NI 43-101 INDEPENDENT TECHNICAL REPORT

# HAMAMA WEST DEPOSIT,

# ABU MARAWAT CONCESSION,

# ARAB REPUBLIC OF EGYPT.

24 January 2017

Prepared For:

ATON RESOURCES LTD.

Matt Bampton

B.Sc. (Hons.) M.Sc. MAusIMM MAIG

Senior Consultant Geologist

Cube Consulting Pty. Ltd.

Compiled by:
© Cube Consulting Pty Ltd, Perth, Western Australia
Cube Project: 2016_009 and 2016_010
www.cubeconsulting.com.au

## TABLE OF CONTENTS


1 SUMMARY ... 11
1.1 Property Location and Description ... 11
1.2 Geology and Surface Mineralisation ... 12
1.3 Exploration Results ... 12
1.3.1 Hamama and Hamama West ... 12
1.3.2 Other Areas ... 13
1.4 Sample Preparation, Analyses and Data Verification ... 13
1.5 Mineral Resource Estimate ... 14
1.5.1 Abu Marawat Mineral Resource Estimate ... 15
1.6 Interpretations and Conclusions ... 16
1.7 Recommendations ... 17
1.7.1 Mineral Resource Development and Hamama Prospect Exploration ... 17
1.7.2 Regional Exploration ... 17
1.7.3 Procedural and Data Management ... 18
1.8 Work Program and Budget ... 18
2 INTRODUCTION ... 19
2.1 Request for Technical Report and Purpose ... 19
2.2 Sources of Information and Data ... 19
2.3 Property Inspections by the Author ... 19
3 RELIANCE ON OTHER EXPERTS ... 20
4 PROPERTY DESCRIPTION AND LOCATION ... 21
4.1 Project Location ... 21
4.2 Mineral Tenure of the Project ... 22
4.3 Environmental Liabilities ... 24
4.4 Permits Required for Proposed Work Program ... 25
4.5 Other Factors and Risks ... 25
5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE & PHYSIOGRAPHY ... 26
5.1 Accessibility ... 26
5.2 Climate ... 26
5.3 Local Resources and Infrastructure ... 26
5.4 Physiography ... 27
6 HISTORY ... 28
6.1 Ancient Mining ... 28
6.2 Modern exploration – Hamama and Abu Marawat ... 28
6.3 General ... 29
7 GEOLOGICAL SETTING AND MINERALISATION ... 30
7.1 Regional Geology ... 30
7.2 Local and Property Geology ... 30
7.3 Mineralisation ... 33
8 DEPOSIT TYPES ... 34
9 EXPLORATION ... 35
10 DRILLING ... 42
10.1 Historical Drilling ... 42
10.2 Drilling and Sampling Procedures ... 42

10.2.1 Drilling Equipment ....42
10.2.2 Drilling and Sampling Method ....42
10.2.3 Drill Sample Quality ....42
10.2.4 Drill Hole Surveying ....45
10.2.4.1 Collar Location Surveying....45
10.2.4.2 Azimuth and Dip Surveying ....45
10.2.5 Geological Logging ....45
10.2.6 Core orientation ....46
10.2.7 Core photography, processing and storage ....46
10.2.8 Density Measurement ....46
10.3 Drilling Completed and Significant Results – Hamama West.... 46
10.3.1 Other Hamama Exploration Areas....49
11 SAMPLE PREPARATION, ANALYSES AND SECURITY .... 50
11.1 Site Sample Preparation .... 50
11.2 Laboratory Sample Preparation and Analysis .... 50
11.3 Sample Security.... 51
11.4 Quality Assurance and Quality Control .... 51
11.4.1 Certified and Uncertified Reference Materials ....52
11.4.2 Duplicate Samples....52
11.4.3 Monitoring of QC samples ....52
11.4.4 Hamama Mineral Resource QAQC Analysis ....52
11.4.4.1 Certified Reference Material – Standards ....53
11.4.4.2 Uncertified Reference Material – Blank Material Assays ....58
11.4.4.3 Duplicate Samples ....59
11.4.4.4 Umpire Laboratory Check Assaying Duplicates or Pulps....61
11.4.4.5 Twinned Drill Holes ....61
11.5 Assaying Method .... 61
11.6 Principal Author's Statement .... 62
12 DATA VERIFICATION.... 63
12.1 Data Validation .... 64
12.2 Independent Verification Samples .... 65
12.3 Independent Geological Logging.... 66
12.4 Principal Author's Statement .... 66
13 MINERAL PROCESSING AND METALLURGICAL TESTING .... 68
13.1 Hamama West Deposit Testwork .... 68
13.1.1 Direct Cyanidation ....68
13.1.2 Conclusions and Recommendations for Further Work....70
14 MINERAL RESOURCE ESTIMATE.... 71
14.1 Data Sources.... 71
14.2 Project Drillhole Database.... 71
14.3 Geology and Mineralisation Models.... 73
14.3.1 Lithology Domains....73
14.3.2 Mineralisation Domains....75
14.3.3 Weathering Domains ....75
14.4 Bulk Density.... 76

14.5 Compositing ........ 78
14.6 Statistical Analysis ........ 79
14.6.1 Basic Statistics ........ 79
14.6.2 Grade Outliers and Top Cuts ........ 83
14.7 Variography ........ 83
14.8 Block Model Definition ........ 85
14.9 Grade Estimation ........ 86
14.9.1 Search Neighbourhood Analysis ........ 87
14.9.2 Un-estimated Domains and Blocks ........ 88
14.9.3 Model Validation ........ 88
14.9.4 Mining Depletion ........ 92
14.10 Mineral Resource Classification ........ 92
14.10.1 Geological Continuity and Mineralised Volume Models ........ 93
14.10.2 Drill Spacing and Drill Data Quality ........ 93
14.10.3 Modeling Technique ........ 93
14.10.4 Conclusions ........ 93
14.11 Mineral Resource Statement ........ 94
14.12 Abu Marawat Deposit ........ 97
14.12.1 Geology and Mineralisation ........ 98
14.12.2 Exploration ........ 98
14.12.3 Drilling ........ 99
14.12.4 Sample Preparation and analysis ........ 99
14.12.5 Mineral Resource Estimate ........ 100
15 MINERAL RESERVE ESTIMATES ........ 101
16 MINING METHODS ........ 102
17 RECOVERY METHODS ........ 103
18 PROJECT INFRASTRUCTURE ........ 104
19 MARKET STUDIES AND CONTRACTS ........ 105
20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT ........ 106
21 CAPITAL AND OPERATING COSTS ........ 107
22 ECONOMIC ANALYSIS ........ 108
23 ADJACENT PROPERTIES ........ 109
24 OTHER RELEVANT DATA AND INFORMATION ........ 110
25 INTERPRETATION AND CONCLUSIONS ........ 111
25.1 Interpretation of Results ........ 111
25.1.1 Drilling and Geological Model ........ 111
25.1.2 Mineral Resource ........ 112
25.1.3 Metallurgy ........ 113
25.2 Conclusions ........ 113
25.3 Risks and Uncertainties ........ 114
26 RECOMMENDATIONS ........ 116
26.1 Hamama West Mineral Resource Development ........ 116
26.2 Hamama Prospect Exploration ........ 116
26.3 Regional Exploration ........ 117
26.4 Procedural and Data Management ........ 117

26.5 Work Program Budget ... 118
27 REFERENCES ... 119
28 DATE AND SIGNATURE PAGE ... 121
28.1 Certificates of the Qualified Persons ... 121

**LIST OF FIGURES**

Figure 4-1 Location of the Abu Marawat and Fatiri Concessions within the Arab Republic of Egypt ... 21
Figure 4-2 Location of Hamama within the Abu Marawat Concession ... 22
Figure 7-1 Property Scale Geological Setting ... 31
Figure 7-2 Hamama West - Local Geology ... 32
Figure 9-1 2008 Geophysical Survey – grid locations ... 35
Figure 9-2 2008 IP survey results (VMS grid) ... 36
Figure 9-3 2008 TMI survey results (2016 post-processing), with drill locations. ... 36
Figure 9-4 Location of Trenches and Rock Chip Channel Sampling. ... 37
Figure 10-1 Graph of core recovery (x-axis) vs. downhole depth (y-axis) for all measurements within the main oxide domain. ... 43
Figure 10-2 Graph of core recovery (x-axis) vs. downhole depth (y-axis) for the most recent PQ holes within the main oxide domain. ... 43
Figure 10-3 Relationship between core recovery and gold grade, all oxide domain. ... 44
Figure 10-4 Relationship between core recovery and gold grade, oxide domain greater than 15m below surface ... 44
Figure 10-5 Relationship between core recovery and gold grade, oxide domain for most recent PQ holes ... 44
Figure 10-6 Logging diamond drill core at the core farm ... 45
Figure 10-7 Hamama Drill Hole Location Plan ... 47
Figure 10-8 Hamama West Cross Section 533940E ... 47
Figure 10-9 Hamama West Cross Section 534280E ... 48
Figure 10-10 Hamama West Cross Section 534360E ... 48
Figure 10-11 Hamama West Cross Section 534430E ... 49
Figure 11-1 Accuracy and Precision Concept ... 53
Figure 11-2 Standards Plot for Gold – CDN-GS-1Q ... 56
Figure 11-3 Standards Plot for Gold – CDN-CGS-26 ... 56
Figure 11-4 Standards Plot for Gold – CDN-GS-2Q ... 57
Figure 11-5 Standards Plot for Silver – CDN-ME-11 ... 57
Figure 11-6 Standards Plot for Silver – CDN-GS-2Q ... 58
Figure 11-7 Blanks Plot for Gold ... 59
Figure 11-8 Flushing Samples Plot for Gold ... 59
Figure 11-9 Duplicates for Gold (2016 drilling) – Scatter and RPD Plot ... 60
Figure 11-10 Duplicates for Gold (2016 drilling) – Q-Q' Plot ... 60
Figure 11-11 Duplicates for Gold (2011-2015 drilling) – Scatter and RPD Plot ... 61
Figure 11-12 Duplicates for Gold (2011-2015 drilling) – Q-Q' Plot ... 61
Figure 12-1 Comparison of Original assay (half core) against independent assay (quarter core) for Au. 65
Figure 12-2 Comparison of Original assay (half core) against independent assay (quarter core) for Ag. 66
Figure 14-1 Hamama West lithology domains – plan view ... 74
Figure 14-2 Hamama West mineralised domains – oblique view looking NNE ... 74

Figure 14-3 Density histograms for mineralised Domain 101 – oxide ("1 101") and transitional ("2 101") ....77
Figure 14-4 Density histogram for mineralised Domain 102 – fresh ("3 102") ....77
Figure 14-5 Gold in Domain 101 (oxide) – Histogram and Log Probability Plot....81
Figure 14-6 Gold in Domain 102 (fresh) – Histogram and Log Probability Plot ....81
Figure 14-7 Silver in Domain 101 (oxide) – Histogram and Log Probability Plot ....82
Figure 14-8 Silver in Domain 102 (fresh) – Histogram and Log Probability Plot....82
Figure 14-9 Back-transformed variograms for gold for Domains 101 and 102 ....84
Figure 14-10 Back-transformed variograms for silver for Domains 101 and 102....84
Figure 14-11 Validation swath plot – Domain 101 for gold by Easting ....90
Figure 14-12 Validation swath plot – Domain 102 for gold by Easting ....90
Figure 14-13 Validation swath plot – Domain 101 for gold by RL ....91
Figure 14-14 Validation swath plot – Domain 102 for gold by RL ....91
Figure 14-15 Comparison between LUC and Panel OK estimates – Domain 102 (Au) ....92
Figure 14-16 Hamama West Mineral Resource Grade-Tonnage Curve (Gold)....95
Figure 14-17 Hamama West Mineral Resource Grade-Tonnage Curve (Gold equivalent) ....95
Figure 14-18 Hamama West Long-Section View – Resource coloured by Gold grade....96
Figure 14-19 Hamama West Long-Section View – Resource coloured by Silver grade ....97
Figure 14-20 Hamama West Long-Section View – coloured by Resource category....97

## LIST OF TABLES

Table 1-1 Indicated Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off....15
Table 1-2 Inferred Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off ....15
Table 1-3 Abu Marawat Inferred Mineral Resource....15
Table 1-4 Proposed Work Program Budget (USD) - Feb to Jul 2017 ....18
Table 4-1 Abu Marawat Concession corner point coordinates....21
Table 9-1 Zinc intersections from trench and rock chip channels (1% Zn cut-off) ....38
Table 9-2 Gold intersections from trench and rock chip channels (0.5 g/t Au cut-off)....39
Table 11-1 Quality Control Sample Methodology....51
Table 11-2 CRM Performance Summary - Hamama....55
Table 13-1 Intervals and Initial Assays ....69
Table 13-2 Bottle Roll Assays ....69
Table 13-3 Cyanidation Recovery Summary....69
Table 14-1 Summary of Drilling and Trenching campaigns for the Hamama Project....71
Table 14-2 Hamama Project Drilling Breakdown – Project History by Deposit....72
Table 14-3 Drill Hole Database Summary....72
Table 14-4 Hamama Domains – Mineralised and Unmineralised ....75
Table 14-5 Weathering Surfaces and Model Assignment....75
Table 14-6 Density Values Applied to Block Model....78
Table 14-7 Composite File Data Fields....79
Table 14-8 Listing of Mineralised Domain Codes & Composites ....79
Table 14-9 Summary Statistics for 2m Composites by Domain - Uncut Gold....79
Table 14-10 Summary Statistics for 2m Composites by Domain - Uncut Silver ....80

Table 14-11 Mineralisation Domains and High-Grade Assay Capping ....83
Table 14-12 Variogram Parameters....84
Table 14-13 Block Model Definition Summary ....85
Table 14-14 Block Model Attributes....86
Table 14-15 Estimation Domains for Hamama West....88
Table 14-16 Volumetric Comparisons for all mineralised domains ....89
Table 14-17 Gold – composite grade vs. estimated mean grades for classified resource ....89
Table 14-18 Silver – composite grade vs. estimated mean grades for classified resource....89
Table 14-19 Indicated Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off ....94
Table 14-20 Inferred Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off ....94
Table 14-21 Inferred Mineral Resource by Weathering Type: Above 0.5g/t Au_equiv cut-off....94
Table 14-22 Abu Marawat Drilling Summary – Alexander Nubia drillholes ....99
Table 14-23 Abu Marawat Inferred Mineral Resource....100
Table 26-1 Proposed Work Program Budget (USD) - Feb to Jul 2017....118

## GLOSSARY OF ABBREVIATIONS AND DEFINED TERMS

| | |
|---|---|
| $ | US dollars |
| % | Percentage |
| 3D | Three dimensional |
| µm | Micrometre |
| ACV | average coefficient of variation |
| Ag | The chemical symbol for the element silver |
| Andesite | An extrusive volcanic rock of intermediate composition |
| Ankerite | A mixed calcium, iron, magnesium, manganese carbonate mineral |
| Argillaceous | A group of fine grained sedimentary rocks, including clays, shales, mudstones, siltstones and marls |
| Argillic | Of or relating to clay or clay minerals |
| Arsenopyrite | An iron arsenic sulphide |
| As | The chemical symbol for the element arsenic |
| ASTER | Advanced Spaceborne Thermal Emission and Reflection Radiometer |
| Au | The chemical symbol for the element gold |
| Au_equiv | Gold equivalent of gold plus silver, relative to their commodity prices |
| Brecciated | Describes a rock composed of broken angular fragments, often indicating the presence of a fault zone |
| Chalcopyrite | A copper iron sulphide mineral |
| Chrysocolla | A hydrated copper phyllosilicate mineral |
| Conglomerate | A sedimentary rock made up of various sizes of rounded rock fragments, ranging from pebbles to boulders cemented together by a finer grained matrix |
| CRM | Certified Reference Material |
| Cu | The chemical symbol for the element copper |
| DD | Diamond Drill (Hole) |
| DEM | Digital Elevation model |
| Disseminated | Mineralisation carrying fine particles scattered throughout a rockmass |
| E | Easting coordinate |
| EGSMA | Egyptian Geological Survey and Mining Authority |
| EMRA | Egyptian Mineral Resource Authority |
| FW | Footwall |
| GPS | Global positioning system |
| $g/cm^3$ | grams per cubic centimetre |
| g/t | grams per tonne |
| HQ | diamond drill core size (63.5mm core diameter) |
| HW | Hanging wall |
| ISO | International Organisation for Standardisation |
| ICP | Inductively coupled plasma; analytical technique |
| kg | Kilogram |
| kL | Kilolitre |

| | |
|---|---|
| km | Kilometres |
| koz. | Thousands of ounces |
| Lithology | General rock description based usually on hand specimen |
| LUC | Localised Uniform Conditioning – a non-linear estimation method |
| m | Metre |
| $m^3$ | Cubic metre |
| Ma | Millions of years |
| Massive | A term used to describe a large occurrence of a pure mineral species, often with no structure |
| Mineralisation | The presence of minerals of possible economic value or the description of the process by which the concentration of valuable minerals occurs |
| mm | Millimetre |
| MMI | Mobile Metal Ions – exploration analytical technique |
| Mo | The chemical symbol for the element molybdenum |
| Mt | Million tonnes |
| Mtpa | Million tonnes per annum |
| N | Northing coordinate |
| NSR | Net Smelter Return – net revenue received from the sale of a mine's commercial products, less transportation and refining costs |
| OK | Ordinary Kriging – a linear estimation method |
| Pb | The chemical symbol for the element lead |
| PQ | diamond drill core size (85mm core diameter) |
| ppm | Parts per million (same as grams per tonne) |
| QAQC | Quality assurance / Quality Control |
| Q-Q' plots | A probability plot which is a graphical method for comparing two probability distributions by plotting their quartiles (or other quantiles) against each other |
| RC | Reverse Circulation percussion drilling |
| RPD | Graph of relative paired difference between datasets |
| RQD | Rock quality designation, a quantitative estimate of rock mass quality from recovered drill core |
| RL | Reduced level (same as elevation coordinate) |
| S | The chemical symbol for the element sulphur |
| Sandstone | A sedimentary rock consisting of sand size grains, generally the mineral quartz, which is in a consolidated mass |
| Sb | The chemical symbol for the element antimony |
| SMU | selective mining unit |
| Silica | A compound of silicon and oxygen, generally occurring in the form of mineral called quartz |
| Stratiform | Describes a layered or tabular shaped body of mineralised rock that is aligned parallel to bedding |
| Surpac | A proprietary computer program developed to model, view, analyse and report on geological and mining data |

| | |
|---|---|
| SWIR Spectrometer | Remote sensing tool calibrated for use in the Shortwave Infrared range of the electromagnetic spectrum |
| T | Tonne |
| Tuff | General term for volcanic rocks that consist of fine to coarse grained fragmental material thrown into the air by explosive volcanic activity, as opposed to being formed by extrusion of molten lava |
| URM | Un-certified reference material, such as an un-mineralised sand used a Blank or a quartz flush |
| USD | US Dollars |
| UTM | Universal Transverse Mercator geographic coordinate system |
| VMS | Volcanogenic Massive Sulphide (deposit) |
| Whittle | A proprietary computer program developed to analyse potential open pit mining shells |
| XRF analyser | X-Ray Fluorescence – semi-quantitative method for mineral estimation |
| Zn | The chemical symbol for the element zinc |

# 1 SUMMARY

Cube has prepared this independent technical report for Aton Resources Inc. following the release of a maiden Mineral Resource estimate at the Hamama West mineral deposit, which lies within Aton's Abu Marawat Concession in the Arab Republic of Egypt.

Aton Resources Inc. was formerly named Alexander Nubia Inc. (Aton Resources, 2016).

The report complies with the requirements of the Canadian National Instrument 43-101, "Standards of Disclosure for Mineral Projects" for reports filed under Canadian jurisdiction.

This report has been compiled by Matt Bampton (the "**Principal Author**"), a Senior Consultant Geologist with Cube and a Qualified Person under NI 43-101, and is independent of Aton Resources Inc.

## 1.1 Property Location and Description

The Hamama West Project is located in the Central Eastern Desert of Egypt, approximately 450km to the south-southeast of Cairo, and is located within Aton's Abu Marawat Concession, which lies between latitudes 26°18' and 26°34' N, and between longitudes 33°19' and 33°46' E, and is 738.8 km$^2$ in area.

The Hamama West mineral deposit is centred at approximately 26°20'37" N and 33°20'33" E.

In 2007 Alexander Nubia Inc. negotiated an exploration and mining agreement, the Concession Agreement – Abu Marawat ("**CAAM**"), with the Egyptian Mineral Resource Authority ("**EMRA**") and the Egyptian Government, to have the sole right to explore and exploit gold and associated minerals in the Abu Marawat Concession. The CAAM was declared into Law 96 of 2007 with an Effective Date of September 27, 2008, pursuant to which Alexander Nubia Inc. has the sole right to explore and develop gold and associated mineral deposits within the concession area.

An initial exploration period of one year was given to Alexander Nubia Inc. with an option to renew for two successive periods of two years each, with a possibility of a further extension of six months for the last exploration period subject to EMRA's approval, providing Alexander Nubia Inc. meets its minimum financial obligations for each exploration phase. Alexander Nubia Inc. entered into Phase II of the Exploration period of the CAAM as of 28 July, 2010.

Alexander Nubia Inc. applied for *force majeure* as per Article (22) of the CAAM to be effective as of January 25, 2011 received by EMRA on April 3, 2011 and acknowledged by letter dated May 23, 2011. A First Extension Period to the Concession commenced on July 29, 2010, as per Meeting Minutes between EMRA and Alexander Nubia dated November 1, 2010. A Second Extension Period to the Concession commenced on August 1, 2016, as per Letter from EMRA to Alexander Nubia dated August 8, 2016.

To date, the expenditure obligations under the CAAM have been met.

The agreement proscribes various conditions relating to customs duties, any taxes, levies or fees (including income taxes and sales taxes), the right to freely export "ore concentrate, gold or Associated Minerals" produced from the Area, royalties to the Egyptian government, recovery of certain expenditures, equity of production after royalty payments and cost recoveries, and additional payments relating to approval of exploitation leases, extensions of exploration periods, and for an EMRA training budget.

To the extent known, the Project is not subject to any environmental liabilities, or by any other factors that would affect access, title, or the right or ability to perform work on the properties, which would be considered as abnormal to established exploration work practices in the local and regional setting. Aton has secured all necessary permits to conduct the planned exploration programs on its properties.

## 1.2 Geology and Surface Mineralisation

Mineralisation at Hamama consists of primary hypogene sulphide mineralisation overlain by an oxidised zone of gold-bearing gossan. Outcrop mapping and drilling have defined the deposit with a strike length of 800m, an average width of around 60m, outcropping at surface and with an average drill-intersected depth of 120m below surface. The sulphide mineralisation is dominated by abundant disseminated, stringer and blebby pyrite, often associated with lesser amounts of sphalerite, and rare chalcopyrite and galena. The mineralisation is interpreted as being VMS-style mineralisation in origin, although without any classic massive sulphide mounds identified to date. It is interpreted that the deposit formed in a shallow water VMS-epithermal transitional environment, as evidenced by the presence of pillow lavas through the footwall andesitic sequence. Epithermal textures can be seen in the mineralised felsic volcanics, possibly representing an emergent volcanic environment. Alteration associated with the sulphide mineralisation is dominated by silica and carbonate, usually ferroan-dolomite. In places silica-carbonate flooding appears to be so intense that the original textures of the host lithologies have been completely obliterated.

The top of the deposit is characterised as a 30-40m thick gossanous zone of weathered and oxidised material. This zone is quite variable and consists of ruddy to reddish-brown to yellow iron oxide and clay rich material. There are preferentially weathered zones which originally had a high sulphide content; zones of less weathered greyish-brown silica-carbonate altered felsic volcanics; and more limited patches of friable gossanous material. Gold and silver are enriched in the uppermost 3-5m of the profile. This surface enrichment is likely to be caused by supergene, or deflationary and erosional processes, or a combination of both.

The current interpretation is that the Hamama West deposit displays many of the characteristics of the 'VMS-epithermal hybrid' sub-class of Volcanogenic Massive Sulphide deposits, which includes deposits such as LaRonde-Penna and Bousquet in Quebec, Eskay Creek in British Columbia, and Henty and Mount Lyell in Tasmania.

## 1.3 Exploration Results

### 1.3.1 Hamama and Hamama West

Initial exploration in the Hamama area was focussed on two separate geophysical surveys conducted in 2008. The Hamama QT geophysical survey grid was designed to test the response around a north-south trending quartz-hematite vein system exposed in ancient workings at Hamama North. The IP survey results were further post-processed in 2016. The Hamama VMS grid was designed to test the silica-carbonate altered mineralised horizon in the Hamama East and Central areas that had previously been drill tested by Minex in 1988. No direct resistivity correlation was attributable to zones of higher chargeability. In the Hamama VMS survey the background chargeability response was the same as on the adjoining Hamama QT grid to the west. The geophysical response is dominated by a complex north-easterly trending strongly anomalous chargeability zone, which is associated with a similarly trending strong magnetic high, located in the hangingwall of a mineralised horizon. The survey also identified a large resistivity low in the centre of the grid, bounded to the north-west by the trace of an interpreted long narrow quartz vein, and to the south-east by the surface expression of the mineralised horizon.

In 2012, Aton started an extensive programme of detailed traverse fact mapping, trenching and rock chip channel sampling. To date Aton has completed a total of 65 deep excavator dug trenches, and 76 hammer sampled rock chip channel traverses. Encouraging assay results from the first phase of hammer sampled rock chip channel sampling led to a follow-up phase of diamond drilling at Hamama West in 2012, which resulted in the discovery of the Hamama West mineralisation.

### 1.3.2 Other Areas

Exploration by Aton in the Abu Marawat Concession commenced in 2008 and consisted initially of geological mapping and prospecting. A ground geophysical survey was also undertaken over 5 areas within the Abu Marawat Concession between April-July 2008, consisting of pole-dipole induced polarization (IP) and ground magnetic methods. Areas surveyed included Abu Marawat, the Hamama VMS and Hamama QT areas, and the Miranda South and Miranda North prospects.

Prior to 2012, the large majority of Aton's exploration effort was focussed on the Abu Marawat project. Exploration activities at Abu Marawat included geological fact mapping; surface grab sampling, rock chip sampling, MMI and wadi geochemical sampling, and the excavation and sampling of deep trenches. In the late 1980s Minex had drilled 34 diamond and 220 reverse circulation percussion drill holes at the prospect, and results of this drilling were followed-up by Aton, who drilled a total of 81 diamond drill holes up to 2012. This led to the release of a maiden mineral resource estimate (Valliant & Salmon, 2012).

Apart from the Hamama and Abu Marawat projects, there are a number of priority exploration targets within the Abu Marawat Concession which have had limited geological mapping and surface and underground sampling. These include the Miranda, Semna and Sir Bakis prospects. Miranda (both North and South) was covered in the 2008 ground magnetics and IP survey. A pronounced north-south trending resistivity contact was identified at Miranda South, coincident with a large complex zone of higher chargeability, and surface workings. Semna and Sir Bakis were both mined for gold during the modern British mining era, and have been sampled underground in the old workings.

A remote sensing study, comprising ASTER and Landsat 7 alteration mapping and photogeological interpretation was initiated during 2016, to aid with target generation and definition over the Abu Marawat Concession. This will be followed up with a more detailed remote sensing study using high resolution WorldView-3 multispectral data to be acquired in early 2017.

## 1.4 Sample Preparation, Analyses and Data Verification

A total of 9,704m of DD drilling has been completed in 96 HQ and PQ gauge drillholes since Aton (then Alexander Nubia) commenced drilling in December 2011 on the overall Hamama prospect.

Drilling, sampling, downhole surveying, quality control and logistical methods generally met industry standards, although documentation of information from the 2011-2015 drilling programs was sometimes poor.

The sample collection and preparation, analytical techniques, security and QAQC protocols implemented by Aton for the Project are generally consistent with standard industry practice, and are suitable for the purpose of mineral resource estimation and the reporting of exploration results. The insertion rates for certified and uncertified reference materials and duplicates are on the low side and should be increased in future drilling campaigns. The sampling procedures are adequate for and consistent with the understanding of the style of gold and silver mineralisation.

Core recovery was very good within the fresh, sulphide mineralisation and in lithological units out of the main gossan horizon at Hamama West, but there were poor ground conditions encountered within the weathered profile of the mineralised horizon, which reduced the average core recovery, and has implications for sample quality and confidence in these oxidised zones. Improvements in core recovery have occurred during the 2016 drilling campaign, with a switch to PQ size equipment, shorter drill runs, optimised drilling muds, cementing the top of the holes, and a more experienced diamond drilling team.

## 1.5 Mineral Resource Estimate

The Mineral Resource estimate incorporates all diamond drilling completed by Aton since 2011 over the Hamama West deposit (being the western part of the Hamama prospect area), and is also informed by a range of other geological information, including from trenches and outcrop geological mapping, a dataset of bulk density measurements taken from whole core samples, a topographic survey file of the project, and various preliminary geological interpretations from field personnel.

A geological interpretation was completed to establish the underlying geological framework and controls on mineralisation, and to incorporate components of an earlier interpretation by Aton geologists. Three dimensional wireframes were created for the major lithological, mineralisation and weathering domains, and 2m downhole composites of assay data were extracted within key domains. Basic statistics and geostatistics were examined for 5 key mineralised domains for gold, silver, copper, lead and zinc, and this analysis led to the application of high grade assay cuts for silver and zinc in some domains.

Variography and evaluation of suitable estimation parameters based on the final variogram models was undertaken using a commercial software package, and an appropriate search strategy and estimation block size was determined. Estimation was performed in a three dimensional block model, with the primary grade estimation method using Localised Uniform Conditioning for gold and silver in the main mineralised zones. Grade interpolation for the other elements (Cu, Pb, Zn) in the main mineralised zones, and all five elements in the two minor mineralised zones, was by Ordinary Kriging.

After routine block model validation processes were conducted and analysed, and taking into account the areas where the Hamama West mineralisation has been sufficiently drilled, the block model was considered suitable to allow classification of a component of the mineralisation as Indicated and Inferred Mineral Resources. A number of criteria were considered when assessing the mineral resource classification, including the continuity and volume of the mineralised domains, drill spacing and drill data quality (including the zones in the oxidised material of often poor core recovery), independent verification sampling from diamond drill core, analysis of the QAQC data, suitability of estimation methodology and local estimation bias.

The block model was assessed for the likelihood of the mineralisation having reasonable prospects of eventual economic extraction. The assessment included factors such as commodity pricing, potential processing methods, potential mining methods, preliminary metallurgical test work results, and level of geological knowledge of the project. As a result of this assessment process, estimated blocks that did not meet the criteria remained as unclassified and were not included in mineral resource reporting. A final cut-off grade of 0.5 g/t gold equivalent was used based on criteria including a $1,250/oz. gold price and silver:gold ratio of 70:1 for reporting of Indicated and Inferred Mineral Resources.

The Hamama West Mineral Resource as at 24 January, 2017 is reported to a maximum vertical depth of approximately 195m below surface. It has been tabulated separately by resource category (Table 1-1 and Table 1-2).

**Table 1-1 Indicated Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off**

| Classification | Domain | Density | Tonnes | Grade | | | Contained Metal | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (g/cm$^3$) | (t) | Au (g/t) | Ag (g/t) | Au_equiv (g/t) | Au (koz.) | Ag (koz.) | Au_equiv (koz.) |
| Indicated | FRESH | 3.0 | 3,805,000 | 0.72 | 27.6 | 1.12 | 88 | 3,376 | 137 |
| | **TOTAL** | **3.0** | **3,805,000** | **0.72** | **27.6** | **1.12** | **88** | **3,376** | **137** |

**Table 1-2 Inferred Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off**

| Classification | Domain | Density | Tonnes | Grade | | | Contained Metal | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (g/cm$^3$) | (t) | Au (g/t) | Ag (g/t) | Au_equiv (g/t) | Au (koz.) | Ag (koz.) | Au_equiv (koz.) |
| Inferred | OXIDE (surface) | 2.4 | 220,000 | 1.63 | 19.9 | 1.92 | 12 | 141 | 14 |
| | OXIDE | 2.57 | 2,360,000 | 0.80 | 28.9 | 1.22 | 61 | 2,193 | 93 |
| | FRESH | 3.0 | 5,360,000 | 0.87 | 30.4 | 1.30 | 157 | 5,503 | 235 |
| | **TOTAL** | **2.85** | **8,210,000** | **0.87** | **29.7** | **1.29** | **230** | **7,836** | **341** |

## 1.5.1 Abu Marawat Mineral Resource Estimate

Also within the Abu Marawat Concession is the Abu Marawat Deposit, approximately 35km north-east of Hamama West. In 2012 a Mineral Resource for the Abu Marawat Deposit was estimated by Roscoe Postle and Associates Inc. (Valliant and Salmon, 2012).

It is currently undetermined whether this deposit represents a project that would be developed separately or jointly to the Hamama West deposit.

The Abu Marawat Mineral Resource as at 1 March, 2012, is tabulated in (Table 1-3).

**Table 1-3 Abu Marawat Inferred Mineral Resource**

| Classification | Domain | Cutoff | Tonnes | Grade | | | |
|---|---|---|---|---|---|---|---|
| | | NSR ($/tonne) | (t) | Au (g/t) | Ag (g/t) | Cu (%) | Zn (%) |
| Inferred | **Open Pit** | US$20 | 1,636,000 | 2.11 | 34.01 | 0.70 | 1.37 |
| | **Underground** | US$50 | 1,243,000 | 1.27 | 23.14 | 0.85 | 0.87 |
| | **TOTAL** | | **2,879,000** | **1.75** | **29.3** | **0.77** | **1.15** |

## 1.6 Interpretations and Conclusions

Aton has discovered significant gold mineralisation beneath an outcropping gossanous alteration zone at Hamama on the Abu Marawat Concession. The discovery has been subjected to several years of active exploration activities, and together with the gold and base metal deposit at Abu Marawat demonstrates the potential of the Concession to host significant gold mineralisation.

Exploration by Aton in the Abu Marawat Concession commenced in 2008 and consisted initially of geological mapping, prospecting and geophysical surveys. The majority of the exploration effort was focussed on the Abu Marawat project, and generation of a mineral resource estimate in 2012. In the Hamama area, Aton commenced an extensive programme in 2012 of detailed traverse fact mapping, trenching and rock chip channel sampling, with a follow up phase of diamond drilling at Hamama West which confirmed the discovery of the Hamama West mineralisation.

A total of 9,704m of DD drilling has been completed in 96 HQ and PQ gauge drillholes since Aton (then Alexander Nubia) commenced drilling in December 2011 on the overall Hamama prospect. A subset of this drilling was used to define the mineral Resource at Hamama West.

The principal conclusions reached relating to Hamama West and ongoing implications for future Mineral Resource delineation and exploration work are:

- The drilling, sampling, sample preparation, assaying and QA/QC procedures used at Hamama generally provide representative, unbiased analytical results, suitable for use in the estimation of Mineral Resources;

- A potential area of bias is associated with the variable and often poor core recovery in the oxidised zones. This creates a level of uncertainty which is reflected in the classification of the oxidised portion of the mineral resource as Inferred. A change in drilling methodology in 2016 improved the quality of the core available for sampling. These changes should be continued for future programs. Further improvements in quality of information should be achieved through the use of twinned diamond holes and comparison with a different drilling method (such as reverse circulation or sonic drilling);

- Based on data validation, independent data verification and QAQC review completed by Cube, the geological and assay database relating to the diamond drilling is considered to be of a good standard and suitable for the use in the estimation of Mineral Resources;

- The gold and silver mineralisation in the key domains was estimated using Localised Uniform Conditioning. This estimation methodology is considered an appropriate method for the estimation of local recoverable resources for these domains in this deposit;

- The validation procedures applied to the resource block model confirm that this model provides a suitable basis for the estimation of Indicated and Inferred Mineral Resources;

- The geological and structural model for the deposit will continue to evolve with ongoing exploration, and this will inform mineralisation models in any future mineral resource update. This current model provides a framework upon which to base the regional exploration program in the southwest of the Abu Marawat Concession;

- The deposit is not closed off along strike to the east or west, or down dip, so there is potential to extend the resource base by extensional drilling programs; and

- The level of metallurgical testwork to date is preliminary in nature. Samples have been gathered from near surface from excavated trenches, and are therefore not representative of the deeper oxide or primary mineralisation. The current testwork is considered to be indicative only as a ‘proof of concept' of the cyanidation process, but is not sufficiently accurate and representative to support more detailed processing and project studies.

## 1.7 Recommendations

On the basis of this technical report, and in consideration of Aton's operating strategy, the key items below are recommended.

### 1.7.1 Mineral Resource Development and Hamama Prospect Exploration

1. Plan and undertake a program of Reverse Circulation ("**RC**") percussion drilling to further test the oxide gold cap at Hamama West, with the specific aim of increasing the sampling quality, to increase the confidence of the resource estimate. This should include a combination of twin holes and infill holes, and extensional drilling to increase the potential resource base at depth and along strike.

2. Complete a program of high-quality mechanical saw-cut channel sampling of the excavated trenches at Hamama West, as a supplement to the RC drilling programs.

3. Mineralogical assessment, consisting of QEMSCAN bulk mineral analysis and XRD analysis, to identify the mineral species and metal deportment in the geo-metallurgical domains identified logged from the drill core.

4. Metallurgical testwork, including bottle roll tests to further identify and characterize the mineral recovery parameters for each domain, to provide key data on reagent consumption (especially lime and cyanide), and investigation of material strength (Bond Work Indices) to determine crushing and milling characteristics for the key mineralisation domains.

5. Complete reprocessing and reinterpretation of the 2008 geophysical survey (IP and ground magnetics) over the Hamama VMS Grid and QT Grid areas.

6. Collect ground EM and magnetic geophysical data over the entire strike length of the mineralized target horizon. Acquire and collect downhole EM data from existing selected deep drillholes.

7. Plan and undertake a regional geochemical and alteration mapping study of the general Hamama area. This will include lithogeochemistry (whole rock and trace elements) of drilling and trench samples, as well as surface samples. Re-evaluation of the existing drilling database and review of geochemical data currently available, and drill test selected targets using RC or diamond drilling as appropriate.

### 1.7.2 Regional Exploration

8. Complete the ongoing Landsat 7/ASTER spectral and photogeological interpretation study, and generate a series of ranked targets. Acquire and process WorldView-3 satellite imagery to further delineate areas of potentially significant hydrothermal alteration from the enhanced multispectral data, and construct a Digital Elevation Model over the Abu Marawat-Semna area.

9. Complete reprocessing and reinterpretation of the 2008 geophysical survey (IP and ground magnetics) over the Abu Marawat and Miranda North / South areas.

10. Plan and undertake additional RC and/or diamond drilling at Abu Marawat.

11. Further field studies over the Abu Marawat-Miranda trend, including detailed field geological and alteration mapping, ground EM and magnetic geophysical surveys, geochemical exploration (stream sediment, wadi or MMI sampling), trenching and rock-chip sampling.

12. Introduce the use of portable, handheld XRF analysers or SWIR spectrometers.

### 1.7.3 Procedural and Data Management

The additional recommendations listed below are related to procedural improvements to the drilling, sample collection and data management procedures.

13. Bulk Density: Change the operating procedure to use wax coating or cling-film to seal the core prior to density determinations. This will adequately account for variations due to any void spaces (vugs/porosity), especially in the more weathered material. Re-measure a subset of the remaining half-core from drill holes in the 2015 campaign, as a check on the validity of those holes where the documentation or procedures used differ from the current ones.

14. QAQC: For all drilling samples, a regular campaign-based QAQC program of independent umpire laboratory analysis of mineralised drill intercepts should be implemented as a routine check on the precision of the primary laboratory. Introduce as routine practice the assaying of mineralised coarse reject duplicate samples at a reputable external laboratory. Ensure that sufficient CRM are available for future drilling programs, focusing on the grade ranges for Au and Ag that are typical of the grades from the deposit, especially around 0.5-1.0 ppm Au. Analyse some duplicates on the crushed core material by a Screen Fire Assay method, especially with respect to some of the higher gold and silver grades encountered. Revisit and correct the subset of CRMs in the database which were identified as sample mishandling or transcription errors and were excluded from the analysis.

15. Procedures: Compile written procedures for all functions such as drilling, downhole survey methodology, sample collection and QAQC analysis, to ensure that consistent high quality work practices are adhered to and maintained.

## 1.8 Work Program and Budget

To accomplish the project objectives and recommendations, a comprehensive work program has been proposed by Aton primarily focused on the Hamama West deposit and other areas immediately adjacent. The proposed budget and exploration drilling program detailed below in Table 1-4 covers a nominal 6 month period (ending July 2017).

**Table 1-4 Proposed Work Program Budget (USD) - Feb to Jul 2017**

| | Hamama / Hamama West | Abu Marawat | Regional |
|---|---|---|---|
| Drilling | 580,000 | 4,000 | 0 |
| Surveying | 17,000 | 17,000 | 0 |
| Sampling and assaying | 91,000 | 0 | 0 |
| Geophysics | 72,000 | 19,000 | 0 |
| Metallurgical Testwork | 22,000 | 0 | 0 |
| Consultants | 25,000 | 0 | 0 |
| Site Infrastructure | 45,000 | 0 | 25,000 |
| Technical Manning | 152,000 | 58,000 | 38,000 |
| Other | 375,000 | 86,000 | 67,000 |
| **Sub-Total (USD)** | **1,379,000** | **184,000** | **130,000** |
| **TOTAL (USD)** | **1,693,000** | | |

# 2 INTRODUCTION

## 2.1 Request for Technical Report and Purpose

Cube has prepared this independent technical report for Aton Resources Inc. following the release of a maiden Mineral Resource estimate at Hamama West, which is part of Aton's Abu Marawat Concession in the Arab Republic of Egypt.

The report complies with the requirements of the Canadian National Instrument 43-101, "Standards of Disclosure for Mineral Projects" for reports filed under Canadian jurisdiction.

This report has been compiled by Matt Bampton (the "**Principal Author**"), a Senior Consultant Geologist with Cube and a Qualified Person under NI43-101.

## 2.2 Sources of Information and Data

The Principal Author has relied on several sources of information on the Project area, including relevant published and unpublished third party information, and public domain data, a list of which is provided in Section 27 of this report.

This specifically includes information pertaining to an earlier NI43-101 Technical Report on the Abu Marawat Concession, pertaining mainly to the Inferred Mineral Resource at the Abu Marawat Deposit, prepared by Roscoe Postle Associates Inc. for Alexander Nubia International Inc. (Valliant & Salmon, 2012).

Aton has provided project specific information which has formed the technical basis of this report.

All units are metric unless otherwise stated.

## 2.3 Property Inspections by the Author

The Principal Author visited the Project between the 6$^{th}$ May and 11$^{th}$ May 2016, and again from 20$^{th}$ June to 27$^{th}$ June 2016. The main purposes of the site visits were to ascertain the geological setting, witness the extent of the exploration work undertaken by or on behalf of Aton, inspect and verify the drilling program that was in progress, assist with planning of infill drilling programs, and to collect independent core samples and verify their sample preparation and transport protocols from site to an independent international courier.

The Principal Author has not inspected the ALS Group ("**ALS**") laboratory in Roşia Montană, Romania (which has been used exclusively for assaying services).

# 3 RELIANCE ON OTHER EXPERTS

Cube has not independently investigated the tenement status of the Project or the requirements of Egyptian mining and exploration legislation. The Principal Author of this report is not qualified to provide comment on the legal issues associated with the Project, including any agreements, joint venture terms, environmental issues and the legal status of the exploration permits included in the Project.

Cube has relied on a Memorandum from Dentons Egypt LLC to Aton Resources titled "*Concession Agreement – Abu Marawat, Eastern Desert, A.R.E."* dated 2$^{nd}$ March 2017 (Dentons Egypt LLC, 2017), which has provided the bulk of the details on the current tenure and ownership status of the Abu Marawat Concession within which the Project lies, and relates to Sections 4.2, 4.3 and 4.4 of this Technical Report.

# 4 PROPERTY DESCRIPTION AND LOCATION

## 4.1 Project Location

The Project is located is located in the Central Eastern Desert of Egypt, approximately 450km to the south-southeast of Cairo, and is located within Aton's Abu Marawat Concession (Figure 4-1 and Figure 4-2), which lies between latitudes 26°18' and 26°34' N, and between longitudes 33°19' and 33°46' E, and is 738.8 km$^2$ in area. The Hamama West mineral deposit is centred at approximately 26°20'37" N and 33°20'33" E. Table 4-1 lists the corner point coordinates of the current Concession.

**Table 4-1 Abu Marawat Concession corner point coordinates**

| Point | Longitude (DMS) | Latitude (DMS) |
|---|---|---|
| 1 | 33° 19' 00" | 26° 18' 00" |
| 2 | 33° 25' 00" | 26° 18' 00" |
| 3 | 33° 25' 00" | 26° 19' 30" |
| 4 | 33° 40' 00" | 26° 19' 30" |
| 5 | 33° 40' 00" | 26° 23' 50" |
| 6 | 33° 46' 00" | 26° 23' 50" |
| 7 | 33° 46' 00" | 26° 34' 00" |
| 8 | 33° 35' 20" | 26° 34' 00" |
| 9 | 33° 35' 20" | 26° 28' 00" |
| 10 | 33° 29' 10" | 26° 28' 00" |
| 11 | 33° 29' 10" | 26° 25' 00" |
| 12 | 33° 25' 20" | 26° 25' 00" |
| 13 | 33° 25' 20" | 26° 22' 50" |
| 14 | 33° 22' 40" | 26° 22' 50" |
| 15 | 33° 22' 40" | 26° 25' 00" |
| 16 | 33° 19' 00" | 26° 25' 00" |

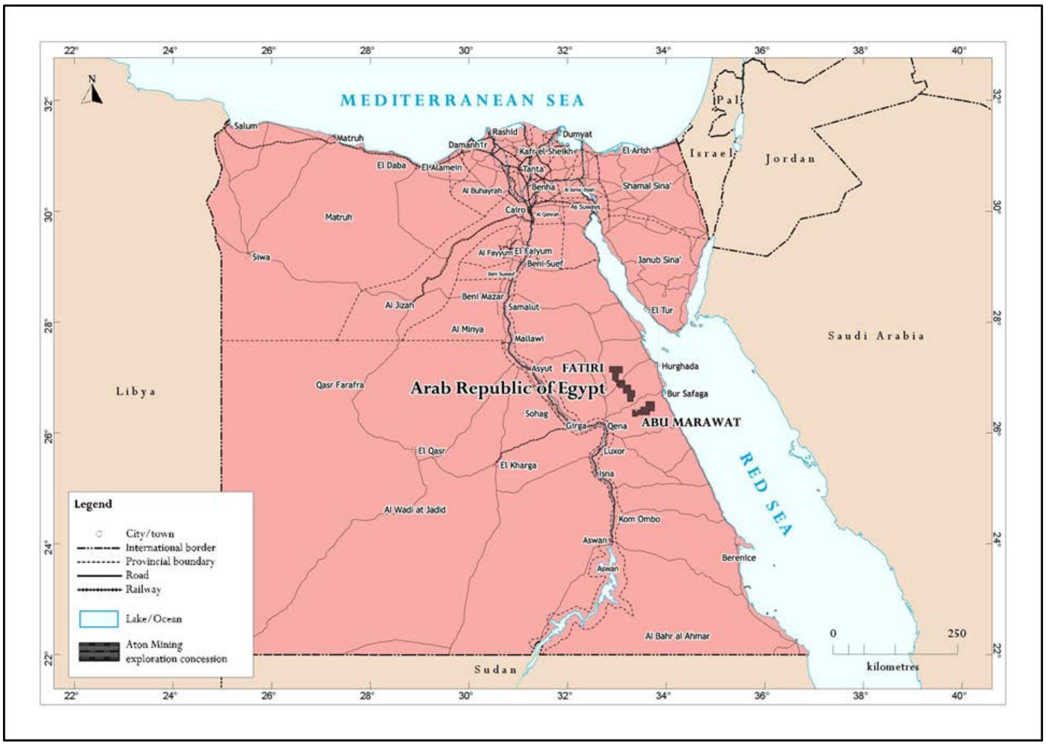


**Figure 4-1 Location of the Abu Marawat and Fatiri Concessions within the Arab Republic of Egypt**

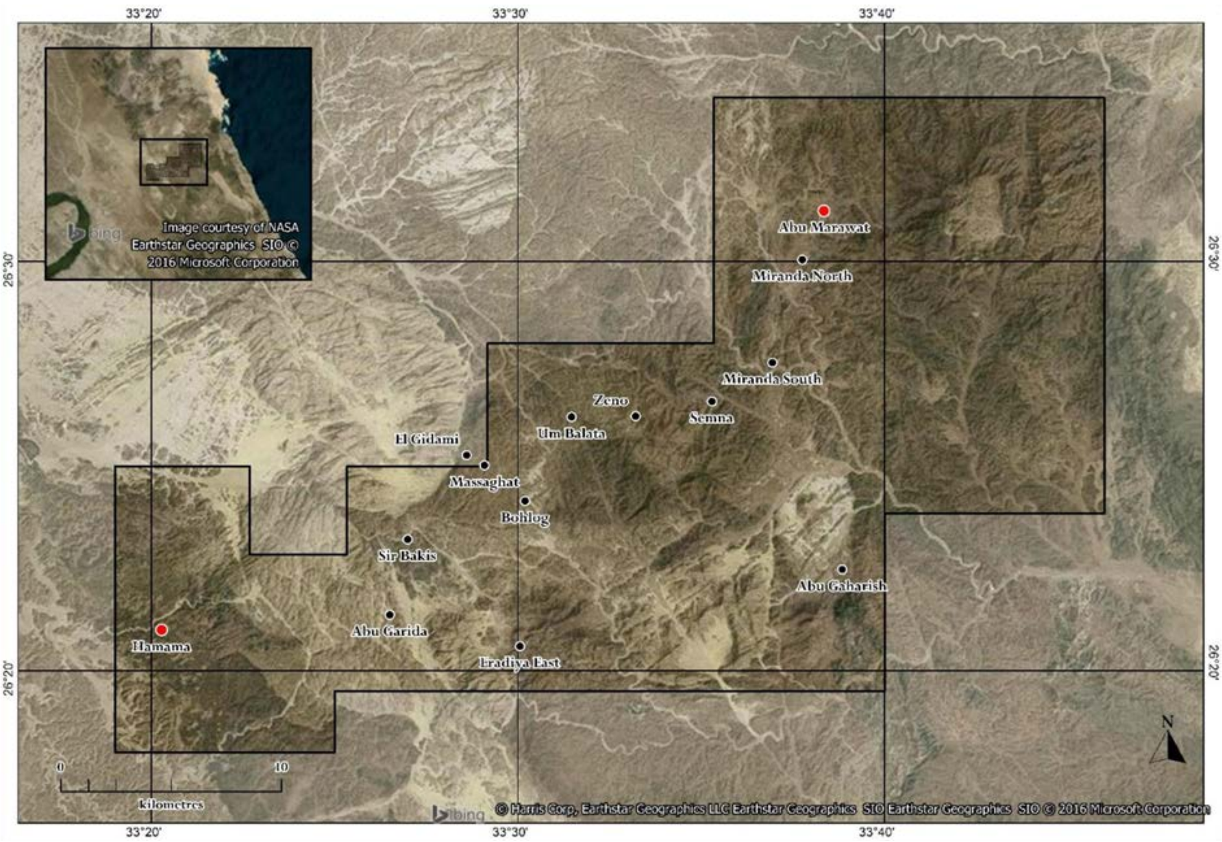


**Figure 4-2 Location of Hamama within the Abu Marawat Concession**

## 4.2 Mineral Tenure of the Project

The following is taken from information sourced for the Abu Marawat Concession as part of a recent legal review (Dentons Egypt LLC, 2017), supplemented by details from a separate NI43-101 Technical Report relating to the Abu Marawat Deposit (Valliant & Salmon, 2012).

Abu Marawat is an exploration concession that has been retained by law for a minimum period of five years and with an option to retain areas within the concession for an additional four years. At the end of each of the first and third years of exploration, the original concession area must be reduced by 25%. At the end of the fifth year, a commercial discovery (i.e. a prospective area that has characteristics of a viable deposit but needs further definition) needs to be defined.

Those area or areas not converted into an Exploitation Lease shall be relinquished with the exception of the Retained Areas. Alexander Nubia Inc. may continue to explore the Retained Areas not converted into an Exploitation Lease by way of two extension period(s) of two years each. A one-time payment to EMRA of USD1,000/km$^2$ to hold those lands retained is required and for an additional two year period, the Company is required to make a one-time payment of USD2,000/km$^2$.

In 2007 Alexander Nubia Inc. negotiated an exploration and mining agreement, the Concession Agreement – Abu Marawat ("**CAAM**"), with the Egyptian Mineral Resource Authority ("**EMRA**") and the Egyptian Government, to have the sole right to explore and exploit gold and associated minerals in the Abu Marawat Concession. The CAAM was declared into Law 96 of 2007 with an Effective Date of September 27, 2008, pursuant to which Alexander Nubia Inc. has the sole right to explore and develop gold and associated mineral deposits within the concession area.

An initial exploration period of one year was given to Alexander Nubia Inc. with an option to renew for two successive periods of two years each, with a possibility of a further extension of six months for the last exploration period subject to EMRA's approval, providing Alexander Nubia Inc. meets its minimum financial obligations for each exploration phase. Alexander Nubia Inc. entered into Phase II of the Exploration period of the CAAM as of 28 July, 2010.

As mutually agreed upon by EMRA, and Alexander Nubia Inc., and with the approval of the Minister of Petroleum and Mineral Resources ("**MoP**"), such area(s) shall be converted into an Exploitation Lease. The exploitation period is for twenty years from the date of signature of the first Exploitation Lease and is renewable for a period not to exceed ten years for reasonable commercial justification and subject to the approval by the MoP.

Alexander Nubia Inc. applied for *force majeure* as per Article (22) of the CAAM to be effective as of January 25, 2011 received by EMRA on April 3, 2011 and acknowledged by letter dated May 23, 2011. A First Extension Period to the Concession commenced on July 29, 2010, as per Meeting Minutes between EMRA and Alexander Nubia dated November 1, 2010. A Second Extension Period to the Concession commenced on August 1, 2016, as per Letter from EMRA to Alexander Nubia dated August 8, 2016.

To maintain the property in good standing, Alexander Nubia Inc. is obligated to spend a minimum of:

- USD600,000 during the Initial Period;
- USD2,000,000 during the first Extension Period; and
- USD3,000,000 during the second Extension Period.

If an amount is spent more than the minimum amount required to be spent during the Initial Period or during the first Extension Period, the excess expenditure shall be deducted from the minimum amount to be spent during any succeeding exploration period(s). In the event that less than the minimum expenditure amount is spent during any of the exploration period, then an amount must be paid to EMRA equal to the difference between the minimum expenditure during that exploration period and the actual expenditure spent during that exploration period.

In case of a commercial discovery and conversion of an area of the Concession into an exploitation lease with commercial production, then there shall be an entitlement to recover any such payments as exploration expenditure, as per specific provisions of the CAAM (to the extent and out of 25% of all gold and associated minerals produced and saved from the exploitation leases).

To date, EMRA has approved contractor expenditures (on the two concessions Abu Marawat Concession and the Fatiri Concession) for USD 7,127,437.90 - plus part of USD 148,928. An aggregate of USD 3,383,465.68 is pending EMRA approval as exploration expenditure. Therefore the expenditure obligations under the CAAM have been met.

Alexander Nubia Inc. (and their associated contractors) are exempted from customs duties, any taxes, levies or fees or sales taxes that may be imposed in the Arab Republic of Egypt when importing machinery and equipment in the territory of the Arab Republic of Egypt. In addition, Alexander Nubia Inc. is exempt from the payment of Egyptian income taxes for the duration of the Agreement. Alexander Nubia Inc. and their respective buyers shall have the right to freely export "ore concentrate, gold or Associated Minerals" produced from the Area pursuant to this Agreement; no license shall be required, and such "ore concentrate, gold or Associated Minerals" shall be exempted from any customs duties, any taxes, levies or any other imposts in respect of the export of "ore concentrate, gold or Associated Minerals".

The Egyptian Government is entitled to a royalty of three per cent (3%) of the total quantity of gold and associated minerals produced after refining, less 50% of all costs related to the delivery of any gold delivered in kind for the payment thereof.

Alexander Nubia Inc. is entitled to recovery of all Exploration Expenditures, Exploitation Expenditures, and Operating Expenditures, at a rate of 20% per year in the case of Exploration and Exploitation Expenditures, and 100% per year in the case of Operating Expenditures of the cumulative balance in each of these categories.

- "Exploration Expenditures" are defined in the CAAM as all costs, expenses for exploration and the related portion of indirect expenses and overheads.
- "Exploitation Expenditures" are defined in the CAAM as all costs and expenses for exploitation, including replacement of assets or part of an asset, additions, improvements, renewals or major overhauling that extend the life of the asset and the related portion of indirect expenses and overheads together with interest with the exception of Operating Expenditures.
- "Operating Expenditures" are defined in the CAAM as all costs, expenses and expenditures made after commercial production that are costs, expenses and expenditures not normally depreciable.

The annual recovery limit defined above is further limited each year by the following:

- 25% of the value of all gold and associated minerals produced for Exploration Expenditures (“Exploration Cost Recovery Gold”); and
- 30% of the value of all gold and associated minerals produced for Exploitation Expenditures and Operating Expenditures (“Exploitation Cost Recovery Gold”).

To the extent that, in any given year there are excess recoverable Exploration and/or Exploitation and/or Operating Expenditures, such excess can be carried forward for cost recovery in the next succeeding year(s) until fully recovered, but not after the termination of the CAAM.

After royalty payment and all cost recoveries, the remaining percentage of total production of gold and associated minerals shall be divided 50% between each Party.

For any given year that the allowable Exploration Cost Recovery Gold or Exploitation Cost Recovery Gold exceeds the Exploration or the Exploitation expenditures and Operating Expenses, the difference (defined in the CAAM as “Excess Gold”) is to be split 60% for EMRA and 40% for Alexander Nubia Inc.

Alexander Nubia Inc. is obligated to make the following additional payments to EMRA at various project milestones:

- upon the approval of each exploitation lease the sum of USD150,000;
- For an extension of the Exploitation Period of 10 years, USD100,000;
- an EMRA training budget of 2% of exploration expenditures during exploration periods; and
- an EMRA training budget of 0.75% of exploitation expenses, up to a maximum of USD375,000.

## 4.3 Environmental Liabilities

To the extent known, the Project is not subject to any environmental liabilities.

## 4.4 Permits Required for Proposed Work Program

The Exploration Permits are the key permits required to conduct the proposed work program and all of these are in place for the properties upon which work is planned.

## 4.5 Other Factors and Risks

To the extent known, the Project is not affected by any other factors that would affect access, title, or the right or ability to perform work on the properties, which would be considered as abnormal to established exploration work practices in the local and regional setting.

Aton has secured all necessary permits to conduct the planned exploration programs on its properties.

# 5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE & PHYSIOGRAPHY

## 5.1 Accessibility

The Abu Marawat Concession is located approximately 400 km to the south-southeast of Cairo. The nearest commercial airports are located at Hurghada and Luxor, both approximately one hours' flight from Cairo. From Hurghada, access to the site is south along an asphalt highway towards the port of Safaga for 57 km. Beyond Safaga, Highway 77 is followed 102 km westwards towards Qena. From Luxor, the site is accessed by taking the Luxor-Qena highway north for 64 km, before turning eastward on Highway 77 for 45 km. The turnoff for the Hamama camp is clearly marked on Highway 77, and Hamama is accessed via a well graded gravel track that runs east for 31 km along Wadi Abu Garida.

## 5.2 Climate

The project is located in the central Eastern Desert of Egypt between the Nile River Valley and the Red Sea. The project site has an extremely arid climate with very little rainfall. Average annual rainfall along the Egyptian Mediterranean coast is approximately 200mm per annum, whereas inland the average annual rainfall is about 25mm. Average annual rainfall in Luxor is only 1mm, with an average of 1.9 precipitation days per year. Although rainfall at Hamama is an exceedingly rare event, flash floods are a risk and have been observed at both the Hamama and Abu Marawat camps during the winter of 2015. The summers are hot with daytime temperatures averaging between 27°C and 32°C, and regularly exceeding 40°C. The highest temperature recorded by Aton was 52°C in 2008 at the Abu Marawat camp. Winters are significantly cooler with daytime temperatures averaging between 15°C and 25°C, and occasionally reach lows of 3°C overnight. During spring or summer, the Khamaseen, a southerly wind, can cause sand or dust storms. Exploration activities can be undertaken throughout the year.

## 5.3 Local Resources and Infrastructure

The nearest population centre is the Nile city of Qena, which has a population of approximately 230,000. Skilled tradesmen and unskilled labour are available. Skilled tradesmen, including mechanics and electricians are also available from Safaga, Luxor and Aswan. Professional and supervisory staff roles have currently been filled from abroad or from Cairo.

A semi-permanent camp has been established at Hamama for exploration purposes, comprising a variety of large air-conditioned steel-framed tents, pre-fabricated cabins, and a selection of brick-built structures for the camp offices, stores, kitchen, accommodation and ablution blocks. Room for expansion at the current camp is limited.

Water is trucked in by tanker from Qena or Safaga and stored in a series of 5 kL heavy-duty plastic tanks for camp use, with a total capacity of 35 kL. During drilling, additional water is stored in a series of large tanks, with a further capacity of 85 kL. This is then pumped to an additional depot nearer to the drilling sites, which has a capacity of 20 kL. An additional tanker unit onsite has a capacity of 7 kL of fuel.

A number of small ancient mine workings exist at Hamama, dated from the New Kingdom, Ptolemaic, and early Arab era (Klemm & Klemm, 2013). Due to the very dry environment, dumps and tailings do not appear to be eroding or leaching.

The project lies close to current infrastructure that would facilitate possible future development. Within 20km of the Project, infrastructure includes the sealed Highway 77, high voltage electricity lines, and a low gradient railway bed 20 km from the Hamama deposit.

The infrastructure requirements for the current and planned exploration activities on the Project are minimal and operational requirements can be satisfied using local and regionally available materials and services. Power is self-generated. The surface rights granted by virtue of the provisions of the various items of legislation and the terms and conditions relating to the Concession are sufficient for the planned exploration activities. No other material permits or authorisations are required to execute the planned work program.

## 5.4 Physiography

Within the Abu Marawat Concession elevations range from ~350m above sea level in the wadis at the south-eastern property boundary, to over 1,000m in more mountainous areas in the central parts. Elevation in the Hamama area ranges from ~430m at Wadi Um Salamat, to the west of Hamama, to ~640m around Hamama East. The topography relates to an incised Palaeozoic peneplain unconformably overlain by low hills of flat-bedded Nubian Sandstone. Access through sandy and gravel-filled wadi areas is generally good, with a series of semi-maintained desert tracks crossing the Concession.

The Eastern Desert has exceedingly sparse vegetation, except in a few locations where water is available from wells. At Km85 on the Qena-Safaga highway, a large oasis contains plentiful date palms and grasses. There is also a disused well at Wadi Maghrabiyyah approximately 6 km southeast of the Hamama area.

# 6 HISTORY

## 6.1 Ancient Mining

Areas throughout Egypt's Eastern Desert have been mined in antiquity, with most workings dated from archaeological artifacts as belonging to the New Kingdom (~1550-1070BC), Ptolemaic (~300-30BC), and Early Arab (800-1000AD) periods (Klemm & Klemm, 2013). Individual sites may have been worked at multiple times throughout this time.

Historic workings in the Hamama area are scattered over an area of ~5km$^2$. The largest at Hamama North (referred to as Hamama I by Klemm & Klemm (2013), and dating to the New Kingdom and Ptolemaic Periods) consists of a 320m long zone of north-south striking trenches, from which a significant amount of vein material has been excavated. Spoil and mine waste in the local area contains abundant specular hematite and red-brown gossan. Other similar vein workings occur in the general Hamama area.

At Hamama East, a small adit has been driven a few tens of metres into the side of the hill, in a regionally mineralised horizon. Klemm and Klemm (2013) refer to this area as the Hamama II site, and suggest that it is of Early Arab Period age. Zinc and copper oxides occur as thin networks of veins, along with patches of gossanous material. Next to this adit are a collection of small rectangular huts which contain numerous shards of pottery, including occasional pieces of amphorae. Little mine waste exists in this area.

At Hamama West, there is relatively little evidence of ancient mining, apart from a few very small pits within a gossanous zone, over a strike length of approximately 70m. Several other small workings, possibly prospecting pits, are scattered around the area. They are usually associated with very small zones of quartz veining with malachite or chrysocolla.

## 6.2 Modern exploration – Hamama and Abu Marawat

The Egyptian Geological Survey and Mining Authority (EGSMA) completed a prospecting campaign in the region in the mid 1970's – consisting of geological traverses, trenching, channel and lump sampling – undertaken in conjunction with V/O Technoexport (USSR).

In March 1986, Minex Minerals Egypt Ltd ("**Minex**"), a wholly owned subsidiary of Greenwich Resources Plc, signed a concession agreement with EGSMA for gold and associated minerals over the 5,000 km$^2$ El Sid Concession, which covered the Hamama area, and from 1987 to 1989 conducted work on the property (Hall & McHugh, 1989). After a detailed literature review, Hamama was explored from 1987 onwards. Minex collected chip and surface grab samples before following up with a short drilling campaign. This consisted of 31 percussion holes (Hall *et al*., 1988) for which only poor quality skeletal drill logs are now available. Detailed assays are not available; a few general comments have been preserved on some intersections, described in Minex logs as "gossan". At least four diamond drill hole collars have been identified by Aton in the Hamama prospect area, but no records exist of who drilled the holes or what they contained. In 1990, Minex failed to develop an exploitation area or negotiate a favourable extension to their concession agreement and withdrew from the project.

In 1995, Centamin's wholly owned subsidiary, Pharaoh Gold Mines NL ("**PGM**") acquired a concession covering the Abu Marawat deposit, which also included the Hamama area. PGM at this time held several concessions in the Eastern Desert including one over the Sukari Project. From 1995 to 1997, PGM conducted reconnaissance geological mapping, prospecting, and sampling programs over their various concessions. The discovery of a world-class gold deposit at Sukari focussed PGM's activities in that area. PGM did not advance the Abu Marawat Concession to the exploitation level and it was relinquished, as part of the agreement with EGSMA to issue an exploitation licence at Sukari.

In 2007, Alexander Nubia Inc. negotiated a concession agreement with EMRA and the Egyptian Government. The Concession Agreement was declared into Law 96 of 2007, with the Effective Date of 27 September 2008, pursuant to which Alexander Nubia has the sole right to explore and develop gold and associated mineral deposits within the concession area. An exploration camp was constructed at Abu Marawat and a smaller field camp at Hamama, and Alexander Nubia began exploration activities, including detailed geological mapping over the entire Hamama area. 14 diamond drill holes were completed at Hamama West between December 2011 and November 2012, and a further 12 holes over the Hamama Central and Hamama East prospects.

A trenching and sampling programme was carried out over the entire Hamama area starting in 2012. Further trenching continued in 2014. Diamond drilling resumed at Hamama West in March 2015 with an additional 70 diamond drill holes completed by the end of August 2016, during two separate drilling campaigns. Most the company's exploration efforts during this period were concentrated on Hamama West, but Hamama Central and Hamama East were also briefly drill tested in 2015.

## 6.3 General

The Author is not aware of any NI 43-101 compliant Mineral Resource or Mineral Reserve estimates that have been completed by any parties prior to Aton's involvement in the Project area, or if there has been any recorded industrial era gold production from the Project area. Artisanal and historic exploitation of minor gold mineralisation is known to have occurred in various areas of the Project (roughly between 1550BC to 1000AD), mostly to the north and east of the area subject to this current Mineral Resource.

# 7 GEOLOGICAL SETTING AND MINERALISATION

The majority of this section has been compiled from information supplied by Aton, and the local geology has been confirmed by Cube's observations during the site visits in 2016.

## 7.1 Regional Geology

The Hamama deposit lies within the Eastern Desert in Egypt and is hosted within the Nubian portion of the Arabian-Nubian Shield. This is a predominantly Proterozoic-aged series of island arcs that were accreted between 1000Ma and 550Ma. On both sides of the Red Sea, these are represented as a series of volcano-sedimentary belts separated by narrow, sinuous belts of mafic and ultramafic rocks. These represent slivers of oceanic crust that were obducted during the early stages of plate collision. The volcano-sedimentary belts are typically dominated by extensive calc-alkaline andesitic volcanism with associated mafic to intermediate intrusive activity. These rocks have been regionally metamorphosed to lower greenschist facies, before being intruded by various tectonic or post-tectonic granitoids. In this regard, they share similarities with other greenstone terranes elsewhere in the world, such as older Archaean belts found in Canada, Zimbabwe, Brazil and Ghana (Hall & McHugh, 1989).

During the Palaeozoic, this area of the Eastern Desert was marked by a long period of peneplanation, when near surface or exposed Volcanogenic Massive Sulphide ("**VMS**") deposits in the shield developed their deep weathering profiles. Rifting occurred during the Cretaceous, leading to the deposition of the Nubian Sandstone, which is a succession of fluviatile/shallow marine conglomerates and sandstones, which unconformably overlies the Proterozoic rocks throughout the region. A later rifting event led to the opening of the Red Sea and the formation of the northwest-trending Najd Fault System. This period is associated with the formation of extensive evaporate sequences, the development of normal faulting and dolerite dyke emplacement.

## 7.2 Local and Property Geology

The Hamama area is located within an undifferentiated series of Neoproterozoic age metavolcanics, predominantly consisting of andesitic rock types (see Figure 7-1). Local geology at Hamama consists of a sequence of intermediate to felsic lavas and tuffs, overlain by tuffaceous sedimentary rocks with minor thin beds of jasper, chert and bedded pyrite. Numerous andesitic dykes and intrusives, probably sub-volcanic in nature, occur in the general area. These rocks were subsequently folded and faulted during the Pan-African Orogeny. Near the Hamama West deposit, the rock package has been overturned, dipping to the north but younging to the south. Towards Hamama Central and Hamama East, the orientation of the units change to generally striking northeast, dipping northwest and similarly overturned. The dip of the main rock units, and also of the main mineralised horizon, varies from approximately -55° to near vertical. Hall *et al*. (1988) interpreted the target horizon as occurring on the southern limb of a synform which closes to the northwest, based on bedding/cleavage relationships.

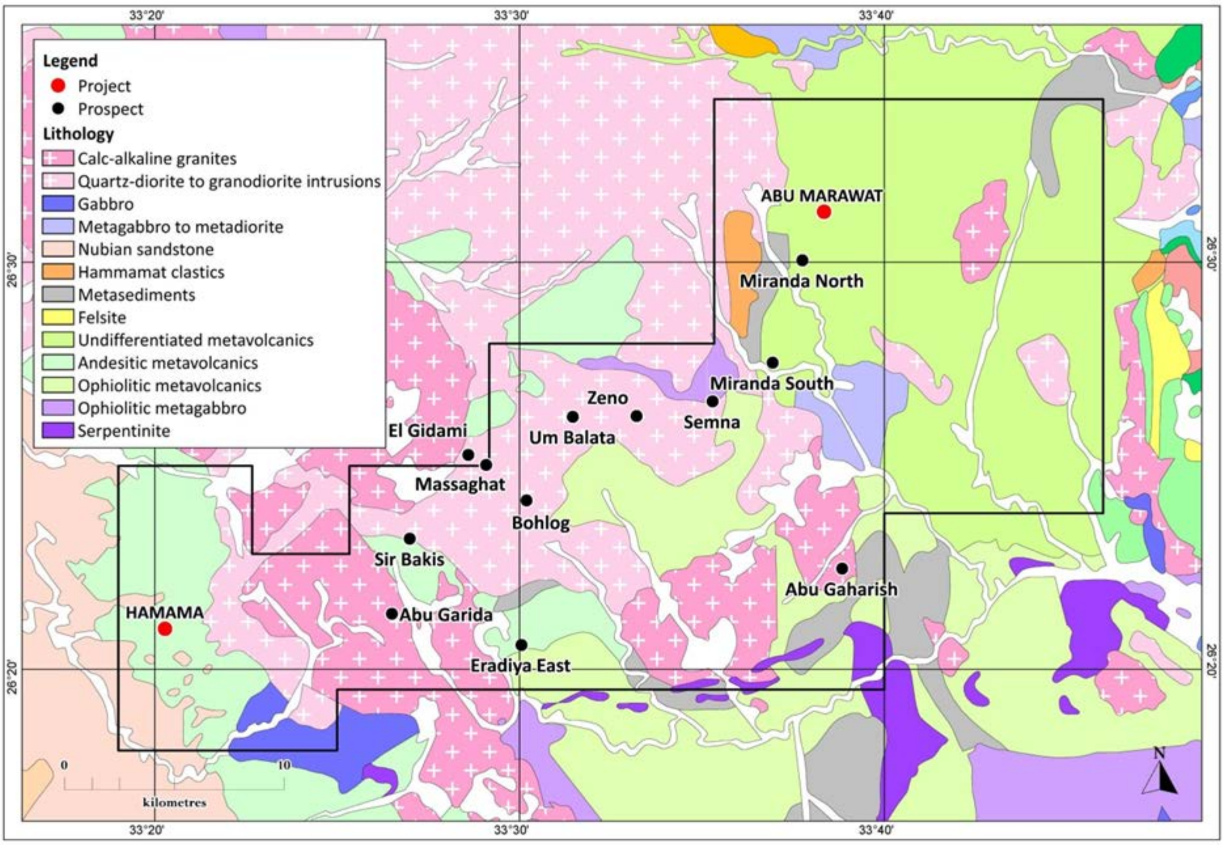


**Figure 7-1 Property Scale Geological Setting**

Stratigraphic footwall rocks are dominated by grey-green andesite lavas with interbedded tuffs. The andesites are occasionally pillowed, and are commonly porphyritic, containing abundant 1-2mm long plagioclase feldspar laths, green hornblende, and stubby, subhedral pyroxene phenocrysts. Where this unit is in proximity to the main mineralised zones, the andesites are commonly more intensely chlorite-sericite altered, and can contain disseminated small pyrite crystals.

Overlying the andesites are a sequence of felsic volcanic rocks, which represent the main mineralised horizon at Hamama West. This sequence has been previously referred to as a carbonate or ankerite exhalite (Alexander Nubia Inc., 2013), but this interpretation is not accepted by current Aton geological staff. The nature and origin of these felsic rocks is not fully understood, due to overprinting by intense silica-carbonate alteration and mineralisation. At Hamama West the basal unit is a semi-coherent felsite, exhibiting various degrees of brecciation at a local scale. This unit is typically pale cream-grey in colour, occasionally with rounded, partially resorbed quartz phenocrysts. In drill holes where the alteration is weaker, the fragmental nature of the protolith is readily apparent. A package of mid-grey tuffs, which vary from moderately poorly-sorted lapilli tuffs to laminated ash tuffs, lies stratigraphically above this. Together with the brecciated felsite zones, they host most of the primary precious metal and sulphide mineralisation.

The hangingwall stratigraphy consists of a series of fine to medium grained felsic to intermediate tuffaceous rocks, and an argillaceous or epiclastic sedimentary sequence. These were deposited during a period of relative volcanic quiescence. It is not clear if there may have been a hiatus between the deposition of this sequence and the underlying felsic volcanics. There are occasional drillholes which have intersected clasts and small blocks of massive sulphide and vein material a few metres above the contact with the main mineralised zone, and these are interpreted as minor slumping or talus features related to the sea-floor topography at the time of the deposition of these tuffs.

The hangingwall sequence consists of a basal series of pale greenish-grey, well-bedded felsic ash tuffs and lithic lapilli tuffs, also referred to as argillites by earlier workers. This unit is typically associated with thin beds of jasper and occasionally pyrite. From drilling and mapping along strike at Hamama Central and Hamama East, this unit thickens and is in places welded, with conspicuous, highly-streaked fiamme and pumice clasts. A distinctive narrow (<3 m wide) welded tuff horizon is also identified towards the eastern end of the Hamama West deposit, typically within a few metres of the contact with the underlying mineralised horizon.

The basal felsic tuffs or argillites grade upwards into a sequence of volcaniclastic rocks. They consist of darker grey-green tuffaceous sandstones and siltstones, which are commonly interbedded with purple cherty argillites and bright red jaspers. Younging direction in these sediments is recognised from textures including graded bedding, load casts and flame structures. The jaspilitic and tuffaceous sediments grade upwards into a distinctive massive, pale green andesitic tuff unit (around 15-25m in thickness). It is a reasonably well-sorted unit, with the lower portion typically containing small, 2-3mm long, dark lithic fragments, rapidly grading upwards into a fine-grained, featureless, massive tuff.

This massive tuff horizon is typically overlain by a sequence of jaspers and andesitic tuffaceous lithologies, including green moderately to poorly sorted polymictic lapillistones or crystal lithic tuffs, and pale green fine-grained ash tuffs.

Several small granodiorite intrusions outcrop to the north of the target horizon. A swarm of late-stage, red or pink rhyolite dykes cuts across the sequence. These exhibit abundant, conspicuous, stubby feldspar and rounded quartz phenocrysts, and commonly have a chilled margin of finer-grained black rhyolite.

The younger Nubian Sandstone outcrops mainly to the west of the Hamama area, although a large outlier lies directly to the south of the Hamama West deposit.

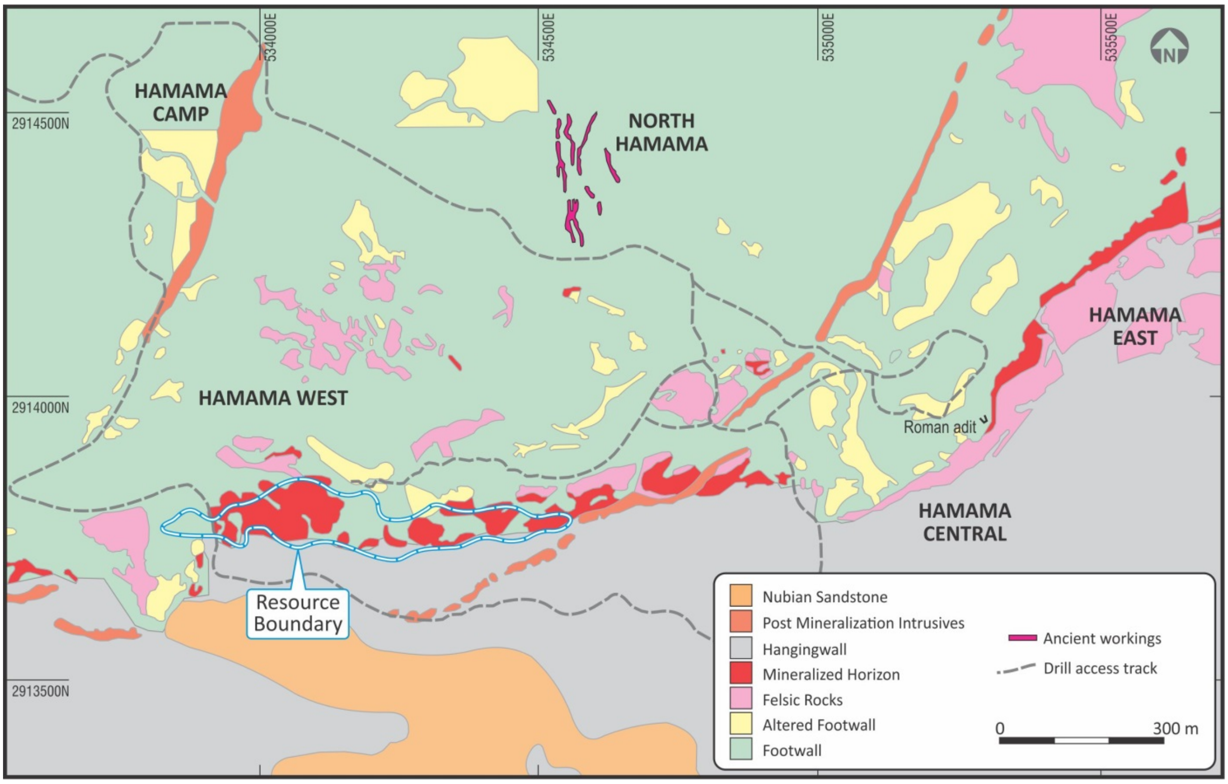


**Figure 7-2 Hamama West - Local Geology**

## 7.3 Mineralisation

Mineralisation at Hamama consists of primary hypogene sulphide mineralisation overlain by an oxidised zone of gold-bearing gossan. Outcrop mapping and drilling have defined the deposit to date with a strike length of 800m, an average width of around 60m, outcropping at surface and with an average drill-intersected depth of 120m below surface. The deepest drillhole to date (AHA-073) has intersected the mineralised zone down to a depth of 275m below surface.

The sulphide mineralisation is dominated by abundant disseminated, stringer and blebby pyrite, often associated with lesser amounts of sphalerite, and rare chalcopyrite and galena. The mineralisation is interpreted as being VMS-style mineralisation in origin, although no classic massive sulphide mound or accumulation has been identified to date in the drilling at Hamama West. Occasionally thicker sulphide-rich zones, up to tens of centimetres in width, previously interpreted as massive sulphide lenses, are now interpreted as having been deposited in feeder zones or fluid channels. It is interpreted that the deposit formed in a shallow water VMS-epithermal transitional environment, as evidenced by the presence of pillow lavas through the footwall andesitic sequence. Clear epithermal textures can be seen in the mineralised felsic volcanics, notably towards or very close to the hangingwall contact of the mineralised horizon, possibly representing an emergent volcanic environment.

In the sulphide zone, gold typically occurs as native grains interstitial to sulphide minerals, and silver is probably associated with sulfosalts and/or galena (Payne, 2013). Gangue minerals consist of silica, ferroan-dolomite, calcite and barite. On a broader scale, zonation of the gold and silver mineralisation is unclear at the current level of drilling, but some shallow north-plunging trends are evident (which would therefore imply a steep to vertical control on mineralisation at the time of deposition). At a smaller scale, there is some evidence of gold enrichment near the stratigraphic hangingwall contact. Zinc commonly occurs throughout, including as disseminated mineralisation into the footwall andesites.

Alteration associated with the sulphide mineralisation is dominated by silica and carbonate, usually ferroan-dolomite. In places silica-carbonate flooding appears to be so intense that the original textures of the host lithologies have been completely obliterated. Towards the hangingwall contact with the overlying tuffs a narrow zone of intense leaching occurs, with the rock displaying vugs which are filled with quartz, replacing bladed calcite. This zone is also associated with kaolinite.

The top of the deposit is characterised as a 30-40m thick gossanous zone of weathered and oxidised material. This zone is quite variable and consists of ruddy to reddish-brown to yellow iron oxide and clay rich material. There are preferentially weathered zones which originally had a high sulphide content, zones of less weathered greyish-brown silica-carbonate altered felsic volcanics, and more limited patches of friable gossanous material. Gold and silver are enriched in the uppermost 3-5m of the profile. This surface enrichment is likely to be caused by supergene, or deflationary and erosional processes, or a combination of both. Zinc-bearing minerals are present in the oxide zone, related to the original distribution of sphalerite prior to the weathering events, and occasionally at concentrations from drillcore of over 10%. Copper oxides and hydroxides are generally rare in the oxide zone, generally confined to joint planes. Minerals recognised in the oxide zone include limonite, hematite, smithsonite, malachite and chrysocolla.

# 8 DEPOSIT TYPES

The Hamama deposit has been described variably as a classic Volcanogenic Massive Sulphide deposit (Hall & McHugh, 1989), a gold-rich VMS (Alexander Nubia Inc., 2015a) and an orogenic precious/base metal vein deposit (Voormeij, 2015). The current interpretation is that the Hamama West deposit displays many of the characteristics of the 'VMS-epithermal hybrid' sub-class of VMS deposits. This distinct group of deposits has been variously described in the literature as "high-Au VMS" (Dubé *et al*., 2007), "high sulphidation VMS" (Sillitoe *et al*., 1996) or "hybrid Volcanic-Hosted Massive Sulphide high-sulphidation epithermal deposits" (Large *et al*., 2001). Examples include the world-class LaRonde-Penna and Bousquet deposits in Quebec, the Eskay Creek deposit in British Columbia, and the Henty and Mount Lyell deposits in Tasmania.

VMS-epithermal hybrid VMS deposits are distinguished from more "classic" VMS's (e.g. bi-modal mafic/felsic – Noranda-type) by:

- being relatively precious metal rich and base metal poor;
- having a higher proportion of volcaniclastic rocks to flows;
- having anomalous geochemical signatures; and
- exhibiting alteration assemblages indicative of low pH fluids.

They are essentially the shallow marine equivalent to subaerial epithermal systems (Dubé *et al*., 2007).

At Hamama West the mineralisation occurs as a stratiform and stratabound tabular deposit, hosted within a host succession of altered felsic pyroclastic rocks, consisting of 'felsite' and associated tuffs. The footwall stratigraphy consists of altered and weakly mineralised andesites. The hangingwall stratigraphy is dominated by unaltered and unmineralised tuffs, tuffites and volcaniclastic or epiclastic sediments (locally referred to as argillites). It also contains numerous thin beds of jasper, chert and occasionally pyrite.

The hangingwall stratigraphy, which in many places displays clear sedimentary textures, suggests a marine environment. The combination of the style of mineralisation (footwall stringers) and the presence of chemical sediments which occur at distinct stratigraphic breaks, along with the style of volcanism, are classic indicators of a VMS environment. Advanced argillic alteration, colloform banded vein fragments and vuggy silica with bladed quartz (after calcite) are suggestive of an epithermal style setting, with boiling of low pH fluids occurring. The anomalous geochemical signatures for As, Mo, and Sb are indicative of a magmatic volatile input. The abundance of pyroclastic rocks, especially towards the east, suggests a shallow marine setting. All the above are likely indicators of a VMS-epithermal hybrid system, with fluids preferentially mineralising a semi-consolidated pile of felsic volcaniclastics with relatively high porosity. The porous nature of the volcaniclastics may have led to the preferential development of the base and precious metal mineralisation within a larger volume of rock than may otherwise have occurred in a deeper marine setting, where hydrothermal fluids may have been more constrained.

# 9 EXPLORATION

Exploration by Aton in the Abu Marawat Concession commenced in 2008 and consisted initially of geological mapping and prospecting. A ground geophysical survey was also undertaken over 5 areas within the Abu Marawat Concession between April-July 2008, consisting of pole-dipole induced polarization (IP) and ground magnetic methods (Welz *et al.*, 2008). Areas surveyed included Abu Marawat, the Hamama VMS and Hamama QT areas, and the Miranda South and Miranda North prospects.

Prior to 2012, the large majority of Aton's exploration effort was focussed on the Abu Marawat project. Exploration activities at Abu Marawat included geological fact mapping; surface grab sampling, rock chip sampling, MMI and wadi geochemical sampling, and the excavation and sampling of deep trenches. In the late 1980s Minex had drilled 34 diamond and 220 reverse circulation percussion drill holes at the prospect, and results of this drilling were followed-up by Aton, who drilled a total of 81 diamond drill holes up to 2012. This led to the release of a maiden mineral resource estimate in 2012 (Valliant and Salmon, 2012).

Two separate geophysical surveys were conducted at Hamama in 2008 (Welz *et al.*, 2008), shown in Figure 9-1.

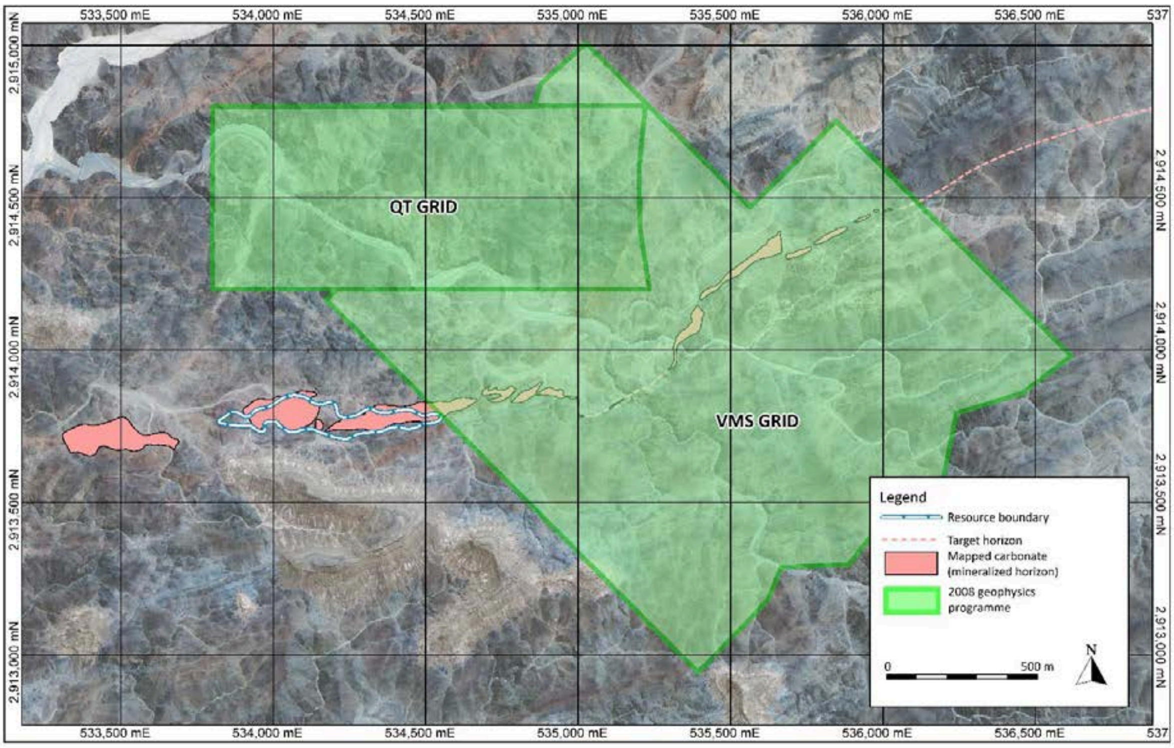


**Figure 9-1 2008 Geophysical Survey – grid locations**

The Hamama QT geophysical survey grid was designed to test the response around a north-south trending quartz-hematite vein system exposed in ancient workings at Hamama North. The IP survey results are shown in Figure 9-2; some post-processing of the magnetic survey (TMI) occurred in 2016, and is shown in Figure 9-3, with drill collars superimposed.

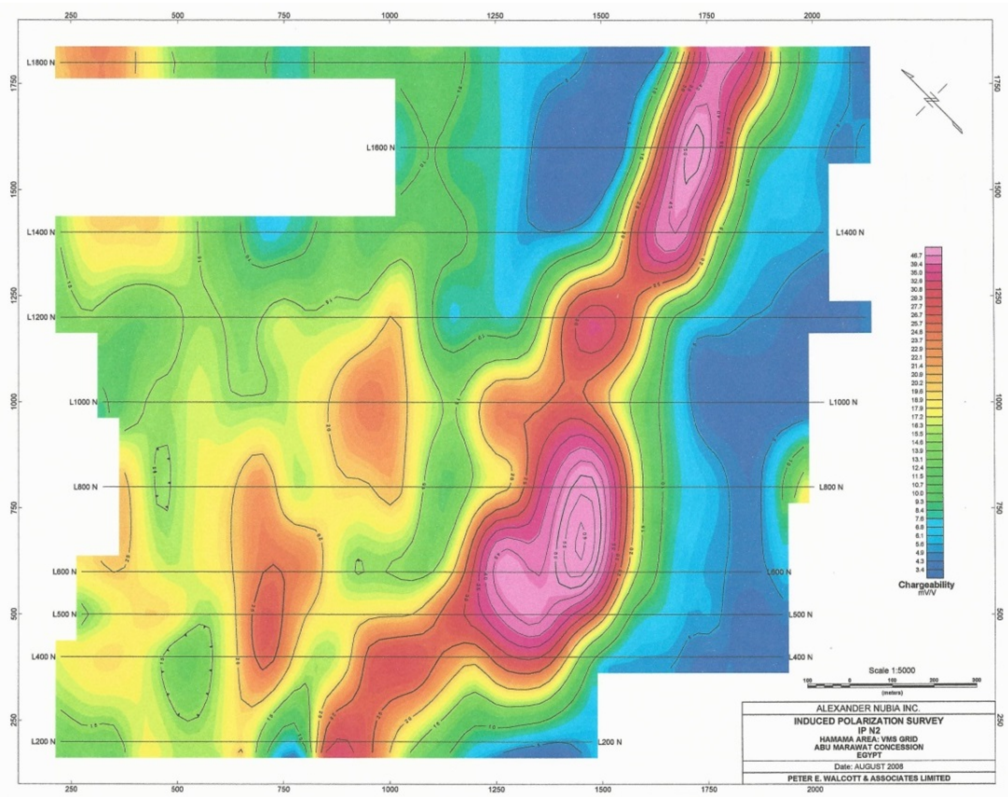


**Figure 9-2 2008 IP survey results (VMS grid)**

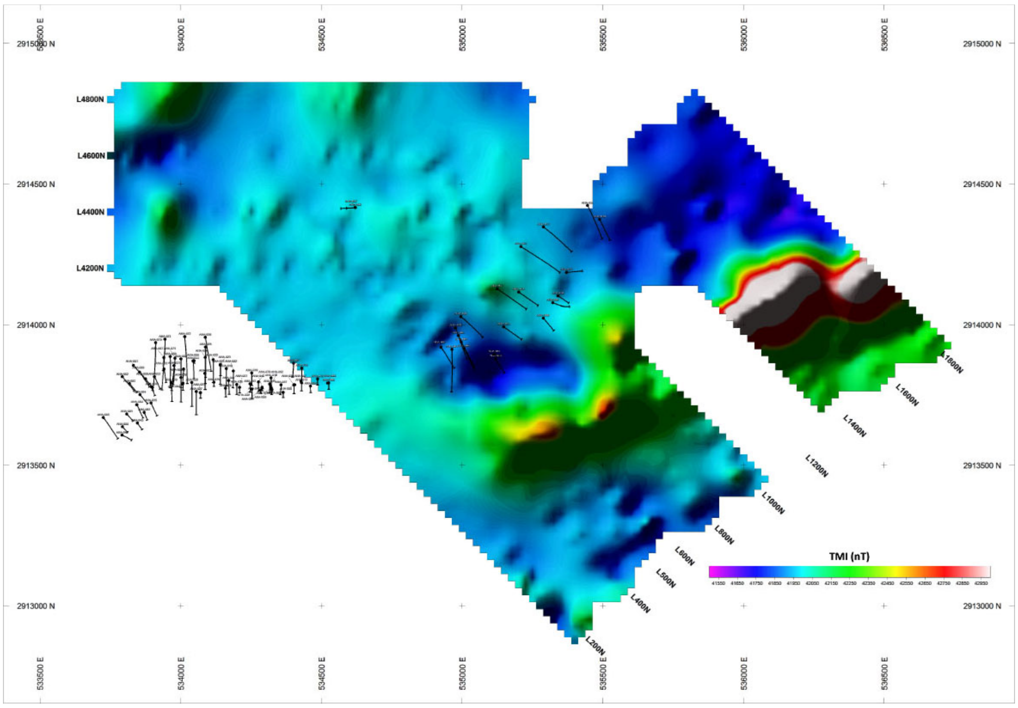


**Figure 9-3 2008 TMI survey results (2016 post-processing), with drill locations**

The Hamama VMS grid was laid out on a NE-SW orientation and was designed to test the silica-carbonate altered mineralised horizon in the Hamama East and Central areas that had previously been drill tested by Minex in 1988. The IP survey totalled 5.8 line km and 17.3 line km over the Hamama QT and VMS grids respectively, and the magnetic survey totalled 6.0 and 15.25 line km respectively. In the Hamama QT survey background chargeability in the 5 mV/V to 7mV/V range were observed on the northernmost line, with chargeability values increasing in strength to the south. No direct resistivity correlation was attributable to zones of higher chargeability.

In the Hamama VMS survey the background chargeability response was the same as on the adjoining Hamama QT grid to the west. The geophysical response is dominated by a complex north-easterly trending strongly anomalous chargeability zone, which is associated with a similarly trending strong magnetic high, located in the hangingwall of the mineralised horizon. The survey also identified a large resistivity low in the centre of the grid, bounded to the north-west by the trace of an interpreted long narrow quartz vein, and to the south-east by the surface expression of the mineralised horizon. In the survey area the mineralised horizon is typically narrow and contains abundant sphalerite which may explain why no IP chargeability response was obtained over its surface expression.

In 2012, Aton started an extensive programme of detailed traverse fact mapping, and trenching and rock chip channel sampling. To date Aton has completed a total of 65 deep excavator dug trenches, and 76 hammer sampled rock chip channel traverses (Figure 9-4). Significant assay intersections from these trenches and channels are shown in Table 9-1 and Table 9-2. Encouraging assay results from the first phase of hammer sampled rock chip channel sampling lead to a follow up phase of diamond drilling at Hamama West in 2012, which resulted in the discovery of the Hamama West mineralisation.

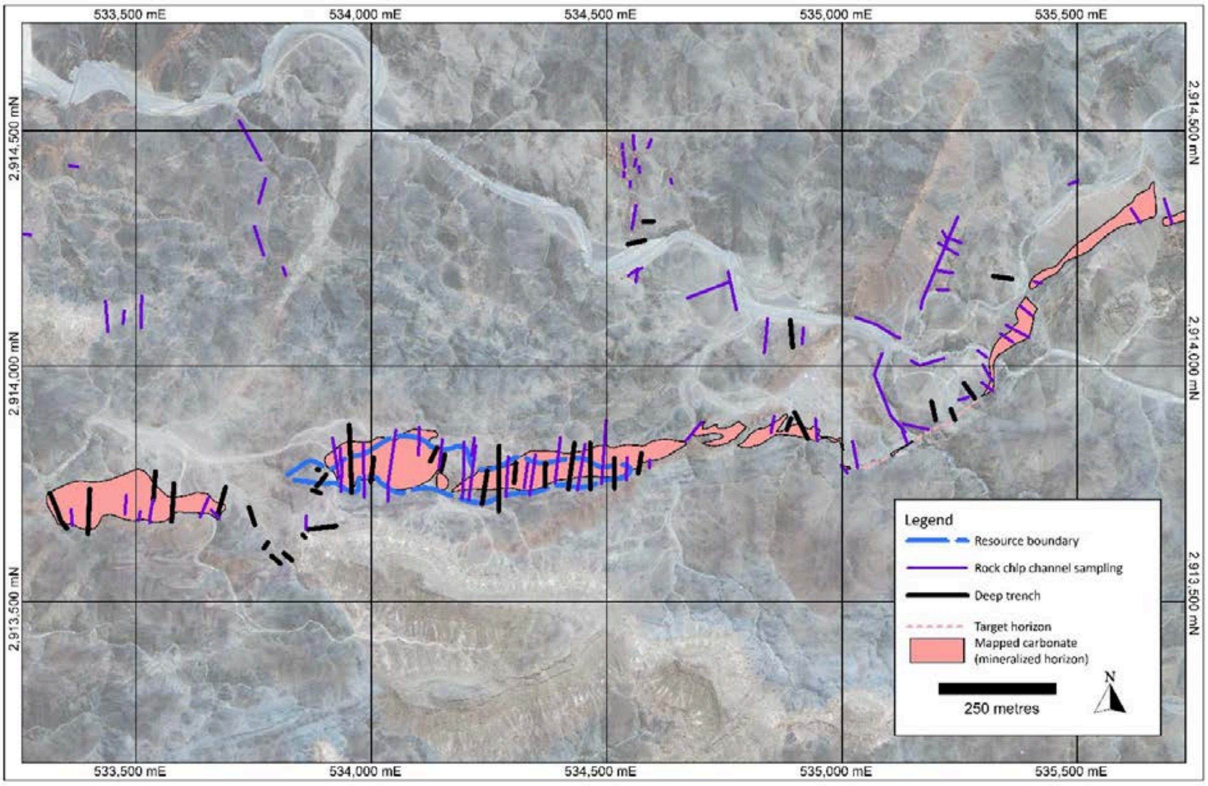


**Figure 9-4 Location of Trenches and Rock Chip Channel Sampling**

**Table 9-1 Zinc intersections from trench and rock chip channels (1% Zn cut-off)**

| Trench ID | Collar E | Collar N | Interval (m) | Zn (%) | Au (g/t) | Ag(g/t) | Cu (%) | Pb (%) | Type |
|---|---|---|---|---|---|---|---|---|---|
| T-005 | 534100 | 2913810 | 4.0 | 2.44 | 0.30 | 39.0 | 0.37 | 0.00 | Channel |
| T-006 | 534144 | 2913784 | 22.0 | 2.61 | 0.37 | 28.6 | 0.44 | 0.48 | Channel |
| and | | | 2.0 | 1.13 | 0.11 | 14.0 | 0.07 | 0.26 | Channel |
| and | | | 24.0 | 2.13 | 0.18 | 6.8 | 0.16 | 0.30 | Channel |
| T-011 | 534336 | 2913726 | 2.0 | 1.73 | 2.54 | 13.0 | 0.38 | 0.03 | Channel |
| T-018 | 534947 | 2913842 | 12.0 | 3.18 | 0.48 | 18.2 | 0.26 | 0.50 | Channel |
| T-019 | 534971 | 2913839 | 4.0 | 1.23 | 0.01 | 0.8 | 0.02 | 0.08 | Channel |
| T-020 | 535033 | 2913784 | 4.0 | 5.73 | 0.03 | 6.0 | 0.14 | 0.31 | Channel |
| and | | | 8.0 | 4.55 | 0.01 | 1.6 | 0.04 | 0.17 | Channel |
| and | | | 4.0 | 3.15 | 0.01 | 1.5 | 0.14 | 0.05 | Channel |
| T-021 | 535242 | 2913885 | 4.0 | 1.45 | 0.03 | 1.0 | 0.03 | - | Channel |
| T-023 | 535321 | 2913947 | 4.0 | 1.47 | 0.21 | 19.5 | 0.01 | - | Channel |
| and | | | 24.0 | 1.80 | 0.44 | 35.1 | 0.05 | - | Channel |
| and | | | 2.0 | 1.15 | 0.41 | 10.0 | 0.06 | - | Channel |
| T-024 | 535397 | 2914062 | 22.0 | 2.64 | 1.37 | 19.7 | 0.11 | - | Channel |
| and | | | 24.0 | 1.59 | 0.28 | 10.6 | 0.07 | - | Channel |
| T-025 | 535402 | 2914108 | 22.0 | 2.15 | 1.06 | 16.7 | 0.07 | - | Channel |
| and | | | 20.0 | 6.16 | 0.61 | 38.9 | 0.25 | - | Channel |
| T-027 | 535613 | 2914417 | 2.0 | 1.39 | 0.02 | 1.0 | 0.01 | 0.01 | Channel |
| T-029 | 535701 | 2914304 | 10.0 | 1.45 | 0.36 | 9.0 | 0.07 | - | Channel |
| T-045 | 535011 | 2913774 | 2.0 | 2.72 | 1.48 | 34.0 | 0.09 | 0.19 | Channel |
| T-049 | 535135 | 2913860 | 2.0 | 1.08 | 0.03 | 1.0 | 0.00 | 0.00 | Channel |
| T-050 | 535307 | 2914019 | 4.0 | 18.40 | 0.47 | 1.0 | 0.48 | - | Channel |
| T-052 | 535123 | 2914060 | 8.0 | 1.10 | 0.01 | 0.6 | 0.02 | 0.03 | Channel |
| T-057 | 535245 | 2914317 | 2.0 | 1.14 | 0.07 | 4.0 | 0.75 | 0.00 | Channel |
| T-076 | 535129 | 2913861 | 24.0 | 3.79 | 0.29 | 5.0 | 0.26 | 0.10 | Channel |
| T-077 | 535130 | 2913878 | 10.0 | 2.30 | 0.38 | 2.8 | 0.29 | 0.78 | Channel |
| T-078 | 535299 | 2914004 | 14.0 | 6.76 | 0.59 | 7.7 | 0.24 | 0.40 | Channel |
| and | | | 6.0 | 1.04 | 0.50 | 9.7 | 0.08 | 0.13 | Channel |
| and | | | 6.0 | 2.21 | 0.49 | 33.7 | 0.10 | 0.49 | Channel |
| T-079 | 535337 | 2914069 | 36.0 | 6.33 | 0.83 | 15.9 | 0.22 | 0.58 | Channel |
| and | | | 2.0 | 1.15 | 2.06 | 27.0 | 0.16 | 0.67 | Channel |
| T-080 | 535423 | 2914176 | 24.0 | 1.91 | 1.02 | 40.3 | 0.09 | 0.39 | Channel |
| T-086 | 534235 | 2913707 | 2.0 | 1.62 | 0.47 | 37.0 | 0.28 | - | Trench |
| T-088 | 534147 | 2913778 | 20.0 | 1.86 | 0.39 | 11.3 | 0.32 | - | Trench |
| and | | | 4.0 | 1.27 | 0.73 | 27.5 | 0.07 | - | Trench |
| T-090 | 533440 | 2914073 | 6.0 | 1.83 | 0.03 | 1.7 | 0.16 | - | Trench |
| T-091 | 533509 | 2914081 | 2.0 | 1.06 | 0.02 | 1.0 | 0.09 | - | Trench |
| T-101 | 533931 | 2913763 | 18.0 | 1.41 | 0.15 | 8.1 | 0.19 | - | Trench |
| T-117 | 533958 | 2913732 | 2.0 | 1.11 | 3.10 | 363 | 0.07 | 0.16 | Trench |
| and | | | 2.0 | 1.40 | 2.25 | 654 | 0.12 | 0.21 | Trench |
| and | | | 2.0 | 1.40 | 0.10 | 11.5 | 0.16 | 0.02 | Trench |
| and | | | 2.0 | 1.31 | 0.07 | 4.0 | 0.09 | 0.01 | Trench |
| T-121 | 534086 | 2913813 | 2.0 | 1.04 | 0.82 | 25.4 | 0.22 | 0.28 | Trench |
| T-122 | 534125 | 2913797 | 2.0 | 1.69 | 0.12 | 23.2 | 0.07 | 0.04 | Trench |
| and | | | 2.0 | 1.22 | 0.10 | 13.7 | 0.02 | 0.42 | Trench |
| T-129 | 535240 | 2913886 | 2.0 | 1.63 | 7.87 | 38.9 | 0.18 | 0.82 | Trench |
| and | | | 2.0 | 1.34 | 0.01 | 1.1 | 0.02 | 0.00 | Trench |
| and | | | 2.0 | 1.30 | 0.01 | 0.9 | 0.02 | 0.01 | Trench |
| T-137 | | | 4.0 | 2.34 | 0.06 | 2.8 | 0.04 | 0.08 | Trench |
| T-138 | 534057 | 2913728 | 6.0 | 5.34 | 2.79 | 131 | 0.22 | 1.80 | Trench |

**Table 9-2 Gold intersections from trench and rock chip channels (0.5 g/t Au cut-off)**

| Trench ID | Collar E | Collar N | Interval (m) | Zn (%) | Au (g/t) | Ag(g/t) | Cu (%) | Pb (%) | Type |
|---|---|---|---|---|---|---|---|---|---|
| T-002 | 533935 | 2913734 | 12.0 | 0.82 | 24.5 | 0.01 | 0.01 | 0.08 | Channel |
| and | | | 6.0 | 0.78 | 7.7 | 0.08 | 0.01 | 0.12 | Channel |
| T-003 | 533985 | 2913721 | 4.0 | 0.90 | 8.0 | 0.04 | 0.04 | 0.23 | Channel |
| and | | | 2.0 | 0.84 | 5.0 | 0.01 | 0.03 | 0.06 | Channel |
| and | | | 8.0 | 0.52 | 5.8 | 0.03 | 0.03 | 0.04 | Channel |
| and | | | 6.0 | 0.48 | 13.7 | 0.02 | 0.01 | 0.04 | Channel |
| T-004 | 534034 | 2913713 | 8.0 | 1.30 | 15.3 | 0.08 | 0.26 | 0.33 | Channel |
| and | | | 18.0 | 0.83 | 10.4 | 0.09 | 0.02 | 0.38 | Channel |
| and | | | 8.0 | 0.67 | 8.8 | 0.07 | 0.02 | 0.16 | Channel |
| and | | | 22.0 | 1.84 | 18.5 | 0.03 | 0.02 | 0.13 | Channel |
| and | | | 2.0 | 0.71 | 12.0 | 0.02 | 0.02 | 0.28 | Channel |
| and | | | 14.0 | 0.85 | 8.0 | 0.03 | 0.02 | 0.07 | Channel |
| T-005 | 534100 | 2913810 | 4.0 | 0.61 | 42.5 | 0.23 | 0.00 | 0.14 | Channel |
| T-006 | 534144 | 2913784 | 2.0 | 0.65 | 11.0 | 0.10 | 0.47 | 1.12 | Channel |
| T-007 | 534193 | 2913718 | 50.0 | 0.96 | 20.2 | 0.04 | 0.02 | 0.09 | Channel |
| T-009 | 534235 | 2913701 | 10.0 | 1.49 | 52.4 | 0.01 | 0.10 | 0.11 | Channel |
| and | | | 50.0 | 2.35 | 48.1 | 0.01 | 0.17 | 0.14 | Channel |
| and | | | 4.0 | 0.81 | 8.0 | 0.00 | 0.04 | 0.02 | Channel |
| T-010 | 534286 | 2913722 | 2.0 | 0.57 | 4.0 | 0.01 | 0.03 | 0.05 | Channel |
| and | | | 12.0 | 1.08 | 18.7 | 0.01 | 0.10 | 0.12 | Channel |
| and | | | 4.0 | 0.73 | 22.5 | 0.01 | 0.01 | 0.06 | Channel |
| and | | | 2.0 | 0.73 | 2.0 | 0.01 | 0.01 | 0.09 | Channel |
| T-011 | 534336 | 2913726 | 58.0 | 2.40 | 22.0 | 0.03 | 0.03 | 0.12 | Channel |
| and | | | 12.0 | 1.16 | 72.5 | 0.01 | 0.01 | 0.03 | Channel |
| and | | | 4.0 | 0.87 | 62.5 | 0.04 | 0.09 | 0.23 | Channel |
| T-012 | 534390 | 2913752 | 32.0 | 3.63 | 11.4 | 0.01 | 0.02 | 0.06 | Channel |
| and | | | 34.0 | 1.12 | 18.4 | 0.02 | 0.01 | 0.05 | Channel |
| and | | | 22.0 | 0.76 | 13.7 | 0.01 | 0.02 | 0.05 | Channel |
| and | | | 2.0 | 0.77 | 5.0 | 0.01 | 0.01 | 0.03 | Channel |
| T-013 | 534437 | 2913737 | 90.0 | 2.14 | 28.0 | 0.02 | 0.04 | 0.07 | Channel |
| T-014 | 534488 | 2913750 | 6.0 | 0.74 | 25.3 | 0.03 | 0.01 | 0.08 | Channel |
| and | | | 20.0 | 3.01 | 17.7 | 0.02 | 0.05 | 0.14 | Channel |
| T-015 | 534541 | 2913759 | 22.0 | 1.32 | 42.3 | 0.03 | 0.01 | 0.06 | Channel |
| T-018 | 534947 | 2913842 | 4.0 | 0.67 | 28.5 | 0.47 | 0.00 | 5.35 | Channel |
| T-023 | 535321 | 2913947 | 8.0 | 1.07 | 22.8 | 0.02 | 0.00 | 0.45 | Channel |
| and | | | 16.0 | 0.50 | 30.0 | 0.06 | 0.00 | 2.17 | Channel |
| and | | | 4.0 | 0.70 | 38.5 | 0.02 | 0.00 | 0.56 | Channel |
| T-024 | 535397 | 2914062 | 22.0 | 1.40 | 24.4 | 0.10 | 0.00 | 2.52 | Channel |
| T-025 | 535402 | 2914108 | 18.0 | 1.24 | 16.6 | 0.07 | 0.00 | 2.41 | Channel |
| and | | | 4.0 | 0.60 | 22.5 | 0.12 | 0.00 | 2.33 | Channel |
| and | | | 4.0 | 1.37 | 123.5 | 0.64 | 0.00 | 20.60 | Channel |
| T-028 | 535634 | 2914305 | 8.0 | 0.71 | 22.0 | 0.01 | 0.00 | 0.13 | Channel |
| and | | | 2.0 | 0.60 | 6.0 | 0.01 | 0.00 | 0.24 | Channel |
| T-032 | 535829 | 2914379 | 2.0 | 0.64 | 6.0 | 0.08 | 0.06 | 0.23 | Channel |
| T-045 | 535011 | 2913774 | 4.0 | 1.80 | 30.0 | 0.02 | 0.04 | 0.48 | Channel |
| and | | | 2.0 | 1.48 | 34.0 | 0.09 | 0.19 | 2.72 | Channel |
| T-050 | 535307 | 2914019 | 2.0 | 0.92 | 1.0 | 0.84 | 0.00 | 35.50 | Channel |
| T-062 | 533361 | 2913695 | 8.0 | 0.69 | 6.8 | 0.02 | 0.00 | 0.03 | Channel |
| T-067 | 533806 | 2913581 | 6.0 | 2.11 | 15.7 | 0.02 | 0.00 | 0.03 | Channel |
| and | | | 6.0 | 1.66 | 13.3 | 0.02 | 0.00 | 0.22 | Channel |
| T-076 | 535129 | 2913861 | 4.0 | 1.31 | 5.5 | 0.23 | 0.28 | 6.97 | Channel |
| T-077 | 535130 | 2913878 | 2.0 | 0.90 | 5.0 | 0.27 | 1.57 | 4.16 | Channel |
| T-078 | 535299 | 2914004 | 8.0 | 0.80 | 7.5 | 0.30 | 0.53 | 7.43 | Channel |
| and | | | 10.0 | 0.54 | 7.6 | 0.06 | 0.15 | 0.85 | Channel |
| and | | | 2.0 | 0.56 | 44.0 | 0.15 | 1.03 | 4.11 | Channel |

| Trench ID | Collar E | Collar N | Interval (m) | Zn (%) | Au (g/t) | Ag(g/t) | Cu (%) | Pb (%) | Type |
|---|---|---|---|---|---|---|---|---|---|
| and | | | 2.0 | 0.73 | 42.0 | 0.04 | 0.18 | 0.79 | Channel |
| T-079 | 535337 | 2914069 | 28.0 | 0.99 | 18.9 | 0.28 | 0.71 | 7.61 | Channel |
| and | | | 2.0 | 0.51 | 9.0 | 0.07 | 0.27 | 3.13 | Channel |
| and | | | 2.0 | 2.06 | 27.0 | 0.16 | 0.67 | 1.15 | Channel |
| T-080 | 535423 | 2914176 | 6.0 | 0.75 | 24.7 | 0.07 | 0.35 | 1.43 | Channel |
| and | | | 14.0 | 1.35 | 51.1 | 0.11 | 0.48 | 2.31 | Channel |
| T-085 | 534270 | 2913692 | 8.0 | 3.73 | 43.0 | 0.01 | - | 0.08 | Trench |
| T-085 | 534270 | 2913692 | 4.0 | 0.90 | 10.5 | 0.05 | - | 0.15 | Trench |
| and | | | 24.0 | 0.80 | 7.3 | 0.00 | - | 0.04 | Trench |
| and | | | 2.0 | 0.53 | 22.0 | 0.01 | - | 0.13 | Trench |
| T-086 | 534235 | 2913707 | 2.0 | 0.76 | 48.0 | 0.08 | - | 0.26 | Trench |
| and | | | 44.0 | 2.89 | 51.1 | 0.03 | - | 0.19 | Trench |
| T-087 | 534206 | 2913716 | 2.0 | 0.56 | 3.0 | 0.01 | - | 0.09 | Trench |
| and | | | 6.0 | 0.94 | 77.0 | 0.07 | - | 0.30 | Trench |
| and | | | 26.0 | 2.70 | 101.1 | 0.05 | - | 0.17 | Trench |
| T-088 | 534147 | 2913778 | 6.0 | 1.01 | 23.3 | 0.38 | - | 4.50 | Trench |
| and | | | 6.0 | 0.87 | 21.0 | 0.63 | - | 3.20 | Trench |
| and | | | 4.0 | 0.73 | 27.5 | 0.07 | - | 1.27 | Trench |
| T-089 | 533865 | 2913653 | 8.0 | 1.34 | 2.8 | 0.01 | - | 0.15 | Trench |
| and | | | 8.0 | 1.47 | 6.5 | 0.01 | - | 0.01 | Trench |
| and | | | 6.0 | 1.31 | 9.0 | 0.02 | - | 0.05 | Trench |
| T-096 | 534418 | 2913740 | 68.0 | 3.07 | 38.1 | 0.05 | - | 0.12 | Trench |
| T-097 | 534567 | 2913773 | 2.0 | 2.79 | 16.0 | 0.03 | - | 0.06 | Trench |
| T-099 | 534517 | 2913741 | 34.0 | 1.34 | 35.5 | 0.02 | - | 0.07 | Trench |
| T-100 | 534465 | 2913739 | 6.0 | 0.78 | 11.7 | 0.01 | - | 0.04 | Trench |
| and | | | 42.0 | 2.91 | 34.1 | 0.03 | - | 0.07 | Trench |
| and | | | 2.0 | 0.75 | 2.0 | 0.01 | - | 0.05 | Trench |
| T-101 | 533931 | 2913763 | 24.0 | 2.61 | 58.8 | 0.05 | - | 0.32 | Trench |
| and | | | 2.0 | 0.71 | 12.0 | 0.05 | - | 0.33 | Trench |
| T-102 | 533998 | 2913755 | 52.0 | 1.77 | 108.3 | 0.07 | - | 0.32 | Trench |
| T-103 | 534324 | 2913741 | 20.0 | 2.63 | 19.8 | 0.01 | - | 0.08 | Trench |
| and | | | 22.0 | 1.32 | 7.8 | 0.00 | - | 0.03 | Trench |
| T-104 | 534368 | 2913745 | 50.0 | 3.10 | 55.0 | 0.13 | - | 0.13 | Trench |
| T-107 | 533397 | 2913645 | 2.0 | 0.50 | 3.9 | 0.01 | 0.01 | 0.01 | Trench |
| and | | | 4.0 | 0.96 | 9.6 | 0.02 | 0.02 | 0.04 | Trench |
| and | | | 4.0 | 0.58 | 5.1 | 0.01 | 0.00 | 0.02 | Trench |
| T-113 | 533831 | 2913588 | 24.0 | 3.73 | 121.8 | 0.01 | 0.21 | 0.12 | Trench |
| T-115 | | | 6.0 | 1.44 | 21.8 | 0.01 | 0.03 | 0.00 | Trench |
| T-116 | 533891 | 2913731 | 2.0 | 1.74 | 42.8 | 0.01 | 0.02 | 0.00 | Trench |
| and | | | 2.0 | 1.79 | 7.8 | 0.02 | 0.01 | 0.02 | Trench |
| T-117 | 533958 | 2913732 | 6.0 | 1.37 | 224.0 | 0.10 | 1.15 | 0.28 | Trench |
| and | | | 66.0 | 3.17 | 130.1 | 0.06 | 0.08 | 0.33 | Trench |
| T-118 | 533884 | 2913745 | 18.0 | 1.71 | 65.8 | 0.04 | 0.12 | 0.08 | Trench |
| T-120 | 533806 | 2913581 | 16.0 | 0.83 | 14.1 | 0.02 | 0.12 | 0.14 | Trench |
| and | | | 2.0 | 2.69 | 4.1 | 0.02 | 0.08 | 0.12 | Trench |
| T-121 | 534086 | 2913813 | 10.0 | 0.73 | 20.8 | 0.13 | 0.18 | 0.56 | Trench |
| T-122 | 534125 | 2913797 | 14.0 | 1.13 | 43.5 | 0.11 | 0.03 | 0.10 | Trench |
| T-123 | 534303 | 2913752 | 48.0 | 2.26 | 16.3 | 0.01 | 0.03 | 0.06 | Trench |
| T-124 | 534927 | 2913846 | 14.0 | 1.35 | 35.3 | 0.03 | 0.06 | 0.13 | Trench |
| T-129 | 535240 | 2913886 | 2.0 | 7.87 | 38.9 | 0.18 | 0.82 | 1.63 | Trench |
| T-138 | 534057 | 2913728 | 8.0 | 6.40 | 230.8 | 0.38 | 3.51 | 8.16 | Trench |
| and | | | 22.0 | 1.65 | 27.6 | 0.06 | 0.04 | 0.14 | Trench |

Apart from the Hamama and Abu Marawat projects, there are a number of priority exploration targets within the Abu Marawat Concession which have had limited geological mapping and surface and underground sampling, but have not been drill tested to date (see Figure 7-1). These include the Miranda, Semna and Sir Bakis prospects. Miranda (both North and South) was covered in the 2008 ground magnetics and IP survey. A pronounced north-south trending resistivity contact was identified at Miranda South, and is coincident with a large complex zone of higher chargeability, and surface workings. Only limited surface grab and channel sampling has been undertaken to date at Miranda. Semna and Sir Bakis were both mined for gold during the modern British mining era, and have been sampled underground in the old workings.

Other potential base and precious metal prospects within the Abu Marawat Concession include the Abu Garida (also mined during the British mining era), Zeno, Bohlog, Massaghat, Um Balata, Eradiya East and Abu Gaharish prospects, all of which have ancient mine workings over them. All these prospects have only had initial cursory geological mapping and limited grab and channel sampling to date. Assay values of up to 470ppm Au were obtained from surface sampling at Massaghat (Alexander Nubia, 2012), but little or no follow up work has been undertaken to date.

A remote sensing study, comprising ASTER and Landsat 7 alteration mapping and photogeological interpretation was initiated during 2016, to aid with target generation and definition over the Abu Marawat Concession. This will be followed up with a more detailed remote sensing study using high resolution WorldView-3 multispectral data to be acquired in early 2017.

# 10 DRILLING

## 10.1 Historical Drilling

Prior to Aton becoming involved with the Hamama Project, Minex drilled approximately 31 percussion holes in 1988 and 1989 (Valliant and Salmon, 2012). Most of the Minex drill collars have been damaged or destroyed over time, but some remain and were picked up during a 2016 survey, undertaken by local survey contractors Arab Nubia Group. This phase of drilling appears to have been done in-house by Minex, using an Ingersoll-Rand LM-300 Crawlair reverse circulation percussion drill rig.

Results of this drilling program cannot be verified, and none of this historical drilling data was used in the mineral resource estimate.

## 10.2 Drilling and Sampling Procedures

### 10.2.1 Drilling Equipment

Aton contracted Hardrock Diamond Drilling Ltd. ("**Hardrock**"), of Penticton, Canada, to undertake all drilling on the Abu Marawat Concession from 2011 until 2015. At Hamama, the first 58 holes (AHA-001 to AHA-058) were drilled by Hardrock using a skid-mounted Atlas Copco CS-1000 diamond drill rig, and were all drilled using HQ size equipment. A new drill contractor, Capital Drilling Egypt ("**Capital**"), was used during the 2016 drill campaign, with most drillholes completed in HQ size, and some completed with PQ size equipment, using a track-mounted Atlas Copco CS-14 drilling rig. Holes in the upper part of the Hamama West gossan were drilled at PQ size to maximise core recovery, and subsequently reduced to HQ gauge in the underlying more competent fresh rocks.

### 10.2.2 Drilling and Sampling Method

Diamond drill core was collected from the core barrel in 10 feet drilling intervals by Hardrock and in 3 metre drilling intervals by Capital. The core was placed directly into purpose-built 2.8m long metal core trays. The core was marked for start and finish of the drill run and the trays were stacked sequentially at the drill site for transport back to Aton's on-site core yard.

Further details on handling procedures and sample preparation are presented in Section 11.1.

### 10.2.3 Drill Sample Quality

Core recovery typically averaging between 96-98% was achieved within the fresh, sulphide mineralisation and in lithological units outside of the main gossan horizon at Hamama West. Recovery within the weathered profile of the mineralised horizon at Hamama West proved problematic, with friable and broken ground conditions reducing the average core recovery to approximately 78%. Rock-quality designation ("**RQD**") averaged approximately 51% for all drillcore produced, but was lower within fault zones and towards the top of each hole.

In order to increase core recovery rates within the weathered profile during the recent drilling, Capital completed the final 15 holes (AHA-082 to AHA-096) using PQ size equipment, used shorter drill runs, optimised drilling muds, and in some instances cemented the top of the holes. This resulted in an improvement in core quality during the latter parts of the 2016 drilling campaign, to approximately 85% recovery (within the oxidised portion of the mineralised horizon). The improvement can be seen in Figure 10-1 and Figure 10-2, where the relatively low core recovery zone is generally limited to within 10m of surface for the most recent PQ holes within the main oxide domain.

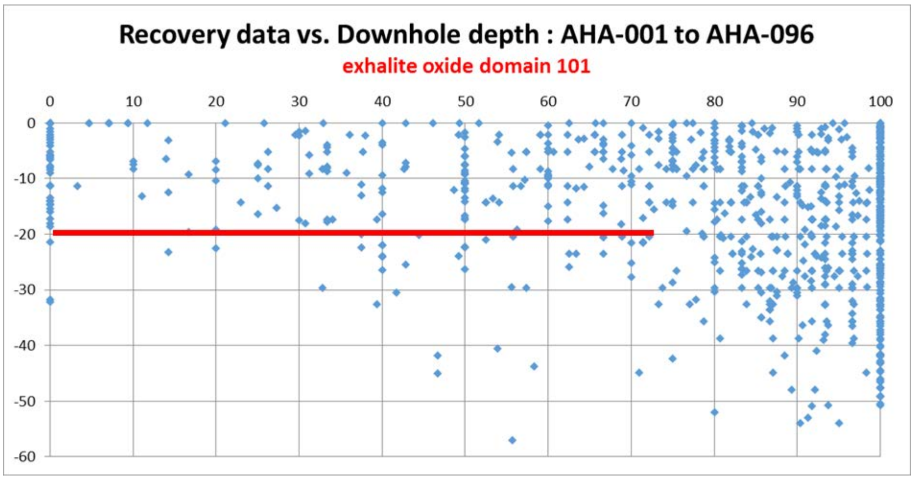


**Figure 10-1 Graph of core recovery (x-axis) vs. downhole depth (y-axis) for all measurements within the main oxide domain.**

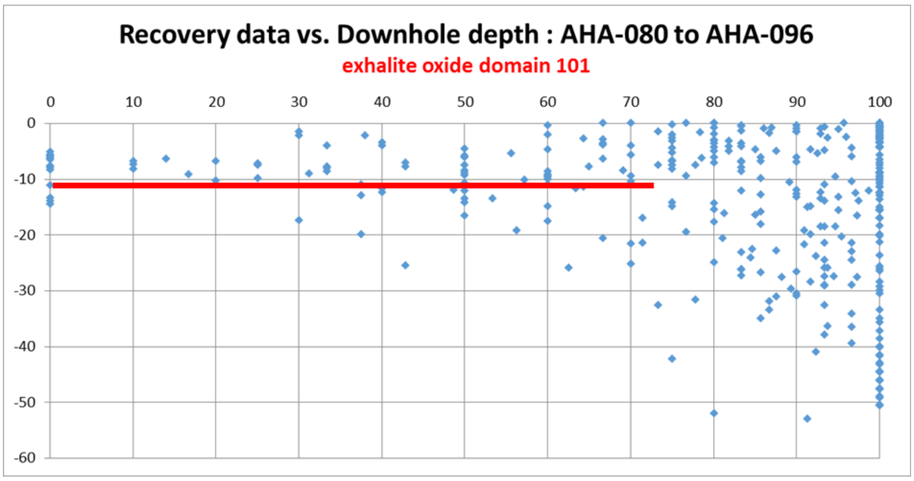


**Figure 10-2 Graph of core recovery (x-axis) vs. downhole depth (y-axis) for the most recent PQ holes within the main oxide domain.**

There is a relationship between core recovery and the gold assay values. For the overall oxide mineralised domain, there is a negative correlation between core recovery and gold grade, shown in Figure 10-3. Where core recovery is less than 80%, the gold grade is on average 51% higher than from samples where the core recovery is ≥ 80%. This may in part be due to the presence of a residual or deflationary zone near surface (which is also indicated by the relatively high grades of channel and chip sampling from the trenches), and may in part reflect a sampling bias. Removing the near surface samples from the dataset (within 15m of surface), the negative correlation is still seen, where the gold grade is on average 37% higher in samples where the core recovery is < 80% (Figure 10-4). Examining the more recent PQ gauge drillholes – which generally had better core recovery – the negative correlation is far less pronounced, with the gold grade being on average 16% higher in samples where the core recovery is < 80% (Figure 10-5).

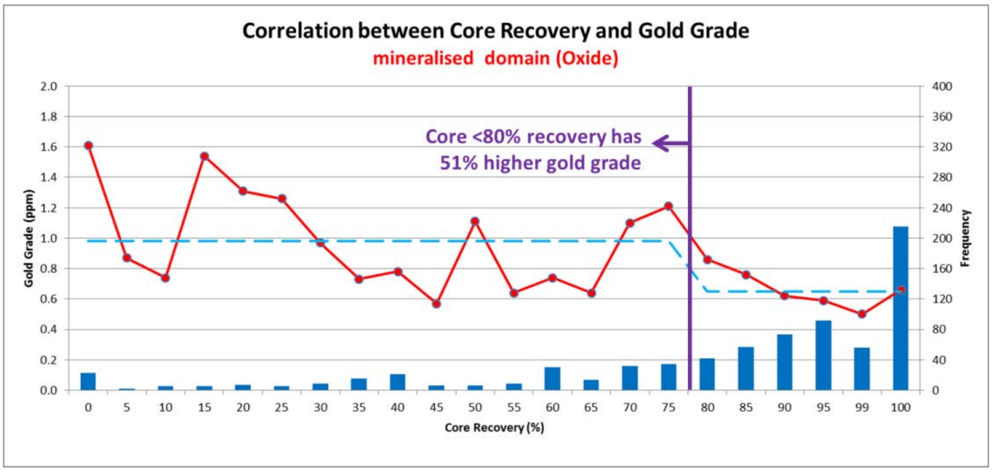


**Figure 10-3 Relationship between core recovery and gold grade, all oxide domain**

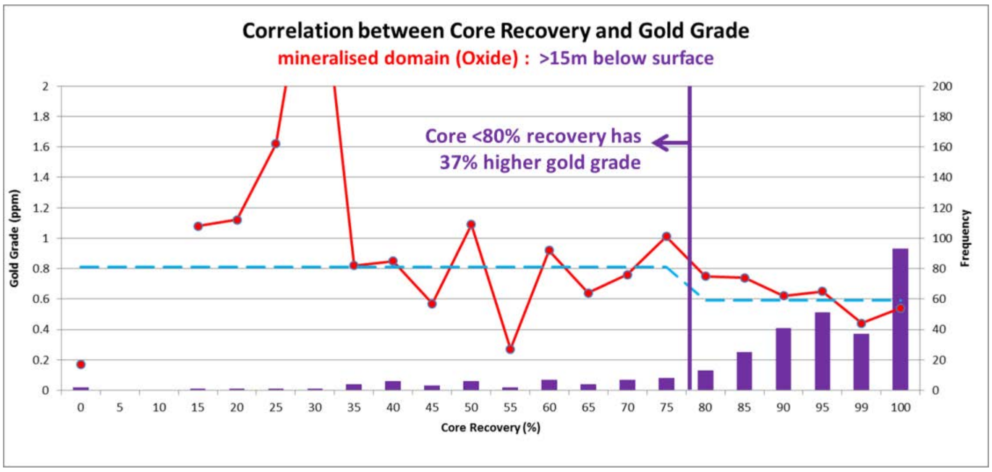


**Figure 10-4 Relationship between core recovery and gold grade, oxide domain greater than 15m below surface**

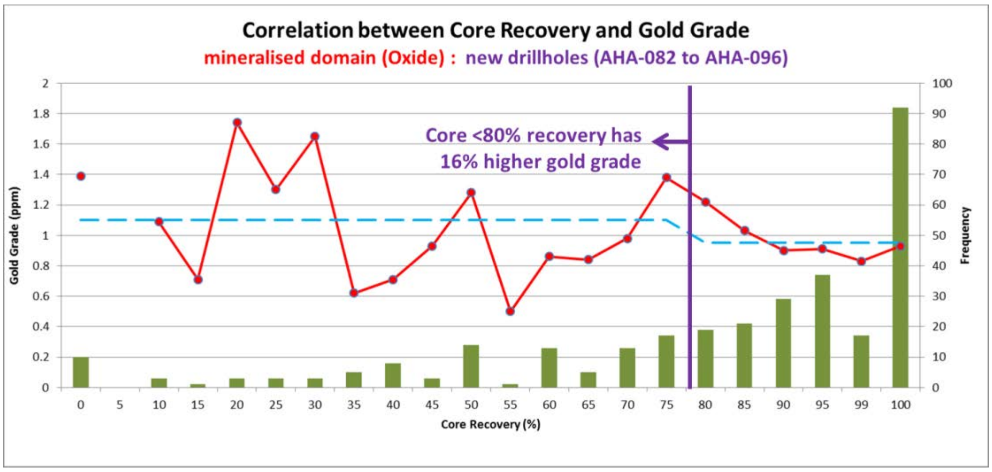


**Figure 10-5 Relationship between core recovery and gold grade, oxide domain for most recent PQ holes**

### 10.2.4 Drill Hole Surveying

#### 10.2.4.1 Collar Location Surveying

Drillhole collar locations have been planned in various mining software packages. Drill hole collars were set out in the field using a Garmin GPS handset, with both a foresight and backsight marked with flagging tape for azimuth. For each hole set up, the drill rig was aligned by a company geologist using a compass. Drill hole collar locations were monumented using a concrete pillar and PVC pipe. Each hole has an aluminium tag, stamped with the hole number attached to the PVC pipe.

Aton contracted Arab Nubia Group to survey all the existing drill hole collar locations (including the historic Minex drill holes), using a Leica Viva GS10 DGPS unit. At the same time, they also surveyed the start and end locations of the majority of the deep trenches, created four survey control points (OBS1-4) which were monumented in cement, and surveyed an additional series of ground control points in order to correctly geo-reference digital information from satellite imagery (WorldView-1 imagery provided by Photosat Information Ltd, of Vancouver, Canada). This satellite data was subsequently used by PhotoSat to generate a Digital Elevation model ("**DEM**") for Hamama at 1m elevation contours, with an estimated spatial accuracy of ±30cm.

#### 10.2.4.2 Azimuth and Dip Surveying

Approximately three-quarters of the drill holes at Hamama have been downhole surveyed, typically at 30 metres downhole intervals. Both Hardrock and Capital Drilling used a Reflex EZ-Trac multifunctional magnetic downhole survey tool. Surveying was undertaken by the drilling contractors.

There are a few drill holes at the Hamama East and Hamama Central areas which deviate significantly, suggesting poor quality survey data. None of the holes in the Hamama West resource area display significant deviation.

### 10.2.5 Geological Logging

Core boxes were driven from the drill sites to the core farm, where core logging was carried out by Aton's staff and contract geologists (Figure 10-6). The geological logging system for the diamond drilling programs includes logs and measurements for rock types, structures and structural measurements, vein type and percentages, sulphide occurrence and percentage, alteration type and intensity, basic geotechnical data and core recovery. Geological logging was carried out using paper logging sheets, and subsequently manually entered into Aton's digital database. The mineralised domains were generally sampled on 1m intervals, with 81% of the 3,721 mineralised samples having a sample length of between 0.9m and 1.1m, and 97% of the mineralised samples having a sample length of between 0.5m and 1.5m.

**Figure 10-6 Logging diamond drill core at the core farm**

### 10.2.6 Core orientation

Core orientation was undertaken on some drill holes during the 2016 drill campaign in competent fresh rock using a Reflex ACT-II survey tool. The drillers placed a bottom of hole mark on the bottom piece of the core run before it was extruded from the core barrel. Drilling was generally undertaken using HQ3 triple tube equipment, with PQ size used in the oxide portion of some holes. The triple tube splits were extruded at the drill site onto a length of angle iron, and the core was then transferred into core boxes, prior to transport to the core farm for logging.

Once the core had arrived from the drill rig at the core farm, it was removed from the core boxes and reassembled on a piece of angle iron. The core was then marked up by Aton's geologists, using the driller's orientation marks. If the core matched up with the preceding/following run, a solid orientation line was drawn on the core. If the core fitted together, but there was deviation between the orientation marks of up to 10°, then a dashed line was marked on the core. Where the marks had a difference of >10° no orientation line was marked on the core. The core was then placed back into the correct core box for further logging. Alpha and beta structural measurements were taken using a "rocket launcher" core orientation device (Marjoribanks, 2010). This device allows the core to be oriented correctly in 3D space. Structural measurements were also taken.

### 10.2.7 Core photography, processing and storage

Diamond drill core is stored onsite in a dedicated area at the core farm, near to the Hamama Camp, in metal core trays, with each holding up to approximately 2.8m of HQ core. Digital photographs are taken of each core tray in a wet and dry state, prior to splitting and sampling. In preparation for sampling, the core is marked up by Aton's geologists, and then cut along the marked line with a diamond saw. Half of the core is returned to the core trays for future reference. In the case of oriented core the core is cut perpendicular to the bottom of hole orientation line, with the top half of the core without the orientation mark being sent for sampling. This ensures that the orientation line remains with the half core that is retained for reference.

### 10.2.8 Density Measurement

Density measurements were taken from diamond drill samples selected across a range of rock types and weathering profiles. Selected samples were first weighed in air, before being weighed in water using a suspended cradle in a bucket of water (Archimedes Method). During the 2016 drilling programme some of the samples of weathered or gossanous material were wrapped in cling-film to prevent ingress of water, but this method is not a standard practice.

## 10.3 Drilling Completed and Significant Results – Hamama West

The nature of the mineralisation as defined by the drilling and surface mapping is presented in Figure 10-7 (plan view), and as representative cross-sections through the mineral deposit in Figure 10-8 to Figure 10-11.

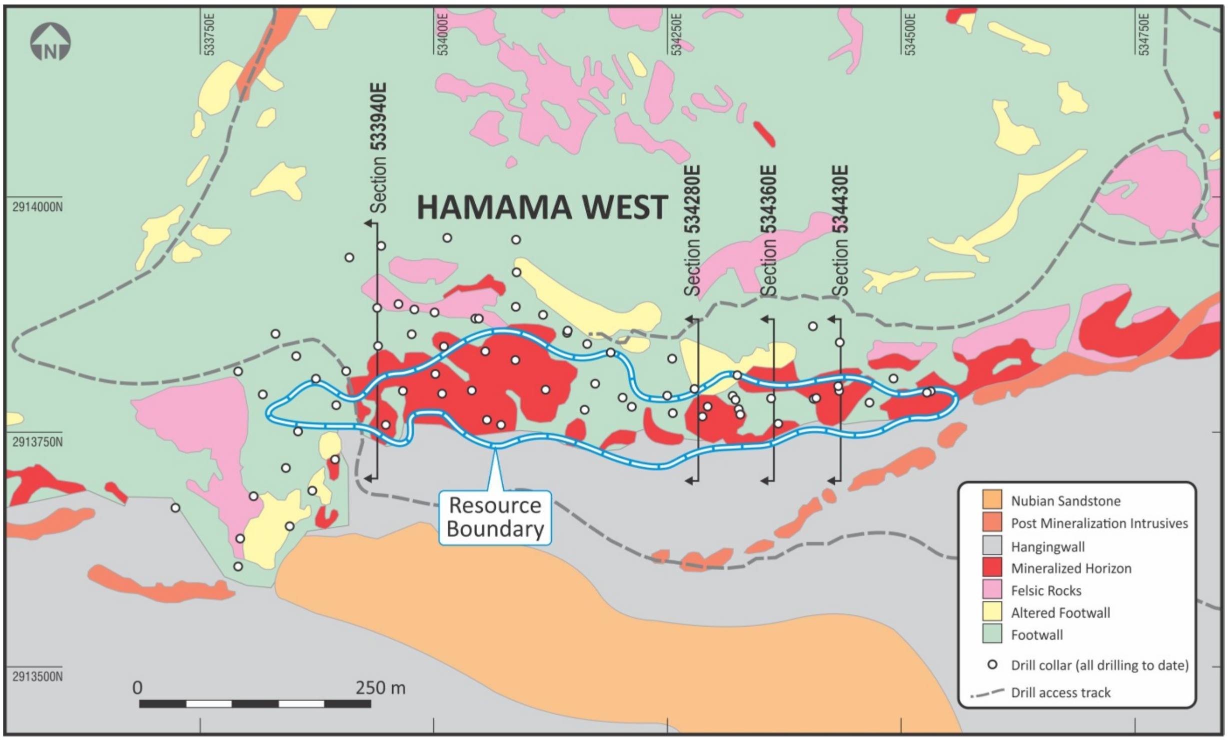


**Figure 10-7 Hamama Drill Hole Location Plan**

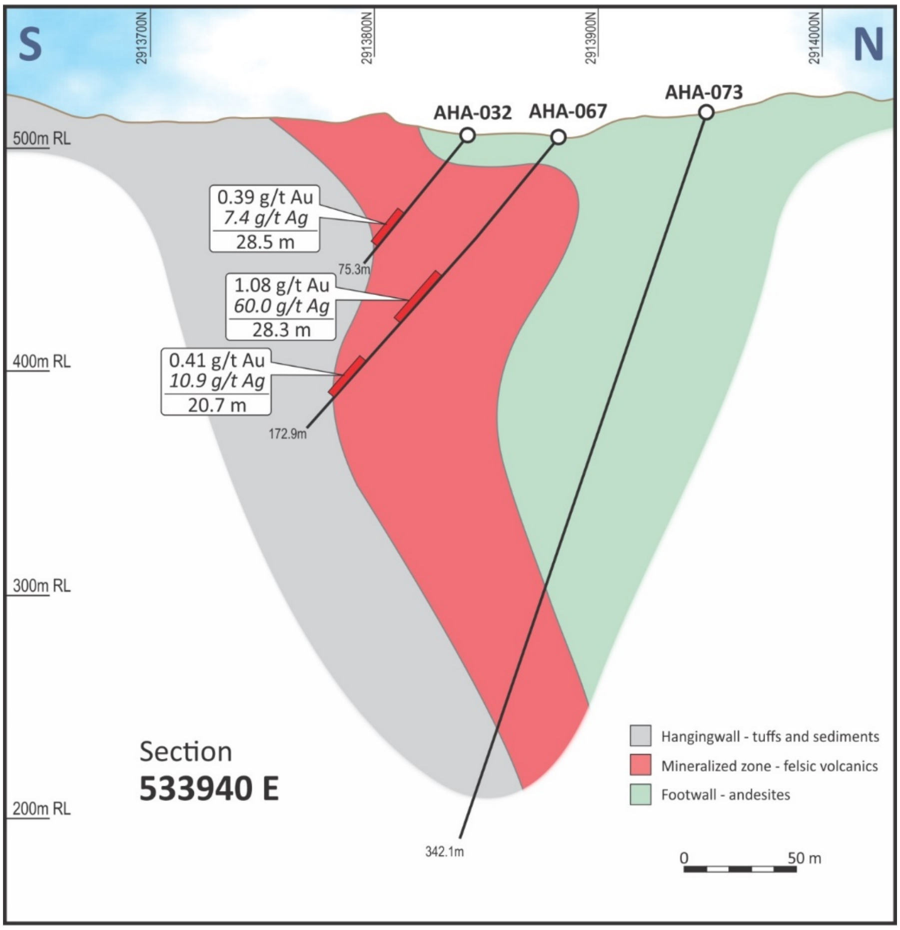


**Figure 10-8 Hamama West Cross Section 533940E**

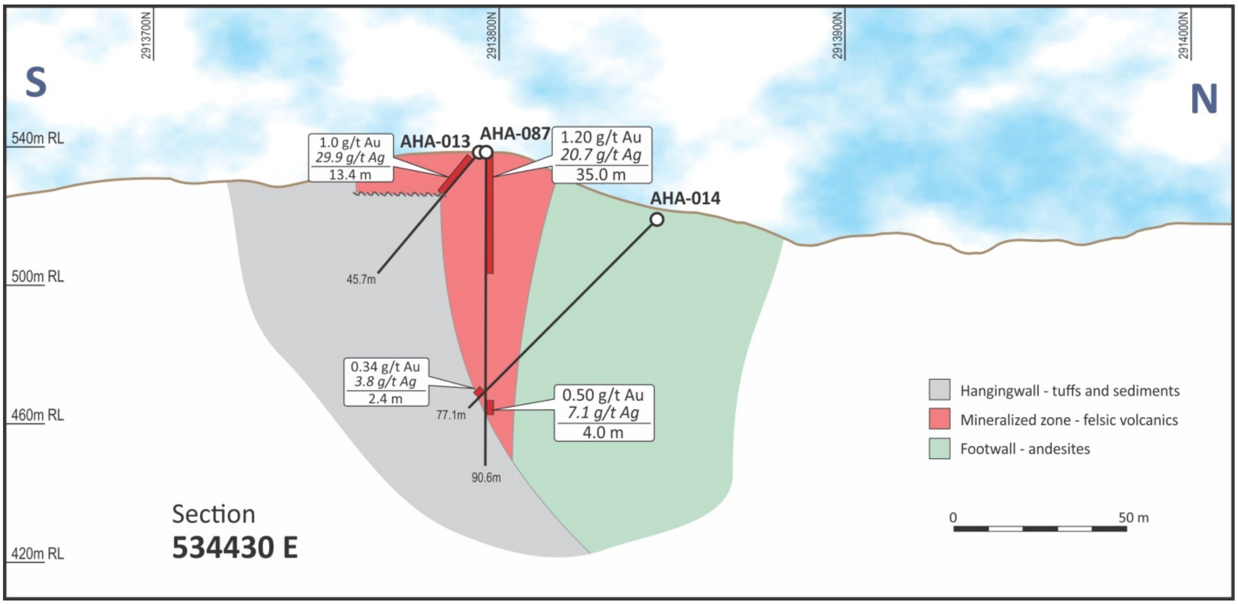


**Figure 10-9 Hamama West Cross Section 534280E**

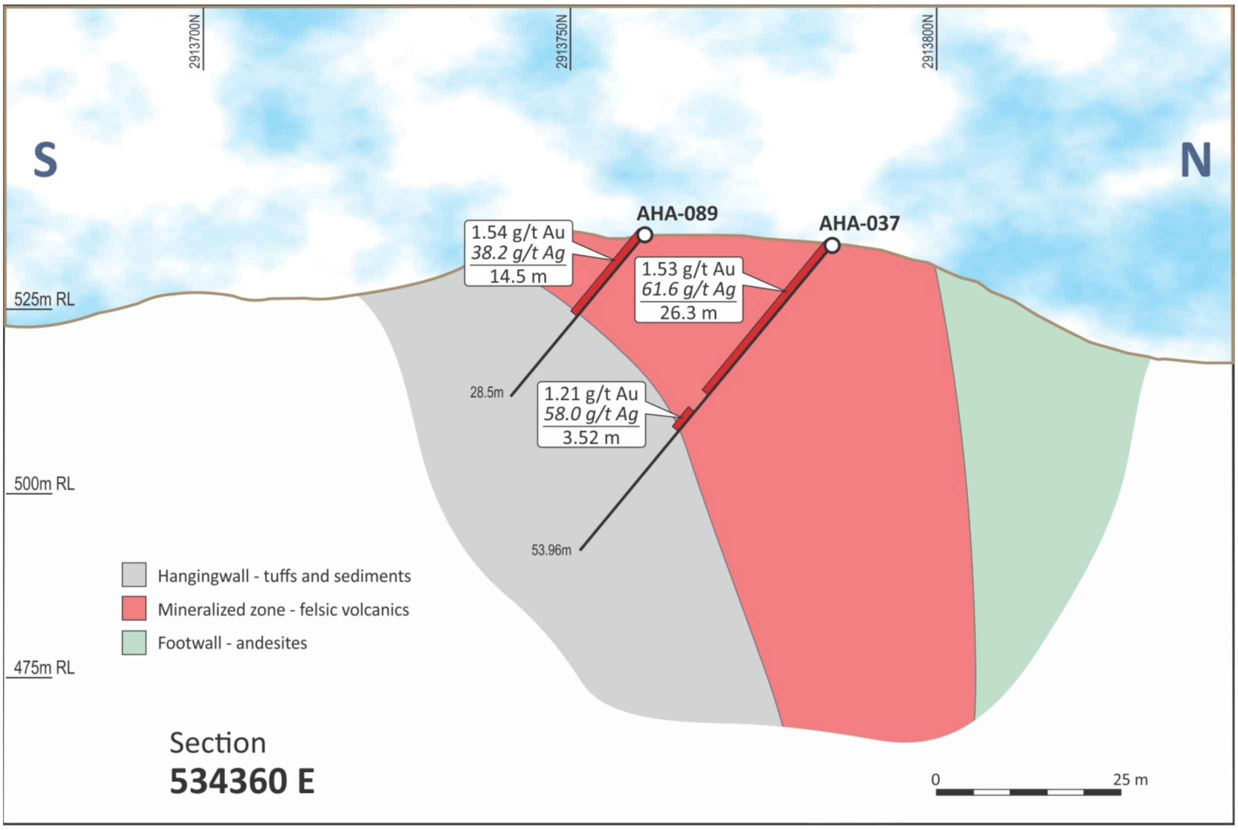


**Figure 10-10 Hamama West Cross Section 534360E**

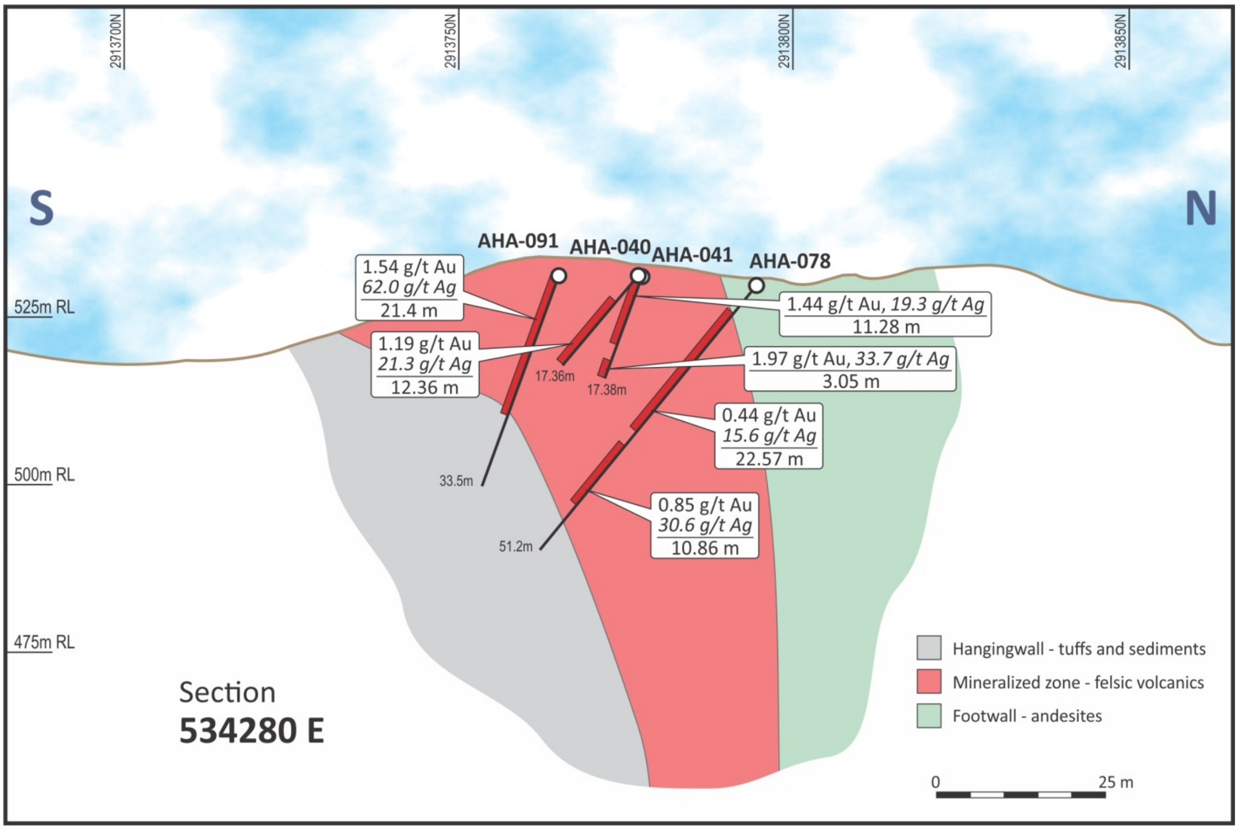


**Figure 10-11 Hamama West Cross Section 534430E**

## 10.3.1 Other Hamama Exploration Areas

Hamama Central and Hamama East were the original targets for both the Minex and Aton drilling. At Hamama Central, drilling intersected a contiguous zone of semi-massive sulphides dipping to the north that included zones of high-grade zinc mineralisation. Elsewhere, faulting and an andesite intrusion, probably subvolcanic in origin, have dislocated the mineralisation. At Hamama East, the stratigraphic sequence has been similarly disrupted by faulting, however encouraging assay results show the area is still prospective for VMS style mineralisation. It is expected that a re-logging exercise combined with more detailed surface mapping and planned ground geophysics will assist to refine the genetic model in these areas and aid target definition.

During the 2015 drill campaign, two diamond holes were drilled to test the Hamama North workings. Both holes encountered altered volcanic rocks with patches of significant pyrite-hematite mineralisation, but no anomalous base metal or precious metal assays were received.

# 11 SAMPLE PREPARATION, ANALYSES AND SECURITY

All samples collected on the Project by Aton during 2016 were subject to quality control procedures that ensured that standard industry practices were utilised for the handling, sampling, transport, analysis, storage and documentation of sample material and analytical results. For the earlier drilling campaigns (2011-2015) not all of the details of the operating procedures used have been able to be verified.

## 11.1 Site Sample Preparation

Half core samples were prepared onsite by company employees in a dedicated sample preparation facility. The facility has two electrically driven diamond core saws, two Bico Bagger 5" x 7" jaw crushers, and an air compressor. The sample processing facility is typically staffed by two to three laboratory technicians and a local laboratory manager or supervisor.

After the core was marked up by Aton geologists for sampling, the lab technicians cut the core and returned half of it to the core boxes. The second half of each sample interval was crushed to approximately <4mm, and then riffle split to produce a 500-600g sub-sample. A duplicate sample of 100-200g is then riffle-split from the reject to produce a sub-sample for EMRA. The remaining coarse reject material was retained and is stored onsite in calico or cloth bags. The crushed sub-samples were then packed in Kraft paper geochemical bags and boxed up for shipment.

## 11.2 Laboratory Sample Preparation and Analysis

Aton has exclusively used the ALS Minerals laboratory in Roşia Montană, Romania for assaying services. ALS is a global independent provider of assaying and analytical testing services for the mining and mineral exploration industry with consistent quality standards implemented across all regions. The laboratory is certified to ISO17025 by Standards Council of Canada. The laboratory participates in group-wide round robin assay work to ensure internal quality performance. Some of the high grade assays, especially for base metals, have pulp sub-samples sent from Romania to another ALS Minerals laboratory in Loughrea, Ireland.

When the samples were received by ALS they were sorted and electronically logged into their system.

Samples were pulverised to more than 85% of the sample passing 75µm, in accordance with sample preparation method PUL32.

Prior to 2015 samples from the Hamama West drilling were submitted to ALS for analysis of gold by fire assay, followed by an atomic absorption finish; and silver, copper and zinc by atomic absorption spectrometry, after an Aqua Regia digestion. Samples from the 2016 campaign were additionally analysed for lead by atomic absorption, after an Aqua Regia digestion.

Fire assay for gold was undertaken using the ALS analytical code Au-AA23 (0.005-10 ppm range), using a 30g charge. Where samples assayed above 10 ppm Au they were re-assayed using the ALS Au-AA25 code (0.01-100 ppm range) for higher grade samples, which also used a 30g charge.

Silver, lead, zinc, and copper were analysed using the ALS atomic absorption analytical code ME-AA45 (maximum detection levels of 100 ppm Ag, and 1.0% Pb, Zn, and Cu). Where samples assayed above these detection levels, they were re-analysed using the ore grade technique ME-AA46 which has maximum detection levels of 1500 ppm Ag, 30% Pb, 60% Zn and 50% Cu.

Additional multi-element low level geochemical analysis have been performed on a number of drillholes, especially in the Hamama East and Hamama Central areas, from the 2012 and 2015 drilling programs. 10g sub-samples of the sample pulps were sent from Romania to the ALS Minerals facility in Vancouver, Canada, where they were analysed using inductively coupled plasma ("**ICP**") mass spectrometry, after a four acid digestion. A 33 element determination was carried out on these samples, using the ME-ICP61 analytical method.

## 11.3 Sample Security

Samples were transported from site by road to Aton's Cairo office by Aton personnel. They were then sent to the Egyptian Geological Museum in Cairo (on behalf of EMRA), and were inspected, re-packed and sealed for export. The samples were then delivered by Aton personnel to the international courier, usually DHL (Egypt) International Couriers. Samples were accompanied by Chain of Custody documents for the entire duration of their transport from site to ALS Minerals in Roşia Montană, Romania.

## 11.4 Quality Assurance and Quality Control

Aton has instigated external QAQC processes to monitor the reproducibility of geochemical and drilling data. The QAQC programs have been employed during the exploration programs to monitor assay sample data for contamination, accuracy and precision. The control samples consist of Certified Reference Materials ("**CRM**"), uncertified reference materials ("**URM**"), and duplicate samples (from crushed half core). The nominal and actual insertion rates for these control samples has varied between the different drilling campaigns, and is summarised in Table 11-1.

In addition, the ALS laboratory has their own internal quality performance processes which follow best practice guidelines required for their certification under ISO17025 and ISO9001. The standard QAQC protocols for the laboratories includes the insertion of CRMs, blank, duplicates and repeat assaying to monitor the quality of the preparation and analytical processes of the laboratory. The results of the internal laboratory quality control are reported regularly to Aton on a batch by batch basis.

**Table 11-1 Quality Control Sample Methodology**

<table>
<tr><th>Sample Type</th><th>Control Sample Type</th><th>Nominal Sample Insertion Rate</th><th>Actual Percent of Total Samples</th></tr>
<tr><td rowspan="4">Diamond Drilling and Trench Sampling (2011 to 2015 Campaigns)</td><td>CRM - Standard</td><td rowspan="4">not known</td><td>1.2 %</td></tr>
<tr><td>URM - Blank</td><td rowspan="2">1.8 %</td></tr>
<tr><td>URM - Flush</td></tr>
<tr><td>Field Duplicate (crushed core)</td><td>1.8 %</td></tr>
<tr><td rowspan="4">Diamond Drilling (2016 Campaign)</td><td>CRM - Standard</td><td>2 in every 78 samples (2.6%)</td><td>2.8 %</td></tr>
<tr><td>URM - Blank</td><td>1 in every 78 samples (1.3%)</td><td>3.3 %</td></tr>
<tr><td>URM - Flush</td><td>1 in every 10 samples (mineralised zones) (10%)<br>1 in every 30 samples (unmineralised zones) (3.3%)</td><td>1.3 %</td></tr>
<tr><td>Field Duplicate (crushed core)</td><td>3 in every 78 samples (3.8%)</td><td>2.7 %</td></tr>
</table>

### 11.4.1 Certified and Uncertified Reference Materials

Various CRMs and URMs were used by Aton during drilling activities to monitor the accuracy and precision of the assay laboratory and to check for sample contamination during the sample preparation and analytical processes.

Eleven CRMs were supplied by CDN Resource Laboratories Ltd. in individually wrapped 60g or 100g Kraft geochem bags. Each bag is supplied in an individual plastic ziplock bag. These were selected as they provided for different grade ranges for gold and silver, but also contained elevated copper, lead and zinc values. None of this material is matrix-matched with the type of mineralisation encountered at Hamama.

Blank material, also used as a flushing medium, was sourced from quartz pebbles sourced from wadis in the Nile Valley.

### 11.4.2 Duplicate Samples

The term 'duplicate' is a generic name for a repeat assay measurement or a second sample of the same sample interval. It is generally an assay check on the original sample. Duplicate samples check on the quality of the sample collection, sample preparation and analytical precision. The inclusion of duplicate samples and their comparative analysis is essential in determining the level of precision, or reproducibility of the assay using a particular analytical method.

For Hamama, field duplicates from the drill core are taken on the reject crushed half core (after the initial riffle split which produced a 500-600g primary sub-sample), subject to the same riffle splitting process to generate a 500-600g secondary sub-sample. No quarter coring or other sampling is made on the remaining un-cut drillcore, which remains on-site as a reference.

### 11.4.3 Monitoring of QC samples

Results from the sample control programs are scrutinised for each assay batch by Aton personnel for any obvious errors. In addition, the final laboratory QAQC certificates were also examined as a further check on the control sample data.

### 11.4.4 Hamama Mineral Resource QAQC Analysis

Cube has reviewed and independently assessed all available QAQC sample data for the diamond drilling completed in the Hamama area by Aton. This represents all the relevant validated drilling data which was used for the estimation of the Mineral Resource at Hamama West.

All control samples were assessed on the basis of accuracy and precision. The precision of sample results is the measure of how closely the results can be repeated. The accuracy of sample results relates to how similar the results are to the true value.

Clearly, it is possible to have good accuracy without good precision, and good precision without good accuracy as shown in Figure 11-1. Precision is measured by the use of duplicate and replicate assays, whereas accuracy is measured through the use of reference materials.

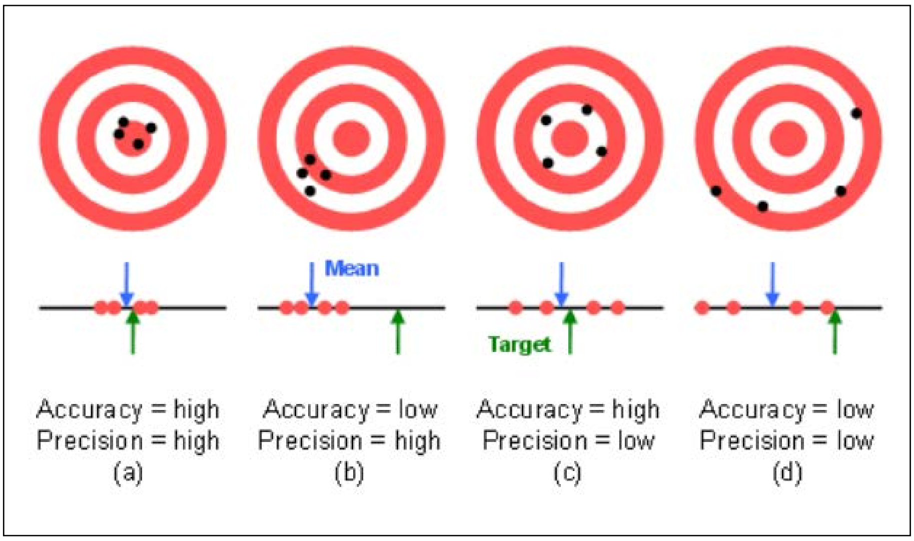


**Figure 11-1 Accuracy and Precision Concept**

#### 11.4.4.1 Certified Reference Material – Standards

The performance of the CRM sample data was assessed by plotting the replicate assay values of the CRMs against time on the control charts. Good quality analysis of the CRMs will be characterised by a random distribution of data points around the certified mean value, with 95% of the data points lying within two standard deviations of the mean (Abzalov, 2008). If more than 5% of the CRM's submitted are outside three standard deviations of the certified mean value, then corrective action should be taken. In addition, no trends or significant bias should be observed in the control charts.

Any obvious assay "outliers" that are likely to be the result of sample mishandling or transcription errors were removed from the dataset prior to analysis, to avoid any skewing of the dataset.

In addition, the CRM data set was assessed by Cube using two statistical tests to demonstrate that the analytical accuracy and precision of the assays were comparable to the certified value of the CRM, and considered acceptable within the 95% confidence limit (Abzalov, 2008).

**Accuracy Test** – involved the comparison of the arithmetic mean of the replicate analysis of the CRM (*m*) against its certified mean ($\mu$), and if the following condition is satisfied then the analytical results are considered acceptable with regard to accuracy:

$$|\mathrm{m} - \mu| \leq 2\sigma_L$$

here $\sigma_L$ is the standard deviation of the replicate analyses of the CRM

**Precision Test** (*Chi Square*) – involves the comparison of the estimated standard deviation of the replicate assays against the CRM deviation, and if the following condition is satisfied then the analytical precision is considered acceptable;

$$\left(\frac{S_w}{\sigma_c}\right)^2 \leq \frac{X^2_{(n-1)0.95}}{n-1}$$

where;

- $S_w$ is the standard deviation of the replicate analyses of the CRM;
- $\sigma_C$ is the certified value of the CRM standard deviation;

- $X^2_{(n-1)0.95}$ is the critical value of the 0.95 quantile of the $X^2$ distribution at $(n-1)$ degrees of freedom; and
- $n$ is the number of replicate assays of the CRM.

All CRMs with less than 5 replicate assays are considered as having insufficient data to properly assess their performance.

The results are summarised in Table 11-2. A total of 167 CRM samples were inserted into the sample stream (assayed for multiple analytes) which relates to around 1.5% of the total samples (including from the trench sampling campaigns). The insertion rate of CRMs through the 2016 drilling campaign at around 2.8% was considered sufficient overall, but relatively low for particular CRMs with the most appropriate grades for the mineralised orebody. This was reported as being influenced by stock levels and the inability to replace them in a timely manner.

In general a bias of greater than 5% is considered not acceptable. A number of the CRMs displayed a consistent positive bias of 3-5% for gold, especially for the 2011-2015 drilling campaigns which may be an issue for concern. A number of the CRMs displayed a small positive bias of <5% for silver in the 2011-2015 drilling campaigns, but with different distributions over time from samples associated with the 2016 drilling campaign.

Graphs of the performance of some of the more commonly used CRMs, with their summary statistics, are shown in Figure 11-2 to Figure 11-4 for gold, and Figure 11-5 to Figure 11-6 for silver.

None of the CRMs available are matrix-matched with the style of mineralisation shown at Hamama. If required, this could be addressed by generating a bulk sample of some material from Hamama and producing site-specific products that are externally certified.

About 1% of the CRM results were identified as sample mishandling or transcription errors and were excluded from the analysis as outliers. It is recommended that these samples are located and corrected in the database for future analysis.

Given the identified precision issues, the overall accuracy and precision of the assay data relating to the CRMs being within tolerance limits, no major bias is apparent within the primary assay data. However, there is the possibility for a minor positive bias with respect to gold and silver, especially relating to the 2011-2015 drilling campaigns.

**Table 11-2 CRM Performance Summary - Hamama**

| Analyte | CRM | Certified Value (ppm) | No. Assays | Accuracy Test | Precision Test | % Passing 3SD | % Bias | Period in Use |
|---|---|---|---|---|---|---|---|---|
| Ag | CDN-CM-30 | 16 | 7 | PASS | PASS | 100 | -2 | 2015-2016 |
| | CDN-CM-38 | 6 | 8 | PASS | PASS | 100 | -1 | 2015-2016 |
| | CDN-GS-1Q | 40.7 | 18 | PASS | PASS | 100 | 2 | 2015-2016 |
| | CDN-GS-2Q | 73.2 | 19 | PASS | PASS | 100 | 3 | 2015-2016 |
| | CDN-GS-5P | 119 | 15 | PASS | PASS | 100 | 1 | 2015-2016 |
| | CDN-GS-P5D | 66 | 12 | PASS | PASS | 100 | -3 | 2015-2016 |
| | CDN-ME-11 | 79.3 | 32 | PASS | FAIL | 100 | 3 | 2011-2016 |
| | CDN-ME-2 | 14 | 14 | PASS | FAIL | 89 | 5 | 2011-2016 |
| Au | CDN-CGS-26 | 1.64 | 30 | PASS | PASS | 97 | 5 | 2011-2016 |
| | CDN-CM-30 | 1.3 | 7 | PASS | PASS | 100 | 0 | 2015-2016 |
| | CDN-CM-38 | 0.942 | 9 | PASS | PASS | 100 | -5 | 2015-2016 |
| | CDN-GS-10D | 9.5 | 3 | PASS | PASS | 100 | -1 | 2016 |
| | CDN-GS-1Q | 1.24 | 18 | PASS | PASS | 100 | 0 | 2015-2016 |
| | CDN-GS-26 | 2.34 | 2 | FAIL | PASS | 50 | -30 | 2016 |
| | CDN-GS-2Q | 2.367 | 19 | PASS | PASS | 100 | 2 | 2015-2016 |
| | CDN-GS-5P | 4.78 | 15 | PASS | PASS | 100 | 1 | 2015-2016 |
| | CDN-GS-P5D | 0.643 | 12 | PASS | PASS | 100 | 5 | 2015-2016 |
| | CDN-ME-11 | 1.38 | 33 | PASS | FAIL | 100 | 2 | 2011-2016 |
| | CDN-ME-2 | 2.1 | 19 | PASS | PASS | 100 | 1 | 2011-2016 |
| Cu | CDN-CGS-26 | 15800 | 27 | PASS | PASS | 100 | 3 | 2011-2016 |
| | CDN-CM-30 | 7300 | 7 | PASS | PASS | 100 | 0 | 2015-2016 |
| | CDN-CM-38 | 6860 | 9 | PASS | FAIL | 89 | -3 | 2015-2016 |
| | CDN-ME-11 | 24400 | 29 | PASS | PASS | 100 | 3 | 2011-2016 |
| | CDN-ME-2 | 4800 | 18 | PASS | PASS | 100 | 0 | 2011-2016 |
| Pb | CDN-CM-30 | 2370 | 4 | FAIL | FAIL | 25 | 12 | 2015-2016 |
| | CDN-ME-11 | 8600 | 20 | PASS | PASS | 100 | 6 | 2011-2016 |
| Zn | CDN-ME-11 | 9600 | 32 | PASS | PASS | 100 | 1 | 2011-2016 |

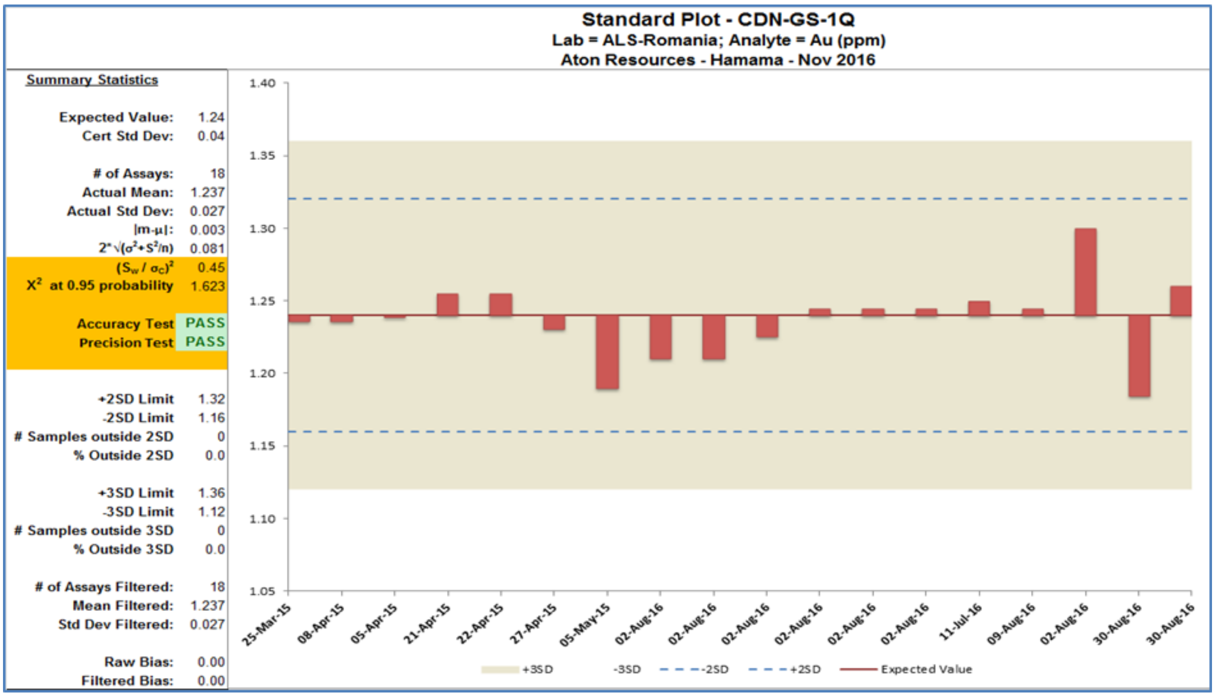


**Figure 11-2 Standards Plot for Gold – CDN-GS-1Q**

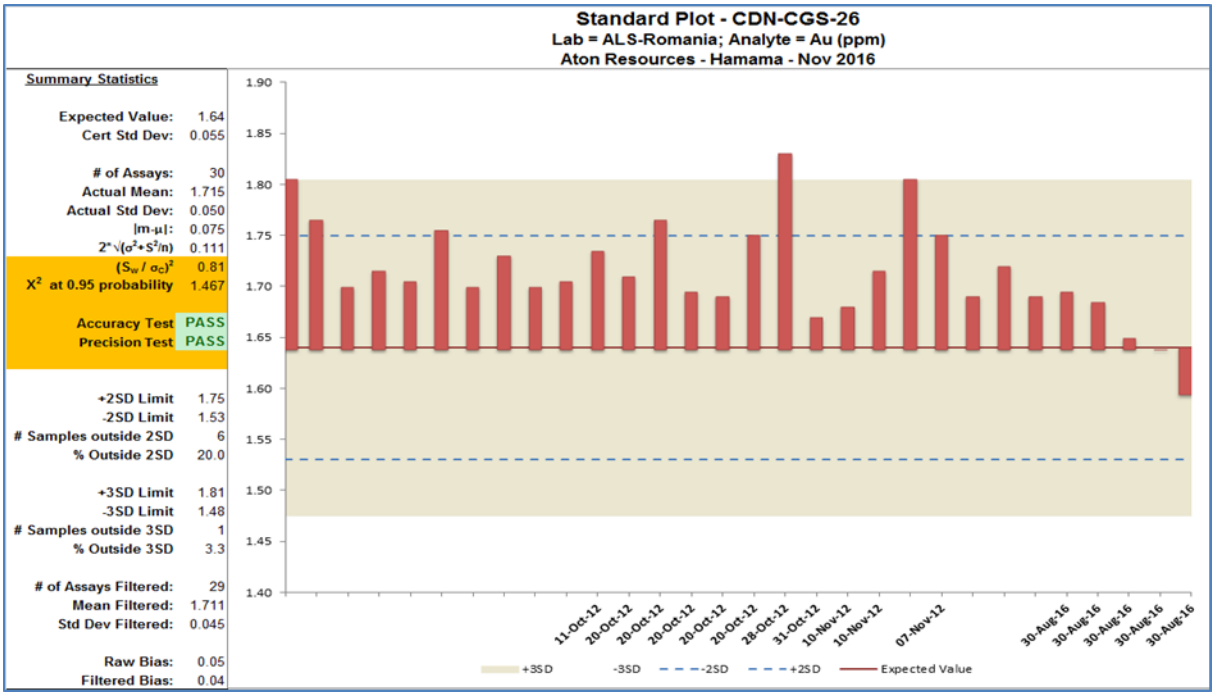


**Figure 11-3 Standards Plot for Gold – CDN-CGS-26**

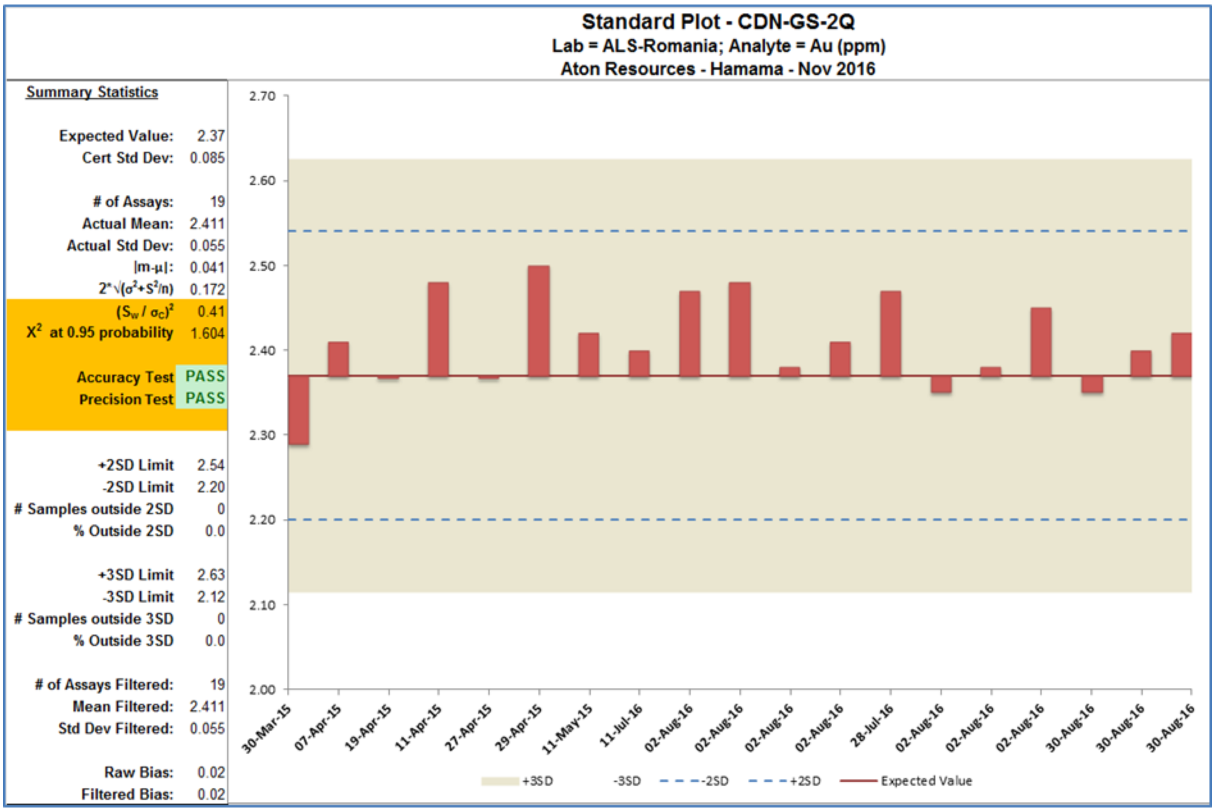


**Figure 11-4 Standards Plot for Gold – CDN-GS-2Q**

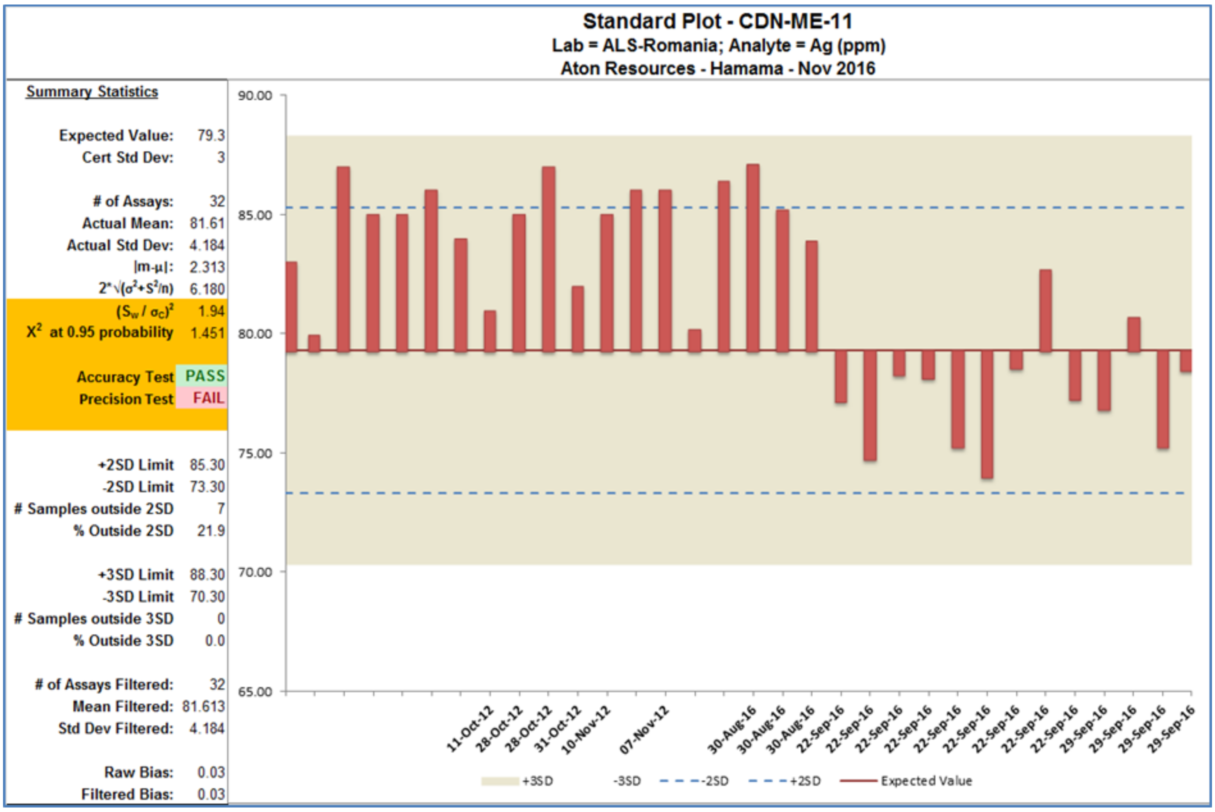


**Figure 11-5 Standards Plot for Silver – CDN-ME-11**

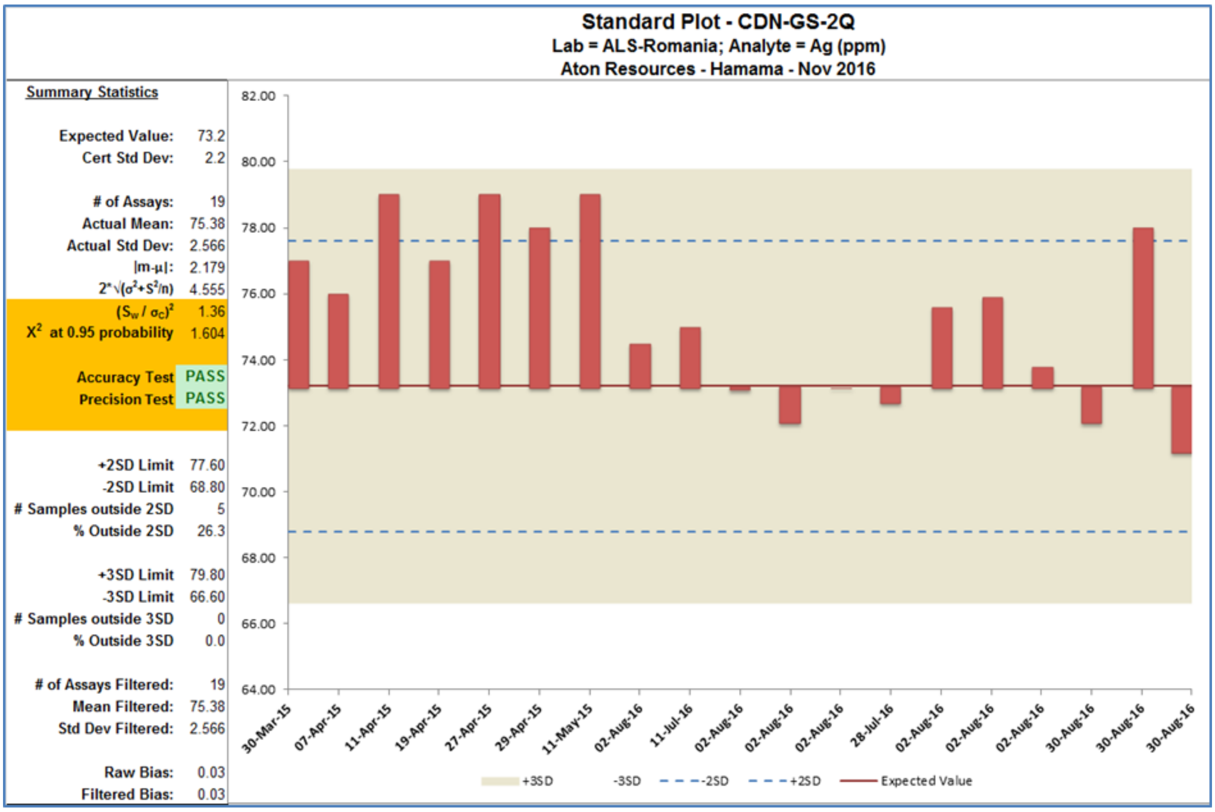


**Figure 11-6 Standards Plot for Silver – CDN-GS-2Q**

### 11.4.4.2 Uncertified Reference Material – Blank Material Assays

Assays for blank material were assessed by graphing the actual value and the maximum accepted value which was, assigned as 0.1ppm Au. The maximum accepted value for this study was considered to be 2.5 times the lower analytical detection limit for gold, set at this threshold to limit the potential for bias and precision issues which increase close to the assay method detection limit. Using these limits, blanks should return a value less than 0.025ppm Au at least 95% of the time.

Unmineralised material used as a flushing medium for the on-site sample preparation (jaw crushing) uniformly returned assays below detection limit for gold.

Graphs of the performance of the blanks and flushing sample, with their summary statistics, are shown in Figure 11-7 and Figure 11-8 for gold. The results indicate that the assay blanks data are within acceptable limits. No obvious contamination issue is apparent within the primary assay data.

A total of 233 assay blank samples and 35 flushing samples were inserted into the sample stream, around 2.5% of the total samples (including from the trench sampling campaigns). Of these, one sample was considered to be an 'outlier' resulting from a likely transcription error and was excluded from the analysis.

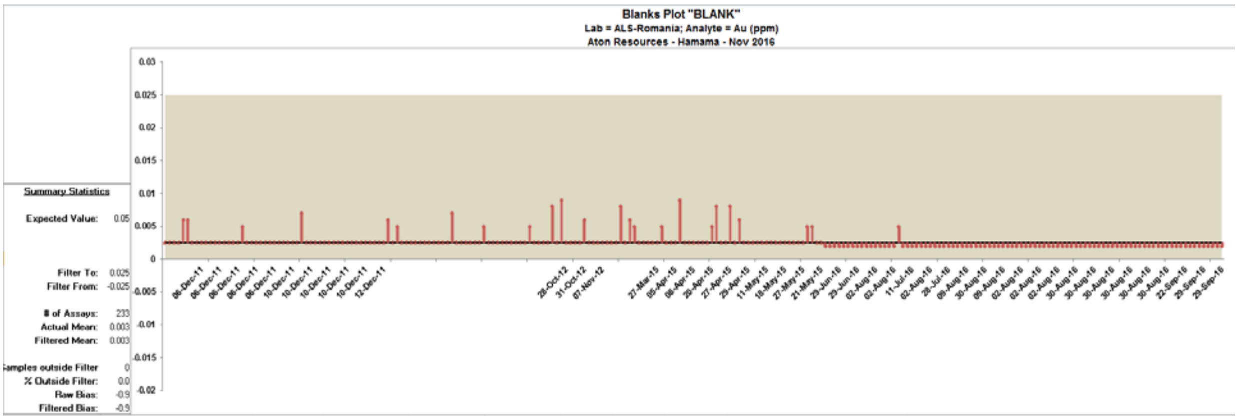


**Figure 11-7 Blanks Plot for Gold**

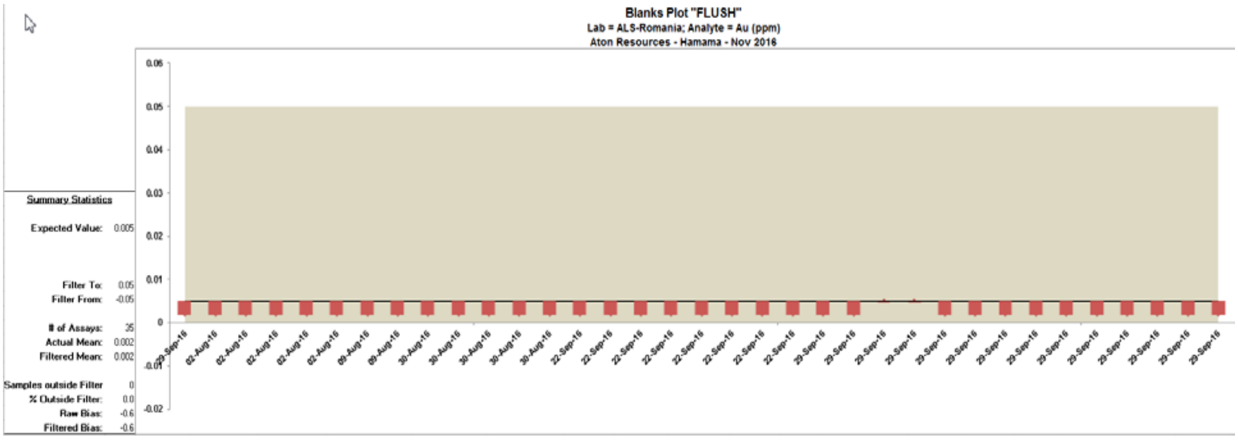


**Figure 11-8 Flushing Samples Plot for Gold**

#### 11.4.4.3 Duplicate Samples

For Hamama, field duplicates from the drill core are taken on the reject crushed half core rather than as samples from the other half of the core. Therefore the analysis of the duplicate data has to take into account that the data comparison is relative, as both sets of samples have already been subject to a sub-sampling stage of crushing and multiple riffle-splitting.

The results for pairs of duplicate samples (original and duplicate) are plotted as X/Y scatter plots, relative paired difference plots (“**RPD**”), and quantile-quantile plots (“**Q-Q’**”). Scatter plots allow for direct comparison of the data pairs and the assessment of general dispersion, data regression as well as the presence of any outliers. RPD plots evaluate the coefficient of variation for each pair (difference between pairs relative to the pair mean) and allow the measurement of the relative precision error between pairs based on the average coefficient of variation (“**ACV**”).

Approximate guidelines for assessing analytical quality allow for a maximum ACV of around 40% for field duplicates in gold deposits with very coarse grained nuggetty gold and 30% for coarse to medium grained gold (Abzalov, 2008). Pulp duplicates are expected to have an ACV value in the range of 10% to 20%. The RPD plots allows for the visualisation of any bias or trend between pairs.

Overall, the precision of the duplicate samples was within acceptable limits and no obvious trend or bias was identified. A total of 220 duplicate samples were collected which represents an insertion rate of around 2.0% of the total samples (including from the trench sampling campaigns), with a somewhat higher rate of around 2.7% of the samples from the 2016 drilling campaign. Industry accepted exploration and resource practices generally requires that an insertion rate for duplicate samples should be in the order of 10%, and it is recommended that the level of all duplicate sampling should be increased to allow more definitive analysis of the precision data. Note that for the core samples, sampling of the coarse crushed material is not a true duplicate (as sampling the other half of the diamond core would be), as the variance shown does not take into account any random or systematic errors associated with the crushing and sub-sampling process.

A comparison was made between the data from the 2016 drilling campaign (subject to the current well-documented sampling and data handling procedures), and the data from earlier drilling campaigns. The precision of both datasets was similar, which improves the confidence in the quality of the earlier drilling (which does not have the same degree of documentation to support the methods and procedures used at the time).

Plots for gold from the 2016 drilling campaign – Scatter Plot, RPD Plot and Q-Q' plot – are shown in Figure 11-9 and Figure 11-10, while plots for gold from the 2011-2015 drilling campaigns are shown in Figure 11-11 and Figure 11-12 respectively.

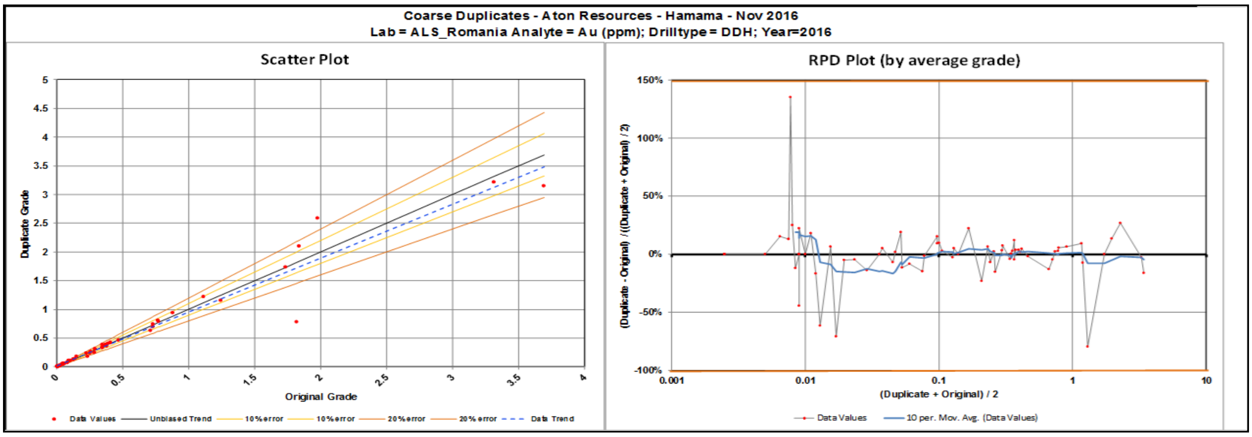


**Figure 11-9 Duplicates for Gold (2016 drilling) – Scatter and RPD Plot**

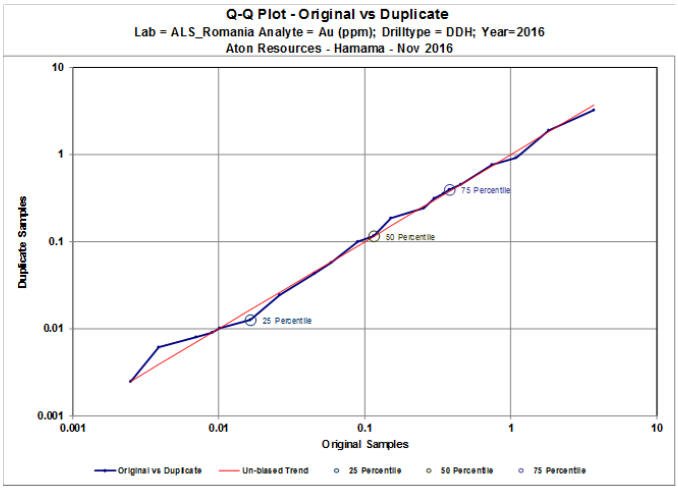


**Figure 11-10 Duplicates for Gold (2016 drilling) – Q-Q' Plot**

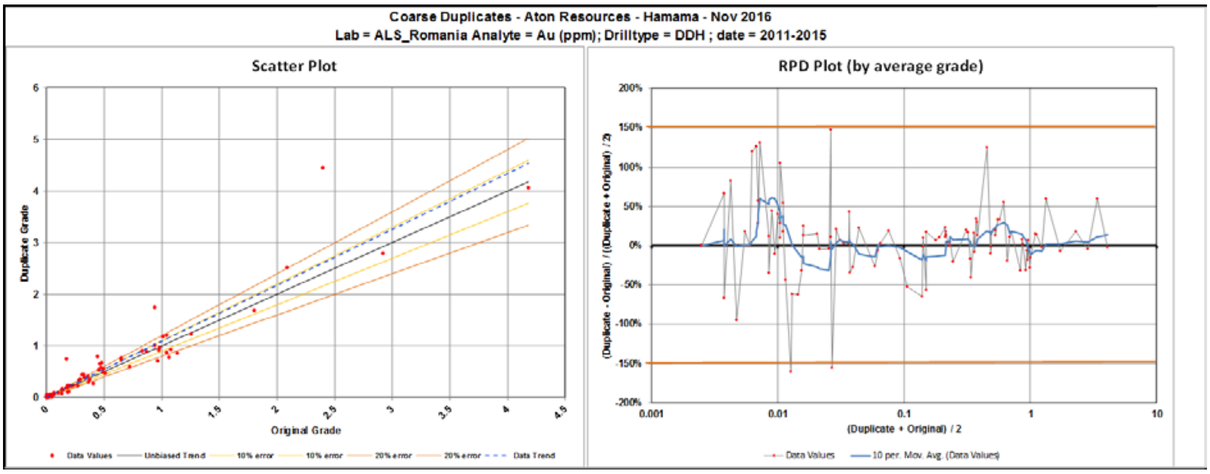


**Figure 11-11 Duplicates for Gold (2011-2015 drilling) – Scatter and RPD Plot**

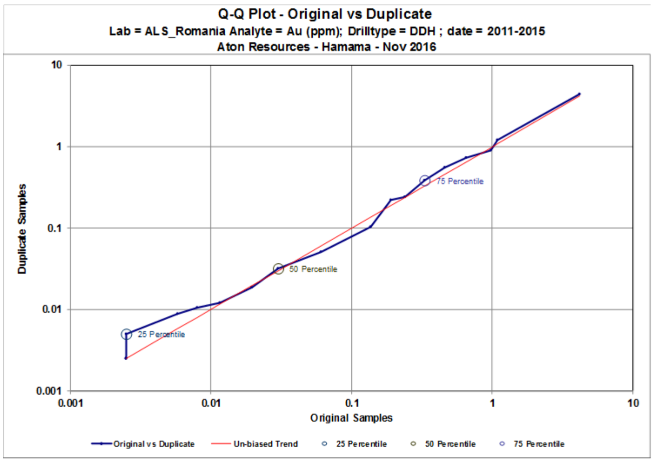


**Figure 11-12 Duplicates for Gold (2011-2015 drilling) – Q-Q' Plot**

#### 11.4.4.4 Umpire Laboratory Check Assaying Duplicates or Pulps

All assaying for the project for the elements of economic interest has taken place at the ALS Roşia Montană laboratory in Romania, apart from the 'ore grade' assays for base metals which were forwarded onto the ALS Loughrea laboratory in Ireland. There were no checks performed at an alternative laboratory.

#### 11.4.4.5 Twinned Drill Holes

There are currently no formal twinned drillholes within the resource area at Hamama West.

## 11.5 Assaying Method

All gold and silver assaying has been performed by a Fire Assay method. It is recommended to analyse some duplicates on the crushed core material by a Screen Fire Assay method, especially with respect to some of the higher gold and silver grades encountered.

## 11.6 Principal Author's Statement

All aspects of the methods employed for the collection, preparation and dispatch of drill samples carried out by Aton personnel were witnessed by Cube in May and June 2016.

The sample collection and preparation, analytical techniques, security and QAQC protocols implemented by Aton for the Project are generally consistent with standard industry practice and are suitable for the purpose of mineral resource estimation and the reporting of exploration results. The insertion rates for CRMs, URMs and duplicates are on the low side and should be increased in future drilling campaigns. The sampling procedures are adequate for and consistent with the Principal Author's understanding of the style of gold and silver mineralisation targeted by Aton on the Project.

# 12 DATA VERIFICATION

The Principal Author visited the Project between 6th May and 11th May 2016 to inspect selected areas within the project area to ascertain the geological setting, witness the extent of the exploration work, and in particular, inspect and verify the drilling program that was in progress.

The site visit involved comprehensive data verification, inspections and reviews of the following:

- geology and exploration history of the Hamama area, including historic workings;
- exploration model and strategy;
- current exploration data and exploration procedures;
- ground checking of surface geological and alteration features by geological traversing and inspection of trenches;
- trench and drilling data;
- current diamond drilling operations and core handling processes;
- QAQC procedures and control data;
- data and database management systems; and
- on-site sample handling and storage facility.

The Principal Author again visited the Project between 20th June and 22nd June 2016 specifically to:

- collect independent core samples;
- witness their initial sample preparation (jaw crushing);
- personally transport them from site to Cairo; and
- witness their inspection by the Egyptian Geological Museum, and subsequent dispatch to the international courier.

The Principal Author returned to the Project Area between 24th June and 27th June 2016 to further review and discuss:

- the geological interpretations with field geologists;
- inspect drill core from recent holes;
- validate the revisions to the collar locations from the new survey pickups against the previous locational data; and
- assist with planning of infill drilling programs to increase the data density within the oxide domain of the deposit.

## 12.1 Data Validation

Aton has collected all site geochemical and drilling data initially as hard copy logs, transcribed into spreadsheets, and collated into a stand-alone MS Access database. As part of the data verification process, Aton supplied all relevant data to Cube to undertake various validation checks of the stored information.

A manual check was made on a subset of the geology data in the Lithology_2016 table in the database with the original paper copy geological logs.

A manual check was made on a subset of the data in the Drill_Assays_2016 table in the database with paper copy print outs of the ALS Minerals assay certificates, and a further subset of Certificates of Analysis that were independently emailed to Cube by ALS Minerals (Roşia Montană, Romania).

Cube performed further data validation and analysis of the database provided during the first site visit, with feedback to Aton to investigate areas of missing, incomplete, invalid or poorly documented data. Items which were subsequently addressed prior to the final database used for the resource estimation include:

- Collars initially picked up in a format using a different geoid to that used for the site DEM, which had a discrepancy of around 9-10m. This was superseded by a new survey pickup of collars by Arab Nubia Group surveyors, and cross-referenced against a new PhotoSat survey for a more accurate DEM; and

- A number of minor errors in an interim MS Access database (as reviewed in May 2016) with respect to missing or overlapping assay intervals, data outside of expected ranges (ppm values listed as percent values), prioritization of different assaying methods, and inconsistencies between tables (logging intervals beyond the end of hole).

Items which remained outstanding included:

- Lack of documentation for some of the earliest drillholes (2011-2012) with respect to orientation of downhole surveys (mag or UTM36N grid) and core orientations;

- Lack of any downhole survey information for the holes drilled in 2012 (AHA012-AHA026);

- Lack of documentation for immersion method density measurements, and the potential for an incorrect formula applied to the density calculation in a number of holes, and a further subset of the data where the spreadsheet calculations of density do not match the database; and

- Consistency between logging codes through multiple drilling campaigns.

The final MS Access drilling database received by Cube (*master_database_DM.accdb*, dated 24 October 2016) was converted into a new purpose built database for the resource estimation (*cube_hamama_nov_2016.accdb*), and a further series of data validation checks were performed. Comparisons were made against the collar locations for all holes against the interim (May 2016) database.

No material errors were detected in the collar, assay or survey tables during this checking process. A small number of minor issues were found, such as missing lead assays, data outside of expected ranges (ppm values listed as percent values), missing RQD values for parts of 6 holes, missing assays from part of hole AHA-043. These were investigated and rectified by Aton, and updated into Cube's database as appropriate.

## 12.2 Independent Verification Samples

In June 2016, the Principal Author selected mineralised intervals from 5 diamond drillholes for independent analysis. Two of the holes (AHA-031; AHA-058) were from older drilling programs, where ½ drill core was retained on-site, whereas the other three holes were from the current drilling campaign (AHA-066 to 068) which were being cut and sampled at the same time.

The Principal Author observed:

- All cutting of the ¼ core for the independent samples;
- All of the crushing of the samples (Bico Badger 5" x 7" jaw crusher), and subsequent riffle splitting procedure (designed to reduce the sample size to an approximate range of 500-700g);
- All sample packing for delivery to Cairo, including insertion of blanks and CRMs;
- Delivery of the samples to the Egyptian Geological Museum in Cairo, where they were inspected, re-packed and sealed for export; and
- Delivery of the samples to DHL (Egypt) International Couriers, ready for dispatch to the ALS Minerals laboratory in Romania.

The objective of this check sampling was to confirm the presence of the mineralised drill intersections.

Assay data including the Certificate of Analysis was emailed directly to Cube by ALS Roşia Montană, Romania.

Comparisons of the replicate assays to the original assays are displayed in Figure 12-1 (for gold) and Figure 12-2 (for silver). Cube concludes that the mineralised intercepts returned from the independent verification sampling confirm the original ALS drill assays reported by Aton.

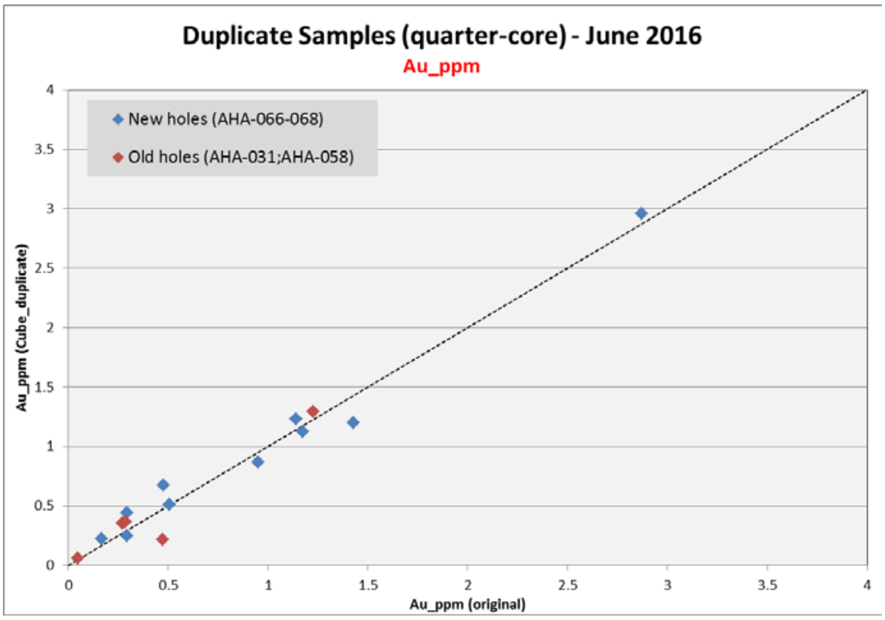


**Figure 12-1 Comparison of Original assay (half core) against independent assay (quarter core) for Au**

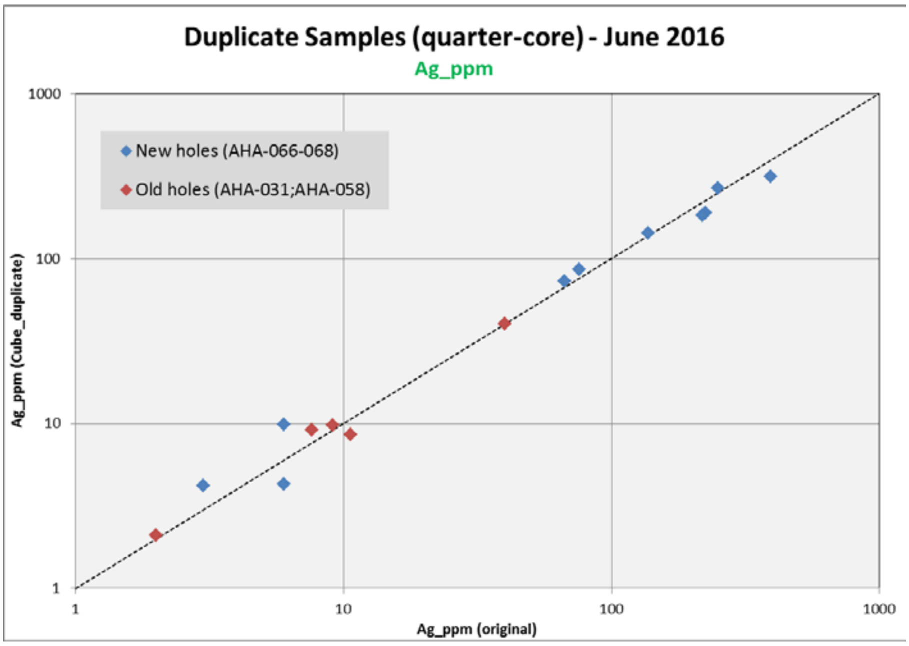


**Figure 12-2 Comparison of Original assay (half core) against independent assay (quarter core) for Ag**

## 12.3 Independent Geological Logging

A number of holes were summary logged by Cube to verify the interpreted geology and compare against the Aton geology logging and assay results supplied as part of the drilling database. The objective was to understand the style and paragenesis of the mineralisation and to confirm the consistency of the logging codes for use in interpretation. This was supplemented by examination of core photography for each drillhole.

Cube concluded that although there was a degree of inconsistency between the logging codes and the logging data especially between the different drilling campaigns, the gross stratigraphy of the deposit from the summary logging confirmed the original Aton logging in the supplied drilling database.

## 12.4 Principal Author's Statement

Cube has assessed the veracity of the drilling data for the Hamama Project. Where it has been able to be assessed, the logging, sampling and data QAQC procedures implemented by Aton from 2015 to 2016 were undertaken to a reasonable industry standard. For current drilling programs, the record keeping and data management were considered adequate for an advanced exploration project.

Some doubts remain about some aspects of the drilling data from the earlier campaigns, in terms of poor record keeping and missing data. The risk on data quality associated with these holes has been reduced by consideration and analysis of aspects such as:

- the overall grade distribution in these holes (relative to the newer drillholes);
- consistent core recovery and RQD;
- consistent downhole positions of major lithological contacts (implying no major downhole deviations of dip); and

- consistent independent interpretation of geology from core photography.

It is concluded that this data is of a sufficient standard and appropriate for mineral resource estimation.

The Principal Author's site visits to the Project in May and June 2016 included field inspection at the Hamama Project, and confirmation of the overall location of drill holes, geological outcrops and trenches, nearby artisanal workings, mineralisation in the diamond drill holes within this deposit, and site data management processes (including the operation of the site sample preparation facility).

Results of the independent drill core sampling procedure confirm the existence and tenor of gold and silver mineralisation within the selected area of the deposit.

Cube has independently reviewed and assessed all of the available quality control sample data relating to the diamond drilling completed by Aton. Overall, the quality control samples are unbiased and have an acceptable level of precision, indicating that the sample data is of a sufficient standard and appropriate for mineral resource estimation.

# 13 MINERAL PROCESSING AND METALLURGICAL TESTING

A preliminary phase of metallurgical testwork was undertaken on the deposit in 2015, focussing solely on the potential for cyanide leaching of the oxide portion of the deposit. Samples were taken largely from surface trenches, with the testwork undertaken by ALS Minerals in Ireland. The testwork is regarded as preliminary and designed to serve as proof of concept only.

The information below has been summarised from internal Aton reports, and from the website of Aton Resources, including from a Media Release in January 2015 (Alexander Nubia, 2015b).

## 13.1 Hamama West Deposit Testwork

### 13.1.1 Direct Cyanidation

Direct cyanidation testwork was undertaken on a suite of samples to verify whether acceptable extraction results could be achieved via this method. The results are listed in Table 13-3.

Sample selection and sample preparation was based on the following:

- Seven composite samples were selected, sourced from six surface trenches, and one diamond drillhole (AHA-015);
- Samples collected were of the order of 10kg;
- These were crushed in a jaw crusher at the on-site sample preparation facility (to nominally <5mm), and reduced to a sub-sample of approximately 1kg;
- The sub-samples were shipped to ALS Minerals in Roşia Montană, Romania, and pulverised to a nominal grind size of 80% passing 75µm;
- Splits of these samples were analysed by 50g Fire Assay (for gold), and a four-acid digestion followed by ICP-AES (for silver, copper, lead and zinc); and
- The remainder of the material was shipped to ALS Minerals in Loughrea, Ireland.

Leach tests were performed under the following non-optimised leach conditions:

- A 500g subsample of the pulverised material was used;
- Bottle roll with 500mL of water and a LeachWELL™ 60x reagent, requiring 1-2 hours leaching time; and
- After filtration, the solution and the residue were analysed for gold and silver. For the residue, a 50g Fire Assay (for gold) and a four-acid digestion followed by ICP-AES (for silver), was used.

The following highlights were noted (by Alexander Nubia, 2015b) in relation to this phase of the testwork program:

1. Gold responds very well to cyanidation of the oxide material;
2. Gold recoveries averaged 86.6% (in a range from 72.9% to 92.2%);
3. Silver recoveries averaged 45.0% (in a range from 22.8% to 62.4%); and
4. The sample with the lowest gold recovery (from trench AHA-T-088) is associated with elevated levels of base metals.

Table 13-1 shows the intervals of the oxide composite samples used, along with their initial assay results (ALS Romania). Table 13-2 shows the assay results of the leach liquor and the residual material after bottle roll cyanidation, with the summary recoveries detailed in Table 13-3.

**Table 13-1 Intervals and Initial Assays**

| Sample ID | Width (m) | Au (ppm) | Ag (ppm) | Cu (%) | Pb (%) | Zn (%) |
|---|---|---|---|---|---|---|
| AHA-015 | 37 | 2.14 | 114 | 0.05 | 0.34 | 1.46 |
| AHA-T-88 | 18 | 0.82 | 23 | 0.27 | 0.69 | 3.82 |
| AHA-T-96 | 62 | 3.04 | 60 | 0.05 | 0.04 | 0.35 |
| AHA-T-99 | 24 | 1.38 | 100 | 0.04 | 0.04 | 0.05 |
| AHA-T-100 | 42 | 2.93 | 34 | 0.02 | 0.04 | 0.05 |
| AHA-T-103 | 52 | 0.76 | 25 | 0.02 | 0.06 | 0.09 |
| AHA-T-104 | 50 | 4.81 | 69 | 0.07 | 0.07 | 0.13 |

**Table 13-2 Bottle Roll Assays**

| Sample ID | Cyanide Leach Assays | | | | | Residual Assays | |
|---|---|---|---|---|---|---|---|
| | Au (ppm) | Ag (ppm) | Cu (%) | Pb (%) | Zn (%) | Au (ppm) | Ag (ppm) |
| AHA-015 | 1.75 | 55.7 | <0.01 | <0.02 | 0.30 | 0.20 | 34 |
| AHA-T-88 | 0.62 | 8.8 | 0.04 | <0.02 | 0.31 | 0.23 | 16 |
| AHA-T-96 | 2.67 | 32.4 | <0.01 | <0.02 | 0.13 | 0.31 | 30 |
| AHA-T-99 | 1.19 | 49.3 | <0.01 | <0.02 | <0.01 | 0.23 | 60 |
| AHA-T-100 | 2.71 | 13.1 | <0.01 | <0.02 | <0.01 | 0.28 | 24 |
| AHA-T-103 | 0.67 | 6.2 | <0.01 | <0.02 | <0.01 | 0.10 | 21 |
| AHA-T-104 | 4.82 | 44.9 | 0.01 | <0.02 | 0.01 | 0.41 | 27 |

**Table 13-3 Cyanidation Recovery Summary**

| Sample ID | Gold Extracted Au (g/t) | Tail Au (g/t) | Calculated Head Grade Au (g/t) | Gold Recovery (%) | Silver Extracted Ag (g/t) | Tail Ag (g/t) | Calculated Head Grade Ag (g/t) | Silver Recovery (%) |
|---|---|---|---|---|---|---|---|---|
| AHA-015 | 1.75 | 0.20 | 1.95 | 89.7 | 55.7 | 34 | 89.7 | 62.1 |
| AHA-T-88 | 0.62 | 0.23 | 0.85 | 72.9 | 8.8 | 16 | 24.8 | 35.5 |
| AHA-T-96 | 2.67 | 0.31 | 2.98 | 89.6 | 32.4 | 30 | 62.4 | 51.9 |
| AHA-T-99 | 1.19 | 0.23 | 1.42 | 83.8 | 49.3 | 60 | 109.3 | 45.1 |
| AHA-T-100 | 2.71 | 0.28 | 2.99 | 90.6 | 13.1 | 24 | 37.1 | 35.3 |
| AHA-T-103 | 0.67 | 0.10 | 0.77 | 87 | 6.2 | 21 | 27.2 | 22.8 |
| AHA-T-104 | 4.82 | 0.41 | 5.23 | 92.2 | 44.9 | 27 | 71.9 | 62.4 |
| **Average** | | | | **86.6** | | | | **45.0** |

### 13.1.2 Conclusions and Recommendations for Further Work

The location of the samples taken for this preliminary test work is a function of the availability of test material at the time (prior to the bulk of the diamond drilling activities) and as such may not be representative of the entire oxidized portion of the deposit.

Direct cyanidation testwork using an accelerant such as a LeachWELL™ 60x reagent is not necessarily representative of what may be achieved by a traditional bottle-roll test of 48 to 72 hours duration, which will provide key information such as the kinetics of the reactions (leaching performance over time) and cyanide consumption.

Further metallurgical testwork planned for 2017 includes:

- An initial phase of mineralogical assessment, consisting of QEMSCAN bulk mineral analysis and XRD analysis, to identify the mineral species and metal deportment in the geo-metallurgical domains identified logged from the drill core.
- Additional bottle roll tests to further identify and characterize the geo-metallurgical domains, and to provide key data on reagent consumption (especially lime and cyanide).
- Crushing and milling characteristics (Bond Work Indices) for the key lithologies and/or geo-metallurgical domains.

# 14 MINERAL RESOURCE ESTIMATE

The Mineral Resource estimate incorporates all Diamond Drill ("**DD**") drilling completed by Aton since 2011 over the western part of the Hamama prospect area. The Hamama prospect area is part of a mineralized corridor which extends along a potential strike length of over 3km, and which may be comprised of several discrete mineralised zones.

## 14.1 Data Sources

The following data was supplied by Aton and forms the basis of the Mineral Resource:

- drill hole data and trench assays as a Microsoft Access database;
- topographic survey file of the project exported as 1m contours;
- digital photos of all DDH drill core; and
- various preliminary geological interpretations from Aton geological staff.

## 14.2 Project Drillhole Database

The drilling database was supplied by CSA Global (providing contract database management services to Aton) as a copy of the master Microsoft Access database which is managed by Aton geologists on-site. The database reflects all the available drilling data as of the 23rd October 2016.

A total of 9,704m of DD drilling has been completed in 96 holes since Aton (then Alexander Nubia) commenced drilling in December 2011 on the overall Hamama prospect, including the subset of holes in the western end of the prospect covered by the Mineral Resource. A drilling data breakdown by hole type is detailed in Table 14-1.

Historical drillholes drilled by Minex in the 1980s (see Section 6.2) were excluded from the Mineral Resource estimate and are not included in this drilling breakdown.

**Table 14-1 Summary of Drilling and Trenching campaigns for the Hamama Project**

| Year / Campaign | Phase | Range of Hole No. | No. of DD holes | Length of DD holes (m) | Average Depth (m) | Date Drilled From - To |
|---|---|---|---|---|---|---|
| 2011 | DD | AHA-001 to AHA-011 | 11 | 1,187 | 108 | Dec 2011 |
| 2012 | DD | AHA-012 to AHA-026 | 15 | 1,420 | 95 | Oct 2012 – Nov 2012 |
| 2015 | DD | AHA-027 to AHA-058 | 32 | 3,668 | 115 | Mar 2015 – May 2015 |
| 2016 | DD | AHA-059 to AHA-096 | 38 | 3,429 | 90 | Apr 2016 – Aug 2016 |
| **TOTALS** | | | **96** | **9,704** | **101** | |
| multiple | Trench | AHA-T-001 to AHA-T-138 | 138 | ~6,846 | ~50 | - 2015 |

A subset of the master database supplied by Aton was extracted containing only Hamama West data, which was used for the Mineral Resource estimate and is summarised in Table 14-3. The current interpretation and estimation was largely completed using DD core holes, supported by general reference to the surface expression of mineralised zones as indicated from geological mapping and the sampling programs from the trenches. The trench assay information was not used in the grade estimation for the deposit, as it is considered to be of insufficient quality with respect to accuracy and representivity of the collected samples, and the uncertainty of spatial location as compared with the DD information.

**Table 14-2 Hamama Project Drilling Breakdown – Project History by Deposit**

| Deposit | Data Type | Hole_IDs | No of Holes | Total Drill Metres | Average Depth (m) |
|---|---|---|---|---|---|
| **Hamama West** | **DDH** | **AHA-012 to 019<br>AHA-021 to 047<br>AHA-058 to 096** | **74** | **6,597** | **89** |
| Hamama Central | DDH | - | 10 | 1,369 | 137 |
| Hamama East | DDH | - | 10 | 1,567 | 157 |
| NH1 | DDH | - | 2 | 172 | 86 |
| **TOTAL DRILLING** | | | **96** | **9,704** | **101** |

**Table 14-3 Drill Hole Database Summary**

| Table | No. of Records (DDH total) | No. of Records (DDH Hamama West) | Number of Records (Trenches) |
|---|---|---|---|
| cube_Collar | 96 | 74 | 138 |
| cube_Survey | 388 | 284 | 161 |
| cube_Alteration | 2,446 | 1,521 | - |
| cube_Assay | 6,906 | 4,997 | - |
| cube_Density | 2,047 | 1,607 | - |
| cube_Lithology | 1,918 | 588 | - |
| cube_Oxidation | 224 | 184 | - |
| cube_Recovery_RQD | 3,548 | 3,064 | - |
| cube_Structure | 986 | 986 | - |
| cube_Vein_Min | 3,115 | 2,502 | - |
| cube_Trench_Assay | - | - | 3,399 |
| cube_Trench_Assay_points | - | - | 3,395 |

Routine validation of the database prior to coding and compositing included checks for overlapping and duplicate sample intervals, minimum and maximum assay values, depths, azimuths, dips and collar co-ordinates for data consistency. Discussion of the potential limitations with respect to core recovery with some of the drillholes intersecting near-surface mineralisation, are detailed in Section 10.2.3. Further measures that were taken to verify the data are detailed in Section 12.1.

The "*AU_BEST_PPM*" field in the assay table was copied into a new database field "*cube_au*" and used for compositing purposes. All negative values, representing below detection assay results (-0.01, -0.005) were assigned a small positive value (0.005) in the new assay field.

The final validated database was considered acceptable for the purposes of Mineral Resource estimation.

## 14.3 Geology and Mineralisation Models

Utilising all the available drilling data, Cube completed a geological interpretation to establish the underlying geological framework and controls on mineralisation and to incorporate components of an earlier interpretation by Aton geologists.

### 14.3.1 Lithology Domains

Three dimensional wireframes were created, which defined:

- the main mineralised horizon at the stratigraphic top of an andesitic volcanic unit :
  - the base of this unit is diffuse, and has been loosely defined by alteration and mineralogical features (mostly quartz and ankerite), as well as a gold mineralisation cutoff of approximately 0.2g/t Au;
  - there is a generally very sharp contact at the top of this unit with the overlying epiclastics sediments; and
  - further definition on weathering constraints to categorise an upper gossanous unit.
- a small near-surface residual or deflationary zone of mineralisation, spatially associated with the gossanous unit and related to the surrounding topography;
- several very small pods of mineralisation within the stratigraphically overlying epiclastics sediments, which have been interpreted to be minor breccia zones or talus deposits very close to the contact with the main horizon;
- a poorly-defined shallow-dipping fault zone which appears to truncate or displace the main mineralised horizon at the western end of the deposit;
- several late-stage andesitic or rhyolitic dykes which cross-cut the stratigraphy, and which are generally devoid of gold or silver mineralisation; and
- the flat-lying Nubian Sandstone formation (Cretaceous), which unconformably overlies the Proterozoic sequence.

Fifteen irregularly-spaced east-west sections were created using Geovia Surpac 6.7 software, generally 30-50m apart and depending on individual drill hole data spacing.

The lithology domains used in the resource estimation are summarised in Table 14-4, and displayed in Figure 14-1 (plan view) and Figure 14-2 (oblique view).

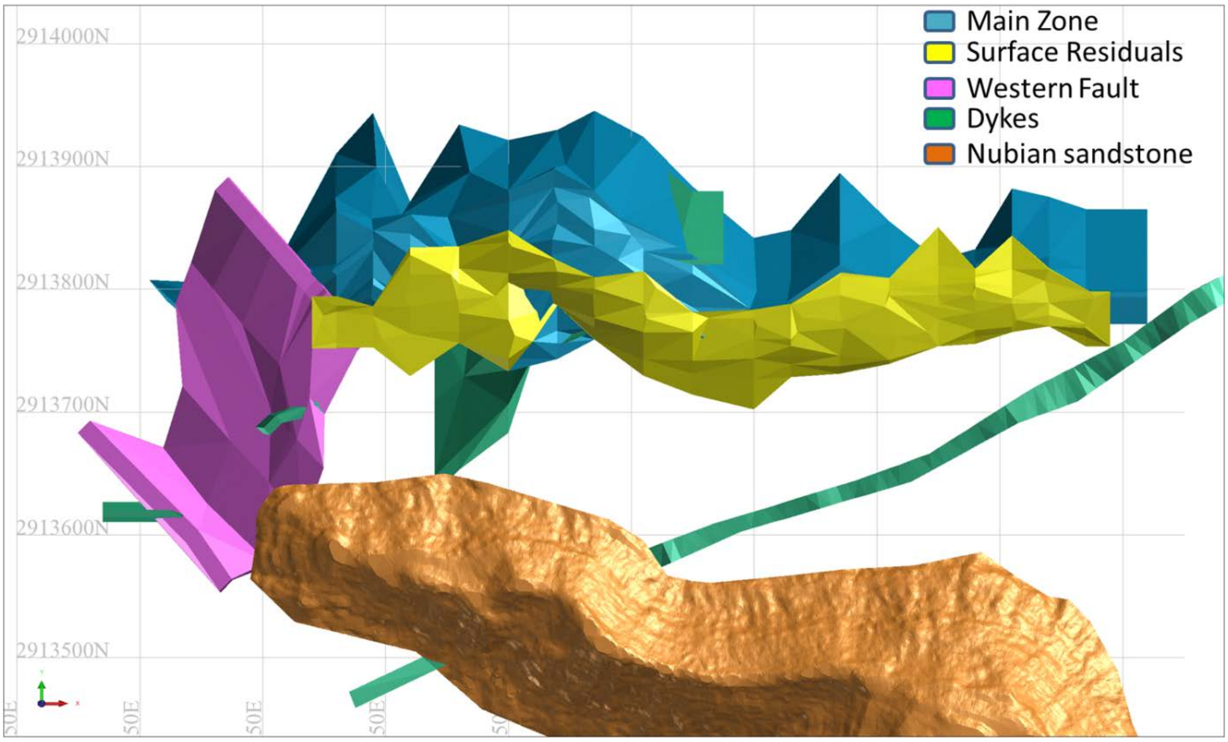


**Figure 14-1 Hamama West lithology domains – plan view**

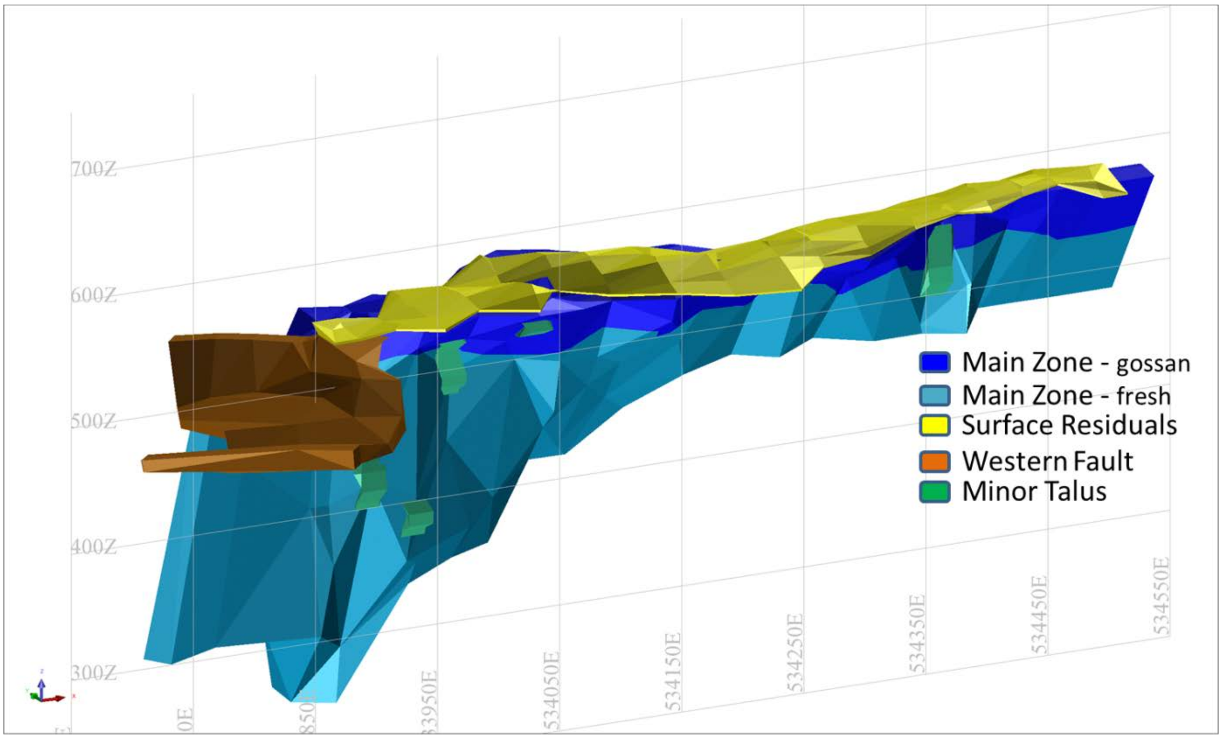


**Figure 14-2 Hamama West mineralised domains – oblique view looking NNE**

### 14.3.2 Mineralisation Domains

The wireframes that were used for the lithology domains were also used for the mineralisation domains.

All mineralised wireframes were "snapped" to the drillhole lithology sample interval as long as the geometric robustness and integrity of the domain was preserved and a valid three dimensional digital model ("**3DM**") could be created.

On most cross sections the interpretation was not extended more than 50m past the last drill hole intercept both along strike and down-dip. However, sectional interpretations were extended further than 50m on some sections in areas of sparsely drilling where the geological and grade continuity could be reasonably assumed.

The mineralisation domains used in the mineral resource estimation are summarised in Table 14-4, and displayed in Figure 14-2.

**Table 14-4 Hamama Domains – Mineralised and Unmineralised**

| Rock type | Lith Domain | Min. Domain | # of 3DM solids | Volume | % of Total Volume |
|---|---|---|---|---|---|
| Main Zone (Oxide) | **101** | **101** | 1 | 1,665,473 | 19% |
| Main Zone (Fresh) | **102** | **102** | 1 | 6,511,550 | 76% |
| minor Talus in HW | **103** | **103** | 5 | 17,206 | 0.2% |
| Surface Residuals | **104** | **104** | 1 | 96,573 | 1% |
| Western Fault Zone | **400** | **400** | **1** | 269,053 | 3% |
| **SUB-TOTAL MINERALISED DOMAINS** | | | | **8,559,855** | **100%** |
| Dykes | **500** | **-** | **4** | **-** | **-** |
| Nubian Sandstone | **600** | **-** | **1** | **-** | **-** |

### 14.3.3 Weathering Domains

Two weathering surfaces, defining the base of complete oxidation and the top of fresh, were interpreted utilizing the logged regolith and weathering codes in the 'cube_Oxidation' table from the database, and from inspection of core photography for all holes. Wireframes were "snapped" to drill hole traces on north-south cross-sections for all drill holes in the estimation area.

The final weathering surfaces for block model assignment are summarised below in Table 14-5.

**Table 14-5 Weathering Surfaces and Model Assignment**

| Domain Type | Surpac 3DM file | Block Model Attribute (geo_ox_n) |
|---|---|---|
| Air | Above Topo - cube_hamama_topo_nov2016.dtm | 0 |
| Oxide | Below Topo - cube_hamama_topo_nov2016.dtm<br>Above - hamama_weath_nov2016.dtm Object 1 | 1 |
| Transition | Below - hamama_weath_nov2016.dtm Object 1<br>Above - hamama_weath_nov2016.dtm Object 3 | 2 |
| Fresh | Below - hamama_weath_nov2016.dtm Object 3 | 3 |

## 14.4 Bulk Density

Bulk density was assigned on the basis of logged lithology and weathering, as defined by the interpreted lithology wireframes and weathering surfaces.

Density measurements were taken by using the Archimedes Method (water displacement) of whole core samples.

As the core in the oxide and transition zone is generally broken and differentially weathered, the more competent and unweathered sections of the core are the most suitable for density determinations and hence are likely to overstate the assigned density in the oxide zone. Additionally, the core used was generally neither coated nor waxed, though some later holes in the 2016 drilling campaign were wrapped in cling-film. The risk of not using a method which adequately accounts for potential void spaces is considered to be generally low in all fresh rock types, and moderate in more weathered material.

A total of 1,612 bulk density measurements were made across the deposit based on drill core. After filtering out a few obvious outliers, a total of 1,598 measurements were used for the analysis, and ranged in value from 1.35 to 5.04 g/cm$^3$. In addition, 15 grab samples were taken from surface outcrop of the adjacent Nubian Sandstone, which was not intersected in any drilling.

The key results from the density analysis included:

- Measurements from the main mineralised domain were moderately variable within fully oxidised and transitional material, and have the potential for positive bias as the samples collected may not be representative of the domain as a whole, and the procedure does not use a wax coating or cling-filmto seal the core prior to measurement;

- Measurements from the 2015 drilling campaign - especially in oxidised material from the main mineralised domain - were more variable than those recorded from the 2012 campaign, or the current 2016 campaign. This may in part be attributed to the quality of the drilling operations and procedures as a whole during the 2015 drilling campaign, and remains to be verified;

- Measurements from the main mineralised domain were less variable within fully fresh material. A small positive skew is evident, which may be related to an increasing component of sulphide minerals. There is currently no sulphur assaying undertaken, and the quality of the visual logging estimates of sulphide minerals is too variable to develop a regression formula to link density with sulphide content. A comparison of the density measurements against the nearest zinc assay was undertaken – using zinc grade (from sphalerite) as the closest proxy for sulphide content available – but no clear correlation was evident;

- Some of the original data recorded in spreadsheets from the earlier drilling campaigns appear to have incorporated an incorrect or inconsistent formula in the density calculation, from incorporating the weight of the sample cradle in the formula, rather than tareing the equipment to include the sample cradle's weight. Although this may only introduce a small additional error, it has not been verified as to what portion of the data in the final MS Access database is subject to this problem; and

- There is only limited data relating to the minor cross-cutting dykes, and the adjacent Nubian Sandstone unit. Densities for these un-mineralised lithological domains were assigned as a single value regardless of weathering state.

Figure 14-3 and Figure 14-4 show the histograms of the density measurements for the main mineralised domain, for oxide, transition, and fresh components respectively. These figures are for the total dataset, prior to filtering out a few obvious outliers.

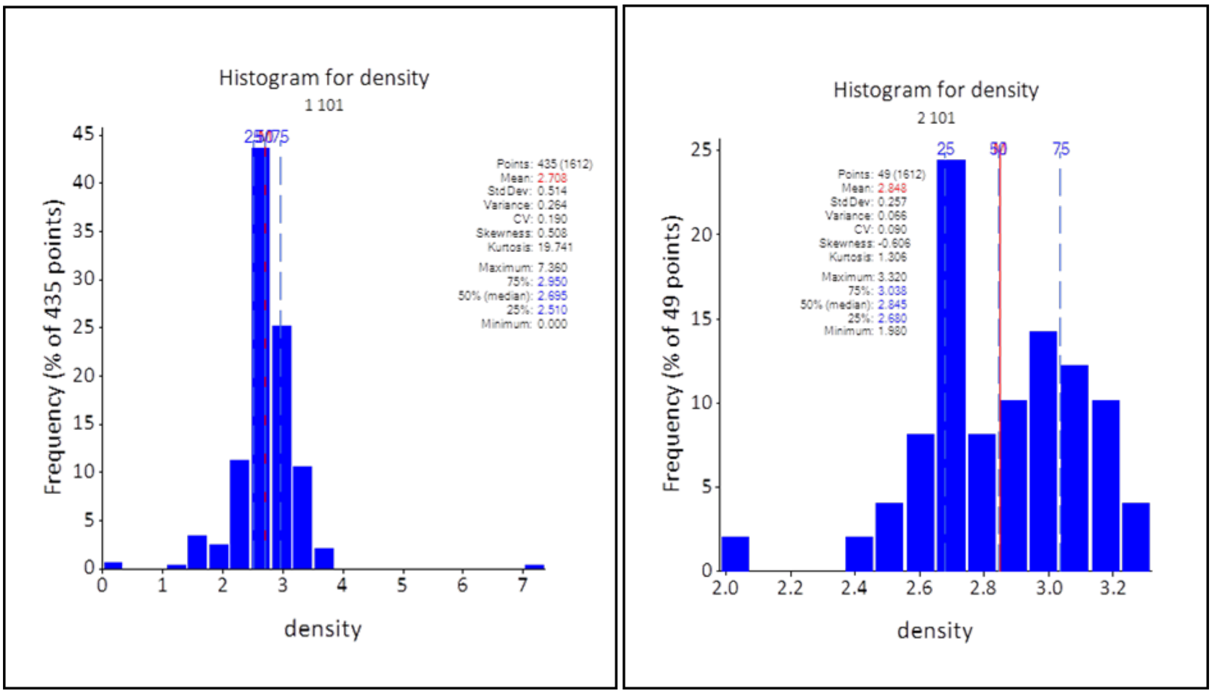


**Figure 14-3 Density histograms for mineralised Domain 101 – oxide (*"1 101"*) and transitional (*"2 101"*)**

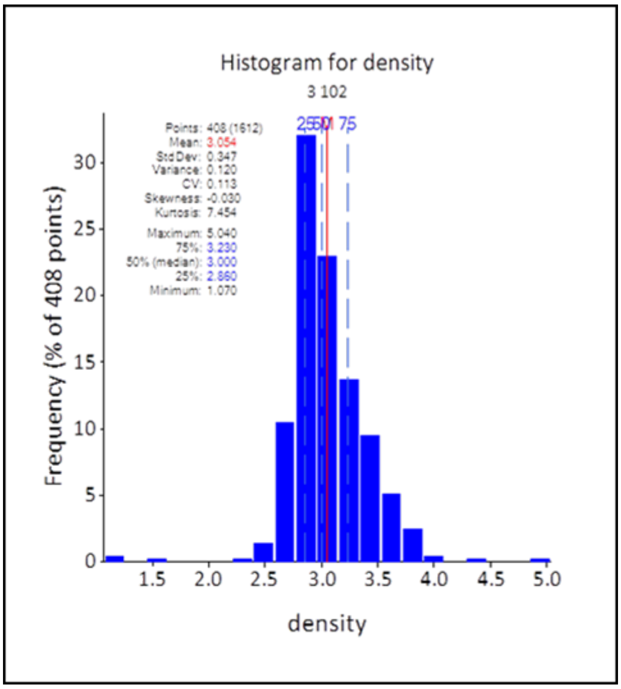


**Figure 14-4 Density histogram for mineralised Domain 102 – fresh (*"3 102"*)**

Table 14-6 summarises the values used to assign bulk densities to the block model based on weathering state and lithology.

**Table 14-6 Density Values Applied to Block Model**

| Rock type | Domain | Number of samples | Oxide ($g/cm^3$) | Transition ($g/cm^3$) | Fresh ($g/cm^3$) |
|---|---|---|---|---|---|
| Main Zone (Oxide) | **101** | 480 | 2.5 | 2.8 | n/a |
| Main Zone (Fresh) | **102** | 405 | n/a | n/a | 3.0 |
| minor Talus in HW | **103** | 24 | 2.5 | 2.8 | 3.0 |
| Surface Residuals | **104** | 34 | 2.4 | n/a | n/a |
| HW Epiclastics | **200** | 285 | 2.6 | 2.8 | 3.0 |
| FW Andesites | **300** | 326 | 2.6 | 2.7 | 2.8 |
| Western Fault Zone | **400** | 31 | 2.5 | n/a | n/a |
| Dykes | **500** | 101 | 2.7 (nominal) | | |
| Nubian Sandstone | **600** | 15 | 2.3 (nominal) | | |

## 14.5 Compositing

In the drill hole database, a unique code for drill intercepts within each of the mineralised domains was added to the database table "zonecode". This coded interval was used to control the compositing process and extract sample and composite data combinations for statistical analysis and estimation.

The mineralised domains were generally sampled on 1m intervals, with 81% of the 3,721 mineralised samples having a sample length of between 0.9m and 1.1m, and 97% of the mineralised samples having a sample length of between 0.5m and 1.5m.

Several factors were considered when determining the most appropriate compositing length for the various mineralised styles at Hamama West;

- Sample length statistics;
- Additivity of variables;
- Mineralisation complexity and dimensions;
- Homogeneity of mineralisation in the zones; and
- Expected parent block and selective mining unit (“**SMU**”) size.

After an examination of the above criteria, Cube decided that 2m downhole composites were appropriate for all compositing within the mineralised domains. The downhole compositing process used a ‘best fit’ approach which results in composites of slightly variable but equal length within the domain for a particular drillhole, ensuring the assay sample composite length is as close as possible to the nominated 2m composite length.

A total of 1,861 two metre downhole composites were extracted from the database for the 5 main mineralised domains. These composites formed the basis for the statistical and variography analysis.

The structure for composite files used in the estimation is summarised in Table 14-7, and a listing of the mineralisation zonecodes and number of composites is shown in Table 14-8.

**Table 14-7 Composite File Data Fields**

| Field | Description |
|---|---|
| **D1** | Au ppm – Uncut interval composite |
| **D2** | Ag ppm – Uncut interval composite |
| **D3** | Cu (%) – Uncut interval composite |
| **D4** | Pb (%) – Uncut interval composite |
| **D5** | Zn (%) – Uncut interval composite |
| **D6** | Hole ID |
| **D7** | Interval From Depth |
| **D8** | Interval To Depth |
| **D10** | Downhole Composite Interval Length |
| **D11** | Zonecode (Domain Number) |
| **D22** | cut_Ag ppm – Cut interval composite |
| **D25** | cut_Zn (%) – Cut interval composite |

**Table 14-8 Listing of Mineralised Domain Codes & Composites**

| Rock type | Domain | Wireframe Volume ($m^3$) | Comp. Length | # of Holes | # of Comps |
|---|---|---|---|---|---|
| Main Zone (Oxide) | **101** | 1,665,473 | 2 | 54 | 668 |
| Main Zone (Fresh) | **102** | 6,511,550 | 2 | 31 | 1,060 |
| minor Talus in HW | **103** | 17,206 | 2 | 7 | 39 |
| Surface Residuals | **104** | 96,573 | 2 | 24 | 39 |
| Western Fault Zone | **400** | 269,053 | 2 | 15 | 215 |

## 14.6 Statistical Analysis

A statistical and visual analysis of the extracted 2m downhole composites was undertaken for each of the 5 mineralised domains. A key objective was to validate the overall controls on the mineralised domains and to determine whether further subdivision of the domains was required based on weathering, grade or lithology.

### 14.6.1 Basic Statistics

The basic descriptive statistics for gold and silver grades in the mineralised domains are summarised in Table 14-9 and Table 14-10, and shown as log probability plots for the main mineralised domains (101 and 102) in Figure 14-5 to Figure 14-8 respectively.

**Table 14-9 Summary Statistics for 2m Composites by Domain - Uncut Gold**

| Domain | 101 | 102 | 103 | 104 | 400 |
|---|---|---|---|---|---|
| Number | 658 | 1054 | 38 | 35 | 55 |
| Minimum | 0.003 | 0.003 | 0.006 | 0.044 | 0.006 |
| Maximum | 5.82 | 11.36 | 1.24 | 4.89 | 4.34 |
| Mean | 0.63 | 0.58 | 0.38 | 1.70 | 0.91 |
| Std. Dev. | 0.75 | 0.85 | 0.35 | 1.49 | 1.23 |
| Coeff. Var. | 1.20 | 1.47 | 0.94 | 0.88 | 1.36 |
| Variance | 5.82 | 11.36 | 1.24 | 4.89 | 4.34 |

| Domain | 101 | 102 | 103 | 104 | 400 |
|---|---|---|---|---|---|
| **Percentiles** | | | | | |
| 10 | 0.05 | 0.04 | 0.03 | 0.23 | 0.02 |
| 20 | 0.11 | 0.11 | 0.08 | 0.31 | 0.03 |
| 30 | 0.17 | 0.19 | 0.09 | 0.42 | 0.03 |
| 40 | 0.25 | 0.28 | 0.13 | 0.65 | 0.09 |
| 50 | 0.37 | 0.35 | 0.29 | 1.36 | 0.25 |
| 60 | 0.51 | 0.45 | 0.35 | 1.67 | 0.47 |
| 70 | 0.74 | 0.60 | 0.47 | 2.33 | 1.14 |
| 80 | 1.04 | 0.82 | 0.64 | 2.85 | 1.80 |
| 90 | 1.52 | 1.24 | 0.90 | 3.91 | 2.79 |
| 95 | 1.90 | 1.78 | 1.15 | 4.65 | 3.59 |
| 97.5 | 2.62 | 2.63 | 1.20 | 4.89 | 4.13 |
| 99 | 3.56 | 3.87 | 1.22 | 4.89 | 4.27 |

**Table 14-10 Summary Statistics for 2m Composites by Domain - Uncut Silver**

| Domain | 101 | 102 | 103 | 104 | 400 |
|---|---|---|---|---|---|
| Number | 658 | 1054 | 38 | 35 | 55 |
| Minimum | 0.5 | 0.1 | 0.9 | 4.0 | 0.3 |
| Maximum | 444.0 | 1854.1 | 350.8 | 76.0 | 297.2 |
| Mean | 28.3 | 28.5 | 28.9 | 19.1 | 60.8 |
| Std. Dev. | 45.8 | 87.0 | 68.4 | 16.3 | 84.8 |
| Coeff. Var. | 1.62 | 3.05 | 2.37 | 0.86 | 1.40 |
| Variance | 2095 | 7577 | 4681 | 267 | 7191 |
| **Percentiles** | | | | | |
| 10 | 3.3 | 1.9 | 2.2 | 4.8 | 0.8 |
| 20 | 6.5 | 5.2 | 3.2 | 6.0 | 2.1 |
| 30 | 9.3 | 8.1 | 4.7 | 7.1 | 2.8 |
| 40 | 12.2 | 10.7 | 6.9 | 9.4 | 4.2 |
| 50 | 14.6 | 13.6 | 9.4 | 11.5 | 12.8 |
| 60 | 18.7 | 17.2 | 10.5 | 19.5 | 29.6 |
| 70 | 24.5 | 22.8 | 14.5 | 26.0 | 58.0 |
| 80 | 34.0 | 30.9 | 20.2 | 27.0 | 115.1 |
| 90 | 60.4 | 47.3 | 48.9 | 36.6 | 204.4 |
| 95 | 91.0 | 82.8 | 96.9 | 46.3 | 259.5 |
| 97.5 | 170.7 | 146.5 | 260.4 | 54.9 | 275.2 |
| 99 | 246.7 | 253.6 | 314.6 | 67.5 | 285.9 |

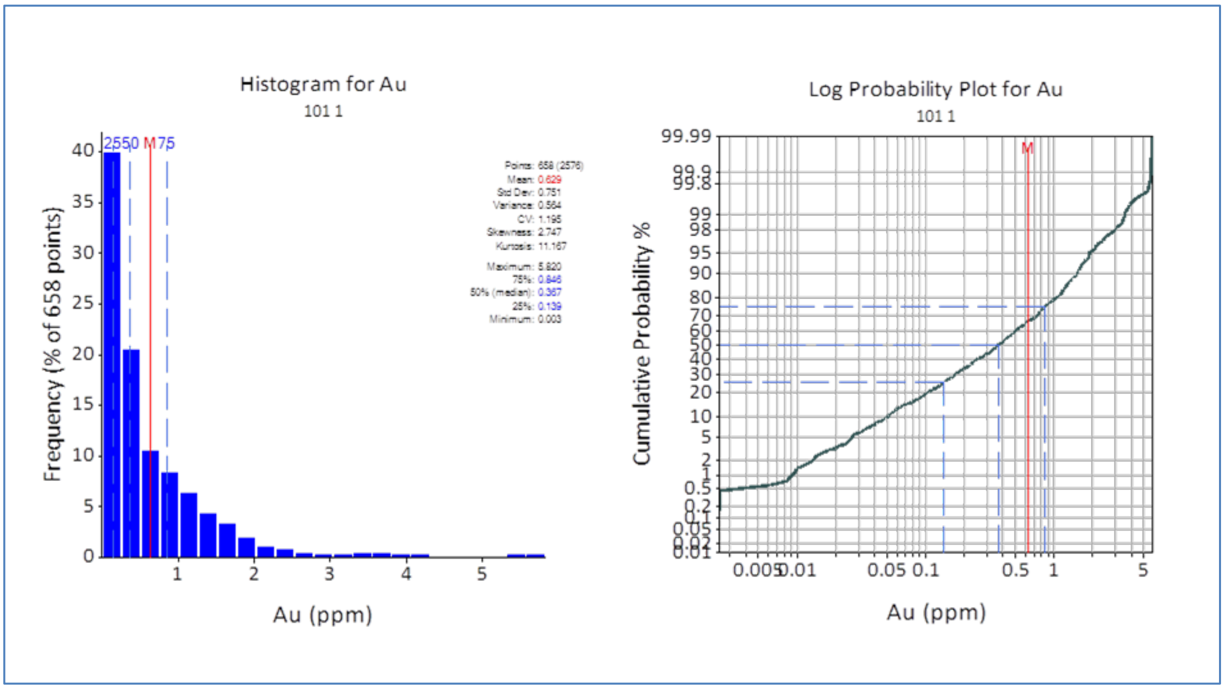


**Figure 14-5 Gold in Domain 101 (oxide) – Histogram and Log Probability Plot**

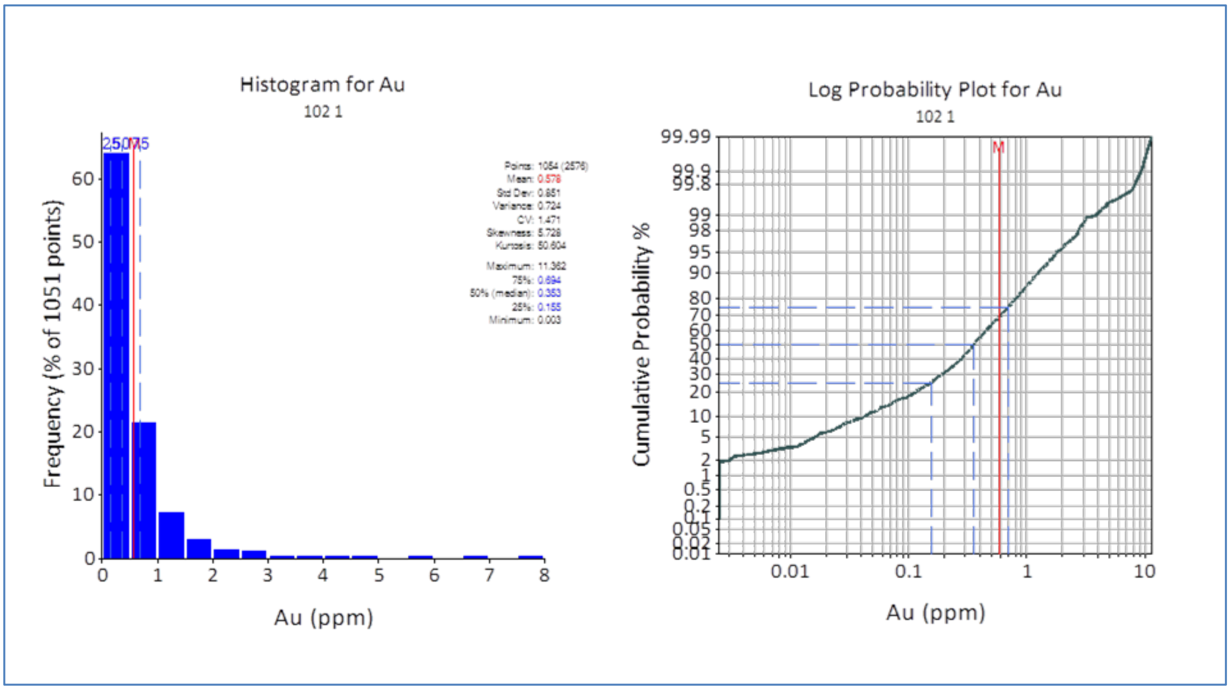


**Figure 14-6 Gold in Domain 102 (fresh) – Histogram and Log Probability Plot**

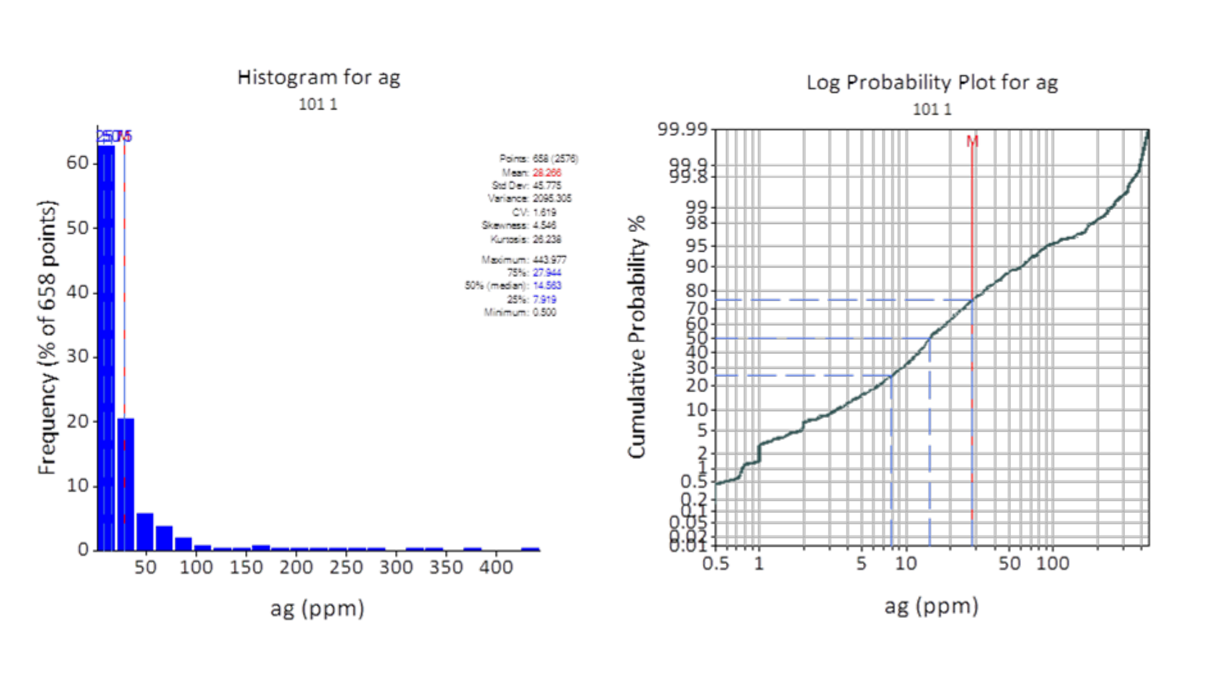


**Figure 14-7 Silver in Domain 101 (oxide) – Histogram and Log Probability Plot**

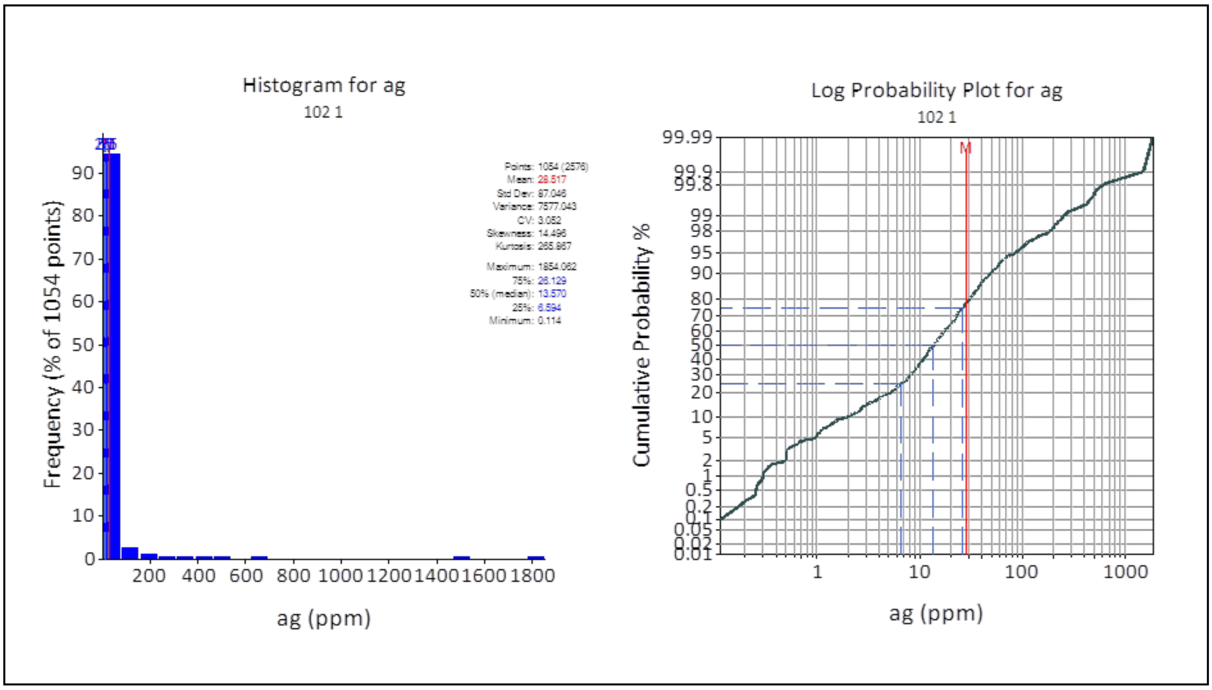


**Figure 14-8 Silver in Domain 102 (fresh) – Histogram and Log Probability Plot**

### 14.6.2 Grade Outliers and Top Cuts

Cube reviewed the statistics of the composites to check for outlier composite grades prior to estimation. The composite data was reviewed for each domain using histograms, log-histograms, log-probability plots and graphical inspection of the spatial grade distribution.

For silver composites from the Main Zone (fresh, domain 102), two adjacent drillholes (AHA-031 and AHA-058) contain consistent zones with very high silver grades, and applying a global top-cut to the entire domain was not considered appropriate. A separate top-cut of 400ppm Ag was applied to composites from these two holes. The remaining holes were spatially analysed to consider a top-cutting strategy for this fresh domain, and a top-cut of 150ppm Ag was applied for these composites.

Although copper, lead and zinc are not considered part of the classified mineral resource, these elements were estimated to aid understanding of overall mineralisation controls. Their statistics were also reviewed, and it was considered appropriate to apply a 5% top-cut to the zinc composite grades.

It was not considered necessary to apply top-cuts to gold, copper or lead.

High grade assay cuts were applied to the silver and zinc composite data for the estimation in the various domains, as shown in Table 14-11.

**Table 14-11 Mineralisation Domains and High-Grade Assay Capping**

| Rock type | Domain | Top-Cuts Applied | | | | |
|---|---|---|---|---|---|---|
| | | Au (ppm) | Ag (ppm) | Cu (%) | Pb (%) | Zn (%) |
| Main Zone (Oxide) | **101** | none | 100 | none | none | 5 |
| Main Zone (Fresh) | **102** | none | 150 / 400 | none | none | 5 |
| minor Talus in HW | **103** | none | 150 | none | none | 5 |
| Surface Residuals | **104** | none | none | none | none | 5 |
| Western Fault Zone | **400** | none | 100 | none | none | 5 |

## 14.7 Variography

Variography and evaluation of suitable estimation parameters based on the final variogram models was undertaken using Supervisor software.

Variogram models were based on the 2m composites derived from the mineralized domains described in Section 14.3.2, initially evaluated after a Gaussian transformation, and then back-transformed. Where data for particular domains proved to be insufficient for variographic analysis, parameters for grade estimation were adopted from other representative mineralisation.

Table 14-12 summarises the variogram parameters for the key domains, with back-transformed variogram models for gold and silver in the main mineralised domains (101 and 102) in Figure 14-9 and Figure 14-10.

**Table 14-12 Variogram Parameters**

| Element | Domain | Relative Nugget | Structure 1 | | | | Structure 2 | | | | Surpac rotation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | sill | range | anisotropy | | sill | range | anisotropy | | | | |
| | | | | | semi | minor | | | semi | minor | azi | plunge | dip |
| Au | **101** | 0.15 | 0.31 | 25 | 1 | 1.25 | 0.54 | 200 | 1 | 10 | 270 | 0 | -15 |
| | **102** | 0.19 | 0.47 | 40 | 1 | 1.33 | 0.34 | 185 | 1 | 3.7 | 270 | 0 | -20 |
| | **104** | 0.42 | 0.19 | 10 | 1 | 1 | 0.38 | 100 | 1 | 1 | 0 | 0 | 25 |
| Ag | **101** | 0.16 | 0.38 | 26 | 1 | 1.73 | 0.46 | 200 | 1 | 9.1 | 270 | 0 | -15 |
| | **102** | 0.30 | 0.45 | 38 | 1 | 1.9 | 0.25 | 155 | 1 | 2.28 | 270 | 0 | -20 |
| | **104** | 0.22 | 0.40 | 14 | isotropic | | 0.38 | 100 | isotropic | | | | |
| Zn | **101** | 0.20 | 0.51 | 45 | 1 | 3 | 0.30 | 125 | 1 | 6.25 | 270 | 0 | -15 |
| | **102** | 0.28 | 0.56 | 42 | isotropic | | 0.15 | 110 | isotropic | | | | |
| Cu | **102** | 0.44 | 0.51 | 35 | isotropic | | 0.06 | 110 | isotropic | | | | |
| Pb | **102** | 0.23 | 0.45 | 55 | isotropic | | 0.31 | 155 | isotropic | | | | |

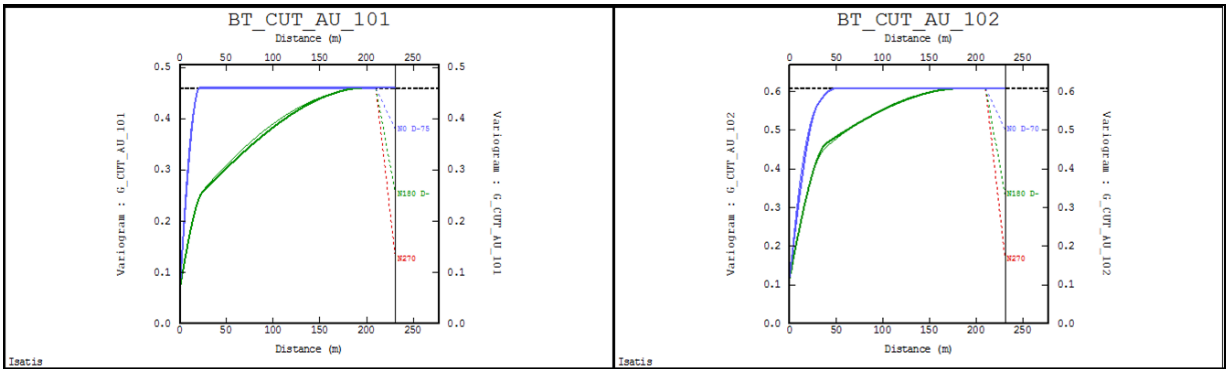


**Figure 14-9 Back-transformed variograms for gold for Domains 101 and 102**

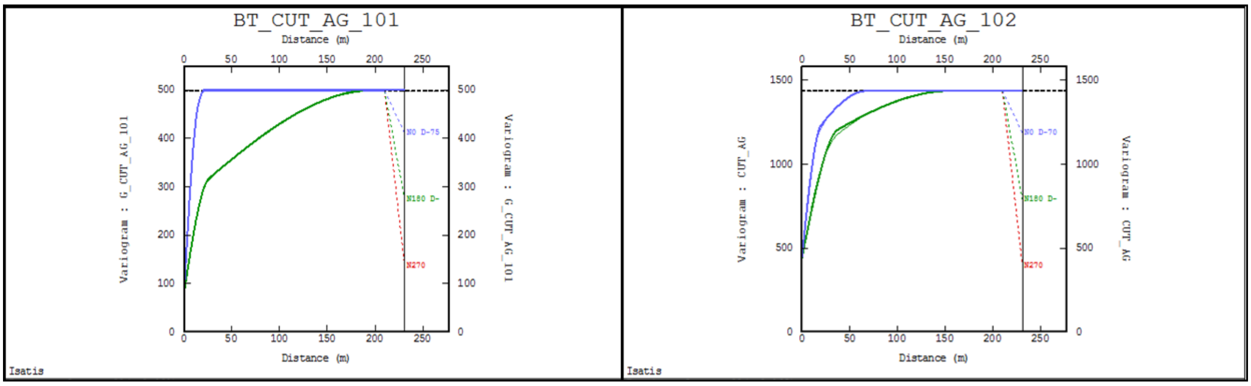


**Figure 14-10 Back-transformed variograms for silver for Domains 101 and 102**

## 14.8 Block Model Definition

A number of issues were taken into consideration when deciding on an appropriate search strategy and estimation block size, including data spacing, variogram nugget effect, model ranges, estimation quality and resource classification.

Data spacing within the mineralised domains is highly variable, and generally a function of the topography and logistics of drill pad construction and access. Drilling is generally on sections spaced between 30m to 50m along strike (east-west), with drill spacing variable but approximating 20m to 25m within sections (north-south).

Cube considers it good geostatistical practice to use an estimation parent cell size that approaches the data spacing where possible and while at the same time being mindful of potential future mining and selectivity implications. Cube reviewed the 'physical' data spacing relative to the mineralised zones to be estimated and decided that an estimation block size of 20m(Y) x 20m(X) x 5m(Z) was appropriate. Sub-blocking to 2.5m(Y) x 2.5m(X) x 2.5m(Z), was used to improve the volume representation of the block model for the narrow mineralised zones, especially the near surface 'deflationary' or residual domain.

The definitions for the 3D block model *'hamamawest_nov2016_final.mdl'* are summarised in Table 14-13. The block model attributes and descriptions are summarised in Table 14-14.

**Table 14-13 Block Model Definition Summary**

| Block Model File ID : | hamamawest_nov2016_final.mdl | | |
|---|---|---|---|
| **Type** | **Northing (Y)** | **Easting (X)** | **RL (Z)** |
| **Minimum Coordinates** | 2,913,400 | 533,600 | 200 |
| **Maximum Coordinates** | 2,914,260 | 534,700 | 650 |
| **Parent Block Size** | 20 | 20 | 5 |
| **Sub-Cell Minimum** | 2.5 | 2.5 | 2.5 |
| **Rotation** | 0 | 0 | 0 |

**Table 14-14 Block Model Attributes**

| Attribute Name | Background | Description |
|---|---|---|
| **ag_final_ppm** | 0.01 | Silver estimate - Ag ppm |
| **au_equiv_ppm** | 0 | Gold Equivalent (Au + Ag/70) ppm |
| **au_final_ppm** | 0.01 | Gold estimate - Au ppm |
| **cu_final_pct** | 0.01 | Copper estimate - Cu wt.% |
| **density** | 2.8 | Dry Bulk Density : default is fresh FW andesite |
| **domain** | 0 | mineralisation domain : 101 ; 102 ; 103 ; 104 ; 400 |
| **estpass_au** | 0 | estimation pass for gold : 1 ; 2 ; 3 ; 4 (assigned) ; 5 (LUC) |
| **estpass_ag** | 0 | estimation pass for silver |
| **geo_lith_c** | GR | Lithology Character : EXH ; SED ; AND ; FLT ; DYK ; NUB |
| **geo_lith_n** | 0 | Lithology Integer : 100 exhalites ; 200 HW epiclastics ;<br>300 FW andesites ; 400 faults ; 500 dykes ;<br>600 Nubian Sandstone |
| **geo_ox_c** | BLANK | Oxidation Character : AIR ; OXIDE; TRANS ; FRESH |
| **geo_ox_n** | 0 | Oxidation Integer : 0=air, 1=oxide, 2=trans, 3=fresh |
| **pb_final_pct** | 0.01 | Lead estimate - Pb wt.% |
| **res_class_c** | UNC | Resource Classification Character: MEAS; IND ; INF ; UNC |
| **res_class_n** | 4 | Resource Classification Number: 1=Measured;<br>2=Indicated; 3=Inferred; 4=Unclassified |
| **zn_final_pct** | 0.01 | Zinc estimate - Zn wt.% |

## 14.9 Grade Estimation

The primary grade estimation method used for gold and silver in the main mineralised zone (Domain 101 and 102) is Localised Uniform Conditioning ("**LUC**") and was completed using Isatis software. LUC is considered an appropriate method for the estimation of local recoverable resources for this domain as it produces accurate grade-tonnage functions which are in good accordance with volume-variance relationship principles. It limits the smearing of high grade and the over-smoothing of grade compared to other estimation methods.

The final grade estimate for gold and silver used for the main mineralised domain is effectively a diluted recoverable resource estimate, given the process attempts to estimate the recoverable tonnage and grade based on the dimensions of a SMU, which is regarded as representative of what is considered practically achievable during actual mining. Estimation is undertaken using relatively large panels and therefore can be considered as being 'diluted', as the panels are estimated using all data within a broad mineralised envelope. A Change of Support correction is applied to the large diluted panels in order to predict the likely grade-tonnage distribution of SMU selectivity. In addition to the imposition of a minimum selective mining dimension, a further Change of Support correction was applied to the models in the form of an Information Effect. The Information Effect is a theoretical 'penalty' adjustment to the SMU grade-tonnage distribution to account for the anticipated dilution incurred when making mining selectivity decisions based on future grade control spaced data.

The LUC method consists of the following steps:

- Undertake an Ordinary Kriging ("**OK**") estimate of gold and silver grade into panels, in this case 20m(Y) x 20m(X) x 5m(Z);

- Undertake a Change of Support process, using a Discrete Gaussian Model. This makes use of a Gaussian model fitted to the sample data, in conjunction with the gold variogram model and the silver variogram model, to predict the grade distribution for smaller, SMU-sized blocks defined as 5m(Y) x 5m(X) x 2.5m(Z);

- Implement Uniform Conditioning ("**UC**"), which uses the results of the Change of Support and the panel OK to produce an array variable of volume proportion and grade above a chosen set of grade thresholds. This represents the grade distribution of SMU's inside each panel. The UC results are conditioned to the original panel OK grade estimate; and

- The UC is post-processed using the Abzalov (2006) approach to produce a single grade per SMU (5m(Y) x 5m(X) x 2.5m(Z)) block. The mean grade of the SMU's in any given panel is equal to the OK grade for that panel, and so the total metal is preserved.

Grade interpolation for the other elements in the main mineralised zone (Domain 101 and 102), for Cu, Pb, Zn was by Ordinary Kriging ("**OK**"). All grade interpolation was into parent cells of 20m(Y) x 20m(X) x 5m(Z), and block discretisation points were set to 3(Y) x 3(X) x 3(Z).

For the near surface residuals and the mineralised fault (Domains 104 and 400), OK was used for all 5 elements. Domain 400 is not part of the classified mineral resource.

The assay grades for Ag, Au, Cu and Zn were assigned to the 5 small areas that comprise the minor breccia/talus zone (Domain 103), based on the average sample grades of each of these small areas. This domain is not part of the classified mineral resource.

### 14.9.1 Search Neighbourhood Analysis

Cube has attempted to characterise the spatial relationship of the data using variography and to implement search strategies aimed at producing a robust block estimate, whilst at the same time minimising estimation error and conditional biases. Fundamental to the search strategy is the determination of appropriate minimum and maximum numbers of composites for estimation.

First pass search distances were based on the analysis of the theoretical kriging weight charts. Examination of these kriging weight charts provides a good starting point for testing a search strategy as they provide a guide as to the distribution of kriging weights for a given variogram with respect to distance along the major axis of the search volume. Of particular interest is the approximate distance that kriging weights tend towards zero. Cube believes that it is good estimation practice to use a search distance that ensures that kriging weights allocated to composites tend toward zero or slightly negative on the periphery of the search.

A Quantitative Kriging Neighbourhood Analysis was undertaken to assist in optimising the search parameters. The procedure for search optimisation adopted by Cube involves selecting several individual blocks representing data configurations ranging from poorly informed to well informed. The aim of these tests is to optimise the kriging search neighbourhood and maximise the quality of the kriging when dealing with a non-exhaustive data set.

Computer software used for the modelling and estimation was Surpac v.6.7, with SuperVisor software used to conduct geostatistical analysis.

Appropriate estimation parameters were determined for each estimation domain and are tabulated in Table 14-15. Search ellipse orientations for each domain interpolation were orientated to follow the mineralised domain trends.

**Table 14-15 Estimation Domains for Hamama West**

| Estimation Domain | Minimum number of Composites | Maximum number of composites | Surpac Azim/Plunge/Dip | Search Radius (m) | Anisotropy |
|---|---|---|---|---|---|
| **101** | 8 | 20 | 270° / 0° / -15° | Au, Cu : 200 | 1 : 1 : 10 |
| | | | | Ag, Pb : 155 | 1 : 1 : 9.1 |
| | | | | Zn : 125 | 1 : 1 : 6.25 |
| **102** | 8 | 20 | 270° / 0° / -20° | Au : 185 | 1 : 1 : 3.7 |
| | | | | Ag : 155 | 1 : 1 : 2.3 |
| | | | | Cu, Zn : 110 | isotropic |
| | | | | Pb : 155 | isotropic |
| **103** | assigned – see below | | | | |
| **104** | 8 | 20 | 270° / 0° / 0° | 100 | isotropic |
| **400** | 8 | 20 | 090° / 0° / -25° | 90 | isotropic |

### 14.9.2 Un-estimated Domains and Blocks

Mineralised domains that did not have sufficient data support for grade interpolation (which was the case for the small breccia/talus domain 103 in the stratigraphic hangingwall), were assigned the arithmetic mean of the cut gold and silver grades for the (generally 1m) samples within the domain. All assigned blocks were coded as ‘4’ in the block model attributes *est_pass_au* and *est_pass_ag*.

A second search pass was run on domains that were inadequately interpolated at the peripheries well away from the drillholes, reducing the minimum number of composites to six, and searching to 150% of the main search distance. Blocks estimated in this second pass were coded as ‘2’ in the block model attributes *est_pass_au* and *est_pass_ag*.

### 14.9.3 Model Validation

Block model validation was conducted by the following means:

- Visual inspection of block model estimation in relation to raw drill data and 2m composite data on a section by section basis;
- Volumetric comparison of the 3D wireframe volume to that of the block model volume for the two main domains;
- Relationship plots (swath plots), comparison to the block model estimated grade for the two main domains;
- Comparison of the LUC estimate was compared to the Panel OK estimate for gold and silver; and
- An additional estimate for all elements using an Inverse Distance Squared interpolation, as a check against the OK results.

The volume variance between the wireframes and the block models (see Table 14-16) was considered to be acceptable for the intended use of the model.

**Table 14-16 Volumetric Comparisons for all mineralised domains**

| Domain | Wireframe volume ($m^3$) | Block Model volume ($m^3$) | Difference (%) |
|---|---|---|---|
| **101** | 1,582,300 | 1,552,000 | -2.0% |
| **102** | 6,264,130 | 6,231,422 | -0.5% |
| **103** | 17,206 | 17,484 | 1.6% |
| **104** | 96,573 | 92,594 | -4.3% |
| **400** | 269,053 | 261,641 | -2.8% |

Statistics of the modelled and composites grades – within the spatial area relating to the classified mineral resource – were compared in Table 14-17 and Table 14-18.

**Table 14-17 Gold – composite grade vs. estimated mean grades for classified resource**

| Domain | Composite Grades (Au uncut - g/t) | Block Model Grades (Au g/t) | Difference (%) |
|---|---|---|---|
| **101** | 0.63 | 0.53 | -16% |
| **102** | 0.58 | 0.63 | +9% |
| **104** | 1.70 | 1.63 | -4% |

**Table 14-18 Silver – composite grade vs. estimated mean grades for classified resource**

| Domain | Composite Grades (Ag uncut - g/t) | Composite Grades (Ag cut - g/t) | Block Model Grades (Ag g/t) | Cut Difference (%) |
|---|---|---|---|---|
| **101** | 28.3 | 23.6 | 20.5 | -13% |
| **102** | 28.5 | 24.8 | 23.4 | -6% |
| **104** | 19.1 | 19.1 | 19.9 | +4% |

Key validation swath plots are presented in Figure 14-11 to Figure 14-14. It is concluded that the estimates have globally honoured the composite sample data.

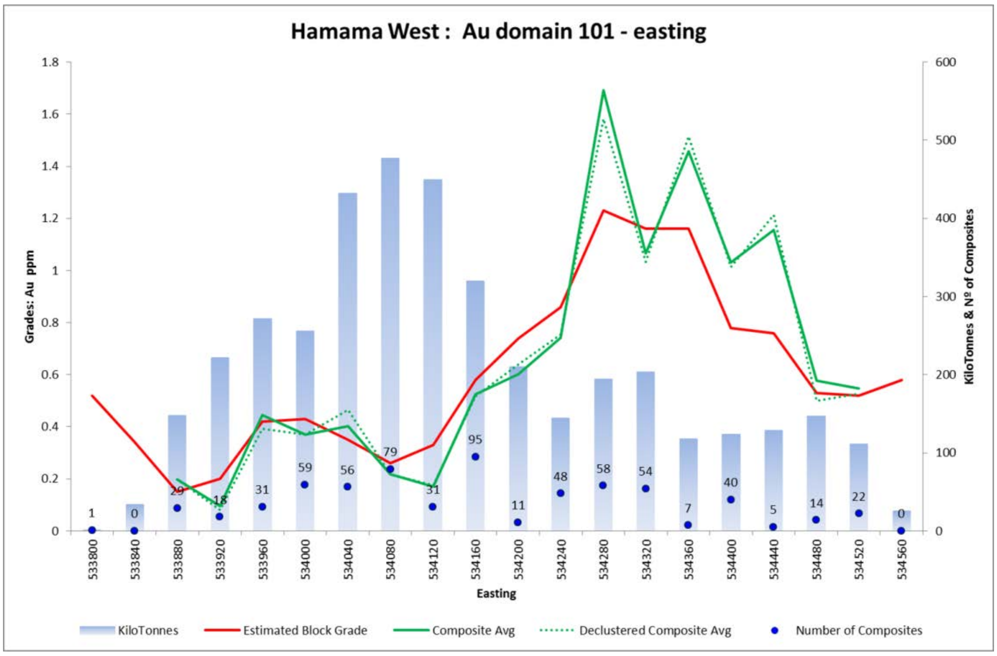


**Figure 14-11 Validation swath plot – Domain 101 for gold by Easting**

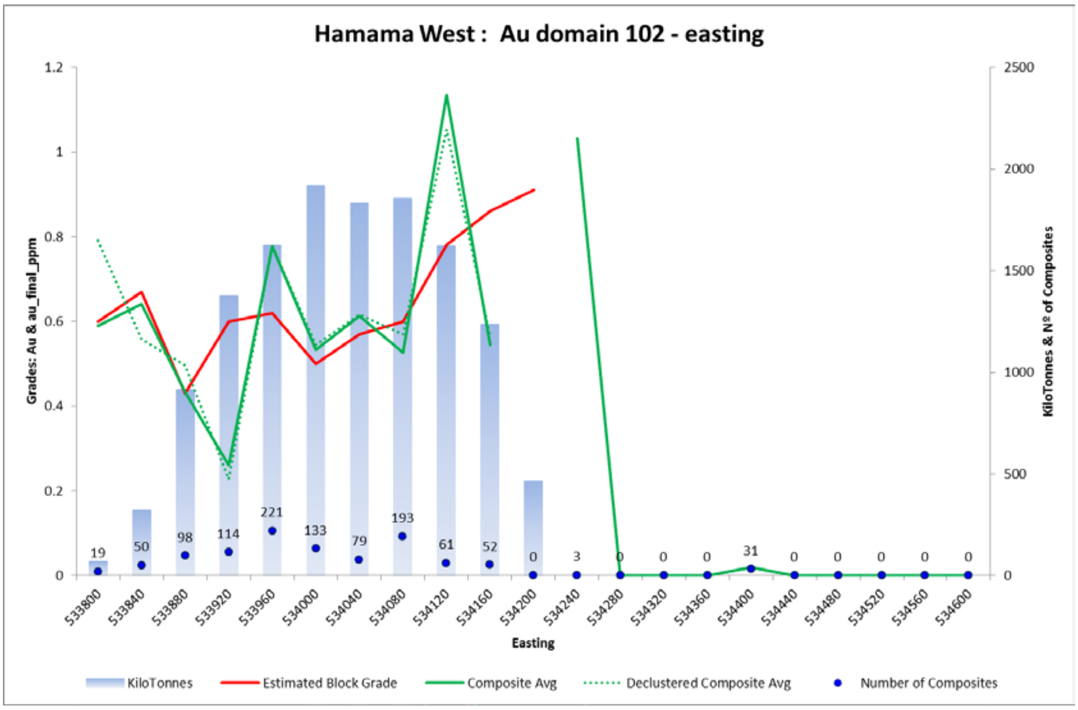


**Figure 14-12 Validation swath plot – Domain 102 for gold by Easting**

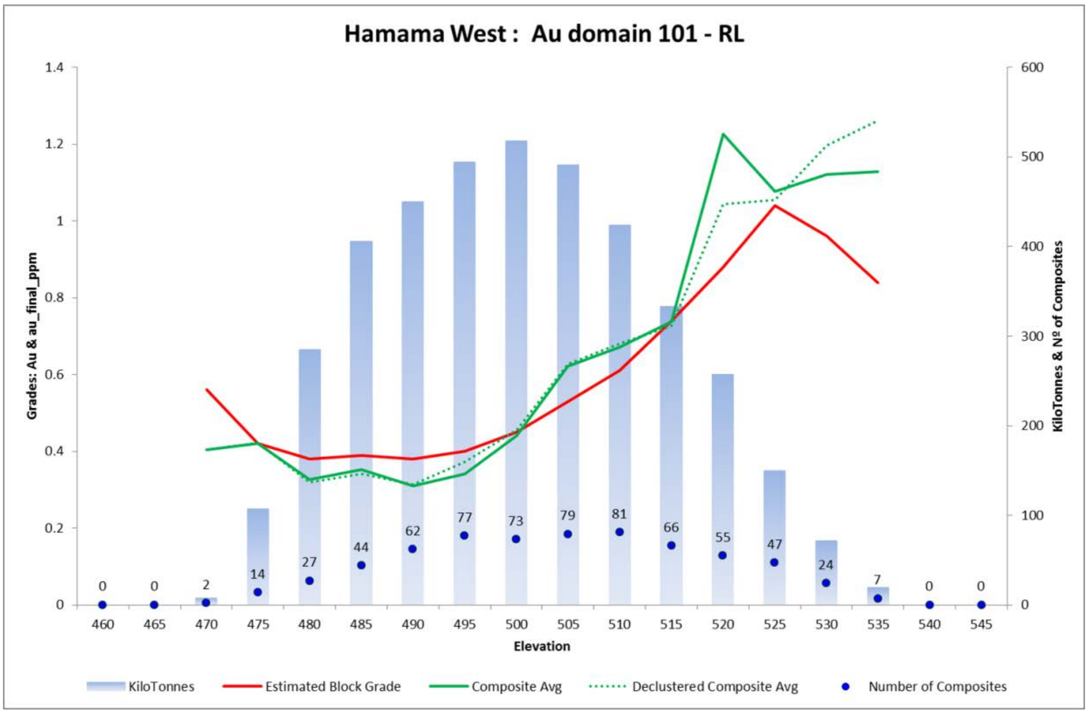


**Figure 14-13 Validation swath plot – Domain 101 for gold by RL**

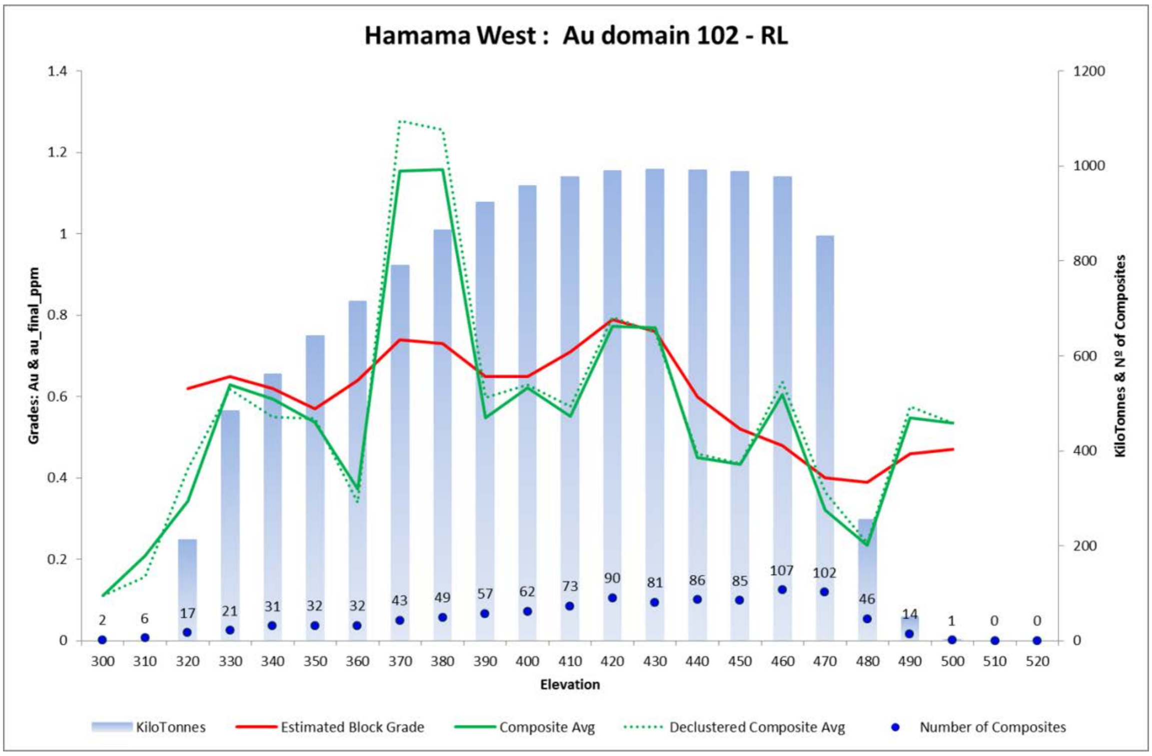


**Figure 14-14 Validation swath plot – Domain 102 for gold by RL**

The LUC estimate was compared to the Panel OK estimate for gold and silver in the main mineralised domains (101 / 102). At low metal thresholds, the LUC estimate resulted in slightly lower overall tonnages at slightly higher grades, which was expected as the OK estimate is likely to be over-smoothed at the panel size used. An indicative tonnage-grade curve showing the results for the Au estimates in the main fresh domain is shown in Figure 14-15.

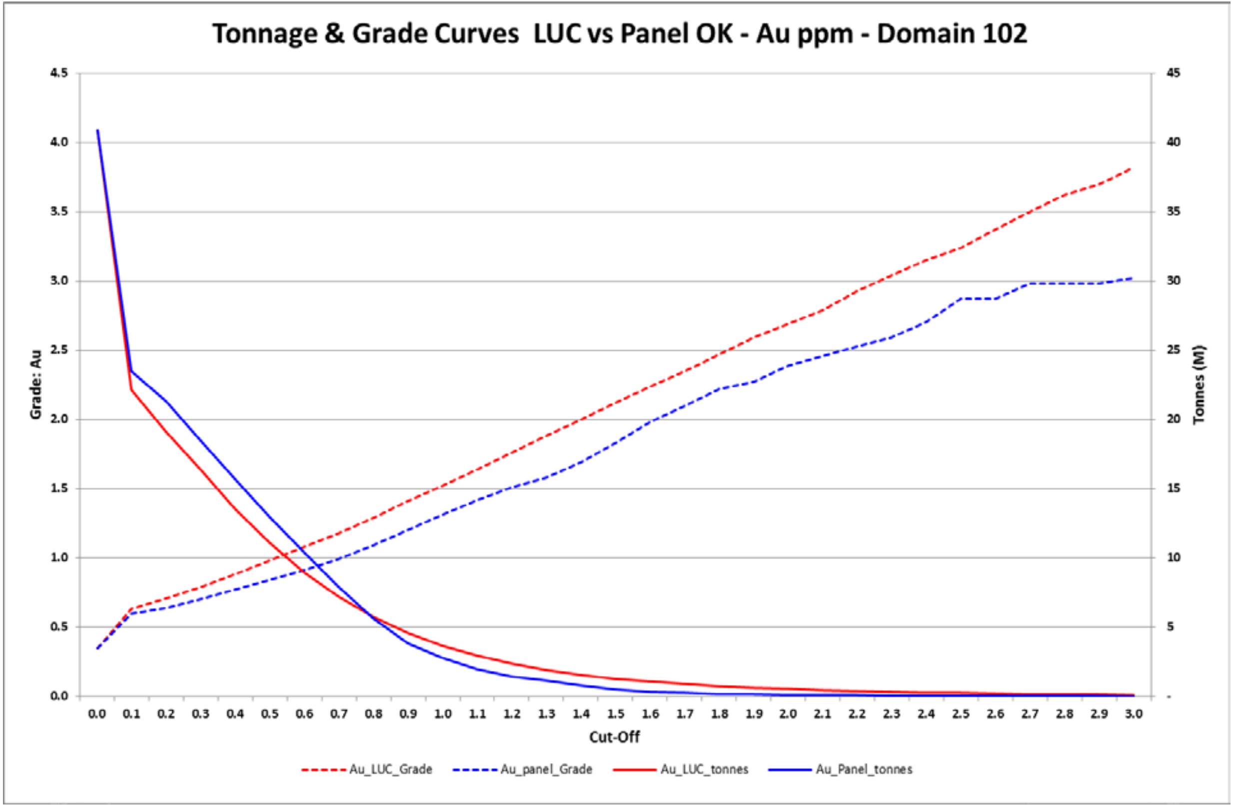


**Figure 14-15 Comparison between LUC and Panel OK estimates – Domain 102 (Au)**

A final validation involved a comparison of the OK estimate against an Inverse Distance Squared estimate. The same search strategies were used for both models. Above a 0 g/t Au or 0 g/t Ag cut-off, there was very good agreement between the models using the two estimation techniques, with the reported total contained metal between the models having a relative difference of less than 2% on a global basis for Au, and less than 4% on a global basis for Ag.

No significant bias between the block models or the composite data is apparent.

### 14.9.4 Mining Depletion

No historical or current mining activity has occurred within the area of the defined Mineral Resources.

## 14.10 Mineral Resource Classification

The Hamama West mineralisation has been sufficiently drilled to allow classification as Indicated and Inferred Mineral Resources in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum ("**CIM**") *Definition Standards for Mineral Resources and Mineral Reserves* (CIM, 2014).

A number of criteria were considered when assessing the mineral resource classification and included:

### 14.10.1 Geological Continuity and Mineralised Volume Models

The continuity and volume of the mineralised domains has been established by drilling to a confidence level where the grade and quantity can be reasonably assumed. The approach to defining the mineralised volume was primarily based on geological attributes. In general, the interpreted mineralised volumes have not been extrapolated to unreasonable distances beyond data limits, and in such cases for the main mineralised horizon (Domains 101,102), the material has not be classified as a Mineral Resource.

The interpretation of the mineralised fault zone (Domain 400) in terms of geometry, continuity, and contact with the main mineralised horizon, is not sufficiently robust to allow this domain to be classified as a Mineral Resource.

At the current density of drilling, the interpretation of the talus zones in the epiclastics sediments in the immediate stratigraphic hangingwall (Domain 103) indicates that these zones are unlikely to have significant spatial continuity, and therefore there is insufficient data to allow this domain to be classified as a Mineral Resource.

### 14.10.2 Drill Spacing and Drill Data Quality

The supplied drilling database represents an appropriate record of the drilling and sampling undertaken at the project. In general, drilling, surveying, sampling, analytical methods and controls are considered appropriate for the style of mineralisation under consideration.

Cube has undertaken independent verification sampling from diamond drill core, and QAQC analysis has confirmed the integrity of the assay data for Hamama West. This has confirmed that the data is suitable for the purposes of mineral resource estimation.

The drill spacing is variable, generally ranging from a nominal 25m drill spacing on 30m to 50m spaced sections, and is primarily a function of the topography and drill pad access.

The oxidised and transition zones of the main mineralised horizon (Domain 101) exhibit variable and often poor core recovery, and a moderate negative correlation has been demonstrated between gold grades and core recovery (discussed in Section 10.2.3). Despite the greater drilling density and confidence in the geological continuity in this gossanous zone, the data quality was not considered sufficient for classification as an Indicated Mineral Resource.

### 14.10.3 Modeling Technique

The 3D modelling method and the associated search and interpolation parameters used in the LUC and OK methodology, are considered appropriate for estimation of the Mineral Resources at this stage of the project evaluation. Appropriate risk adjustments in the form of high grade assay cuts have been applied in some cases for silver and zinc to limit the influence of statistical outliers. Standard block model validation processes have been undertaken.

### 14.10.4 Conclusions

Cube has considered all the relevant criteria and has classified the estimated Mineral Resources at Hamama West as Indicated and Inferred. There are no environmental, permitting, legal, title, taxation, socio-economic, marketing or political factors known to Cube which would materially affect the mineral resource estimate.

## 14.11 Mineral Resource Statement

The Hamama West Mineral Resource is current as at 24 January, 2017 and is reported above a 0.5 g/t gold equivalent cut-off grade within the interpreted mineralised domains to a maximum vertical depth of approximately 195m below surface (at the 325mRL).

The calculation of gold equivalent value is based on a gold: silver ratio of 1:70.

The Mineral Resource has been tabulated separately by resource category in Table 14-19 and Table 14-20. The Indicated Mineral Resource is all in the Fresh domain. The Inferred Mineral Resource is further tabulated by weathering type in Table 14-21).

**Table 14-19 Indicated Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off**

| Classification | Domain | Density | Tonnes | Grade | | | Contained Metal | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (g/cm$^3$) | (t) | Au (g/t) | Ag (g/t) | Au_equiv (g/t) | Au (koz.) | Ag (koz.) | Au_equiv (koz.) |
| Indicated | **102** | 3.0 | 3,805,000 | 0.72 | 27.6 | 1.12 | 88 | 3,376 | 137 |
| | **TOTAL** | **3.0** | **3,805,000** | **0.72** | **27.6** | **1.12** | **88** | **3,376** | **137** |

**Table 14-20 Inferred Mineral Resource by Domain: Above 0.5g/t Au_equiv cut-off**

| Classification | Domain | Density | Tonnes | Grade | | | Contained Metal | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (g/cm$^3$) | (t) | Au (g/t) | Ag (g/t) | Au_equiv (g/t) | Au (koz.) | Ag (koz.) | Au_equiv (koz.) |
| Inferred | **101** | 2.57 | 2,360,000 | 0.80 | 28.9 | 1.22 | 61 | 2,193 | 93 |
| | **102** | 3.0 | 5,360,000 | 0.87 | 30.4 | 1.30 | 157 | 5,503 | 235 |
| | **104** | 2.4 | 220,000 | 1.63 | 19.9 | 1.92 | 12 | 141 | 14 |
| | **TOTAL** | **2.85** | **8,210,000** | **0.87** | **29.7** | **1.29** | **230** | **7,836** | **341** |

**Table 14-21 Inferred Mineral Resource by Weathering Type: Above 0.5g/t Au_equiv cut-off**

| Classification | Weathering | Density | Tonnes | Grade | | | Contained Metal | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (g/cm$^3$) | (t) | Au (g/t) | Ag (g/t) | Au_equiv (g/t) | Au (koz.) | Ag (koz.) | Au_equiv (koz.) |
| Inferred | **Oxide + Trans** | 2.56 | 2,580,000 | 0.87 | 28.1 | 1.29 | 72 | 2,334 | 106 |
| | **Fresh** | 3.0 | 5,360,000 | 0.87 | 30.4 | 1.30 | 157 | 5,503 | 235 |
| | **TOTAL** | **2.85** | **8,210,000** | **0.87** | **29.7** | **1.29** | **230** | **7,836** | **341** |

The Mineral Resource is not a Mineral Reserve and does not have demonstrated economic viability. All tonnages, grade and ounces have been rounded to reflect the relative uncertainty and the approximate quality of the estimate.

The cut-off grade of 0.5 g/t gold equivalent has been selected partially on the results of a preliminary Whittle optimisation, in turn based on applying some generic costs and other parameters deemed applicable to similar African projects.

The grade-tonnage characteristics of the Mineral Resource are shown in Figure 14-16 and Figure 14-17, for gold and gold equivalent respectively.

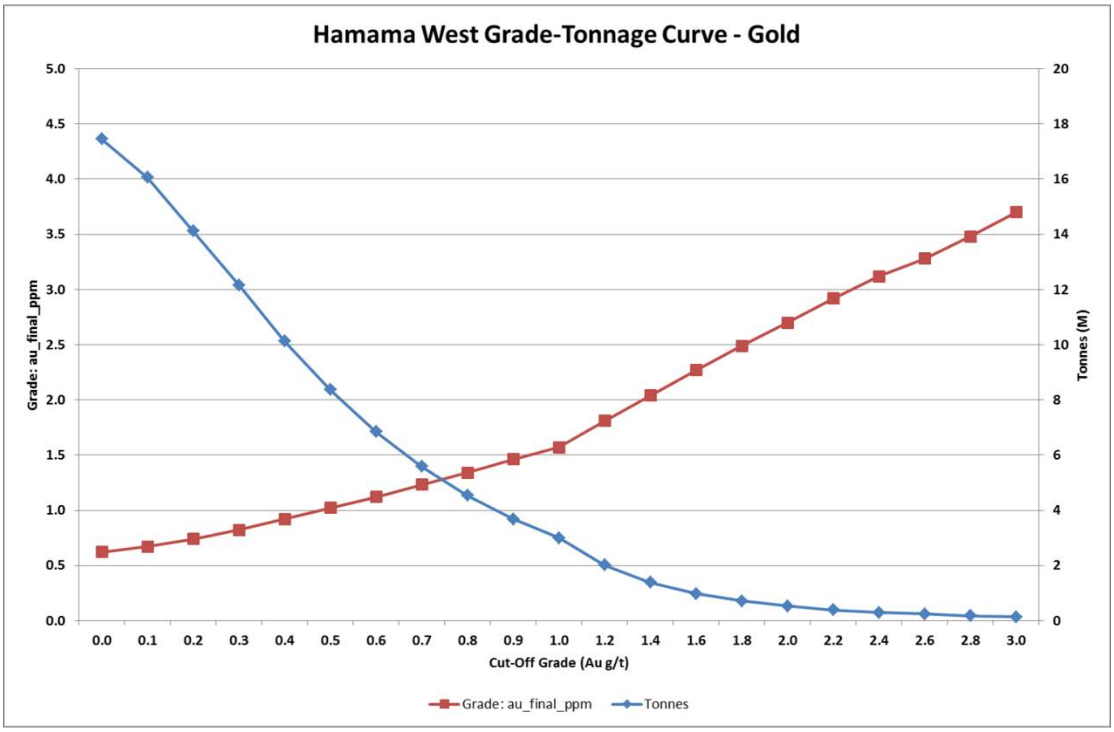


**Figure 14-16 Hamama West Mineral Resource Grade-Tonnage Curve (Gold)**

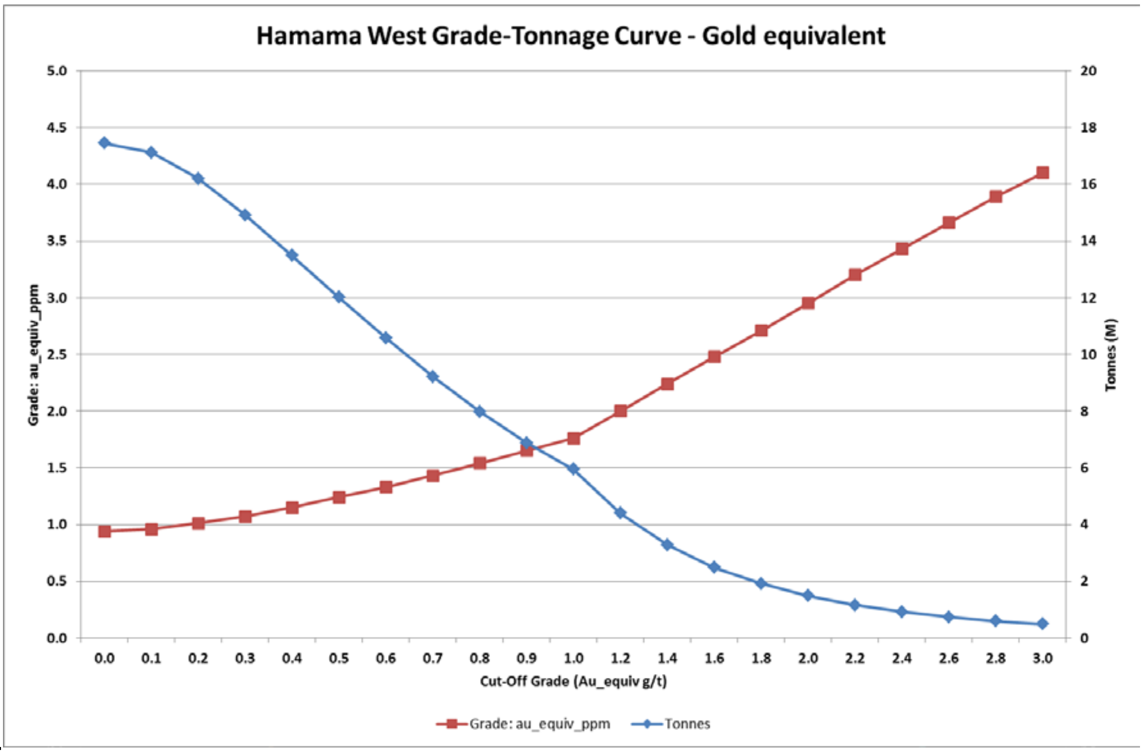


**Figure 14-17 Hamama West Mineral Resource Grade-Tonnage Curve (Gold equivalent)**

The Mineral Resource has reasonable prospects for economic extraction based on the consideration of suitable parameters during the estimation.

These factors included:

- mineralised wireframe interpretations relating to geological boundaries and grade continuity;
- continuous mineralisation domains that are visually robust and reasonably consistent with respect to gold and silver grades, consistent with the classification applied.
- limiting the mineralisation interpretation and grade interpolation to 195m vertical depth; and
- a preliminary Whittle optimisation based on applying some generic costs and other parameters deemed applicable to similar African projects.

There are no environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that the Principal Author is aware of that could materially affect the Mineral Resource estimates at this stage.

The gold and silver grade distribution is shown schematically in long section in Figure 14-18 and Figure 14-19, and the resource categories (IND and INF) in Figure 14-20.

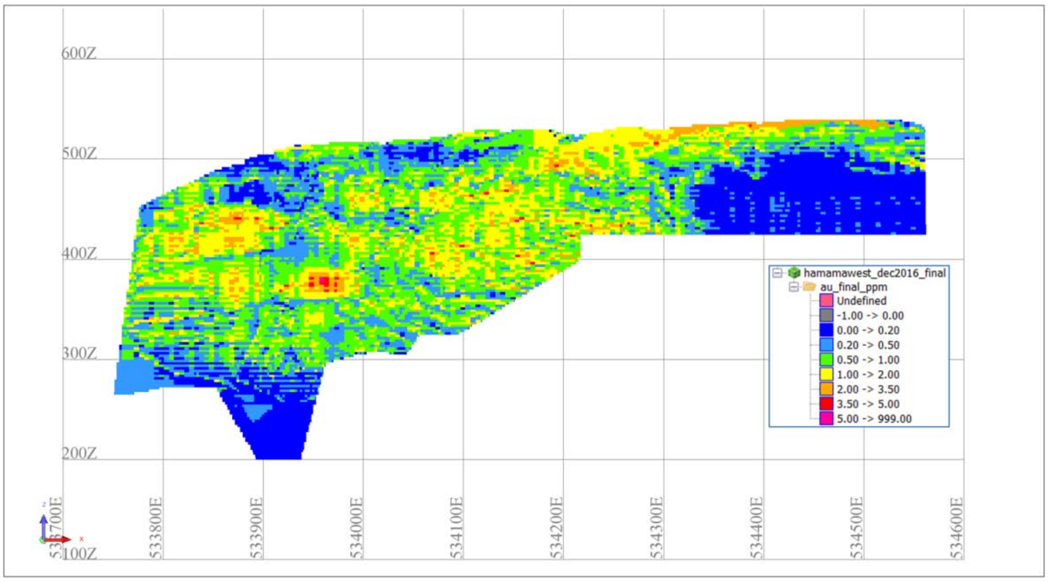


**Figure 14-18 Hamama West Long-Section View – Resource coloured by Gold grade**

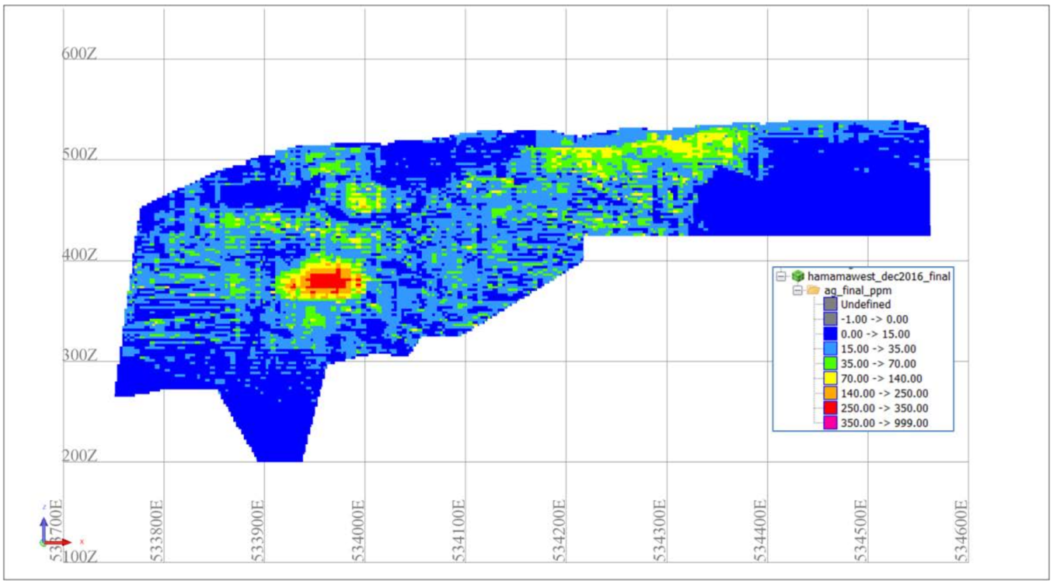


**Figure 14-19 Hamama West Long-Section View – Resource coloured by Silver grade**

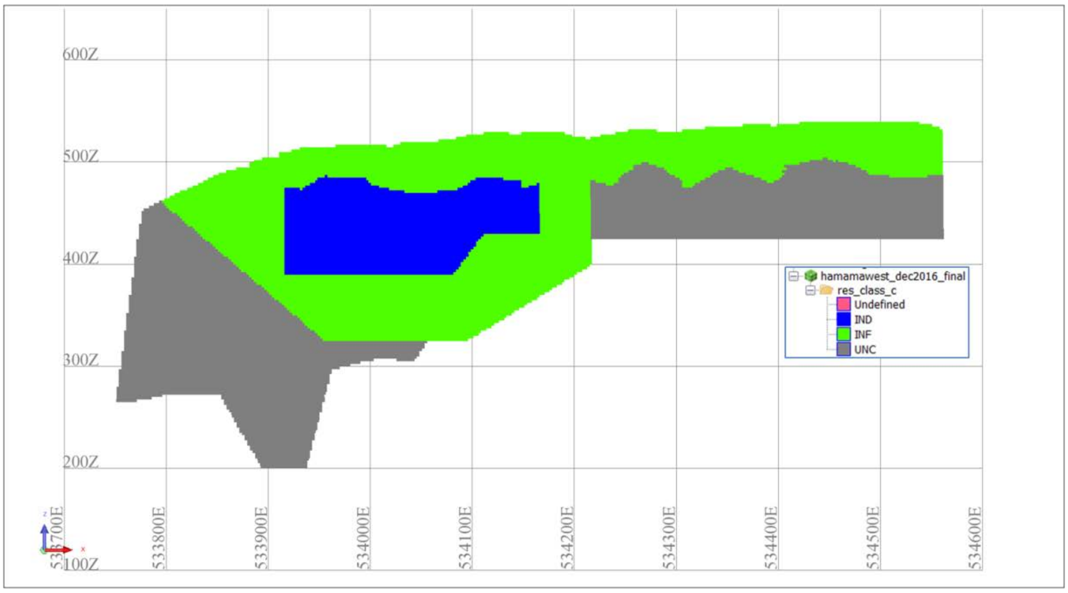


**Figure 14-20 Hamama West Long-Section View – coloured by Resource category**

## 14.12 Abu Marawat Deposit

A Mineral Resource was estimated by Roscoe Postle and Associates Inc. in 2012 for the Abu Marawat Deposit. The Abu Marawat Deposit lies in the north-eastern part of the Abu Marawat Concession (Figure 7-1), approximately 35km north-east of Hamama, and is located at 26°31'00"N – 33°38'28"E.

The bulk of the text in this section has been sourced from the "*Technical Report on the Abu Marawat Concession, Egypt*" dated 5th April, 2012 (Valliant and Salmon, 2012).

It is currently undetermined whether this deposit represents a project that would be developed separately or jointly to the Hamama West deposit, and hence why this information is presented here.

### 14.12.1 Geology and Mineralisation

The mineralisation at the Abu Marawat deposit comprises a series of near vertical quartz-hematite-sulphide veins or vein zones, hosted by mainly andesitic to rhyolitic tuffs and lavas and cut by small bodies of intrusive rhyolite and andesite. The prospect covers an area of about 1 km$^2$ within a mineralised terrain about 3 km$^2$ in size, that is separated from the Miranda prospect area to the southwest by a narrow fault-bounded NW-SE trending belt of greywacke and mudstone. To the north Abu Marawat is truncated by a large E-W trending fault postulated to run beneath Wadi Safaga. To the east a prominent ridge composed of altered ultramafic rocks (listwaenites) is thought to represent a significant geological terrain boundary.

Within the Abu Marawat area the felsic to intermediate volcanics have undergone intense pervasive quartz-sericite or kaolinitic alteration, which gives the rock a distinct pink colouration and a fissile texture, which is much less apparent in the unaltered rocks. Quartz-sericite-hematite-±carbonate alteration forms selvedges to the larger veins. Tiny patches of brown iron oxide scattered throughout the quartz-sericite altered rocks relate to the former presence of disseminated pyrite, particularly on the central Gabel Abu Marawat hill.

A series of roughly parallel N-S to NNW-SSE trending veins is located within the alteration zone. The two principal structures - the Fin Zone and Central Vein Zone - are about 50m apart and have been traced for 800m in surface outcrop and drill holes. The drilling has demonstrated that these structures extend to at least 200m in depth. The main ore-bearing minerals are sphalerite, chalcopyrite, electrum, gold, and a number of gold and silver tellurides such as petzite and hessite. The gangue minerals comprise quartz, hematite, ankerite, pyrite, magnetite and hematite. Close to the surface the carbonates have been leached and the sulphides are largely replaced by willemite, chrysocolla, malachite and limonite. In the oxidised material, the gold occurs as minute free grains in limonite or malachite. In the fresh sulphide mineralisation it is associated with tellurides and sphalerite. The presence of tellurides and the low iron content of the sphalerite suggest that the mineralisation is epithermal in style, despite the lack of classical epithermal textures within the veins.

Parts of the deposit have been worked since New Kingdom Pharaonic and Ptolemaic times (Klemm & Klemm, 2013), with the ancient workings scattered over an area of one square kilometre, with the largest workings in the eastern area of the project, including an open cut extending to about 40m depth.

### 14.12.2 Exploration

The ground magnetics and IP geophysical surveys that were conducted at Hamama in 2008 (Welz *et al.*, 2008) were also applied to the Abu Marawat area. The readings on the ground magnetic survey were somewhat noisy with a range of some 600 nanoteslas over the grid, but no direct correlation was seen with the mineralized veins.

The IP survey showed a fairly low chargeability background response, with a readily discernible, broad but complex chargeability zone striking north-west through the central portion of the deposit. This zone is approximately 1,500m in length and 400 m wide and is undefined to the southeast. It was interpreted to be subparallel to the main shear directions, with interpreted sources having a depth of burial of some 30 m to 50 m. The higher resistivity areas appear to correlate with topographic highs, whereas the lower resistivities reflect the extent of the wadis in the northwest portion of the grid. The gravels in the wadis are shallow, approximately 25 m to 30 m thick. Drilling in this area did not satisfactorily explain the anomalies. The two main narrow mineralized veins, the Fin and CZV veins, are located on the eastern slope of the central resistivity and topographic feature, occurring in an embayment of moderate chargeability. Although the mineralisation is of the ‘high sulphidation’ type, the veins are too narrow to be detected directly by the array used.

Structures in the south-western extent of this prospect remain to be investigated in detail, and they include some of the best surface sample grades in the project area. Only a limited amount of percussion drilling had previously been done by Minex in this area.

### 14.12.3 Drilling

The target was identified by Minex in 1987, who drilled 220 percussion holes and 34 diamond holes at the project. This work lead to the estimation of a small resource and the outline design for a potential starter pit (Turner, 1988). Only 28 of these holes were able to be located in 2008 at the time of the geophysical surveys.

Diamond drilling recommenced in 2011, undertaken by Hardrock Diamond Drilling Ltd., of Penticton, B.C. Practically all of the drill core was HQ-sized resulting in high quality samples. The sulphide-bearing quartz veins, coupled with the large core diameter, resulted in very high recoveries of core (usually 98% or better). Only one drill hole with poor ground conditions and two deep holes required reduction to NQ-sized core, representing less than 5% of the total drillcore. Drill holes were generally drilled on 50 m northeast-southwest section lines with approximately 50 m spacing on the sections. Drilling was done within a 1200m x 600m area and drill holes were oriented to optimally intersect the northwest-striking Valley and Fin zones, and the CVZ to a depth of approximately 200 m. Drill collars were surveyed using a differential GPS with sub-centimetre accuracy.

Table 14-22 summarizes the drilling in the various drill campaigns conducted by AAN.

**Table 14-22 Abu Marawat Drilling Summary – Alexander Nubia drillholes**

| Timeframe | Data Type | Hole_IDs | No of Holes | Total Drill Metres |
|---|---|---|---|---|
| Q1, 2011 | DDH | AAM-001 to 017 | 17 | 3,318 |
| Q2, 2011 | DDH | AAM-018 to 050 | 33 | 6,896 |
| Q3, 2011 | DDH | AAM-051 to 065 | 15 | 3,395 |
| Q4, 2011 | DDH | AAM-066 to 081 | 16 | 4,652 |
| **TOTAL DRILLING** | | | **81** | **18,261** |

### 14.12.4 Sample Preparation and analysis

The procedures and practices followed for diamond core logging, sample preparation, analysis and security as detailed by Valliant & Salmon (2012), were deemed by them to be appropriate for Mineral Resource estimation, and followed similar procedures and practices to those used at Hamama West which have been discussed in Chapters 10 and 11 of this report.

### 14.12.5 Mineral Resource Estimate

The details of the Mineral Resource estimate are presented in Valliant & Salmon (2012), and are summarised here as follows:

- A database with collar, survey, assay and lithology data, comprised of:
  - 81 diamond holes drilled by Alexander Nubia (for 18,260m);
  - 62 diamond or percussion holes drilled by Minex (for 6,466m); and
  - 6 short trenches for 42m.
- Interpretation of veins and vein zones from the diamond holes only, on 50m spaced vertical cross-sections. Assay data were also converted into an overall Net Smelter Return "("**NSR**") value to assist with interpretation of mineralised domains.
- 3D wireframes were constructed from the cross-section interpretations, and truncated with a topographic surface.
- Coding of the assays with the 3D wireframes, and raw statistics analysed for the 8 main mineralised domains, for Au, Ag, Cu and Zn.
- Analysis of top-cuts, and application of a global top-cutting strategy to raw assays for Au and Ag only.
- Generation of 1m downhole composites using the cut data.
- Variographic investigation of the cut composite data for the 8 main mineralised domains, and generation of a set of estimation parameters.
- Interpolation of grade into a block model based upon the final estimation parameters, using an Inverse Distance Squared estimation method.
- Application of a bulk density value of 2.78 g.cm$^{-3}$, based upon approximately 3,900 specific gravity determinations on drill core throughout the project area.
- Convert the block model estimated grades into an overall NSR value as inputs into a Whittle 4X optimization.
- Reporting of the mineralisation within the selected open pit shell above an NSR cutoff grade of USD20/tonne, and reporting of the mineralisation below the selected open pit shell – as an underground component - above an NSR cutoff grade of USD50/tonne

The Abu Marawat Mineral Resource as at 1 March, 2012, is tabulated in (Table 14-23).

**Table 14-23 Abu Marawat Inferred Mineral Resource**

| Classification | Domain | Cutoff | Tonnes | Grade | | | |
|---|---|---|---|---|---|---|---|
| | | NSR ($/tonne) | (t) | Au (g/t) | Ag (g/t) | Cu (%) | Zn (%) |
| Inferred | **Open Pit** | US$20 | 1,636,000 | 2.11 | 34.01 | 0.70 | 1.37 |
| | **Underground** | US$50 | 1,243,000 | 1.27 | 23.14 | 0.85 | 0.87 |
| | **TOTAL** | | **2,879,000** | **1.75** | **29.3** | **0.77** | **1.15** |

# 15 MINERAL RESERVE ESTIMATES

There are no Mineral Reserves estimated for the Hamama West Deposit.

# 16 MINING METHODS

Not applicable.

# 17 RECOVERY METHODS

Not applicable.

# 18 PROJECT INFRASTRUCTURE

Not applicable.

# 19 MARKET STUDIES AND CONTRACTS

Not applicable.

# 20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Not applicable.

# 21 CAPITAL AND OPERATING COSTS

Not applicable.

# 22 ECONOMIC ANALYSIS

Not applicable.

# 23 ADJACENT PROPERTIES

Not applicable.

# 24 OTHER RELEVANT DATA AND INFORMATION

There is no other relevant data or information required for disclosure in this NI 43-101 technical report.

# 25 INTERPRETATION AND CONCLUSIONS

## 25.1 Interpretation of Results

### 25.1.1 Drilling and Geological Model

Aton has discovered significant gold mineralisation beneath an outcropping gossanous alteration zone at Hamama on the Abu Marawat Concession. The discovery has been subjected to several years of exploration activities during modern times, and together with the gold and base metal deposit at Abu Marawat demonstrates the potential for the Concession to host significant gold mineralisation.

Exploration by Aton in the Abu Marawat Concession commenced in 2008 and consisted initially of geological mapping, prospecting and geophysical surveys. The majority of the exploration effort was focussed on the Abu Marawat project, and generation of a mineral resource estimate in 2012. In the Hamama area, Aton commenced an extensive programme in 2012 of detailed traverse fact mapping, trenching and rock chip channel sampling, with a follow up phase of diamond drilling at Hamama West which confirmed the discovery of the Hamama West mineralisation.

A total of 9,704m of DD drilling has been completed in 96 HQ and PQ gauge drillholes since Aton (then Alexander Nubia) commenced drilling in December 2011 on the overall Hamama prospect, including the subset of holes in the western end of the prospect which defines the Mineral Resource. Historical drillholes drilled by Minex in the 1980s (see Section 6.2) were excluded. Drilling, sampling, downhole surveying, quality control and logistical methods generally met industry standards, although documentation of information from the 2011-2015 drilling programs was sometimes poor.

Core recovery was very good within the fresh, sulphide mineralisation and in lithological units outside of the main gossan horizon at Hamama West, but there were friable and broken ground conditions encountered within the weathered profile of the mineralised horizon. This reduced the average core recovery, and has implications for sample quality and confidence in these oxidised zones. Improvements in core recovery have occurred during the 2016 drilling campaign, with a change to PQ size equipment, shorter drill runs, optimised drilling muds, cementing the top of the holes, and a more experienced diamond drilling team.

Samples prepared on-site are from half-sawn core, crushed to nominally <4mm, and sub-sampled using riffle-splitters to nominally 500-600g and boxed up for shipment to a commercial laboratory in Romania. After pulverisation to $P_{85}$ -75µm, samples were assayed for gold by fire assay, followed by an atomic absorption finish; and silver, copper and zinc by atomic absorption spectrometry, after an Aqua Regia digestion. Aton has used a range of certified and uncertified reference materials, and duplicate samples (from crushed half core), as control samples. The sample collection and preparation, analytical techniques, security and QAQC protocols implemented by Aton for the Project are generally consistent with standard industry practice, and are suitable for the purpose of mineral resource estimation and the reporting of exploration results. The insertion rates for certified and uncertified reference materials and duplicates are on the low side and should be increased for future drilling campaigns. The sampling procedures are adequate for and consistent with the understanding of the style of gold and silver mineralisation.

Mineralisation at Hamama consists of primary hypogene sulphide mineralisation overlain by an oxidised zone of gold-bearing gossan. Outcrop mapping and drilling have defined the deposit with a strike length of 800m, an average width of around 60m, outcropping at surface and with an average drill-intersected depth of 120m below surface. The sulphide mineralisation is dominated by abundant disseminated, stringer and blebby pyrite, often associated with lesser amounts of sphalerite, and rare chalcopyrite and galena. The mineralisation is interpreted as being VMS-style mineralisation in origin, although without any classic massive sulphide mounds being identified to date. It is interpreted that the deposit formed in a shallow water VMS-epithermal transitional environment, as evidenced by the presence of pillow lavas through the footwall andesitic sequence. Epithermal textures can be seen in the mineralised felsic volcanics, possibly representing an emergent volcanic environment. Alteration associated with the sulphide mineralisation is dominated by silica and carbonate, usually ferroan-dolomite. In places silica-carbonate flooding appears to be so intense that the original textures of the host lithologies have been completely obliterated.

The top of the deposit is characterised as a 30-40m thick gossanous zone of weathered and oxidised material. There are preferentially weathered zones which originally had a high sulphide content, zones of less weathered greyish-brown silica-carbonate altered felsic volcanics, and more limited patches of friable gossanous material. Gold and silver are enriched in the uppermost 3-5m of the profile. This surface enrichment is likely to be caused by supergene, or deflationary and erosional processes, or a combination of both.

The current interpretation is that the Hamama West deposit displays many of the characteristics of the 'VMS-epithermal hybrid' sub-class of Volcanogenic Massive Sulphide deposits, which includes deposits such as LaRonde-Penna and Bousquet in Quebec, Eskay Creek in British Columbia, and Henty and Mount Lyell in Tasmania.

### 25.1.2 Mineral Resource

The Mineral Resource estimate incorporates all diamond drilling completed by Aton since 2011 over the western part of the Hamama prospect area. It is also informed by geological information from trenches, the surface expression of mineralised zones as indicated by geological mapping, a dataset of bulk density measurements taken from whole core samples, a topographic survey file of the project exported as 1m contours, digital photos of all DDH drill core, and various preliminary geological interpretations from Aton geological staff.

An interpretation was completed to establish the underlying geological framework and controls on mineralisation, and to incorporate components of an earlier interpretation by Aton geologists. Three dimensional wireframes were created of the major lithological, mineralisation and weathering domains, and 2m downhole composites of assay data extracted within key domains. Basic statistics and geostatistics were examined for 5 key mineralised domains for gold, silver, copper, lead and zinc, and this analysis led to the application of high grade assay cuts for silver and zinc in some domains.

Variography and evaluation of suitable estimation parameters based on the final variogram models was undertaken using a commercial software package, and an appropriate search strategy and estimation block size was determined. Estimation was performed in a three dimensional block model, with the primary grade estimation method using Localised Uniform Conditioning for gold and silver in the main mineralised zones. Grade interpolation for the other elements (Cu, Pb, Zn) in the main mineralised zones, and all five elements in the two minor mineralised zones, was by Ordinary Kriging.

After routine block model validation processes were conducted and analysed, and taking into account the areas where the Hamama West mineralisation has been sufficiently drilled, the block model was considered suitable to allow classification of a component of the mineralisation as Indicated and Inferred Mineral Resources. A number of criteria were considered when assessing the mineral resource classification, including the continuity and volume of the mineralised domains, drill spacing and drill data quality (including the zones in the oxidised material of often poor core recovery), independent verification sampling from diamond drill core, analysis of the QAQC data, suitability of estimation methodology and local estimation bias.

The block model was assessed for the likelihood of the mineralisation having reasonable prospects of eventual economic extraction. The assessment included factors such as commodity pricing, potential processing methods, potential mining methods, preliminary metallurgical test work results, and level of geological knowledge of the project. As a result of this assessment process, estimated blocks that did not meet the criteria remained as unclassified and were not included in mineral resource reporting. A final cut-off grade of 0.5 g/t gold equivalent was used based on criteria including a $1,250/oz. gold price and a silver:gold ratio of 70:1 for reporting of Indicated and Inferred Mineral Resources.

### 25.1.3 Metallurgy

The Project is at an early stage of development, and only preliminary metallurgical testwork has been undertaken on the mineralisation at this point. The testwork focussed on analysis of a suite of samples by direct cyanidation, to verify whether acceptable extraction results could be achieved via this method. The samples were analysed in commercial laboratories in Romania and Ireland, with average gold recoveries achieved of 86.6%, and average silver recoveries achieved of 45%.

The samples were taken from excavated trenches prior to the major diamond drilling programs which have been used for the resource estimation. Consequently the average gold recoveries achieved to date relate only to the near surface expression of the mineralisation.

Further metallurgical testwork planned includes an initial phase of mineralogical assessment to identify specific mineral species and metal deportment in key geometallurgical domains, additional bottle roll tests to further identify and characterize the domains, and to provide key data on reagent consumption (especially lime and cyanide), and to investigate crushing and milling characteristics for the key lithologies.

## 25.2 Conclusions

The principal conclusions reached relating to the Project and ongoing implications for future Mineral Resource delineation and exploration work are:

- The drilling, sampling, sample preparation, assaying and QA/QC procedures used at Hamama generally provide representative, unbiased analytical results, suitable for use in the estimation of Mineral Resources;

- A key potential area of bias is associated with the variable and often poor core recovery in the oxidised zones. This creates a level of uncertainty which is reflected in the resource classification of the oxidised portion of the mineral resource as Inferred. The change in drilling methodology in 2016 improved the quality of the core available for sampling and these changes should be implemented for future programs. Further improvements in quality of information should be achieved through the use of twinned diamond holes and comparison with a different drilling method (such as reverse circulation or sonic drilling);

- Based on data validation, independent data verification and QAQC review completed by Cube, the geological and assay database relating to the diamond drilling is considered to be of a good standard and suitable for the use in the estimation of Mineral Resources;

- The gold and silver mineralisation in the key domains was estimated using Localised Uniform Conditioning, considered to be an appropriate method for the estimation of local recoverable resources for these domains in this deposit;

- The validation procedures applied to the resource block model confirm that this model provides a suitable basis for the estimation of Indicated and Inferred Mineral Resources;

- The geological and structural model for the deposit will continue to evolve with ongoing exploration, and this will inform mineralisation models in any future mineral resource update. The current model provides a framework upon which to base the regional exploration program in the southwest of the Abu Marawat Concession;

- The deposit is not closed off along strike to the east or west, or down dip, so there is potential to extend the resource base by extensional drilling programs; and
- Metallurgical testwork is a key avenue for further work, to underpin any future scoping or pre-feasibility studies.

## 25.3 Risks and Uncertainties

The generation of the Indicated and Inferred Mineral Resource at Hamama West by Aton does not necessarily imply that the eventual extraction of an economically viable deposit can be achieved. The bulk of the resource is reported at an Inferred Resource category, where the quantity and grade of gold mineralisation in this estimation are uncertain in nature, and there has been insufficient exploration to define these Inferred Mineral Resources as an Indicated or Measured Mineral Resource. Given its current Indicated and Inferred classification, the Mineral Resource is global and represents a reasonably reliable estimate of the total contained metal within the deposit, but the current block estimates are unlikely to be a true reflection of the actual grade/tonnage distribution that would be achieved during any selective open-pit mining in shorter production time periods.

The key technical risks and uncertainties which relate to the Mineral Resource Estimate (and are generally reflected in the classification of the reported Mineral Resource Estimate), and which could impact on the viability of the project, are summarised as:

- Exploration knowledge – the deposit is open to the east and the west, and also at depth, so the full potential of the deposit has not yet been fully defined. The exploration model for the area, encompassing the structural framework and the mineralisation, is still under development and will be refined as more information is gathered and synthesized.
- Exploration data – there remains some gaps in the documentation relating to the earlier drilling programs (2011-2015), which may have an impact on data quality in terms of downhole surveys, core orientations and density measurements. Though there has been poor record-keeping in the past, the consistency of data is high when comparing similar features between the older and the newer drilling programs (overall grade distribution, low but consistent core recovery and RQD, consistent downhole positions of major lithological contacts, consistent independent interpretation of geology from core photography), and this reduces the risk associated with the data quality from the earlier drilling programs.
- Representivity of near-surface drillcore – the diamond drilling recovery within the weathered profile of the mineralised horizon at Hamama West was relatively low, with friable and broken ground conditions reducing the average core recovery to approximately 78%. RQD measurements averaged approximately 51% for all drillcore produced, but lower within fault zones and towards the top of each hole. Changes to the diamond drilling method for the final 15 holes resulted in an improvement in core quality, to approximately 85% recovery (within the oxidised portion of the mineralised horizon). Given there is a relationship between core recovery and the gold assay value – whether from geological processes in the weathering horizon or a sample bias – there is a risk of overstating the gold and silver grades for portions of the oxidized zones. The level of uncertainty is reflected in the current classification as Inferred category for the mineral resource in the oxidised zones. Maintaining the changes to the diamond drilling method is important, and this can be supplemented by a program of infill and twin holes using a reverse circulation percussion method, which should result in a better sample if downhole air pressure is adequately managed.

- Representivity of samples used for bulk density measurement – as the core in the oxide and transition zone is generally broken and differentially weathered, the more competent and unweathered sections of the core is the most likely material used for density determinations and hence is likely to overstate the assigned density in the oxide zone. Additionally, the core used was generally neither coated nor waxed, though some later holes in the 2016 drilling campaign were wrapped in cling-film. The risk of not using a method which adequately accounts for potential void spaces is considered to be generally low in all fresh rock types, and moderate in more weathered material.

- Quality of the grade estimation in the block model – this is a function of the data spacing, quality and variability of the input data, and the degree to which the final result is an unbiased estimate of the total contained metal. Specific areas within the modelling process where risks and uncertainties were managed included:

    - Separately domaining the near surface deflationary or residual domain, to limit the influence on the main oxide domain from the relatively higher grades which occur within a few metres from surface,

    - Statistical analysis to validate the overall controls on the mineralised domains and to determine whether further subdivision of the domains was required based on weathering, grade or lithology;

    - Review and application of grade top-cuts (to silver and zinc composite data). There is a discrete but relatively very high grade silver zone in the block model, associated with two adjacent drillholes which have consistent zones showing very high silver grades. Further drilling is required in this area to confirm the spatial extents of this high grade sub-domain.

    - Variographic analysis – At the current drill spacing, the controls on mineralisation are only weakly developed, and appear to be shallowly dipping within the overall steep mineralised horizon, consistent with a steep control at the time of mineralisation (i.e. pre-deformation). Data from further infill drilling may change this preferred direction of mineralisation continuity.

    - Estimation into an appropriate estimation block size, and selection of Localised Uniform Conditioning as an appropriate primary grade estimation method for the estimation of local recoverable resources for the main mineralised domains.

    - The interpretation of two of the minor mineralised domains – a western fault zone and several areas of mineralisation in the hangingwall epiclastics (potentially talus debris) – which were not sufficiently robust to allow these domains to be classified as a Mineral Resource.

- Conceptual nature of mine planning and operating parameters – the factors used for initial open pit mining costs and recovery factors (which were used to assess the Mineral Resource as having reasonable prospects for economic extraction) are preliminary in nature, and further work is required to define the capital and operating parameters to support formal evaluation of the economic viability of the project.

- Preliminary nature of metallurgical test work – the test work samples have been gathered from the excavated trenches near surface, and are therefore not representative of the oxide or primary mineralisation. The current testwork is considered to be indicative only as a ‘proof of concept’ of the cyanidation process, but is not considered representative or sufficiently accurate to support detailed processing and project studies.

Other than the comments and potential risks discussed above, Cube is not aware of any other factors (including environmental, permitting, legal, title, taxation, socio-economic, marketing, political) which could materially affect the exploration data or the exploration potential of the Project as presented in this report.

# 26 RECOMMENDATIONS

On the basis of this technical report, and in consideration of Aton's operating strategy, the items below are recommended.

The recommendations reflect the current status of the Mineral Resource and the Project and are not based on the completion of successive phases of work. Some of the items listed serve to highlight general improvements or enhancements to current work practices.

## 26.1 Hamama West Mineral Resource Development

1. Plan and undertake a program of Reverse Circulation ("**RC**") percussion drilling to further test the oxide gold cap at Hamama West, with the specific aim of increasing the sampling quality and hence increase the confidence of the mineral resource estimate. This should include a combination of twin holes and infill holes, as well as extensional drilling to increase the potential resource base at depth and along strike.

2. Complete a program of high-quality mechanical saw-cut channel sampling of the excavated trenches at Hamama West, as a supplement to the RC drilling programs.

3. Mineralogical assessment, consisting of QEMSCAN bulk mineral analysis and XRD analysis, to identify the mineral species and metal deportment in the geo-metallurgical domains identified by geological logging of the drill core.

4. Metallurgical testwork, including bottle roll tests to further identify and characterize the mineral recovery parameters for each domain, to provide key data on reagent consumption (especially lime and cyanide), and investigation of material strength (Bond Work Indices) to determine crushing and milling characteristics for the key mineralisation domains.

5. Further drilling is required in the area adjacent to drillholes AHA-031 and AHA-058, which contain consistent zones with very high silver grades. This will confirm the spatial extents of this high grade sub-domain.

## 26.2 Hamama Prospect Exploration

6. Complete reprocessing and reinterpretation of the 2008 geophysical survey (IP and ground magnetics) over the Hamama VMS Grid and QT Grid areas.

7. Collect ground EM and magnetic geophysical data over the entire strike length of the mineralized target horizon. Acquire and collect downhole EM data from existing selected deep drillholes.

8. Plan and undertake a regional geochemical and alteration mapping study of the general Hamama area. This will include lithogeochemistry (whole rock and trace elements) of drilling and trench samples, as well as surface samples. Re-evaluation of the existing drilling database and review of geochemical data currently available.

9. Drill test selected targets within the general Hamama area, using RC or diamond drilling, as appropriate.

## 26.3 Regional Exploration

10. Complete the ongoing Landsat 7/ASTER spectral and photogeological interpretation study, and generate a series of ranked targets. Acquire and process WorldView-3 satellite imagery to further delineate areas of potentially significant hydrothermal alteration from the enhanced multispectral data, and construct a Digital Elevation Model over the Abu Marawat-Semna area.

11. Complete reprocessing and reinterpretation of the 2008 geophysical survey (IP and ground magnetics) over the Abu Marawat and Miranda North / South areas.

12. Plan and undertake additional RC percussion or diamond drilling, as appropriate, at Abu Marawat.

13. Further field studies over the Abu Marawat-Miranda trend, including detailed field geological and alteration mapping, ground EM and magnetic geophysical surveys, geochemical exploration (stream sediment, wadi or MMI sampling), trenching and rock-chip sampling.

14. To supplement laboratory-based precious and base metal analytical methods, introduce the use of portable, handheld XRF analysers or SWIR spectrometers.

## 26.4 Procedural and Data Management

The additional recommendations listed below are related to procedural improvements to the drilling, sample collection and data management procedures.

15. Bulk Density: Change the operating procedure to use wax coating or cling-film to seal the core prior to density determinations. This will adequately account for variations due to any void spaces (vugs/porosity), especially in the more weathered material. Re-measure a subset of the remaining half-core from drill holes in the 2015 campaign, as a check on the validity of those holes where the documentation or procedures used differ from the current ones.

16. QAQC: About 1% of the CRM results were identified as sample mishandling or transcription errors and were excluded from the analysis as outliers. It is recommended that these samples are reviewed and corrected in the database for future analysis.

17. For all drilling samples, a regular campaign-based QAQC program of independent umpire laboratory analysis of mineralised drill intercepts should be implemented as a routine check on the precision of the primary laboratory. Contiguous assay pulps should be selected from mineralised drill intervals and include representative proportions of both high and low grade material. Rounds of umpire check assays should comprise approximately 2-5% of the total samples submitted, and be conducted on a regular monthly basis and upon completion of each drilling phase. The umpire pulp duplicates are used to identify any analytical bias associated with the primary laboratory.

18. Introduce as routine practice the assaying of mineralised coarse reject duplicate samples at a reputable external laboratory. This type of duplicate sample is used to detect any sampling bias associated with sample preparation which cannot be identified by the use of CRMs only. CRMs can only identify analytical bias.

19. Ensure that sufficient CRM are available for future drilling programs. Focus on the grade ranges for Au and Ag that are typical of the grades from the deposit, especially around 0.5-1.0 ppm Au, as confidence in this grade range will be critical in defining the mineralisation boundaries for any future resource estimations.

20. Compile written procedures for all field functions such as drilling, downhole survey methodology, sample collection and QAQC analysis, to ensure that consistent high quality work practices are implemented and maintained.

21. Assay some duplicates of the crushed core material by a Screen Fire Assay method, especially in areas where higher gold and silver grades are encountered.

## 26.5 Work Program Budget

Outside of the Abu Marawat and Hamama projects, there are a number of priority exploration targets within the Concession which have had limited mapping and sampling, but not been drill tested to date. These include the Miranda, Semna and Sir Bakis prospects. Other potential base and precious metal prospects within the Abu Marawat Concession include the Abu Garida, Eradiya East, Bohlog, Massaghat, Um Balata, Zeno and Abu Gaharish prospects, which have only had initial cursory mapping and sampling to date. It is Aton's intention to aggressively explore these targets during 2017. A remote sensing study, comprising ASTER and Landsat 7 alteration mapping and photogeological interpretation has been initiated, to better define regional prospectivity and to aid with target definition. This will be followed up with a more detailed remote sensing study using WorldView 3 multispectral data.

To accomplish the above objectives and recommendations, a comprehensive work program has been proposed by Aton primarily focused on the Hamama West deposit and other areas immediately adjacent. The proposed budget and exploration drilling program detailed below in Table 26-1 covers a nominal 6 month period (ending July 2017).

**Table 26-1 Proposed Work Program Budget (USD) - Feb to Jul 2017**

| | Hamama / Hamama West | Abu Marawat | Regional |
|---|---:|---:|---:|
| Drilling | 580,000 | 4,000 | 0 |
| Surveying | 17,000 | 17,000 | 0 |
| Sampling and assaying | 91,000 | 0 | 0 |
| Geophysics | 72,000 | 19,000 | 0 |
| Metallurgical Testwork | 22,000 | 0 | 0 |
| Consultants | 25,000 | 0 | 0 |
| Site Infrastructure | 45,000 | 0 | 25,000 |
| Technical Manning | 152,000 | 58,000 | 38,000 |
| Other | 375,000 | 86,000 | 67,000 |
| **Sub-Total (USD)** | **1,379,000** | **184,000** | **130,000** |
| **TOTAL (USD)** | **1,693,000** | | |

# 27 REFERENCES


Abzalov, M.Z. (2006): Localized Uniform Conditioning (LUC): A New Approach to Direct Modelling of Small Blocks. *Mathematical Geology* 38(4), pp 393-411.

Abzalov, M.Z. (2008): Quality Control of Assay Data: A Review of Procedures for Measuring and Monitoring Precision and Accuracy. *Exploration and Mining Geology*, Vol 17(3-4),pp 131-144.

Alexander Nubia Inc. (2012): Alexander Nubia makes a new copper-gold porphyry/vein discovery and identifies several New Targets in the Abu Marawat Concession, Egypt. Gold grades up to 470 g/t from a channel sampling program at Massaghat. Press Release on 15 August 2012. Available online at URL: http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00027019&issuerType=03&projectNo=01945277&docId=3173547 Accessed 7 February 2017]

Alexander Nubia Inc. (2013): Alexander Nubia releases further trench results at its Hamama VMS deposit in Egypt. Press Release on 10 January 2013. [Available online at URL: http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00027019&issuerType=03&projectNo=02004745&docId=3253968 Accessed 7 February 2017]

Alexander Nubia Inc. (2014): Alexander Nubia Provides a Summary on the Abu Zawal Gold Deposit located In the Fatiri Concession, Egypt. Press Release on 21 January 2014. [Available online at URL: http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00027019&issuerType=03&projectNo=02156016&docId=3464838. Accessed 7 February 2017]

Alexander Nubia Inc. (2015a): Felsic Dome at Hamama Gold-Rich VMS. Unpublished internal report, 2pp.

Alexander Nubia Inc. (2015b): Alexander Nubia Reports 92.2% Gold Recovery With Bottle Roll Test From Hamama Oxide Gold Cap. Press Release on 13 January 2015. [Available online at http://www.atonresources.com/2015/01/12/alexander-nubia-reports-92-2-per-centgold-recovery-withbottle-roll-testfrom-hamama-oxide-gold-cap/ Accessed 27 November 2016]

Alexander Nubia Inc. (2015c): Alexander Nubia adds to project pipeline: grab samples returned high-grade copper-gold mineralisation at Rouh al Hadid: gold grades up to 82.4 g/t and copper grades up to 3.53 %. Press Release on 24 March 2015. [Available online at URL: http://www.sedar.com/GetFile.do?lang=EN&docClass=8&issuerNo=00027019&issuerType=03&projectNo=02323699&docId=3699069. Accessed 7 February 2017]

Aton Resources Inc (2016) : Alexander Nubia International Inc. Announces That it has Changed its Name to Aton Resources Inc. [Available online at URL: https://www.atonresources.com/site/assets/files/1215/june152016-1.pdf. Accessed 16 June 2016]

Canadian Institute of Mining, Metallurgy and Petroleum (CIM) (2014): CIM Definition Standards – For Mineral Resources and Mineral Reserves. [Available online at http://web.cim.org/standards/MenuPage.cfm?sections=177&menu=178/ Accessed 12 December 2016]

Centamin plc (2016): Centamin Annual Report 2015. [Available online at http://www.centamin.com/investors/reports/2016 centamin-ar15-smart-secure-7mb.pdf Accessed 26 November 2016]

Dentons Egypt LLC (2017): Concession Agreement – Abu Marawat, Eastern desert, A.R.E. Memorandum from A.Karmal to Aton Resources Inc. from El Afifi Law Office (in association with Dentons Egypt LLC).

Dubé, B., Gosselin, P., Mercier-Langevin, P., Hannington, M., and Galley, A. (2007): Gold Rich Volcanogenic Massive Sulphide Deposits. In Goodfellow, W.D.: *Mineral Deposits of Canada: A Synthesis of Major Deposit-Types, District Metallogeny, the Evolution of Geological Provinces and Exploration Methods.* Geological Association of Canada, Mineral Deposits Division, Special Publication No. 5, pp. 75-94.

Gonzalez R.A. and Payne J.G. (2014): Summary Report on the Fatiri Concession, Egypt, April 2014. Internal company report prepared for the Egyptian Mineral Resource Association, Cairo, Egypt.

Hall D. and McHugh, J.J. (1989): Gold Exploration in the Eastern Desert, Egypt: A Case History. Mineral Exploration Programmes '89, Paper 18. 25 pages.

Hall D., McHugh J. J., de Jong A., and Phillips, J. (1988): Report on Exploration Percussion Drilling at Hamama. Minex Minerals Ltd internal report. 66 pages.

Large, R.R., McPhie, J., Gemmell, J.B., Hermann, W., and Davidson, G.J. (2001). The Spectrum of Ore Deposit Types, Volcanic Environments, Alteration Halos and Related Exploration Vectors in Submarine Volcanic Successions: Some Examples from Australia. *Economic Geology,* vol. 96(5),pp 913-938.

Klemm, R. and Klemm, D. (2012): *Gold and Gold Mining in Ancient Egypt and Nubia – geoarchaeology of the ancient gold mining sites in the Egyptian and Sudanese Eastern Deserts..* Springer-Verlag, Berlin, 649 pages.

Marjoribanks R. (2010): Geological Methods in Mineral Exploration and Mining. Springer, 256pp.

Payne, J.G. (2013): Report 130086 – Petrographic report on samples from holes AHA-015, AHA-019, AHA-020, AHA-021 and AHA-026. Internal Alexander Nubia Inc. internal report, February 2013, 33pp.

Sillitoe R.H., Hannington M.D., and Thompson J.F.H. (1996): High Sulfidation deposits in the volcanogenic massive sulphide environment. *Economic Geology*, vol. 91, pp. 204-212.

Turner, R. W. (1988): The Abu Marawat Project, Egypt. A Preliminary Report on Mine Design and Mine Capital and Operating Costs. Report prepared for and on behalf of Greenwich Resources PLC., London, December 1988.

Valliant, W.W. and Salmon, B. (2012): *Technical Report on the Abu Marawat Concession, Egypt.* NI43-101 Report for Alexander Nubia International Inc. by Roscoe Postle Associates Inc. SEDAR published report, 5 April, 2012. [Available online at URL: http://www.sedar.com/GetFile.do?lang=EN&docClass=24&issuerNo=00027019&issuerType=03&projectNo=01890290&docId=3092371 Accessed 14 June 2017]

Voormeij, D. (2015): Geological Model for Hamama. Unpublished Alexander Nubia Inc. internal report, 3pp.

Welz, M., Walcott, A., and Walcott, P. E. (2008): A Report on Induced Polarization & Magnetic Surveying, Abu Marawat Concession, Red Sea Governorate, Arab Republic of Egypt. Peter E. Walcott & Associates Limited, Vancouver.

# 28 DATE AND SIGNATURE PAGE

## 28.1 Certificates of the Qualified Persons

I, Matt Bampton, do hereby certify that:

I am a Senior Consultant Geologist with Cube Consulting Pty Ltd of 1111 Hay Street, West Perth, WA 6005.

I am the author of the technical report titled "NI 43-101 Independent Technical Report (NI43-101), Hamama West Deposit, Abu Marawat Concession, Arab Republic of Egypt" and dated 24 January 2017 (the "**Technical Report**") relating to Aton Resources Ltd.'s Abu Marawat Concession in Egypt.

I am a Geologist, with a Bachelor of Science (Honours) degree from the University of Sydney, graduating in 1988. I am a Member of the Australian institute of Geologists (Membership No.6028), and a Member of the Australasian Institute of Mining and Metallurgy. I have worked as a geologist for more than 20 years since my graduation from University. Relevant experience has been gained from working in the gold and base metal mining and exploration industry in various provinces throughout Australia. I am a Qualified Person as defined in NI 43-101, having more than 5 years of experience which is relevant to the style of mineralisation and type of deposit described in the Report, and to the activity for which I am accepting responsibility.

I conducted site visits of the Hamama exploration property between the between 6th May and 11th May 2016, between 20th June and 22nd June 2016, and between 24th June and 27th June 2016.

I am responsible for the preparation of all sections of this Technical Report, and I am independent of Aton Resources in accordance with Section 1.5 of NI 43-101.

Prior to the engagement in 2016 which relates to this Technical Report, I have had no previous involvement with the properties in the Abu Marawat Concession which are the subject of this Technical Report.

I have read NI 43-101 and Form 43-101F1 and the Technical Report has been prepared in compliance with that instrument and form.

As of the date of this Technical Report and certificate, to the best of my knowledge, information and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated at Perth, Australia, this 16th day of June, 2017.

Matt Bampton
B.Sc.(Hons), M.Env. Sci., MAusIMM, MAIG
Senior Consultant Geologist
Cube Consulting Pty Ltd