

All waste phyllites were assigned to rock type 160. No attempt was made to differentiate greenstones, altered phyllites, carbonaceous phyllites, or noncalcareous phyllites.

Overburden as rock type 82 was also entered into the model as a surface grid using GEO-MODEL. The overburden surface grid was prepared by hand contouring the triconed elevations in plan at five metre intervals. This surface was digitized into GEO-MODEL and converted to a surface grid using the average from both rows and columns. The program RKSURF (Pigage 1987) was then used to convert all blocks whose centres occur at a higher elevation than this surface to an overburden rock code (82).

Air (rock type 500) was also entered into the rock type model using the RKSURF program with the surface topography grid. The topography grid was created in GEO-MODEL by digitizing the 1:2,000 topography and exporting it to a PC-MINE grid using the averages of the rows and columns. In this instance only those blocks whose toes occur at elevations higher than the surface grid are converted to the air rock code.

COMPOSITES

Drill holes are entered into a PC-XPLOR database (database B). The database contains header information in table 1, downhole deviations in table 2, lithologies in table 3, assays in table 4, and composites in tables 5.

The Anvil District alphanumeric rock codes in Tables 3 and 4 were converted to numeric values using the Fortran program LITHCOMP (Pigage 1990). This program substituted an integer rock code for the alphanumeric rock name of the dominant unit for a particular assay interval (table 4) or lithology interval (table 3). Rock code 4 (4EC) was not incorporated into this conversion because it has such a limited occurrence in the Grum drill holes.

Assays for the quartzose ores (rock codes 2, 3) and massive sulphide ores (4, 5, 7, 8) were grouped and analyzed using univariate histograms Pb, Zn, Ag, Au, and pulp SG assays for each of these two groups were then cut to the 95th percentile. Table 6 contains the 95th percentile values used to cut the assays.

ROCK CODE	Table 6. 95th PERCENTILE CUT OFF VALUES				
	Pb %	Zn %	Ag g/t	Au g/t	SG
2-3	6.24	10.77	102.0	1.85	3.86
4-8	9.72	17.19	157.0	2.36	4.85

Drill holes inclined at an angle greater than 60° (ie. near vertical to vertical) were composited in 6m bench intervals starting at 1336m elevation. The composite location is given by the mid bench elevation. The shallower holes (mostly underground) were composited using 6 metre equal length intervals starting at the drill hole collar. The composite location is given by the mid elevation of the interval.

G9108 composites are length weighted only. G8705 and G9009 are length * SG weighted.

Missing ore rock type assays were ignored except where they comprised more than 25% of the composite interval. In this case, the composite was discarded. Waste rock type intervals are assigned a 0 assay value. This differs from the G8705 and G9009 where missing ore rock type assays were also assigned a background value of 0.

PC-XPLOR assigns a rock code to the composited interval based on the lithology at the centre of the interval. It does not take into account whether that particular rock type is the dominant lithology in the interval. To overcome this problem, the Fortran program RKCOMP1 Pigage 1990 modified in 1991) was written to incorporate a weighting factor when assigning the rock code to a particular composite interval. The rock type could be assigned to the composites using a length weighting algorithm. The weighted length of each different rock code in the composite interval was calculated separately. Waste rock types therefore, were not lumped into a single rock type. The rock code assigned to the composite was the dominant rock type based on the weighted lengths.

PRINTOUT OF PROPERTY INFORMATION

Model description (max 64 characters) :	G9108 GRUM - 6 metre benches (Simpson-Adamson interpretation)
Easting co-ordinate of model bottom left hand corner :	2234.37
Northing co-ordinate of model bottom left hand corner :	5423.67
Model rotation angle (degrees anticlockwise) :	.00
Datum elevation of top of model :	1336.00
Number of columns in model (max 128) :	127
Number of rows in model (max 128) :	109
Width of columns :	7.62
Width of rows :	15.17

Number of labels : 5 ; Pb+Zn% ; Pb% ; Zn% ; Ag g/t ; Au g/t

Current units are :

Linear : m
Area : m**2
Volumetric : bcm
Density : tn/bcm
Monetary : Cdn $

Current file profile number is : 0

Standard block models have been specified

PRINTOUT OF PROPERTY INFORMATION

BENCH	HEIGHT [m]	CREST ELEVATION [m]	TOE ELEVATION [m]	CREST DEPTH [m]	TOE DEPTH [m]
1	6.00	1336.00	1330.00	.00	6.00
2	6.00	1330.00	1324.00	6.00	12.00
3	6.00	1324.00	1318.00	12.00	18.00
4	6.00	1318.00	1312.00	18.00	24.00
5	6.00	1312.00	1306.00	24.00	30.00
6	6.00	1306.00	1300.00	30.00	36.00
7	6.00	1300.00	1294.00	36.00	42.00
8	6.00	1294.00	1288.00	42.00	48.00
9	6.00	1288.00	1282.00	48.00	54.00
10	6.00	1282.00	1276.00	54.00	60.00
11	6.00	1276.00	1270.00	60.00	66.00
12	6.00	1270.00	1264.00	66.00	72.00
13	6.00	1264.00	1258.00	72.00	78.00
14	6.00	1258.00	1252.00	78.00	84.00
15	6.00	1252.00	1246.00	84.00	90.00
16	6.00	1246.00	1240.00	90.00	96.00
17	6.00	1240.00	1234.00	96.00	102.00
18	6.00	1234.00	1228.00	102.00	108.00
19	6.00	1228.00	1222.00	108.00	114.00
20	6.00	1222.00	1216.00	114.00	120.00
21	6.00	1216.00	1210.00	120.00	126.00
22	6.00	1210.00	1204.00	126.00	132.00
23	6.00	1204.00	1198.00	132.00	138.00
24	6.00	1198.00	1192.00	138.00	144.00
25	6.00	1192.00	1186.00	144.00	150.00
26	6.00	1186.00	1180.00	150.00	156.00
27	6.00	1180.00	1174.00	156.00	162.00
28	6.00	1174.00	1168.00	162.00	168.00
29	6.00	1168.00	1162.00	168.00	174.00
30	6.00	1162.00	1156.00	174.00	180.00
31	6.00	1156.00	1150.00	180.00	186.00
32	6.00	1150.00	1144.00	186.00	192.00
33	6.00	1144.00	1138.00	192.00	198.00
34	6.00	1138.00	1132.00	198.00	204.00
35	6.00	1132.00	1126.00	204.00	210.00
36	6.00	1126.00	1120.00	210.00	216.00
37	6.00	1120.00	1114.00	216.00	222.00
38	6.00	1114.00	1108.00	222.00	228.00
39	6.00	1108.00	1102.00	228.00	234.00

40	6.00	1102.00	1096.00	234.00	240.00
41	6.00	1096.00	1090.00	240.00	246.00
42	6.00	1090.00	1084.00	246.00	252.00
43	6.00	1084.00	1078.00	252.00	258.00
44	6.00	1078.00	1072.00	258.00	264.00
45	6.00	1072.00	1066.00	264.00	270.00
46	6.00	1066.00	1060.00	270.00	276.00
47	6.00	1060.00	1054.00	276.00	282.00
48	6.00	1054.00	1048.00	282.00	288.00
49	6.00	1048.00	1042.00	288.00	294.00
50	6.00	1042.00	1036.00	294.00	300.00
51	6.00	1036.00	1030.00	300.00	306.00
52	6.00	1030.00	1024.00	306.00	312.00
53	6.00	1024.00	1018.00	312.00	318.00
54	6.00	1018.00	1012.00	318.00	324.00
55	6.00	1012.00	1006.00	324.00	330.00
56	6.00	1006.00	1000.00	330.00	336.00
57	6.00	1000.00	994.00	336.00	342.00
58	6.00	994.00	988.00	342.00	348.00
59	6.00	988.00	982.00	348.00	354.00
60	6.00	982.00	976.00	354.00	360.00
61	6.00	976.00	970.00	360.00	366.00
62	6.00	970.00	964.00	366.00	372.00
63	6.00	964.00	958.00	372.00	378.00
64	6.00	958.00	952.00	378.00	384.00
65	6.00	952.00	946.00	384.00	390.00
66	6.00	946.00	940.00	390.00	396.00
67	6.00	940.00	934.00	396.00	402.00
68	6.00	934.00	928.00	402.00	408.00
69	6.00	928.00	922.00	408.00	414.00
70	6.00	922.00	916.00	414.00	420.00

CURRAGH RESOURCES INC. – NUMERIC ANVIL LITHOSTRATIGRAPHIC CODE

ROCK CODES (OLD CODES INCLUDED FOR COMPARISON)

DISSEMINATED QUARTZITES

2	4A	Ribbon banded carbonaceous quartzite
3	4C/4D	Pyritic quartzite (<30% pyrite)

SEMI MASSIVE SULPHIDE (Generally low grade)

4	4EC/4E1/ 4C3	Siliceous pyritic sulphides (30–60% pyrite)

MASSIVE SULPHIDES

5	4E/4F	Massive pyritic sulphides (60–100% pyrite)
6	4K	Massive pyritic sulphide with clasts of dolomite/ankerite
7	4G	Baritic pyrite sulphides (>10% barite)
8	4H	Pyrrhotitic sulphides
9	4J	Nonpyritic sulphides & oxides – pyrite poor

METASEDIMENTS

20	3G	Noncalcareous, muscovite–chlorite, medium grey phyllite
22	1C/1CD/1D	Noncalcareous, bio–musc–qtz staurolite+andalusite+garnet+fibrolite schist
30	5A/5G/3E/1E	Carbonaceous phyllite/schist
32	5E/3F/1G	Marble + calc–silicate bands
33	1B	Skarn and 'silicated' marble
36	3D	Calc–silicate
40	5B	Calcareous, silvery grey, muscovite chlorite phyllite
44	5C/3C/1F	Metabasite, poorly foliated greenstone (relict igneous texture)
45	5C/3C/1F	Pyroxinite – commonly serpentinized (relict bastites)
46	5C/3C/1F	Amphibolite – blue–green hornblende + plagioclase + quartz
47	5D/3B/1H	Chloritic phyllite/schist – pale green, homogenous

ALTERED ROCKS

52	4L0	Muscovite>chlorite quartz phyllite/schist – light cream to white
54	4L6	Chlorite>muscovite quartz phyllite/schist – pale green

CRETACEOUS INTRUSIVES

60	10Q	Quartz vein – white bull quartz
61	10AB	Anvil Batholith – Mt Mye phase of Anvil plutonic suite. Musc–bio granite
65	10C	Pegmatite
66	–	Aplite
68	10E	Hornblende–biotite quartz diorite – massive and unfoliated
69	10F	Smokey quartz–feldspar porphyry – massive and unfoliated

FAULT ROCK (use only if parent not recognized)

72	Gouge
74	Tectonic breccia
76	Mylonite

OVERBURDEN

82	Unclassified – general
84	Triconed – no recovery
86	Till – silt – sand
88	Ferricrete
99	Air

OTHER

0	No Recovery
&	+/–

GRADE MODIFIERS

N	no visible grade
W	1–3% Pb+Zn
L	3–5% Pb+Zn
H	5–10% Pb+Zn
V	>10% Pb+Zn

MINERAL IDENTIFIERS

Carbonates
- c calcite
- k ankerite
- v carbonate–non specific
- w dolomite

Micas
- b biotite
- j 'fuchsite'
- l chlorite
- m muscovite
- s sericite
- t talc

Felspars – Quartz
- f feldspar
- q quartz (fine grained)
- y kaolinite (clay minerals)
- p potash feldspar
- Q quartz (vein)

Calc Silicates
- a actinolite
- e epidote
- h hornblende
- i diopside

Alumino–Silicates/Pelites
- d andalusite
- n garnet
- r fibrolite
- u staurolite
- z chloritoid

Oxide/Sulphide/Sulphates
- A Arsenopyrite
- B Barite
- C Chalcopyrite
- G Galena
- L Limonite (iron oxides)
- M Magnetite
- P Pyrite
- R Pyrrhotite
- Z Sphalerite
- F Marcasite

Other
- g carbon
- x noncalcareous

ROCK TEXTURES

+	equigranular
!	foliated
=	laminated/ribbon banded
>	coarse–grained
^	medium grained
<	fine grained
\	clotted
:	porphyroblastic
%	porphyritic
'	interstitial
@	porous
*	weathered
~	fault gouge
X	fault breccia (tectonic)
?	mylonite
#	altered
$	'stringered'
o	spotted

BILL - INCLUDED ARE BENCHES 9 TO 21. I WILL GIVE THE REST TO DAVE ON THURSDAY.

Len

G9108 Bench Block Plans:

Bill, Here are some notes to accompany the block bench plans I have plotted.

1. Each plan has the following plotted:

a) Outline of ore rock type blocks

b) Within each block - %Pb+Zn
Black = Sulphide Waste 0 to 3%
Green = Low Grade 3 to 4%
Blue = Medium Grade 4 to 5%
Red = High Grade +5%
followed by ore rock code using the new coding scheme. (Dave has a copy of the code)

Blocks with a rock type code but no Pb+Zn value are uninterpolated blocks. (Usually these blocks are a significant distance from any drillhole thus remain uninterpolated in the model run.

Block model row and column numbers are in green around perimeter of drawing.

c) Drillhole composites - %Pb+Zn and ore rock type for each drillhole.
Near vertical to vertical holes (60 to 90 degrees) are bench composited. Shallow drilled holes (mostly underground) are composited in 6m equal lengths starting at the hole collar. Both types of composites are plotted on the bench block plans. The rock type assigned to the composite is the majority rock type in the composite interval. If the majority of the composite is a waste type, ie. phyllite, unconsolidated overburden (till), or air, it is given a code of -1. Note that a composite assigned -1 could also have a Pb+Zn value if less than half the composite is an ore type. Only composites assigned an ore type are used in the grade interpolation of a block.

I have given Dave documentation which gives more detail about compositing and the construction of the block model.

d) Midbench contours of gridded model surfaces - Note that these are only estimates of contours created by digitizing the contours, griding the data, and contouring the grid. If you want actual design toes and crest for the bench I recommend overlaying Ion's original drawings and tracing them on the bench. The model grids that are represented are:
1) Original topography - Digitized from orthophoto: thin solid blue line.
2) Bedrock Topo - Hand contoured from all available DDH data: broken blue line.
3) Stage 1,2,3, Pits. Thick red, blue, and green lines.
4) Jan 1 1991 Pit Surface - MINESURVEY: thick black line.

Note SE Stage 1 pit wall is inside Stage 2 and 3 Pit wall. This wall should be the same for all three. I think this is a result of a digitizing problem so don't rely on the location of this mid bench contours as the gospel truth. The pits will be redigitized in the new model using the latest software to improve these surfaces.

Ore starts at bench #9 toe=1282m. I have plotted bench 9 to bench 30 (toe=1156m).