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CENTRAL ASIA METALS PLC
PEEL HUNT LLP
J. P. MORGAN SECURITIES PLC

COMPETENT PERSON'S REPORT ON THE KOUNRAD COPPER IN SITU DUMP LEACH ASSET, CENTRAL KAZAKHSTAN

22 SEPTEMBER 2017

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COMPETENT PERSON'S REPORT ON THE KOUNRAD COPPER DUMP LEACH ASSET, CENTRAL KAZAKHSTAN

22 SEPTEMBER 2017

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Phil Newall	Managing Director, Mining Geologist-Competent Person

The information in this report that relates to copper resources for the Central Asia Metals Plc, Kounrad Project, is based on a Mineral Resource Estimate completed by Mr Phil Newell who is employed by Wardell Armstrong Limited. Mr Newell, BSc (ARSM), PhD (ACSM), CEng, FIMMM, Managing Director of WAI (mining geologist) with 30 years' experience in the mining industry and sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". Mr Newell), CEng, FIMMM] and consents to the inclusion of this information in the form and context in which it appears in this report. The author states that this report complies with the guidelines as stipulated in the JORC code, 2012 Edition and coal resources are reported in accordance with the JORC code.

CONTENTS

TABLES

FIGURES

PHOTOGRAPHS

EXECUTIVE SUMMARY

Wardell Armstrong International ("WAI") was commissioned by Central Asia Metals Plc ("CAML" or "Client") to prepare an updated Competent Person's Report ("CPR") on the Kounrad in-situ copper dump leach project ("Project"), central Kazakhstan. This CPR represents an update to the CPR prepared by WAI in 2010 for the CAML IPO. The CPR is complete, up to and including 17 July 2017.

WAI have been informed that CAML is intending to publish an AIM Admission Document in connection with the proposed acquisition of the Sasa Mine in Macedonia, and seeks readmission of the Company's shares on the AIM market, as required under the AIM Rules, and that as part of this, CAML is required to include a report on Kounrad.

Historically, copper ore was mined from the porphyry deposit at Kounrad from 1936, originally by Balkhashtsvetmed and more recently by Kazakhmys, which still owns the open pit mine and the liabilities associated with restoration of the site. Importantly, over the decades of production, detailed mining and processing records have been maintained relating to the classification and grades of the various waste dumps.

The sulphide ores were treated by conventional flotation, whilst oxide ores and low-grade sulphide ores were stockpiled around the site, to the eastern and western margins of the pit, namely the Eastern and Western Dumps.

Currently, CAML operate an in situ dump leach operation from the Eastern and Western Dumps that were left by the Soviet mining operations, and CAML irrigate these dumps with acidic solutions "in situ" and transport the copper pregnant leach solution to the SX-EW plant for copper mineral processing and metal recovery.

In-situ acid leaching, is where acidic solutions are irrigated on top of the dumps in order to recover soluble copper as a pregnant solution. The copper pregnant solution flowing from the base of the dumps is collected and pumped to a solvent extraction and electro-winning (SX-EW) plant which is located at the Eastern Dumps.

The higher-grade oxide ores which are restricted to the Eastern Dumps provided the focus for initial production during 2012-2016. Testwork on the potential methods for the extraction and recovery of copper from the various waste dumps and leaching of the dumps has been undertaken since the 1970s.

In 2006 CAML, through its Kazakhstan wholly owned subsidiary Sary Kazna LLP, acquired 60% ownership of the sub-soil use contract (contract number 2447) covering the Kounrad waste dumps from the State Entrepreneurial Corporation Saryarka (SEC Saryarka).

Having raised US$60 million at IPO in September 2010, CAML completed construction of the Kounrad SX-EW copper plant in 2012, on schedule and US$9m below budget. The plant began producing copper in late April 2012.

CAML completed the acquisition of the remaining 40% of the project in 2014.

Summary of Assets

Asset	Holder	Interest (%)	Status	Licence Expiry Date	Licence Area	Comments
Kounrad	CAML	100%	Exploration and Processing	20th August 2034	22.5Km^2	

Since operations on the Eastern Dumps commenced, CAML has increased annual production each year and has now produced approximately 61,000 tonnes of copper cathode:

Year	2012	2013	2014	2015	2016	H1 2017
Cu (t)	6,586	10,509	11,136	12,071	14,020	7,027

In May 2015, CAML successfully completed the Kounrad Stage 1 Expansion, on schedule, and under budget, which involved increasing the PLS handling facilities, boiler capacity and copper plating capacity.

The Stage 2 Expansion project (covering the Western Dumps) was materially completed in Q4 2016 and copper production from this area commenced in Q2 2017.

In terms of the Mineral Resource model, WAI prepared a Mineral Resource Estimate in accordance with the JORC Code (2004) in 2013 based on work carried out using CAE Studio 3® (Datamine) software. The base data for this work included the large volume of historical data from open pit mine records, and the more recent reverse circulation drilling works carried out in 2011 and 2012.

Subsequently the JORC Code has been updated to the JORC Code (2012) which took full effect as of 01 December 2013, and the Mineral Resources reported within this CPR have therefore been amended to meet the guidelines of the JORC Code (2012).

Summary of Eastern, Western and Northern Mineral Resources

Category	Gross			Net attributable			Operator
Kounrad Mineral Resources	Tonnes (kt)	Grade (%)	Contained metal	Tonnes (kt)	Grade (%)	Contained metal	
Indicated	388,977	0.10	372,546	388,977	0.10	372,546	CAML
Inferred	264,023	0.09	237,175	264,023	0.09	237,175	CAML
Sub-total	653,000	0.09	609,722	653,000	0.09	609,722	
Total	653,000	0.09	609,722	653,000	0.09	609,722	

Between the commencement of production at Kounrad and the end of H1 2017, circa 61,000t of copper cathode have been produced. Due to the leaching method, it is not possible to specifically define where within the dumps copper mineralisation has been leached, with leached solutions potentially propagating through several contiguous irrigation blocks before being sent to the process plant.

To account for the depletion of the Mineral Resource as of end of H1 2017, the updated Mineral Resource statement includes columns for the recovered copper "Cu Production 2012-2017 (t)" and the remaining copper "Remaining Cu (t)".

The results of this work are summarised in the table below, and demonstrate a close correlation with previous historical Mineral Resource Estimates.

An important factor that has been noted during the 2011-2012 exploration as well as production is that many of the assumptions pertaining to the makeup of the material identified as "mixed" (10 to 20% acid soluble copper) and "sulphides" (less than 10% acid soluble species) are no longer correct. Assay results show that acid soluble assays in "mixed" dump 15-16 were higher than expected and averaged around 45% and with similar values being determined in the "sulphide" dumps such as 1, 1a, 21.

It is highly likely that these higher than anticipated levels of soluble copper are due to the historic and ongoing (continuously active) natural oxidation conditions occurring within the dumps, over a 70-80 year time frame.

Such changes can be accelerated by near surface oxidation, species conversion related with ferric iron leaching; and both being accelerated by the presence of naturally occurring bacteria. Visually, it is very clear to see such natural activity having occurred, with extensive plumes of copper oxide colouration seen on large areas of the dump side walls.

Consequently, and in particular for the Western Dump Mineral Resources, this has implications for potential enhanced recoveries.

Processing

In terms of processing, a considerable amount of testwork, pilot scale testing together with the last five years operational data, has been compiled for the leaching of the Eastern and Western Dumps at Kounrad. The quantity of material remaining in the dumps (most notably the Western Dumps), the copper content, and its amenability to leaching, all confirm the continued viability of the CAML Kounrad project.

The oxide waste was dumped entirely on the eastern margin of the open pit and has been the initial operational focus of the project. The sulphide, and the bulk of the mixed waste, are located in the Western Dumps area and have been subjected to metallurgical testing in the period 2009-2012 to verify copper recoveries and acid consumptions.

Kounrad Dump Mineral Resource (Global Estimate), (WAI, 30 June 2017) In accordance with the Guidelines of the JORC Code (2012)							
Classification	**Dump**	**Tonnage (kt)**	**Cu_{total} (%)**	**Cu_{acid} (%)**	**Cu_{total} (t)**	**Cu Production 2012- 2017 (t)**	**Remaining Cu (t)**
Eastern Dumps							
Indicated	2	21,470	0.07	0.04	15,641	-	
	3	-	-	-	-		
	5	33,896	0.08	0.04	27,246		
	6	11,404	0.09	0.04	10,086		
	7	12,328	0.10	0.04	11,938		
	9 &10	10,555	0.20	0.07	20,890		
	Total	**89,653**	**0.10**	**0.04**	**85,799**		
Inferred	2	13,775	0.07	0.04	9,659		
	3	1,033	0.22	-	2,285		
	5	35,058	0.10	0.05	33,528		
	6	3,442	0.11	0.04	3,641		
	7	22,989	0.11	0.04	25,501		
	9 &10	3,350	0.21	0.09	7,126		
	Total	**79,646**	**0.10**	**0.05**	**81,740**		
Indicated + Inferred	**Total**	**169,299**	**0.10**	**0.04**	**167,539**	**60,048**	**107,491**
Western Dumps							
Indicated	1	36,942	0.18	0.10	65,193		
	1a	-	-	-	-		
	15 & 16	189,953	0.08	0.04	152,687		
	21	10,398	0.20	0.10	20,788		
	21a	858	0.17	-	1,433		
	22	37,276	0.10	0.05	36,057		
	13	6,472	0.03	0.01	1,750		
	20	14,452	0.03	0.01	4,478		
	Total	**296,351**	**0.10**	**0.05**	**282,386**		
Inferred	1	19,751	0.14	0.07	26,958		
	1a	1,467	0.04	0.02	651		
	15 & 16	114,701	0.08	0.04	94,670		
	21	6,870	0.18	0.08	12,321		
	21a	4,452	0.17	-	7,559		
	22	22,167	0.08	0.04	18,108		
	13	4,705	0.03	0.01	1,534		
	20	7,408	0.03	0.02	2,488		
	Total	**181,521**	**0.09**	**0.04**	**164,289**		
Indicated + Inferred	**Total**	**477,872**	**0.09**	**0.04**	**446,675**	**1,300**	**445,375**
Northern Dumps							
Indicated	Northern	2,973	0.04	0.01	1,277		
Inferred	Northern	2,856	0.05	0.02	1,455		
Indicated + Inferred	**Total**	**5,829**	**0.05**	**0.01**	**2,732**	**0**	**2732**

Notes:
1) *Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-feasibility study.*
2) *Mineral Resources are reported inclusive of any reserves.*

Summary of Testwork

In addition to a pilot scale trial undertaken at the Eastern Dump, a pilot scale trial was also performed at the Western Dumps in 2011-2012. The pilot plant trial had demonstrated the feasibility of producing saleable copper cathode from the Eastern Dumps.

From the Western Dumps, the pilot plant ran from June 2011 to the end of September 2012, but was stopped during the severe winter of 2011-2012. Two cells of Western Dump material were subject to leaching during this period, with the second test cell being curtailed early due to some operational issues regarding solutions return connected with unknown ground topography.

Although the trial did not deliver the same quantity of specific metallurgical data as generated when running at the Eastern Dump, it had however shown that the copper was recoverable via acid leaching with a recovery approaching 50% being obtained from Western Dump material.

The required FS design data was subsequently enhanced from undertaking large diameter column tests at site, this was also used to develop a realistic kinetic model for leaching. It is known, and expected, that this can only be a best approximation, based upon the data presently available. Two leach recovery curves were produced, one for lower grade material (<0.05% TCu) with a final recovery of 35%, and a higher grade (>0.5% TCu) terminating at 42% total Cu recovery, both at 20 months.

In 2012, the SX-EW Plant was commissioned and later expanded in 2015. In 2013, BGRIMM completed a Feasibility Study as part of the expansion. BGRIMM detailed the leaching schedule and designed a plant capable of treating a range of flow rates and solution grades to produce up to 50 tonnes of copper cathode per day at 99.99% quality. The plant design has taken the extremes of climate into consideration, especially the operability through the winter period.

For the Eastern Dumps, CAML has adopted recovery levels of 51% for Dumps 6,7,9 and 10, while a leach recovery level of 42% was adopted for Dumps 2 and 5.

The Eastern Dumps are expected to recover a further 25,136t (from 79,843t originally available) of leached copper during its remaining operational life. Leaching of the Western Dumps has only recently commenced (Q2 2017) following the installation of solution ponds, pumps, 3 boilers and two overland pipelines, which transport the PLS and raffinate between the western facility and the SX-EW Plant at the Eastern Dump. The site is now supplied with technical water from the nearby Lake Balkhash via an overland pipeline at a flow rate of up to 200m^3/hr.

Over the life of operation for the Western Dumps, it is expected that some 173,173t of copper will be recovered to the PLS. This is significantly higher than the copper to be recovered from the Eastern Dump because the Western Dumps contain significantly more material.

In summary, production from the Eastern Dumps has demonstrated that CAML has successfully leached copper from the low-grade copper waste dumps, and early indications suggest that the Western Dumps will continue this process for the long-term.

WAI has reviewed the environmental and social performance of the Kounrad operations based on a review of documentation provided by the Client.

The operation is compliant with local Kazakh legislation, and a considerable amount of work has been undertaken to bring it in line with International Best Practice. A document register is maintained for all Environment and Social, and Health and safety policies, plans and procedures; and WAI considers the Environmental and Social performance is well managed, and to a high standard.

Studies show that there is potential for Acid Mine Drainage ("AMD") and Pregnant Leach Solution ("PLS") migration down gradient of the Dumps due to "historic" contamination. CAML has instigated a number of studies to develop a detailed understanding of these issues, and continues to monitor closely to manage the risk. WAI is satisfied that historical liability is not the responsibility of CAML, and furthermore, WAI believes this aspect of the operations is given sufficient consideration, and the risks associated with potential contamination are well managed.

Financial Analysis

WAI has performed a technical valuation of the Kounrad copper dump leach project using a Discounted Cash Flow (DCF) analysis. The operating costs and sustaining capital requirements were estimated by the Client based on the actual operation results and approved Company budgets. WAI finds these costs to be reasonable for the scale and the location of the operation.

Based on the financial analysis performed by WAI, the Kounrad Project generates a strongly positive Net Present Value (NPV) of US$355M at a 10% discount rate (Base Case). As a part of a sensitivity analysis, NPVs based on various discount rates ranging between 8% and 20% were also calculated. A summary of the Project NPVs at various discount rates is shown in the table below:

Project NPV Summary		
NPV @ Discount Rate of 8%	US$ M	401
NPV @ Discount Rate of 10%	**US$ M**	355
NPV @ Discount Rate of 15%	US$ M	271
NPV @ Discount Rate of 20%	US$ M	215

Total average life of mine C1 project cash costs were estimated at US$0.54/lb.

A Base Case metal price forecast used for the financial analysis is presented below:

Selected Project Copper Price Forecast*							
Cu Price	Units	**2017E**	**2018E**	**2019E**	**2020E**	**2021E**	**LT**
	US$/t	5,401	5,512	5,908	6,393	6,415	6,283
	US$/lb	2.45	2.50	2.68	2.90	2.91	2.85

* Broker consensus copper price forecasts, supplied by CAML

Based on the sensitivity analysis performed, the project is mostly sensitive to the change in copper price. None of the assessed sensitivity analysis parameters were observed to bring the project to negative results.

1 TERMS OF REFERENCE

1.1 Introduction

Wardell Armstrong International ("WAI") has been commissioned by Central Asia Metals Plc ("CAML") to prepare a Competent Person's Report ("CPR") for the Kounrad copper waste dump operation ("Project"), situated approximately 15km north of the town of Balkhash in south-central Kazakhstan in accordance with the AIM rules and guidelines as set out by the AIM Note for Mining, Oil and Gas Companies (June 2009).

This report is addressed to CAML, its Nominated Adviser, Peel Hunt LLP and its financial adviser J.P. Morgan PLC.

WAI understands that this report will be included as part of an AIM re-admission document to be published by CAML (the "Admission Document"). For the purposes of the AIM rules for Companies, WAI is responsible for this report as part of the re-admission Document, and declares that it has taken all reasonable care to ensure that the information contained in this report is, to the best of its knowledge, in accordance with the facts, and contains no omission likely to affect its import and no material change has occurred from 30 June 2017 to 22 September 2017 that would require any amendment to the CPR. WAI consents to the inclusion of this report, and reference to any part of this report, in the Admission Document.

Central Asia Metals PLC (AIM:CAML) is a copper production and base metals mineral exploration company, with operations in Kazakhstan.

CAML is based in London and own 100% of the Kounrad solvent extraction and electrowinning (SX-EW) copper facility in central Kazakhstan, and 80% of the Shuak copper exploration project in northern Kazakhstan. CAML also owns a 75% interest in Copper Bay Ltd, a private company holding the Copper Bay project in northern Chile.

CAML is incorporated in the United Kingdom and raised US$60 million at IPO in September 2010, which was used to build the Kounrad recovery plant in central Kazakhstan. Construction of the Kounrad plant was completed in early 2012, 15% below budget. Copper production commenced in April 2012, and production has increased year on year since, reaching 14,020t in 2016.

This CPR considers the Mineral Resources, extraction, processing, financial analysis and environmental and social issues for the Kounrad project that has been in successful operation for the last five years.

This CPR will be valid for 6 months from the completion date being 22 September 2017.

1.2 Project Description

CAML is the sole owner and operator of the solvent extraction–electrowinning (SX-EW) copper recovery plant at the Kounrad mine site, near the city of Balkhash in central Kazakhstan. This facility has been in operation for the last five years recovering copper from various waste dumps, namely the Eastern and Western Dumps (see Figure 1.1) that originated from the Kounrad open-pit copper mine which operated from 1936, originally by the State, and more recently by Kazakhmys.

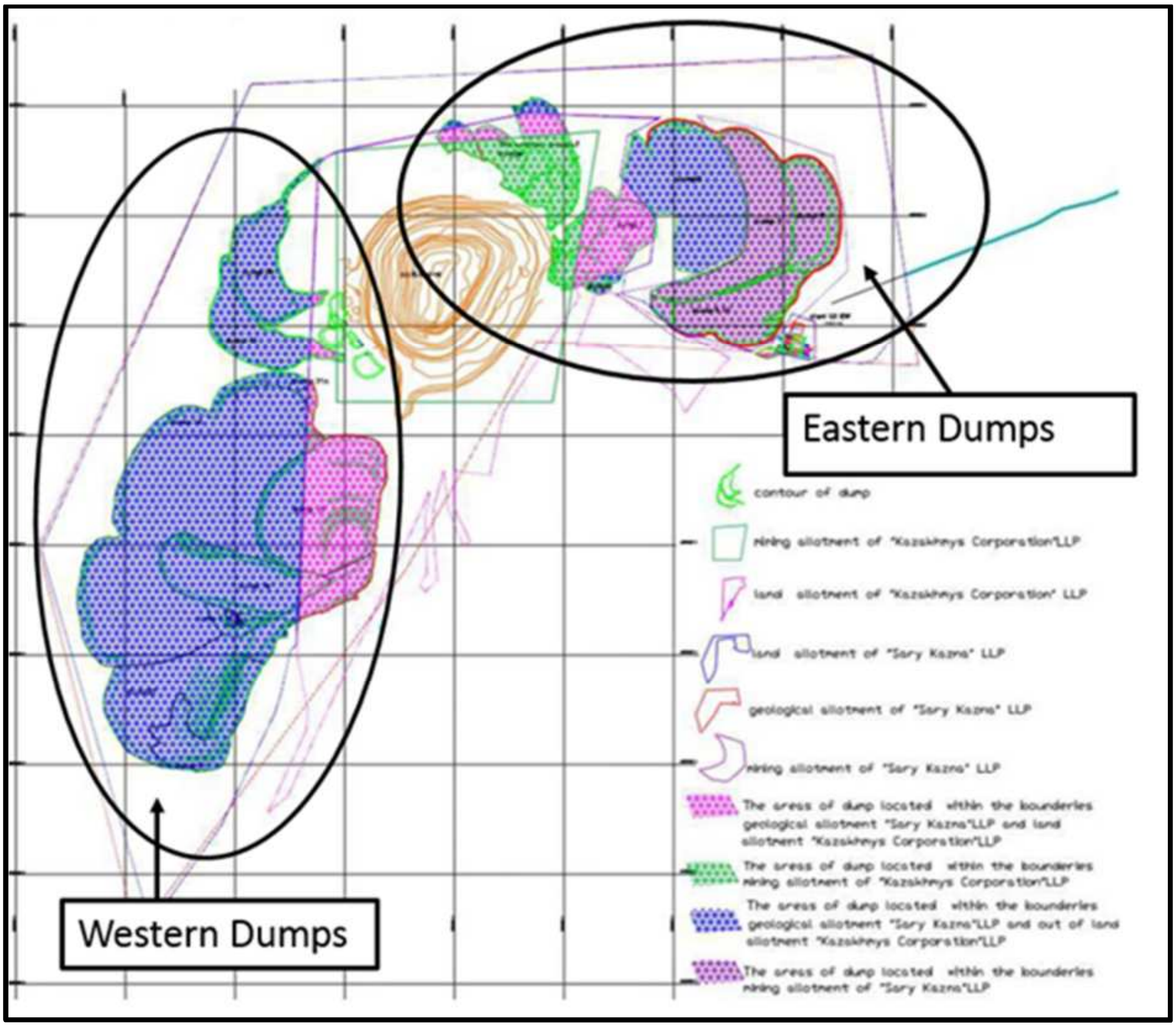


Figure 1.1: Location of Eastern and Western Dumps
(Green dumps are not part of the Mineral Resource)

The site around the mine contains a number of mineralised dumps from which, it has been proven during five years of continuous operations, that copper can be extracted through an in-situ leaching process, followed by SX-EW.

The SX-EW processing plant produces copper cathode, and the metal is delivered from the Kounrad site by rail and sea to the end customers, currently predominantly in Turkey.
CAML acquired an interest in the Kounrad project in 2007. The original agreement was a 60/40 joint venture and, in May 2014, the Company completed the acquisition of the remaining 40% of the project.

Having raised US$60 million at IPO in September 2010, CAML completed construction of the Kounrad SX-EW copper plant in 2012, on schedule and US$9M below budget. The plant began producing copper from the Eastern Dumps in late April 2012 but, in 2017, this has been supplemented by new production from the much larger Western Dumps.

The Company produced a record 14,020t of copper in 2016, exclusively from the Eastern Dumps, whilst in 2017, some 40% of copper production is expected to come from the Western Dumps. This proportion is planned to increase from 2018 onwards as the quantity recovered from the Eastern Dumps declines.

1.3 Independent Consultants

WAI, formerly CSMA Consultants, is part of Wardell Armstrong LLP, an independent British, partner-owned engineering and environmental consultancy, established in 1837. The company has 12 offices in the UK with around 500 staff.

WAI provides the mineral industry with specialised geological, mining, processing and environmental expertise from our main offices in Truro, Cornwall, as well as Russia and Kazakhstan. The office in Truro, at the old Wheal Jane mine site, includes an extensive mineral assaying, processing and pilot plant testing facility.

WAI, its directors, employees and associates neither has nor holds:

- Any rights to subscribe for shares in CAML either now or in the future;
- Any vested interests in any concessions held by CAML;
- Any rights to subscribe to any interests in any of the concessions held by CAML either now or in the future;
- Any vested interests in either any concessions held by CAML or any adjacent concessions; or
- Any right to subscribe to any interests or concessions adjacent to those held by CAML, either now or in the future.

WAI's only financial interest is the right to charge professional fees at normal commercial rates, plus normal overhead costs, for work carried out in connection with the investigations reported here. Payment of professional fees is not dependent on the success of the Admission or linked to the value of the Company.

1.4 Data Reviewed

For the CPR, WAI has downloaded all data provided by the Company which has been divided into the following sub folders:

- Production Reports;

- Geology;
- Metallurgy;
- Feasibility;
- Pilot Plant, Eastern and Western Dumps; and
- Environmental.

In addition, WAI has been provided with the latest financial model, dated March 2017.

WAI was able to access all the information detailed above which have been used to prepare this report along with observations made during the site visit (described in section 1.5).

Notwithstanding the above, the author has relied upon this information covering the areas of previous exploration, geology, infrastructure, processing, financial and environmental and social matters, all in good faith.

It should be noted that WAI has not taken any independent samples, nor verified the legal status of the operations.

1.5 Personal Inspections

Phil Newall, BSc (ARSM), PhD (ACSM), CEng, FIMMM, **Managing Director** of WAI (Mining Geologist), Barrie O'Connell, CEng, PhD, BEng (MCSM), **Principal Mineral Processing Engineer**, and Ruslan Erzhanov, **General Director, WAI KZ** (Mineral Resource Geologist) conducted a personal inspection of the Project on 13 June 2017, primarily covering historical sampling and resource estimations, processing, production, supporting infrastructure, and environmental and social measures.

1.6 Units and Currency

All units of measurement used in this report are metric unless otherwise stated. Tonnages are reported as metric tonnes ("t"), and base metal values are reported in weight percentage ("%") or parts per million ("ppm"). Other references to geochemical analysis are in parts per million ("ppm") or parts per billion ("ppb") as reported by the originating laboratories.

Unless otherwise stated, all references to currency or "$" are to United States Dollars (US$).

2 RELIANCE ON OTHER EXPERTS

This technical report has been prepared by WAI for CAML, and WAI has wholly relied upon the data presented in formulating its opinion. The information, conclusions, opinions, and estimates contained herein are based on:

- Information made available to WAI by CAML at the time of preparing this CPR, and
- Assumptions, conditions, and qualifications as set forth in this CPR.

The competent person has not carried out any independent exploration work, drilled any holes or carried out any sampling and assaying at the project area.

For the purposes of this report, WAI has relied on ownership information provided by CAML. WAI has not researched property title or mineral rights for the concession area and expresses no opinion as to the ownership status of the property.

The majority of technical data, figures and tables used in this report are taken from reports prepared by others, and provided to WAI by CAML.

Whilst WAI has endeavoured to validate as much of the information as possible to ensure that the information contained in the CPR is, to the best of WAI's knowledge and belief, factually accurate without omission that would otherwise materially affect the import of the document, WAI cannot be held responsible for any omissions, errors or inadequacies of the data received. WAI has not conducted any independent verification or quality control sampling, or drilling.

WAI has not undertaken any accounting, financial or legal due diligence of the asset or the associated company structures, and the comments and opinions contained in this report are restricted to technical and economic aspects associated with principally the proposed project.

WAI has not undertaken any independent testing, analyses or calculations beyond limited high level checks intended to give WAI comfort in the material accuracy of the data provided. WAI cannot accept any liability, either direct or consequential for the validity of information that has been accepted in good faith.

3 PROJECT BACKGROUND

3.1 Location, Access and Infrastructure

The Kounrad pit and waste dumps are located approximately 15km north of the town of Balkhash, in the Karaganda Province, which in turn is some 380km from Karaganda to the north, in south-central Kazakhstan (Figure 3.1). The nearest habitation is the local village of Kounrad, with a population of approximately 2,000.

Figure 3.1: Location of Kounrad Mine, Balkhash Region

The village of Kounrad is readily accessible by well paved roads with a journey time of approximately 8 hours by road (660km) from Almaty, which also has an international airport to other destinations within the FSU.

Balkhash has a small airstrip which is serviced by SCAT Airlines from Almaty. The airport is a 10 minute drive from the Project site.

In terms of infrastructure, the area has thus been the focus of heavy industry for some time, until the mine ceased operating in 2005. The entire region around Balkhash (pop. 80,000 est.) is an industrial centre focused around the mining and smelting of copper. The city of Balkhash lies approximately

500km west of the Chinese border on the north side of the lake at an altitude of 440m. The history of the city is closely connected with mining of deposits of copper and development of a smelting plant.

Due to this background, the region is well served with infrastructure and an experienced mining population. Potable water is available at the Kounrad village whilst process water is available from several sources including Lake Balkhash.

Power supply to the project is via an OHL system rated at 35Kv, which is then stepped down to 10kV at the main facility sub-station.

3.2 Topography & Climate

The mine site lies at an elevation of approximately 420m in a relatively flat area with scrub vegetation. Long-term mining activity has severely affected the landscape which itself is dominated by the large waste dumps surrounding the pit (see Photo 3.1).

Photo 3.1: View from the Western Dumps

The topography is relatively consistent throughout the site and slopes to the southeast. There are no distinct drainages within the study area based on available topographic maps. The site may have been graded smooth prior to dump placement based on the uniformity of the topography.
The site is covered with a thin layer of alluvium. Bedrock and cemented sediments outcrop in some areas.

The site geology consists of unconsolidated sediments and granitic bedrock units. The sediments range from gravels, to sand and silts with some units being reported as "cemented" sediments. The bedrock ranges from granite to granodiorite. The bedrock units are reported to be highly weathered at the surface and grade to competent bedrock within 30m from the surface.

The climate is sharply continental with extreme summer temperatures of +40°C, and minimum winter temperatures of -40°C with an annual average temperature of +5°C. The frost zone penetrates the ground to a depth of 1.5 to 2m. The dominant wind directions are northwest and northeast, with average velocities of 5-6m/s (maximum gust of 28m/s). North-easterly winds predominate in winter and north-westerly's in summer.

Precipitation is low and varies between 60mm to 200mm per annum, average 121mm, with relative humidity of 30-80%. As a result, water resources are scarce. Winter precipitation plays the most significant role in the formation of surface and groundwater, whilst evaporation is high in summer (1200-1500mm/yr).

The area is a low seismic zone, rated 1 on the Soviet scale (very low activity).

3.3 Kazakhstan Summary Information

Kazakhstan is situated in Central Asia and is the second largest among the CIS states with a surface area of 2,724,900km^2. The country has a border with China of 1,460km, Kyrgyzstan of 980km, Turkmenistan of 380km, Uzbekistan of 2,300km and the Russian Federation of 6,467km. Steppes occupy some 26% of the territory of Kazakhstan, deserts 44% and semi-deserts 14% with forests occupying the remainder.

Administratively, Kazakhstan comprises 14 provinces with a population of some 18.4 million (2016 census) with a population density of less than 6 people per km^2. The capital city is Astana (transferred from Almaty on December 10, 1997) whose population is approximately 760,000 (2015). Kazakh is the official language, although in State institutions and local administration bodies, Russian is also an official language.

Kazakhstan, geographically the largest of the former Soviet republics, excluding Russia, possesses substantial fossil fuel reserves and other minerals and metals, such as uranium, copper, and zinc. It also has a large agricultural sector featuring livestock and grain. The government realises that its economy suffers from an overreliance on oil and extractive industries and has made initial attempts to diversify its economy by targeting sectors like transport, pharmaceuticals, telecommunications, petrochemicals, and food processing for greater development and investment.

Kazakhstan's vast hydrocarbon and mineral reserves form the backbone of its economy. Chevron-led Tengizchevroil announced a US$36.8 billion expansion of Kazakhstan's premiere Tengiz oil field in July 2016. Meanwhile, the super-giant Kashagan field finally launched production in October 2016 after years of delay and an estimated US$55 billion in development costs.

Kazakhstan is landlocked and depends on Russia to export its oil to Europe. It also exports oil directly to China. In 2010, Kazakhstan joined Russia and Belarus to establish a Customs Union in an effort to boost foreign investment and improve trade. The Customs Union evolved into a Single Economic Space in 2012 and the Eurasian Economic Union (EAEU) in January 2015. In part due to weak commodity prices, Kazakhstan's exports to EAEU countries declined 23.5% in 2016. Imports from EAEU countries to Kazakhstan declined 13.7%.

The economic downturn of its EAEU partner, Russia, and the decline in global commodity prices from 2014-2015 contributed to an economic slowdown in Kazakhstan, which continues to experience its slowest economic growth since the financial crises of 2008-09. In 2014, Kazakhstan devalued its currency, the Tenge, and announced a stimulus package to cope with its economic challenges. In the face of further decline in the Ruble, oil prices, and the regional economy, Kazakhstan announced in 2015 it would replace its currency band with a floating exchange rate, leading to a sharp fall in the value of the Tenge. Since reaching a low of 391 to the dollar in January 2016, the Tenge has modestly appreciated, helped by somewhat higher oil prices.

Despite some positive institutional and legislative changes in the last several years, investors remain concerned about corruption, bureaucracy, and arbitrary law enforcement, especially at the regional and municipal levels. An additional concern is the condition of the country's banking sector, which suffers from low liquidity, poor asset quality, and a lack of transparency. Investors also question the potentially negative effects on the economy of a contested presidential succession as Kazakhstan's first president, Nursultan Nazarbayev, who turns 77 in 2017, has not announced whether he will seek re-election in 2019.

3.4 Mineral Tenure

Kazakhmys holds the mining licence for the Kounrad open pit copper mine that is currently closed, and has mineral tenure to some of the dumps closest to the abandoned pit. Figure 3.2 shows the Kazakhmys licence area and land allotment, as well as the Sary Kazna LLP land and geological exploration allotment.

CAML, through the operating subsidiary Sary Kazna LLP, originally had a 60% interest in the Kounrad mineralised dumps, although in 2014, this was increased to 100%.

The exploration and processing licence for the mineralised dumps (Sub Soil Contract number 2447) covers an area of 22.5km^2 (2,350ha) and expires 20 August 2034. The co-ordinates of the licence area are given in Table 3.1 and the co-ordinates for an exclusion zone (Kazakhmys land allotment) are given in Table 3.2.

Figure 3.2: Licence Areas and Land Allotment

Table 3.1: Exploration and Processing Licence Co-ordinates		
Point	**Northing**	**Easting**
1	46°56'17''	74°56'56''
2	46°58'11''	74°56'13''
3	47°00'28''	74°57'45''
4	47°00'36''	75°02'13''
5	46°59'05''	75°02'33''
6	46°59'12''	74°59'48''
7	46°58'05''	74°58'52''

Table 3.2: Exclusion Zone Co-ordinates		
Point	**Northing**	**Easting**
1	47°00'08''	74°58'22''
2	47°00'14''	75°00'15''
3	46°58'54''	74°59'55''
4	46°58'54''	74°58'22''

***WAI Comment**: although WAI has not undertaken a legal due diligence on the mineral tenure of the assets, WAI has no reason to believe that the information provided above is not factually correct.*

3.5 Project History

Copper ores have been exploited from the Kounrad open pit since 1936, with sulphide ores treated by conventional flotation, whilst oxide ores and low-grade sulphide ores were stockpiled around the site.

CAML is not the first company to consider the leaching merits of these stockpiles. In 1969 the Engineering Institute Unipromed (Yekaterinburg) published laboratory study results which concluded that the Kounrad Copper Mine was the most promising mine in the FSU for the application of the acid dump leaching technology with copper recovery by the iron cementation technique.

Unipromed's pilot plant scale test work on oxidised ores in 1969-1970 yielded the source data for the design of a commercial pilot plant for dump leaching, which was built in 1975.

A dump containing 1Mt of oxidised ore was constructed and sprayed with a weak solution of sulphuric acid and this test facility produced 1,147t of copper from 1975 to 1979 and 1,569t of copper from 1980 to 1986, resulting in an estimated recovery of 61%.

The test programme provided the main metallurgical parameters that could be applied to commercial pilot plant operations namely acidity of the leaching (technological) solutions, duration of the leaching period, circulation of solutions, and other technological parameters.

The dominant type of micro-organisms (Th. Ferro-oxidans) was identified and the successful application of micro-organisms for reactivation and acceleration of the leaching process was proved.

Based on the results of studies conducted in 1980, Unipromed justified designing and constructing a commercial size plant, which was authorised by the protocol No.39 of the Ministry of Non-ferrous Metallurgy of the USSR, dated 27.03.1989.

The leaching plant was located to treat the oxide dumps specified below:

- **Heap No. 9-10** 13,114,000t of ore (42,164t of copper); and
- **Heap No. 6-7** 54,038,000t of ore and (71,420t of copper).

The commercial plant produced 7,517t of a copper in total until its closure; with the following outputs per year, 1987 (820t), 1988 (900t), 1989 (2,136t), 1990 (1,506t), 1991 (900t) and 1992 (1,255t).

The Kenzhetay Joint Venture was created in 1993 by JSC Balkashmed (Kazakhstan) and Resource Development (USA) to continue hydrometallurgical operations, who then engaged Bateman Engineering to complete an engineering design for a hydrometallurgical (SX-EW) plant; Montana

Resources to verify and update Mineral Resources, and Terramatrix Inc. and Hydrogeo Consulting Inc. for the environmental section of the project.

In 1995, design and construction of the SX-EW plant began, but in 1996 JSC Balkashmed, which had financed the project, was privatised and the construction was interrupted due to a lack of finance, and soon thereafter the Kenzhetay Joint Venture was liquidated. The copper bearing dumps passed into State ownership, and were included in the Mineral Balance Sheet of the Republic of Kazakhstan.

In 2000, the Government of the Republic of Kazakhstan invited tenders for copper production from the eastern group of dumps, containing oxidised ores from the Kounrad deposit. The tenders and the right to produce (mine) the copper was won by a new mining company, Zhalyn, specifically created for the project by a group of investors.

Zhalyn invited the Turkish construction and engineering company "PakPas" to design and construct a plant, and they in turn signed an agreement with the American company KD Engineering, Inc (Arizona), well known in hydrometallurgy, to design a SX-EW plant. In parallel with the American company, PakPas also engaged the Metallurgical Equipment Corporation of China ("MECC") (Beijing) and both companies have issued basic designs for the construction of a plant.

For unknown reasons, Zhalyn stopped financing the work, resulting in non-performance of its licence obligations to the State, and in 2005 the Contract for Exploitation of Subsoil Assets made with the Ministry of Natural Resources of Kazakhstan was annulled.

At the beginning of 2006, CAML began preparations for a new tendering process declared by the Government for the deposit, and in July 2006, won the tender and obtained the mining rights.

In 2006 CAML, through its Kazakhstan wholly owned subsidiary Sary Kazna LLP, acquired 60% ownership of the sub-soil use contract covering the Kounrad waste dumps from the State Entrepreneurial Corporation Saryarka (SEC Saryarka).

Having raised US$60 million at IPO which was completed in September 2010, CAML completed construction of the Kounrad SX-EW copper plant in 2012, on schedule and US$9m below budget. The plant began producing copper in late April 2012.

CAML completed the acquisition of the remaining 40% of the project in 2014.

Since operations on the Eastern Dumps commenced, CAML has increased annual production each year and has now produced approximately 61,000 tonnes of copper cathode:

Table 3.3: Annual Production by Year to Present

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**H1 2017**
Cu (t)	6,586	10,509	11,136	12,071	14,020	7,027

In May 2015, CAML completed the Kounrad Stage 1 Expansion, on schedule and under budget, which involved increasing the PLS handling facilities, boiler capacity and copper plating capacity.

The Stage 2 Expansion project into the Western Dumps was materially completed in Q4 2016 with approximately 1,300t of Cu produced from this area since the start of leaching in mid- April 2017.

4 GEOLOGY & MINERALISATION

4.1 Geology

The Kounrad open pit copper mine is located in the Balkhash metallogenic belt within the Balkhash-Junggar orogenic belt of the Central Asian Metallogenic Domain ("CAMD"). The geology encompassing the deposit comprises porphyry copper mineralisation related to tectono-magmatism during the Devonian and Carboniferous-Permian volcano-magmatic arcs.

A geological map of the western Balkhash metallogenic belt is shown in Figure 4.1 below.

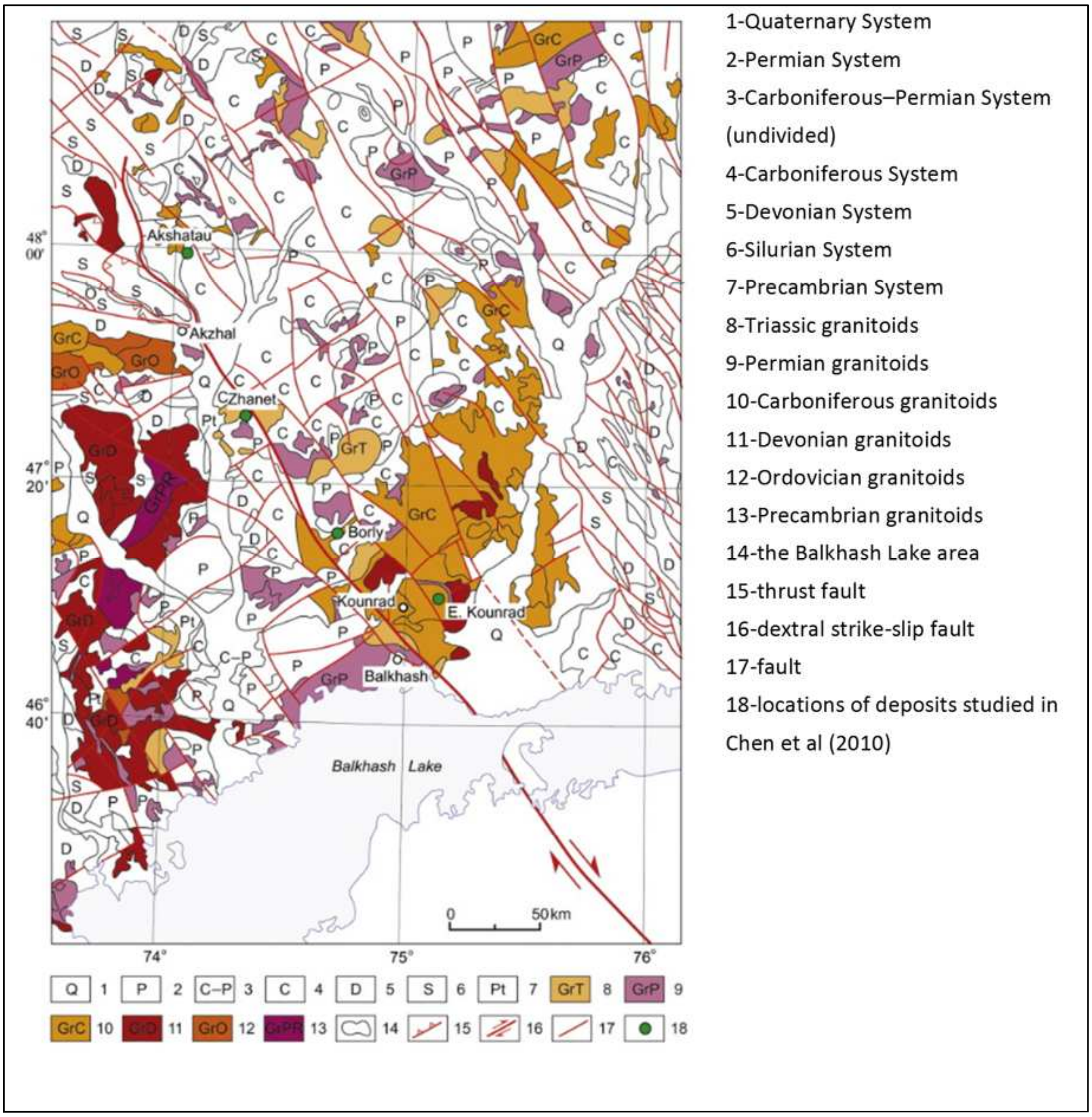


Figure 4.1: Regional Geological Sketch Map of the Western Balkhash Metallogenic Belt

Site geology consists of unconsolidated sediments and granitic bedrock units. Sediments range from gravels, to sand and silts with some units being reported as ''cemented'' sediments. Bedrock ranges from granite to granodiorite. Highly weathered at the surface, the bedrock grades to competent rock within 10-40m from the surface.

Weathering and supergene enrichment have produced a general zonation of the mineralisation in the deposit:

- Oxidised cap - characterised by hematite, limonite, manganese oxyhydroxide, malachite, azurite, cuprite, native copper, chrysocolla mineralisation;
- Leached zone - characterised by moderate oxidation in the upper part and destabilisation of sulphide minerals under acidic conditions in the lower parts;
- Supergene blanket - characterised by chalcocite and covellite mineralisation; and
- Primary sulphide zone - characterised by disseminated and stockwork ore with pyrite, chalcopyrite, enargite and chalcocite mineralisation.

All of these mineralised phases, to a greater or lesser extent, are reflected in the composition of the waste dumps.

Very importantly from a dump leaching standpoint is the fact that there is a layer of impermeable clay/cemented material at or close to surface which effectively acts as a barrier to percolating fluids, thus allowing capture of the pregnant liquor with only very minor permeation below this layer.

4.2 Waste Dump Characteristics

The Kounrad waste dumps have been estimated to contain in excess of 250,000t of recoverable copper (WAI, 2013) based on the estimated recoveries of the acid-soluble copper contained within the Eastern Dumps, which have provided the focus of operations to date, and the larger Western Dumps, from which production has recently commenced (April 2017).

Photo 4.1 shows an aerial view of the waste dumps.

The mineralogy of the various dumps can be divided into Oxide, Secondary and Primary minerals:

- **Eastern Dumps**: Chrysocolla, Malachite, Azurite, Chalcocite, Bornite, and Chalcopyrite: and
- **Western Dumps**: Chalcopyrite, Chalcocite, Covellite, Chalcanthite, Chrysocolla, Malachite, Azurite.

Following the start of open pit mining operations at the Kounrad mine in 1936, the copper sulphide ore was selectively mined and transported by rail for processing via froth flotation at the concentration plant of the Balkashmed company located 15km south in Balkhash city. Waste and uneconomically treatable materials were dumped at designated areas adjacent to the open pit.

Photo 4.1: Location of the Waste Dumps, Kounrad Project

Historical information confirms that grade control methods were well developed with sample drill-holes based on a 25m by 25m pattern, to depths of 30-45 metres (penetrating 2 to 3 benches). The samples taken were used to determine grade, acid solubility and the suitability for flotation treatment i.e. delineating between true sulphides and secondary or oxide materials. After assaying and process testing, the drilled blocks were then classified according to suitable ore, oxides, secondary waste (mixed), low grade sulphide waste, and waste.

From these data, a mining plan per bench was developed and drilled on a 6m ×6m pattern. Each blast-hole was again sampled and assayed for copper and other characteristics, as detailed above, and then following blasting, segregated by type and dispatched either to the main treatment plant or one of the designated waste dumps.

From 1936 until 1961 the open pit was mined to a cut-off grade of 0.5% copper, but from 1961 until its closure in 2005 the open pit was mined at a reduced cut-off grade of 0.2% copper.

The waste materials were classified into four groups by this technique, three of which are based upon the amount of acid soluble copper present, and the fourth being related to the sulphide grade as follows:

- Oxide Waste – any material with greater than 20% acid soluble copper;
- Mixed Waste – any material with greater than 10% but less than 20% acid soluble copper;
- Sulphide Waste – any material below the cut-off grade and with less than 10% acid soluble copper; and
- Waste – any material with less than 0.15% total copper grade.

The excavated ore was hauled to stockpiles/dumps from deep levels of the pit by rail and from auxiliary benches by 40t dump trucks with reloading into 105t rail dump cars at the pit head.

The main ramp for ore haulage out of the pit and to the concentration plant in Balkhash exited southwards. The ramp access for waste and low-grade sulphide material haulage to the western and south-western group of dumps/stockpiles was at the western edge of the pit, and access to northern and north-eastern group of dumps/stockpiles of waste and low-grade oxidised material was on the eastern side of the pit, which led to the layout of the existing dumps we see today.

The principal method of dumping and stockpiling the various waste materials was by using a 3m spreader plough along all the perimeter of a dump/stockpile, followed by bulldozers to level and angle the material in accordance with design regulations. All of the materials dumped were measured and recorded continuously by the geology, survey and QC departments of the mine department and so there is a vast amount of information known about their metal content.

As the dumps comprise primary blasted material, with no crush stage, the size distribution of material is wide ranging from 1-2m boulders down to dust. Typically, due to the "rilling" effect, the coarser fractions are found in the lower regions that form the skirt to the dumps. Data records indicate the overall size distribution is as follows: about 20% is plus 200mm, 60% is in the range of -200+10mm and 20% is less than 10mm.

The estimated bulk density of the oxide wastes is 1.875t/m^3 whilst the value used for the sulphide type wastes is 2.04t/m^3.

5 DUMP SAMPLING

5.1 Introduction

Prior to production commencing at Kounrad, several dump sampling programmes were undertaken over a number of years. The purpose of this work was to understand copper content within the dumps and how successful leaching of this material would be.

This test work has been put into practice now, as Kounrad has now been producing copper from these dumps for over five years. Leaching to date has mostly been focussed on the Eastern Dumps, with additional leaching planned from these dumps.

In the Western Dumps, leaching has commenced, and WAI has been provided with information that CAML has been successfully producing copper cathode from both the Eastern, and more recently, the Western Dumps for the last five years.

5.2 2007-2010

5.2.1 Introduction

The layout of the waste dumps at the abandoned Kounrad copper open pit mine are shown in Photo 4.1. On the eastern flank of the pit, oxide and mixed waste type materials were dumped, the oxide portion of which was already categorised as "Approved C_2 category" by GKZ (RK) and was the focus for the first phase of successful exploitation by CAML using acid leach and SX-EW processing technology.

The materials dumped to the western side of the open pit are all categorised as sulphide and mixed waste. Whilst very significant amounts of historical sampling data from the period of mine operations exist, from which reserve estimates could theoretically be calculated, these materials had not been given formal GKZ (RK) approval during this period. Undertaking appropriate exploration studies of these dumps, in order to obtain GKZ (RK) approval, was an integral condition of the sub-soil use agreement conditions.

Accordingly, in 2009, Sary Kazna undertook some dump exploration, but this was considered inadequate to obtain GKZ (RK) approval. Consequently, a second programme of sampling work was executed during 2010.

The above notwithstanding, WAI is aware that the production of copper has been in line with planned recoveries.

5.2.2 2007 Programme

In December 2007, 10 drill holes were completed on oxide dumps 9-10, 6 and 7 with the samples being sent to VNIItsvetmet for copper analysis and acid leaching tests.

5.2.3 2008-09 Programme

Sary Kazna contracted a Karaganda based consulting firm, CenterKazNedra to develop a sampling programme for the Western Dumps, utilising a mix of drilling and trenching techniques. The location of the drill holes for both the 2009 and 2010 programmes are shown in Figure 5.1 below.

A licence to explore these dumps was initially granted in August 2007 for 2 years and an application for an extension to the licence and was granted until 2011.

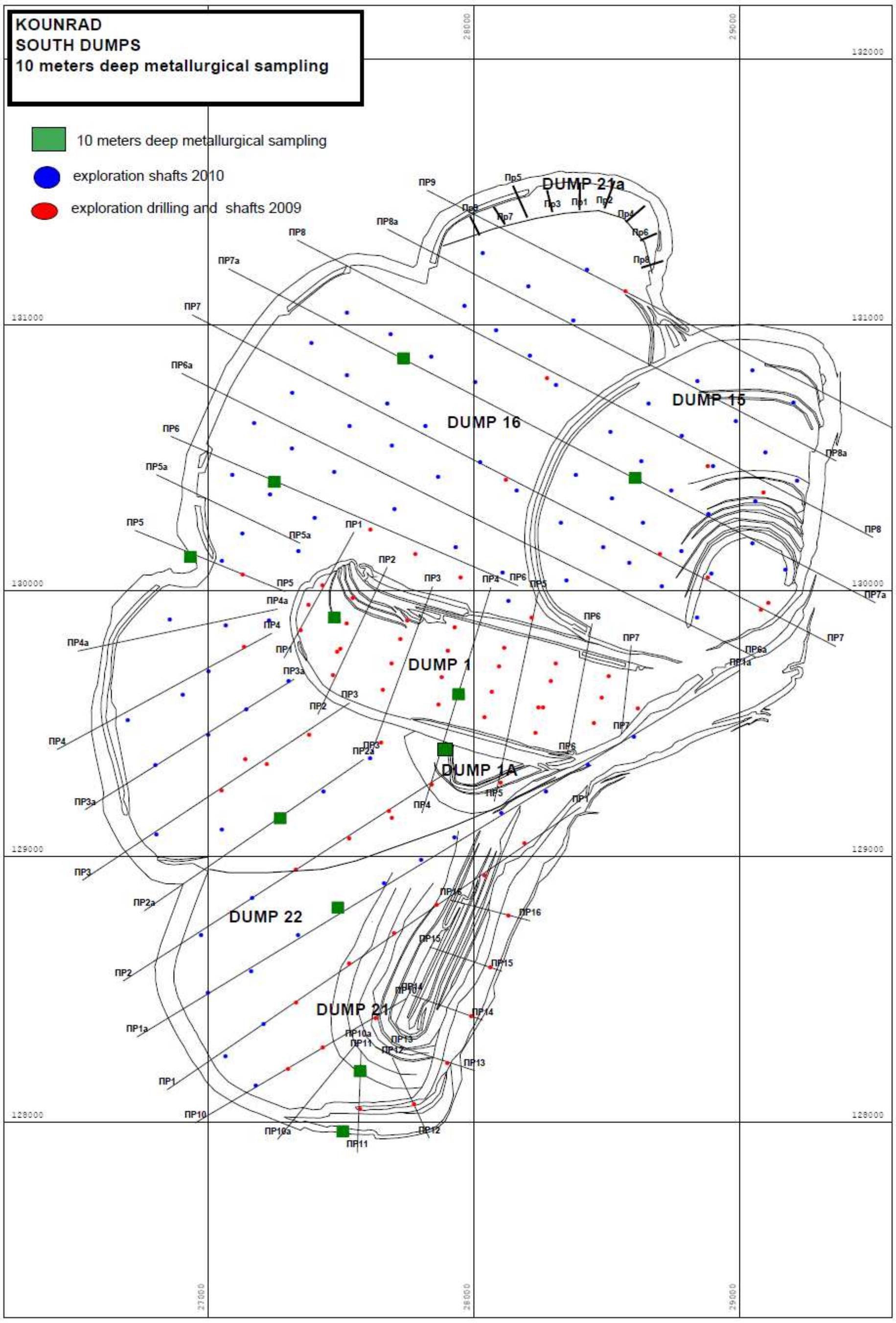


Figure 5.1: Location of Samples Taken in 2009-2010 and Metallurgical Samples 2010 (for the Western Dumps)

The programme of works commenced in 2009 with an original plan to drill 172 holes from surface to the dump base. However, due to difficulties with this technique, and poor core recoveries (only 45-50%), only 85 holes, were completed. The holes were drilled on a grid of 100m x 200m, with samples (averaging between 3-5kg), being collected every 2 to 4m. Due to poor core recovery and hole collapse, no hole made its target depth, with the maximum depth achieved being 30m.
In addition, 10 channel trenches were excavated from which samples were taken. A combined total of 775 samples were collected for copper analysis; determining total copper, acid soluble copper and cyanide soluble copper to characterise the materials.

The results from the drilling programme are given in Table 5.1 below.

Table 5.1: Results of Drilling (2009)

Dump No.	Ore Type	Historical Grade % Cu	Sampled Grade % Cu	% Correlation
1-W	Sulphide	0.24	0.195	80
21-W	Sulphide	0.25	0.19	71
1a-W	Sulphide	0.19		
22-W	Mixed	0.10		
15-W	Mixed	0.10	0.09	90
16-W	Mixed	0.10		
2-E	Mixed	0.10		
5-E	Mixed	0.10	0.08	80
6-E	Oxide	0.13		
7-E	Oxide	0.16		
9-10-E	Oxide	0.19		

Assay results from those dumps studied, clearly indicated that the grade distribution is irregular both vertically and horizontally; with increasing grade with depth. It was also proved that the % of acid soluble mineralisation increased significantly from what was expected, suggesting that a degree of natural oxidation has occurred, together with a migration of copper vertically to the lower levels of the dumps.

VNIItsvetmet also conducted a series of bottle roll acid leaching tests on samples crushed to -2mm. Whilst not being fully representative of the in-situ particle size, the results demonstrated a higher than anticipated level of acid soluble recovery, again indicating significant levels of oxide and secondary sulphide mineralisation. The results are shown in Table 5.2 below.

Table 5.2: Results of Bottle Roll Tests on Dump Material (VNIItsvetmet 2009)

Dump No.	Ore Type	Expected Recovery %	Actual Cu Recovery, %
1	Sulphide	30	47-72
1a	Sulphide	30	66
21	Sulphide	30	41-66
22	Mixed	30	48-65
16	Mixed	30	57-68
15	Mixed	30	51
5	Mixed	30	48-65

6	Oxide	50	47
7	Oxide	50	51

Due to the wide particle size distribution in the dumps, (from microns to metre size lumps), drilling was very difficult with frequent stoppages, caving of holes and breakage of equipment. After a review of the field programme with CenterKazNedra, it was agreed that additional sampling work should be completed in 2010, using a grid of pits from which samples could be collected, rather than further drilling.

5.2.4 2010 Programme

An application was made to GKZ (Republic of Kazakhstan) to extend the duration of the licence and switch the method of sampling from drilling to pitting and bulk trenching, with an extension to the licence granted until 2011.

For 2010, a programme of sampling 137 pits to a depth of 3m from surface, on a 200m by 200m grid was agreed upon with CenterKazNedra. Additionally, samples were taken from the base of the dumps in an attempt to sample material that was inaccessible in the 2009 drilling programme. For Dump 21, which contains the bulk of the sulphide material, a further 9 surface channel trenches 100m in length to a depth of 1m, were excavated and sampled. Total exploration for the sulphide dumps comprised 1,500m^3 of extraction from the pits and trenches.

The work commenced in early May 2010, with all samples collected and prepared for analysis by mid-June. The sampling grid was laid out by a surveyor, and utilising a back-hoe excavator, pits approximately 2.5m^2 were dug to a depth of between 2.5 to 3m depth, from which a sample of approximately 150kg was removed by the field technicians.

This sample material was levelled to a depth of about 15cm, over which was then placed a 20cm square sampling grid. Sub-samples were then removed from each grid to produce a composite sample of approximately 10kg. 137 such samples were collected and bagged for dispatch to the analytical laboratory.

On Dump 21, nine trenches were excavated to a depth of 1m, and samples were taken every 5m along their length. From this, a further 180 samples were prepared, as described above.

Material within the dumps consisted of massive-light-grey silicified material, often highly weathered/oxidised with iron-oxidation, intensely fractured with hematite-limonite pyrite veinlets and random epidote; and intensely weathered, iron-hydroxide altered granodiorites.

Typically for the sulphide dumps, the material is characterised by vein and veinlet-disseminated sulphide mineralisation with covellite, chalcopyrite, bornite and pyrite.

Malachite, azurite, chrysocholla, and chalcopyrite (partly replaced by hematite and pyrite) are typical ore minerals found on the oxide dumps.

A total of 317 samples was collected and dispatched to the analytical laboratory operated by CenterGeoAnalyt, based in Karaganda. Following crushing and pulverising, 10% of the sample pulps were forwarded to the VNIItsvetmet laboratory in Ust Kamenogorsk for duplicate analysis.
The analysis for copper was as employed in the 2009 programme, providing total copper, acid soluble copper and cyanide soluble copper (secondary copper).

5.2.5 2010 Metallurgical Sampling

In addition to the sampling programme to provide data for resource estimation, a metallurgical programme started at the VNIItsvetmet lab to test the amenability of the sulphide and mixed waste materials (at laboratory scale) by column leaching.

Samples for these tests were taken from a depth of approximately 10m below surface in order to try and generate as representative sample as possible. A bulldozer was utilised to prepare a sample area, accessed by a 30m ramp, down to a depth of 6m by pushing surplus material away. The excavator was then positioned and using its boom to its maximum extent, collected a sample from ±4m further down.

By this method, approximately 2t of sample was recovered from each sample pit, after which they were reduced in size to a final sample size of approximately 150kg, which was dispatched to the laboratory.

Samples were taken from Dumps Nos. 1a, 15, 16, 21 and 22 reflecting sulphide and mixed waste materials. Additionally, 3 samples were taken from the perimeter (base) of Dumps Nos. 1a, 16, 21 at a depth of 8-9m to reflect the material encountered at the lower part of these dumps.

During the 2010 site visit, WAI requested further test material was taken from oxide Dump #7, and so two samples from this dump were also taken. A total of 13 samples each weighing approximately 150kg was collected for dispatch to the VNIItsvetmet laboratory in June 2010. The location of the samples is shown in Table 5.3 below.

Table 5.3: Description of Metallurgical Samples taken in 2010

Dump No.	Sample Location	Number of Samples	Depth of Dump (m)
16	Pit 66	1	10
15	Pit 72	1	9,5
16	Pit 43	1	10
1a	Pit 2-6	1	10,5
1a	Pit 12	1	11
21	Dump Base	1	9
16	Dump Base	1	8
22	Pit 25	1	11
7	Pit 8	1	10,5
7	Pit 10	1	11
1a	Dump Base	1	8
22	Pit 14	1	11
21	Pit 36	1	10

5.3 2010 to Present

5.3.1 Introduction

Following advice from WAI as part of the 2010 CPR preparation, further sampling was recommended to better understand the grade distributions across the dumps, as well as prepare for a JORC (2004) compliant Mineral Resource.

5.3.2 2011 Exploration Works

Reverse Circulation (RC) drilling was carried out by a drilling contractor "AK Niyet Burga" using a Nemek 814 BE drill rig, with a hole diameter of 125mm. This field work was overseen on a daily basis, for the entire duration, by a contract geologist, Mr Zsolt Peregi, from Hungary.

Drillhole samples from the 2011 exploration work programme were collected at 3m intervals corresponding with the length of the drilling rods. The samples were collected in a nylon lined bag, which was fixed at the lower open side of the cyclone. The procedure for the onsite preparation of sub-samples comprised:

- Sampled material being placed on to nylon sheet;
- Mixing of the sample three times by hand shovel;
- Placing material in the shape of a 70cm x 70cm quadrangle approximately 8cm in depth;
- Division of the sample into 16 equal sections using a 4 by 4 sampling grid; and
- Obtaining an approximately 5kg sub-sample by taking a specific amount of material from each of the 16 sections.

Two sub-samples were obtained for each 3m drillhole interval; one to be sent to the laboratory and one to be retained as reference material.

Details of the onsite sample preparation are included Zsolt Peregi's report "Report on Wardell Armstrong International's RC drilling program on the waste dumps of Kounrad copper mine (Balkhash District, Kazakhstan) in 2011" dated September 2011.

5.3.3 2012 Exploration Works

Drilling works in 2012 were once again carried out by AK Niyet Burga using the same drill rig and sampling methodology as used in 2011, and samples were sent to VNIITSvetmet laboratory for copper analysis (Cu_{total} and Cu_{acid}).

5.4 QA/QC Analysis

5.4.1 2010 Exploration Works

Exploration works of 2010 included both the oxide and sulphide mineralised dumps. In total, 317 test pits were developed to 3m depth, and all pits were sampled. Test work was carried out at the Centergeoanalit LLP laboratory in Karaganda. Chemical analysis of 40 samples and 11 group samples was carried out to assess the oxide and sulphide content as well as Cu_{total}. External check analysis was carried out by VNIITSvetmet laboratory, with 30 samples submitted for chemical analysis.

In 2010, 13 technological samples were submitted for testwork, to ascertain the technical parameters for leaching. From the 13 samples, 11 were taken from the sulphide dumps and 2 from dump 7 (oxide). Samples were analysed at the mine laboratory assessing the chemical and mineral compositions, element to compound distribution, and the structural/textural properties.

Assays were carried out for Cu_{total}, CuO, S, Fe, Zn, Mo, As, Sb, Pb, Au and Ag. Element to compound ratios were studied for compounds of copper, sulphur, iron, calcium carbonates and magnesium.

WAI has reviewed the 2010 QA/QC results for internal (duplicate sample submission to the same laboratory as original sample) and external (duplicate sample sent to a third party laboratory) checks. The sample data produced were compiled and the precision estimates done using the method of Thompson and Howarth (1978) ("T-H").

The initial step in the T-H method is to plot the data in X-Y scatter chart format to determine if there is a bias between the original sample and the duplicate, or internal and external laboratories with Internal laboratory QA/QC analysis demonstrates a good correlation, but external laboratory QA/QC analysis shows a poor correlation. This indicates that there were issues, either with the principal laboratory and/or the external check laboratory.

Whilst the poor correlation for the external check analysis indicates a potential risk, the fact the Mineral Resource estimates are supported by 5 years of production, with historical dump development records, and that the 379 Cu_{total} samples from the 2010 exploration represents only 6% of the database, substantially mitigates the risk. The significant deviation between the primary and external duplicate results may be due to different sample preparation and assay methods applied by the respective laboratories.

5.4.2 2011 Exploration Works

Exploration works carried out in 2011 included drilling of the Western Dumps (1, 15 and 16) and Eastern Dumps (5, 6, 7, and 9-10). In total 98 holes were drilled by RC drilling, totalling 3,213m of which 2,761m was sampled for Cu_{total} and Cu_{acid}. Testwork was carried out by VNIITSvetmet laboratory (primary laboratory) and Alex Stewart labs, (Moscow branch) as the external laboratory.

The sample database comprised 918 samples and additional samples for QA/QC comprising 28 internal control samples (repeat testing of samples by VNIItzvetmet laboratory), 16 blank samples and 75 duplicate samples.

Each batch of 60 samples included 1 barren (blank) sample which comprised blank granite material. A total of 16 blank samples were assayed. With the exception of two samples, the blank samples were within background trace values (below 0.005% Cu_{total}).

From 918 samples assayed as part of the 2011 exploration works, 75 samples (8%), were re-assayed by Alex Stewart laboratory in Moscow. External repeat analysis (duplicates) for the 2011 exploration works are presented in Figure 5.2. The external laboratory assayed each sample twice. The external control samples by the Alex Stewart laboratory for the 2011 exploration works are presented in Figure 5.2.

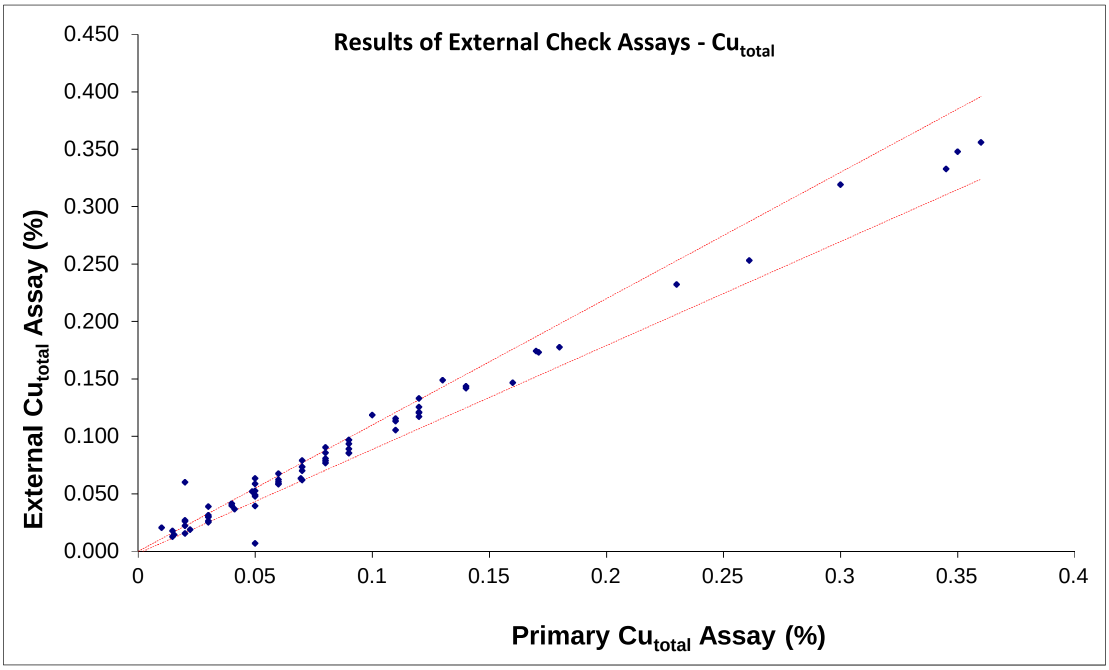


Figure 5.2: 2011 External Check Analysis (Duplicates)

WAI reviewed the results of the re-assays, and found that:

- External repeat assays indicate that precision is reasonable. Although there are some errors, most are at low copper grades, i.e. near detection limits, and there does not appear to be any bias towards high or low grades; and
- For the external laboratory, for both Acid Soluble and Total Cu analyses, precision was excellent.

5.4.3 2012 Exploration Works

Further drilling in 2012 included dumps 2, northern, 13, 20, 15, 16, 21 and 22, and the programme comprised 131 drillholes totalling 4,107m of which 4,089m were sampled for Cu_{total} and Cu_{acid}. The analytical testwork was carried out by VNIITSvetmet laboratory (primary laboratory) and Alex Stewart lab, (Moscow branch) as the external laboratory.

The sample database comprised 1,364 samples assayed for Cu_{total} and additional samples for QA/QC comprising 114 internal control samples (repeat testing of samples by VNIITSvetmet laboratory), 20 blank samples and 137 duplicate samples.

A total of 20 blank samples were assayed, and WAI determined that the blank samples were within background trace values (below 0.005% Cu_{total}).

Of 1,364 samples assayed as part of the 2012 exploration works, 137, or 10%, were re-assayed by an external laboratory (Alex Stewart), with the external laboratory assaying each sample twice.

WAI reviewed the results of the re-assays, and found that:

- External repeat assays demonstrate a good correlation; and
- For the external laboratory, for both Acid Soluble and Total Cu analyses, precision was excellent.

5.5 Conclusions

The Kounrad waste dumps represent a large Mineral Resource of copper metal accumulated over many years of open pit mining.

WAI is aware that the Eastern Dumps have been leached as part of Phase 1, with additional leaching planned.

The leaching of mainly the Western Dumps is currently underway, and WAI has been provided information that CAML has been successfully producing copper cathode from the Eastern Dumps (and recently the Western Dumps) for the last five years.

WAI is also aware that the production of copper has been in line with planned recoveries.

For future production, the detailed tipping plans that were available to CAML in combination with the extensive sampling programmes that have been undertaken on the various dumps, provide comfort to the broad tenor of the dumps.

The tipping plan data are by far the most valuable information pertaining to the dumps as these are based on data collected from the original 6m x 6m blasthole patterns at the mine, i.e., considerably more detailed that any sampling could achieve on the dumps themselves.

Thus, taking into consideration the above, WAI is confident that the acquired sampling data is suitable for use in the Mineral Resource estimation described below.

6 MINERAL RESOURCE ESTIMATION

6.1 Introduction

WAI completed the Mineral Resource Estimate for the CPR used by CAML in 2012, and subsequently has completed an updated MRE which is summarised below.

Table 6.1: Summary of Eastern, Western and Northern Mineral Resources

Category	Gross			Net attributable			Operator
Kounrad Mineral Resources	Tonnes (kt)	Grade (%)	Contained metal	Tonnes (kt)	Grade (%)	Contained metal	
Indicated	388,977	0.10	372,546	388,977	0.10	372,546	CAML
Inferred	264,023	0.09	237,175	264,023	0.09	237,175	CAML
Sub-total	653,000	0.09	609,722	653,000	0.09	609,722	
Total	653,000	0.09	609,722	653,000	0.09	609,722	

6.2 Historical Results

Copper resources were previously estimated in 1993 by Bateman Engineering USA, and these estimates included dumps 3, 6, 7, 9-10, and 21. A subsequent estimation of "reserves" in these dumps plus dumps 1, 1a and 21a was performed by JSC Balkashmed in 1997, and included all material accumulated until 1996.

In 2001, JSC Balkashmed completed a further copper "reserves" estimation which was then submitted to and approved by the State Committee for Reserves (SCR) of Kazakhstan (audited by JSC Balkashmed in 2006).

Additionally, in 2002 Jalyn LLP completed a copper "reserves" estimation which was based on the 1993 Bateman dump data.

In 2006 Gorno-Geologichesky Dizain LLC (GGD LLC) also completed a copper "reserves" estimation.

All of these previous estimates have been based on detailed examination of the historical mining data, developed for each dump regarding the material hauled from the pit and subsequently dumped.

In 2002, the State Reserve Committee (GKZ- Republic of Kazakhstan) approved Category C_2 "reserves" for oxide dumps 6, 7, and 9-10 containing 49.2Mt at 0.16% Cu_{total} containing 77.7kt of in-situ copper. Category C_1 "reserves" for dumps 6, 7, and 9-10 were subsequently approved by GKZ RK in 2011 and are summarised in Table 6.2.

Table 6.2: GKZ Category C_1 Approved Reserves			
Dump	**Tonnage (kt)**	**Cu_{total} (%)**	**Cu (Mt)**
6	11,364.4	0.129	14.6
7	27,605.6	0.156	43.1
9&10	12,213.8	0.192	23.5
Total	**51,183.8**	**0.159**	**81.2**

It should be noted that the term 'reserve' used in the above context does not reflect the requirements of the JORC Code (2004 or 2012) "Ore Reserve" but is the usual terminology used in Soviet estimates.

Table 6.3 below summarises the previous reserve estimates for the Kounrad mineralised dumps.

Table 6.3: Summary of Previous Reserve Estimates for Kounrad Mineralised Dumps												
Dump No	**Bateman 1993**			**Balkashmed 1997**			**Jalyn LLP 2002**			**GGD LLC 2006**		
	Tonnes (kt)	**Grade (%Cu_{total})**	**Cu_{total} metal (kt)**	**Tonnes (kt)**	**Grade (% Cu_{total})**	**Cu_{total} metal (kt)**	**Tonnes (kt)**	**Grade (% Cu_{total})**	**Cu_{total} metal (kt)**	**Tonnes (kt)**	**Grade (% Cu_{total})**	**Cu_{total} metal (kt)**
6	13,813	0.12	16.3	15,758	0.12	18.9	11,364	0.13	15.0	15,758	0.12	18.9
7	33,262	0.14	45.9	38,280	0.14	53.6	27,606	0.16	43.1	38,272	0.13	49.8
9-10	11,677	0.32	37.4	14,114	0.32	45.2	12,214	0.19	23.5	14,111	0.33	46.6
1	-	-	-	24,065	0.244	58.7	-	-	-	-	-	-
1a	-	-	-	5,341	0.19	10.2	-	-	-	-	-	-
21a	-	-	-	5,204	0.248	12.9	-	-	-	-	-	-
3	1,950	0.43	8.3	908	0.38	3.3	-	-	-	908	0.37	3.3
21	25,527	0.27	68.4	22,641	0.27	60.7	-	-	-	22,724	0.30	68.2
Total	**86,229**	**0.20**	**176.3**	**126,311**	**0.21**	**263.4**	**51,184**	**0.16**	**81.5**	**91,773**	**0.20**	**186.7**

The Mineral Resource Estimate presented herein which was compiled in 2013, incorporates the historical (2007-2010), 2011 and 2012 exploration programme data.

6.3 Database Compilation

6.3.1 Introduction

Six sample databases were provided to WAI in Excel format and comprised:

- Hist Holes (pre-2007);
- Ex Holes (2007);
- 2008 Drillholes;
- 2010 Trenches;
- Pits Holes; and
- Tech Holes.

The 2011 and 2012 exploration data were provided to WAI in Excel format and comprised assay and collar data. The collar data file also contained survey data (location, dip and azimuth). These data cover both the Eastern and Western Dumps.

6.3.2 Historical Holes

A total of 2,409 samples with Cu_{total} assays are included in the 'Hist Holes' database with samples having been taken at an interval of 0.5m. The drillholes are located within dumps 6, 7 and 9-10, the locations are shown in Figure 6.1.

The 'Ex Holes' database includes 21 holes to a depth of 2.5m drilled in 2007. A total of 21 samples with Cu_{total} and Cu_{acid} assays are included in the database. The holes are located within dumps 6 and 9-10 and the locations are shown in Figure 6.2.

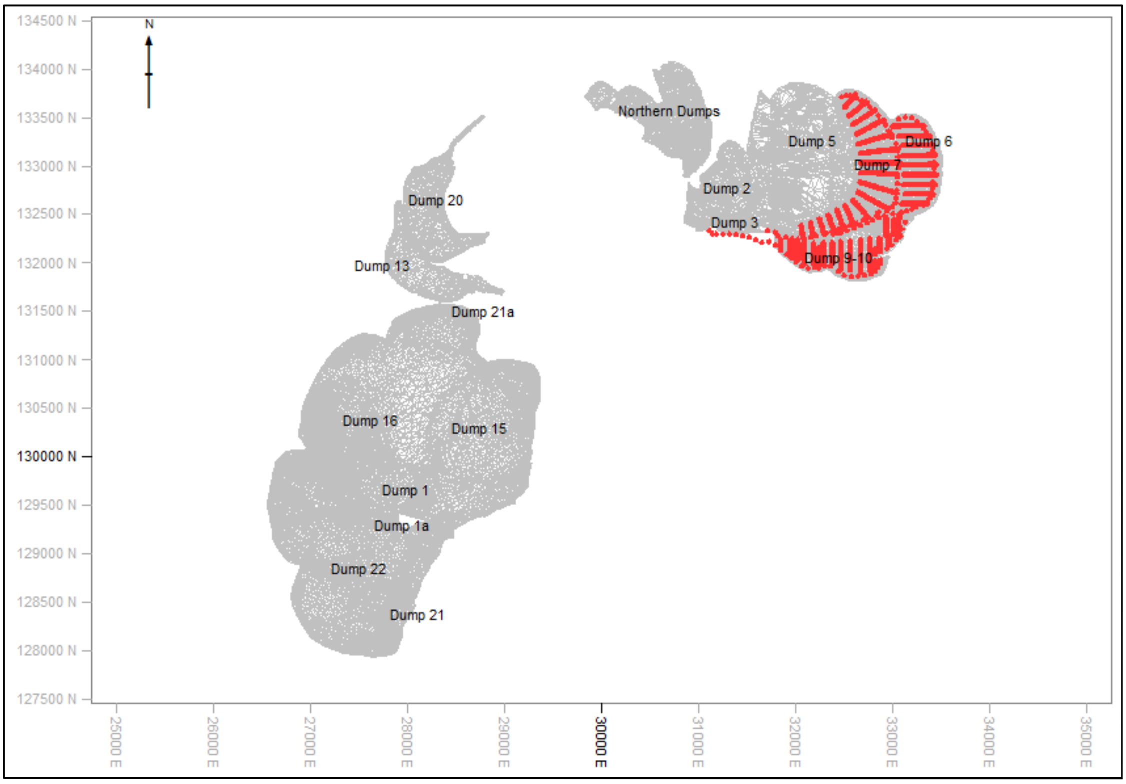


Figure 6.1: Location of 'Hist Holes'

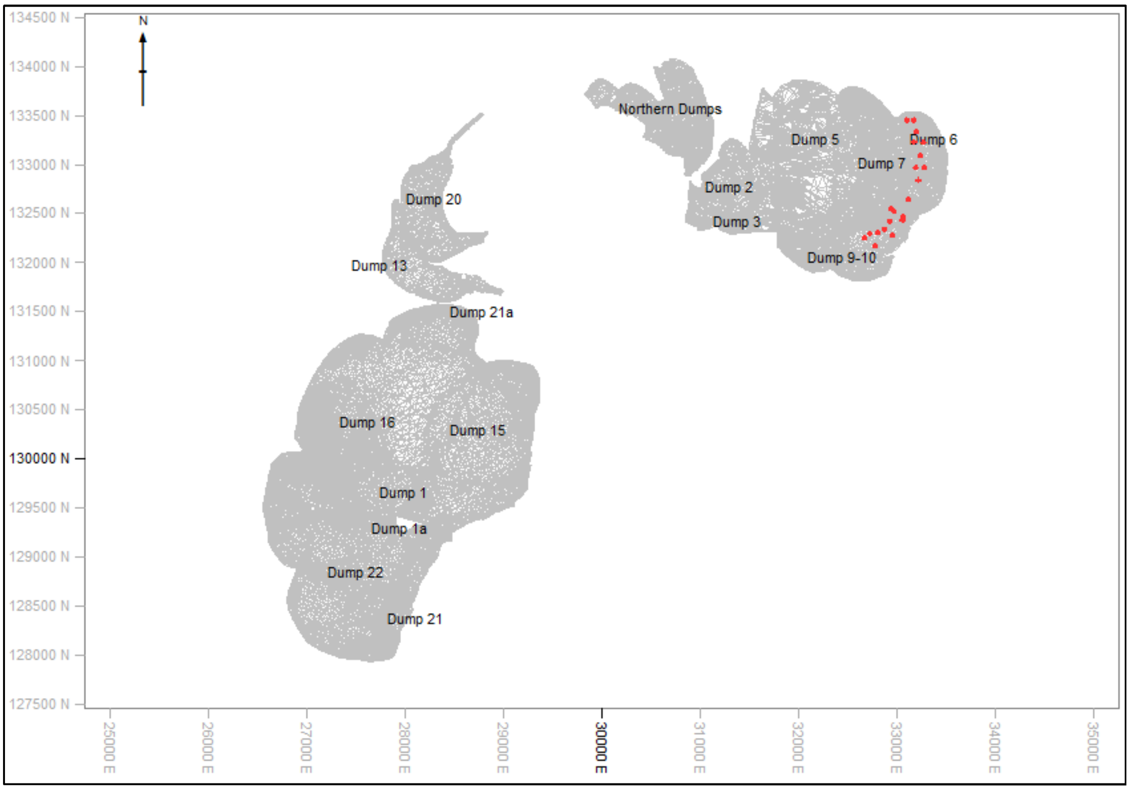


Figure 6.2: Location of 'Ex Holes'

6.3.3 2008 Holes

The database includes 85 holes drilled in 2008. The holes range in depth from 8m to 30m. The database also included 10 channel trenches. A total of 742 samples with 742 Cu_{total} assays and 728 Cu_{acid} assays are included in the database. The drillholes are located within dumps 1, 1a, 5, 6, 7, 9-10, 15, 16, 21 and 22 and the locations are shown in Figure 6.3.

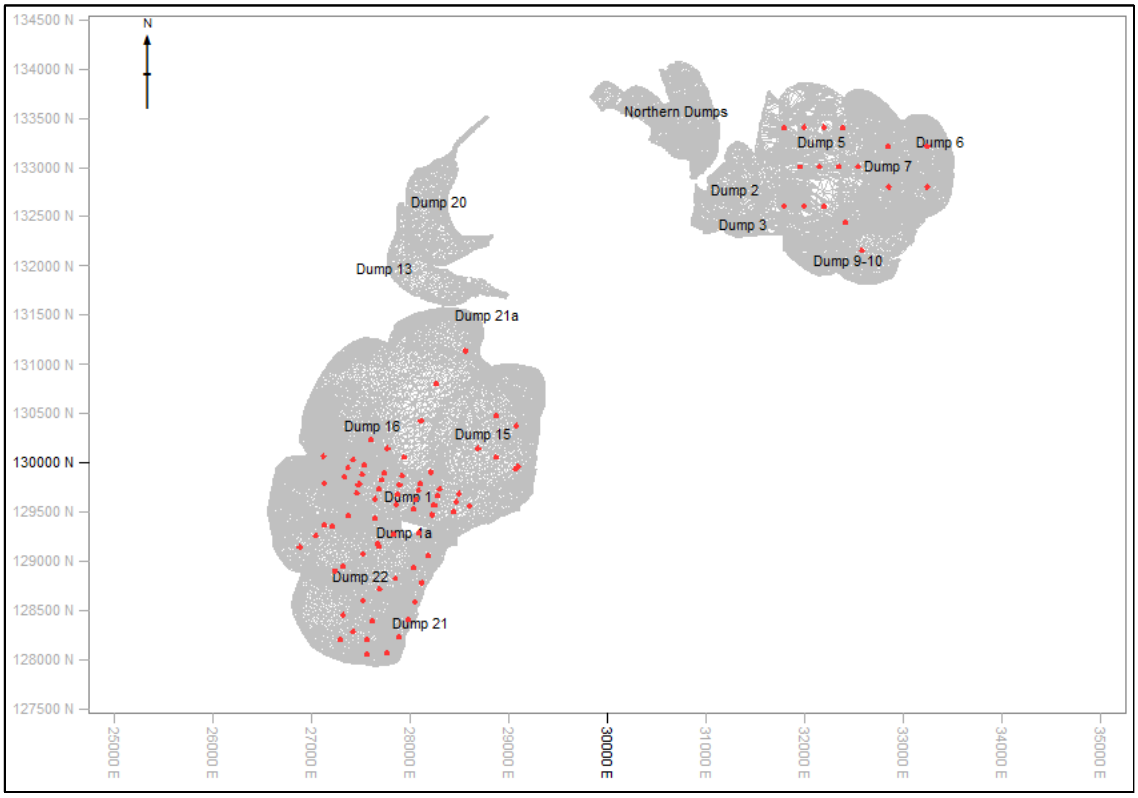


Figure 6.3: Location of '2008 Drillholes'

6.3.4 2010 Trenches

The 2010 trench data includes 9 surface trenches within mineralised dump 21a. The trenches are 100m in length and contain a total of 189 samples with 187 Cu_{total} assays, with the locations shown in Figure 6.4.

6.3.5 2010 Pit Holes

The database includes 137 pits to a depth of 3m, and pit locations are shown in Figure 6.5. A total of 179 samples with Cu_{total} assays are included in the database.

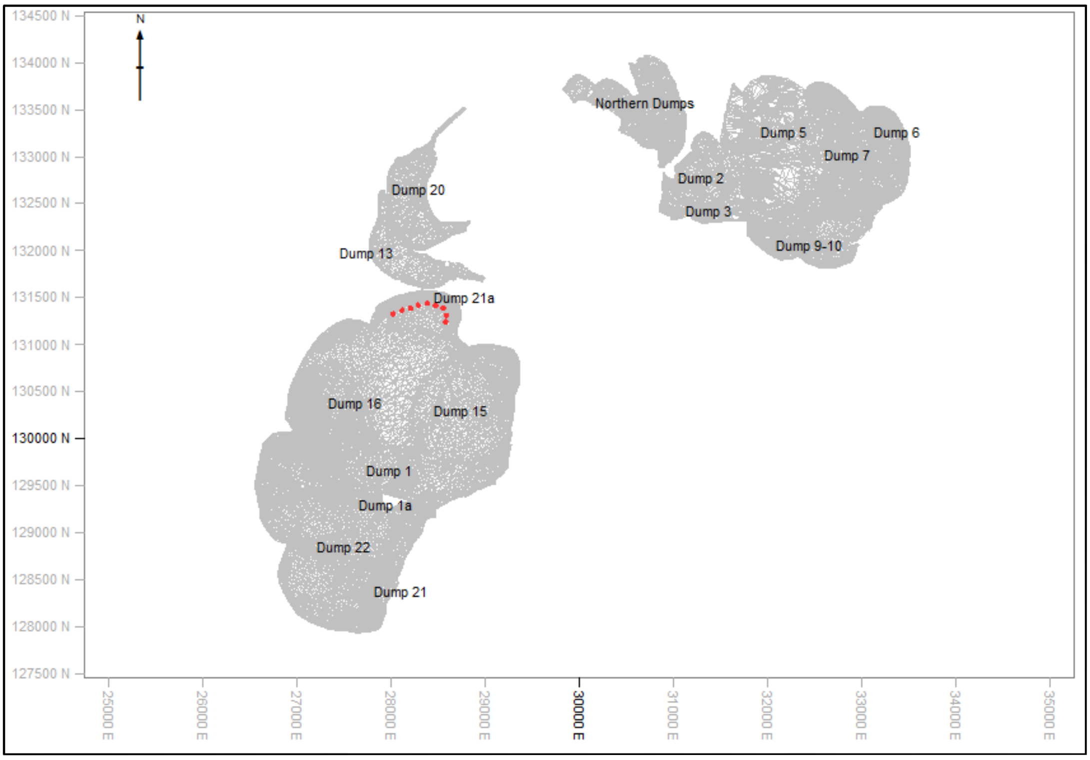


Figure 6.4: Location of '2010 Trenches'

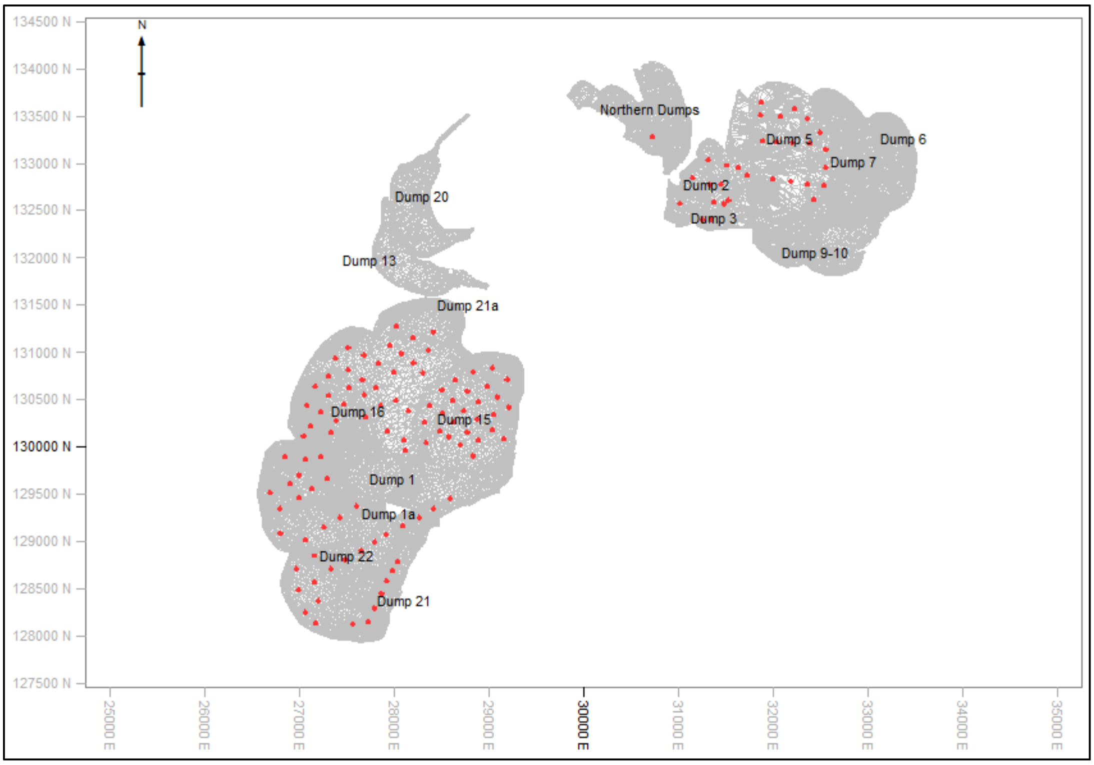


Figure 6.5: Location of 2010 'Pit Holes'

6.3.6 2010 Technological Holes

The database also includes 13 pits excavated in 2010 for metallurgical sampling. The pits range in depth from 8m to 11m. A total of 13 samples with Cu_{total} and Cu_{acid} assays are included in the database. The locations of these pits are shown in Figure 6.6.

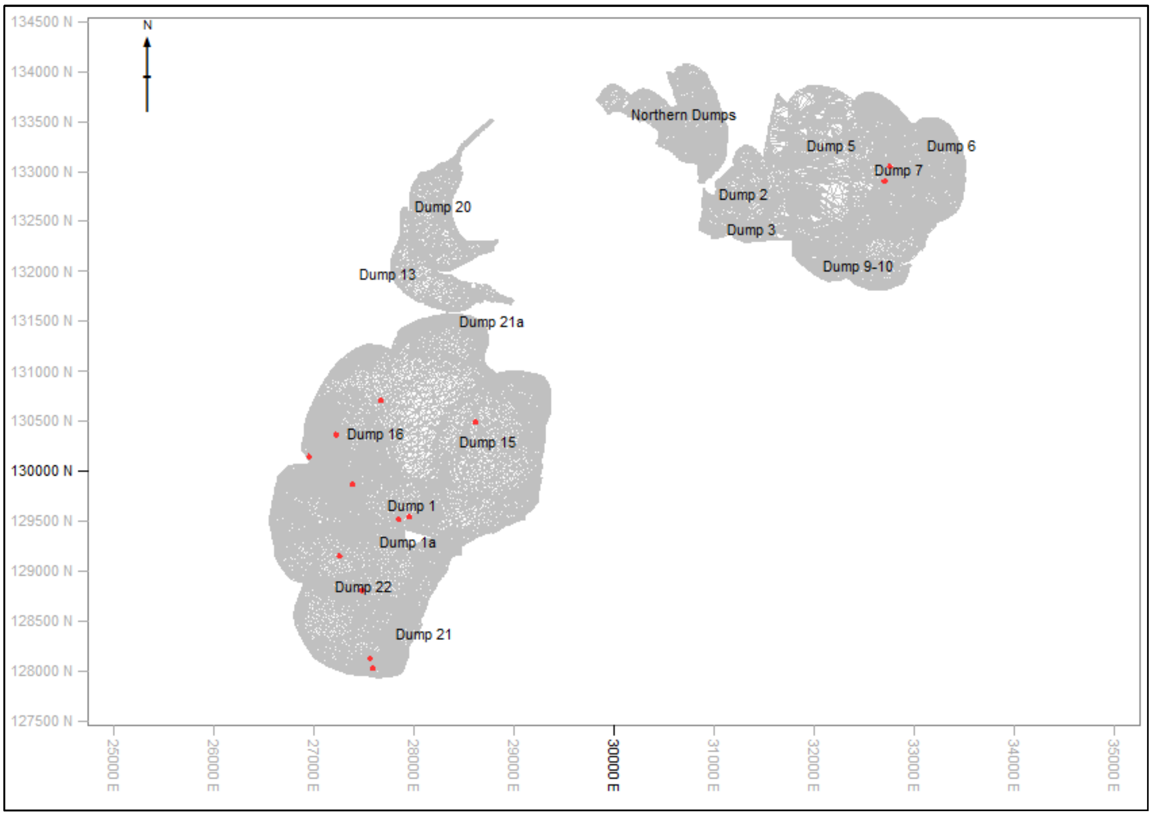


Figure 6.6: Location of 'Technological Pits'

6.3.7 2011 Holes

98 drillholes are included in the 2011 database with the locations of the drillholes shown in Figure 6.7. A total of 918 samples with Cu_{total} and Cu_{acid} assays are included in the database.

6.3.8 2012 Holes

131 drillholes are included in the 2012 database with the locations of the drillholes shown in Figure 6.8. A total of 1,364 samples with Cu_{total} and Cu_{acid} assays are included in the database.

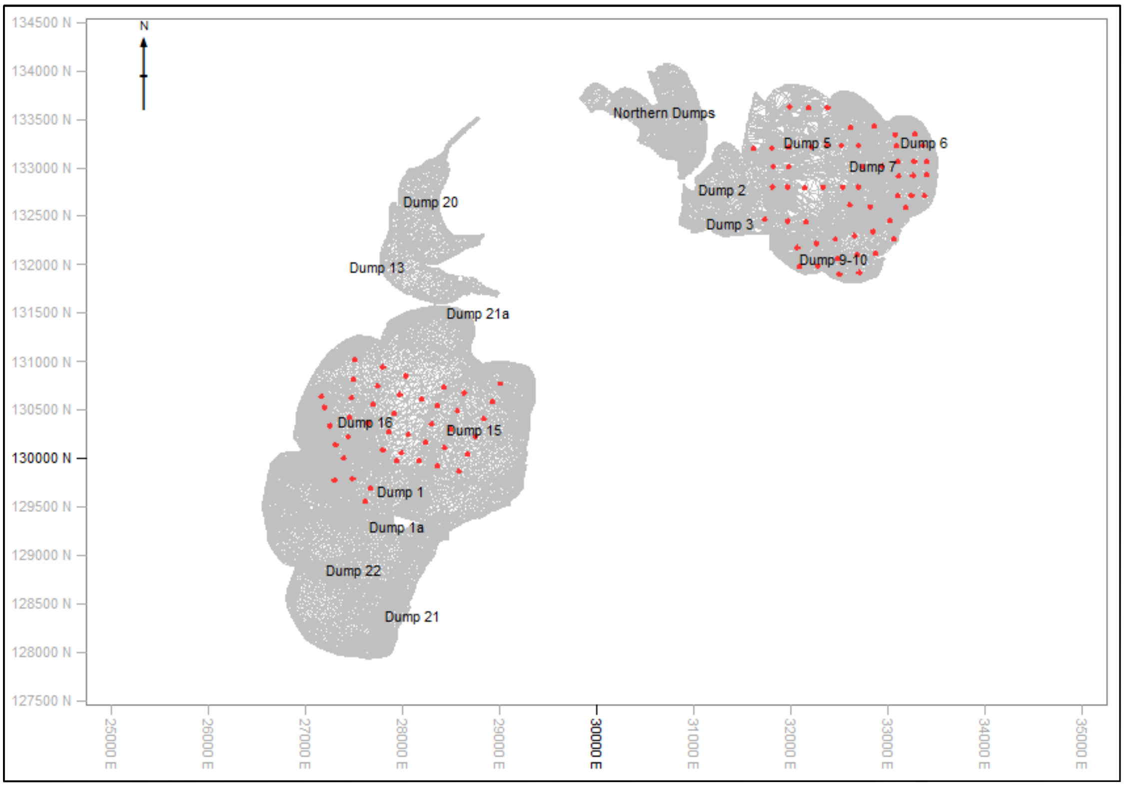


Figure 6.7: Location of '2011 Holes'

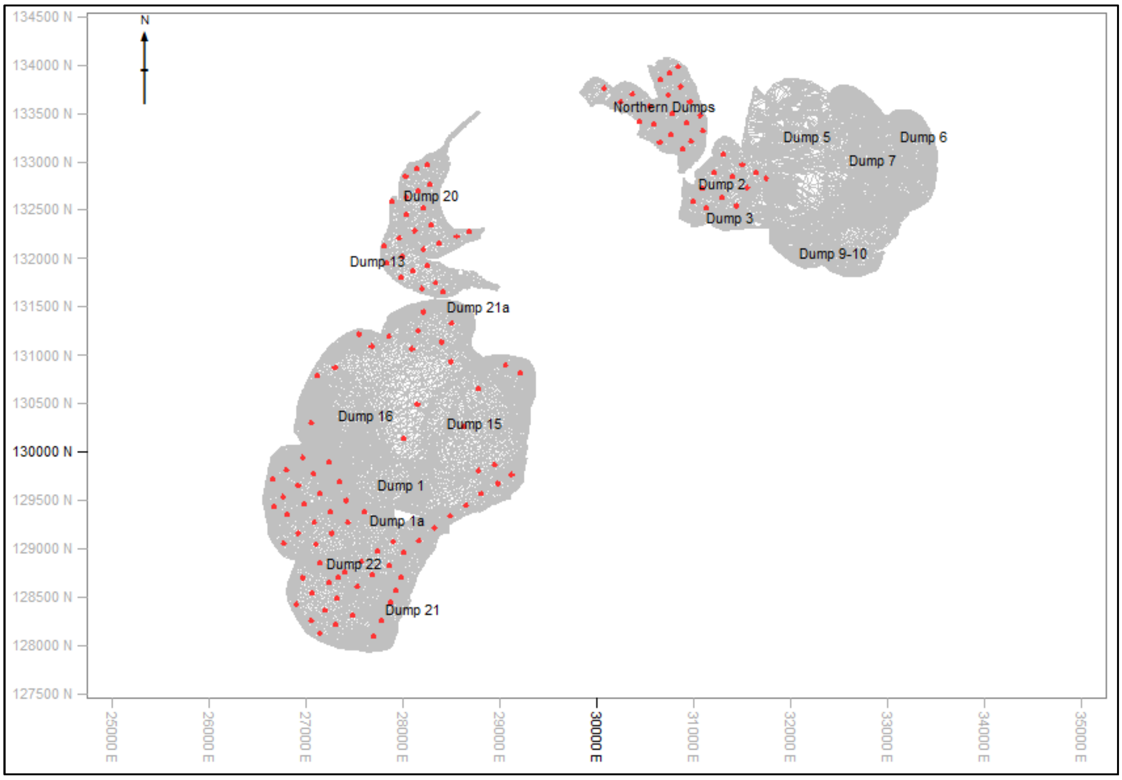


Figure 6.8: Location of '2012 Holes'

6.4 Dump Interpretation

Wireframes were provided by the client to WAI, and comprised 16 dumps (1, 1a, 2, 3, 5, 6, 7, 9-10, 13, 15, 16, 20, 21, 21a, 22 and Northern), and the dump wireframes are shown in Figure 6.9.

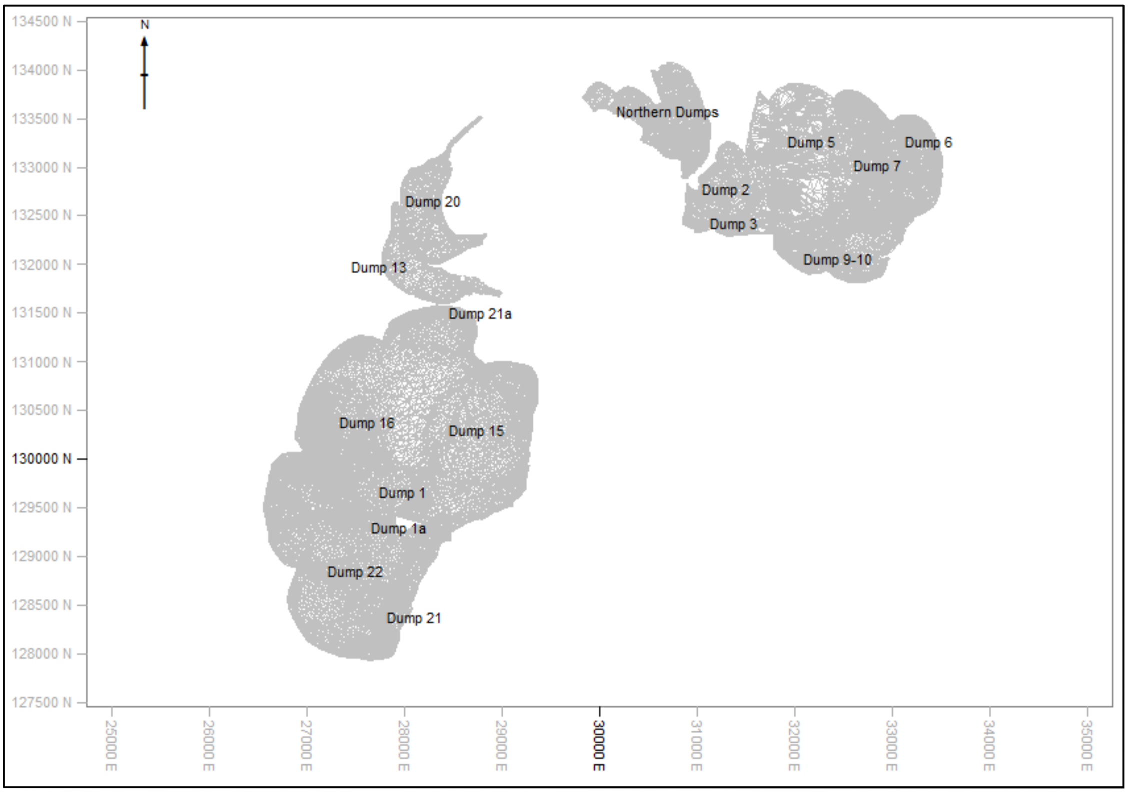


Figure 6.9: Plan View of Dump Wireframes

Dump wireframes were constructed based on surveys carried out by personnel at site using total station equipment. WAI has verified the dump surveys using historical pre-dump topographic surfaces and logging of the basement contact during the 2011 and 2012 drilling programmes.

Comparison of the 2011 and 2012 drillholes with the dump wireframes generally shows a good correlation. The wireframe from dump 5, which previously was poorly characterised, was modified to reflect the data obtained during the 2011 drilling programme. A DTM was created based on the drillhole collar data, and the base of the dump was taken as the average depth of the dump from the drillhole data.

6.5 Database Compilation

Prior to inclusion of all the sample data into one sample file for use in the grade estimation, it was necessary to first ensure that there was no bias, by one or more of the sample methods.

The sample data within the dumps were reviewed as shown in Figure 6.10 and Table 6.4. The sample sets are broken down by sample type (STYPE2):

1. Drillholes;
2. Trenches;
3. Pits; and
4. Tech Holes.

Table 6.4: Statistics for Samples within the Dump Wireframes

Sample Type	Field	Min	Max	Range	Mean	Variance	Std Dev	Skewness	Kurtosis
Drillholes	Cu_{total}	0.00	1.50	1.50	0.10	0.01	0.09	3.23	24.26
Trenches	Cu_{total}	0.01	1.05	1.04	0.19	0.02	0.14	1.33	1.84
Pits Holes	Cu_{total}	0.01	0.47	0.46	0.07	0.01	0.09	2.56	6.79
Tech Holes	Cu_{total}	0.05	0.29	0.24	0.14	0.01	0.07	0.54	-0.94

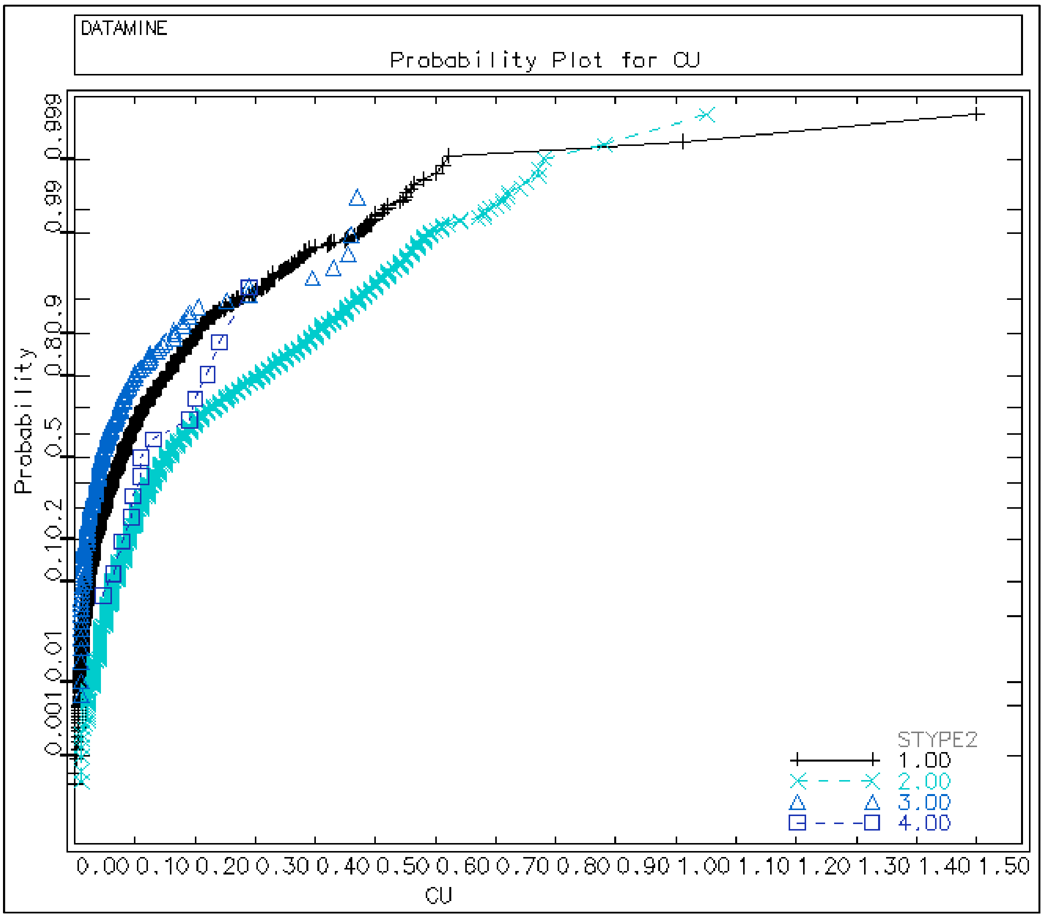


Figure 6.10: Log Probability Plot for Samples within the Dump Wireframes by Sample Type

From the statistical analysis, it is clear that all sample types generally display similar population trends. Trenching (light blue in Figure 6.10) shows a slightly different population reflecting a clustering of sample data. It is therefore the opinion of WAI, that no individual or combined set of sample types exert undue bias. For the purpose of geostatistical evaluation and grade estimation, the complete set of sample types can be applied.

6.6 Sample Data Processing

6.6.1 Statistical Analysis

The samples contained within the dump wireframes were selected for further data processing. The samples were coded by dump as shown in Table 6.5.

Table 6.5: Dump Coding

Code	Dump
1	Dump 1
11	Dump 1a
2	Dump 2
3	Dump 3
5	Dump 5
51	Northern dump
6	Dump 6
7	Dump 7
9	Dump 9
15	Dump 15
16	Dump 16
21	Dump 21
211	Dump 21a
22	Dump 22

Statistical analysis has been carried out on samples within the dump wireframes to identify any potential bias that may be present within the data (Figure 6.11 and Table 6.6).

Table 6.6: Statistics for Samples Falling within the Dump Wireframes

Dump	Field	Min	Max	Range	Mean	Variance	Std Dev	Skewness	Kurtosis
1	Cu_{total}	0.000	0.612	0.612	0.18	0.01	0.11	1.44	2.23
2	Cu_{total}	0.008	0.390	0.383	0.08	0.00	0.07	2.39	6.50
3	Cu_{total}	0.124	0.455	0.331	0.24	0.02	0.15	0.71	-1.49
5	Cu_{total}	0.010	1.010	1.000	0.09	0.01	0.09	5.74	50.50
6	Cu_{total}	0.010	1.050	1.040	0.12	0.01	0.08	3.34	29.94
7	Cu_{total}	0.010	0.740	0.730	0.14	0.01	0.09	2.29	8.65
9-10	Cu_{total}	0.020	1.500	1.480	0.32	0.02	0.14	0.91	4.75
1a	Cu_{total}	0.016	0.092	0.076	0.04	0.00	0.02	1.15	0.61
13	Cu_{total}	0.004	0.167	0.163	0.03	0.00	0.03	2.11	4.27
15	Cu_{total}	0.000	0.400	0.400	0.07	0.00	0.06	2.47	7.01
16	Cu_{total}	0.002	0.700	0.698	0.08	0.00	0.06	3.04	18.83
20	Cu_{total}	0.003	0.268	0.265	0.03	0.00	0.03	4.03	25.01
21	Cu_{total}	0.009	0.460	0.451	0.19	0.01	0.11	0.24	-0.61
22	Cu_{total}	0.007	0.565	0.558	0.09	0.01	0.08	2.67	9.80
Northern	Cu_{total}	0.005	0.171	0.167	0.05	0.00	0.04	1.09	0.75
21a	Cu_{total}	0.035	0.490	0.455	0.16	0.01	0.08	1.59	3.31

If sample populations display a positive skew due to the presence of high grade outlier values, then top cutting maybe necessary to remove the high grades. Outlying high grade values can exert significant bias on grade estimation, as they may contain a high proportion of the database's contained metals. Statistical and decile analysis indicate the presence of outlying high Cu_{total} grades. Decile analysis and top cutting of the data is described below.

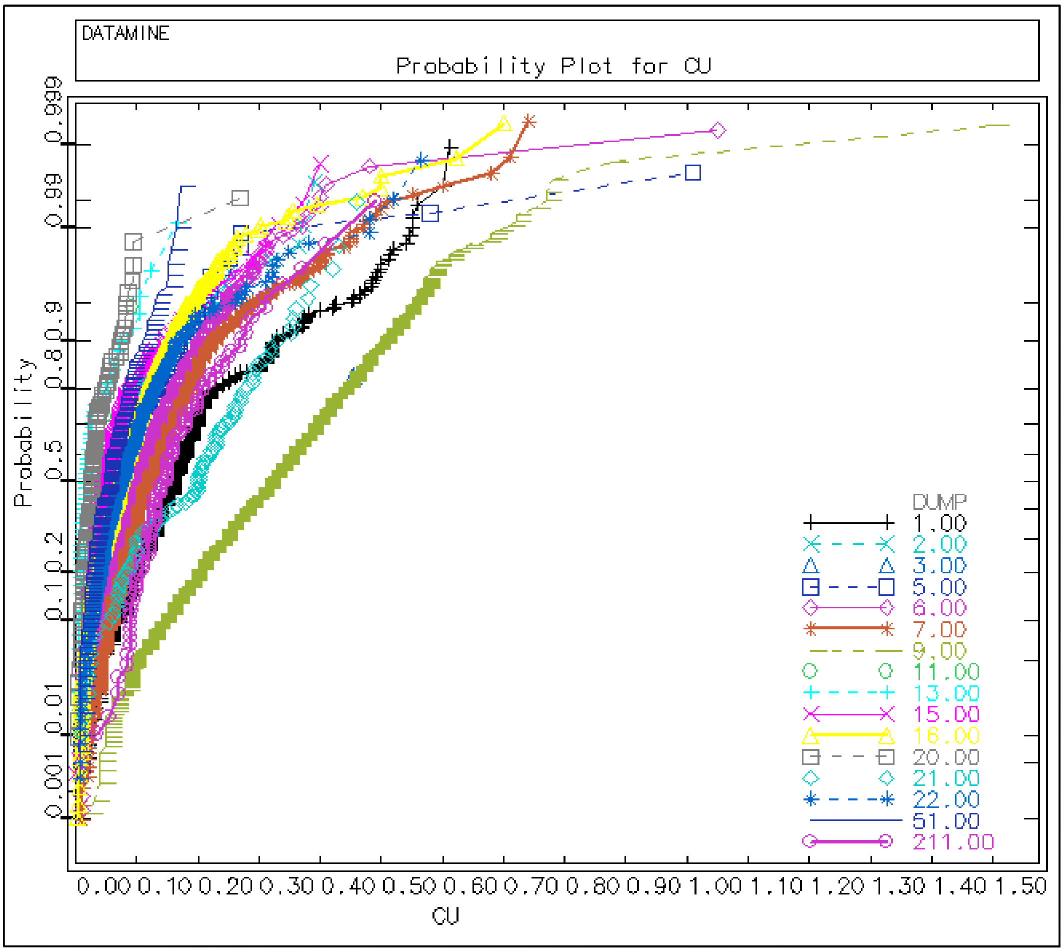


Figure 6.11: Log Probability Plot for Samples within the Dump Wireframes by Dump

6.6.2 Decile Analysis

WAI performed a decile analysis to ascertain any need for top cutting; the results of the decile analysis are shown in Table 6.7. From the statistical and decile analysis, WAI is of the opinion that top cutting is necessary.

Table 6.7: Decile Analysis							
Q%_FROM	Q%_TO	NSAMPLES	MEAN	MIN	MAX	METAL	METAL%
0	10	558	0.02	0.00	0.03	10.43	1.30
10	20	559	0.04	0.03	0.05	22.24	2.78
20	30	559	0.06	0.05	0.07	32.85	4.10
30	40	558	0.08	0.07	0.09	42.89	5.36
40	50	559	0.1	0.09	0.11	53.30	6.66
50	60	559	0.12	0.11	0.13	65.65	8.20
60	70	558	0.15	0.13	0.16	81.49	10.18
70	80	559	0.18	0.16	0.21	103.37	12.91
80	90	559	0.26	0.21	0.32	145.37	18.16
90	100	559	0.43	0.32	1.50	243.14	30.36
90	91	55	0.33	0.32	0.34	18.04	2.25
91	92	56	0.34	0.34	0.35	19.31	2.41
92	93	56	0.36	0.35	0.37	20.32	2.54
93	94	56	0.38	0.37	0.39	21.28	2.66
94	95	56	0.40	0.39	0.41	22.31	2.79
95	96	56	0.42	0.41	0.44	23.55	2.94
96	97	56	0.45	0.44	0.47	25.31	3.16
97	98	56	0.48	0.47	0.50	26.97	3.37
98	99	56	0.52	0.5	0.55	29.30	3.66
99	100	56	0.66	0.55	1.50	36.75	4.59
0	100	5587	0.14	0.00	1.50	800.74	100.00

Having reviewed the decile analysis and probability plots on a dump by dump basis, a top cut was applied to selected dumps:

- Dump 2 top cut of 0.25% Cu;
- Dump 13 top cut of 0.12% Cu;
- Dump 15 top cut of 0.3% Cu;
- Dump 20 top cut of 0.1% Cu; and
- Dump 22 top cut of 0.4% Cu.

6.6.3 Missing Assays

The assay database contained a number of absent values. Sample intervals where no assay value is recorded, were therefore treated as absent in the database. Samples falling outside of the mineralisation wireframe were excluded from the database.

6.6.4 Compositing

A histogram of sample length is shown in Figure 6.12. The sample length varied with sample type. Ideally all samples should be a similar sample length to provide equal support. Compositing of the samples is necessary to provide an equal level of support for all samples, and is important for the geostatistics, and subsequent Mineral Resource estimation.

For the purpose of the estimation, a 3m composite length was applied. The 3m composite length was a compromise selected to reduce the impact on samples by minimising the number of samples that would be split, and the number of samples that would be combined. Statistical analysis has been carried out to ascertain the impact of the compositing exercise (Table 6.8).

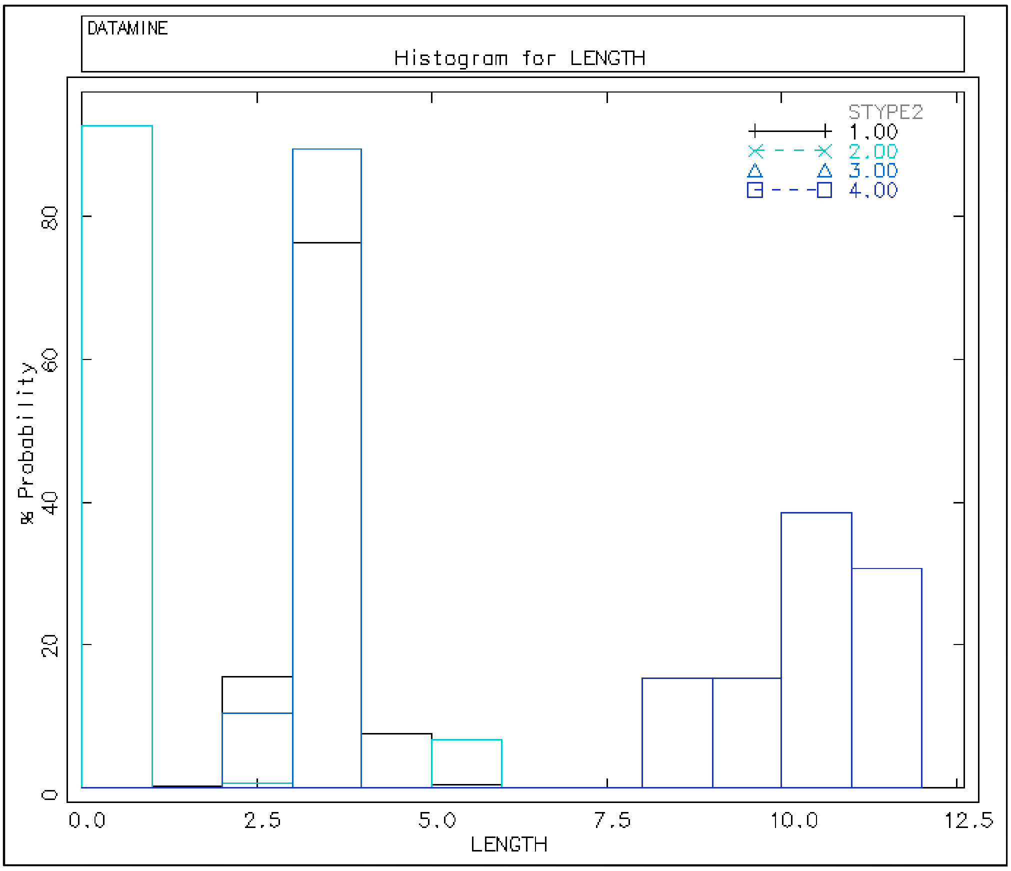


Figure 6.12: Histogram for Sample Length by Sample Type

Table 6.8: Statistical Analysis Showing Effect of Sample Compositing		
	Samples	**Composites**
FIELD	Cu_{total}	Cu_{total}
NRECORDS	5678	5734
NSAMPLES	5587	5737
MINIMUM	0.00	0.00
MAXIMUM	1.50	1.50
RANGE	1.50	1.50
MEAN	0.14	0.14
VARIANCE	0.02	0.01
STANDDEV	0.12	0.12
SKEWNESS	1.91	1.91
KURTOSIS	5.93	6.03

6.6.5 Data Processing Summary

The statistical analysis of the Kounrad mineralised dumps sample database is summarised below:

- All sample types have been included in the Mineral Resource Estimate;
- Top cutting was applied to dumps 2 (0.25% Cu), 13 (0.12% Cu), 15 (0.3% Cu), 20 (0.1% Cu) and 22 (0.4% Cu); and
- A 3m composite interval has been applied to standardise sample length.

6.7 Variography

WAI undertook variography analysis to review the estimation and search parameters that had been used, as well as:

- To produce suitable variogram model parameters for use in geostatistical grade interpolation; and
- To check the validity of search parameters upon which the Mineral Resource Estimates were based.

Variography was carried out based on 3m composite intervals; variogram analysis was performed using CAE Studio v3® (Datamine) software. Variography has been carried out along with variogram searches on 20° azimuth increments to check for anisotropy. Variogram maps have been produced for each dump to identify possible principle directions of continuity. Directions of continuity may have resulted from the way the dumps were developed.

6.7.1 Variogram Parameters

Isotropic variograms were generated for Cu_{total} using 3m composite sample data.

6.7.2 Variography Interpretation

Example experimental variograms and the subsequent variogram models, for dump 7, are shown in Figure 6.13.

6.8 Block Modelling

A block model was constructed for the dumps. The model comprises a parent cell size of 50m x 50m x 3m (x/y/z) with sub cell splitting to a minimum block size of 6.25m x 6.25m x 3m where additional cell resolution is required. The model is un-rotated and contains a coding for the dumps.

Directions of continuity were identified from the variography and dump configuration profiles. Directional control strings were defined outlining local variation resulting from the dump profile. These orientations were subsequently used during grade estimation to orient the search ellipses independently for each block. This dynamic anisotropy procedure gives a more realistic reflection of the local variations within the dumps.

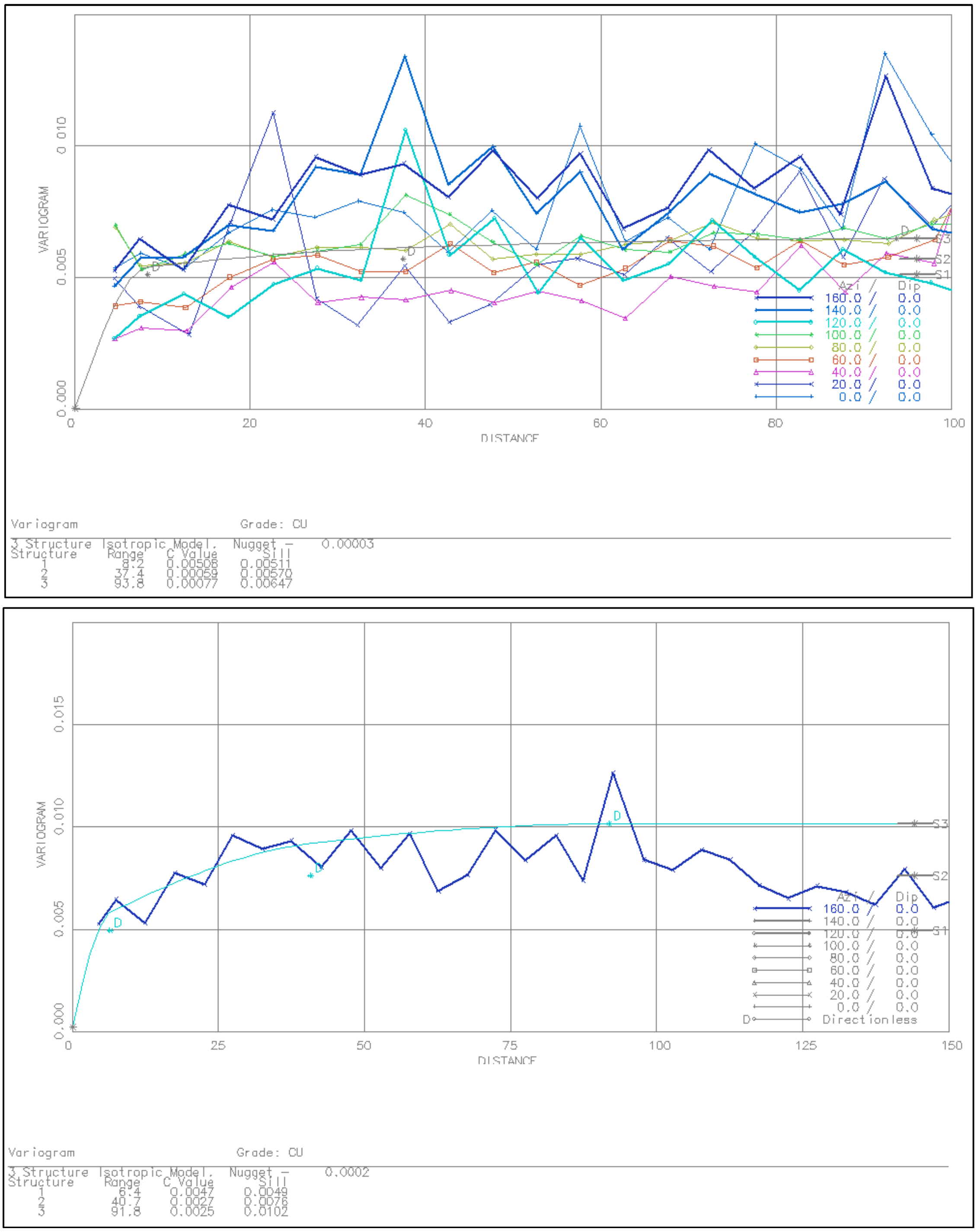


Figure 6.13: Example Isotropic Variograms for Dump 7

6.9 Density

For the current Mineral Resource Estimate, a density value of 1.87t/m^3 was used for oxide wastes and 2.04t/m^3 was used for sulphide and mixed wastes, consistent with previous estimates. Dumps 2, 3, 5, 6, 7 and 9-10 were categorised as oxide waste and dumps 1, 1a, 13, 15, 16, 20, 21, 21a, 22 and northern, were categorised as either sulphide or mixed waste.

Density data from the 2009 investigation was supplied to WAI by CAML (Table 6.9) and generally supports the sulphide and mixed waste density values used in the Mineral Resource Estimate. Values for oxide dumps 6 and 7 are higher than that used during the Mineral Resource Estimate; however, these are based on limited testing.

Table 6.9: Kounrad Relative Density – 2009 Investigation

Dump	Bore hole (2009)	Weight of the test (t)	Dump Volume (m^3)	Relative Density (t/ m^3)
15	91	13.98	6.781	2.06
1a	5	14.76	5.211	1.72
1a	21	13.08	5.822	2.25
16	47	11.78	4.994	2.36
16	42	12.98	5.850	2.22
7	125	11.03	5.02	2.19
7	126	11.87	4.70	2.52
7	127	13.71	5.38	2.55
6	128	15.12	6.76	2.23
6	129	13.23	5.57	2.37

WAI recommends that future works include further review of density values. In addition, Zsolt Peregi's report "Report on Wardell Armstrong International's RC drilling program on the waste dumps of Kounrad copper mine (Balkhash District, Kazakhstan) in 2011", describes the characterisation of the dumps as oxide, sulphide or mixed.

As recommended by WAI, the 2012 investigation programme included further density testing (Table 6.10) which supports the oxide, sulphide and mixed waste density values used in the Mineral Resource Estimate.

As detailed in Zsolt Peregi's 2011 report, dumps 15, 16 and 22, which have historically been classified as mixed dumps, contain predominantly sulphide mineralisation, and accordingly have been recharacterised in this estimate from former historical descriptions. Relative density results from the 2012 investigation, indicate some variation within individual dumps, for example dump 22, reflecting the observed variability as described in Zsolt Peregi's 2011 report.

Table 6.10: Kounrad Relative Density – 2012 Investigation

Dump	Bore Hole (2012)	Hole Volume (m^3)	Ore Weight (t)	Volume Weight (t/m^3)	Average Dry Volume Weight (t/m^3)	Humidity (%)	Dry Ore Volume Weight (t/m^3)
21a	1	8.31	16.28	1.96	1.91	2.5	1.91
16	1	8.54	18.33	2.15	2.07	2.5	2.09
	2	7.65	15.77	2.06		2.5	2.01
	3	7.44	16.46	2.21		2.5	2.16
	4	7.96	16.29	2.05		2.5	2
	5	6,71	17.00	2,53		2.5	
22	1	8.54	16.24	1.9	1.96	2.5	1.85
	2	8	17.06	2.14		2.5	2.08
	3	8.39	16.22	1.93		2.5	1.88
	4	8.06	16.71	2.07		2.5	2.02
21	1	7.8	16.36	2.1	2.06	2.5	2.05
	2	8.09	17.21	2.13		2.5	2.07
1	1	8.47	15.78	1.86	1.92	2.5	1.82
	2	8	16.51	2.06		2.5	2.01
1a	1	8.61	16.78	1.95	1.96	2.5	1.9
	2	8.26	17.03	2.06		2.5	2.01
15	1	8.56	17.72	2.07	2.01	2.5	2.02
	2	8.6	17.03	1.98		2.5	1.93
	3	8.54	17.57	2.06		2.5	2.01
	4	7.7	16.30	2.12		2.5	2.06
13	1	7.56	15.71	2.08	2.05	2.5	2.03
	2	8.06	17.07	2.12		2.5	2.06
20	1	7.75	15.69	2.02	1.95	2.5	1.97
	2	8	15.72	1.97		2.5	1.92
2	1	N/A	N/A	N/A	1.89	N/A	N/A
	2	8.45	15.73	1.86		2.5	1.82
	3	8.45	17.17	2.03		2.5	1.98
	4	8.2	16.52	2.01		2.5	1.96
	5	8.32	15.41	1.85		2.5	1.81
5	1	7.61	15.19	1.99	1.9	2.5	1.95
	2	8.59	16.07	1.87		2.5	1.82
	3	7.72	14.53	1.88		2.5	1.84
	4	7.89	15.98	2.03		2.5	1.97

6.10 Grade Estimation

6.10.1 Introduction

Grade estimation was carried out using Inverse Distance Weighted Cubed (IDW^3) as the principle interpolation method. Nearest Neighbour (NN) was also used for comparative purposes.

6.10.2 Grade Estimation Plan

The estimation process comprised three different search radii, each one progressively larger than the last. The three search radii and the sample constraints are shown in Table 6.11.

Table 6.11: Kounrad Search Estimation Parameters

Interpolation Run No	Search Axis (m)			Min No Samples	Max No Samples	Max No Samples per Hole[1]
	Strike	Down Dip	Across strike			
1	50	25	1	5	12	2
2	200	100	4	4	12	2
3	>200	>100	>4	1	16	2

Note: [1]Maximum of one channel sample.

6.11 Validation

6.11.1 Introduction

A statistical and visual assessment of the block models was undertaken to assess the robustness of the grade estimations within each dump, and to ensure that the grade estimates and search radii were acceptable.

The model validation methods carried out included a visual assessment of grade, global statistical grade validation, and SWATH plot (model grade profile) analysis. The SWATH plot analysis considers a swath or strip through the model and is described further below.

6.11.2 Visual Assessment of Grade Estimation

A visual comparison of composite sample grade and block grade was conducted in plan-view and cross section as shown in Figure 6.14 to Figure 6.17. Visually the model was generally considered to spatially reflect the composite grades.

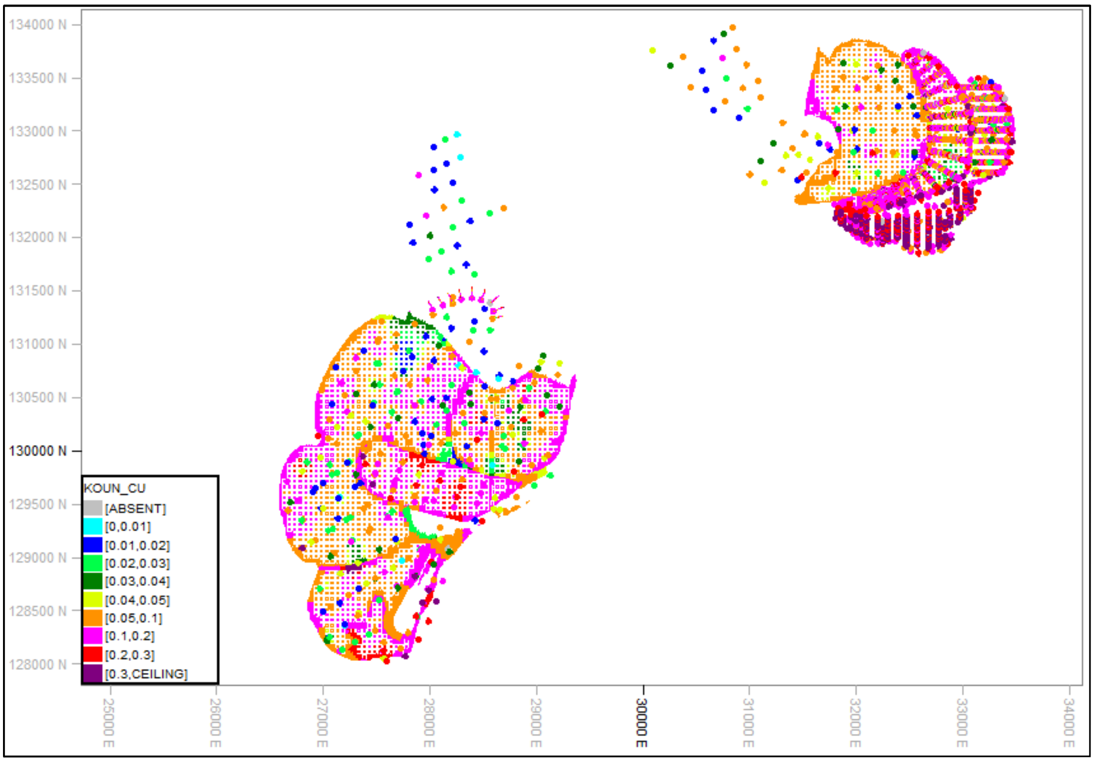


Figure 6.14: Plan View of Dumps Showing Drillhole Cu$_{total}$ Samples

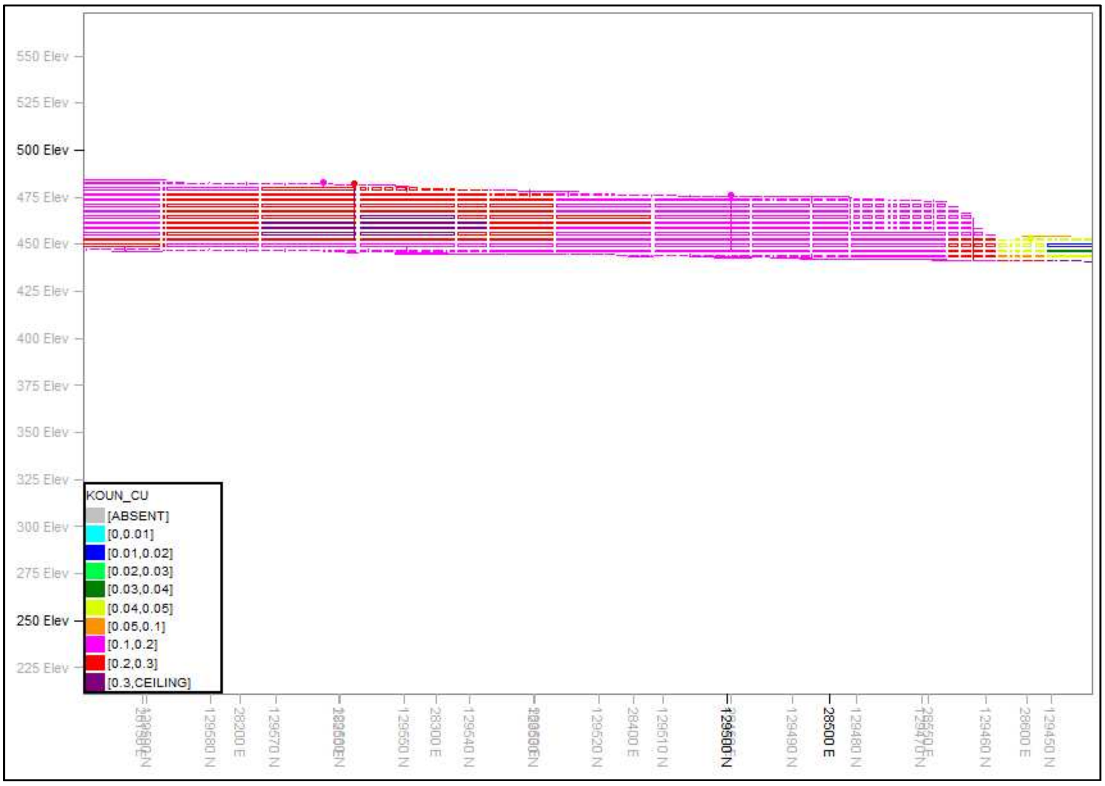


Figure 6.15: Sectional View of Dump 1 Showing Drillhole Cu$_{total}$ Samples

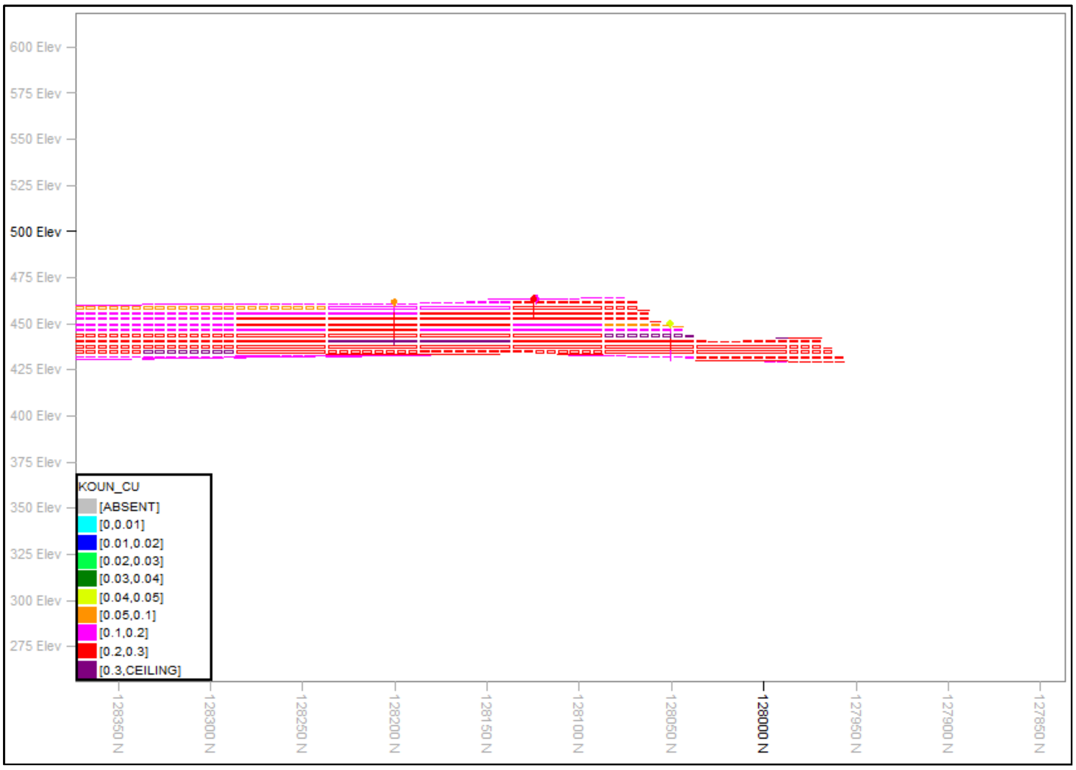


Figure 6.16: Sectional View of Dump 21 Showing Drillhole Cu$_{total}$ Samples

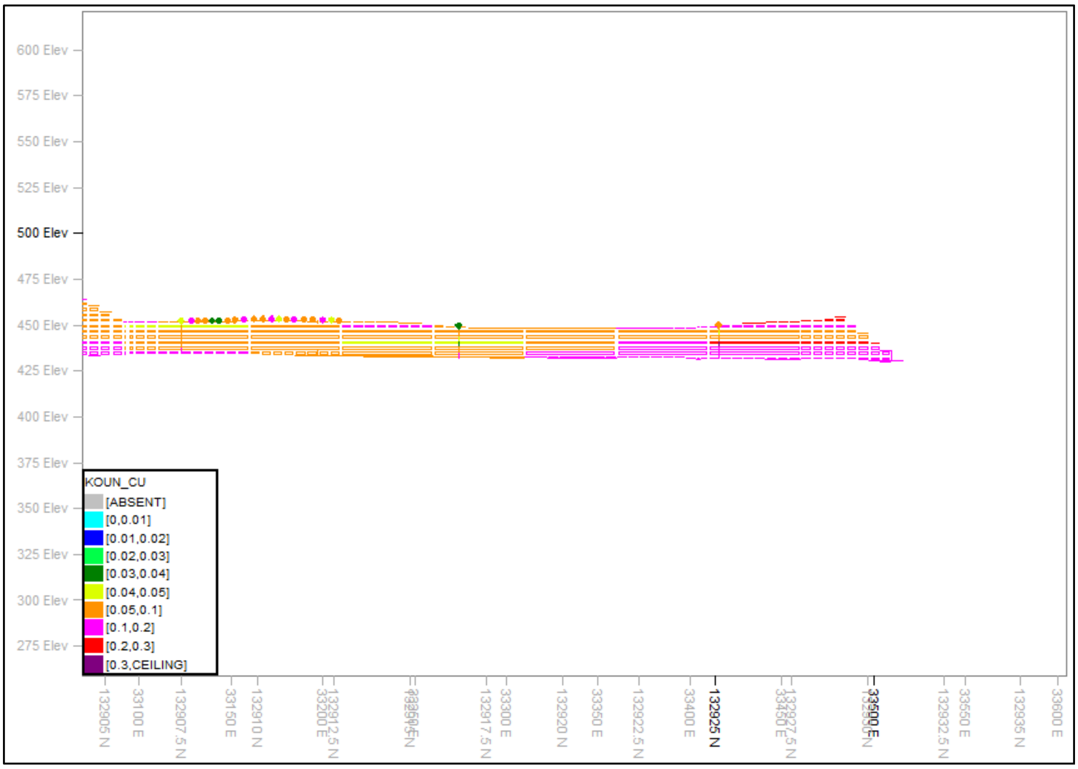


Figure 6.17: Sectional View of Dump 6 Showing Drillhole Cu$_{total}$ Samples

6.11.3 Global Statistical Grade Validation

Statistical analysis of the block model was carried out to compare the mean sample grades against the mean weighted model grade. This analysis provides a check on the reproduction of the grades within the block model globally. Typically, the mean grade of the block model should not be significantly different to that of the samples from which it has been derived.

The mean block model grade for each zone and its corresponding mean sample and composite grades are shown in Table 6.12. As well as the principal estimation using IDW^3, the table also contains the alternative grade estimates made using nearest neighbour (NN).

Table 6.12: Comparison of Global Average Grades

Dump	Sample Composites Grades	Block Model Grades	
		IDW^3	NN
2	0.08	0.07	0.07
3	0.24	0.22	0.27
5	0.08	0.09	0.09
6	0.12	0.09	0.09
7	0.14	0.11	0.11
9&10	0.32	0.20	0.19
1	0.18	0.16	0.16
1a	0.04	0.04	0.04
15	0.06	0.07	0.07
16	0.09	0.09	0.08
21	0.2	0.19	0.18
21a	0.16	0.17	0.16
22	0.09	0.09	0.09
13	0.03	0.03	0.03
20	0.03	0.03	0.03
Northern	0.05	0.05	0.05

Due to the relatively high concentration of high grade channel samples in dumps 6, 7 and 9-10, the global average grades for these dumps do not compare particularly well.

6.11.4 SWATH Analysis

SWATH plots have been generated from the model by averaging both the composites and blocks along northings and eastings. The dimensions of each panel are controlled by the dimensions of the block size. Each estimated grade should exhibit a close relationship to the composite data upon which the estimation is based. An example of the SWATH analysis, for dump 7, is shown in Figure 6.18.

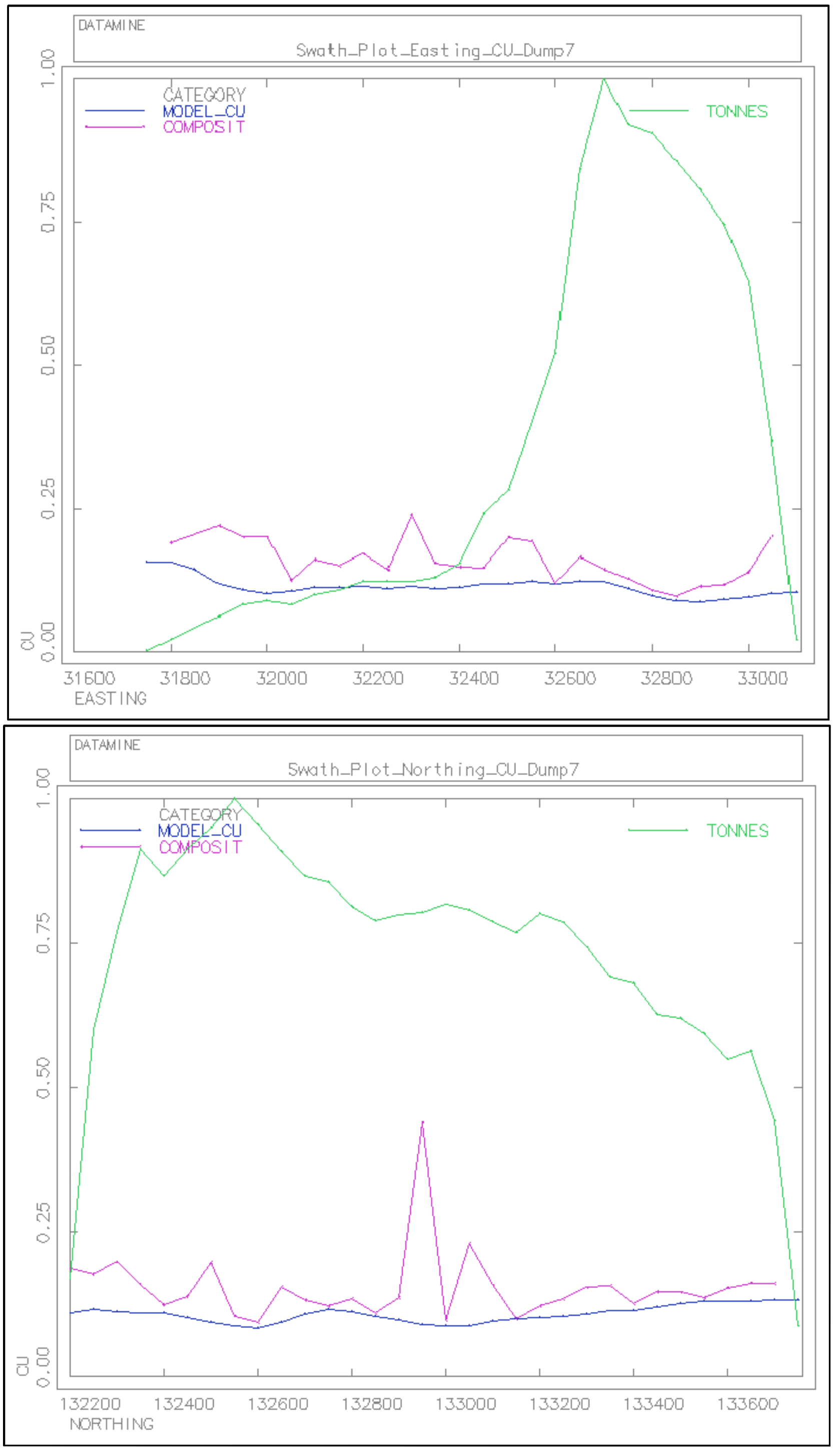


Figure 6.18: Example Kounrad SWATH Plots for Dump 7

6.11.5 Validation Summary

Globally, no indications of significant over or under estimation are apparent in the models, nor were any obvious interpolation issues identified. From the perspective of conformance of the average model grade to the input data, WAI considers the models to be a satisfactory representation of the drillhole and channel sample data used, and an indication that the grade interpolation has performed as expected.

6.12 Mineral Resource Classification

The WAI Mineral Resource Estimate completed in 2013 was reported in accordance with the JORC Code (2004). Subsequently, the JORC Code (2004) has been updated to the JORC Code (2012) which took full effect as of 01 December 2013.

Due to the revision in the reporting codes, the Mineral Resource classification for the Kounrad copper mineralised dumps has been amended. Mineral Resources presented herein, are reported in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2012). The criteria for defining Mineral Resource categories are based on a review of the sampling and assay methods, supporting QA/QC results, geostatistical studies, and validity of the estimation.

The 2011 and 2012 exploration programmes included confirmation drilling at a sample spacing of 200m to 3m below the base of the dumps, to provide information at depth, and to characterise the original topography prior to waste dump deposition. Step out sampling was also undertaken within dump 1, in order to further delineate grade zonation.

Internal laboratory QA/QC analysis for the 2010 exploration programme shows a good correlation, but the 2010 external laboratory QA/QC analysis shows a poor correlation. Whilst the poor correlation for the external check analysis represents a risk, the assays from the 2010 exploration programme only represent 6% of the sample database.

2011 and 2012 internal QA/QC comprised duplicate samples (repeat testing of samples by the primary laboratory), blank samples and external samples (re-assayed by an external laboratory). Internal and external control samples show a good correlation.

The lateral extent of the dumps has been well characterised by surveys carried out by qualified personnel at site, historical pre-dump topographic surfaces, and logging of the base of the dumps during the 2011 and 2012 drilling programmes. However, the sample data are insufficient to allow the grade continuity to be confidently interpreted at a sample spacing of greater that 200m x 100m.

Based on the above, WAI has assigned Mineral Resource classifications of *Indicated* and *Inferred* in accordance with the guidelines of the JORC Code (2012).

Indicated Mineral Resources were based on a sample spacing of less than 200m x 100m in the X and Y directions and with a minimum of 5 samples required from a minimum of 2 drillholes.

Inferred Mineral Resources were those Mineral Resources which were estimated, but did not fulfil the criteria for *Indicated* classification.

6.13 Depletion

Conventional mineral deposits rely on depletion of the Mineral Resources during the mine life through surveying either the open pit or the underground workings, and subsequently removing the surveyed volume of material from the resource model.

In the case of the Kounrad copper dump leaching operation, the host dumps remain in situ while the valuable copper component is recovered and dissolved in the leaching solution. Therefore, conventional depletion methods cannot be applied at the Kounrad project.

Since the commencement of production at Kounrad circa 61kt of copper has been extracted to produce copper cathode, as of the end of Q1, 2017. Due to the leaching method, it is not possible to clearly define where within the dumps copper mineralisation has been leached, with leached solutions potentially propagating through several contiguous blocks, before being collected and sent to the process plant.

For the purposes of accounting for depletion, and for the sake of transparency, the Mineral Resource statement has been revised to not only include the Mineral Resources reported as of 2013, but also to show the contained metal recovered. The recovered metal is stated on a dump group basis comprising:

- Eastern dumps;
- Western dumps;
- Western dumps; and
- Northern dumps.

The estimated, recovered and remaining contained metal for each dump group is reported. It should be noted that grade is not reduced directly in proportion due to the remaining contained metal. This reflects that whilst some parts of the dumps have been leached, seeing a reduction in grade, other parts of the dumps are yet to be leached, and the original grades are retained.

6.14 Mineral Resource Estimate

The grades in the final Mineral Resource Estimate (Table 6.13) were derived from drillhole, pit, and trench sample composites, based on the Inverse Power Distance Cubed method for Cu_{total}. Table 6.13 below shows the Mineral Resource Estimate summary for the Kounrad copper dumps in accordance with the guidelines of the JORC Code (2012).

Mineral Resources have been estimated by WAI, and previously reported in January 2013 (WAI, 2013). Subsequent production has recovered approximately 61kt of copper, predominantly from the Eastern dumps. To account for the depletion of the Mineral Resource as of end of H1, 2017, Table 6.13 includes columns for the recovered copper "Cu Production 2012- (H1) 2017 (t)" and the remaining copper "Remaining Cu (t)".

Table 6.13: Kounrad Dump Mineral Resource (Global Estimate), (WAI, 30 June 2017)
In accordance with the Guidelines of the JORC Code (2012)

Classification	Dump	Tonnage (kt)	Cu_{total} (%)	Cu_{acid} (%)	Cu_{total} (t)	Cu Production 2012- 2017 (t)	Remaining Cu (t)
Eastern Dumps							
Indicated	2	21,470	0.07	0.04	15,641	-	
	3	-	-	-	-		
	5	33,896	0.08	0.04	27,246		
	6	11,404	0.09	0.04	10,086		
	7	12,328	0.10	0.04	11,938		
	9&10	10,555	0.20	0.07	20,890		
	Total	**89,653**	**0.10**	**0.04**	**85,799**		
Inferred	2	13,775	0.07	0.04	9,659		
	3	1,033	0.22	-	2,285		
	5	35,058	0.10	0.05	33,528		
	6	3,442	0.11	0.04	3,641		
	7	22,989	0.11	0.04	25,501		
	9&10	3,350	0.21	0.09	7,126		
	Total	**79,646**	**0.10**	**0.05**	**81,740**		
Indicated + Inferred	**Total**	**169,299**	**0.10**	**0.04**	**167,539**	**60,048**	**107,491**
Western Dumps							
Indicated	1	36,942	0.18	0.10	65,193		
	1a	-	-	-	-		
	15&16	189,953	0.08	0.04	152,687		
	21	10,398	0.20	0.10	20,788		
	21a	858	0.17	-	1,433		
	22	37,276	0.10	0.05	36,057		
	13	6,472	0.03	0.01	1,750		
	20	14,452	0.03	0.01	4,478		
	Total	**296,351**	**0.10**	**0.05**	**282,386**		
Inferred	1	19,751	0.14	0.07	26,958		
	1a	1,467	0.04	0.02	651		
	15&16	114,701	0.08	0.04	94,670		
	21	6,870	0.18	0.08	12,321		
	21a	4,452	0.17	-	7,559		
	22	22,167	0.08	0.04	18,108		
	13	4,705	0.03	0.01	1,534		
	20	7,408	0.03	0.02	2,488		
	Total	**181,521**	**0.09**	**0.04**	**164,289**		
Indicated + Inferred	**Total**	**477,872**	**0.09**	**0.04**	**446,675**	**1,300**	**445,375**
Northern Dumps							
Indicated	Northern	2,973	0.04	0.01	1,277		
Inferred	Northern	2,856	0.05	0.02	1,455		
Indicated + Inferred	**Total**	**5,829**	**0.05**	**0.01**	**2,732**	**0**	**2732**

Notes:
3) Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-feasibility study.
4)

6.15 WAI and Historical Mineral Resource Estimate Comparison

In comparing the Mineral Resource estimation carried out by WAI (in January 2013) with the historical estimations (Table 6.14), it can be noted that in some instances, there has been some variations in grade and/or tonnage for individual dumps.

Table 6.14: WAI January 2013 and Historical Estimate Comparison

Dump	WAI January 2013				Historical			
	Tonnage (kt)	Tonnage (Mt)	Cu_{total} (%)	Cu (t)	Tonnage (Mt)	Cu_{total} (%)	Cu (t)	Source
2	35,245,430	35.2	0.07	25,300	48.5	0.1	48,466	IPO
3	1,032,762	1.0	0.22	2,285	0.9	0.38	3,300	Balkhashmed (2006)
5	68,954,001	69.0	0.09	60,774	44.2	0.1	44,241	IPO
6	14,845,755	14.8	0.09	13,727	11.4	0.13	15,000	GKZ 2002 (C2)
7	35,317,115	35.3	0.11	37,438	27.5	0.15	42,900	GKZ 2002 (C2)
9&10	13,904,843	13.9	0.20	28,016	10.3	0.19	19,800	GKZ 2002 (C2)
1	56,692,681	56.7	0.16	92,151	23.2	0.22	51,771	IPO
1A	1,466,729	1.5	0.04	651	5.3	0.19	10,148	IPO
15&16	304,654,444	304.7	0.08	247,357	257.6	0.1	257,572	IPO
21	17,267,279	17.3	0.19	33,109	22.6	0.27	60,678	IPO
21A	5,309,619	5.3	0.17	8,992	5.2	0.25	12,906	IPO
22	59,443,597	59.4	0.09	54,165	28	0.1	27,997	IPO
13	11,176,972	11.2	0.03	3,284	13.6	0.1	13,656	IPO
20	21,859,489	21.9	0.03	6,966	22.1	0.1	22,100	IPO
Northern	5,829,095	5.8	0.05	2,732	106	0.1	105,949	IPO
TOTAL	652,999,811	653	0.09	616,947	626	0.12	733,184	
TOTAL exc Northern	647,170,716	647	0.09	614,214	520	0.12	627,235	

The main difference between the WAI estimate and the historic estimates is related primarily to the Northern Dumps. This is due to a significant volume discrepancy between the WAI estimate ($15,325,000m^3$) and the Balkashmed (2006) estimate ($48,900,000m^3$).

Calculation of the average height of the dumps based on the Balkashmed (2006) volume and area data implies an average height of approximately 48m. This is significantly in excess of the height determined from recent onsite surveys. Wireframes produced from onsite surveys, and used for the WAI estimate give an average height of approximately 22m.

WAI therefore considers that the difference in tonnage between the WAI and Balkashmed (2006) estimates, is partly due to the differences in volume. In addition, a significant proportion of the Northern Dumps is within the Kazakhmys exclusion zone, and has been excluded from the WAI estimate.

The historical estimates based on in pit grade control drilling, and the production records detailing what material was dumped on which dump, provides a useful tool in reconciling any estimations. The historical records provide actual production data and sampling at a high level of detail. If the Northern Dumps are excluded from the comparison, the WAI estimate of in-situ copper is within 2% of the historic estimates. Given the differences in methodology applied in the deriving the grade and metal content, the WAI estimate appears to be robust, and validated by the historical production records.

The results of the drilling and assaying campaigns, particularly during 2011 and 2012, have highlighted that the original categorisation of the differing mineralised materials during the open pit operational life may no longer be applicable, or actually important. According to the original classifications, material identified as "mixed" contained between 10 to 20% acid soluble copper, whilst "sulphides" contained less than 10% acid soluble species. The assay results show that this is no longer the case, with acid soluble assays in "mixed" dump 15 - 16 averaging around 45%, and with similar values being determined in the "sulphide" dumps such as 1, 1a, 21.

It is highly likely that these higher than anticipated levels of soluble copper are due to the historic and ongoing (continuously active) natural oxidation conditions occurring within the dumps, over a 70-80-year time frame.

Such changes can be accelerated by near surface oxidation, species conversion related with ferric iron leaching; and both being accelerated by the presence of naturally occurring bacteria. Visually, it is very clear to see such natural activity having occurred, with extensive plumes of copper oxide colouration seen on large areas of the dump side walls.

For the purpose of reporting in this CPR, WAI has removed the "mixed" and "sulphide" designations previously assigned to the Western Dump Mineral Resources in the 2010, IPO. This is not considered a change of any significance when it comes to future works in estimating the Western Dumps amenability to acid leaching.

In general, the WAI estimate displays higher tonnages and lower grades than in some of the historic estimates. Variations in the tonnage and grade distributions between dumps are likely to be the results of a number of factors:

- Historic production records may have some erroneous reporting, this can include mis-reporting which dump material was actually placed on, assumed truck tonnages, and operators not keeping a full record of their works;
- Natural leaching of the dumps. Over the years there has been a significant amount of natural in-situ leaching leading to mobilisation of the copper mineralisation, this can lead to mobilisation of copper between dumps. During the spring thaw, it is possible to see small streams of solution containing high soluble copper and iron values, verifying this natural activity within the dump;
- Looking at some of the historical records, it appears an arbitrary 0.1% Cu_{total} grade was assigned to production records for very low-grade material. The material may in fact have been lower than this, and the use of a standard 0.1% Cu_{total} grade subsequently caused some historical over reporting of material; and
- Additional waste material may not have been reported as having been sent to the dump, this may be the case if it was below a certain cut-off grade. If this is the case,

then the result would be reduced tonnage and elevated grades in the historically reported data.

In 2011 the State Reserve Committee (GKZ) approved the C_1 category reserves for dumps 6, 7, and 9-10 totalling 51.2Mt at a grade of 0.16% Cu_{total} containing 81.2kt of in-situ copper. This compares to the WAI estimate of 64.1Mt at 0.12% Cu giving 79.2kt of in-situ copper. The WAI in-situ copper is within 2% of the GKZ 2011 approved C_1 category reserves demonstrating that both estimates provide comparable global results.

6.16 Conclusions

As has been demonstrated above, the reconciliation between the WAI 2013 Mineral Resource Estimates, and GKZ and other historic estimates, is generally good (with the exception of the Northern Dumps), certainly in terms of contained metal.

However, unlike normal mining where ore is extracted and processed to a point where the grade of the ore is accurately known, no such checks and balances are possible due to the nature of dump leaching. The only measure is the output of copper.

Clearly, the acid soluble copper is removed through the leaching process, and any recoveries are estimated from the received copper versus what was predicted to be in the dumps.

This process is further complicated by the fact that the original classification of the dump material into oxide, sulphide and mixed, is now somewhat arbitrary in that a proportion of the mixed and sulphide material now appears to have been oxidised through continued exposure to the elements, and natural bacterial activity, thus potentially enhancing future recoveries.

As a result, the whole concept of "what are the grade of the dumps" is somewhat subjective, and in reality, the economics of the operation can only truly be measured on the amount of copper metal being produced against costs.

Thus, at Kounrad, rather than use the detailed geostatistical block model as produced by WAI in 2013, CAML uses the global dump estimates produced under the GKZ system for estimates of available copper and recovery.

This approach has a certain logic about it, in that although the leaching takes place in panels on the surface of the dumps, which do have a grade and tonnage as derived from the block model, there is limited control of where those fluids percolate on their migration downwards. Therefore, depletion may be taking place outside of the block lying immediately adjacent the panel being irrigated.

Moreover, once part of a dump has been irrigated, it is also nearly impossible to ascertain what the remaining residue grade might be without re-drilling and sampling that the block.

Therefore, the whole concept of depletion of "reserves" is not one which can be demonstrated through the normal mechanisms. As such, the 2013 Mineral Resource Estimate still stands as the definitive record of the contained metal, and this should then be viewed against the production records to date, to determine the approximate depletion of the "reserves".

7 MINERAL PROCESSING AND METALLURGICAL TESTWORK

7.1 Introduction

Copper ores have been exploited from the Kounrad open pit since 1936 with the sulphide ores being treated by conventional flotation, whilst the oxide ores and low-grade sulphide ores were stockpiled (and referred to as "dumps") around the site.

Through metallurgical testing and pilot plant trials, CAML has developed a schedule for the Kounrad Project for the recovery of the copper from the dumps to produce an average of 11,665t of copper cathode (99.99% Cu) per year over the LOM.

The Kounrad flowsheet uses *in-situ* acid leaching, where acidic solutions are irrigated on top of individual blocks within the dumps in order to recover soluble copper. The copper solutions flowing from the base of the dumps are collected and pumped to a solvent extraction and electro-winning (SX-EW) plant which is located at the Eastern Dumps. The Plant was commissioned in March 2012 and uses conventional technologies and industrial practices.

The Kounrad dumps consists of two main areas known as the Eastern and Western Dumps. The predominantly oxide waste dumps are located entirely on the eastern margin of the open pit mine, these initially being targeted.

The predominantly sulphide and mixed waste are located in the western area. CAML started leaching the Western Dumps in Q2 2017, with the pregnant solutions being collected and pumped to the SX-EW Plant, as shown in Photo 4.1.

Since commissioning of the SX-EW plant, CAML has produced circa 61kt of copper cathode up to H1 2017. A further 194kt of copper cathode is expected to be recovered from all the dumps until expected closure in 2033.

7.2 Historical Testwork

7.2.1 Introduction

Metallurgical testing of the waste dumps has been a subject of investigation since the early 1960s when the property was entirely state owned. Following laboratory testwork, field trials were conducted from 1970 to 1992, involving the acid leaching of the dumps followed by the precipitation of copper from solution using the iron cementation process.

Subsequent to the political break-up of the Soviet Union, this work halted, and the plant was dismantled, with various metallurgical tests being recommenced in early 2002 as the Kazakh economy recovered.

CAML resumed testing, and this led to the installation of a pilot plant facility at the Eastern Dump in August 2008. The pilot plant was later moved to the Western Dumps in 2011 as part of on-going investigative studies where it operated for a total time period of 15 months (excluding 4 months of winter).

7.2.2 Eastern Dumps

Studies for the application of acid leaching to recover copper from the Kounrad mine waste dumps first started in the 1960s, with the most recent being undertaken by VNIItsvetmet in 2007. Their results indicated that a significant degree of natural oxidation had occurred since the previous programme of testing. Their results indicated a decrease in copper grades in the upper levels, probably owing to dissolution and migration of copper downwards through the heap, and lower associated values of sulphur and iron.

VNIItsvetmet: The VNIItsvetmet research institute became involved for a second time in November 2007 by undertaking comparative analysis of samples collected using similar methods as adopted in 1984 (Unipromed data).

7.2.3 Western Dumps

7.2.3.1 Unipromed Column Testwork (1970 – 1987)

A programme of column testwork was undertaken by the Unipromed Institute. A total of 2,296 samples were collected from Dump 6-7, Dump 9-10, and Dump 21, for the purpose of mineralogical and chemical analysis, with a total of 140t of sample taken.

The test columns used were 1m in diameter, and the samples that were tested graded approximately 18% coarser than 200mm. The results of the tests undertaken by Unipromed are given in Table 7.1.

Table 7.1: Unipromed Test Results (West Dump)

	Dump		
	21	**9-10***	**6-7***
Leach period (days)	440	570	300
Acid consumption kg per kg of Cu	4.42	4.55	3.70
Acid content of leach solution g/l	5.0	3.6	n.d.
Leach rate at end of test % per day	0.06	0.057	0.076
Recovery at end of leach %	48.1	68.4	35.5

*Data from Eastern Dump No. 9-10 and No. 6-7 included for comparison

7.2.3.2 VNIItsvetmet (2009)

During early 2008, an exploration programme approved by CenterKaznedra Regional Authority, was conducted with the drilling of boreholes to a maximum depth of 30m to obtain samples for further laboratory testing. It should be noted that drilling of dumps this material, with widely varying particle size ranges from microns to meters, is difficult to perform, and the sampling method cannot be relied upon to give truly representative samples.

The samples collected were sent to the VNIItsvetmet research institute for metallurgical examination by bottle rolls tests on samples crushed to -2mm. Whilst not being fully representative of the in-situ particle size, the results demonstrated a higher than anticipated level of acid soluble recovery, again indicating significant levels of oxide and secondary sulphide mineralisation. The results are shown in Table 7.2.

Table 7.2: Results of Bottle Roll Tests on Dump Material (VNIItsvetmet 2009)

Dump No.	Ore Type	Expected Recovery %	Actual Cu Recovery, %
1	Sulphide	30	47-72
1a	Sulphide	30	66
21	Sulphide	30	41-66
22	Mixed	30	48-65
16	Mixed	30	57-68
15	Mixed	30	51
5	Mixed	30	48-65
6	Oxide	50	47
7	Oxide	50	51

*Bottle Roll Tests undertaken on material crushed to -2mm

The tests undertaken on the sulphide material are of limited use in determining potential heap leach recoveries, as a 2mm crush size was used. However, the copper leach recoveries are relatively high for a sulphide material, ranging from 50.8% to 66.5%, which indicates that a significant proportion of the copper minerals are either in the oxide form, or present as chalcocite or as other acid soluble copper sulphide minerals.

7.2.3.3 VNIItsvetmet (2010)

A metallurgical programme was undertaken by VNIItsvetmet in July 2010 to test the amenability of the sulphide and mixed waste materials at laboratory scale by column leaching.

Samples for these tests were taken from a depth of approximately 10m below surface in order to try and generate as representative sample as possible. A bulldozer was utilised to prepare a sample area, accessed by a 30m ramp, down to a depth of 6m by pushing surplus material away. The excavator was then positioned and using its boom to maximum extent collected a sample from about 4m further down. By this method approximately 2t of sample was recovered from each sample pit, after which they were reduced in size to a final sample size of approximately 150kg, which was dispatched to the laboratory.

A description of the metallurgical samples is shown in Table 7.3, whilst their locations are shown in Figure 5.1.

Samples were taken from Dumps 1a, 15, 16, 21 and 22 reflecting sulphide and mixed waste materials. Additionally, 3 samples were taken from the perimeter (base) of Dumps 1a, 16 and 21 at a depth of 8-9m to reflect the material encountered at the lower part of these dumps. Samples were also taken from two pits from Dump 7 (Eastern Dumps).

Table 7.3: Description of Metallurgical Samples taken in 2010

Dump No.	Sample Location	Number of Samples	Depth of Dump (m)
16	Pit 66	1	10
15	Pit 72	1	9.5
16	Pit 43	1	10
1a	Pit 2-6	1	10.5
1a	Pit 12	1	11
21	Dump Base	1	9
16	Dump Base	1	8
22	Pit 25	1	11
1a	Dump Base	1	8
7	Pit 8	1	10.5
7	Pit 10	1	11
22	Pit 14	1	11
21	Pit 36	1	10

VNIItsvetmet used the 13 samples to make three Composites, detailed as follows:

- **Composite 1** – Sulphide dumps (Western Dump);
- **Composite 2** – Oxide dumps (Eastern Dump); and
- **Composite 3** – Perimeter dump material (Dumps 1a, 16 and 21).

The Composites contained 0.22, 0.066 and 0.1% Cu for Composites 1, 2 and 3 respectively. Chemical analysis indicated that 54 to 59% of the copper was acid soluble.

Column tests were undertaken on the three composites using 100kg of material crushed to -40mm. The columns used were 1.8m high with a diameter of 20cm.

All the samples responded favourably to column leaching with Composite 1 (sulphide material) yielding a final recovery of between 50 to 58% after 60 days of leaching. Leach recoveries >60% were also obtained for Composites 2 and 3.

7.2.3.4 Site Trials (2012)

In early 2012, bench column leach tests were performed by CAML technical personnel on four Western Dump samples of sulphide dump material and two on mixed dump material. Material was obtained from pits dug on dumps 21, 22, 16 and 1. The aim of the testwork was to ascertain the metallurgical performance of the sulphide and mixed dumps and what the likely operating parameters would be.

Samples were obtained from the Western Dumps by excavating pits 5m deep and 10m wide. Samples were taken from around the pit and put into plastic bags until approximately 2t of sample had been obtained. Each sample was prepared separately, where they were individually homogenised through cone and quartering before a 5kg sub sample was sent to the Centergeolanalit (Karaganda) laboratory for head grade analysis. The remaining samples were used for testing using 4m high, 380mm diameter columns.

The column tests are shown in Photo 7.1.

Photo 7.1: CAML Column Leach Tests

Once irrigation had started, a 100ml sample of solution was taken daily and submitted to the KCC laboratory. Residue remaining at the end of the column leach test period was removed from the column, mixed through cone and quartering and a 5kg sub sample taken and submitted for analysis.

The recovery time curves obtained from the 2012 column leach tests are presented in Figure 7.1.

The maximum column leach recovery that could be expected from Dump 16 and 22 varied between 35% and 42%, with the lower grade materials yielding a lower recovery.

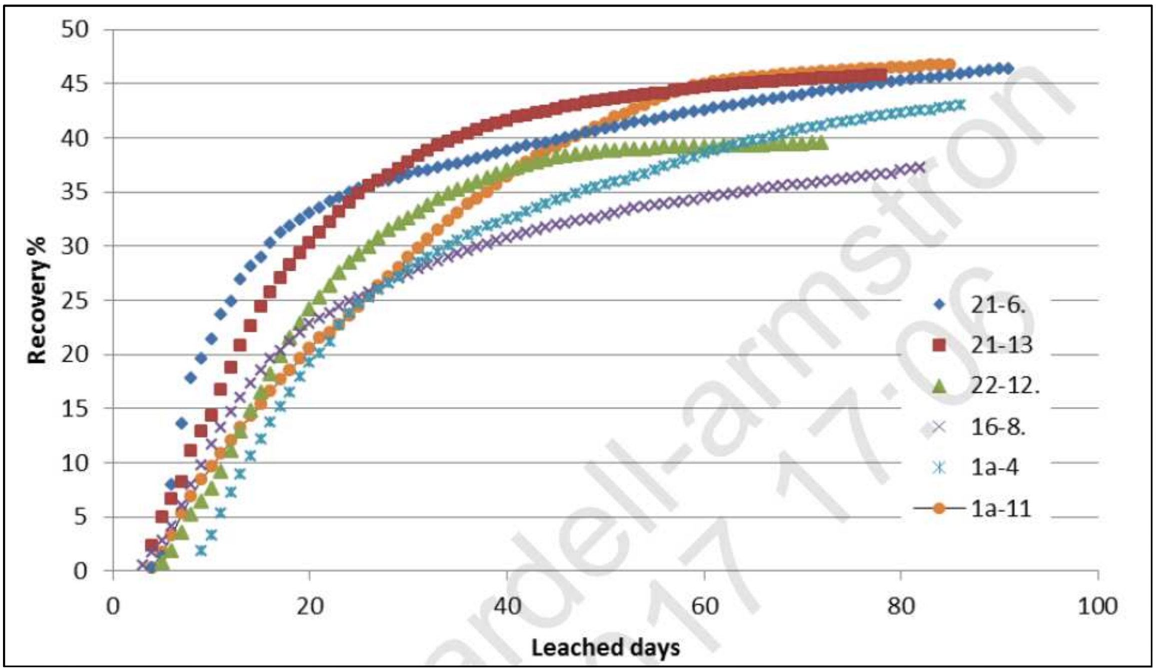


Figure 7.1: Western Dumps Column Test Results (2012)

Based on the column test results and leach flux data taken from historical test and site production data, an estimated leach recovery curve was determined for Dumps 16 and 22. In developing the Design Leach Curve for Dump 16 and 22, a number of factors were considered:

1. The copper grade of Dumps 16 and 22 is about half of the grade of Dump 9/10. This has a corresponding, adverse, effect upon the copper pick-up grade and recovery across the leach;
2. The height of Dump 16/22 is approximately twice that of Dump 9/10. This prolonged the leach cycle, adversely affecting leach recovery, whilst having a positive impact upon early leach solution grades;
3. The acid soluble Cu concentration of Dump 16/22 is about 44%, compared to approximately 60% for Dump 9/10. This will adversely affect the copper recovery, leach rate and copper pick-up across the Western Dumps leach;
4. The column tests conducted at VNIITSvetmet and site used prepared material where coarse fractions were removed. In the former case, the ore size was -40mm; and in the latter -75mm. This contrasts with the actual size distribution on the Dump with some "particles" up to approximately 1m diameter. Whilst most of the oxidised Cu mineralisation is thought to be along fractures, etc, the disparity in particle size will reduce the industrial scale leach recovery compared to laboratory column test results.

The Leach Design Curves are shown in Figure 7.2.

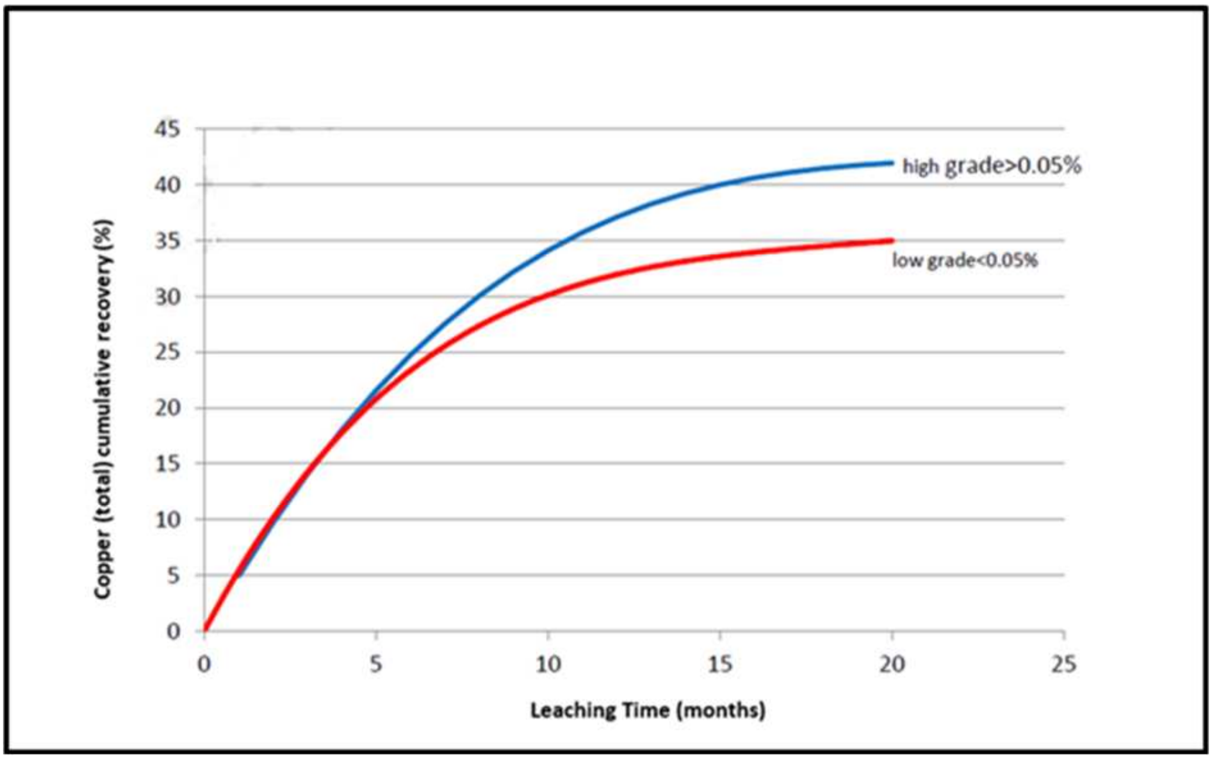


Figure 7.2: Leach Design Recovery Curves

The model leaching curves represent the leaching rate of the whole of the Western Dumps area; however, there is significant variation of ore grade within the dumps ranging from a minimum of 0.028% to a maximum of 0.178%.

Leach recovery, kinetics and PLS grade are known to vary with ore grade, therefore the leach curves have been constructed to cater for the varying grades, with a recovery of 35% from ore grading less than 0.05% and a recovery of 42% from ore grading above 0.05%. Based upon these factors a leach recovery of about 30% could be expected within 10 months from the low-grade material and about 34% from the high grade. A further 10 months of leaching would be required in order to obtain the final recovery of 35% for low grade and 42% for high grade ore, but since the final 10 months leach cycle would utilise the common rest-rinse leach practice, the actual time required to obtain the target leach recovery would be several months longer.

7.2.4 Summary of Testwork

Initial testing on material taken from the Western Dumps was performed by VNIITSvetmet using relatively small diameter columns. However, due to the smaller particle size (which are indicative but not representative of the in-situ size distribution of the dumps) of the material tested they do not give a true reflection of performance for the purpose of forecasting leach recoveries.

In later studies, column tests were undertaken in larger diameter columns at the Kounrad site. The objective was to produce a realistic model leaching curve which is applicable to the Western Dump materials. It is known, and expected, that this can only be a best approximation, based upon the data presently available. Two curves were produced, one for lower grade material (<0.05% TCu) with a final recovery of 35%, and a higher grade (>0.5% TCu) terminating at 42% total Cu recovery, both at 20 months. As a cross check, the historical performance of Dump 9/10 together with the VNIITSvetmet and Kounrad Dump 22-12 column leach test results were incorporated onto the same graphical plot by CAML. These show good correlation with the Design Curve up to a cumulative recovery level of about 20 to 25%.

7.3 Pilot Plant Trial (CAML)

7.3.1 Introduction

In August 2008, CAML commissioned a pilot scale SX-EW pilot plant that had an initial design output of 200kg per day of copper; in May 2009, this was subsequently expanded to 600kg per day. The facility was located at the No. 6 waste dump, with test leaching being undertaken on four "cells" located on Dump 6. Each cell had an area of 1000m^2 each being irrigated at any one time.

Since that time, barring minor stoppages, the plant had operated continuously through two winters (where temperatures have fallen as low as minus 35°C). On the 21st July 2010, it was determined that 196 tonnes of copper cathode, generally with a purity of 99.99% Cu, had been produced from the trial (four cells). This equated to a copper recovery of 50.2%.

In Q2 2011, the pilot plant was moved to the Western Dumps as part of evaluating the response of Dump 1a to leaching. During the trial, two cells were tested. In the first cell, the flux rate was found to be too high as observed by ponding on top of the cell. While testing the second cell, it was found that the solutions emanating at the base of the dumps were not being recovered at the expected locations. Following investigations, it was found that the underlying topography, which was not representative of the entire dumps, was the cause for this effect. Despite these challenges, a copper recovery approaching 50% was still achieved.

7.3.2 Pilot Plant Tests Results (Eastern Dump)

CAML selected four trial areas or "Cells" within oxide Dump 6 for the pilot trial. Each cell typically has a surface area of about 1,000m^2.

Leaching of the dump began in August 2008 and in September 2009 the copper recovery was determined for Cells 1 to 4.

The amount of copper within Cells 1 to 4 was estimated to be 390.4t while the amount copper extracted (based on copper cathode produced and pond and trench inventories) was 196t. The calculated copper recovery was therefore 50.2% over the period October 2008 to July 2010.

7.3.2.1 Pilot Plant Tests Results (Western Dumps)

The pilot plant facility was relocated to the Western Dumps and positioned on Dump 1 (at the foot of Dump 1a). Two trials were undertaken where Dump 1a was irrigated with an acidic solution.

In the initial trial, an area of 1,000m^3 was tested, some 57,377t of material was tested (at a dump height of 33.7m). The material contained 0.14Cu_{Total} (lower than that expected BGRIMM at 0.19% Cu_{Total}) which equates to some 80t of copper. Unfortunately, the rate of irrigation chosen was relatively high and resulted in ponding on top of the cell. After reviewing the data and with further operational experience, it was later found that the optimum irrigation rate was 3l/hr/m^2. Regardless, of ponding and lower than expected head grades, the material responded favourably to leaching with a leach recovery of 62.9% being obtained after 169 days as shown in Figure 7.3.

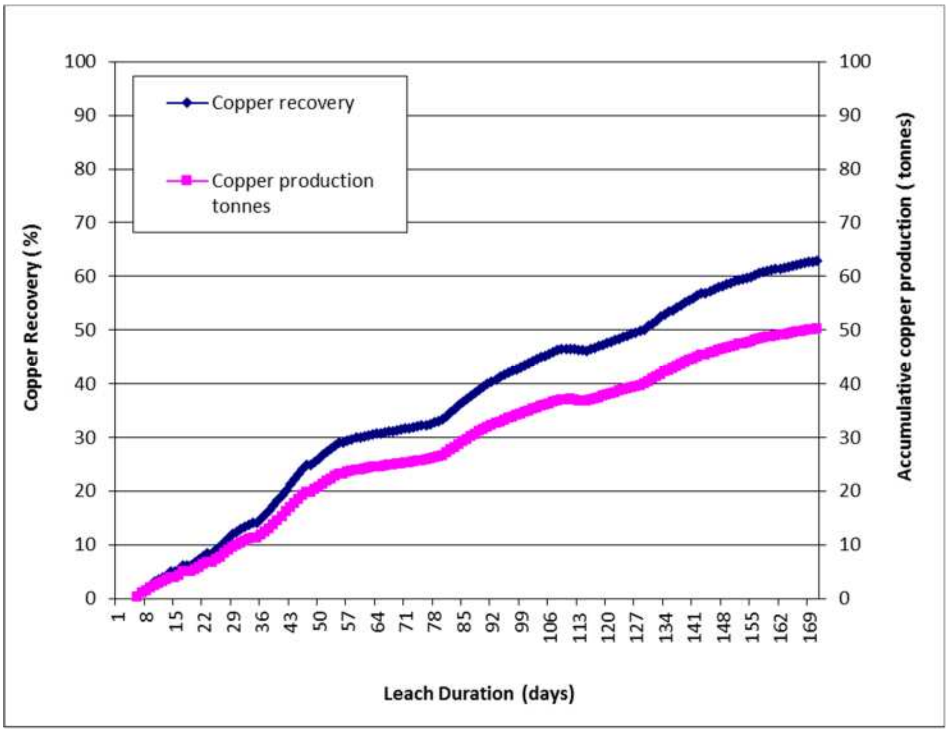


Figure 7.3: Western Dumps Pilot Plant Trial on Dump 1a (at a Head Grade of 0.139% Cu_{Total})

Given the difficulty in estimating the grade of the dump and given the calculation of recovery is particularly sensitive to the head grade (particularly at such a low value), both CAML and WAI note the difficulty in determining an accurate recovery figure. Regardless, the trial indicated the successful leaching of Dump 1a.

In 2012, an attempt was made to re-trial Dump 1a, in doing so, a new leach cell was selected (positioned in the near vicinity to the initial cell). While testing the second cell, it was found that the solutions emanating at the base of the dumps were not being recovered at the expected locations. Following investigations, it was found that the underlying topography, which was not representative of the entire dumps, was the cause of this effect. The trial on the second cell was therefore abandoned in September 2012. Further tests were curtailed as commercial operation at the East was established and the trial was using some 20-operational staff and required the very frequent transportation of water by truck to the site as the water pipeline had not been constructed at the time.

7.4 Processing Facility

7.4.1 Introduction

In 2010, BGRIMM developed a detailed leaching schedule and designed a plant capable of treating a range of flow rates and solution grades to produce 10ktpa of copper cathodes at a minimum 99.99% quality. The design has taken the extremes of climate into consideration, especially the operability through the winter period. The construction of the plant was completed in March 2012 and a capital expenditure of some US$39M, 15% below that budgeted.

The first copper was produced at the end of April 2012 and since then the plant has successfully operated continuously, including the five full seasons of winter.

Stage 1 of a two stage expansion project was undertaken in May 2015, where the production capacity was increased to 50t of copper cathode per day. Between start-up and June 2017, some 61kt of copper cathode cathode (LME Grade A, M00K) has been produced.

The expansion project was undertaken in two stages:

- **Stage 1 (Enhancing Existing Facility)**
  - An additional two boilers were installed to increase the overall heating capacity to 14MWh. This expansion allowed the PLS flows to be increased by 25% during winter;
  - The capacity of the SX-EW circuit was increased by installing a 4th settler unit.
- **Stage 2: (Developing the Western Dumps)**
  - The construction of 24km transfer pipelines for PLS and raffinate;
  - A 12km overhead power line and substation;
  - Intercept trenches and ponds;
  - Pumping stations;
  - A 24km water pipe line from Lake Balkhash for requirement of additional water; and
  - A 8.4MWh boiler house.

Stage 2 was completed in November 2016 and marked the completion of all the significant capital expenditure at Kounrad. The Western Dumps are expected to provide more than 15 years of production, recovering approximately 170kt of copper.

7.4.2 Flowsheet

7.4.2.1 Introduction

The process design is based upon the leaching of the Kounrad dumps with sulphuric acid solution at pH 1.2 in order to dissolve the copper mineralisation. The Pregnant Leach Solution (PLS) is collected at the base of the dumps by an HDPE lined interceptor trench and pumped to a series of holding ponds.

From these ponds, the PLS is treated by the solvent extraction and electro-winning plant, located south of the Eastern Dumps. PLS solutions from the Western Dumps are pumped to the plant as shown in Photo 4.1.

7.4.2.2 Solution Collection

For collection of the Pregnant Leach Solution draining from the dumps, the same technique is used at both the Eastern and Western Dumps. In both locations, a collection interceptor trench is excavated at the toe of the dump. The collection trench for the Initial Leaching Area (ILA) on the Western Dumps is shown in Photo 7.2.

Photo 7.2: PLS Collection Trench for ILA at the Western Dumps

The collection trench on the Western Dumps extends 3,000m in readiness for the capture of PLS when leaching begins on Dump 16 and 22. The trenches are typically 3.5m deep and 7m wide and are all HDPE lined. At both the Eastern and Western Dumps the PLS is pumped into separate PLS ponds, for instance the PLS pond on the Western Dumps is shown in Photo 7.3.

Photo 7.3: Western Dumps Collection Ponds, Boiler Houses and Pump Stations

Both sites also have irrigation solution ponds for the storage of acidic solutions (raffinate) generated from the SX-EW Plant. The PLS from the Western Dumps is pumped to the eastern SX-EW Plant while the raffinate is pumped through a separate pipeline back to the western irrigation solution pond.

The irrigation solution (raffinate) is currently pumped to Dump 22 (height of 40m) where an area has been designated for initial leaching (known as the Initial Leaching Area). Dump 5 is currently being irrigated on the Eastern Dumps. In both cases, the raffinate is distributed through an irrigation dripper network at a rate of some 2.5-3 $l/m^2/h$. The raffinate percolates through the dumps, dissolving acid soluble copper and then flows into solution collection trench.

7.4.2.3 Solvent Extraction

The solvent extraction plant was commissioned in 2012, and its PLS treatment capacity was increased to $1200m^3/hr$ as part of the Stage 1 Expansion. PLS, received from both the Western Dumps and Eastern Dumps, will be delivered into the mixing pond (primary emergency pond), and then pumped to the PLS ponds (primary PLS sand pond, PLS pond and raffinate pond together). From here, the PLS is pumped to the SX section by two pipelines; the existing primary line and the new second line.

The circuit consists of six mixer-settler tanks complete with ixer boxes having a dimension of 2.8 x 2.8 x 3.4m and the settlers with dimensions of 20.0 x 13.0 x 12.0m ($260m^2$). The settlers are constructed with appropriate off-takes and valves to allow the volume of PLS passing through the circuit to be modified as required. This allows the process to be run in a number of circuit variants in order to optimise flow rates and extraction efficiencies.

The circuit is designed for a rich electrolyte flow rate of $180m^3/h$.

7.4.2.4 Electro-winning

The rich electrolyte from the SX section is heated to a minimum of 35°C, via heat exchangers, and is then pumped to the first stage (EW1) consisting of 24 EW cells to produce copper cathode. The lean electrolyte is then pumped to the second stage (EW2) consisting of 50 EW cells to produce copper cathode.

7.4.2.5 Boiler House

The original circuit consisted of three boiler units and this was later expanded to five units in October 2014 to give a total capacity of 14MWh.

7.4.3 Metallurgical Performance

7.4.3.1 General

The Eastern Dumps were targeted for the first phase of copper production for the project and will be operated for a further 11 years with copper production diminishing in each successive year, and post 2023 production will be very minimal. The exploitation of the Western Dump will be completed in 17 years' time (2033).

7.4.3.2 Eastern Dumps

The Plant received leach solutions emanating from the Eastern Dumps with 60,048t of copper cathode being recovered up until year-end 2016. copper cathode

The status of the leach pads, as of April 2017, is shown in Figure 7.4.

Dumps 6, 7 and 9-10 have been "officially" depleted, although intermittent leaching still continues due to solution grades being higher than 1gpl when under irrigation. At the Eastern Dumps, Dump 5 is being irrigated with areas set aside for winter leaching for 2017 and 2018. Dump 2 is scheduled for leaching in 2018.

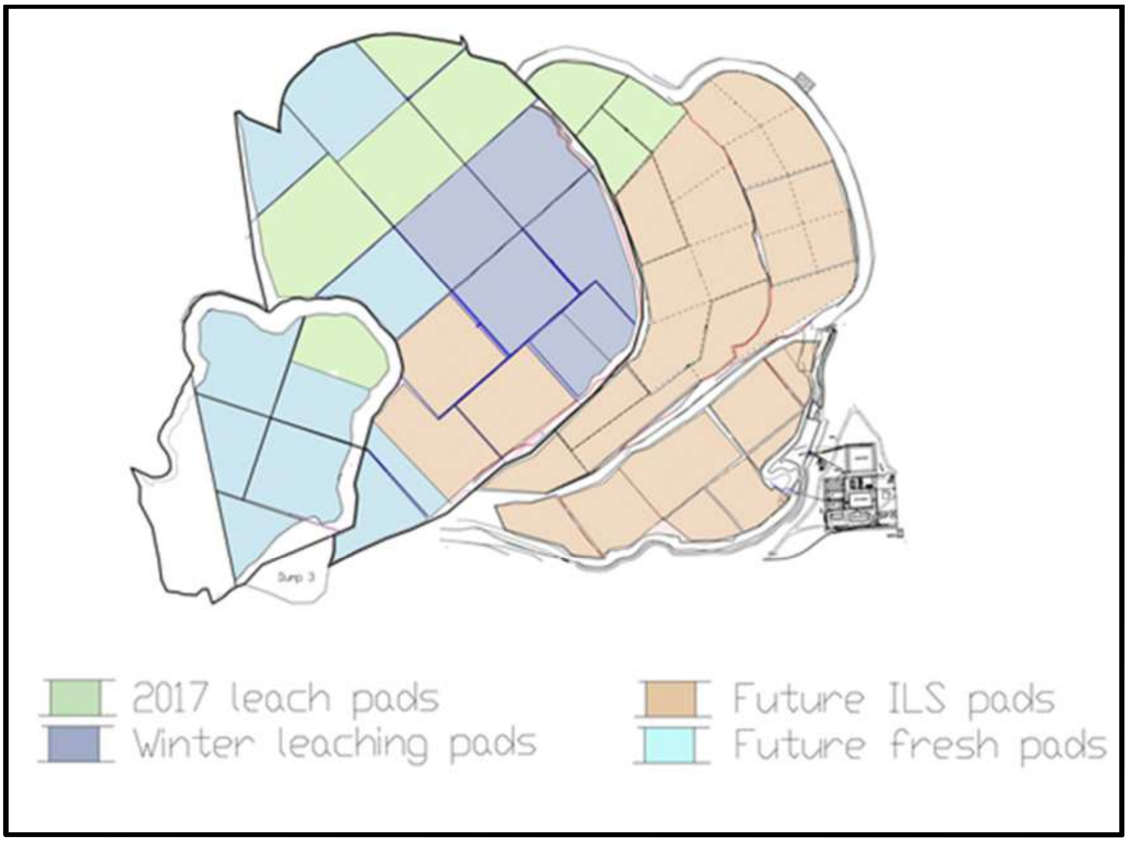


Figure 7.4: Status of Leaching at Eastern Dump (as of April 2017)

The production data, as of April 2017, is summarised in Table 7.4.

Table 7.4: Historical Production Data for Eastern Dump (as of April 2017)

Dump No.	Material, kt	Grade, %	Leached Copper Recovered, t	Leachable Copper Remaining*, t	Target Recovery*, %	April 2017 Recovery*, %
6	11,364	0.129	7,227	250	51	49.3
7	27,606	0.156	20,728	1,235	51	48.1
9-10	12,214	0.192	11,840	119	51	50.5
5	70,061	0.095	19,151	8,803	42	28.8
2	32,435	0.077	0	10,490	42	0.0
Total	153,679	0.130	58,946	20,897	46	34.1
*Based on copper total						

By the end of April 2017, some 58,946t of copper had been recovered from the Eastern Dumps with a further 20,897t yet to be recovered.

7.4.3.3 Western Dumps

Leaching commenced in Q2 2017 on parts of Dumps 16 and 22 (referred to as the Initial Leaching Area or ILA). The ILA has a surface area of 109ha and contains some 96.3Mt of material at a grade of 0.095% Cu. The total amount of recoverable copper expected from the ILA is 36,872t.

As of the end of June 2017, some 1,300t of copper have been leached with a remaining recoverable amount of circa 36kt of copper. Of the total copper estimated in Dumps 16 and 22 (87,790t), it is expected that 42% will be recoverable to leaching.

The leaching schedule for the ILA leach pads is shown in Figure 7.5 and the overall production schedule for the Western Dumps is shown in Table 7.5.

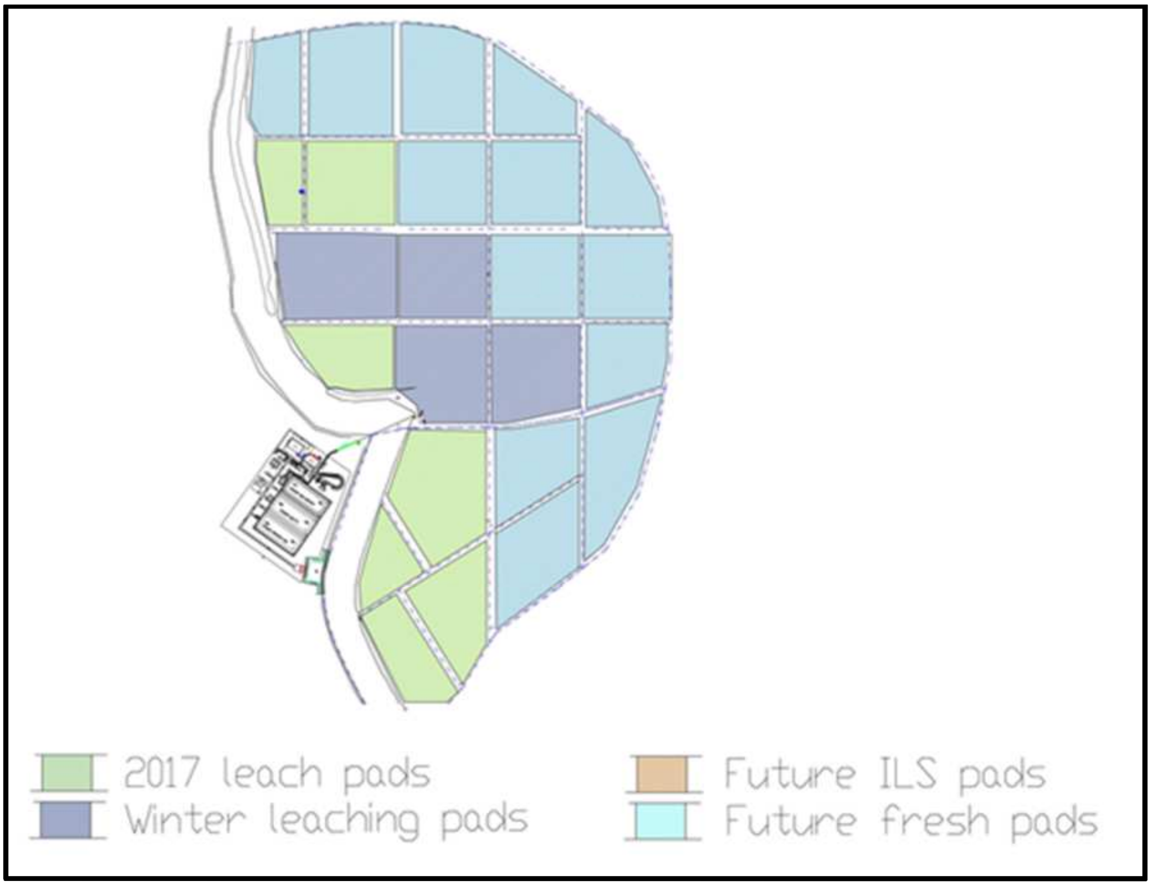


Figure 7.5: Plan of the Initial Leaching Area for the Western Dumps

The in-situ copper grade of the Western Dumps is slightly lower than the Eastern Dumps, and is dominated by a mixture of oxide and sulphide material. These two factors are taken in to account for the selection of the expected copper recovery from these dumps. Over the life of operation for the Western Dumps, it is expected that some 173,173t of copper will be recovered.

Table 7.5: Planned Production Schedule for the Western Dumps					
Dump No.	**Material, kt**	**Grade, %**	**Copper Recovered, t**	**Copper Remaining, t**	**Target Recovery, %**
1	1,136	0.039	0	140	35
1a	49,984	0.178	0	37,380	42
13	11,139	0.028	0	1,085	35
15	70,247	0.063	0	18,606	42
16	206,608	0.084	0	72,912	42
20	20,888	0.036	0	2,625	35
21	16,883	0.176	0	12,474	42
21a	5,023	0.141	0	2,982	42
22	53,986	0.106	0	24,024	42
Northern 1	2,393	0.049	0	420	35
Northern 2	3,151	0.048	0	525	35
Total	4,414,6	0.086	0	173,173	

It should be noted that of the copper recovered to the PLS, there will be copper recovery inefficiencies during the downstream processing at the SX-EW Plant. CAML has applied a "loss factor" of 0.5% to the solution recovery rates of copper in SX and EW sections and this is taken into account in the production schedules. Therefore, a leach recovery of 42% equates to an overall recovery (to cathode) of 41.5%.

7.4.4 Production Schedule

Currently CAML expects to produce between 13-14ktpa copper cathode in 2017 and plans to produce between 11.5 -14ktpa copper cathode from 2017 to 2031.

CAML has produced 61kt copper cathode so far, with a further 194kt expected to be leached from all the dumps through to 2033 (when copper cathode production decreases).

7.4.5 Operating Costs

A summary of the forecasted LoM operating costs is shown in Table 7.6.

Table 7.6: Summary of Processing Operating Cost for the Project LoM		
Item	**Cost**	
	US$M	**$/lb**
Reagents	23.8	0.05
Power	35.0	0.08
Payroll	58.1	0.13
Materials*	25.2	0.06
Consulting & Other	25.8	0.06
Cost of Production of cathodes	167.8	**0.38**
Distribution & Selling	38.4	0.09
Local G&A (excl all Taxes)	29.2	0.07
Total	235.4	**0.54**
**Note: Includes fuel, consumables and maintenance*		

In the final year of production (2033), the copper produced from the operation significantly decreases to 2,299t of copper cathode (including additional 137t added to the last year of operations from the project opening balance).

WAI believes that the operating cost is realistic at average LOM of US$0.38 per pound of copper produced.

7.4.5.1 Labour

The total compliment of direct site management and operating labour is 340. This number of staff is in accordance with all the local Kazakhstan labour regulations regarding working hours and also allows provision for sickness and holiday relief.

The forecasted annual cost for labour is US$3.52M (for the period of 2017 – 2032) and includes management at the Kounrad and Balkhash sites.

7.4.5.2 Power, Coal and Water

The estimated costs of power, coal and water is shown in Table 7.7.

Table 7.7: Summary of Electricity and Coal Costs (2017)

Item	US$/t Cu	US$c./lb Cu
Electricity (SX-EW)	121.4	5.51
Electricity (Balkhash water pipeline)	3.5	0.16
Electricity (Eastern Dumps)	19.3	0.87
Electricity (Western Dumps)	12.6	0.57
Electricity (Total)	**156.7**	**7.11**
Coal	**18.7**	**0.85**

The expected annual energy consumption for an output of 13.67ktpa of copper cathode production (2017) has been calculated as 46.8GWh or 3,424kWh/t Cu produced. The current price paid for power by CAML is US$0.0458 per kWh. On this basis, the total power cost for 2017 will be US$156.7 per tonne of copper cathode or US$2.142M.

Provision has been made for heating the incoming PLS during the winter months to a temperature of 10-11°C. The consumption of coal increases each year as the volumes of solutions transported from the Western Dumps to the SX-EX Plant increases. From 2017 to 2031 the coal consumption is expected to increase from 1.097t to 1.304t for each tonne of copper cathode produced. The unit price of coal is US$17.1 per tonne.

7.4.5.3 Reagents

The cost of reagents used has been based upon their projected consumption rate and the unit price delivered to site. The summary of reagent costs is shown in the Table 7.8.

Table 7.8: Summary of Reagent Costs

Item	kg/t Cu	Consumption (t)	Unit Cost (US$/t)	Annual Cost (US$)
Escaid	28.41	388	1,320	512,619
LIX-984	4.47	61	9,760	596,280
Cobalt	0.40	5	8,590	46,967
Guar/Vecosol	0.20	3	2,180	5,959
Acid East & West	362.22	4,951	52	259,395
Genesys L.F.	0.02	0	10,407	3,161
Clay	1.11	15	2,500	37,969
FC100	0.18	2	46,014	112,074
TOTAL				**1,574,424**

The total cost of all the necessary reagents is US$1.574M with the bulk of this being incurred in Escaid and LIX (c. 60%).

7.4.6 Capital Costs (Sustaining)

The annual sustaining capital expenditure is US$2M (for the full production capacity years), with overall LOM cost of US$31.2M.

7.5 Conclusions

The Kounrad flowsheet uses in-situ acid leaching, where acidic solutions are irrigated on top of individual blocks within the dumps in order to recover soluble copper. The copper solutions flowing from the base of the dumps are collected and pumped to a solvent extraction and electro-winning (SX-EW) plant, which is located at the Eastern Dumps. The plant uses conventional technologies and industrial practices.

Following the 2012 commissioning of the SX-EW Plant, in 2013, BGRIMM completed a Feasibility Study (FS) as part of the planned expansion project. BGRIMM detailed the leaching schedule and designed a plant capable of treating a range of flow rates and solution grades to produce up to 50tpd of copper cathode at 99.99% quality. The plant design has taken the extremes of climate into consideration, especially the operability through the winter period. Through metallurgical testing, pilot scale trails and from full scale operation, CAML has developed a production model for an average recovery of 11,665t of copper cathode (99.99% Cu) per year over the life of the operation.

Subsequently, the circuit was later expanded in 2015 in readiness for the treatment of the Western Dumps. The expansion later saw the installation of solution ponds, pump and boiler houses at the Western Dumps together with two overland pipelines, which carries the PLS and raffinate between the western facility and the SX-EW plant at the Eastern Dump.

In addition, the site is now supplied with water from the nearby Lake Balkhash via an overland pipeline. CAML started leaching the Western Dumps in Q2 2017, with the pregnant solutions being collected and pumped some 12km to the SX-EW Plant located at the Eastern Dumps. All of these units of operation were seen installed during WAI's site visit.

The works completed by the pilot scale SX-EW trial undertaken at the Eastern Dumps (yielding a recovery of 50.2%) has been confirmed in practice over the last five years, where a leach recovery of 51% has been adopted for Dumps 6,7,9 and 10 while a leach recovery level of 42% was adopted for Dumps 2 and 5.

In addition, a pilot scale trial was also performed at the Western Dumps in 2012. Unfortunately, some operational issues were encountered which resulted in the trials lasting for a shorter duration than when testing the Eastern Dumps.

Although the trial had not delivered the same quality of data required for the development of the Western Dumps, it has however shown that the copper is recoverable via acid leaching with a recovery of >50% being obtained.

The required design data for the plant expansion, was subsequently obtained from undertaking large diameter column tests at site, this was also used to develop a kinetic model for leaching for the Western Dumps. It is known, and expected, that this can only be a best approximation, based upon the data presently available. Two curves were produced for the Western Dumps, the low grade (<0.05% Cu_{Total}) and high grade (>0.5% Cu_{Total}) material, where final recoveries of 35%, and 42% respectively were predicted after 20 months of leaching.

The Western Dumps, being more refractory to acid leaching (due to the presence of sulphide material), are expected to respond less favourably to leaching with leach recoveries ranging from 35 (sulphide material) and 42% (mixed material) being adopted. However, It is entirely feasible (and expected) that material will yield higher recoveries due to the natural biological oxidation of the copper sulphide minerals.

Ideally, the pilot plant trial would have run for a longer period in order to acquire additional data and operational understanding, however, during the recent H1 2017 operations, the reality of producing saleable copper cathode from the Western Dumps has been demonstrated.

Once the majority of the copper is being generated from the Western Dumps, the annual production rate is expected to be some 12,000t copper cathode. This is higher than that scheduled in BGRIMM's FS of 2013 where a production rate of 10,400t copper cathode was scheduled. CAML based its most recent production model from the accumulation of actual operational experience gained since the issue of the 2013 FS.
In addition, the selected recoveries used in the original (2012) financial model are considered conservative having later obtained better than expected actual recoveries from the Eastern Dumps over the last five years.

The revised leach model, as supported by Dr Phil Crane (external hydrometallurgical expert), is now believed to be more accurate. Of course, due to the nature of the leaching Kounrad Project, it is not possible to have complete confidence in likely performance, but WAI believes that the assumptions made are valid, and are as robust as they can be, with present data and five years of actual operational experience.

Based on CAML's most recent financial model, the Eastern Dumps is expected to recover a further 20,897t (79,843t originally available) of copper during its remaining operational life (11 years).

Successful leaching of the Western Dumps recently commenced in Q2 2017. Over the operational life of the Western Dumps, it is expected that some 173,173t of copper will be recovered. This is significantly higher than the copper that will be recovered from the Eastern Dump because the Western Dumps contains significantly more material.

The quantity of material remaining in the dumps (most notably the Western Dumps), the copper content, and its amenability to leaching, are all positive for the future success of the project. In addition, given the five years operational experience gained from running the Project at full production since 2012, and the high calibre of the management team and industrial specialists involved on the project, WAI considers that this combination, allows for the best opportunity for the Kounrad Project to continue with its ongoing success.

8 ENVIRONMENT & SOCIAL, H&S

8.1 Introduction

This section reviews the environmental and social performance of the Kounrad operations and is based on desk top review of documentation provided by Kounrad and discussions with CAML's Corporate Social Responsibility Director.

This chapter aims to highlight key issues and any red flags/fatal flaws associated with the Environmental Health and Safety ("EHS") aspects of the Project and their associated risk and should not be considered as a full Technical Due Diligence.

8.2 Environmental Permitting System

The Project is required to comply with State Laws for Nature Protection, which stipulate a process of impact assessment for all Projects. Baseline data are collected by ecological contractors employed to undertake the OVOS procedure (Kazakh equivalent of Environmental and Social Impact Assessment (ESIA)). Maximum Allowable Concentrations (MACs) and Maximum Allowable Emissions (MAEs) are set by the State for operations, calculated for the Project based information collected for the OVOS. Discharge permits with stated limits are then issued for the Project, usually on a three-year basis. An Ecological Passport for the Project is usually also compiled and State Permits for Nature Management are issued.

8.3 Environmental Report Status

CAML has commissioned the State approved independent ecological contractors "Ecolimit", based in Almaty, to satisfy all state requirements as detailed above.

An Initial Environmental Assessment and Audit for the Solvent Extraction – Electro-winning (SX-EW) Project was prepared by Sary Kazna in 2006, using existing reference information. No field surveys were undertaken as part of this study.

OVOS reports were produced by Ecolimit in 2008 for the pilot-scale leaching operations and the pilot plant (with a separate OVOS for each area). Baseline data were collected for atmosphere, soil, surface and groundwater, flora and fauna, cultural heritage and socioeconomic information. It was reported to WAI that apart from technical project information, all data was collected via field survey campaigns.

Baseline data has been captured in a 2008 OVOS for the pilot plant operations with further OVOS report in 2010 and 2014.

As part of the OVOS process, public hearings were held, and minutes of a hearing held in Balkhash, attended by agency representatives and inhabitants in Kounrad village were reviewed.

WAI considers that the 2014 OVOS for the Kounrad operations appears to comprehensively review baseline conditions at the site, and has been prepared in line with Kazakh legislative requirements.

With regard to progress in addressing previous WAI recommendations, concerns reported in WAI previous reports (dated 2006, 2008 and 2011) have been addressed. CAML has employed a CSR Director to oversee the environmental and social and health and safety team and address recommendations for international compliance and a comprehensive suite of management plans and systems have been developed for the Project.

8.4 Environmental Liability

Contracts between the Ministry of Natural Resources, Sary Kazna and Kazakhmys state that since the Kounrad site has already been disturbed and contaminated by natural leaching, previous operations of Balkhashmed, and other local industry, the current owners are only responsible for additional pollution which may occur in the course of the proposed operations (not historic contamination) and are required not to worsen existing conditions.

Ecolimit performed a baseline assessment of the site, including baseline monitoring in 2007, to provide an environmental benchmark, including soil, surface and groundwater quality. The conceptual closure plan for the dumps includes the removal of infrastructure and some dump flushing with water, but no re-vegetation or re-profiling. Six months of post closure monitoring is envisaged. WAI is satisfied that historical liability is not the responsibility of CAML.

Further closure measures will be required to ensure that the dumps do not pose an ongoing environmental liability which may include some dump detoxification, post closure monitoring, and ideally some re-profiling. CAML is aware this will be required and is in the process of actioning a new closure plan.

8.5 Land Ownership

Site tenure is limited by the JV agreement entered into by CAML and the leaching operations are managed by their local subsidiary Sary Kazna, with the large-scale plant operations operated by Kounrad Copper Company, a 100% owned subsidiary of CAML.

8.6 Description of Natural Environment

The climate in the Project area is typical of open semi-desert, characterised by extreme summer and winter temperatures. Vegetation growth with no frosts occurs for about 160 days from May to mid-September. Freezing depth, depending on soil type, is between 160 and 215cm. Rainfall is low. Air quality is reported to be generally good, but strong winds result in increased dust content from nearby abandoned mining operations. The nearest habitation is the local village of Kounrad, with a population of approximately 2,000, and the settlement of eastern Kounrad, with four dwellings.

8.7 Corporate EHS Management

8.7.1 Policies and Practice

The company currently employs an in-country CSR Director managing a team of 13 Safety Environment and Social staff, with all environmental legislative requirements being satisfied by Ecolimit, and site monitoring controlled as part of operations, with the company hydrogeologist being the responsible person. Ecolimit will continue as retained consultants for the life of the Project. There is currently an Environmental Management Plan (EMP) outlining some mitigation measures alongside specific environmental issues. For Health and Safety, tasks and responsibilities are described, and assigned to different team members. There are health and safety plans and procedures, and appropriate training is delivered. The company is required to report annually on environmental performance to State authorities.

A CAML CSR Director was appointed in 2010 to develop environmental policy, environmental targets and objectives to encourage continuous environmental improvement at operations, an Environmental Action Plan (EAP) and Environmental Management System (EMS).

8.7.2 Security

A fence and security control point is present at the entrance to the site, and site areas, such as the raffinate ponds are also fenced and danger/ warning signs are posted. Reagent storage and plant areas are also appropriately secured. Given the large dump areas, it is not considered possible to fence the whole site area.

WAI considers that current site security is adequate to restrict personnel access, and that hazardous areas have been made safe.

8.7.3 Fire Safety

Fire safety training is included within the CSR programme of training presentations and is delivered by the Chief Fire Department. CAML has a fully equipped fire team on site on a permanent basis with fire engine and firefighting equipment. There are State fire inspections on a regular basis, with no recent contraventions.

Moreover, a fire suppression system is installed in both the SX and EW sections of the processing plant.

8.7.4 Contingency Plans and Emergency Procedures

The company 2008 Health and Safety Plan included contingency plans and emergency procedures. Staff are given appropriate training to implement these plans, and awareness is also tested via drills.

Emergency response plans are reviewed regularly by department managers to ensure they meet site requirements and comply with both Kazakh law and international best practice with the next revision due this year.

8.7.5 Staff Training and Supervision

In line with Kazakh laws and standards, health and safety training programmes are delivered to company staff. Further environmental and social training is also provided for staff and contractors at Kounrad in compliance with international requirements.

8.8 Internal and External Stakeholder Dialogue

8.8.1 Internal Employee Consultation Practice

An internal and external communication plan is in operation at Kounrad, last reviewed in July 2016. This plan includes an operating complaints and grievance mechanism for staff. Training is also used as means of communication.

8.8.2 External Stakeholder Dialogue

Under Kazakh law, there is no on-going requirement for public consultation, after the OVOS process is completed, however, CAML developed a Stakeholder Engagement Plan as part of their CSR procedures in August 2014 last updated in 2016. A complaints and grievance management system is in operation at Kounrad and records are maintained in a grievance register that is monitored by the CSR department.

It is reported that the local communities are very positive about the leaching operations and associated job opportunities. As part of the Social Management system, external communications and expectation management and commitment procedures have been developed for the Project.

CAML has made large improvements in the social management of the Project since 2011, and WAI believes the CSR team have developed robust procedures to manage this aspect of the Project in line with international best practice.

8.9 Environmental Monitoring and Compliance

8.9.1 Internal Monitoring

No non-compliance issues were reported to WAI. Monitoring of groundwater is performed and analysed internally at the company laboratory and external monitoring of the atmosphere, surface and groundwater, soils, vegetation and fauna is carried out by Ecolimit.

The company hydrogeologist is responsible for groundwater monitoring which occurs on a continual basis. There are permanent ground level loggers at strategic locations to record groundwater level, depth of borehole and water temperature, with values compiled in a spreadsheet. CAML has purchased a MonitorPro which provides a comprehensive database for all data.

Groundwater level measurements are taken three times per month, and water temperature – once a month by an external lab.

Additionally, monitoring occurs to assess irrigation/leaching influence via six boreholes near the interceptor trench by the dumps. Additionally, there will be somewhere in the region of 300 boreholes in three lines around the edge by the end of 2017 used to monitor any signs of seepage from the dumps. Water is sampled once per week and is tested for Cu, pH, Fe total and Cl. The catchment area for the site covers approximately 400km^2.

Given the local geology, results indicate a low filtration coefficient, and slow groundwater flow, with precipitation being the main inflow. The boreholes are cased, with a filter located just below the groundwater table. This is considered to allow water in and allow both surface and deeper flows to be monitored.

8.9.2 External Monitoring

External monitoring is performed by Ecolimit and other licensed contractors and results area stated in the monthly monitoring report. It is understood that there have been non-compliances reported that are thought to be based on background levels which are exceeded due to historic contamination at the site. There were three inspections in 2016 from which a number of non-compliances were reported although none were reported as particularly onerous. Non-compliance is assessed based on an average of all contaminants and whether they exceed, or fall below the thresholds. Exceedances consider whether the sum total of the average exceeds an order of magnitude threshold rather than reviewing contaminants on an individual basis.

Following previous audit recommendations, the groundwater model was updated in 2014 to allow for greater understanding of the potential for dump leaching and ensure mitigation actions could be implemented.

Based on the data available it was shown that the waste at Kounrad is prone to acid generation and that there is some legacy of metalliferous contamination of groundwater. Drainage and process manholes are routinely monitored.

8.10 Inputs, Products and Waste Streams

8.10.1 Raw Materials – Consumption and Source

Various reagents are used in the SX-EW process. Sulphuric acid for leaching is sourced from the local smelter at Balkhash, and the limited quantity of diesel currently used, in addition to Escaid 110 imported from Belgium for the process, is also obtained locally. LIX, the organic component in the process is stored in a bunded area, and is imported from Ireland. Cobalt sulphate is stored as a powder in bags in a locked container. Tyres are obtained from a company in Karaganda.

Audits of raw materials consumed, handled or stocked on site are performed to assess usage and look for options to recycle, or reduce consumption where possible.

8.10.1.1 Water Consumption and Source

CAML sources water by an installed pipeline from Lake Balkhash. Water abstraction levels are measured and reported monthly, April 2017 recorded a water consumption figure of 33,678m^3 from the mine shaft at East Kounrad and potable water abstraction.

8.10.2 Energy Consumption and Sourcing

Power supply to the Project is via an overhead 35kV line to a substation where it is stepped down to 10kV. A coal fired boiler is also used at the site to heat buildings during the winter and coal is sourced locally and stored at site.

An audit of energy use and supply options has been undertaken for the Project and monthly CSR Reporting includes Energy consumption figures, greenhouse gas emissions from onsite coal burning and emissions from diesel and gasoline.

Total emissions for Kounrad in April 2017 is recorded as 8,741.32 tonnes of CO_2 equivalent (January to April 2017) according the Kazakhstan method. The requirements under Kazakh legislation include emissions limits of 20,000 tonnes CO_2 equivalent. CO_2 figures are reported using this Kazakh method but are also reported these as per international method i.e. IFC calculation methodology.

8.10.3 Intermediate Products Arising

Waste dumps are leached in-situ and all intermediate wastes (such as spent, or spilled raffinate) recycled back into this process.

Crud, the solid waste residue from the hydrometallurgical process in the SX section, is removed and placed back on the dump. Approximately 1tpa is expected to be produced. Slag and dust from the coal-fired boiler, recovered via de-dusting cyclones and slag removal system, is disposed of in the Kounrad municipal landfill facility. Approximately 70 tonnes were produced in April 2017 to be transferred to the landfill in May. However, much of the ash that is produced is taken by the community to make bricks for construction, therefore very little is actually transferred to landfill.

8.10.4 Effluent Volume and Quantity

A septic tank for sewage treatment is currently present at the site, which is periodically emptied by a local contractor (Balkash Su). Waste solutions, or spills in the processing plant are collected and recycled back to the raffinate pond, which is fully lined. The processing circuit is reported to have zero liquid discharge to the environment.

WAI considers that the zero-discharge policy is sound as CAML has modelled and assessed potential losses to groundwater (JH Groundwater) which showed a very low percentage of loss and have in place a series of mitigation measures in the event of contamination. In addition to the collection trench, a first line of boreholes acts as technical abstraction boreholes which feed any water back into the trench.

8.10.5 Air Emissions

It is considered that the main potential sources of air pollution are windblown dust particles from leach piles and drops of raffinate from the spraying of leach piles due to commence summer 2017. Any vehicle movement on site will also generate dusts and watering of roads is undertaken during summer months. The SX-EW has virtually no gaseous emissions other than in the EW circuit where the release of oxygen at the anodes can result in the production of a fine acid mist. The cells are covered, and small PVC balls are added to each unit to reduce the problem and CAML add FC1100 solution into the system which reduces gaseous emissions.

Emissions also result from the burning of coal for the boiler system, however, these emissions currently fall below emissions limits and no exceedances have been reported.

Noise generation in the hydrometallurgical process is low, averaging 65dB. Additionally, the local community has grown up around mining and given the nature of the proposed operations, it is not expected that noise generation would be an issue. Workers are provided with appropriate Personal Protective Equipment (PPE).

8.10.6 Solid Wastes

Tyres are disposed of by a licenced Karaganda based company. Domestic waste is sent to the local landfill. Materials packaging and waste reagents are reported to be sorted into recyclable and non-recyclable materials, with any non-recyclable materials being taken by licensed contractor to licensed disposal sites.

8.11 Handling and Storage

As part of the process circuit, PLS, leachate and raffinate are collected in trenches or ponds lined with welded HDPE liners, on compacted bases, with sufficient capacity to deal with snow melt, or a full plant failure. An 'emergency' pond is also available for use. ESCAID, a reagent in the SX-EW process is stored in two tanks with a volume of $75m^3$ each. The tanks are placed in a concrete bund of respective volume in case of leakage. The concrete bund is currently being covered with viniplast. LIX, an organic process reagent is stored in intermediate bulk containers ("IBC") at the commodities and materials storage area and covered with textile. Plans have been developed for installation of a concrete pad and shed within the next month.

A special storage facility, in the form of a bunded cage, within a special storage container, is used for sulphuric acid, which has automatic monitoring of levels. There is a plan in place to cover this area in Viniplast. The limited amount of diesel used on site is stored in a fuel tank truck with the capacity of 6.5m^3, the maximum volume of diesel delivered on site is 3m^3, with diesel deliveries 2-3 times per week.

Cobalt sulphate and guar, also used in the process, are stored in plastic bags in the reagent warehouse. A special storage area for coal for the boiler is in operation. PPE was worn by all personnel viewed during the site visit and generally appeared to be appropriate to the task being undertaken.

8.12 General Housekeeping Issues

Housekeeping was generally good at the site, and areas were tidy and well managed.

8.13 Soil, Surface and Groundwater Contamination

The dumps are leached in-situ, using sulphuric acid. Metal contamination is historically present in the groundwater, and in surface soils from former operations.

The dumps are unlined, and collection measures for PLS are via a lined interceptor trench, a retention berm, and pumping wells. Reports indicate that the majority of leached solution is intercepted by the interceptor trench, and that pumping wells downstream of the leach piles, operated at regular intervals, intercept all PLS and prevent further contamination of groundwater.

A revised groundwater conceptual model was developed in 2014 (JH Groundwater, May 2014) for the Eastern Dumps. This study included a risk assessment to groundwater from PLS migration. The study concluded that the revised model indicates PLS migration will occur down gradient of the dumps, and that the risk associated with dumps 5, 6 and 7 is classified as High, whilst areas adjacent to Dumps 9 and 10 is lower risk (Medium to High). Based on this, water monitoring and control is carefully managed at the site with the use of interceptor boreholes for containment. Review of the Western Dumps by SRK indicate a low risk of impact from this hydrogeological unit.

Latest monitoring results in April 2017, showed elevated concentrations of copper, chloride and sulphides in four of the manholes and low pH (3.3). However, these are considered to be associated with zones of historic contamination and not from the plant and its operations. The levels recorded are reportedly within expected concentrations for the spring period.

No major spills or losses of any PLS or chemicals used in the process have been recorded during the period the reporting covers.

CAML has instigated a number of studies to develop a detailed understanding of the issues associated with historic contamination. WAI believes this aspect of the operations is given sufficient consideration and the risks associated with potential contamination are well managed.

8.14 Current Environmental Expenditure

Ecolimit consultants are paid per invoice and any extra works are paid on an ad hoc basis. The internal monitoring budget is assessed by the CSR Director and reported monthly within the CSR reporting.

Total environmental capex/opex spending at Kounrad in April 2017, according to the latest monthly report available, was 530,566KZT which consisted of 375,000KZT capex costs for the purchase of containers for temporary storage of oily rags and filters at the garage, and opex spending of 155,566KZT for sampling on the ponds. Further environmental opex expenditure in April consisted of 560,002KZT at Sary Kazna, and further expenditure on hydrogeology which is reported in a separate budget.

8.15 Health and Safety Management and Compliance

A company Health and Safety Manager, is responsible for the health and safety management of site personnel, supported by two safety engineers and full-time medics. There is also a full time firefighting team on site with fire engine and equipment.

There is an approved Health and Safety Plan that was updated in March 2017, designed in compliance with Kazakh State requirements, and in line with international best practice which covers all aspects of H&S management. Formal accident statistics are collected and reported monthly in the CSR reporting. The Health and Safety Management plan is comprehensive and covers induction and training, emergency response plan, health and safety communications plan as well as community health and safety.

CAML operates a detailed risk assessment process, which has so far identified around 250 safety risks for which mitigation measures have been identified.

Site safety recording was updated in 2014 to include incidents and near misses as required by international best practice in excess of state requirements. WAI considers this, as well as the conscientious efforts by management has changed the culture with respect to health and safety and commends the team for the works undertaken.

All staff are provided with PPE appropriate to the tasks that they will be performing, and were wearing appropriate PPE during WAI's visit.
There is a clinic at Kounrad, and the company has a contract with them to deal with any accidents. There is also a first aid point and medics at the site. All staff has medical insurance, and access to medical facilities in Balkhash.

WAI considers that H&S management is good at the site, and that the company is operating in line with both Kazakh legislative requirements and international best practice.

8.16 Closure, Reclamation and Rehabilitation

Closure requirements are briefly mentioned in the OVOS, and it is noted that a closure fund and resources will be required. Whilst there are no formal legal requirements to set aside funding for closure, KCC has a formal closure plan and currently pays 48,075.7KZT into a separate account on a quarterly basis.

The closure fund, into which monies (generally 1% of capital expenditure) are invested is in compliance with Kazakhstan legal requirements. The fund is held externally to the company, and is a protected fund in the event of unplanned company closure. In 2013 a closure study for Sary Kazna was commissioned and submitted to the regulator, however to date the study has not been approved due to changes in legislation.

The current operational plan does not involve closure of the Eastern or Western Dumps for a number of years. Practice has shown after leaving (resting) the blocks for some time they can then leach again. The capacity for leaching will diminish over time, however this practice means the Company will likely return several times to each leached block until it is considered no longer productive.

Closure monies should be allocated in response to tasks outlined in the detailed closure plan, rather than on a per tonne mined basis, such that realistic amounts have accrued (not currently considered to be the case). WAI considers that the early estimates may be low, and would suggest developing a new estimate, based on actual closure tasks, and amending fund investment accordingly. CAML is aware a more detailed closure plan is required.

8.17 Community Development

The majority of the workforce comes from Balkhash, however where possible workers are taken from Kounrad located within a couple of kilometres from the site.

It was reported that people are very positive about the operation, and in general the Project enjoys support from the local community. A stakeholder engagement plan is in operation at the Project which includes a grievance mechanism, and any grievances received are reported in the Monthly CSR Reporting. On the basis of a sample of reports reviewed by WAI, no grievances were reported.

By law, the company is required to set aside funds, or perform social development activities as a requirement of the Sub Soil Contract. In addition to its central government obligations CAML also sets aside funds for social development focused on the neediest, and is in the process of registering its own foundation.

The latest CSR report showed stakeholder engagement, including the organisation of a festival dinner and congratulation of employees on the 5th anniversary of copper production held in April 2017.

WAI is impressed by the current social development initiatives being performed by the company, and its proactive attitude to working with local groups.

8.18 Conclusions and Recommendations

A considerable amount of work has been undertaken at Kounrad to bring the Project in line with international best practice on environmental, social and health and safety practices. A CSR committee which includes the Chairman and Directors of CAML regularly meets in London (quarterly) to review all CSR activities and a mechanism of continuous improvement is in action.

The legacy of mining at Kounrad since the 1930's has meant that the area is not only dominated by the waste dumps, but also the environmental impact of such a large-scale former open pit operation.

Environmental studies, assessments and procedures are being performed in line with State requirements. The Health and Safety aspects of the Project are well managed, and the company has developed and implemented some good social development initiatives, and these more recently have been structured into a Community Development Plan.

Groundwater monitoring at the Project has been significantly increased and a number of studies commissioned to gain a better understanding of the legacy contamination from waste dumps. Some of the boreholes indicate low pH, not attributable to sulphuric acid, however, this is not considered to be derived from the current operations.

It is recommended the closure plan is revisited to review compliance with changes in legislation, and international best practice, with realistic closure estimates, to include post-closure monitoring, site remediation and recultivation. CAML has recognised that this needs to be undertaken and has plans to review.

9 ECONOMIC ANALYSIS

WAI has performed a technical valuation of the Kounrad copper dump leach project using a Discounted Cash Flow (DCF) analysis. The operating costs and sustaining capital requirements were estimated by the Client based on the actual operational results and approved Company budgets. WAI finds these costs to be reasonable for the scale and the location of the operation.

Based on the financial analysis performed by WAI, the Kounrad Project generates a strongly positive Net Present Value (NPV) of US$355M at 10% discount rate (Base Case). As a part of a sensitivity analysis, NPVs based on various discount rates ranging between 8% and 20% were also calculated.

9.1 Life of Mine Production Schedule

Based on the current resource estimate, the remaining project life comprises 17 years, with annual copper production in a range between 13-14ktpa for 2017 to c.12ktpa by 2031, and full depletion in year 2033.

Overall "reserves" considered in the financial analysis were estimated at 198.5kt, from which 25.1kt are fed from Eastern Dumps and 173.2kt from the Western Dumps.

9.2 Capital Costs

As the Kounrad copper project is currently in operation, only minor capital investments are required to sustain operations. Thus, overall LOM capital cost was estimated at US$31.2M based on annual capex of US$2M for the period to 2031.

9.3 Depreciation

Salvage value from previous periods was included in the project depreciation as per data supplied by the Client.

The CAML depreciation policy is outlined below.

Property, plant and equipment Property, plant and equipment are stated at cost less accumulated depreciation and accumulated impairment losses. Cost comprises the aggregate amount paid and the fair value of any other consideration given to acquire the asset and includes costs directly attributable to making the asset capable of operating as intended.

The cost of the item also includes the cost of decommissioning any buildings or plant and equipment and making good the site, where a present obligation exists to undertake the restoration work.

Following receipt of the regulatory approvals required for the Kounrad Stage 2 Expansion in November 2015, management has extended the useful economic lives of certain property, plant and equipment. The original estimate of 10 years useful economic life has now been increased through to 2034 which represents the end of the subsoil user licence. IAS 8 Accounting Policies, Changes in Accounting Estimates and Errors accounts for a change in an assets useful economic life as a change in estimate and therefore the change is calculated prospectively to the depreciation of the asset at the date of change. This change in estimate was applied from 1 January 2016.

Depreciation is provided on all property, plant and equipment on a straight-line basis over its total expected useful life. As at 31 December 2016 the remaining useful lives were as follows:

- Construction in progress – not depreciated
- Plant and equipment – over 5 to 18 years
- Mining assets – over 2 to 18 years
- Motor vehicles – over 5 to 10 years
- Office equipment – over 2 to 10 years

Construction in progress is not depreciated until transferred to other classes of property, plant and equipment.

The carrying values of property, plant and equipment are reviewed for impairment if events or changes in circumstances indicate the carrying value may not be recoverable, and are written down immediately to their recoverable amount. Useful lives and residual values are reviewed annually and where adjustments are required, these are made prospectively.

An item of property, plant and equipment is derecognised upon disposal or when no future economic benefits are expected to arise from the continued use of the asset. Any gain or loss arising on de-recognition of the asset is included in the income statement.

9.4 Operating Costs and Cash Costs

Project cash costs have been provided for WAI to review and were based on the actual operations and costs of supplied materials, and WAI considers these reasonable.

The total life of mine cost and average life of mine C1 Cash Cost summary is shown in Table 9.1 below.

Table 9.1: Project Cash Costs (C1) Summary

C1 Cash Cost	US$ M	US$/lb
Reagents	24	0.05
Power	35	0.08
Payroll	58	0.13
Materials	25	0.06
Consulting & Other	26	0.06
Cost of Production of cathodes	168	**0.38**
Distribution & Selling	38	0.09
Local G&A (excl. all Taxes)	29	0.07
Total C1 costs	**235**	**0.54**

9.5 Metal prices

The final product from Kounrad project operations is a copper cathode. The base case of the project valuation was performed using the following price forecast (Table 9.2):

Table 9.2: Selected Project Copper Price Forecast*

	Units	2017E	2018E	2019E	2020E	2021E	LT
Cu Price	US$/t	5,401	5,512	5,908	6,393	6,415	6,283
	US$/lb	2.45	2.50	2.68	2.90	2.91	2.85

* Broker consensus copper price forecasts, supplied by Bloomberg

9.6 Selling and Distribution

As per CAML's current off-take agreement, the final product is distributed between up to 10% being allocated to domestic and at least 90% to international customers. The financial model considers distribution between 5 and 95%, respectively.

Domestic sales are discounted at 5.5% from LME price for the recovered content. International sales are through an international metal trader, which charges a fixed fee per tonne.

A summary of the LOM selling and distribution costs is provided below:

- International buyer's fees – US$34.9M;
- Payroll and related taxes – US$1M;
- Railway costs – US$2.4M;
- Other – US$0.04M; and
- **Total Selling Cost – US$38.4M**

9.7 Closure Cost

As per the data provided by the Client, a closure and reclamation cost of US$3M was allocated to the last year of the project life.

9.8 Taxation Regime and Royalty

In accordance with State legislation of the Republic of Kazakhstan the Mineral Extraction Tax (mining royalty) of 5.7% shall be paid based on the value of copper sold.

The rate of Corporate Income Tax at 20% was applied to net income, taking into account carried forward losses.

All other taxes are covered by the project general and administration costs.

9.9 Discounted Cash Flow Model

9.9.1 Currency and Exchange Rate

All project costs are expressed in United States Dollars (US$) and are based on 2017 market conditions with no provision carried in the estimate for inflation or escalation beyond this date. Currency costs have been converted to US$ at a Kazakhstan Tenge (KZT) exchange rate of 340.

9.9.2 Discount Rate

The purpose of the discount rate is to reflect both the time value of money and the investment risk of the project. Traditionally resources projects use higher than average discount rates, in the 10-15% range. According to the Note for mining and oil and gas companies listed on London Stock Exchange (AIM), a 10% discount rate should be applied to the cash flow to estimate net present value of the reserves.

Therefore, WAI has used 10% discount rate as a base case for financial results.

Additionally, a sensitivity analysis of NPVs was performed on various discount rates ranging between 8% and 20%.

9.9.3 Cash Flow Model Summary and Results

A post tax cash flow model has been constructed based on the WAI mining schedule and processing schedule prepared as of 2017.

The Base Case scenario indicates a positive post-tax NPV at a 10% discount rate of US$355M over 17 years, using an average copper price of US$2.72/lb (or US$5,986 per tonne). As the project is in operation, with no major capital investments being required, it generates positive cash flows.

All revenue and costs estimates are expressed in US Dollars. Cost inflation has not been applied to the cash flow model, operating or capital costs.

WAI understands that the selection of discount rate is subjective, and therefore in order to better demonstrate the project performance, NPVs at various discount rates were estimated. A summary of the key project indicators is given in Table 9.3.

Table 9.3: Project NPV Summary

NPV @ Discount Rate of 8%	US$ M	401
NPV @ Discount Rate of 10%	**US$ M**	**355**
NPV @ Discount Rate of 15%	US$ M	271
NPV @ Discount Rate of 20%	US$ M	215

9.10 Sensitivity Analysis

A sensitivity analysis was performed on several key parameters within the financial model to assess the impact of changes upon the Net Present Value of the project (at a 10% discount rate). These parameters are as follows:

- Copper Price;
- Project Production Costs; and
- Project Sustaining Capital Costs.

Each factor was increased and lowered between -25% and +25% to examine the sensitivity of the model to changing economic and operational conditions.

The results of this analysis are shown graphically in Figure 9.1 to Figure 9.4.

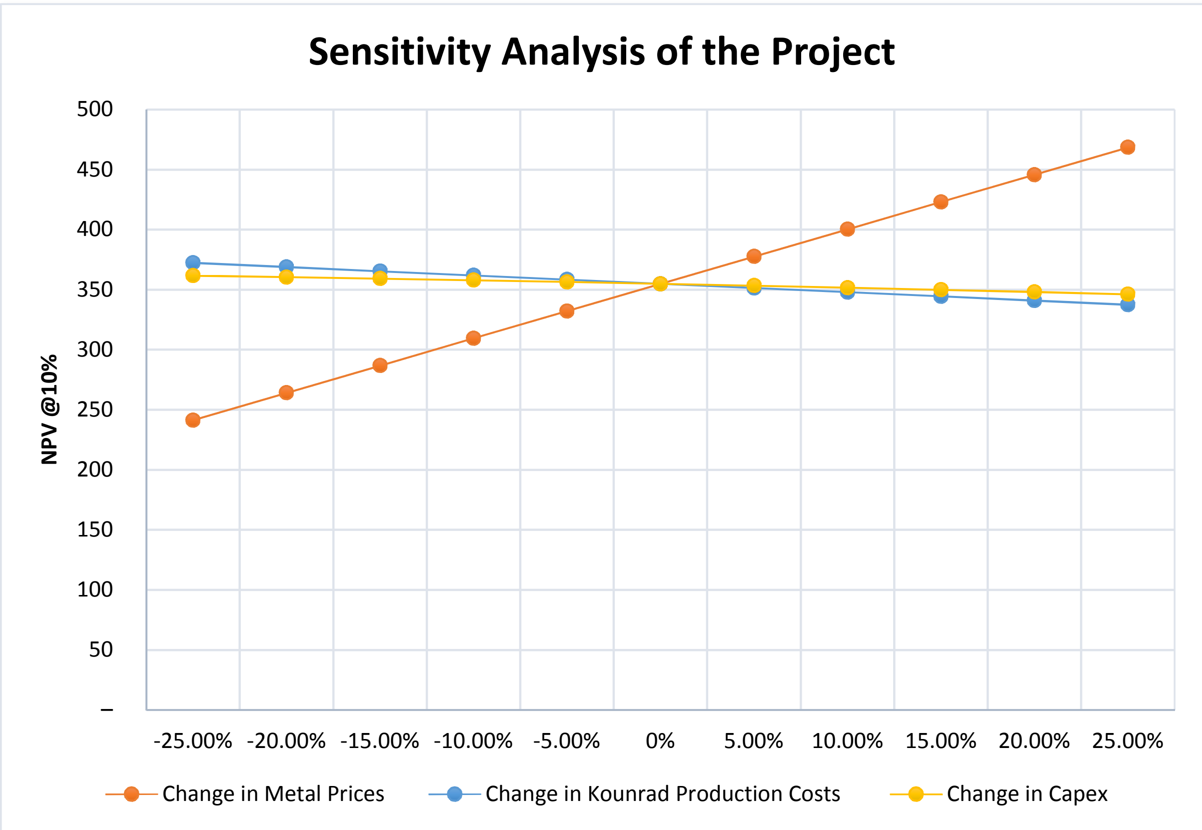


Figure 9.1: Sensitivity Analysis Chart

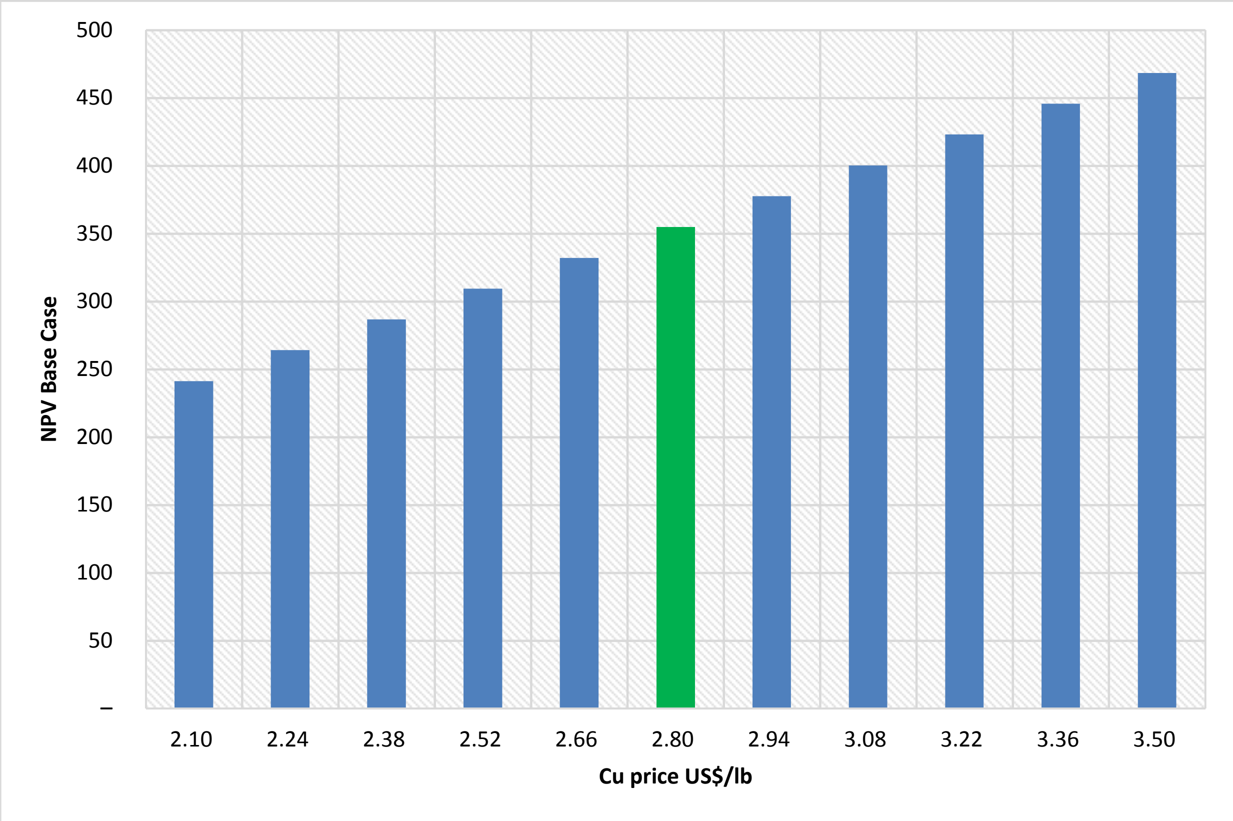


Figure 9.2: Project Sensitivity to Copper Price

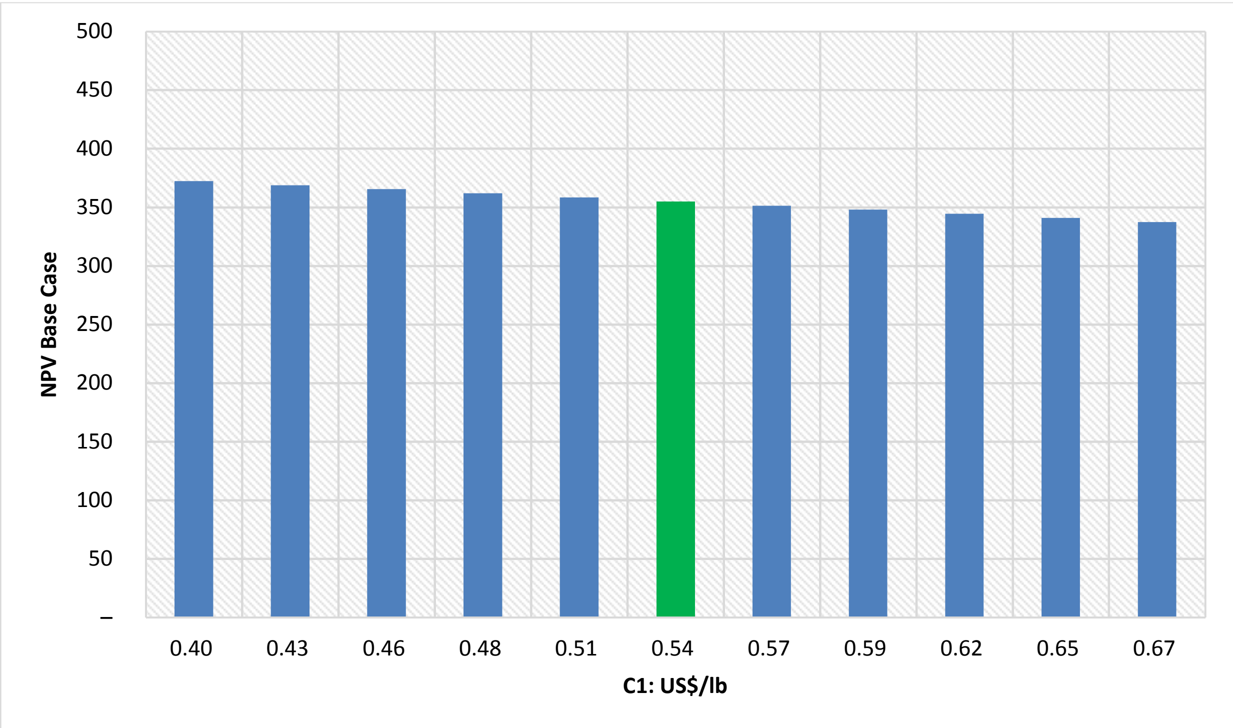


Figure 9.3: Project Sensitivity to change in Kounrad Production Costs

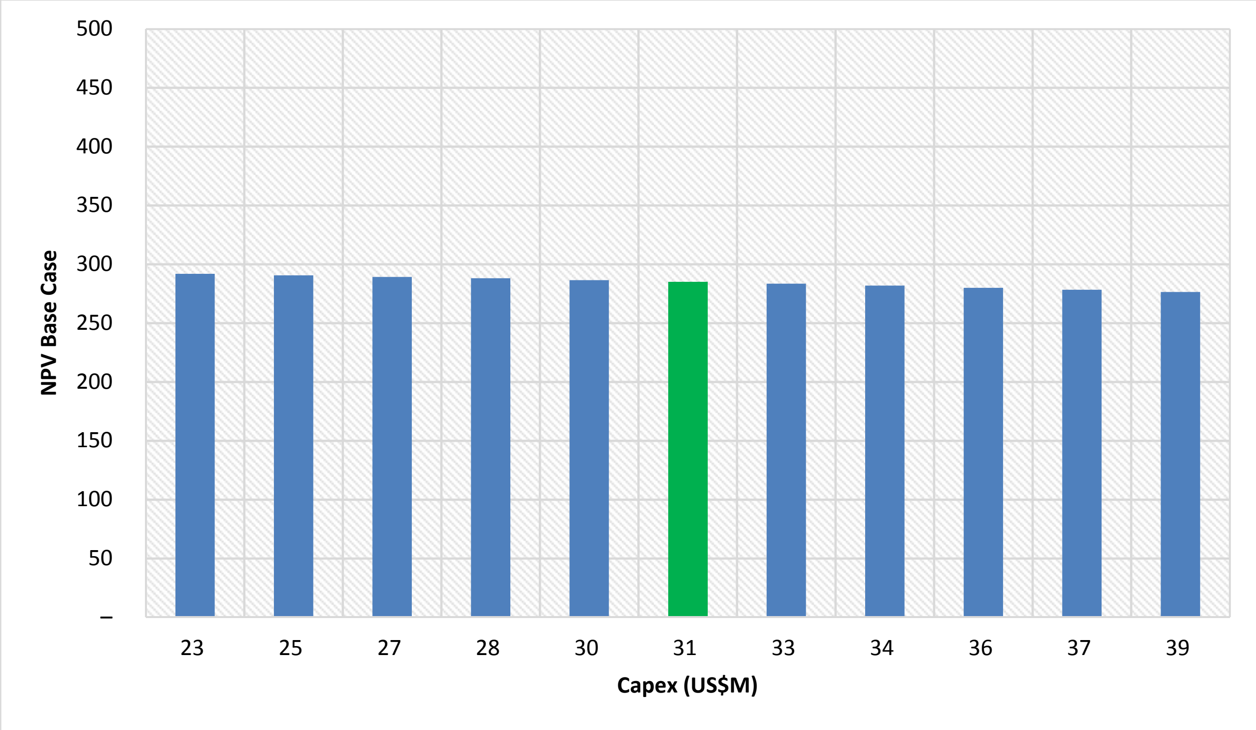


Figure 9.4: Project Sensitivity to change in Sustaining Capital Costs

Based on the sensitivity analysis results, the Kounrad project is most sensitive to changes in copper price, which is typical for mining projects. Should the price be increased by 25% (up to US$3.50/lb) the Project NPV would increase to US$468M. In the event of the copper price falling by 25% (US$2.10/lb), the NPV would reduce to US$241M.

The project is less sensitive to the change in operating costs and almost insensitive to the sustaining capital costs, owing to insignificant proportion of capex in generated project cash flow.

WAI notes, that none of the considered changes in the technical parameters leads the project to become negative.

10 JORC CODE, 2012 EDITION – TABLE 1 REPORT

10.1 Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.*	• Sampling of the Kounrad copper dumps has comprised trenching, pitting and Reverse Circulation (RC) drilling, in addition detailed dump development records have been kept from the periods during which the dumps were constructed. • During production from the Kounrad open pit, grade control works comprised sampling of the blast holes on a 6m x 6m grid. Samples were assayed and logged according to whether they were oxide, sulphide or mixed. The mine production department kept records of material exiting the pit noting what material it was, approximate grade and where the material was sent, this includes material sent to the dumps. • 2007 exploration work programme comprised 10 Reverse Circulation (RC) drillholes located within dumps 6, 7, and 9-10. Samples were assayed for total copper (Cu_{total}) and acid soluble copper (Cu_{acid}). • 2008-2009 exploration works comprised 85 RC drillholes and 10 channel trenches with samples assayed not only for Cu_{total} and Cu_{acid} but also for cyanide soluble copper (Cu_{cyan}). • 2010 exploration works included 137 pits, 9 surface trenches plus a further 13 pits excavated for metallurgical sampling, samples were assayed for Cu_{total}, Cu_{acid} and Cu_{cyan}. • In 2011, RC holes were drilled in Western Dumps, 1, 15 and 16, as well as the Eastern Dumps 5, 6, 7, 9 and 10. A total of 98 holes were carried out and drilled through the full depth of the dumps. Samples were assayed for Cu_{total} and Cu_{acid}. • Following the 2011 drilling programme additional RC drilling works were conducted in 2012 totalling 131 holes, drilled in dumps 2, Northern, 13, 20, 15, 16, 20, 21 and 22. • Sampling has been done on 3m intervals. • The majority of assays have been conducted at the VNIITSvetmet laboratory in Ust-Kamenogorsk. Pit and trench samples from 2010 were assayed at CenterGeoAnalyt in Karaganda.

Criteria	JORC Code explanation	Commentary
		• Although QA/QC procedures have been implemented for all exploration works since 2007, only results since 2010 have been obtained and reviewed by WAI.
Drilling techniques	• *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• All drilling of the Kounrad dumps has been undertaken using RC drilling. • The majority of drilling works has been conducted in 2011 and 2012 by the drilling contractor AK Niyet Burga using Nemek 814 BE and HYDCO – 300 trailer drill rigs, with a hole diameter of 125mm. • Due to the challenges faced by drilling the dump material, in particular the wide range of material sizes AK Niyet Burga developed a method which yielded reasonable samples for used in a Mineral Resource Estimate. Following drilling a 3m run the drill bit was raised and lowered several times before flushing to recover the RC chips.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Based on the drilling method used by AK Niyet Burga RC sample recoveries averaging 76% were obtained. • Sample recoveries are based on the recovered sample weight of a 3m drill run compared to the theoretical sample weight for 100% recovery from a 3m run. • Given the challenges with drilling unconsolidated dump material, WAI considers the sample recoveries obtained to be reasonable. • No relationship between grade and core recovery has been identified by WAI.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• Following sampling, small piles of RC chips corresponding to each of the 3m drill runs were set aside adjacent to the drill rig. The RC chips were then logged by Mr Zsolt Peregi a consultant geologist to the project. • Samples were sieved, washed and placed into chip boxes. • Logging included: o Dump ID; o Depth to base of dump; o Drill bit size; o Start/End dates; o Drill rig; o Contractor; o Dump composition (oxide/mixed/sulphide) o RC chip geology descriptions; o Primary minerals; o Moisture; and o Sample structure (coarse, fine etc).

Criteria	JORC Code explanation	Commentary
		• Logging was carried out for the whole of the RC drill holes, through the entire thickness of the copper dumps.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	**2007-2009** • Sub-sampling and sample preparation methods for samples from 2007-2009 are unknown. **2010** • A total of approximately 2t was extracted from each metallurgical pit which was subsequently sub-sampled to a weight of 150kg using the following methodology: o Sampled material being placed on a level area; o Particles greater than 150 mm being broken down by hammer or using the excavator bucket; o Mixing of the sample three times by hand shovel; o Placing material in the shape of a disc approximately 20-30cm in depth; o Division of the sample into four equal quarters; o Discarding of the two opposite quarters; o Hand mixing of the two remaining quarters; and o Repetition of the process until a sub-sample of approximately 150kg was obtained. **2011-2012** • Due to the quantity of sample material recovered from each 3m drill run initial sub-sampling was carried out at the drill rig site, comprising: o Sampled material being placed on to nylon sheet; o Mixing of the sample three times by hand shovel; o Placing material in the shape of a 70cm x 70cm quadrangle approximately 8cm in depth; o Division of the sample into 16 equal sections using a 4 by 4 sampling grid; and o Obtaining an approximately 5kg sub-sample by taking a specific amount of material from each of the 16 sections. • Two sub-samples were obtained for each 3m drillhole interval; one to be sent to the laboratory and one to be retained as reference material. • Samples were then transported to the VNIITSvetmet laboratory in Ust-Kamenogorsk,

Criteria	JORC Code explanation	Commentary
		where additional sample preparation was carried out. • At VNIITSvetmet laboratory samples were crushed to initially passing <2mm in a jaw crusher, before a second round of crushing to <1mm. The sample was then reduced to in weight to <0.5kg, during several sub-sampling phases. The remaining sample was then pulverised to 74µm before a 250g sub sample was taken for assay. • For oxide samples the final 250g sub-sample was further split with 30g of sample being used for assay and the remainder for spectral analysis. • It is considered that all sub-sampling and laboratory preparations are satisfactory for the intended purpose. • Details of the QA/QC procedures are described in the next paragraph. • The sample size (3m for RC drillholes) is considered as appropriate for the type of material being sampled.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.*	**2007-2009** • Samples have been assayed at the VNIITSvetmet laboratory in Ust-Kamenogorsk. • WAI understands that samples would have been subjected to the same assay methods as subsequently used in the 2011-2012 exploration works. • Although QA/QC sample submissions are understood to have been carried out for the 2007-2009 exploration works details of the QA/QC procedures and results for this phase of works are not available. **2010** • Samples were sent for preparation and assay at the Centergeoanalit LLP laboratory in Karaganda. • A total of 40 samples and 11 group samples have been assayed via chemical assay. • Internal and external duplicate samples have been used as part of the QA/QC procedures. • Internal duplicate assay results show good levels of sample precision. • Thirty QA/QC duplicate samples were submitted to VNIITSvetmet laboratory in Ust-Kamenogorsk. • The external duplicate assay results show a poor correlation, indicating a potential issue, either with the principal laboratory and/or the external check laboratory. Whilst the poor correlation for the external check analysis represents a risk, there are a total of 379 Cu_{total} samples from the 2010 exploration programme in the sample

Criteria	JORC Code explanation	Commentary
		database representing only 6% of the Mineral Resource database. The significant deviation between the primary and external duplicate results may be due to different sample preparation and assay methods applied by the respective laboratories. **2011-2012** • Samples have been assayed at the VNIITSvetmet laboratory in Ust-Kamenogorsk. • Total copper analyses have been carried out using aqua regia acid digestion with ICP-MS finish. • Analysis of acid soluble copper was carried out on 50g samples. Samples were treated with a 5% solution of sulphuric acid, and heated for 30 minutes. The leach residue was washed with water and the sample analysed by ICP. The difference in the total copper and copper in the leach residue is calculated as the acid soluble copper content. • As part of the QA/QC procedures in 2011-2012 sample submissions included blank granite samples inserted at a rate of 1 in 60, as well as external duplicate assays (approximately 8% of samples submitted) which were assayed at Alex Stewart, Moscow. • Results of the QA/QC submissions show there is no significant sample contamination, and sample precision is good for both Cu_{Total} and Cu_{Acid}.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• WAI visited the project in November 2012 and reviewed the drilling procedures, sampling and logging methods first hand. • Data was recorded initially in hard copy before entry into digital format. • Although no dedicated twin hole verification works have been carried out, the WAI Mineral Resource Estimate has been correlated against the historical dump development records which were based on grade control drilling and production records. Excluding the Northern Dumps the WAI estimates fall within 2% of the production records. • The greatest difference between the WAI Mineral Resource Estimate and the previous production records is for the Northern dumps. This is due to a significant volume discrepancy between the WAI March 2013 estimate (15,325,000m^3) and the Balkashmed (2006) estimate (48,900,000m^3). Calculation of the average height of the dumps based on the Balkashmed (2006) volume and area data implies an average height of approximately

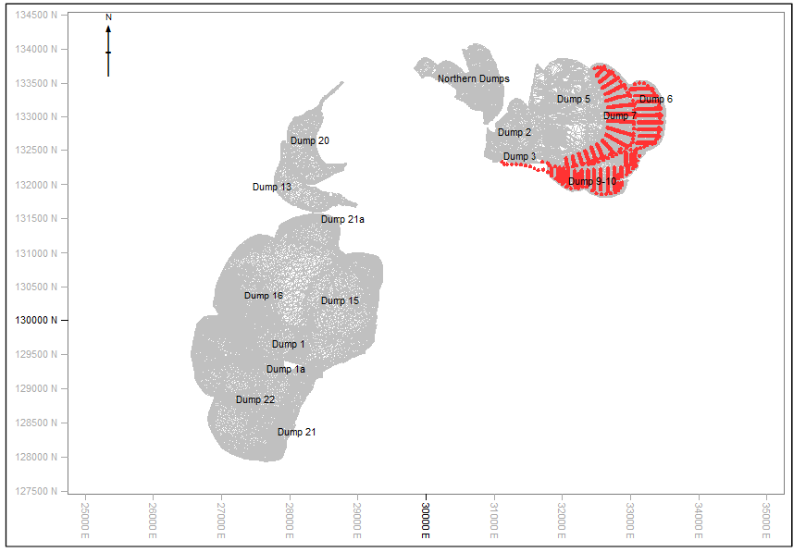
Criteria	JORC Code explanation	Commentary
		48m. This is significantly in excess of the height determined from recent onsite surveys. WAI has not been able to establish the reason for this difference. • WAI has not taken any check samples as Kounrad has been in operation since 2012 and verification can be sought through production data and reconciliation. • No holes have been twinned. • No adjustments have been made to the assay data.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• During the 2011-2012 exploration works each completed drillhole was marked by a wooden stake with corresponding bore hole ID. Survey of drill hole collars were initially undertaken using a hand-held GPS but subsequently updated using a total station. • Updated surveys of the dumps were conducted using a total station. • Although no specific details have been provided regarding the pre-2011 sample surveys, WAI notes that the sample collar elevations correspond to the latest dump surveys, providing support to their validity. • The base of the dumps was defined from a digitised historical topographic survey pre-dump development; this was supported through logging of the 2011-2012 drillholes which intercepted the base of the dumps. • No downhole surveys were carried out; however, WAI is of the opinion that the relatively short drill hole lengths, the vertical orientation of all drill holes, and the type of dump material being drilled, is unlikely to have caused hole deviations material to the Mineral Resource Estimate. • The topographic data appear adequate and reliable.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• No exploration results, resource drilling only. • Geological continuity is defined by the copper dump total station surveys, historical surveys pre-dump development denoting the base of dumps supported by the logging from the 2011-2012 RC drilling. • Average sample spacing is 100-200m; WAI considers this sufficient to demonstrate spatial and grade continuity within the dumps to support the definition of Inferred and Indicated resources. • Raw sample data has not been composited.
Orientation of data in relation to	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and*	• The drillhole orientation is such that the dumps are intersected with vertically drillholes and pits, so no bias is likely to generated by the drilling.

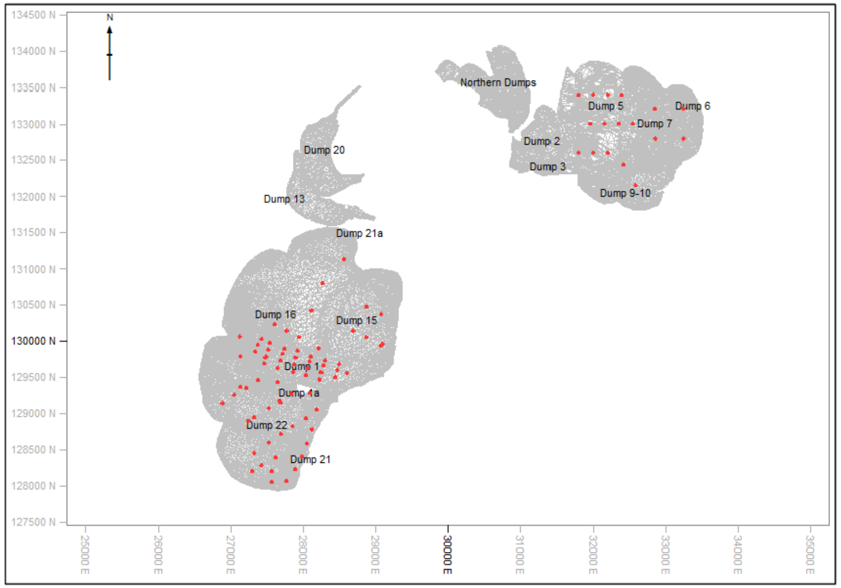
Criteria	JORC Code explanation	Commentary
geological structure	*the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	
Sample security	• *The measures taken to ensure sample security.*	• No specific details regarding sample security from the 2007-2010 works have been identified by WAI. • Samples from 2011-2012 were sub-sampled and placed into sample bags with the corresponding sample ID at the drill rig site. Sample bags were then grouped into batches of 8-10 samples and placed into large rice bags and transported to two locked shipping containers at the Sary Kazna pilot plant facility by CAML, for storage prior to transporting to the VNIITSvetmet laboratory in Ust-Kamenogorsk. • Each sample bag is labelled with the appropriate sample ID, the same sample ID was written on a cardboard tag which was placed inside the sample bag.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• No independent audits or reviews have been conducted.

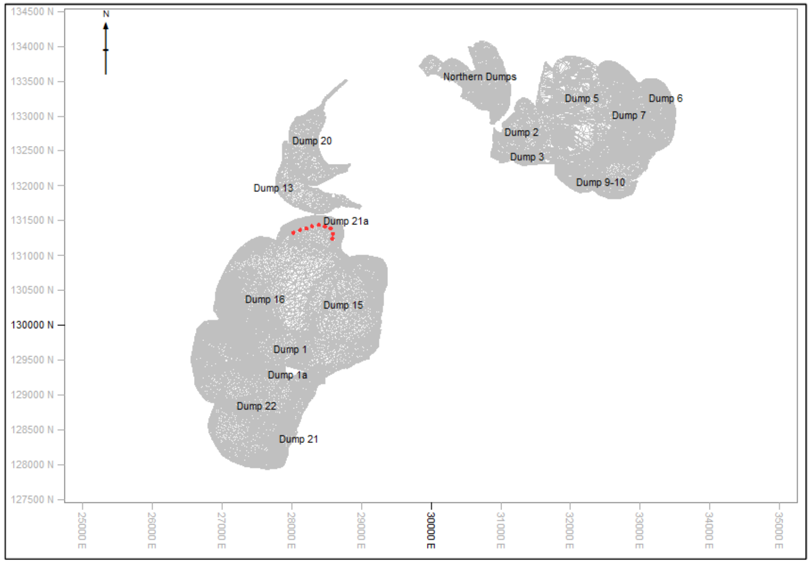
10.2 Section 2 Reporting of Exploration Results

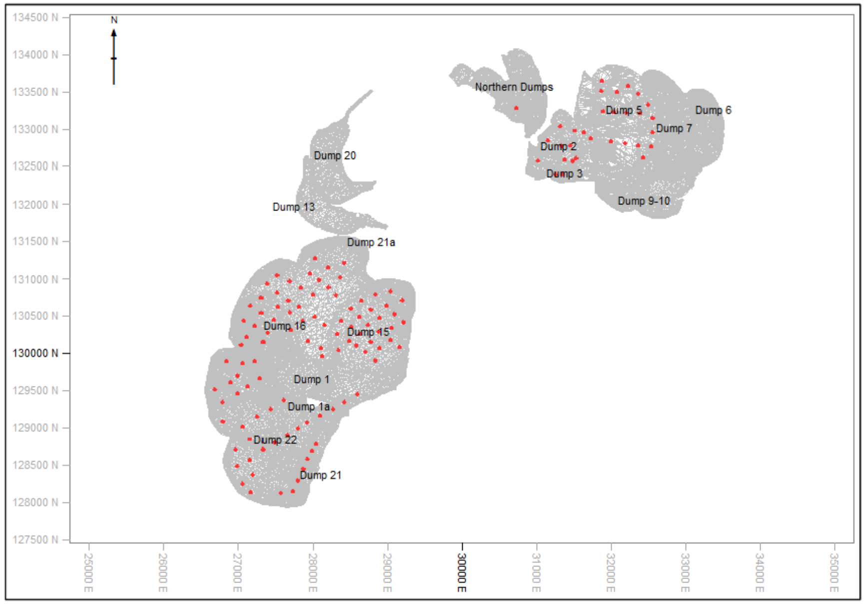
(Criteria listed in the preceding section also apply to this section)

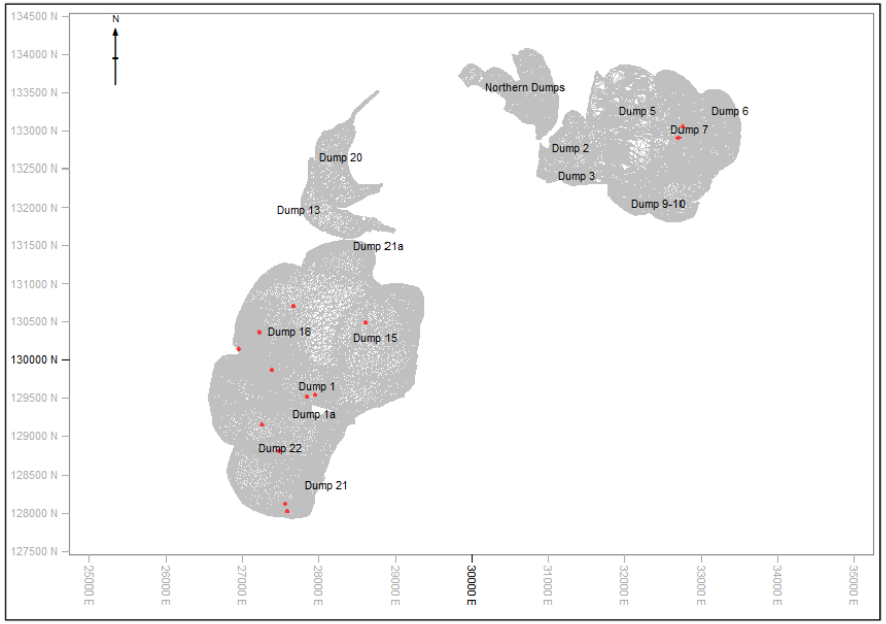
Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• CAML, through the operating subsidiary Sary Kazna LLP, originally had a 60% interest in the Kounrad mineralised dumps, although in 2014, this was increased to 100%. • The exploration and processing licence for the mineralised dumps (Sub Soil Contract number 2447) covers an area of 22.5km^2 (2,350ha) and expires 20 August 2034.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• All exploration works of the copper dumps from 2007-2012 have been undertaken by CAML.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The Kounrad open pit copper mine is located in the Balkhash metallogenic belt within the Balkhash-Junggar orogenic belt of the Central Asian Metallogenic Domain (CAMD). The geology encompassing the deposit comprises porphyry copper mineralisation related to techtono-magmatism during the Devonian and Carboniferous-Permian volcano-magmatic arcs. • Following the start of open pit mining operations at the Kounrad mine in 1936, the copper sulphide ore was selectively mined, material classified as waste and uneconomically treatable materials at the time were dumped at designated areas adjacent to the open pit, thus forming the current copper dumps. • The waste materials were classified into four groups by this technique, three of which are based upon the amount of acid soluble copper present and the fourth being related to the sulphide grade as follows: o Oxide Waste – any material with greater than 20% acid soluble copper; o Mixed Waste – any material with greater than 10% but less than 20% acid soluble copper; o Sulphide Waste – any material below the cut-off grade and with less than 10% acid soluble copper; and o Waste – any material with less than 0.15% total copper grade.

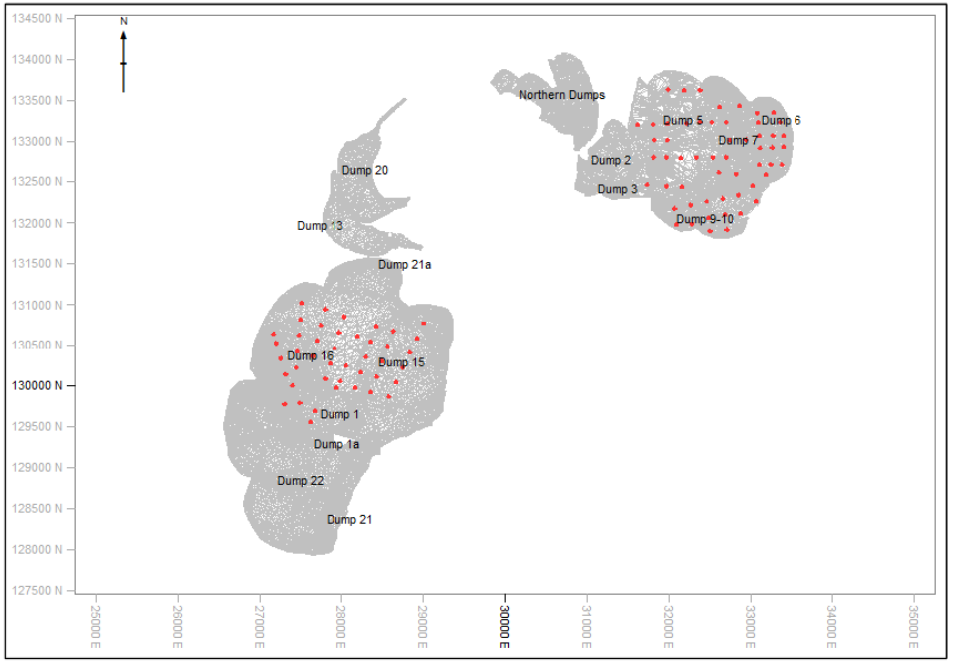
Criteria	JORC Code explanation	Commentary
Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:* o *Easting and northing of the drill hole collar;* o *Elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar;* o *Dip and azimuth of the hole;* o *Down hole length and interception depth; and* o *Hole length.* • *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*	• All drill holes have been drilled vertically. • All drilling has been carried out using Reverse Circulation. • 2007 Pitting comprised 2,409 pit samples taken from an average depth of 0.5m in dumps 6, 7, 9 and 10, highlighted in red in the figure below.  • In 2008, a total of 85 holes were drilled to depths of between 8m and 30m dumps 1, 1a, 5, 6, 7, 9-10, 15, 16, 21 and 22 as shown in the figure below.

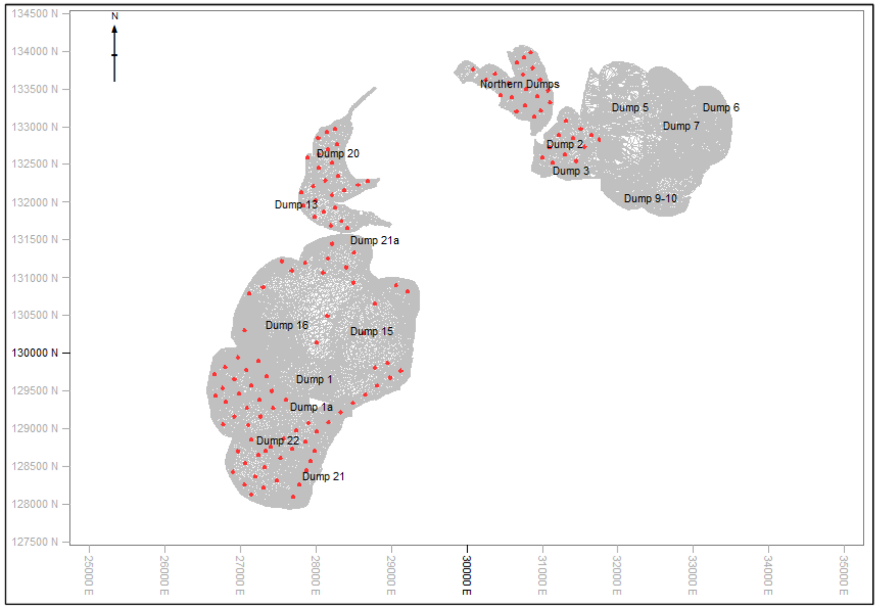
Criteria	JORC Code explanation	Commentary
		 • Nine surface trenches, each 100m long were undertaken in 2010 on dump 21a as shown in the following figure.

Criteria	JORC Code explanation	Commentary
		 • 137 pits were excavated in 2010 to an average depth of 3m. Locations of the pits is shown in the figure below.

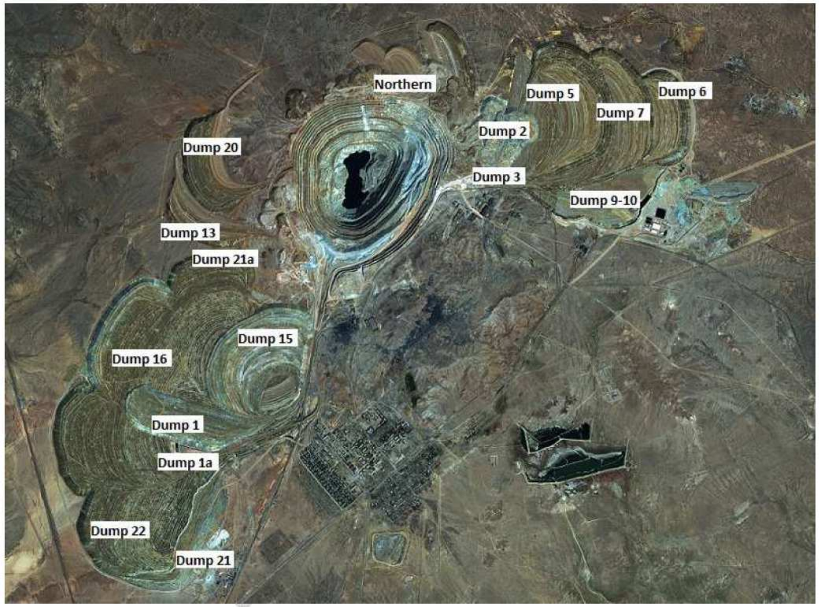
Criteria	JORC Code explanation	Commentary
		 • 13 pits were also excavated in 2010 for metallurgical samples, with depths ranging between 8-11m.

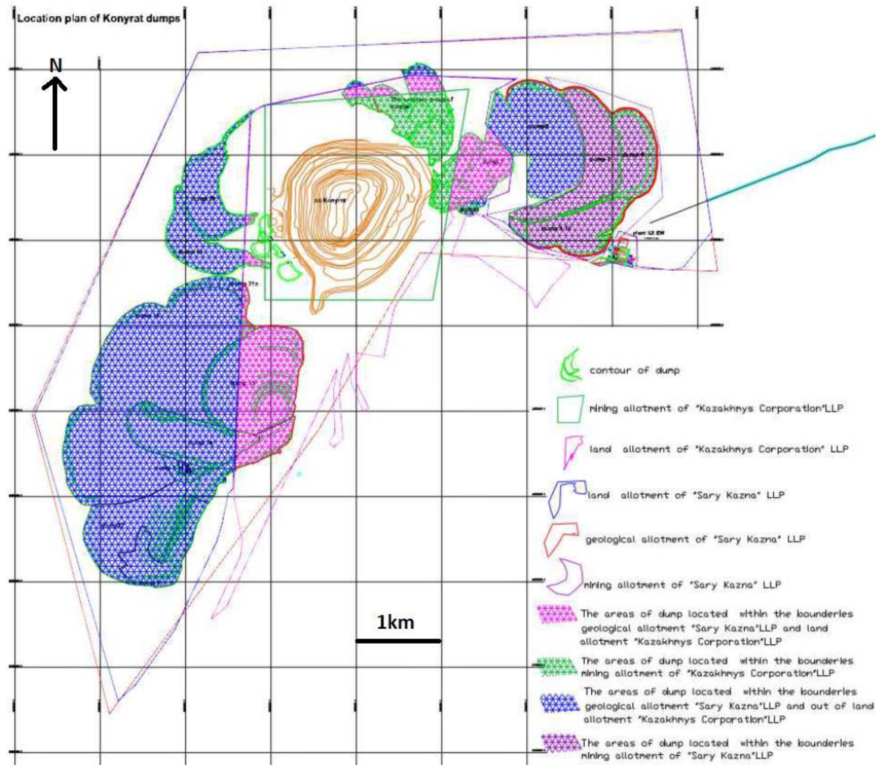
Criteria	JORC Code explanation	Commentary
		 • In 2011, 98 RC drillholes were carried out. The drillholes intersected the full thickness of the dumps and were drilled vertically.

Criteria	JORC Code explanation	Commentary
		
		• The most recent drilling works were carried out in 2012, comprising 131 RC drillholes.



Criteria	JORC Code explanation	Commentary
		• Given the number of drill holes at Kounrad it is not practicable to report all drill hole collar co-ordinates in this section. The figures above show the coverage of drill hole locations for the various dumps
Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• No metal equivalents have been used at the Kounrad project. • Sample lengths vary depending on the sampling method. Where RC drilling has been carried out the sample length averages 3m. • The raw sample database has not been top-cut. • Sample data has only been top-cut at part of the Mineral Resource estimation process.

Criteria	JORC Code explanation	Commentary
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').*	• Only drilling conducted in 2011-2012 has intersected the full thickness of the copper dumps. • Holes have been drilled vertically and represent the true thickness of the copper dumps.
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	 **Aerial Photograph of Kounrad Site Showing Dump Locations**

Criteria	JORC Code explanation	Commentary
		 **Plan View of Kounrad Licence and Land Allotment Areas**
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• Given the quantity of sampling that has been carried out by CAML it is not practicable to include detailed reporting in this section. • The mineralisation at Kounrad is hosted in a series of manmade copper dumps from low grade mineralisation extracted from the adjacent Kounrad open pit. • Sampling via surface trenching and pitting has only intercepted the near surface dump material, RC drilling in 2011 and 2012 was carried out through the full thickness of the dumps, representing full dump depth profiles. • The table below provides a summary of the minimum and maximum sample grades by dump prior to top-cutting and compositing.

Criteria	JORC Code explanation	Commentary

Table 8.5: Statistics for Samples Falling within the Dump Wireframes

Dump	Field	Min	Max	Range	Mean	Variance	Std Dev	Skewness	Kurtosis
1	Cu_{total}	0.000	0.612	0.612	0.18	0.01	0.11	1.44	2.23
2	Cu_{total}	0.008	0.390	0.383	0.08	0.00	0.07	2.39	6.50
3	Cu_{total}	0.124	0.455	0.331	0.24	0.02	0.15	0.71	-1.49
5	Cu_{total}	0.010	1.010	1.000	0.09	0.01	0.09	5.74	50.50
6	Cu_{total}	0.010	1.050	1.040	0.12	0.01	0.08	3.34	29.94
7	Cu_{total}	0.010	0.740	0.730	0.14	0.01	0.09	2.29	8.65
9-10	Cu_{total}	0.020	1.500	1.480	0.32	0.02	0.14	0.91	4.75
1a	Cu_{total}	0.016	0.092	0.076	0.04	0.00	0.02	1.15	0.61
13	Cu_{total}	0.004	0.167	0.163	0.03	0.00	0.03	2.11	4.27
15	Cu_{total}	0.000	0.400	0.400	0.07	0.00	0.06	2.47	7.01
16	Cu_{total}	0.002	0.700	0.698	0.08	0.00	0.06	3.04	18.83
20	Cu_{total}	0.003	0.268	0.265	0.03	0.00	0.03	4.03	25.01
21	Cu_{total}	0.009	0.460	0.451	0.19	0.01	0.11	0.24	-0.61
22	Cu_{total}	0.007	0.565	0.558	0.09	0.01	0.08	2.67	9.80
Northern	Cu_{total}	0.005	0.171	0.167	0.05	0.00	0.04	1.09	0.75
21a	Cu_{total}	0.035	0.490	0.455	0.16	0.01	0.08	1.59	3.31

Criteria	JORC Code explanation	Commentary
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• Prior to the commencement of the mining operation a pilot scale SX-EW trial was undertaken at the Eastern Dump yielding a recovery of 50.2%, a pilot scale trial was also performed at the Western Dumps in 2012. • Large diameter column tests have also been undertaken at site. • As part of the 2012 exploration works bulk density measurements were taken for 11 dumps to supplement the previous density testwork carried out in 2009. The 2012 bulk density testwork involved the excavation of pits with the subsequent weighing of the recovered material and adjustment for the moisture content. The volume of the pits was determined using detailed surveys of the pits by total station and the calculation of the pit volumes by WAI from DTM wireframes produced by the surveys.
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• Other than the ongoing leaching activities at Kounrad WAI is unaware of any additional planned exploration activities.

10.3 Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in Section 1, and where relevant in Section 2, also apply to this section)

Criteria	JORC Code explanation	Commentary
Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.* • *Data validation procedures used.*	• The sample data was supplied as Microsoft Excel spreadsheets from CAML. • Seven different database files were supplied to WAI representing different phases of the exploration works. • Data recorded in the databases included: o Collar coordinates; o Down hole surveys; and o Assays. • The Excel spreadsheets were used to regenerate separate collar, survey, assay and geology files in CAE Studio v3® (Datamine) software. These in turn were used to create a single de-surveyed sample file. • Verification was carried out on the digital database to check for erroneous sample positions, absent data fields, and to ensure there were no duplicate or overlapping samples. • From the measures taken, WAI considers the sample database suitable for use in the Mineral Resource Estimate
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• As part of the 2013 Mineral Resource Estimate by WAI the project and sampling works were visited by Mr Nick Szebor, BSc, MSc (MCSM), CGeol, EurGeol, FGS, **Associate Director** of WAI in November 2012. • A subsequent site visit has more recently been carried out by Dr Phil Newall, BSc (ARSM), PhD (ACSM), CEng, FIMMM, **Managing Director** of WAI, Barrie O'Connell, CEng, PhD, BEng (MCSM), **Principal Mineral Processing Engineer**, and Ruslan Erzhanov, **General Director, WAI KZ** conducted a personal inspection of the Project on 13 June 2017, primarily covering historical sampling and resource estimations, processing, production, supporting infrastructure, and environmental and social measures. • In the opinion of the competent persons, the drilling, sampling and recovery practices used on site are of a good industry standard.

<table>
<tr><th>Criteria</th><th>JORC Code explanation</th><th>Commentary</th></tr>
<tr><td>Geological interpretation</td><td>Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.
Nature of the data used and of any assumptions made.
The effect, if any, of alternative interpretations on Mineral Resource estimation.
The use of geology in guiding and controlling Mineral Resource estimation.
The factors affecting continuity both of grade and geology.</td><td>Copper dump wireframes have been constructed based on surveys carried out by personnel at site using a total station and fixed with known base stations.
The base of the dumps has been defined from digitized historical topographic surveys pre-dump development supported by the RC chip logging carried out during the 2011 and 2012 drilling.
A different grade interpretation, if used in the Mineral Resource Estimate, may affect the results of the Mineral Resource Estimate slightly. As the entire waste dump is leached there is no real alternative to volume interpretation.
The copper dump volumes have been robustly defined through appropriate techniques.
Due to the dump construction methods the distribution of grades throughout the dumps may be variable, but possibly could display tabular characteristics corresponding to successive dump raises. Given the age of the dumps some remobilization of the copper may have occurred due to environmental factors.</td></tr>
<tr><td>Dimensions</td><td>The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.</td><td>
<table>
<tr><th>Dump</th><th>Drillhole spacing</th><th>Average thickness (m)</th><th>Area (m²)</th></tr>
<tr><td>1</td><td>100m x 200m</td><td>41</td><td>679,180</td></tr>
<tr><td>1a</td><td>250m (only two drillholes)</td><td>11</td><td>63,047</td></tr>
<tr><td>2</td><td>150m x 200m</td><td>33</td><td>567,695</td></tr>
<tr><td>3</td><td>100m x 100m</td><td>16</td><td>33,477</td></tr>
<tr><td>5</td><td>200m x 200m</td><td>28</td><td>1,332,109</td></tr>
<tr><td>6</td><td>150m x 150m
Channel samples 100m spacing</td><td>19</td><td>420,352</td></tr>
<tr><td>7</td><td>200m x 200m
Channel samples 100m spacing</td><td>27</td><td>701,328</td></tr>
<tr><td>9-10</td><td>200m x 200m
Channel samples 50-100m spacing</td><td>15</td><td>508,867</td></tr>
<tr><td>13</td><td>200m x 200m</td><td>11</td><td>401,289</td></tr>
<tr><td>15</td><td>150m x 150m</td><td>32</td><td>1,145,391</td></tr>
<tr><td>16</td><td>150m x 150m</td><td>38</td><td>2,929,570</td></tr>
<tr><td>20</td><td>150m x 200m</td><td>18</td><td>521,484</td></tr>
</table>
</td></tr>
</table>

Criteria	JORC Code explanation	Commentary
		<table><tr><td>21</td><td>150m x 200m</td><td>20</td><td>420,586</td></tr><tr><td>21a</td><td>100m</td><td>21</td><td>122,305</td></tr><tr><td>22</td><td>100m x 200m</td><td>27</td><td>1,084,375</td></tr><tr><td>Northern Dumps</td><td>150m x 200m</td><td>22</td><td>705,586</td></tr></table>
Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.* • *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource Estimate takes appropriate account of such data.* • *The assumptions made regarding recovery of by-products.* • *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).* • *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* • *Any assumptions behind modelling of selective mining units.* • *Any assumptions about correlation between variables.* • *Description of how the geological interpretation was used to control the Mineral Resource Estimates.* • *Discussion of basis for using or not using grade cutting or capping.* • *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*	• The Mineral Resource estimation has been carried out using CAE Studio v3® software. • The Mineral Resource model is based on a geological model using the copper dump volumetric wireframes produced based on the topographic surveys. The model and sample data was domained on a dump by dump basis. • The sample data has been statistically reviewed for each dump to assess for any additional domaining requirements. Sample data was also statistically reviewed by sample type to determine any bias exerted by one method compared to others. No bias was shown by the various sampling methods, nor was any need for further domaining identified. • During production from the Kounrad open pit, grade control works comprised sampling of the blast holes on a 6m x 6m grid. Samples were assayed and logged according to whether they were oxide, sulphide or mixed. The mine production department kept records of material exiting the pit noting what material it was, approximate grade and where the material was sent, this includes material sent to the dumps. • The greatest difference between the current WAI Mineral Resource Estimate and the previous production records is for the Northern Dumps. This is due to a significant volume discrepancy between the WAI March 2013 estimate (15,325,000m^3) and the Balkashmed (2006) estimate (48,900,000m^3). Calculation of the average height of the dumps based on the Balkashmed (2006) volume and area data implies an average height of approximately 48m. This is significantly in excess of the height determined from recent onsite surveys. WAI has not been able to establish the reason for this difference. • Only Cu_{Total} and Cu_{Acid} grades are estimated. • Currently there are no geostatistical estimations made on deleterious elements. • Decile analysis in conjunction with probability plots were used to ascertain the need for top-cutting, to reduce the influence of high grade outliers. Based on the results WAI applied the following top-cuts:

Criteria	JORC Code explanation	Commentary
		o Dump 2 topcut of 0.25% Cu; o Dump 13 topcut of 0.12% Cu; o Dump 15 topcut of 0.3% Cu; o Dump 20 topcut of 0.1% Cu; and o Dump 22 topcut of 0.4% Cu. • To ensure all samples have equal support samples have been composited to 3m. • A non-rotated volumetric block model with a parent cell size of 50m x50m x 3m has been used with each dump coded separately. The block spacing compares to an average sample spacing of 100m x 100m over the majority of the deposit. • Variography has been carried out for the selected top-cut and composited sample data. No robust anisotropic variograms could be produced, WAI therefore produced isotropic variograms for the copper dumps. • Grade estimation was carried out using Inverse Distance Weighted Cubed (IDW^3) as the principle interpolation method. Nearest Neighbour (NN) was also used for comparative purposes. • Grade estimations have been carried out on a three pass plan with each successive estimation increasing the search ellipse size to estimate blocks not estimated on the previous passes. The estimation search ellipses (along strike/down dip/across strike) are typically: o First search 50m x 25m x 1m (along strike/down dip/across strike); o Second search 200m x 100m x 4m; and o Third search >200m x >100m x >4m. • The minimum number of sample composites was set to 5 for the first run, 4 for the second and 1 for the final pass. The maximum number of composites set to 12 for the first and second passes and 16 for the final third pass. • Search radii were determined based on the sample spacing. • Mineral Resources have been classified as ***Indicated*** where sample spacing is less than 200m x 100m. and with a minimum of 5 samples required from a minimum of 2 drillholes. • Mineral Resources which were estimated but did not fulfil the criteria for *Indicated*

Criteria	JORC Code explanation	Commentary
		classification were assigned an ***Inferred*** classification. • Visual, statistical, and grade profile validations of the block model against the composite grades show a good correlation, and that the block model is representative of the sample data. • WAI has carried out a comparison of the WAI Mineral Resource Estimate against the dump development records. Excluding the Northern dumps the WAI estimates are within 2% of the reported metal content in the dump development reports. • The updated topographic surveys show that the Northern D • Dumps have typically been over reported historically due to the height of the dumps being over stated. • Mineral Resources have not been adjusted for metallurgical recovery and are reported in-situ. • No deleterious elements have been included in the Mineral Resource Estimate. • Since the commencement of production at Kounrad circa 61kt of copper has been extracted to produce copper cathode, as of the end of Q1, 2017. Due to the leaching method it is not possible to clearly define where within the dumps copper mineralisation has been leached, with leached solutions tending to propagate through several dumps before being sent to the process plant. • For the purpose of accounting for depletion and for the sake of transparency the Mineral Resource statement has been revised to not only include the resources reported as of 2013, but also to show the contained metal recovered.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• Mineral Resource tonnages have been reported on a dry basis.
Cut-off parameters	• *The basis of the adopted cut-off grade(s) or quality parameters applied.*	• Due to the leaching method employed by CAML, dumps are not selectively leached. WAI has therefore reported the Mineral Resources on a total in-situ basis with no cut-off applied.
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the*	• CAML operate a commercial in-situ leaching process followed by SX-EW process at Kounrad whereby acid is sprayed over the copper dump surface, propagates through the dump material scavenging copper as it passes through. The pregnant solution is

Criteria	JORC Code explanation	Commentary
	process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.	then collected in a series of lined trenches and pumped to the SX-EW plant where copper cathode is produced. • To date circa 61kt of copper cathode has been produced, predominantly from dumps 5, 6, 7, 9 and 10.
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	• Metallurgical testwork, pilot scale testing together with operational data, has been compiled for the leaching of the Eastern and Western Dumps at Kounrad. • A pilot scale Solvent Extraction Electro Winning (SX-EW) trial was undertaken at the Eastern Dump (yielding a recovery of 50.2%) in 2011. • Pilot scale trial was also performed at the Western Dumps in 2011-2012. • The pilot testwork has shown that copper is recoverable via acid leaching with a recovery approaching 50% being obtained. • In 2012, the SX-EW Plant was commissioned and later expanded in 2015 in readiness for the treatment of the Western Dumps. • Since 2012 CAML has produced over 61,000t of copper cathode through the dump leaching and Solvent Extraction Electro Winning (SX-EW). • For the Eastern Dumps, CAML has adopted recovery levels of 51% for Dumps 6,7,9 and 10 while a leach recovery level of 42% was adopted for Dumps 2 and 5. The Western Dumps, being more refractory to acid leaching (due to the presence of sulphide material) are expected to respond less favorably to leaching with leach recoveries ranging from 35 and 42% being adopted.
Environmental factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental*	• WAI has reviewed the environmental and social performance of the Kounrad operations based on a review of documentation provided by the Client. • The Project is considered compliant with local Kazakh legislation and a considerable amount of work has been undertaken to bring the Project in line with international best practice. • Waste dumps are leached in-situ and all intermediate wastes (such as spent, or spilled raffinate) recycled back into this process. • Crud, the solid waste residue from the hydrometallurgical process in the SX section, is removed and placed back on the dump. • The processing circuit is reported to have zero liquid discharge to the environment.

Criteria	JORC Code explanation	Commentary
	assumptions made.	
Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* • *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* • *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	• As part of the 2012 exploration works bulk density measurements were taken for 11 dumps to supplement the previous density testwork carried out in 2009. The 2012 bulk density testwork involved the excavation of pits with the subsequent weighing of the recovered material and adjustment for the moisture content. The volume of the pits was determined using detailed surveys of the pits by total station and the calculation of the pit volumes by WAI from DTM wireframes produced by the surveys. • In total 33 pits were carried out in 2012. • For the current Mineral Resource Estimate a density value of $1.87t/m^3$ was used for oxide wastes and $2.04t/m^3$ was used for sulphide and mixed wastes, consistent with previous estimates and supported by the 2012 bulk density measurements. Dumps 2, 3, 5, 6, 7 and 9-10 were categorised as oxide waste and dumps 1, 1a, 13, 15, 16, 20, 21, 21a, 22 and northern were categorised as either sulphide or mixed waste.
Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.* • *Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).* • *Whether the result appropriately reflects the Competent Person's view of the deposit.*	• The model has been classified based on data spacing, for Indicated and Inferred categories. • No Measured category was defined due to confidence in grade continuity based on the current sample spacing, the lack of Certified Reference Materials (CRMs), and the lack of supporting details for exploration works between 2007 and 2010. • Mineral Resources have been classified as ***Indicated*** where sample spacing is less than 200m x 100m. and with a minimum of 5 samples required from a minimum of 2 drillholes. • Mineral Resources which were estimated but did not fulfil the criteria for *Indicated* classification were assigned an ***Inferred*** classification. • The quality of the sample data on which the estimate is based has been reviewed including a review of QA/QC results. Overall the input data is of sufficient quality for the reporting of *Indicated* and *Inferred* Mineral Resources. • Geological continuity is robustly defined through appropriate surveys of the copper dumps. • The classification of the Mineral Resource Estimate reflects the Competent Person's view of the deposit.

Criteria	JORC Code explanation	Commentary
Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• No audits or reviews have been carried out.
Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource Estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* • *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	• The topographic survey works of the current dumps and surrounding topography has been carried out to a high level of accuracy and covers the area under consideration sufficiently. • Geological continuity and volumes of the copper dumps is well established through appropriate surveying. • WAI considers that the current sample spacing is sufficient to assume or infer grade continuity between sample points. • QA/QC results available for the 2010-2012 exploration works show reasonable levels of precision and no noticeable sample contamination issues, with the exception of the external 2010 duplicate assays. External 2010 duplicates show a poor correlation indicating a possible issue, either with the principal laboratory and/or the external check laboratory. This may be related to the digestion methods used for the assay. • Based on the QA/QC results WAI is of the opinion that the sample data is sufficient for use in a Mineral Resource Estimate, however, given the lack of Certified Reference Materials (CRMs), the issue identified with the 2010 external samples. WAI is of the opinion that no Measured Resources can be assigned to the Mineral Resource Estimate. • The relative accuracy and confidence is reflected in the assigned Mineral Resource classification. • Limited grade support is available based on the current sampling, however, the final estimates of contained metal compare well with the historical dump development reports indicating that the grade estimates are reasonable. • Those areas defined by Indicated and Inferred Mineral Resources are considered global estimates only.

11 GLOSSARY

Glossary	
Term	**Definition**
"alteration"	Changes in the chemical or mineralogical composition of a rock, generally produced by weathering or hydrothermal solutions.
"Au"	Chemical symbol for the element gold
"C"	Degrees Celsius
"CAML"	Central Asia Metals Plc
"Cgeol"	Chartered Geologist of the Geological Society
"chalcopyrite"	The mineral sulphide of iron and copper, $CuFeS_2$; sometimes called copper pyrite or yellow copper ore
"CPR"	Competent Persons Report
"Cu"	Chemical symbol for copper
"Cut-off grade"	The minimum concentration of a valuable component in a marginal sample of the mineral. The cut-off grade is used to delineate parts of the deposit to be mined
"Cuacid"	Acid Soluble Copper
"CuTotal"	Total Copper ("CuTotal")
"deposit"	A body of mineralisation that represents a concentration of valuable metals.
"dilution"	Waste rock that is, by necessity, removed along with the ore in the mining process subsequently lowering the grade of the ore
"disseminated"	Mineral deposit in which the desired minerals occur as scattered particles in the rock, but in sufficient quantity to make the deposit an orebody
"DTM"	Digital Terrain Models
"Ecolimit"	Independent ecological contractors
"EHS"	Environmental, Health & Safety
"ESIA"	Environmental and Social Impact Assessment
"Fe"	Chemical symbol for iron.
"feasibility study"	Technical and financial study to assess the commercial viability of a project
"FGS"	Fellow of the Geological Society
"g/t"	gramme per metric tonne
"grade"	Relative quantity or the percentage of ore mineral or metal content in an orebody
"hematite"	Hematite is the mineral form of iron(III) oxide (Fe_2O_3), one of several iron oxides
"hydrothermal"	Refers in the broad sense to the process associated with alteration and mineralisation by a hot mineralised fluid (water).
"IDW^3"	Inverse Distance Cubed
"IFC"	International Finance Corporation
"Indicated resource"	An economic mineral occurrence have been sampled (from locations such as outcrops, trenches, pits and drillholes) to a point where an estimate has been made, at a reasonable level of confidence, of their contained metal, grade, tonnage, shape, densities, physical characteristics.
"JORC Code"	Joint Ore Reserve Committee Code; the Committee is convened under the auspices of the Australasian Institute of Mining and Metallurgy
"kg" "km(s)"	Kilogramme (1,000kg = 1t) kilometres
"km^2"	square kilometres
"lb"	Unit of mass, pound (1 metric tonne = 2,204lb)
"leached"	A rock that is subject to the process of being broken down by the action of substances dissolved in water.
"LOM"	Life of Mine
"m"	metre
"malachite"	$Cu_2CO_3(OH)_2$; bright green; occurs in oxidised zones of copper deposits and a source of copper.
"mine"	A mineral mining enterprise. The term is often used to refer to an underground mine.
"mineral deposit"	A body of mineralisation that represents a concentration of valuable metals. The limits can be defined by geological contacts or assay cut-off grade criteria.
"mineral resource"	a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such a form that there are reasonable prospects for the eventual economic extraction; the location, quantity, grade geological characteristics and continuity of a mineral resource are

Glossary	
Term	**Definition**
	known, estimated or interpreted from specific geological evidence and knowledge; mineral resources are sub-divided into Inferred, Indicated and Measured categories
"mineralisation"	Process of formation and concentration of elements and their chemical compounds within a mass or body of rock.
"mining method"	A combination of technical solutions that define the geometry, technology and sequence of mining.
"mm"	millimetre, one thousandth of a metre.
"MRE"	Mineral Resource Estimate
"Mt"	Million tonnes.
"NN"	Nearest Neighbour
"open pit"	A mine that is entirely on surface; also referred to as open-cut or open-cast mine.
"ore"	Naturally occurring material from which a mineral or minerals of economic value can be extracted profitably or to satisfy social or political objectives.
"ounce" or "oz"	troy ounce (= 31.1035 grammes)
"oxide"	Mineral formed by the union of an element with oxygen; the portion of an orebody near the surface that has been leached by percolating water carrying oxygen, carbon dioxide, or other gases.
"ppb"	Parts per billion
"ppm"	Parts per million
"processing"	A combination of processes for primary treatment of solid minerals in order to extract the products amenable to further technically and economically feasible chemical or metallurgical treatment or use.
"pyrite"	Mineral compound of iron and sulphur, sulphide mineral, iron sulphide, chemical symbol FeS_2.
"QA/QC"	Quality assurance/quality control.
"quartz"	Mineral composed of silicon dioxide.
"RC"	Reverse Circulation
"sampling"	The process of studying the qualitative and quantitative composition and properties of natural formations comprising a deposit.
"sulphide"	Mineral containing sulphur in its non-oxidised form; that part of a sulphide deposit that has not been oxidised by near-surface waters. Ore which is in its primary mineralised state and has not undergone the process of natural oxidation.
"SX-EW"	Solvent extraction and electrowinning (SX-EW) is a two-stage hydrometallurgical process that first extracts and upgrades copper ions from low-grade leach solutions into a solvent containing a chemical that selectively reacts with and binds the copper in the solvent. The copper is extracted from the solvent with strong aqueous acid which then deposits pure copper onto cathodes using an electrolytic procedure (electrowinning).
"t"	metric tonne (1,000kg)
"tailings"	Liquid wastes of mineral processing with valuable component grade lower than that of the initial material.
"US$"	United States Dollars
"vein"	Tabular deposit of minerals occupying a fracture, in which particles may grow away from the walls towards the middle.
"WAI"	Wardell Armstrong International
"XRF"	X-ray fluorescence; emission of characteristic "secondary" (or fluorescent) X-rays from a material that has been excited by bombarding with high-energy X-rays or gamma rays; widely used for elemental analysis.
"Zn"	Chemical symbol for zinc
"$"	United States Dollars
"%"	Percent

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