



Northwest

# ASX RELEASE

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## Excellent flotation testwork results from the Blue Spec Shear Gold-Antimony Project Metallurgical Study

Northwest Resources Limited (ASX: NWR, “Northwest” or “the Company”) is pleased to report that first phase flotation tests on samples from the Blue Spec and Gold Spec deposits have produced excellent recoveries of 95% for gold and 98-99% for antimony into concentrate. The flotation tests are part of a comprehensive Metallurgical Study currently under way.

Northwest’s vision for the Blue Spec Shear Gold-Antimony Project is to bring the Blue Spec and Gold Spec deposits into production in 2013 as a high-grade narrow vein underground mining operation producing a gold enriched antimony concentrate for direct sale and to expand the project through the discovery of additional high-grade deposits along the shear zone.

### Highlights

Highlights of the first phase testwork include:

- 95% recovery of gold and 98-99% recovery of antimony in flotation testwork from Blue Spec and Gold Spec composite samples clearly demonstrate the effectiveness of using flotation for metal recovery.
- Assays of test concentrates indicate that typical contaminants for antimony concentrates are below penalty levels for the elements assayed.
- Gravity gold recovery testwork shows that up to 23% of the gold from composite samples is free milling and recoverable by gravity separation.
- Comminution tests confirm the suitability of a conventional comminution circuit with typical operating costs for similar ores.

The second phase of flotation testwork will now focus on refining the flotation process to increase the antimony grade of the concentrate produced whilst maintaining 95% gold recoveries into a single antimony concentrate.

Based on the first phase testwork results, Northwest has every confidence that the second phase testwork will demonstrate the Company’s ability to produce an antimony concentrate which meets the specifications of potential off-take partners and maximises gold recovery.

**Mr John Merity, Northwest's Managing Director commented:**

"We are very pleased with the results of these metallurgical tests. The results indicate that very high recoveries of gold and antimony are achievable using a conventional flotation process which greatly reduces our project's technical risk and capital costs. We believe that a gold-enriched antimony concentrate produced from our project will be highly marketable and Northwest is progressing discussions with potential off-take partners."

**Background**

Previous operators of Blue Spec and Gold Spec experienced very poor metallurgical recoveries of gold and antimony. At Blue Spec under Anglo American's operation in the 1970's recoveries averaged 52% for gold and 59% for antimony. This was the prime contributor to the closure of past operations, notwithstanding that historical ore reserves grading in excess of one ounce per tonne gold were defined at the deposits at different times during their operations.

Poor metallurgical recoveries of gold and antimony at Blue Spec and Gold Spec were due to the complex nature of the auro-stibnite ore (stibnite being the sulphide form of antimony) and the difficulties of separating the gold and antimony. Despite the focus of past operators on maximising gold doré production at the expense of antimony concentrate production, gold recovery to doré was very poor. In addition, significant gold in the antimony concentrate was not paid for by antimony smelters due to the abundant supply of antimony concentrates at the time, particularly in China.

*Antimony market*

However, in recent years there has been a fundamental shift in the world antimony market. Demand for antimony trioxide (the main commercial form of antimony production) has grown consistently over the last decade and is forecast to reach 250,000 TPA in 2016. By contrast, there has been a significant decline in Chinese antimony mine supply over the last decade and a large proportion of Chinese antimony production (the world's largest producer) is already dependent on imported concentrates.

As a result, the price of antimony metal has risen from around US\$2,000/t in 2004 to US\$13,500/t today and is forecast to reach over US\$20,000/t in the medium term as the market supply deficit continues and widens. PwC has valued the current world antimony at \$1.8 billion annually.

Declining antimony mine supply has resulted in Chinese antimony smelters starting to pay for gold in antimony concentrate in recent years in order to secure supplies of concentrate. Metal pay levels for good quality gold enriched antimony concentrates have reached 85-90% of the contained value of gold in addition to 60-65% of the contained value of antimony.

The very high payment terms for gold contained in antimony concentrate now available means that there is no longer a commercial imperative to separate the gold and antimony in Blue Spec-Gold Spec ores through complex treatment processes. Northwest's plan to produce a gold-enriched antimony concentrate for direct sale takes advantage of the excellent flotation properties of both gold and antimony and is a low risk market driven solution to the problem of poor metal recoveries in the past.

**Metallurgical Study scope**

Northwest engaged process engineering firm, Como Engineers Pty Limited, to design the Metallurgical Study testwork programme and the testwork was undertaken by Amdel Laboratories in Perth.

The Metallurgical Study was commissioned to test the technical feasibility of Northwest's plan to produce a gold-enriched antimony concentrate for direct sale from Blue Spec-Gold Spec ore and to enable processing flowsheet designs to be prepared as the basis for engineering designs and estimating treatment plant capital and operating costs.

The first phase of the testwork programme investigated five main areas:

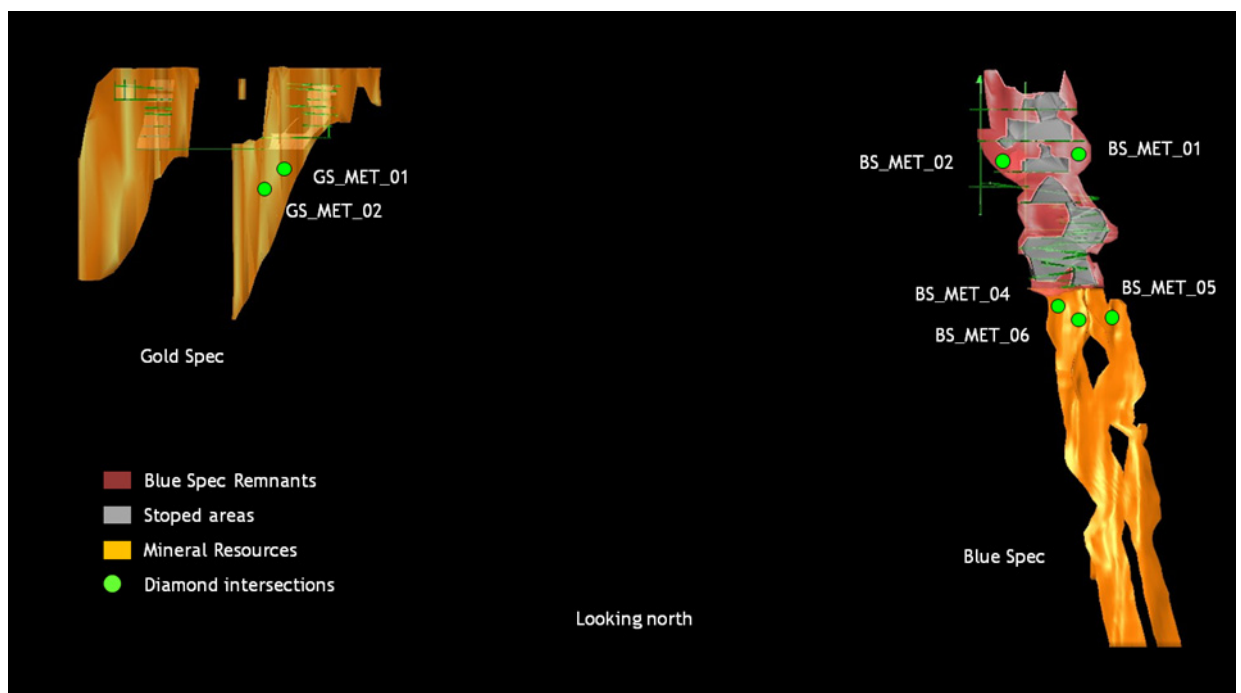
- the recovery levels for gold and antimony into a flotation concentrate;
- the levels of contaminant elements in concentrate which could negatively impact on sale terms;
- the comminution properties of Blue Spec and Golden Spec ore;
- the gravity gold properties of Blue Spec-Golden Spec ore both from the perspective of maximising flotation efficiency and to assess the potential to produce a gold doré from a gravity circuit; and
- after the completion of the flotation testwork, test the recovery levels for cyanide leaching of the flotation tails to determine viability of improving overall gold recoveries.

#### Sample selection and assay results of composite samples

A total of 681kg of metallurgical ore samples were sourced from Gold Spec, Blue Spec and the Blue Spec remnant zones (from surface to 320m VD) (**Blue Spec Remnants**) to represent the potential variations to metallurgical characteristics of the deposits to be mined.

Six diamond core samples from two parent holes and two wedges from each parent hole were taken from Gold Spec and Blue Spec Remnants totalling 182kg and 281kg respectively. Ten diamond core samples from three parent holes and seven wedges were taken from Blue Spec totalling 217kg. The samples from each domain were combined for flotation tests.

**Figure 1: Long section of Blue Spec and Gold Spec view showing metallurgical sample diamond parent holes**



The composite samples from each domain were assayed for a number of elements with significant results presented below.

**Table 1: Assays of composite samples**

	Au Grade (g/t)	Sb Grade (%)	Fe Grade (%)	S Grade (%)
Gold Spec	91.4, 92.9	12.4	1.95	6.24
Blue Spec	15.5, 25.6	1.77	3.50	2.02
Blue Spec Remnants	5.48, 5.57	0.17	3.96	1.84

In accordance with normal practice, gold assays were duplicated as this can provide an indication of nuggetty gold (coarse particles) in the sample as is suggested in the Blue Spec assays. The gravity gold recovery tests on the Blue Spec composite sample also show the highest gravity component.

The assay results above should not be taken as representative of grades for each domain but of their metallurgical characteristics.

#### **Flotation recovery to concentrate**

A series of conventional rougher-scavenger-cleaner tests using standard sulphide re-agents were undertaken on samples from each of the three Blue Spec-Gold Spec domains to test gold and antimony recovery to an antimony concentrate.

Initial batch rougher-scavenger flotation tests conducted at a grind size of 80% passing 106µm on each domain composite sample returned very high recoveries of gold and antimony into a bulk sulphide concentrate which are reported in Table 2. These are excellent recovery results from first phase testing and clearly demonstrate the effectiveness of using flotation for the recovery of gold and antimony from Blue Spec-Gold Spec ores.

**Table 2: Initial batch rougher-scavenger flotation tests results**

	Mass Recovery (%)	Au Grade (g/t)	Au Recovery (%)	Sb Grade (%)	Sb Recovery (%)
Gold Spec	35.6	226	95.3	35.2	99.1
Blue Spec	15.4	108	95.7	11.9	98.4
Blue Spec Remnants	13.9	36	89.9	1.0	83.2

Subsequently, two-stage cleaner flotation tests were then conducted on composite samples from each of the domains at a finer grind of 80% minus 75µm to improve the antimony grade of the concentrates, with the results summarised in Table 3.

The two-stage cleaner flotation tests for Blue Spec and Gold Spec samples were able to increase the antimony grade of the concentrate to 45-50% Sb (well above the minimum Sb grade of 30-35% required for a commercially saleable product).

Table 3: Two-stage cleaner flotation tests results

		Mass Recovery (%)	Au Grade (g/t)	Au Recovery (%)	Sb Grade (%)	Sb Recovery (%)	Fe Grade (%)
Gold Spec	Sb Rougher Conc.	27.7	254	82.9	45.1	98.6	2.0
	Fe Conc.	7.9	132	12.4	0.7	0.5	9.1
	<b>Sb Conc. + Fe Conc.</b>			<b>95.3</b>		<b>99.1</b>	<b>3.6</b>
Blue Spec	Sb Conc 1-4	3.5	366	73.9	50.7	96.0	3.28
	Fe Conc.	11.9	32	21.8	0.4	2.4	11.0
	<b>Sb Conc. + Fe Conc.</b>			<b>95.7</b>		<b>98.4</b>	<b>9.2</b>
Blue Spec Remnants	Sb Conc. 1-4	1.8	174	56.5	6.5	23.6	32.9
	Fe Conc.	12.9	15	35.3	0.1	3.6	10.3
	<b>Sb Conc. + Fe Conc.</b>			<b>91.9</b>		<b>27.2</b>	<b>13.0</b>

However, whilst the total recoveries of gold and antimony remain unchanged, the tests indicate that to maximise the antimony grade of the concentrate, approximately 20% of the gold (which is associated with iron (Fe)) is recovered into an iron concentrate.

As Northwest's primary goal is to maximise gold recoveries to an antimony concentrate, the second phase of flotation testwork will now focus on refining the flotation process to produce a single antimony concentrate grading at least 35% Sb whilst maintaining full gold recovery.

The initial bulk sulphide float tests show that the antimony in the Blue Spec Remnants will respond to flotation (+80% recoveries achieved in initial tests) but there is difficulty in achieving a selective float that results in a concentrate of high enough Sb grade. Tests will now focus on bringing the Sb grade of the concentrate up without reducing gold recovery by altering flotation sequences (Fe/Sb) and trialling different reagents.

It is important to note that mining of the Blue Spec Remnants will be carried out in conjunction with mining of the Gold Spec deposit which shows far more favourable metallurgical characteristics. Based on the indicated mass pulls from the different stages of flotation to date, blending the two ores will assist in producing an acceptable concentrate for sale.

Based on the current testwork results, Northwest has every confidence that the second phase testwork will demonstrate Northwest's ability to produce an antimony concentrate which meets the antimony grade specifications of our potential off-take partners and maximises the gold content of the concentrate.

#### Concentrate contaminant levels

Flotation test concentrates were analysed for common antimony concentrate contaminant (penalty) elements levels with results reported in Table 4. Penalty levels for typical antimony concentrate contaminants are set out in Table 5.

Table 4: Contaminant levels in composite samples

	Sb (%)	As (%)	Pb (%)	Bi (ppm)	Se (ppm)
Gold Spec	45.1	0.034	0.166	<1.0	Not assayed
Blue Spec	50.7	0.052	0.24	3.8	Not assayed
Blue Spec Remnants	6.5	0.85	0.14	3.6	Not assayed

Table 5: Contaminant penalty levels for antimony concentrates

	As (%)	Pb (%)	Bi (ppm)	Se (ppm)
Penalty element level	0.5 max	0.5 max	30 max	40 max

The arsenic (As) level of the Blue Spec Remnants test concentrate was slightly above indicated penalty levels, however the Company is confident that further testwork will show that this can be reduced to below penalty levels by either dilution or a selective float process.

There have been no assays of Selenium (Se) above detection levels in drilling at Blue Spec or Gold Spec and accordingly Se was not assayed in the composite samples at this time. A final confirmation of the absence of Se will be carried out at the end of the testwork programme.

### Comminution testing

Standard Bond Abrasion, Rod Mill and Ball Mill Work Index tests were conducted on each domain composite. The results in Table 6 below show the samples to have low abrasiveness and moderate hardness levels.

Table 6: Comminution tests

	Abrasion Index	Rod Mill Work Index (kWhr/t)	Ball Mill Work Index (kWhr/t)
Gold Spec	0.1790	15.7	15.0
Blue Spec	0.1850	16.1	17.4
Blue Spec Remnants	0.1169	15.5	15.4

The comminution tests are very positive, indicating no abnormal power requirements for crushing and grinding of Blue Spec and Gold Spec ore down to 80% passing 125µm. The tests also suggest no unusual wear factors would impact a conventional crushing and milling circuit.

### Gravity gold separation

Subsamples (1kg in weight) of each domain composite were subjected to gravity gold concentration using a laboratory Falcon concentrator. The resulting gravity concentrate was then subjected to amalgamation. The results of these tests are reported below.

Table 7: Gravity gold tests

	Mass Distribution to Gravity Concentrate (%)	Gravity Recoverable Au (%) (Au in amalgam)	Au % Distribution in Amalgam Tail	Au % Distribution in Falcon Concentrate
Gold Spec	7.8	7.2	37.6	44.8
Blue Spec	8.5	23.4	46.7	70.0
Blue Spec Remnants	14.0	7.8	36.8	44.6

The testwork indicates that 7% to 23% of the free gold in the composite samples is recoverable through a conventional gravity circuit.

Northwest's second phase testwork will evaluate the opportunity to incorporate gravity gold separation into the metallurgical flowsheet prior to flotation in order to recover a gravity concentrate for direct smelting which would maximise early gold payment for the project.

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