INTEGRATED ACID ROCK DRAINAGE MANAGEMENT AT THE PHU KHAM COPPER GOLD OPERATION IN LAO PDR

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Abstract

PhuBia Mining Limited commissioned the Phu Kham Copper Gold Operation in PDR Lao in 2008. An extensive sulphur database identified the acid rock drainage (ARD) risk ahead of mining .AnARD management plan was developed involving blending and encapsulating lower capacity potentially acid forming (PAF) rock (0.3 to 4%S) in the downstream section of the tailings storage facility (TSF) embankment and placing higher capacity PAF rock (>4%S) in the TSF. Detailed operational guidelines allow the integration of ARD management practices into daily operating activities.

Grade control drilling drives the short term planning for ore and waste mining. Waste blocks are characterised, marked up in pit, and scheduled into the TSF embankment or deposited within the TSF.

PAF cells are built to tight geotechnical and geochemical specifications to ensure control of sulphur grade, pH and effective exclusion of oxygen from completed cells. A comprehensive monitoring program includes pore gas, temperature, drainage and sampling each 1 m raise ofPAF cells on a 50m grid for physical and chemical testing.

The results confirm that design specifications are being met or exceeded and drainage chemistry and pore gas oxygen concentrations within the encapsulated cells have demonstrated the efficacy of this strategy for ARD control.

Key Words: encapsulation, oxygen, compaction, flooded, cells, dam.

1.0 Introduction

PhuBia Mining Limited (90% PanAust and 10% Government of Lao) commissioned the 12MtpaPhu Kham Copper Gold Operation in May 2008. The site is located approximately 120 kilometers north of the Lao capital, Vientiane.

The site and all infrastructureare located within the Nam Mo River catchment. The southwest-flowing Nam Mo River joins the south-flowing Nam Ngum River approximately 14 km west-southwest of the Phu Kham deposit. Both rivers are major drainage lines. The Nam Ngum flows into the Nam Ngum Reservoir approximately 40 km downstream of the Project Area.

In the Project Area, temperature varies from daily peaks well in excess of 30° C between May and July, to mild daily temperatures and cool nights in December and January. Average rainfall varies between approximately 2,000 and 3,200 mm/year following a distinct wet season/dry season pattern, and significantly exceeds evaporation (estimated to be 1,000 mm per year). During the wet season (May to September),monthly rainfall can exceed 1,000 mm. The mine received two 1 in 100 year storm events over a 3 day period at the end of June 2011 which resulted in extensive flooding and infrastructure damage in the region.

The main rock types in the Project Area are shales, sandstones, limestones (often karst-forming), felsic volcanics, granitic intrusives and cherts. The rock sequence has been folded and faulted.

The Phu Kham deposit is part of a copper-gold mineralisation system. The mineralisation is hosted by highly foliated granitic intrusive, felsic tuffs and an interbedded carbonate rich shale, sandstone, siltstone and limestone unit. The sulphide mineral assemblage associated with both styles of mineralisation is predominantly pyrite, chalcopyrite, chalcocite, bornite, and covellite.

Phu Kham uses a conventional open-pit mining method. The process plant comprises a SAG and ball mill grinding circuit with copper and precious metal recovery by flotation. The current milling rate is approximately 12 Mtpa (with planned upgrade to 16 Mtpa) and the final product is a copper-gold concentrate, which is trucked to a port south-east of Bangkok, Thailand, a distance of 990 km for sale to customers primarily in China. The flotation tailings report to an engineered tailings storage facility.

The Phu Kham copper-gold deposit comprises both transitional (partially oxidised) and primary ores.
The Phu Kham processing operations produce a potentially acid forming tailing product high in pyrite that is deposited subaqueously into a 200Mt capacity tailings storage facility. The TSF is being constructed progressively over the mine's life utilising selected waste rock from the mine and borrow from surrounding areas.

Approximately 150Mt of waste rock will be produced over the current mine life to 2021. Waste rock exhibits a range of sulphur grade and ARD rock types from non acid forming to highly acid forming with a low inherent acid neutralising capacity (ANC) and short lag time before onset of acid generation in PAF rock. The site is located in a challenging mountainous and tropical monsoonal environment, which further adds to the high ARD risk status at Phu Kham.

Waste characterisation for ARD potential began with the inclusion of sulphur as an integral component of the orebody modelling phase of mine development. This highlighted the need for integrated tailings and waste rock ARD management in the life of mine plan. A multidisciplinary team comprising representatives from geology, mining, processing and environment was established in conjunction with external consultants.This team evaluated various management options including ex-pit waste rock dumps; placement of all PAF waste below water in the TSF; and the preferred strategy of encapsulation of lower capacity PAF rock in the downstream section of the TFS embankment and placing higher capacity PAF rock in the TSF. The team developed detailed operational guidelines that allow the integration of ARD management practices into the daily operating activities with the overall objective of preventing any ARD legacy from waste rock and tailings at Phu Kham.

PBM is working with the Government of PDR Lao, pursuing the establishment of a Water Resources Environment Agency Environmental Monitoring Unit in Vientiane province, where the Phu Kham operations are based. The unit will facilitate transparent communication and engagement on matters relating to environmental management, of which ARD is the most significant.

2.0 Waste Rock Classification

An extensive and expanding database of total sulphur,ANC and net acid generation (NAG) is available for the Phu Kham ore and waste zones. Prior to mining, approximately 25,000 sulphur assays where available and although only limited ANC and NAG data were available, the generally low inherent ANC of the deposit enabled sulphur grades to be used to provide preliminary cut off criteria for classifying non-acid forming (NAF) and PAF rock types for block modeling and to produce waste type production schedules for mine planning. The pre-mining data indicated an average sulphur grade of 3.2%S with 20% of the projected waste rock having a sulphur grade of more than 5%S. Based on the available data pre-mining, a conservative NAF/PAF cut-off was set at 0.1%S. Based on block modelling at that time, about 25% of the planned waste rock productionhad a sulphur grade less than 0.1%S and was expected to be NAF.

Since mining started, 50 to 100 samples per month of waste rock are selected from grab samples and grade control drilling and analysed for sulphur, carbon, ANC and NAG. In addition, samples from horizontal geotechnical holes and exploration holes are included in the geochemical programme. These data are used to continually update the geological block model and to provide an expanding database to review operational criteria for waste type classification.

Based on these data, the NAF/PAF cut off has been revised and is currently set at 0.3%S.Figure 1 shows an acid base plot for grade control samples taken over a 22 month period from January 2010 to November 2011. Also shown is the net acid producing potential (NAPP)equal zeroline, where the theoretical potential of the sample to generate acid is balanced by the inherent ANC. Samples plotting to the right of this line are NAPP positive due to a deficiency in ANC and samples plotting to the left have excess ANC. These data show the typical distribution of S and ANC for Phu Kham waste rock with most samples being NAPP positive with a relatively low ANC of less the 20 kgH_2SO_4/t.

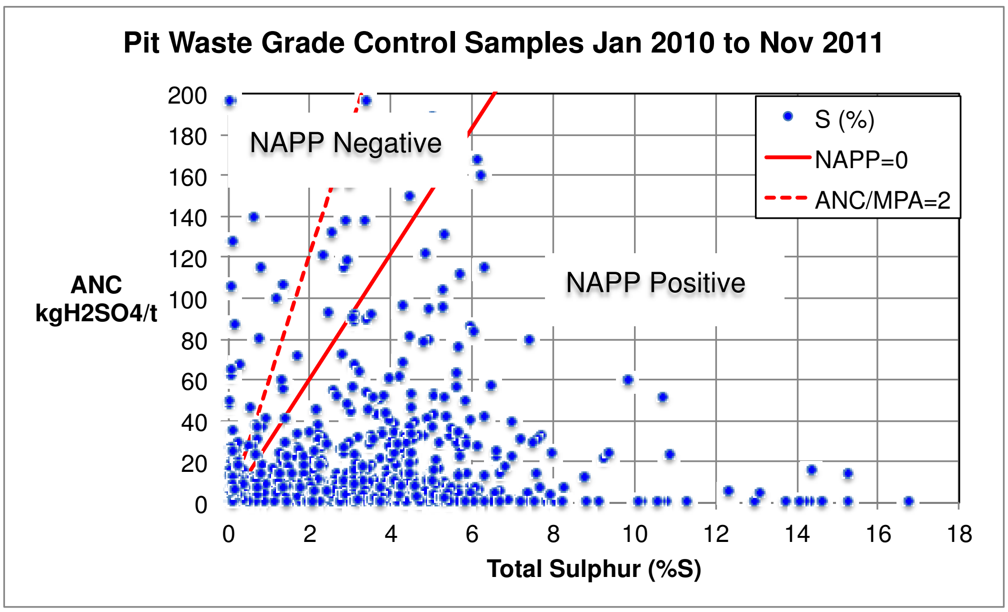

Figure 1: Acid Base Account (NAPP)plot – Waste grade control samples

Figure 2 is an ARD classification plot showing NAPP and NAGpH for the same waste grade control sample set plotted on Figure 2. NAF, PAF and Uncertain (UC) domains are shown with most samples plotting in the PAF domain, although there are a significant number of samples plotting in the upper right hand side UC domain and some samples clearly plotting in the NAF domain. Since NAPP and NAG are independent measures of the acid potential of samples, using both tests greatly improves confidence in prediction and identifies samples with conflicting NAPP and NAG results that are classified as UC. These UC samples can be further investigated to confirm their ARD potential. Figure 2 shows a number of samples plotting near the intersection of the NAPP = 0 and the NAGpH = 4.5 lines. These samples are typically low in ANC and S and are essentially barren with respect to ARD potential.

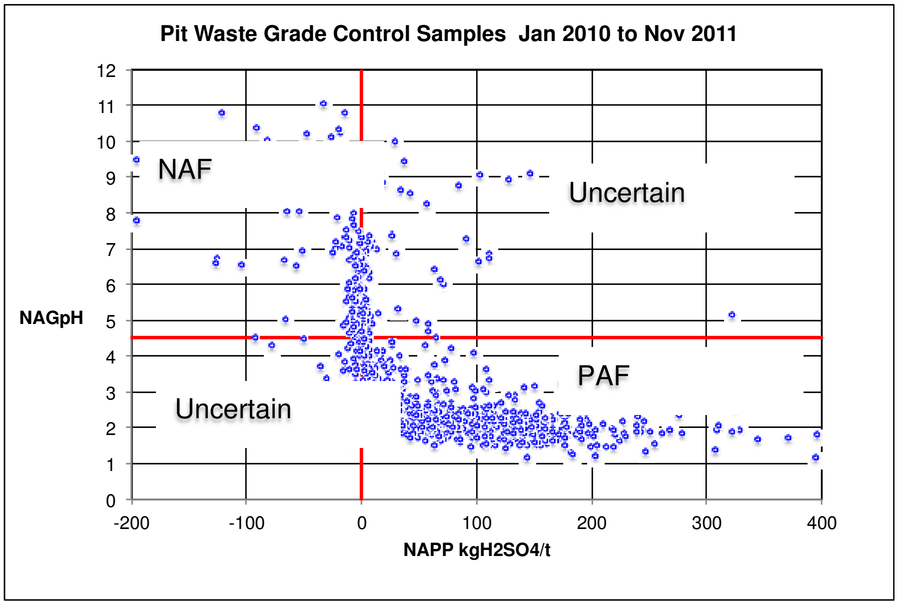

Figure 2: ARD Classification Plot – 2011 Grade Control Samples

Figure 3 is a plot of Total S and NAGpHshowing the current cutoff S grades for Green (NAF), Amber (PAF_Lower Capacity, PAF-LC) and Red (PAF_Higher Capacity, PAF-HC). This plot shows that most samples with a sulphur grade less than 0.2%S have a NAGpH greater than 4.5. These samples are classified NAF. Although many samples withsulphur contents from 0.2 to 0.3%S have NAGpH less than 4.5 and have the potential to develop low pH conditions, they are currently included in the Green category. To date, these samples have been widely distributed throughout Green zones and through run of mine (ROM) blending do not appear to influence the overall geochemistry of Green waste reporting to the TSF embankment, which to date hashad an overall average S grade of 0.1%S. However, the Green waste cut-off may be lowered to 0.2%S, if ongoing monitoring indicates that this is required, especially for material used for general earth works on site.

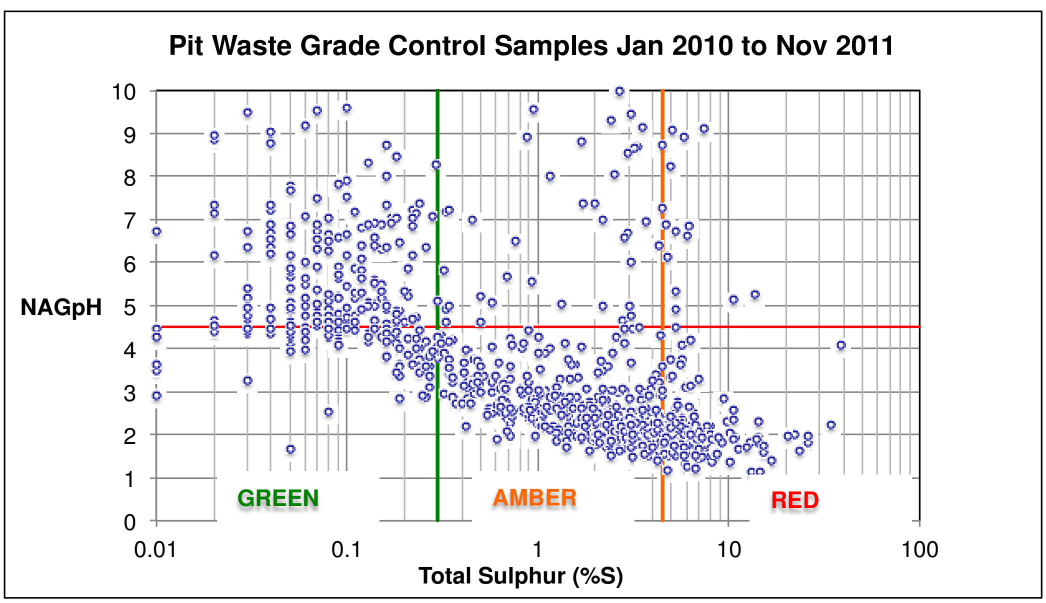

Figure 3: Waste Rock Classification Criteria - Sulphur and NAGpH

More than 95% of samples with total S greater than 0.3%S have NAGpH less than 4.5, and most have values less than 3. These samples are classified PAF. The current cut-off criteria for Amber and Red waste is 4.5%S and the overall average S grade is 2.2%S for Amber and 7.1%S for Red waste. The cut-off grade between Amber and Red is reviewed on a 6 month basis. As described in the following sections, the Amber cut-off is set to achieve an average S grade of not more than 1%S in the PAF cells in the TSF embankment, which are a blend of Amber, Green and Borrow material.

3.0 ARD Management Plan

The ARD management plan is based on the fundament strategy of isolating sulphidic mine waste from atmospheric oxygen. This essentially places the material within a pH and redox regime similar to the original orebody where pyrite is thermodynamically stable.

Engineering options for achieving isolation from atmospheric oxygen include placing sulphidic material under a permanent water cover or construction of an engineered seal that limits oxygen transfer to geological rates. At Phu Kham, both strategies have been adopted with the Red waste rock reporting to the tailings impoundment and the Amber waste rock mixed with Green and Borrow material and then isolated in cells and zones (PAF cells) within the downstream portion of the tailings storage facility. Fine-grained non-acid forming material is used for construction of encapsulation layers around PAF cells.

As outlined in the previous section, a simple traffic light system is used to segregate waste into three ARD categories labeled Green (NAF), Amber (PAF-LC) and Red (PAF-HC). Over the life of the mine, it is estimated that about 40% of the waste rock will be NAF and 60% PAF.

The PAF cells comprise a mix of Green, Amber and additional material extracted from borrow pits within and around the final TSF footprint. The sulphur cut-off for Amber waste is set to ensure this blend meets the following design specifications for sulphur grade within the PAF cells:

- average total sulphur content not more than 1%S; and
- 90% of samples less than 2%S.

The basis for these specificationswas to achieve an average net acid producing potential (NAPP) in the PAF cell blend (Green, Amber and Borrow) of 10 kgH_2SO_4/t, which was considered a feasible upper limit ifoperational monitoring identified a need toincorporatecrushed limestone during construction of the PAF cells to treat any low pH hot spots, prior to encapsulation. The operational monitoring strategy involves sampling material left exposed directly to atmospheric conditions for more than 1 week within PAF cells on a 20m grid pattern. Approximately 100g of sample from the surface 100mm is taken and mixed with 200g of deionised water and the slurry pH measured. A pH less than 5.5 triggers the need for mitigation treatment, but to date, no additional treatment has been necessary.

Based on operational monitoring within the pit and the projected waste rock and borrow material production schedules, the current cut-off for Amber waste is set at 4.5%S. In summary, the current sulphur grade criteria for Green, Amber and Red waste are as follows:

- Green: <0.3%S
- Amber: 0.3 to 4.5%S
- Red: >4.5%S

3.1 TSF Construction

Figures 4 and 5 show the general arrangement of the PAF cells within the embankment and the encapsulation layer.

Figure 4: TSF embankment showing location of PAF cells in the downstream section of the dam wall

Figure 4 also shows the location of the Red waste dump within the TSF. The sections following these figures describe the construction of the cells and encapsulation layers, instrumentation for monitoring pore gas oxygen concentrations and in-situ temperature, and management of the Red waste rock dump.

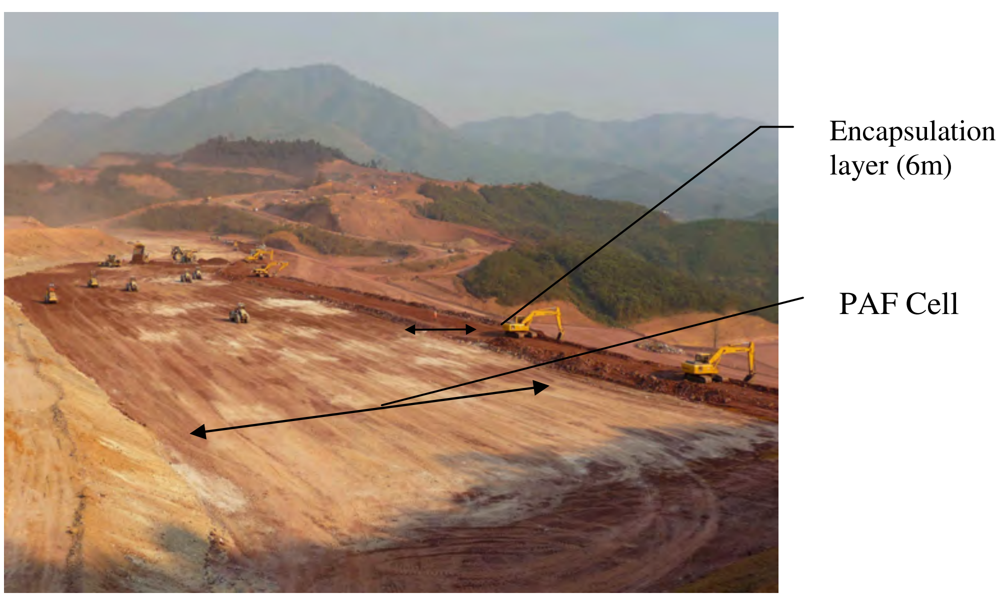

Figure 5: TSF embankment and PAF cell construction

3.1.1 Encapsulation layers

The encapsulation layers are a critical component of the design. These layers surround the PAF cells and construction of each stage rise of the embankment commences with a 5m thick base layer comprising a mix of green waste and borrow that is placed at the base.

A 6 m wide encapsulation layer is constructed on the external face (downstream) of the embankment. In addition, a 6 m wide layer is constructed where the embankment is in contact with natural ground.

The material for the encapsulation layers comprises green waste sourced from the mine and from designated borrow areas. It is a sandy gravelly intermediate plasticity clay (CI) to clayey gravel (GC) with a fines content in excess of 20% and a plasticity index of greater than 8%. The material is placed in 300mm layers, compacted to a minimum density of 98% of the standard maximum dry density at a moisture content equivalent to a degree of saturation of not less than 90%.

3.1.2PAFcell construction

The material for PAF cells is a mix of Amber and Green waste sourced from the mining operations and borrow material from designated borrow areas. It is placed in 300mm layers to facilitate blending of the materials and compacted to a minimum density of 98% of the standard maximum dry density.

All boulders or fragments of rock of greater than 200mm diameter are either removed from the layer or broken down with a rock breaker to a size less than 2/3 of the layer thickness prior to compaction.

3.1.3 Instrumentation

To effectively evaluate the performance of the encapsulation layer,pore gas oxygenmonitoring arrays are installedhorizontally as the cells are constructed. Figure 6 shows the installation and survey locating of pore gas sampling tubes located at 2.0 m increments through the first 10m of the PAF waste then at 15m and 20m into the PAF cells.

Figure 6: Installation of horizontal pore gas monitoring system

Vibrating wire piezometers (VWP) are installed to monitor pore pressures but also provide a continuous record of temperature at the monitoring points. These data are used to aid in the evaluation of the level of any historical or ongoing oxidation of sulphides in the PAF cells.

3.2 RedRock Waste Dump

The Red waste is placed in an engineered dump (Red Rock Waste Dump, RRWD) within the tailings impoundment where it is progressively inundated as the tailings dam water level rises. ARD generated and released from the PAF rock while above the water level mixes with TSF decant where it is neutralised by the alkalinity in the tailings water. Figure 7 shows construction of RRWD within the tailings storage area and Figure 4showed the location of the dump in relation to the TSF embankment.

The alkalinity of tailings liquor discharged to the dam and the return water are monitored daily to ensure that the dissolved alkalinity within the dam remains above 30 mg$CaCO_3$/l. Additional lime is added at the mill to the tailings discharge to provide a level of protective alkalinity to buffer acid inputs from the exposed rock during construction.

At closure, all red waste will be permanently under water to prevent on-going oxidation and acid generation.

Figure 7: Red Road Waste Rock Dump

4.0. Quality Control

4.1 Geotechnical

Standard geotechnical control and record testing is conducted on the materialplaced within the downstream embankment zone. Tests are carried out on PAF material placed in the cells as well as the encapsulation layer and include: Proctor (standard compaction), Atterberg Limit, Moisture Content, Particle Size Distribution, Specific Gravity, Nuclear Density, and Sand Cone.

4.2 Geochemical

Geochemical testing of the PAF fill is routinely carried out. The testing is conducted on the completion of every third 300mm layer, with samples collected on a50m grid spacing. Each sample comprises a 1m depth interval taken from a back hoe pit excavation. The samples are collected by the soil testing team and deliveredto the site laboratory for geochemical testing.

Samples are assayed for total sulphur, ANC,NAGpH and NAG acidity (kgH_2SO_4/t).

5.0 Operational Procedures and Performance

5.1 Construction

Grade control drilling undertaken in advance of mining drives the short term planning for both ore and waste mining. Waste blocks are characterised, marked up in pit, and then scheduled into the tailings storage facility embankment construction (Green and Amber) or deposited within the tailings storage facility (Red waste). Borrow is mined from designated borrow areas.

The mining operation uses a real time, GPS based, equipment management software (Jigsaw). The grade control mark ups are mapped into Jigsaw to allow the waste (and ore) blocks to be directed to the correct destination on a truck by truck basis.

5.2 Monitoring and Performance

5.2.1 In-pit waste classification

Routine monthly mine bench samples are assayed for total S, ANC, C, Cu and NAG. The results are used to confirm the in-pit classification and mapping of ARD waste rock types (Green, Amber and Red). All data are compiled, evaluated and presented in monthly reports and an ongoing database is maintained with sample locations and logged details. These data are used to update the ARD rock type model of the mine pit to facilitate short term mine planning for segregation and selective mining of ARD rock types for placement in the TSF embankment and RRWD.

5.2.2 PAF cells and encapsulation layer - geotechnical

Construction monitoring is completed on all encapsulation material placed in accordance with the testing requirement presented previously in Section 4.1. Testing results are reported to the construction team upon completion to provide feedback on construction quality. At the end of each month all data are compiled and documented into a report to record the dam construction history.

A geotechnical construction specification has been produced for all zones within the TSF embankment. This specification provides particle size limits, Atterberg limits, compaction and moisture content requirements for the materials to be placed within the PAF cells and material which can be used for construction of encapsulation layers.

The testing data for the material placed in the PAF cells indicates that a high degree of compaction has been achieved. The average compaction for all tests equated to a density of 99.9% of the standard maximum dry density, which is above the specified minimum of 98%.

The gradation of the material placed in the PAF cells is variable ranging from high plasticity clay (CH) with up to 90% fines to clayey sandy gravel (GC) with only 10% fines. The average grain size for the material was a clayey sandy gravel (GC) with approximately 37% fines.

To limit the oxidation of material placed within the PAF cells an encapsulation zone is constructed at the outer limits of the PAF cells. The testing data for the encapsulation material indicates that a high degree of compaction has been achieved. The average compaction for all tests equated to a density of 99.8% of the standard maximum dry density, which is above the specified minimum of 98%.

Key to the effectiveness of the encapsulation layers ability to reduce the flux of oxygen to the PAF waste is the degree of saturation at which the material is placed and compacted. By constructing the zone at high moisture content the ability for oxygen to diffuse through unsaturated pore spaces is significantly reduced.

The PAF encapsulation material has been placed at an average degree of saturation of 93.6%, which exceeds the minimum design specification of 90%.

5.2.3 PAFCells Geochemistry

As outlined previously, sampling is carried out on a 50 m grid to a depth of 1 m as each 1 metre raise is completed in a PAF cell.

Figure 8 shows the monthly average and 90th percentiles of a total of 628 samples taken during embankment construction of Stages 3 and 4 from November 2009 to March 2011. Note that construction is carried out during the dry season. During the wet season, waste production is reduced and any Green or Amber is stockpiledwhile Red and other unsuitable material report to the RRWD.

The results show that the design specifications of an average sulphur of less than 1%S and a 90th percentile of not more than 2%S were met in all months except December 2009 and April 2010.The results also indicate that the current construction period (2010-2011) meet the design criteria and indicate an overall lower sulphur grade than for the previous construction period (2009-2010).

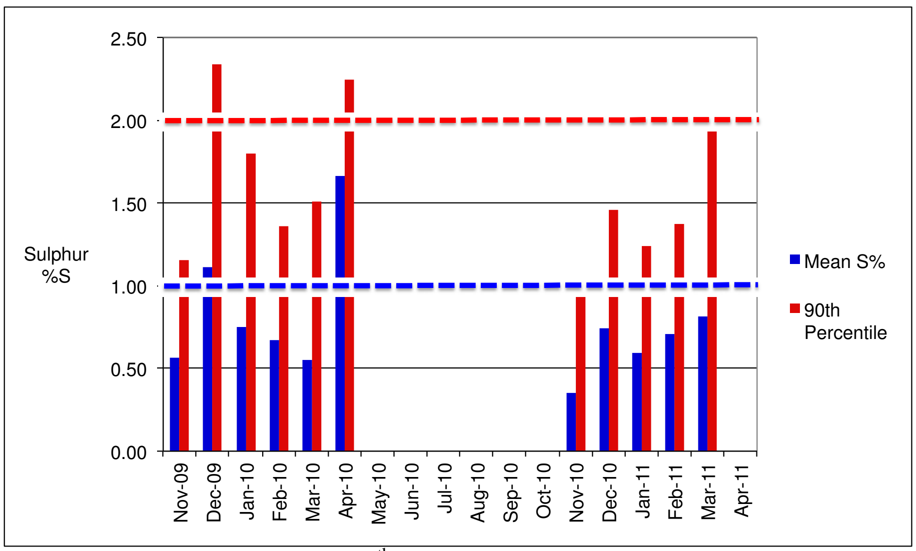

Figure 8. Monthly Average and 90th Percentile Sulphur Grades for PAF Zone Samples

5.2.4 PoreGas Oxygen Concentrations

As described in section 3.2, pore gas monitoring arrays are routinely installed as PAF cells are constructed with measurements taken on a weekly basis for the first 2 to 3 months and then monthly. The probes are installed horizontally with sampling ports within the PAF material and extend through the outer sealing layer to allow access to the sampling tubes. To date, 17 arrays have been installed (8 during Stage 3 and 9 during Stage 4 construction lifts).

Atmospheric oxygen must contact pyrite mineral surfaces to initiate and sustain pyrite oxidation and acid generation. Control of the oxygen flux into PAF material is a critical component of the overall ARD management plan at Phu Kham. The flux of oxygen is directly proportional to the oxygen diffusion coefficient of the PAF material and encapsulation layer and inversely proportional to the thickness of the inert encapsulation layers. Maintaining a high degree of saturation in the PAF material and in the sealing and encapsulating layers is the most effective method of achieving oxidation control.

The oxygen concentration profiles and trends through time are shown on Figures9 for one of the oxygen monitoring arrays (OMA 10) from Stage 4 construction. All 17 monitoring locations show similar trends with oxygen concentrations decreasing to zero within 1 to 4 months. OMA 10 was installed on 20 November 2010, and Figure 9 shows that the oxygen concentration at the sampling ports decreased to less than 15% O_2 by 5 December 2010 and zero O_2 on 12 January 2011 at Ports 2 and 5 with all ports recording zero by 4 February 2011, a period of 2 to 3 months.At some of the Stage 3 arrays, short term excursions in oxygen concentration (1 to 3% O_2) were measured at ports 6 and 7 which are closest to the outer embankment. However, these were not sustained and probably reflect short term settlement effects on pore gas exchange.

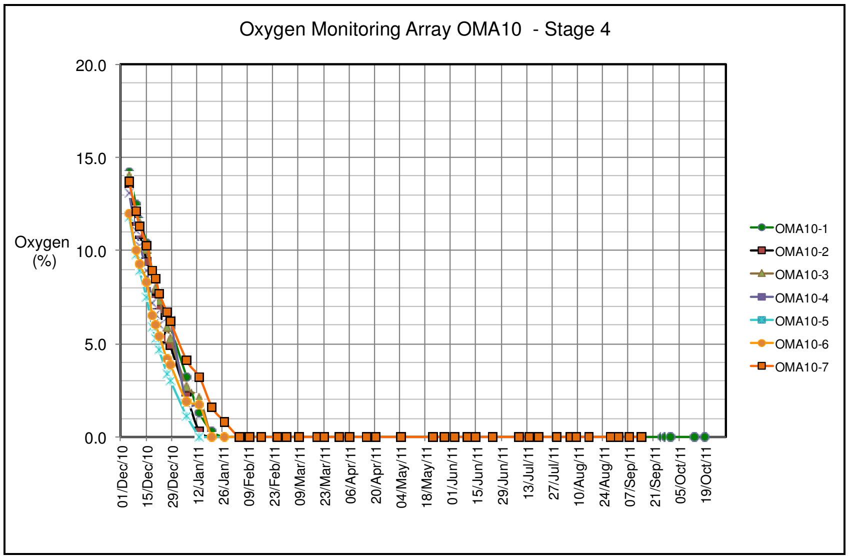

Figure 9. PAF cell pore gas oxygen concentration trends.
(Port 1 furthest from sealing layer and port 7 adjacent to sealing layer)

Overall the results show that oxygen concentrations in the pore space decrease to zero within weeks to a few months after placement and indicates that ongoing oxidation within the PAF cells is negligible.

The oxidation rates for the mixed PAF material at each location were calculated from the measured rates of oxygen depletionand ranged over an order of magnitude from 1.5 x 10^{-8} to 4 x 10^{-7} $kgO_2/m^3/sec$. These values indicate that the rock mix within the PAF cells is moderately to highly reactive sulphidic material. This supports the need to maintain a high level of management to ensure ongoing control of oxidation to prevent ARD generation.

5.2.5 PAF Cell Temperature Trends

As described previously, the installed VWP's provide continuous temperature records at the monitoring tips. The results for installations located in areas of negative pore pressure within the PAF cellsare used to monitor temperature in the PAF cells.

The temperature trends show an initial decrease towards steady state values consistent with the annual average daily temperature at Phu Kham. These trends indicate a lack of other sources of heat in the PAF cells such as oxidation of pyrite, which is an exothermic reaction, and support the findings of the oxygen monitoring data that oxidation is being effectively controlled within the PAF cells.

5.2.6 TSF Embankment Seepage Chemistry

Drainage from the TSF embankment is directed through a V notch weir where the flow is continually monitored and a water sample is collected weekly.

Table 1 shows the mean and the 90th and 99th percentiles (10th and 1th for pH) for water quality parameters for the TSF toe seepage, based on weekly samples from January 2009 to November 2011.

Seepage from the TSF has maintained circum-neutral pH (median 6.6) with high dissolved alkalinity (mean 123 $mgCaCO_3/l$) and low sulphate (mean 59 mg/l). Concentrations of dissolved metals and metalloids are low and comply with the discharge guidelines.

There is no discernable impact on seepage chemistry from sulphide oxidation products from the PAF cell within the embankment.

Table 1: TSF Toe Seepage Chemistry

Parameter mg/l (except pH)	Mean Median for pH	90thPercentile (10th for pH)	99th Percentile	Discharge Guideline
pH	6.6	7.5	6.1	6 to 9
TDS	281	370	619	
Alkalinity*	123	150	232	
SO_4	59	73	349	
Ag	0.044	0.050	0.100	0.100
As	0.031	0.100	0.100	0.100
Cu	0.017	0.021	0.101	0.300
Fe	0.55	1.00	1.29	2.000
Ni	0.027	0.050	0.050	0.500
Mo	0.036	0.090	0.229	
Pb	0.021	0.040	0.100	0.200
Zn	0.056	0.100	0.100	0.500
Ca	60.8	68.8	217.1	
Mg	22.8	38.3	64.0	
Na	6.2	7.3	11.9	

*Alkalinity as $mgCaCO_3/l$

6.0 Conclusions

The Phu Kham site presents significant challengesfor managing potentially acid forming mine waste in steep topography and a high rainfall environment. Early identification of the ARD risks prior to mining and integration of the geochemical requirements with the mine plan has enabled PBM todesign and manage ARD without any significant events.

The plan is based on the fundamental strategy of isolating sulphidic mine waste from atmospheric oxygen. This is achieved through placement of the higher sulphidic rock (Red Waste) within the tailings impoundment where it is progressively inundated by the supernatant pond with the lower sulphidic rock (Amber Waste) mixed with non-acid forming (Green Waste) waste and borrow and isolated in cells within the downstream portion of the tailings storage facility embankment. Fine grained Green Waste and borrow material are used to encapsulate PAF cells.

Performance monitoring of the geochemical and geotechnical characteristics of placed waste rock; oxygen and temperature monitoring within the PAF cells; and water quality data demonstrate that ARD is being effectively controlled during construction and closure of PAF cells. The long-termperformance will ultimately depend on maintaining the physical integrity of the PAF cells and encapsulating layers with an adequate depth of cover to allow for erosion and any settlement effects. Stage 4 of the proposed 8 Stage TSF construction program is complete and on-going monitoring is in place to continually assess and evaluate the current and long term stability of the embankment to identify any need to modify or refine the design and to provide data for the ultimate final cover zone. To final design, an additional 60 m perpendicular depth of material will be placed and the current waste rock production schedule to life of mine indicates that at least the final 30 m depth will comprise only Green and Borrow material. During this final production period, all PAF material mined will report to the tailings dam where it will be under permanent water coverat closure.

Key to the success of ARD managementPhu Kham has been company wide awareness of the ARD risks and diligent operational management with regular technical review and evaluation of performance.

Acronyms

ANC: Acid Neutralising Capacity (kgH_2SO_4/t)
NAF: Non-Acid Forming
NAG: Net Acid Generation
NAGpH: Net Acid Generation pH value
NAPP: Net Acid Producing Potential (kgH_2SO_4/t)
PAF: Potentially Acid Forming
PAF-HC: Potentially Acid Forming – Higher Capacity
PAF-LC: Potentially Acid Forming – Lower Capacity
ROM: Run of Mine
RRWD: Red Rock Waste Dump
TSF: Tailings Storage Facility
UC: Uncertain