REPORT ON CYANIDE LEACH TESTING OF THREE DIFFERENT GOLD ORE COMPOSITE SAMPLES FROM THE AMULSAR DEPOSIT, ARMENIA

Prepared for

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NOTE:
This report refers to the samples as received.

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Executive Summary

This report summarises the findings of a metallurgical test programme conducted on three composite samples from the Amulsar gold deposit, Armenia.

Cyanide leach testing, in the form of bottle rolls and column-simulated heap leaching were performed at a variety of particle top sizes in order to identify any variation in gold recovery by particle size.

Results showed that total gold recoveries ranging from 95.8% to 89.2% could be achieved at a particle top size of up to 2mm reducing to between 89.1% and 76.5% at -19mm and 80.3% and 64.4% at -38mm.

On average, Cyanide across the whole of the test work programme was 0.14kg/t, which was very low considering the recoveries achieved, whilst lime consumption was 1.04kg/t which is relatively normal.

The low gold content of all three of the composites suggests fine grinding followed by leaching is unlikely to be economical and as such more significance should be placed on the results of the column tests which simulate the more likely processing route, heap leaching.

These showed that, of the two crush sizes tested, a -19mm crush appeared to produce the optimum results with total gold recoveries in the region of 90% achieved for composites A and B after 70 days of leaching.

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1. Introduction

SGS Minerals Services (SGS) were requested by Mr Andor Lips, Technical Director, Lydian International Ltd (Lydian) and Mr Jon Foruria, Interim Manager – Amulsar Project, NVL Caucasus Ltd LLC (NVL), to undertake a programme of laboratory based cyanidation test work in order to identify the efficacy of leaching gold from samples of ore taken from the Amulsar deposit, Armenia.

1.1 Background

Previous testing, conducted by SGS Lakefield, Canada, on a composite sample of material from drill hole DDA-004 identified that gold recoveries ranging from 94.7% to 97.3% could be achieved by means of whole ore leaching at fine grind sizes ranging from 150µm to 75µm.

Further leaching test work, in the form of heap leach simulation tests, performed using coarse ore bottle rolls, demonstrated that gold recoveries of 94.7% could be maintained up to crush sizes of 12.5mm.

Finally, testing to determine the efficacy of extracting gold using a gravity process showed that the gold was finely disseminated within the ore with a recovery of just 8.5% achieved at a 150µm grind size and as such, a gravity concentration stage was unlikely to be warranted.

Following this testing, it was recommended that further work was undertaken on samples or composites representing the entire deposit and that testing should be continued to optimise the operating parameters for the heap leach process which was identified as the most likely amenable processing methodology.

Based on this, and following additional discussions between SGS, NVL and Lydian, a proposal was generated to undertake further metallurgical testing on samples from the Amulsar deposit.

This proposal was accepted by NVL and Lydian on 1st June 2009.

1.2 Objectives

The objectives of the test work program, as defined by the proposal, were to provide additional information relating to the potential gold recovery from composite samples of material from the Amulsar deposit, Armenia.

This was achieved by testing a total of three composite samples at both coarser particle sizes and lower cyanide solution strengths than tested as part of the previous phase of work.

2 Head Samples

A total of 160 discrete drill core sections, representing 12 drill holes were submitted to SGS for testing. These intervals were used to prepare three composite samples; Composite A, Composite B and Composite C, which were blended according to instructions provided to SGS by Lydian.

The samples selected for compositing were chosen in order to represent the three most distinct ore types within the deposit based on lithology, alteration pattern, gold and multi-element distribution.

A summary of the intervals blended to generate each composite sample is shown below in Table 1, Table 2 and Table 3.

Table 1: Composite A Blending List

Drill Hole	From	To	Length (m)	Weight (Kg)
DDA-001	18	25	7	16.25
DDA-001	124	126	2	5.60
DDA-003	67	71	4	12.45
DDA-003	98.75	107	8.25	27.40
DDA-006	45	46	1	1.95
DDA-006	143.3	144	0.7	1.65
DDA-007	2	13	11	42.60
DDA-007	18.8	25	6.2	26.65
DDA-007	31	37	6	17.00
DDA-007	42	50	8	22.10
DDA-009	96	100	4	11.45
DDA-016	132	149.5	17.5	52.15
DDA-019	64	66	2	5.60
DDA-020	79	81	2	4.95
Total			79.65	247.80

Table 2: Composite B Blending List

Drill Hole	From	To	Length (m)	Weight (Kg)
DDA-001	50.4	57.2	6.8	20.60
DDA-002	63	69	6	4.85
DDA-003	11.8	38	26.2	75.40
DDA-006	0	35	35	139.00
DDA-008	17	24	7	22.50
DDA-008	39	62	23	51.20
DDA-017	49	63	14	37.05
DDA-019	0	22	22	98.05
DDA-020	110	116	6	15.70
Total			146	464.35

Table 3: Composite C Blending List

Drill Hole	From	To	Length (m)	Weight (Kg)
DDA-007	102	110	8	24.30
DDA-015	41	52	11	24.15
DDA-015	71	91	20	46.05
DDA-017	37	49	12	35.30
Total			51	129.80

In order to facilitate coarse column-simulated heap leach testing, all material was received as ‘cubes’ of half HQ core cut into approximately 38mm lengths.

2.1 Sample Preparation

Upon receipt, each of the three composites was blended as per the lists shown above.

The total amount of material in Composites A & B exceeded that which was necessary to conduct the test work programme (circa 120kg) and so this weight was split out of both of the composites using the ‘Coning and Quartering’ method.

All residual sample material was placed into storage whilst the three 120kg head samples were then prepared for testing as follows;

Initially, 50kg of material was extracted from each of the composites, again using 'Coning and Quartering' in order to provide a sufficient amount of 'as-received' feed to conduct -38mm column-simulated heap leach tests.

The unused sample was then stage crushed to 100% passing 19mm after which a second 50kg sub-sample was extracted, again by means of 'Coning and Quartering', in order to provide feedstock for -19mm column-simulated heap leach tests (one per composite).

The remaining 20kg of -19mm material was then stage crushed to 100% passing 2mm at which point two 5kg sub-samples were riffled out of each composite; one to facilitate -2mm cyanide bottle roll tests and the other to allow chemical head assay and mineralogical characterisation.

Finally, the residual 10kg of each composite was crushed and ground to 80% passing 75µm where a final 5kg sub-sample was extracted from each of the composites for ~75µm cyanide bottle roll tests.

Any remaining material left over following the preparation of each composite sample was again placed into storage for possible future use.

3 Test work Description

The programme of testing undertaken as part of the defined program of work was divided into two separate phases. The first phase consisted of full chemical head analysis and cyanidation bottle rolls tests, both of which had a fairly short lead time, whilst the second phase comprised of column-simulated heap leach amenability tests, which had a significantly longer lead time.

Testing was structured in this manner to maximise the amount of information generated in the shortest possible time, in order to provide an indication of the amenability of the composites to leaching, before the lengthy process of column-simulated heap leaching was commenced.

Details of the test work stages undertaken are outlined below.

3.1 Head Assay

Head assay of the three composites was performed in order to characterise each of the samples in terms of both chemical and mineralogical composition.

Two different methodologies were employed as part of the chemical analysis, with the gold and silver content being determined by means of ‘screened metallics’ analysis, whilst all remaining elements were determined using direct chemical measurement.

Mineralogical characterisation was performed using X-Ray diffraction (XRD) analysis.

Analysis was performed using two 1kg sub samples taken from one of the 5kg samples of -2mm material generated during sample preparation.

3.1.1 Screened Metallics Analysis

Screened metallics analysis is a methodology employed to analyse for precious metals such as gold and silver.

It involves taking a minimum of 1kg of representatively prepared feed and stage crushing it through a screen, until approximately 50g of oversize remains. The entire oversize fraction and two duplicate 50g sub-samples of the undersize are then assayed to extinction in order to determine metal content.

By reducing the amount of coarse material present in the sample, and subsequently analysing all of it, the methodology minimises the likelihood of coarse, nugget like gold biasing the assay results as a result of poor sampling. The screened metallics method also enables a balance of the distribution of gold by size (screen oversize or screen undersize), which can also assist in providing an indication as to suitable processing methods with which to treat the sample.

For all three of the composite tested, one of the 1kg samples was crushed in closed circuit with a 106µm screen. The resultant products were then analysed for both gold and silver by means of a total oxidising attack with an AAS finish.

3.1.2 Direct Chemical Analysis

Direct analysis was performed on a sub-sample of the second 1kg head sample in order to determine the concentration of elements present that are not usually found in their native form and as such are less likely to be subject to the same sampling errors that can occur for gold and silver.

Each 1kg sample of composite material was pulverised to 100% passing 75µm and submitted for chemical analysis in order to determine content of the following elements; Aluminium, Antimony, Arsenic, Bismuth, Cadmium, Calcium, Carbon (organic and carbonate), Chlorine, Chrome, Cobalt, Copper, Fluorine, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silica, Sodium, Sulphur (total, soluble and sulphide), Tellurium and Zinc.

Analysis was performed through a combination of mixed acid attack with an AAS finish and XRF.

3.1.3 Mineralogical Characterisation

Characterisation of the mineralogical composition of the composite samples was performed by means of X-Ray Diffraction (XRD) analysis.

Sub-samples of the second 1kg head sample were pulverised and submitted for semi-quantitive mineralogical investigation whereby the abundances of each mineral identified are reconciled against the results of the chemical analysis.

The minerals identified are the reported in one of four categories; major (>30%), moderate (>10<30%), minor (>2<10%) and trace (<2%), by weight percent.

3.2 Cyanidation Bottle Roll Testing

Cyanidation Bottle Roll tests were performed on representative sub-samples of the -2mm size fractions in order to provide evidence for the amenability of extracting gold from the three composites at fine particle sizes.

1kg samples of the -2mm and 80% -75µm material were placed into glass bottles and pulped, using deionised water, to 40% solids. The pH of the pulps were then raised to 11.0 and allowed to stabilise after which cyanide, equivalent to a solution concentration of 250ppm, was added.

The bottles were then 'rolled' on a laboratory unit for one minute every hour for a total of 14 days in order to maximise the contact between the solution and the sample whilst minimising attrition of the ore.

During the test, both pH and cyanide levels were regularly measured and, where necessary, maintained at their original levels whilst aliquots of pregnant solution were extracted and submitted for analysis for gold content at intervals of 5 hours, 1 day, 2 days, 4 days, 7 days, 10 days and 14 days.

Upon completion of the test, the remaining pulps were filtered, washed, dried and sub-samples submitted for gold assay. The results were then used to calculate the residual amount of gold in the ore and balance the actual amount of gold extracted from each of the samples.

Cyanide and Lime consumption rates for each test were also calculated.

3.3 Column-Simulated Heap Leach Testing

Following completion of the Cyanidation Bottle Roll tests, the coarser -38mm and -19mm size fractions of each composite sample were submitted for column-simulated heap leach testing.

The entire mass of sample (circa 50kg) of both size fractions from all three composites, prepared previously, was loaded into the columns which measured 150mm (ID) by 2m tall.

Samples were not agglomerated specifically at the request of Lydian in order to best simulate the run-of-mine conditions likely to be employed on site.

All columns were configured as per the arrangement shown overleaf in Figure 1. Each column consisted of the following general components; test column, filter and carbon trap, reservoir tank and pump.

The reservoir tank was used to store the approximate 8 litres of water used in each of the column circuits and as the dosage point for both the lime and cyanide reagents. From this, the barren leach solution was pumped, at a rate equivalent to 10L/hr/m^2 to the top of the column where it was allowed to percolate through the sample.

Once at the bottom of the column, the now pregnant leach solution was separated from the sample by means of a filter membrane and perforated plate where it was collected and passed through a carbon trap containing 15-20g of activated carbon.

Any gold in solution was absorbed onto the surface of the carbon with barren leach solution discharged back into the reservoir tank.

Upward flow recirculation was used through the carbon trap to prevent short-circuiting and maximise solution contact with the activated carbon.

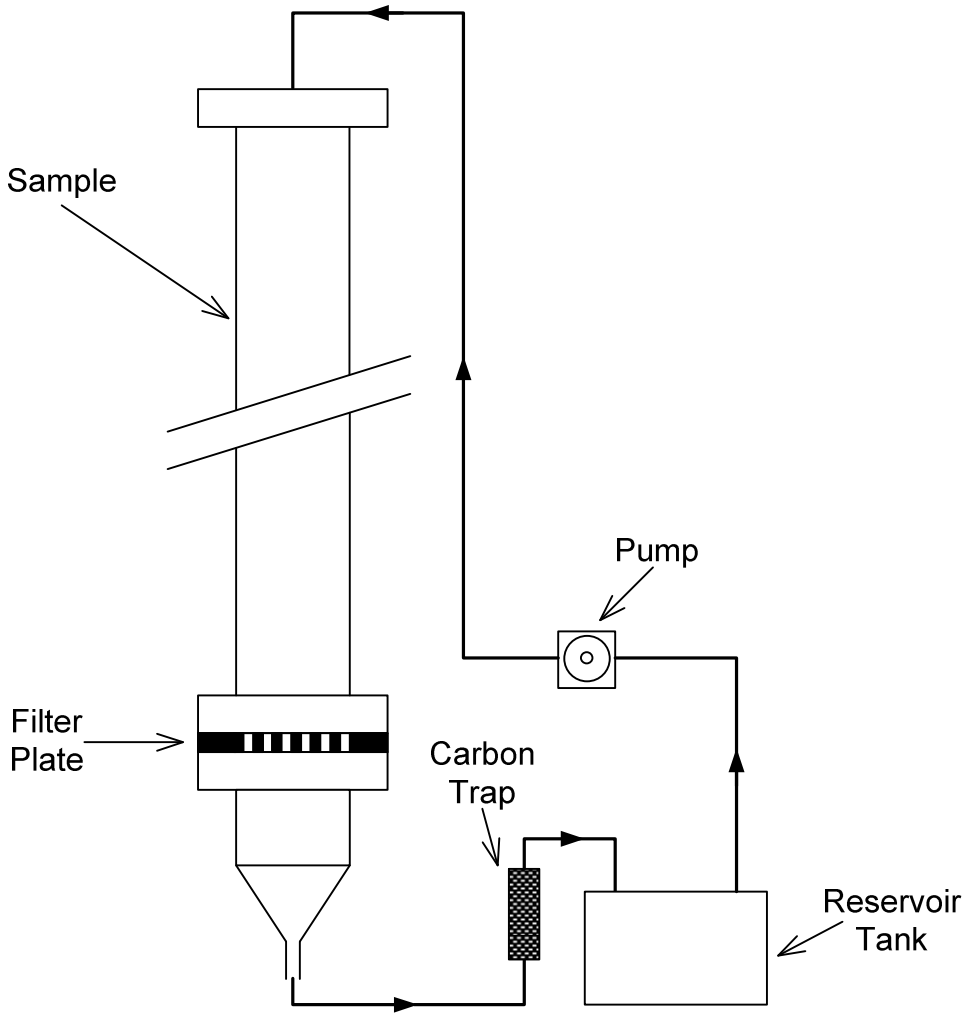


Figure 1: General Column-Simulated Heap Leach Arrangement

Once each reservoir tank had been filled with water, the pumps were switched on in order to first saturate the surfaces of the samples within. Once completed, the reservoir levels were topped-up and the pH of the water adjusted to 11.0. This was undertaken in order to neutralise any acid generating minerals present in the sample.

Upon stabilisation of the pH, whereby the outflow solution pH matched that of the inflow solution, sodium cyanide was added in order to produce a leach solution concentration of 250ppm NaCN.

This was then pumped around the circuit continuously for the duration of the test.

Free lime and cyanide levels were measured at regular intervals and, where appropriate, additional reagent added to maintain the initial levels. The rate at which solution entered and exited the column was also measured and adjusted where necessary.

Throughout the test, the activated carbon charge was changed so as to provide a breakdown of the recovery of gold by time. Each carbon sample was changed after the first 2, 4 and 7 days of running the columns on cyanide leach solution, and then weekly thereafter until completion of the tests. Following extraction, samples were dried, weighed and submitted for assay for gold only.

On completion of each test, the activated carbon sample was changed once more and the cyanide leach solution replaced with deionised water. The columns were then run for a further two days on this fresh water in order to 'rinse' and gold bearing solution through the final activated carbon sample.

After the two days had elapsed, samples of the barren leach solution, deionised water 'rinse' solution and final carbon charge were removed and submitted for gold assay and the columns allowed to drain.

The residual sample material was then removed from each column, split into four sections, each representing approximately 0.5m of the columns total height, and dried.

Once dried, these sections were each screened into a total of four size fractions; -19+15mm, -15+10mm, -10+4.5mm and -4.5mm for the -19mm samples and -38+25mm, -25+15mm, -15+6.3mm and -6.3mm for the -38mm samples and weighed.

Each fraction was then crushed to 80% -1mm and a 250g sub-sample extracted. These sub-samples were then pulverised to 80% -75µm and a 50g sample submitted for analysis for gold and silver.

The results were then used to calculate the amount of gold present in the column resides which in-turn was used to determine to amount of gold extracted.

For the -19mm samples, the columns were run for a total of 70 days (10 weeks) whilst for the -38mm samples, this was extended to 142 days (20 weeks 2 days).

4 Results

A summary of the key metallurgical results are detailed below. Full results can be found within the Appendix located towards the back of the document.

4.1 Head Assay

4.1.1 Screened Metallics Analysis

Results of the screened metallics analysis performed on the three composite head samples are shown below in Table 4 and overleaf in Table 6.

Following subsequent testing, a discrepancy between the back calculated head grade and screened metallics head assay for gold in Composite C was identified and as a result, a repeat analysis was performed as a check. The results of this duplicate analysis are shown in Table 5.

Table 4: Screened Metallics Head Assay – Gold

	Calculated Head Grade (g/t)	+106µm Fraction			-106µm Fraction			
		Weight %	Au (g/t)	Au Distribution (%)	Weight %	Au (g/t)	Au Duplicate (g/t)	Au Distribution (%)
Composite A	1.17	4.17	0.33	1.17	95.83	1.21	1.21	98.83
Composite B	1.09	4.44	0.43	1.75	95.56	1.18	1.07	98.25
Composite C	1.29	4.20	0.36	1.17	95.80	1.32	1.34	98.83

Table 5: Screened Metallics Head Assay – Gold – Composite C Duplicate

	Calculated Head Grade (g/t)	+106µm Fraction			-106µm Fraction			
		Weight %	Au (g/t)	Au Distribution (%)	Weight %	Au (g/t)	Au Duplicate (g/t)	Au Distribution (%)
Composite C Repeat	1.52	2.95	0.41	0.79	97.05	1.55	1.56	99.21

Table 6: Screened Metallics Head Assay – Silver

	Calculated Head Grade (g/t)	+106µm Fraction			-106µm Fraction			
		Weight %	Ag (g/t)	Ag Distribution (%)	Weight %	Ag (g/t)	Ag Duplicate (g/t)	Ag Distribution (%)
Composite A	1.60	4.17	4.00	10.40	95.83	1.48	1.52	89.60
Composite B	2.42	4.44	4.10	7.54	95.56	2.39	2.29	92.46
Composite C	3.76	4.20	3.05	3.41	95.80	3.57	4.02	96.59

4.1.2 Direct Chemical Analysis

Results of the additional direct chemical analysis performed on each of the composite head samples is shown below in Table 7

Table 7: Direct Chemical Analysis Results

	Composite A	Composite B	Composite C
Assay (%)			
Al	1.93	0.78	1.51
As	0.0214	0.0139	0.0187
Bi	0.0020	0.0080	0.0087
C (org)	0.57	0.51	0.46
C (CO_3)	<0.10	<0.10	<0.10
Ca	0.26	0.28	0.27
Cd	<0.0001	<0.0001	<0.0001
Cl	0.01	0.01	0.03
Co	<0.001	<0.001	<0.001
Cr	0.02	0.03	0.03
Cu	0.016	0.012	0.011
F	<0.01	<0.01	<0.01
Fe	7.49	4.60	5.30
Hg	<0.0001	<0.0001	<0.0001

K	0.55	0.31	0.43
Mg	<0.01	<0.01	0.01
Mn	0.003	0.003	0.005
Na	0.07	0.03	0.04
Ni	0.001	0.001	0.001
Pb	0.027	0.012	0.025
S (tot)	0.23	0.11	0.13
S (S^{2-})	0.05	0.03	0.05
S (sol)	0.18	0.08	0.08
Sb	0.0086	0.0184	0.0124
Se	<0.0001	<0.0001	<0.0001
SiO_2	89.20	90.59	91.19
Te	<0.0001	<0.0001	<0.0001
Zn	0.001	0.002	0.001

4.1.3 Mineralogical Characterisation

A summary of the mineralogical composition of each of the composite samples, in terms of mineral assemblage and semi-quantitative mineral abundance is shown below in Table 8 and Table 9.

A full copy of the report, including chemical balance and diffraction patterns can be found within the Appendix

Table 8: Summary of X-Ray Diffraction Mineral Assemblages

	Major (>30% wt)	Moderate (<30>10% wt)	Minor (<10>2% wt)	Trace (<2% wt)
Composite A	Quartz		Goethite, Alunite, Potassium Feldspar	*Hematite
Composite B	Quartz		Goethite, Potassium Feldspar	*Alunite, *Hematite
Composite C	Quartz		Geothite, Alunite, Potassium Feldspar	*Hematite

** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity.*

Table 9: Semi-Quantitative X-Ray Diffraction Results (Wt %)

	Composite A	Composite B	Composite C
Quartz	82.3	90.2	87.9
Hematite	1.7	1.0	1.1
Goethite	7.3	4.3	4.6
Alunite	5.3	2.0	3.7
Microcline	3.3	2.5	2.6
Total	99.9	100.0	99.9

4.2 Cyanidation Bottle Roll Testing

Summary results of the Cyanidation Bottle Roll tests results are shown below. For clarity, results have been grouped and reported by particle top-size.

4.2.1 -2mm Bottle Roll Tests

Results of the leach tests performed on the -2mm samples are shown in tabular format below in Table 10 and graphically overleaf in Figure 2.

In both cases, gold distribution has been reported incrementally based on the leachate extraction intervals with the final amount of gold recovered, i.e. leached into solution, shown in the row “14 day Pregnant Solution”.

Table 10: -2mm Cyanidation Bottle Roll Results

	Σ % Distribution Au		
	Composite A	Composite B	Composite C
5hr Pregnant Solution	52.0	49.1	52.9
24hr Pregnant Solution	89.1	81.2	78.2
2 day Pregnant Solution	92.7	87.1	83.8
4 day Pregnant Solution	94.3	88.2	84.5
7 day Pregnant Solution	95.0	90.3	87.1
10 day Pregnant Solution	96.9	90.1	88.5
14 day Pregnant Solution	**95.1**	**91.8**	**89.2**
Final Residue	4.9	8.2	10.8

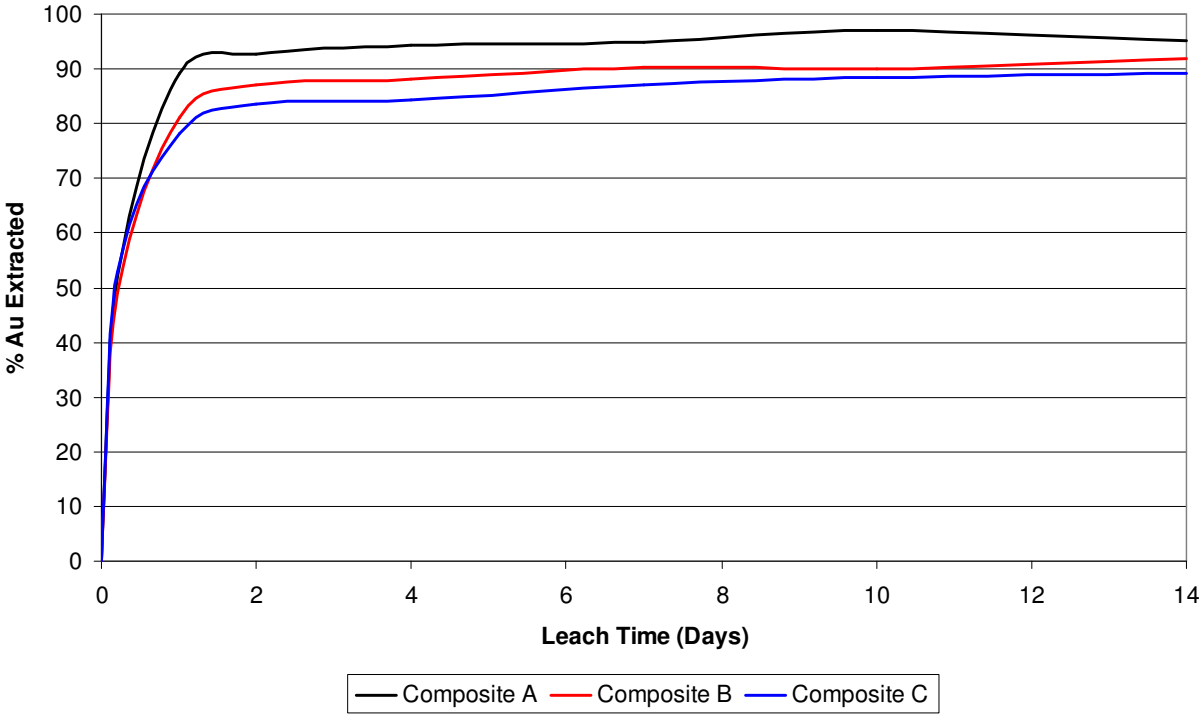


Figure 2: -2mm Cyanidation Bottle Roll Kinetic Leach Curves

The quantity of reagents consumed (both Sodium Cyanide and Lime) during each test is summarised below in Table 11 whilst a comparison of the back-calculated cyanidation bottle roll head assays with the original screened metallics head assays is shown in Table 12.

Table 11: -2mm Cyanidation Bottle Roll Test Reagent Consumptions (Kg/t of feed)

	Cyanide	Lime
Composite A	0.09	1.13
Composite B	0.08	1.06
Composite C	0.08	1.20

Table 12: -2mm Cyanidation Bottle Roll Test Back Calculated Au Head Assay Comparison

	Composite A	Composite B	Composite C
Screened Metallics Head Assay (g/t)	1.17	1.09	1.52
Back Calculated Head Assay (g/t)	1.22	1.23	1.62
Relative Variance	4.27%	12.84%	6.58%

4.2.2 80% -75µm Bottle Roll Tests

Gold distribution results from the three composites for the 80% -75µm cyanidation bottle roll tests are again shown in tabular and graphical format in Table 13, below and Figure 3 overleaf, respectively.

As with the previous results, values are reported incrementally based on the time elapsed at the point of sampling.

Table 13: 80% -75µm Cyanidation Bottle Roll Results

	Σ% Distribution Au		
	Composite A	**Composite B**	**Composite C**
5hr Pregnant Solution	27.8	37.8	38.2
24hr Pregnant Solution	83.7	81.8	80.8
2 day Pregnant Solution	96.2	90.2	89.1
4 day Pregnant Solution	94.9	90.2	88.7
7 day Pregnant Solution	94.5	91.2	89.5
10 day Pregnant Solution	97.6	93.3	92.0
14 day Pregnant Solution	**95.8**	**95.2**	**93.2**
Final Residue	4.2	4.8	6.8

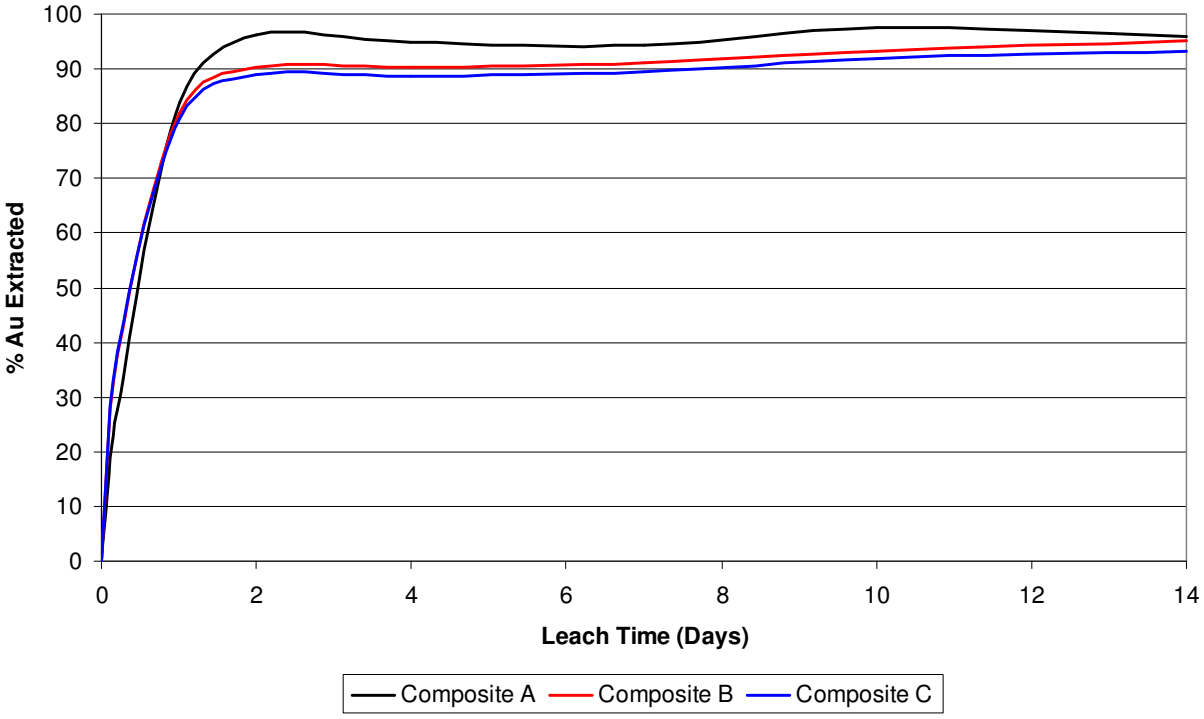


Figure 3: 80% -75µm Cyanidation Bottle Roll Kinetic Leach Curves

Reagent consumptions for each sample are again displayed below in Table 14 whilst comparison of the back-calculated and screened metallics head assay results are shown in Table 15.

Table 14: 80% -75µm Cyanidation Bottle Roll Test Reagent Consumptions (Kg/t of feed)

	Sodium Cyanide	Lime
Composite A	0.10	1.22
Composite B	0.05	1.13
Composite C	0.11	1.32

Table 15: 80% -75µm Cyanidation Bottle Roll Test Back Calculated Au Head Assay Comparison

	Composite A	Composite B	Composite C
Screened Metallics Head Assay (g/t)	1.17	1.09	1.52
Back Calculated Head Assay (g/t)	1.20	1.24	1.62
Relative Variance	2.56%	13.76%	6.58%

4.3 Column-Simulated Heap Leach Testing

Results of the Column-Simulated heap leach tests are shown below. As with section 3.2, results have again been grouped based on the top size of the particles tested.

4.3.1 -38mm Column-Simulated Heap Leach Tests

A summary of the cumulative gold distribution (extractions) for each composite during the -38mm column tests is shown below in Table 16.

Testing was originally due to last a total of 70 days. However, upon reaching this point it was clear that gold was still being recovered from the columns and so the length of the tests were increased to 142 days.

The final amount of gold recovered from each of the composite samples is shown in row "144 day carbon (Final)".

Table 16: -38mm Column-Simulated Heap Leach Results

	Σ % Distribution Au		
	Composite A	Composite B	Composite C
2 day Carbon	13.6	15.3	10.2
4 day Carbon	20.6	23.4	18.8
7 day Carbon	26.1	31.3	25.3
14 day Carbon	35.0	39.3	32.8
21 day Carbon	40.2	49.2	37.4
28 day Carbon	44.4	54.4	41.1
35 day Carbon	47.5	58.0	43.9
42 day Carbon	50.5	62.7	45.8
49 day Carbon	52.8	65.5	48.1
56 day Carbon	54.6	67.6	50.0
63 day Carbon	55.9	69.5	51.8
70 day Carbon	56.7	71.0	53.1
77 day Carbon	58.3	72.1	54.4
85 day Carbon	59.5	73.3	55.7

91 day Carbon	60.6	74.0	56.6
98 day Carbon	61.8	74.9	57.6
105 day Carbon	63.3	75.8	59.0
112 day Carbon	64.4	76.7	60.2
119 day Carbon	65.1	77.4	61.2
126 day Carbon	66.0	78.2	62.3
133 day Carbon	66.9	78.9	63.0
140 day Carbon	67.9	79.7	63.9
142 day Carbon	68.2	80.1	64.1
144 day Carbon (Final)	**68.5**	**80.3**	**64.4**
Barren Leach Solution	68.5	80.3	64.4
Wash Solution	68.5	80.3	64.4
Final Residue	31.5	19.7	35.6

These results are displayed graphically in Figure 4, below, whilst the reagent consumptions and comparison of back-calculated and measured head assay results are shown overleaf in Table 17 and Table 18.

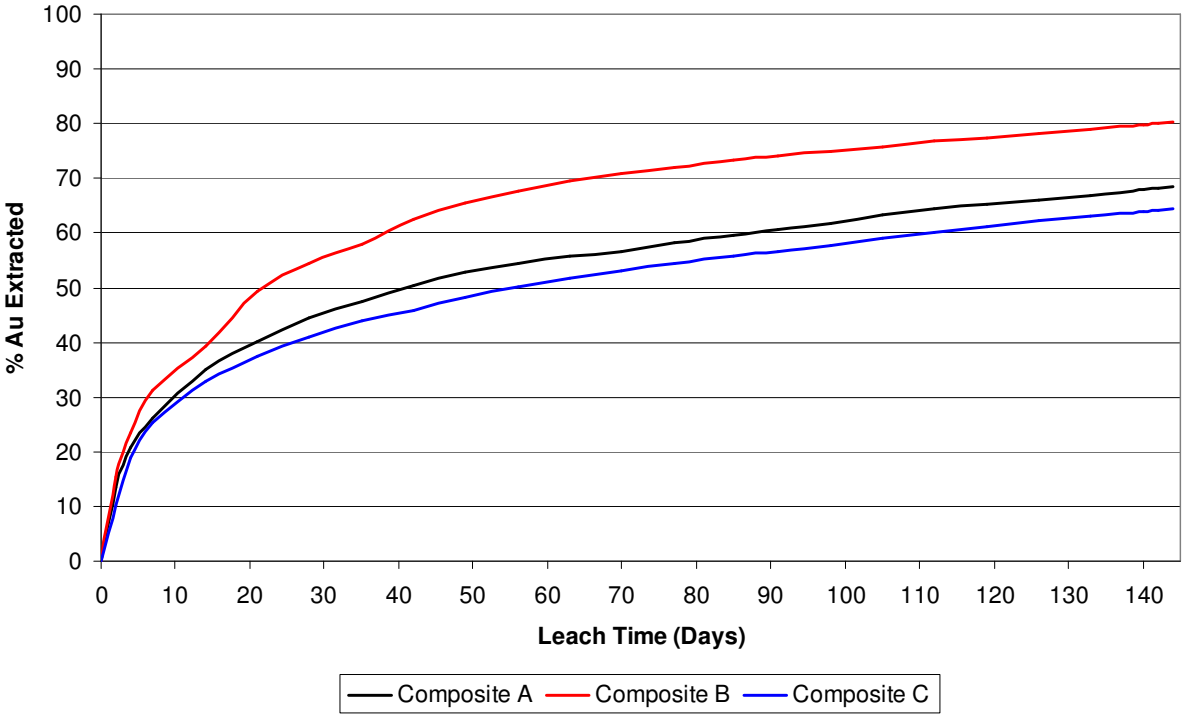


Figure 4: -38mm Column-Simulated Heap Leach Kinetic Leach Curves

Table 17: -38mm Column-Simulated Heap Leach Test Reagent Consumptions (Kg/t of feed)

	Sodium Cyanide	Lime
Composite A	0.18	0.74
Composite B	0.26	0.97
Composite C	0.31	0.63

Table 18: -38mm Column-Simulated Heap Leach Test Back Calculated Au Head Assay Comparison

	Composite A	Composite B	Composite C
Screened Metallics Head Assay (g/t)	1.17	1.09	1.52
Back Calculated Head Assay (g/t)	1.28	1.19	1.78
Relative Variance	9.40%	9.17%	17.11%

4.3.2 -19mm Column-Simulated Heap Leach Tests

Results of the -19mm Column-Simulated heap leach tests are summarised below in Table 19. Reported as total gold recovery against leach time, the data is also reported graphically in Figure 5, overleaf.

Table 19: -19mm Column-Simulated Heap Leach Results

	Σ % Distribution Au		
	Composite A	**Composite B**	**Composite C**
2 day Carbon	33.5	35.3	28.1
4 day Carbon	68.4	63.2	52.4
7 day Carbon	75.1	72.0	56.5
14 day Carbon	81.5	78.7	66.5
21 day Carbon	83.8	82.2	69.8
28 day Carbon	85.0	84.1	72.1
35 day Carbon	86.0	85.1	73.0
42 day Carbon	87.2	86.9	73.6
49 day Carbon	87.9	87.5	74.6
56 day Carbon	88.4	87.9	75.1
63 day Carbon	88.9	88.2	76.0
70 day Carbon	89.0	88.5	76.4
72 day Carbon (Final)	**89.1**	**88.6**	**76.5**
Barren Leach Solution	89.1	88.6	76.5
Wash Solution	89.1	88.6	76.5
Final Residue	10.9	11.4	23.5

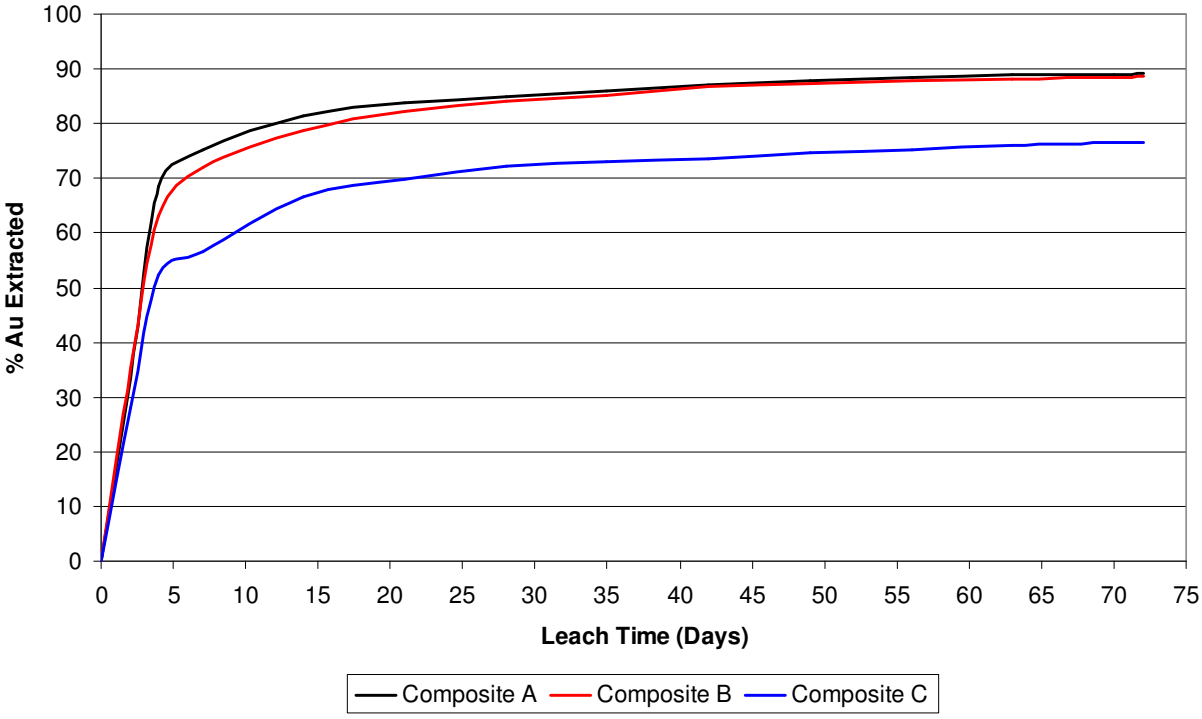


Figure 5: -19mm Column-Simulated Heap Leach Kinetic Leach Curves

Sodium Cyanide and Lime consumptions across the test period are summarised below in Table 20, whilst comparison of the back-calculated and measured screened metallics head assays is shown in Table 21.

Table 20: -19mm Column-Simulated Heap Leach Test Reagent Consumptions (Kg/t of feed)

	Sodium Cyanide	Lime
Composite A	0.10	0.99
Composite B	0.14	1.14
Composite C	0.13	0.90

Table 21: -19mm Column-Simulated Heap Leach Test Back Calculated Au Head Assay Comparison

	Composite A	Composite B	Composite C
Screened Metallics Head Assay (g/t)	1.17	1.09	1.52
Back Calculated Head Assay (g/t)	1.22	1.15	1.58
Relative Variance	4.27%	5.50%	3.95%

5 Discussion

A review of all final gold recovery results for all tests shows that, of the three composites, composite A produced the highest levels of gold recovery in all but the -38mm column test. This is summarised in Table 22, below.

Table 22: Final Gold Recovery Summary by Test and Composite

	Final Au Recovery (%)		
	Composite A	Composite B	Composite C
80% -75µm Bottle Roll	95.8	95.2	93.2
-2mm Bottle Roll	95.1	91.8	89.2
-19mm Column	89.1	88.6	76.5
-38mm Column	68.5	80.3	64.4

The results also show, as might be expected, that there is a reduction in gold extraction with increasing particle size.

Both the smallest and largest change in gold recovery between adjacent tests was observed in Composite A where a difference of just 0.7% (smallest) occurred between the 80% -75µm and -2mm bottle roll tests whilst a difference of 20.6% (largest) occurred between the -19mm and -38mm column tests.

Combined with the fact that in the -38mm column test the overall gold recovery dropped below that of composite B in the, the data would appear to suggest that the recovery of gold from composite A is more susceptible to influence from the effects of particle size than either of the other two composites.

As the XRD mineralogical analysis showed little in the way of any clays present in the composite samples, this would tend to suggest that composite A is less porous than composites B and C and as such, the cyanide leach solution was not able to pass through the sample at the same rate as the other composites resulting in the observed reduction in gold recovery.

With respect to both sets of bottle rolls, the results appeared generally consistent showing that, at both sizes tested, the majority, minimum 93.8%, of the total gold recovered had been extracted after a total leach time of 2 days. By 7 days this had reached a minimum of 95.9% of the total gold extracted for all the tests.

There were however, some slight variations in the amount of gold measured in the leachate which resulted in small reductions in gold recovery being observed between the various sampling intervals.

Experimental error cannot be ruled out as a possible cause for this however, where observed, this can indicate 'preg-robbing' whereby a component of the sample absorbs gold back out of solution and into the sample.

Common causes of 'preg-robbing' are the presence of clays and organic materials in a sample and although no clays were identified by the mineralogy, all three composites contained organic carbon levels of approximately 0.5% which could explain the reductions in gold recoveries observed during some of the tests.

The back-calculated gold head grades compared quite well against those of the measured Screened Metallics analyses with composite A showing an average variance of 3.42% whilst composite C showed a variance of 6.58% for both tests, when compared against the repeat figure.

The variation between calculated and measured head assay was higher in composite B at an average of 13.3%. As the back calculated head grade showed good agreement at 1.23 g/t and 1.24 g/t Au in the -2mm and 80% -75µm tests respectively, this may indicate a similar sampling error in the composite B Screened Metallics head sample as experienced for Composite C.

Finally, the amount of reagents consumed in the bottle roll tests was low for all three composites with Sodium Cyanide dosages ranging from 0.05 to 0.11 kg per tonne of feed whilst lime consumption ranged from 1.06 to 1.32 kg per tonne of feed.

Reagent consumption was generally slightly higher in the 80% -75µm bottle roll tests however this is likely to be simply a result of the increase in overall particle surface area available, as a result of reduced grind size.

Comparison of the Column-Simulated heap leach results by size showed that for the -38mm columns, the recovery of gold occurred gradually over time with approximately 50% of the total gold recovered after 14 days, 75% after 49 days and 90% after 98 days.

This compares with the results of the -19mm tests which showed a very rapid initial recovery of gold, approximately 75% of the total recovered for composites A & B and 56% for composite C, after 7 days of leaching after which the extraction rate began to level off with extractions ranging from a peak of 3.46% for composite B between days 14 and 21 to a minimum of 0.18% for composite A between days 63 and 70.

At both sizes tested, composite B consistently showed the highest level of gold recovered whilst composite C showed the lowest. The results of composite A were consistent with those of

composite B at the -19mm crush size but reduced to just above those of composite C at the -38mm crush size however, as previously mentioned, this is likely to be due to differences in the level of porosity between the three composite.

In addition, it should also be noted that, although composite C showed the lowest levels of gold recovered at both sizes tested, the fact that the head grade of the composite was 0.35g/t higher than that of the next best (composite A), the amount of physical gold recovered in these tests was actually higher than either of the other composites.

This can be seen clearly in Figure 6, below and Figure 7, overleaf.

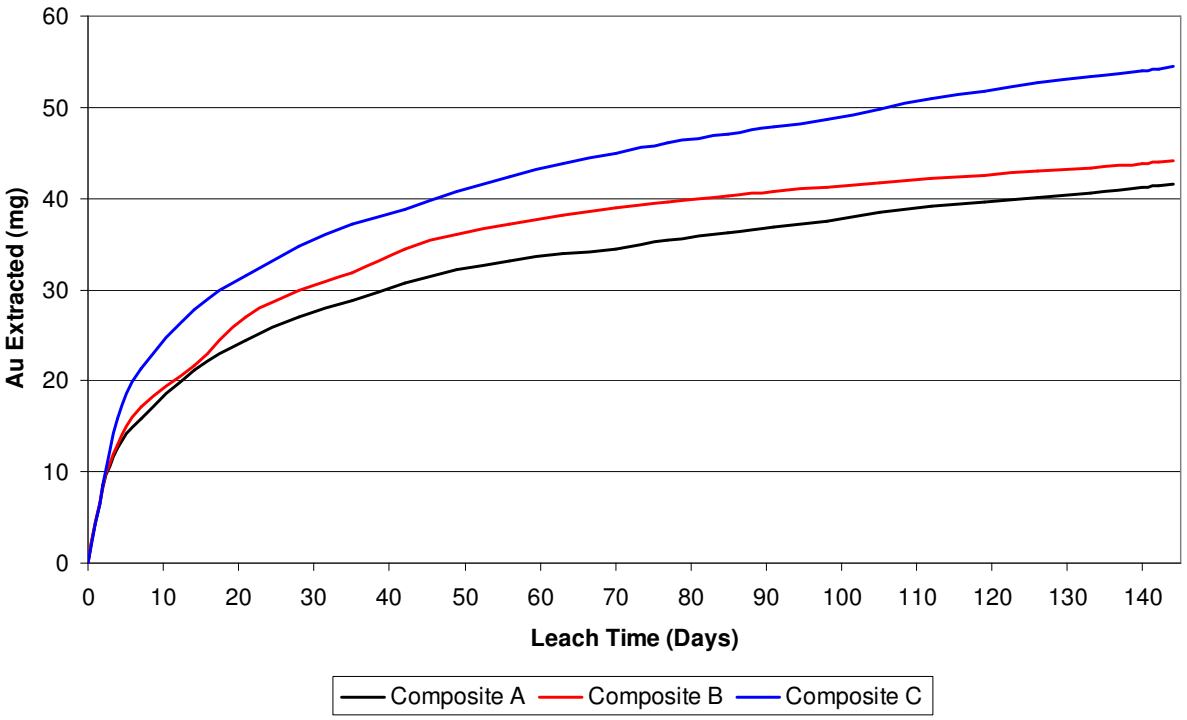


Figure 6: Physical Gold Recovery (mg) -38mm Columns-Simulated Heap Leach Tests

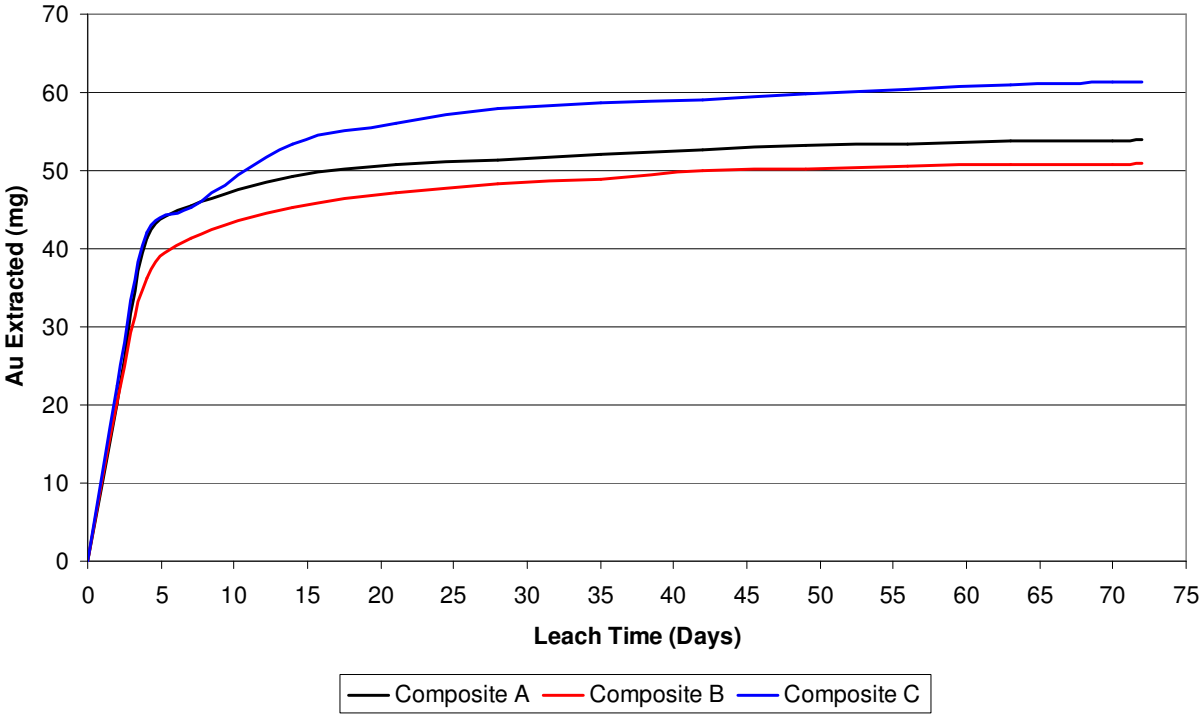


Figure 7: Physical Gold Recovery (mg) -19mm Column-Simulated Heap Leach Tests

This equates to between 0.12g and 0.18g of additional gold per tonne of ore treated compared with composites A and B at -19mm and between 0.27g and 0.19g at -38mm respectively.

Analysis of the variation between back-calculated and measured head assays for the column tests shows that, for the -19mm tests, the relative variance between the two values was at a similar level to those observed for the bottle roll tests ranging from 3.95% for composite C (based on repeat Screened Metallics head assay) to 5.50% for composite B.

At -38mm however, the relative variance between calculated and measured head assays almost doubles to between 9.17% for composite B and 17.11% for composite C. This is however, not unusual given the low grade of the composites combined with the coarseness at which the separation was made (38mm) and, in real terms, represents a discrepancy of between 4.6mg for composite B and 12.3mg for composite C of physical gold across the entire circa 50kg heap leach test samples.

With respect to reagent consumptions, the relative amount of lime used was lower in the column tests than the bottle roll tests ranging from 0.63 to 1.14 kg per tonne of feed. This reduction is likely due to the increase in particle size reducing the liberation, and therefore surface area, of acid generating minerals.

Cyanide dosage was however slightly higher in the column tests ranging from a low of 0.10 at -19mm for composite A to a high of 0.31kg per tonne of feed at -38mm for composite C.

6 Conclusions

The results of the metallurgical testing undertaken as defined above have shown that all three of the composite samples tested are amenable to processing by means of cyanide leaching.

The 14-day bottle roll tests, which provide an indication as to the maximum achievable gold recoveries by leaching, and the likely recovery by means of a grind-CIP/CIL circuit, showed recoveries of between 89.2% and 95.8% were attainable whilst the column tests, which simulate heap leaching, showed that recovery was slightly reduced at between 64.4% and 89.1%

Due to the relatively low gold content of the composites samples, it is however unlikely that a grind-CIL/CIP will be economical and as such, heap-leaching appears to be the most appropriate processing route with which to continue developing the deposit,

The results of the Column-Simulated heap leach tests showed clear differences in both the levels of gold recovered and the recovery kinetics at the differing top sizes tested with the -38mm tests showing a fairly gradual increase in gold recovery throughout the duration of the tests compared to the -19mm tests where the recovery of gold was considerable in the first 14 days after which it reduced to much slower, albeit fairly consistent rate.

This resulted in the total gold recovery of the -19mm columns being between 8% and 20% higher than that of the -38mm columns despite these tests being run for exactly twice the length of the finer tests.

Gold was still being extracted from all of the columns at the time the tests were ended so there clearly appears the scope to increase gold recovery further by increasing the leach time however, the rate at which it was being recovered from the -38mm columns suggests that, even if the current extraction levels of the -19mm columns could have been reached, it would have taken a further 200 to 250 days of leaching, assuming the existing leach rate was maintained.

The -19mm column results however, suggest that for composites A and B, total gold recoveries in excess of 90% could have been reached through an additional 20 to 30 days of leaching.

From these results, it would therefore appear that for composites A and B, a crush size in the region of 19mm would be the optimum, with an even finer crush for composite C, in order to both maximise gold recovery and minimise the heap leach pad residence time of the ore.

7 Recommendations

Following completion of the test work programme, a number of recommendations can be made relating to further testing appropriate to continue development of the project. These include;

- Testing composites A and B at crush sizes around 19mm, e.g. 25mm, 15mm, to identify the optimum crush size to maximise gold recovery whilst minimising leach time
- Testing composite C at crush sizes below 19mm, potentially as low as 12.5mm
- Identifying what effect on both the total gold recovery and leach rate there is by increasing the strength of the cyanide leach solution, for example to 500ppm and 1000ppm

APPENDIX

REPORT ON CYANIDE LEACH TESTING OF THREE DIFFERENT GOLD ORE COMPOSITESAMPLES FROM THE AMULSAR DEPOSIT, ARMENIA

1 Mineralogical Report

Semi-Quantitative X-Ray Diffraction

Report Prepared for: *SGS UK*

Project Number/ LIMS No. *MI4514-AUG09*

Reporting Date: *September 8, 2009*

Instrument: BRUKER AXS D8 Advance Diffractometer

Test Conditions: Co radiation, 40 kV, 35 mA
Regular Scanning: Step: 0.02°, Step time:0.2s, 2θ range: 3-70°

Interpretations: PDF2/PDF4 (ICDD) powder diffraction database. DiffracPlus Eva software.

Detection Limit: 0.5-2%. Strongly dependent on crystallinity.

Contents:

Jennifer LaBelle-Brown, A.Sc.T
Technologist, XRD

Sarah Prout, Ph.D
Project Mineralogist

Method Summary

Mineral Identification and Interpretation:

Mineral identification and interpretation involve matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the JCPDS-ICDD database and released on software as Powder Diffraction File (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (WRA, ICP-OES).

Semi-Quantitative Analysis:

The Semi-Quantitative analysis (RIR method) is performed based on each mineral's relative peak heights and of their respective I/Icor values, which are available from the PDF database. Mineral abundances for the bulk sample (in weight %) are generated by Bruker-EVA Software. These data are reconciled with a bulk chemistry (e.g. whole rock analysis including SiO_2, Al_2O_3, Na_2O, K_2O, CaO, MgO, Fe_2O_3, Cr_2O_3, MnO, TiO_2, P_2O_5, V_2O_5 or other chemical data). A chemical balance table shows the difference between the assay results and elemental concentrations determined by XRD.

Cyanide Leach Testing of Three Different Gold Ore Composite Samples from the Amulsar Deposit, Armenia
Lydian International Ltd

Summary of Semi-Quantitative X-ray Diffraction Results

Crystalline Mineral Assemblage (relative proportions based on peak height)

Sample	Major (>30% Wt)	Moderate (10% -30% Wt)	Minor (2% -10% Wt)	Trace (<2% Wt)
(1) HWA 149:030 Comp A	quartz	-	goethite, alunite, potassium feldspar	*hematite
(2) HWA 150:030 Comp B	quartz	-	goethite, potassium feldspar	*alunite, *hematite
(3) HWA 151:030 Comp C	quartz	-	goethite, alunite, potassium feldspar	*hematite

** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity*

Mineral	Composition
Alunite	$(K,Na)Al_6(SO_4)_4(OH)_{12}$
Goethite	αFeO·OH
Hematite	Fe_2O_3
Potassium Feldspar	$KAlSi_3O_8$
Quartz	SiO_2

Semi-Quantitative X-ray Diffraction Results

Mineral	(1) HWA 149:030 Comp A (wt %)	(2) HWA 150:030 Comp B (wt %)	(3) HWA 151:030 Comp C (wt %)
Quartz	82.3	90.2	87.9
Hematite	1.7	1.0	1.1
Goethite	7.3	4.3	4.6
Alunite	5.3	2.0	3.7
Microcline	3.3	2.5	2.6
TOTAL	99.9	100.0	99.9

Chemical Balance

(1) HWA 149:030 Comp A

Name	Assay	SQD	Delta	Status
Silicon	41.7	39.5	2.20	Both
Iron	7.5	7.3	0.18	Both
Aluminum	1.93	1.36	0.57	Both
Potassium	0.55	0.97	-0.42	Both
Calcium	0.26	-	0.26	XRF
Sulfur	0.23	0.82	-0.59	Both
Hydrogen	-	0.11	-0.11	SQD
Oxygen	47.50	49.90	-2.43	Both

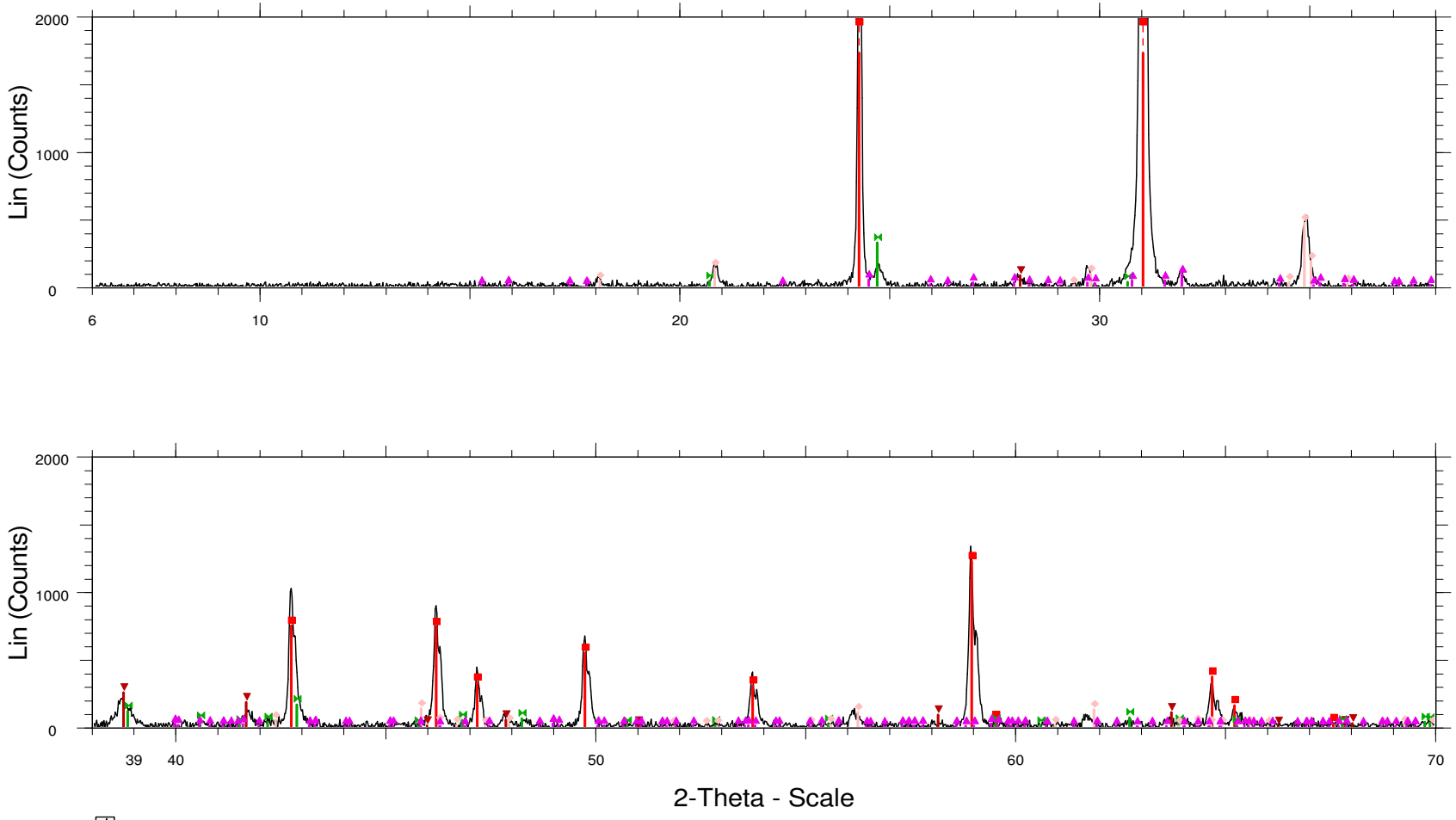
(2) HWA 150:030 Comp B

Name	Assay	SQD	Delta	Status
Silicon	42.3	42.9	-0.58	Both
Iron	4.6	4.3	0.31	Both
Aluminum	0.78	0.63	0.15	Both
Potassium	0.31	0.53	-0.22	Both
Calcium	0.28	-	0.28	XRF
Sulfur	0.11	0.31	-0.20	Both
Hydrogen	-	0.05	-0.05	SQD
Oxygen	48.20	51.30	-3.01	Both

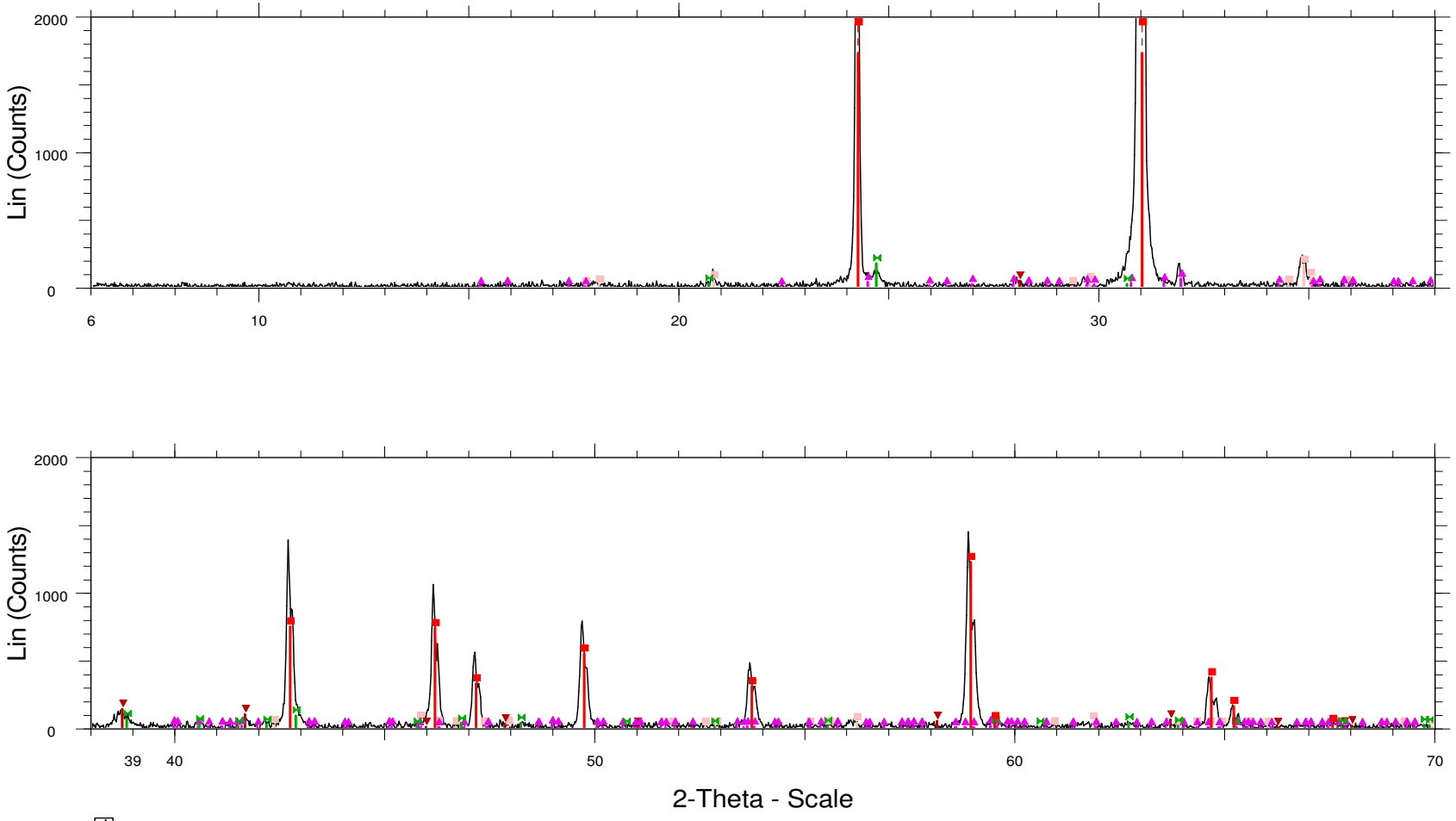
(3) HWA 151:030 Comp C

Name	Assay	SQD	Delta	Status
Silicon	42.6	41.9	0.74	Both
Iron	5.3	4.6	0.67	Both
Aluminum	1.51	0.99	0.53	Both
Potassium	0.43	0.72	-0.29	Both
Calcium	0.27	-	0.27	XRF
Sulfur	0.13	0.58	-0.45	Both
Hydrogen	-	0.08	-0.08	SQD
Oxygen	48.60	51.10	-2.55	Both

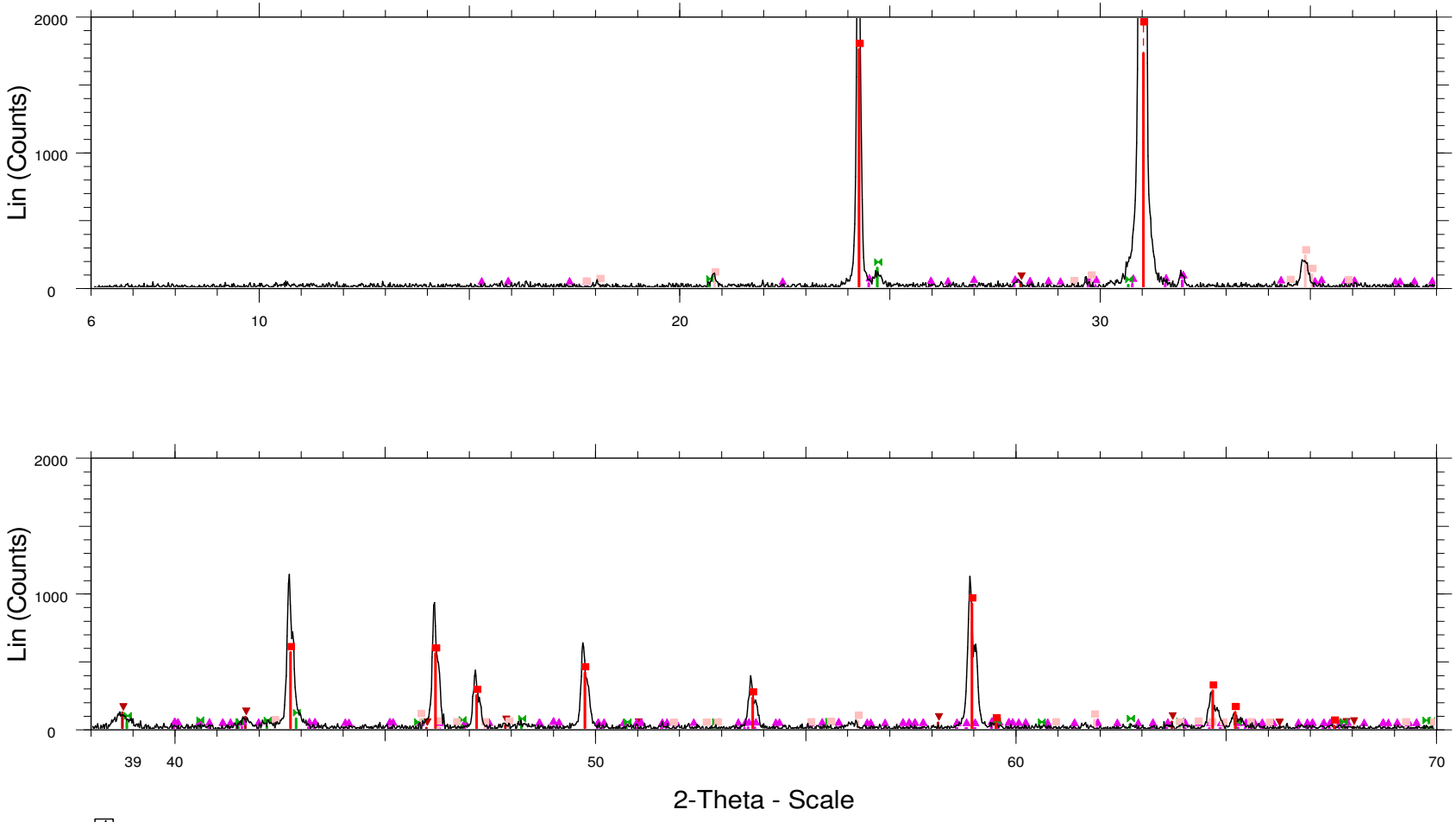
HWA 149:030 Comp A



HWA 150:030 Comp B



HWA 149:030 Comp C



2 Cyanidation Bottle Roll Reports

2.1 -2mm Bottle Roll – Composite A

CN-1 **10866-124** **PM** **September 15, 2009**

Purpose: To determine the extraction of gold from coarse ore bottle roll tests.

Procedure: The sample was pulped to 40% solids and the pH adjusted with lime to 10.5-11.0. Following one hour of pre-conditioning the pH was adjusted again and NaCN added to 0.25g/L. The tests were rolled for one minute in every hour for 14 days, with samples taken at 5h, 24h, 2, 4, 7, 10, 14 days. All leach samples were assayed for Au only. Solid residues were prepared and assayed in duplicate for Au only. NaCN and pH were maintained throughout the test.

Feed: 1,057 g of **149:300**

Solution Volume: 1,586 mL **Bottle Target wt:** **4,191**

Pulp Density: 40 % solids **Bottle Tare:** **1,547**

Sol'n Composition: 0.25 g/L NaCN maintained

pH Range: 10.5-11.0 maintained with lime as required.

Grind: P_{80} = 1.7mm (target); P_{80} = 1.7mm (actual)

Reagent Addition (kg/t of cyanide feed) NaCN: 0.46 CaO: 1.13
Reagent Consumption (kg/t of cyanide feed) **NaCN: 0.09** **CaO: 1.13**

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
hours	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO	
	0.40		0.40						7.5
Pre-condition:									
0-1		0.21							7.5-11.0
Cyanidation:									
0-2	0.40	0.14	0.40	0.14	0.40		0.00		10.1-11.1
2-5	0.00	0.14	0.00	0.14	0.40		0.00		10.6-11.4
5-24	0.00	0.11	0.00	0.11	0.36		0.04		10.7-11.1
24-48	0.04	0.05	0.04	0.04	0.39		0.00		10.5-11.0
48-72	0.00	0.07	0.00	0.07	0.39		0.01		10.4-11.0
72-96	0.01	0.09	0.01	0.09	0.39		0.00		10.5-11.1
96-144	0.00	0.09	0.00	0.09	0.39		0.01		10.2-10.2
144-168	0.01	0.00	0.01	0.00	0.39		0.01		10.0-10.7
168-192	0.01	0.10	0.01	0.10	0.38		0.01		10.2-10.9
192-216	0.01	0.10	0.01	0.10	0.40		0.00		10.4-11.1
216-240	0.00	0.11	0.00	0.10	0.40		0.00		10.4-11.2
240-312	0.00	0.12	0.00	0.11	0.39		0.01		10.1-11.3
312-336	0.01	0.12	0.01	0.12	0.39	0.00	0.01		10.1
Total	0.49	1.46	0.48	1.19	0.39	0.00	0.10	1.19	

Cyanidation Results:

Product	Amount g, mL	Assays, mg/L, g/t Au	% Distribution Au
5hr Pregnant Solution	1,590	0.42	52.0
24hr Pregnant Solution	1,583	0.72	89.1
2 day Pregnant Solution	1,571	0.75	92.7
4 day Pregnant Solution	1,567	0.76	94.3
7 day Pregnant Solution	1,549	0.77	95.0
10 day Pregnant Solution	1,551	0.78	96.9
14 day Pregnant Solution	1,550	**0.76**	**95.1**
Final Residue	1,054.7	0.06	4.9
Head (calc.)	**1,054.7**	**1.22**	**100.0**

Extractions at 14 days **95.1 % Au**

2.2 -2mm Bottle Roll – Composite B

CN-2 **10866-124** **PM** **September 15, 2009**

Purpose: To determine the extraction of gold from coarse ore bottle roll tests.

Procedure: The sample was pulped to 40% solids and the pH adjusted with lime to 10.5-11.0. Following one hour of pre-conditioning the pH was adjusted again and NaCN added to 0.25g/L. The tests were rolled for one minute in every hour for 14 days, with samples taken at 5h, 24h, 2, 4, 7, 10, 14 days. All leach samples were assayed for Au only. Solid residues were prepared and assayed in duplicate for Au only. NaCN and pH were maintained throughout the test.

Feed: 1,043 g of **150:300**

Solution Volume: 1,564 mL **Bottle Target wt:** **4,159**

Pulp Density: 40 % solids **Bottle Tare:** **1,552**

Sol'n Composition: 0.25 g/L NaCN maintained

pH Range: 10.5-11.0 maintained with lime as required.

Grind: P_{80} = 1.7mm (target); P_{80} = 1.7mm (actual)

Reagent Addition (kg/t of cyanide feed) NaCN: 0.45 CaO: 1.06
Reagent Consumption (kg/t of cyanide feed) **NaCN: 0.08** **CaO: 1.06**

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
hours	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO	
	0.39		0.39						8.1
Pre-condition:									8.1-10.9
0-1		0.16							10.1-11.1
Cyanidation:									10.7-11.2
0-2	0.39	0.12	0.39	0.12	0.39		0.00		10.8-11.0
2-5	0.00	0.12	0.00	0.12	0.39		0.00		10.6-11.0
5-24	0.00	0.09	0.00	0.08	0.39		0.00		10.4-11.0
24-48	0.00	0.04	0.00	0.04	0.39		0.00		10.6-11.0
48-72	0.00	0.06	0.00	0.06	0.38		0.01		10.4-11.0
72-96	0.01	0.09	0.01	0.09	0.38		0.01		10.5-11.1
96-144	0.01	0.09	0.01	0.09	0.38		0.01		10.3-10.6
144-168	0.01	0.06	0.01	0.06	0.38		0.01		10.2-10.7
168-192	0.01	0.09	0.01	0.08	0.38		0.01		10.4-11.1
192-216	0.01	0.10	0.01	0.10	0.38		0.01		10.5-11.3
216-240	0.01	0.09	0.01	0.08	0.38		0.01		10.4-11.2
240-312	0.01	0.10	0.01	0.09	0.38		0.01		10.1-11.2
312-336	0.01	0.12	0.01	0.11	0.38	0.00	0.01		10.6
Total	0.47	1.32	0.47	1.11	0.38	0.00	0.08	1.11	

Cyanidation Results:

Product	Amount g, mL	Assays, mg/L, g/t Au	% Distribution Au
5hr Pregnant Solution	1,566	0.40	49.1
24hr Pregnant Solution	1,563	0.66	81.2
2 day Pregnant Solution	1,550	0.71	87.1
4 day Pregnant Solution	1,537	0.72	88.2
7 day Pregnant Solution	1,523	0.74	90.3
10 day Pregnant Solution	1,529	0.73	90.1
14 day Pregnant Solution	1,529	**0.74**	**91.8**
Final Residue	1,040.5	0.10	8.2
Head (calc.)	**1,040.5**	**1.23**	**100.0**

Extractions at 14 days **91.8 % Au**

2.3 -2mm Bottle Roll – Composite C

CN-3 **10866-124** **PM** **September 15, 2009**

Purpose: To determine the extraction of gold from coarse ore bottle roll tests.

Procedure: The sample was pulped to 40% solids and the pH adjusted with lime to 10.5-11.0. Following one hour of pre-conditioning the pH was adjusted again and NaCN added to 0.25g/L. The tests were rolled for one minute in every hour for 14 days, with samples taken at 5h, 24h, 2, 4, 7, 10, 14 days. All leach samples were assayed for Au only. Solid residues were prepared and assayed in duplicate for Au only. NaCN and pH were maintained throughout the test.

Feed: 1,057 g of **151:300**

Solution Volume: 1,586 mL **Bottle Target wt:** **4,206**

Pulp Density: 40 % solids **Bottle Tare:** **1,563**

Sol'n Composition: 0.25 g/L NaCN maintained

pH Range: 10.5-11.0 maintained with lime as required.

Grind: P_{80} = 1.7mm (target); P_{80} = 1.7mm (actual)

Reagent Addition (kg/t of cyanide feed) NaCN: 0.45 CaO: 1.20
Reagent Consumption (kg/t of cyanide feed) **NaCN: 0.08** **CaO: 1.20**

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
hours	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO	
	0.40		0.40						8.0
Pre-condition:									
0-1		0.26							8.0-10.7
Cyanidation:									
0-2	0.40	0.17	0.40	0.16	0.40		0.00		10.1-11.0
2-5	0.00	0.17	0.00	0.16	0.40		0.00		10.6-11.0
5-24	0.00	0.11	0.00	0.11	0.40		0.00		10.7-11.1
24-48	0.00	0.08	0.00	0.08	0.39		0.00		10.6-11.0
48-72	0.00	0.05	0.00	0.05	0.31		0.08		10.4-11.0
72-96	0.08	0.09	0.08	0.09	0.39		0.01		10.5-11.0
96-144	0.01	0.09	0.01	0.09	0.39		0.01		10.3-10.6
144-168	0.01	0.07	0.01	0.07	0.39		0.00		10.3-11.0
168-192	0.00	0.08	0.00	0.07	0.42		-0.03		10.4-10.8
192-216	-0.03	0.08	-0.03	0.07	0.41		-0.01		10.4-11.0
216-240	-0.01	0.11	-0.01	0.10	0.39		0.00		10.5-11.3
240-312	0.00	0.11	0.00	0.10	0.39		0.01		10.2-10.9
312-336	0.01	0.13	0.01	0.12	0.39	0.00	0.01		10.4

Total	0.48	1.59	0.47	1.26	0.39	0.00	0.09	1.26

Cyanidation Results:

Product	Amount g, mL	Assays, mg/L, g/t Au	% Distribution Au
5hr Pregnant Solution	1,587	0.57	52.9
24hr Pregnant Solution	1,584	0.84	78.2
2 day Pregnant Solution	1,573	0.90	83.7
4 day Pregnant Solution	1,561	0.91	84.5
7 day Pregnant Solution	1,566	0.93	87.1
10 day Pregnant Solution	1,548	0.95	88.5
14 day Pregnant Solution	1,551	**0.95**	**89.2**
Final Residue	1,051.8	0.18	10.8
Head (calc.)	**1,051.8**	**1.62**	**100.0**

Extractions at 14 days **89.2 % Au**

2.4 80% -75µm Bottle Roll – Composite A

CN-4 **10866-124** **PM** **September 15, 2009**

Purpose: To determine the extraction of gold from coarse ore bottle roll tests.

Procedure: The sample was pulped to 40% solids and the pH adjusted with lime to 10.5-11.0. Following one hour of pre-conditioning the pH was adjusted again and NaCN added to 0.25g/L. The tests were rolled for one minute in every hour for 14 days, with samples taken at 5h, 24h, 2, 4, 7, 10, 14 days. All leach samples were assayed for Au only. Solid residues were prepared and assayed in duplicate for Au only. NaCN and pH were maintained throughout the test.

Feed: 1,062 g of **149:400**

Solution Volume: 1,593 mL **Bottle Target wt:** **4,192**

Pulp Density: 40 % solids **Bottle Tare:** **1,536**

Sol'n Composition: 0.25 g/L NaCN maintained

pH Range: 10.5-11.0 maintained with lime as required.

Grind: P_{80} = 75µm (target)
P_{80} = 75µm (actual)

Reagent Addition (kg/t of cyanide feed) NaCN: 0.48 CaO: 1.22
Reagent Consumption (kg/t of cyanide feed) **NaCN: 0.10** **CaO: 1.22**

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
hours	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO	
	0.40		0.40						7.9
Pre-condition:									
0-1		0.36							7.9-10.7
Cyanidation:									
0-2	0.40	0.15	0.40	0.14	0.40		-0.01		10.3-10.9
2-5	-0.01	0.15	-0.01	0.14	0.40		0.00		10.6-10.9
5-24	0.00	0.10	0.00	0.10	0.40		0.00		10.5-11.0
24-48	0.00	0.09	0.00	0.08	0.32		0.08		10.4-11.0
48-72	0.08	0.10	0.08	0.09	0.40		0.00		10.3-10.9
72-96	0.00	0.11	0.00	0.10	0.40		0.00		10.4-11.0
96-144	0.00	0.13	0.00	0.12	0.39		0.00		10.2-10.6
144-168	0.00	0.01	0.00	0.00	0.39		0.01		10.2-10.6
168-192	0.01	0.07	0.01	0.07	0.39		0.01		10.2-10.8
192-216	0.01	0.09	0.01	0.09	0.39		0.01		10.3-11.0
216-240	0.01	0.11	0.01	0.10	0.39		0.01		10.2-11.0
240-312	0.01	0.14	0.01	0.13	0.39		0.01		10.1-10.8
312-336	0.01	0.13	0.01	0.12	0.39	0.00	0.00		10.2
Total	0.51	1.72	0.51	1.29	0.39	0.00	0.11	1.29	

Cyanidation Results:

Product	Amount g, mL	Assays, mg/L, g/t Au	% Distribution Au
5hr Pregnant Solution	1,609	0.22	27.8
24hr Pregnant Solution	1,613	0.66	83.7
2 day Pregnant Solution	1,601	0.76	96.2
4 day Pregnant Solution	1,590	0.75	94.9
7 day Pregnant Solution	1,573	0.75	94.5
10 day Pregnant Solution	1,575	0.77	97.6
14 day Pregnant Solution	1,576	**0.75**	**95.8**
Final Residue	1,060.7	0.05	4.2
Head (calc.)	**1,060.7**	**1.20**	**100.0**

Extractions at 14 days **95.8 % Au**

2.5 80% -75µm Bottle Roll – Composite B

CN-5 **10866-124** **PM** **September 15, 2009**

Purpose: To determine the extraction of gold from coarse ore bottle roll tests.

Procedure: The sample was pulped to 40% solids and the pH adjusted with lime to 10.5-11.0. Following one hour of pre-conditioning the pH was adjusted again and NaCN added to 0.25g/L. The tests were rolled for one minute in every hour for 14 days, with samples taken at 5h, 24h, 2, 4, 7, 10, 14 days. All leach samples were assayed for Au only. Solid residues were prepared and assayed in duplicate for Au only. NaCN and pH were maintained throughout the test.

Feed: 1,027 g of **150:400**

Solution Volume: 1,541 mL **Bottle Target wt:** **4,116**

Pulp Density: 40 % solids **Bottle Tare:** **1,548**

Sol'n Composition: 0.25 g/L NaCN maintained

pH Range: 10.5-11.0 maintained with lime as required.

Grind: P_{80} = 75µm (target)
P_{80} = 75µm (actual)

Reagent Addition (kg/t of cyanide feed) NaCN: 0.42 CaO: 1.13
Reagent Consumption (kg/t of cyanide feed) **NaCN: 0.05** **CaO: 1.13**

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
hours	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO	
	0.39		0.39						7.9
Pre-condition:									
0-1		0.28							7.9-10.8
Cyanidation:									
0-2	0.39	0.09	0.39	0.08	0.39		0.00		10.6-10.9
2-5	0.00	0.09	0.00	0.08	0.39		0.00		10.6-11.0
5-24	0.00	0.09	0.00	0.08	0.39		0.00		10.6-11.0
24-48	0.00	0.07	0.00	0.07	0.38		0.00		10.4-11.0
48-72	0.00	0.10	0.00	0.10	0.38		0.00		10.4-10.9
72-96	0.00	0.09	0.00	0.09	0.38		0.00		10.4-10.9
96-144	0.00	0.11	0.00	0.10	0.38		0.01		10.2-10.6
144-168	0.01	0.08	0.01	0.07	0.38		0.01		10.3-10.6
168-192	0.01	0.06	0.01	0.06	0.38		0.01		10.3-10.8
192-216	0.01	0.10	0.01	0.09	0.38		0.01		10.4-10.9
216-240	0.01	0.10	0.01	0.09	0.38		0.01		10.3-11.0
240-312	0.01	0.13	0.01	0.12	0.38		0.01		10.1-10.8
312-336	0.01	0.13	0.01	0.12	0.38	0.00	0.01		10.5
Total	0.44	1.50	0.43	1.16	0.38	0.00	0.06	1.16	

Cyanidation Results:

Product	Amount g, mL	Assays, mg/L, g/t Au	% Distribution Au
5hr Pregnant Solution	1,548	0.31	37.8
24hr Pregnant Solution	1,546	0.67	81.8
2 day Pregnant Solution	1,534	0.74	90.2
4 day Pregnant Solution	1,524	0.74	90.2
7 day Pregnant Solution	1,511	0.75	91.2
10 day Pregnant Solution	1,516	0.76	93.3
14 day Pregnant Solution	1,517	**0.77**	**95.2**
Final Residue	1,025.1	0.06	4.8
Head (calc.)	**1,025.1**	**1.24**	**100.0**

Extractions at 14 days **95.2 % Au**

2.6 80% -75µm Bottle Roll – Composite C

CN-6 **10866-124** **PM** **September 15, 2009**

Purpose: To determine the extraction of gold from coarse ore bottle roll tests.

Procedure: The sample was pulped to 40% solids and the pH adjusted with lime to 10.5-11.0. Following one hour of pre-conditioning the pH was adjusted again and NaCN added to 0.25g/L. The tests were rolled for one minute in every hour for 14 days, with samples taken at 5h, 24h, 2, 4, 7, 10, 14 days. All leach samples were assayed for Au only. Solid residues were prepared and assayed in duplicate for Au only. NaCN and pH were maintained throughout the test.

Feed: 1,038 g of **151:400**

Solution Volume: 1,556 mL **Bottle Target wt:** **4,148**

Pulp Density: 40 % solids **Bottle Tare:** **1,554**

Sol'n Composition: 0.25 g/L NaCN maintained

pH Range: 10.5-11.0 maintained with lime as required.

Grind: P_{80} = 75µm (target)
P_{80} = 75µm (actual)

Reagent Addition (kg/t of cyanide feed) NaCN: 0.49 CaO: 1.32
Reagent Consumption (kg/t of cyanide feed) **NaCN: 0.11** **CaO: 1.32**

Time	Added, Grams				Residual		Consumed		pH
	Actual		Equivalent		Grams		Grams		
hours	NaCN	$Ca(OH)_2$	NaCN	CaO	NaCN	CaO	NaCN	CaO	
	0.39		0.39						7.5
Pre-condition:									
0-1		0.43							7.5-10.7
Cyanidation:									
0-2	0.39	0.16	0.39	0.15	0.39		0.00		10.4-11.0
2-5	0.00	0.16	0.00	0.15	0.39		0.00		10.6-10.9
5-24	0.00	0.17	0.00	0.17	0.31		0.08		10.6-11.0
24-48	0.08	0.10	0.08	0.09	0.39		0.00		10.5-11.0
48-72	0.00	0.09	0.00	0.09	0.39		0.00		10.4-10.9
72-96	0.00	0.10	0.00	0.10	0.39		0.00		10.4-10.9
96-144	0.00	0.12	0.00	0.11	0.38		0.01		10.2-10.6
144-168	0.01	0.01	0.01	0.01	0.38		0.01		10.2-10.5
168-192	0.01	0.07	0.01	0.06	0.38		0.01		10.3-10.7
192-216	0.01	0.09	0.01	0.09	0.38		0.01		10.3-10.8
216-240	0.01	0.12	0.01	0.11	0.39		0.00		10.3-11.0
240-312	0.00	0.14	0.00	0.13	0.38		0.01		10.2-10.7
312-336	0.01	0.12	0.01	0.11	0.39	0.00	0.00		10.5
Total	0.51	1.87	0.50	1.37	0.39	0.00	0.12	1.37	

Cyanidation Results:

Product	Amount g, mL	Assays, mg/L, g/t Au	% Distribution Au
5hr Pregnant Solution	1,562	0.41	38.2
24hr Pregnant Solution	1,569	0.86	80.8
2 day Pregnant Solution	1,557	0.95	89.1
4 day Pregnant Solution	1,541	0.95	88.7
7 day Pregnant Solution	1,528	0.96	89.5
10 day Pregnant Solution	1,530	0.98	92.0
14 day Pregnant Solution	1,541	**0.98**	**93.2**
Final Residue	1,035.7	0.11	6.8
Head (calc.)	**1,035.7**	**1.62**	**100.0**

Extractions at 14 days **93.2 % Au**

3 Column-Simulated Heap Leach Reports

3.1 -38mm Column – Composite A

Column Leach Summary

Product	Amount g, L	Assay, g/t, mg/L Au	Contained Au mg	% Extraction Au Individual	% Extraction Au Cumulative
2 Day Carbon	36.6	225.0	8.24	13.6	13.6
4 Day Carbon	22.4	192.0	4.30	7.1	20.6
7 Day Carbon	20.1	165.0	3.32	5.5	26.1
14 Day Carbon	21.4	253.0	5.41	8.9	35.0
21 Day Carbon	20.2	156.0	3.15	5.2	40.2
28 Day Carbon	20.7	125.0	2.59	4.3	44.4
35 Day Carbon	22.9	81.2	1.86	3.1	47.5
42 Day Carbon	23.0	79.4	1.83	3.0	50.5
49 Day Carbon	21.1	67.3	1.42	2.3	52.8
56 Day Carbon	22.9	46.1	1.06	1.7	54.6
63 Day Carbon	21.9	35.5	0.78	1.3	55.9
70 Day Carbon	21.9	23.5	0.51	0.8	56.7
77 Day Carbon	21.0	45.7	0.96	1.6	58.3
85 Day Carbon	20.4	36.7	0.75	1.2	59.5
91 Day Carbon	21.8	30.6	0.67	1.1	60.6
98 Day Carbon	21.4	33.4	0.71	1.2	61.8
105 Day Carbon	21.2	42.1	0.89	1.5	63.3
112 Day Carbon	21.9	32.3	0.71	1.2	64.4
119 Day Carbon	20.8	20.0	0.42	0.7	65.1
126 Day Carbon	20.2	26.6	0.54	0.9	66.0
133 Day Carbon	19.6	27.4	0.54	0.9	66.9
140 Day Carbon	19.9	30.1	0.60	1.0	67.9
142 Day Carbon	19.9	9.1	0.18	0.3	68.2
Final 144 Day Carbon	20.1	9.8	0.20	0.3	68.5
Final Barren	7.819	0.01	0.00	0.0	68.5
Final Wash	6.800	0.01	0.00	0.0	68.5
Final Residue	47350	0.40	19.15	31.5	
Feed (Calc)	47350	1.28	60.77	100.0	
Feed (Head)	47850	1.17			

Final Residue Summary

	Size Fraction	kg	Mass % Fraction	% Total	Assay (g/t) Au	Assay (g/t) Ag	Distribution - % Fraction Au	Distribution - % Fraction Ag	Distribution - % Total Au	Distribution - % Total Ag
	-38+25mm	6.05	70.8	12.8	0.33	2.62	80.08	86.16	10.42	24.69
	-25+15mm	1.15	13.5	2.4	0.15	0.99	6.92	6.19	0.90	1.77
	-15+6.3mm	0.70	8.2	1.5	0.24	1.00	6.74	3.80	0.88	1.09
	-6.3mm	0.65	7.6	1.4	0.24	1.09	6.26	3.85	0.81	1.10
Top Section		8.55		18.1	0.29	2.15			13.02	28.66
	-38+25mm	11.50	95.0	24.3	0.34	1.20	96.61	95.42	20.41	21.50
	-25+15mm	0.50	4.1	1.1	0.13	1.09	1.61	3.77	0.34	0.85
	-15mm	0.10	0.8	0.2	0.72	1.18	1.78	0.82	0.38	0.18
Upper Mid Section		12.10		25.6	0.33	1.20			21.13	22.53
	-38+25mm	11.70	82.1	24.7	0.54	1.08	86.21	81.06	32.99	19.69
	-25+15mm	1.25	8.8	2.6	0.62	1.37	10.57	10.99	4.05	2.67
	-15+6.3mm	0.50	3.5	1.1	0.12	0.88	0.82	2.82	0.31	0.69
	-6.3mm	0.80	5.6	1.7	0.22	1.00	2.40	5.13	0.92	1.25
Lower Mid Section		14.25		30.1	0.51	1.09			38.26	24.29
	-38+25mm	11.25	90.4	23.8	0.42	1.06	89.40	75.76	24.67	18.58
	-25+15mm	0.55	4.4	1.2	0.43	0.78	4.47	2.73	1.23	0.67
	-15+6.3mm	0.20	1.6	0.4	0.47	1.09	1.78	1.39	0.49	0.34
	-6.3mm	0.45	3.6	1.0	0.51	7.04	4.34	20.13	1.20	4.94
Bottom Section		12.45		26.3	0.42	1.26			27.59	24.52
Final Residue		47.35			0.40	1.36			100.00	100.00

3.2 -38mm Column – Composite B

Column Leach Summary

Product	Amount g, L	Assay, g/t, mg/L Au	Contained Au mg	% Extraction Au Individual	% Extraction Au Cumulative
2 Day Carbon	34.8	241.0	8.39	15.3	15.3
4 Day Carbon	21.0	213.0	4.47	8.1	23.4
7 Day Carbon	20.0	217.0	4.34	7.9	31.3
14 Day Carbon	20.2	219.0	4.42	8.0	39.3
21 Day Carbon	20.3	269.0	5.46	9.9	49.2
28 Day Carbon	20.6	137.0	2.82	5.1	54.4
35 Day Carbon	21.2	93.8	1.99	3.6	58.0
42 Day Carbon	23.5	109.0	2.56	4.7	62.7
49 Day Carbon	20.6	75.7	1.56	2.8	65.5
56 Day Carbon	23.4	49.5	1.16	2.1	67.6
63 Day Carbon	23.7	43.8	1.04	1.9	69.5
70 Day Carbon	21.4	38.2	0.82	1.5	71.0
77 Day Carbon	20.4	29.6	0.60	1.1	72.1
85 Day Carbon	20.6	31.7	0.65	1.2	73.3
91 Day Carbon	21.4	20.3	0.43	0.8	74.0
98 Day Carbon	21.2	21.0	0.44	0.8	74.9
105 Day Carbon	21.7	23.5	0.51	0.9	75.8
112 Day Carbon	22.2	23.3	0.52	0.9	76.7
119 Day Carbon	20.8	18.8	0.39	0.7	77.4
126 Day Carbon	21.4	19.9	0.43	0.8	78.2
133 Day Carbon	19.7	18.2	0.36	0.7	78.9
140 Day Carbon	19.7	23.1	0.45	0.8	79.7
142 Day Carbon	19.8	12.0	0.24	0.4	80.1
Final 144 Day Carbon	20.0	6.5	0.13	0.2	80.3
Final Barren	7.789	0.01	0.00	0.0	80.3
Final Wash	7.593	0.01	0.00	0.0	80.3
Final Residue	46350	0.23	10.81	19.7	
Feed (Calc)	46350	1.19	54.99	100.0	
Feed (Head)	46850	1.09			

Final Residue Summary

	Size Fraction	kg	Mass % Fraction	% Total	Assay (g/t) Au	Assay (g/t) Ag	Distribution - % Fraction Au	Distribution - % Fraction Ag	Distribution - % Total Au	Distribution - % Total Ag
	-38+25mm	8.55	91.4	18.4	0.15	0.69	83.44	70.10	11.87	6.82
	-25+15mm	0.35	3.7	0.8	0.42	1.44	9.56	5.99	1.36	0.58
	-15+6.3mm	0.20	2.1	0.4	0.20	2.56	2.60	6.08	0.37	0.59
	-6.3mm	0.25	2.7	0.5	0.27	6.00	4.39	17.82	0.62	1.73
Top Section		9.35		20.2	0.16	0.90			14.22	9.72
	-38+25mm	9.70	70.3	20.9	0.27	2.15	72.29	50.32	24.23	24.10
	-25+15mm	1.50	10.9	3.2	0.31	6.41	12.83	23.20	4.30	11.11
	-15+6.3mm	1.10	8.0	2.4	0.19	2.34	5.77	6.21	1.93	2.97
	-6.3mm	1.50	10.9	3.2	0.22	5.60	9.11	20.27	3.05	9.71
Upper Mid Section		13.80		29.8	0.26	3.00			33.52	47.89
	-38+25mm	11.50	90.9	24.8	0.17	1.86	84.19	91.17	18.09	24.72
	-25+15mm	0.75	5.9	1.6	0.26	1.45	8.40	4.64	1.80	1.26
	-15+6.3mm	0.20	1.6	0.4	0.30	1.54	2.58	1.31	0.56	0.36
	-6.3mm	0.20	1.6	0.4	0.56	3.38	4.82	2.88	1.04	0.78
Lower Mid Section		12.65		27.3	0.18	1.85			21.48	27.11
	-38+25mm	10.15	96.2	21.9	0.26	1.18	79.32	90.56	24.41	13.84
	-25+15mm	0.25	2.4	0.5	2.38	1.25	17.88	2.36	5.50	0.36
	-15mm	0.15	1.4	0.3	0.62	6.24	2.80	7.08	0.86	1.08
Bottom Section		10.55		22.8	0.32	1.25			30.78	15.28
Final Residue		46.35			0.23	1.87			100.00	100.00

3.3 -38mm Column – Composite C

Column Leach Summary

Product	Amount g, L	Assay, g/t, mg/L Au	Contained Au mg	% Extraction Au Individual	% Extraction Au Cumulative
2 Day Carbon	30.4	284.0	8.63	10.2	10.2
4 Day Carbon	20.9	348.0	7.27	8.6	18.8
7 Day Carbon	20.1	273.0	5.49	6.5	25.3
14 Day Carbon	20.3	313.0	6.35	7.5	32.8
21 Day Carbon	20.2	190.0	3.84	4.5	37.4
28 Day Carbon	20.4	154.0	3.14	3.7	41.1
35 Day Carbon	21.2	114.2	2.42	2.9	43.9
42 Day Carbon	21.4	74.6	1.60	1.9	45.8
49 Day Carbon	21.6	90.0	1.94	2.3	48.1
56 Day Carbon	23.0	69.8	1.61	1.9	50.0
63 Day Carbon	26.4	56.0	1.48	1.7	51.8
70 Day Carbon	21.3	53.8	1.15	1.4	53.1
77 Day Carbon	20.5	53.7	1.10	1.3	54.4
85 Day Carbon	20.4	51.9	1.06	1.3	55.7
91 Day Carbon	20.9	36.0	0.75	0.9	56.6
98 Day Carbon	20.4	44.9	0.92	1.1	57.6
105 Day Carbon	21.4	51.8	1.11	1.3	59.0
112 Day Carbon	21.2	49.3	1.04	1.2	60.2
119 Day Carbon	20.7	39.6	0.82	1.0	61.2
126 Day Carbon	21.2	44.2	0.94	1.1	62.3
133 Day Carbon	19.8	32.1	0.63	0.8	63.0
140 Day Carbon	20.1	38.9	0.78	0.9	63.9
142 Day Carbon	19.8	8.1	0.16	0.2	64.1
Final 144 Day Carbon	20.1	12.9	0.26	0.3	64.4
Final Barren	7.878	0.01	0.00	0.0	64.4
Final Wash	7.693	0.01	0.00	0.0	64.4
Final Residue	47500	0.63	30.07	35.6	
Feed (Calc)	47500	1.78	84.56	100.0	
Feed (Head)	48050	1.52			

Cyanide Leach Testing of Three Different Gold Ore Composite Samples from the Amulsar Deposit, Armenia
Lydian International Ltd

Final Residue Summary

	Size Fraction	kg	Mass % Fraction	% Total	Assay (g/t) Au	Assay (g/t) Ag	Distribution - % Fraction Au	Distribution - % Fraction Ag	Distribution - % Total Au	Distribution - % Total Ag
	-38+25mm	3.40	43.9	7.2	0.44	4.23	48.45	36.53	4.97	6.49
	-25+15mm	1.20	15.5	2.5	0.52	3.60	20.21	10.97	2.08	1.95
	-15+6.3mm	1.25	16.1	2.6	0.47	3.87	19.03	12.29	1.95	2.18
	-6.3mm	1.90	24.5	4.0	0.20	8.33	12.31	40.20	1.26	7.15
Top Section		7.75		16.3	0.40	5.08			10.27	17.77
	-38+25mm	7.50	68.2	15.8	0.93	4.00	79.66	59.11	23.19	13.54
	-25+15mm	1.55	14.1	3.3	0.64	5.63	11.33	17.19	3.30	3.94
	-15+6.3mm	1.10	10.0	2.3	0.47	4.75	5.90	10.30	1.72	2.36
	-6.3mm	0.85	7.7	1.8	0.32	8.00	3.11	13.40	0.90	3.07
Upper Mid Section		11.00		23.2	0.80	4.61			29.12	22.91
	-38+25mm	10.15	72.8	21.4	0.70	4.78	76.31	75.21	23.63	21.91
	-25+15mm	2.10	15.1	4.4	0.67	3.66	15.11	11.91	4.68	3.47
	-15+6.3mm	0.85	6.1	1.8	0.52	3.97	4.75	5.23	1.47	1.52
	-6.3mm	0.85	6.1	1.8	0.42	5.80	3.83	7.64	1.19	2.23
Lower Mid Section		13.95		29.4	0.67	4.62			30.96	29.12
	-38+25mm	12.80	86.5	26.9	0.59	4.58	84.69	87.68	25.11	26.47
	-25+15mm	1.45	9.8	3.1	0.63	3.68	10.24	7.98	3.04	2.41
	-15+6.3mm	0.30	2.0	0.6	0.79	4.43	2.66	1.99	0.79	0.60
	-6.3mm	0.25	1.7	0.5	0.86	6.29	2.41	2.35	0.71	0.71
Bottom Section		14.80		31.2	0.60	4.52			29.65	30.19
Final Residue		47.5			0.63	4.66			100.00	100.00

3.4 -19mm Column – Composite A

Column Leach Summary

Product	Amount g, L	Assay, g/t, mg/L Au	Contained Au mg	% Extraction Au Individual	% Extraction Au Cumulative
2 Day Carbon	32.9	616	20.27	33.5	33.5
4 Day Carbon	21.5	982	21.11	34.9	68.4
7 Day Carbon	20.2	200	4.04	6.7	75.1
14 Day Carbon	20.3	191	3.88	6.4	81.5
21 Day Carbon	20.2	68.9	1.39	2.3	83.8
28 Day Carbon	20.50	34.1	0.70	1.2	85.0
35 Day Carbon	21.8	30.2	0.66	1.1	86.0
42 Day Carbon	21.90	31.1	0.68	1.1	87.2
49 Day Carbon	21.2	22.0	0.47	0.8	87.9
56 Day Carbon	23.7	11.0	0.26	0.4	88.4
63 Day Carbon	22.7	13.0	0.30	0.5	88.9
70 Day Carbon	22.90	4.73	0.11	0.2	89.0
Final 72 Day Carbon	20.1	1.40	0.03	0.0	89.1
Final Barren	6.508	0.03	0.00	0.0	89.1
Final Wash	4.322	0.01	0.00	0.0	89.1
Final Residue	49650	0.13	6.60	10.9	
Feed (Calc)	49650	1.22	60.48	100.0	
Feed (Head)	50300	1.17			

Final Residue Summary

	Size Fraction	Mass kg	Mass % Fraction	Mass % Total	Assay (g/t) Au	Assay (g/t) Ag	Distribution - % Fraction Au	Distribution - % Fraction Ag	Distribution - % Total Au	Distribution - % Total Ag
	-19+15mm	4.25	32.4	8.6	0.19	1.49	47.71	34.98	12.24	9.37
	-15+10mm	3.15	24.0	6.3	0.10	1.39	18.61	24.19	4.77	6.48
	-10+4.5mm	2.75	21.0	5.5	0.10	1.40	16.25	21.27	4.17	5.70
	-4.5mm	2.95	22.5	5.9	0.10	1.20	17.43	19.56	4.47	5.24
Top Section		13.10		26.4	0.13	1.38			25.65	26.79
	-19+15mm	3.85	31.4	7.8	0.14	1.36	35.33	31.37	8.17	7.75
	-15+10mm	3.35	27.3	6.7	0.12	1.31	26.35	26.29	6.09	6.49
	-10+4.5mm	2.90	23.7	5.8	0.12	1.48	22.81	25.72	5.27	6.35
	-4.5mm	2.15	17.6	4.3	0.11	1.29	15.50	16.62	3.58	4.10
Upper Mid Section		12.25		24.7	0.12	1.36			23.12	24.70
	-19+15mm	2.85	28.4	5.7	0.21	1.50	39.00	30.72	9.07	6.33
	-15+10mm	2.35	23.4	4.7	0.13	1.39	19.91	23.47	4.63	4.83
	-10+4.5mm	2.80	27.9	5.6	0.13	1.34	23.72	26.96	5.52	5.55
	-4.5mm	2.05	20.4	4.1	0.13	1.28	17.37	18.85	4.04	3.88
Lower Mid Section		10.05		20.2	0.15	1.38			23.25	20.59
	-19+15mm	2.45	17.2	4.9	0.21	1.48	27.86	19.22	7.80	5.37
	-15+10mm	2.45	17.2	4.9	0.09	1.40	11.94	18.18	3.34	5.08
	-10+4.5mm	4.15	29.1	8.4	0.13	1.18	29.22	25.95	8.18	7.25
	-4.5mm	5.2	36.5	10.5	0.11	1.33	30.98	36.65	8.67	10.23
Bottom Section		14.25		28.7	0.13	1.32			27.98	27.92
Final Residue		49.65			0.13	1.36			100.00	100.00

3.5 -19mm Column – Composite B

Column Leach Summary

Product	Amount g, L	Assay, g/t, mg/L Au	Contained Au mg	% Extraction Au Individual	% Extraction Au Cumulative
2 Day Carbon	34.0	597	20.30	35.3	35.3
4 Day Carbon	21.0	762	16.00	27.9	63.2
7 Day Carbon	20.1	251	5.05	8.8	72.0
14 Day Carbon	20.3	191	3.88	6.7	78.7
21 Day Carbon	20.3	97.8	1.99	3.5	82.2
28 Day Carbon	20.5	54.5	1.12	1.9	84.1
35 Day Carbon	21.9	24.7	0.54	0.9	85.1
42 Day Carbon	20.9	50.7	1.06	1.8	86.9
49 Day Carbon	22.7	14.0	0.32	0.6	87.5
56 Day Carbon	23.9	10.6	0.25	0.4	87.9
63 Day Carbon	25.2	7.6	0.19	0.3	88.2
70 Day Carbon	20.8	7.6	0.16	0.3	88.5
Final 72 Day Carbon	20.0	2.00	0.04	0.1	88.6
Final Barren	7.216	0.06	0.00	0.0	88.6
Final Wash	5.028	0.01	0.00	0.0	88.6
Final Residue	49750	0.13	6.56	11.4	
Feed (Calc)	49750	1.15	57.44	100.0	
Feed (Head)	50150	1.09			

Final Residue Summary

	Size Fraction	Mass kg	Mass % Fraction	Mass % Total	Assay (g/t) Au	Assay (g/t) Ag	Distribution - % Fraction Au	Distribution - % Fraction Ag	Distribution - % Total Au	Distribution - % Total Ag
	-19+15mm	3.30	28.1	6.6	0.16	2.95	32.06	33.92	8.05	8.07
	-15+10mm	2.80	23.8	5.6	0.18	2.01	30.60	19.61	7.68	4.67
	-10+4.5mm	2.50	21.3	5.0	0.12	2.31	18.21	20.12	4.57	4.79
	-4.5mm	3.15	26.8	6.3	0.10	2.40	19.13	26.34	4.80	6.27
Top Section		11.75		23.6	0.14	2.44			25.11	23.79
	-19+15mm	3.05	31.1	6.1	0.16	2.82	33.97	31.49	7.44	7.13
	-15+10mm	2.30	23.5	4.6	0.17	3.25	27.22	27.37	5.96	6.20
	-10+4.5mm	2.35	24.0	4.7	0.13	2.27	21.27	19.53	4.66	4.42
	-4.5mm	2.10	21.4	4.2	0.12	2.81	17.54	21.61	3.84	4.89
Upper Mid Section		9.80		19.7	0.15	2.79			21.90	22.64
	-19+15mm	3.30	28.1	6.6	0.13	1.98	30.87	26.62	6.54	5.42
	-15+10mm	3.00	25.5	6.0	0.10	1.75	21.59	21.39	4.57	4.35
	-10+4.5mm	3.05	26.0	6.1	0.13	2.09	28.54	25.97	6.04	5.28
	-4.5mm	2.40	20.4	4.8	0.11	2.66	19.00	26.01	4.02	5.29
Lower Mid Section		11.75		23.6	0.12	2.09			21.18	20.35
	-19+15mm	3.40	20.7	6.8	0.15	2.18	24.44	18.50	7.77	6.14
	-15+10mm	3.60	21.9	7.2	0.11	2.18	18.98	19.58	6.04	6.51
	-10+4.5mm	4.70	28.6	9.4	0.14	2.44	31.54	28.62	10.03	9.51
	-4.5mm	4.75	28.9	9.5	0.11	2.81	25.04	33.31	7.97	11.07
Bottom Section		16.45		33.1	0.13	2.44			31.81	33.22
Final Residue		49.75			0.13	2.42			100.00	100.00

3.6 -19mm Column – Composite C

Column Leach Summary

Product	Amount g, L	Assay, g/t, mg/L Au	Contained Au mg	% Extraction Au Individual	% Extraction Au Cumulative
2 Day Carbon	30.1	748	22.51	28.1	28.1
4 Day Carbon	22.9	853	19.53	24.3	52.4
7 Day Carbon	20.2	164	3.31	4.1	56.5
14 Day Carbon	20.4	393	8.02	10.0	66.5
21 Day Carbon	20.4	128	2.61	3.3	69.8
28 Day Carbon	20.7	92.2	1.91	2.4	72.1
35 Day Carbon	22.2	32.1	0.71	0.9	73.0
42 Day Carbon	21.3	21.2	0.45	0.6	73.6
49 Day Carbon	21.5	38.3	0.82	1.0	74.6
56 Day Carbon	25.9	16.0	0.41	0.5	75.1
63 Day Carbon	25.5	27.0	0.69	0.9	76.0
70 Day Carbon	21.9	16.7	0.37	0.5	76.4
Final 72 Day Carbon	20.0	1.03	0.02	0.0	76.5
Final Barren	5.855	0.01	0.00	0.0	76.5
Final Wash	5.464	0.01	0.00	0.0	76.5
Final Residue	50850	0.37	18.88	23.5	
Feed (Calc)	50850	1.58	80.25	100.0	
Feed (Head)	51200	1.52			

Final Residue Summary

	Size Fraction	kg	Mass % Fraction	% Total	Assay (g/t) Au	Assay (g/t) Ag	Distribution - % Fraction Au	Distribution - % Fraction Ag	Distribution - % Total Au	Distribution - % Total Ag
	-19+15mm	3.80	29.7	7.5	0.39	5.45	36.19	34.44	7.85	8.96
	-15+10mm	3.30	25.8	6.5	0.36	4.52	29.01	24.80	6.29	6.45
	-10+4.5mm	2.85	22.3	5.6	0.30	4.14	20.88	19.62	4.53	5.10
	-4.5mm	2.85	22.3	5.6	0.20	4.46	13.92	21.14	3.02	5.50
Top Section		12.80		25.2	0.32	4.70			21.69	26.01
	-19+15mm	3.10	27.9	6.1	0.69	4.47	44.53	27.78	11.33	5.99
	-15+10mm	3.10	27.9	6.1	0.46	4.75	29.69	29.52	7.55	6.37
	-10+4.5mm	2.35	21.2	4.6	0.31	4.07	15.17	19.18	3.86	4.14
	-4.5mm	2.55	23.0	5.0	0.20	4.60	10.62	23.52	2.70	5.07
Upper Mid Section		11.10		21.8	0.43	4.49			25.44	21.58
	-19+15mm	3.95	30.6	7.8	0.47	4.41	37.04	30.47	9.83	7.54
	-15+10mm	3.50	27.1	6.9	0.43	4.33	30.03	26.51	7.97	6.56
	-10+4.5mm	2.85	22.1	5.6	0.36	4.06	20.47	20.24	5.43	5.01
	-4.5mm	2.60	20.2	5.1	0.24	5.01	12.45	22.78	3.31	5.63
Lower Mid Section		12.90		25.4	0.39	4.43			26.54	24.73
	-19+15mm	3.10	22.1	6.1	0.45	4.05	28.07	19.62	7.39	5.43
	-15+10mm	3.25	23.1	6.4	0.35	4.58	22.89	23.26	6.03	6.44
	-10+4.5mm	3.70	26.3	7.3	0.41	4.30	30.53	24.86	8.04	6.88
	-4.5mm	4.00	28.5	7.9	0.23	5.16	18.51	32.26	4.87	8.93
Bottom Section		14.05		27.6	0.35	4.55			26.32	27.68
Final Residue		50.85			0.37	4.55			100.00	100.00