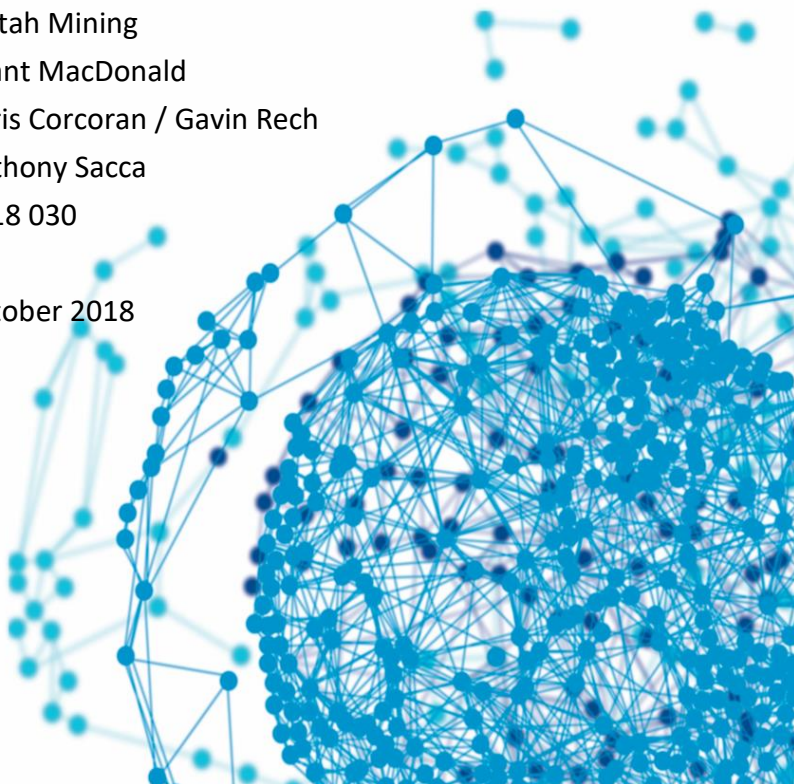


# LOTTAH MINING MT. CHARTER SORTING OF GOLD ORE

## PRE TEST REPORT

<b>Client:</b>	Lottah Mining
<b>Client Representative:</b>	Grant MacDonald
<b>TOMRA Engineers:</b>	Chris Corcoran / Gavin Rech
<b>TOMRA Sales Person:</b>	Anthony Sacca
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### TOMRA Sorting | Mining

Unit 1 / 20 Anella Ave  
Castle Hill NSW 2154  
Phone: +61 8624 0100  
Fax: +61 8624 0101

Managing Director:  
Anthony Sacca  
[Anthony.Sacca@tomra.com](mailto:Anthony.Sacca@tomra.com)

ABN: 45131596239  
[www.tomra.com](http://www.tomra.com)

## 1 EXECUTIVE SUMMARY

TOMRA Sorting | Mining offers ore sorting solutions from initial amenability testing and characterization through equipment sales and complete sorting lines. TOMRA's global presence with offices in North America, Germany, South Africa, and Australia guarantees mining operations local ore sorting expertise and service.

TOMRA has over 20 years of experience in ore sorting and has thus seen many ore types and sorting applications. Based on this previous experience there is often a high degree of confidence in knowing which sensor/sorting system is best suited to the ore being investigated. For these cases, a quick pre-bulk test is done on a small sample (20-100kg) to confirm that the sensor response is as expected before proceeding with shipping and bulk sorting a larger sample.

This report describes the results of the pre-bulk tests performed on samples from Lottah Mining Mt. Charter (gold ore). Data was collected using TOMRA'S contrast XRT system. Further information on the sorting system is found in section 3 and the appendix of this report.

The images from this set of samples prove contrast XRT as a viable sorting technique for this material. High-density barite is well-classified and easily differentiated and separated from the low-density host rock using XRT. For both size fractions, gold upgrades of 1.7x and Ba upgrades of 2.5x were achieved in the products from each feed. This ore can be sorted most effectively using a one-stage contrast XRT sorting program preferably in a 1:3 size fraction ratio (E.g. 10-30mm or 20-60mm).

## 2 RESULTS

To set up/train the sorter and to parameterize the software, images were taken of the samples. The images were analysed using proprietary TOMRA Sorting image processing software. Examples of raw and classified XRT images collected are shown in Figure 1 below. Based on the acquired images, sorting-task specific algorithms were developed.

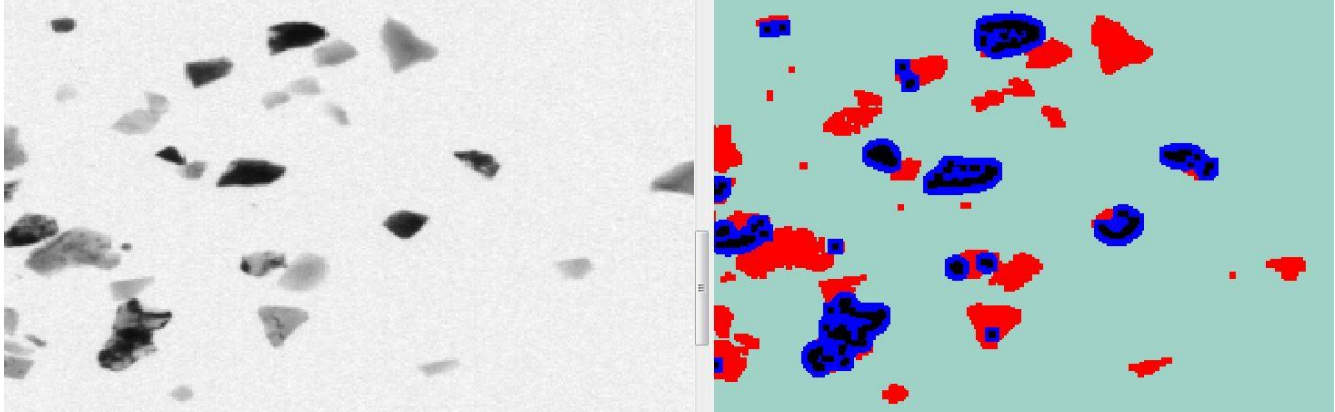


Figure 1: Raw (left) and processed (right) XRT images of high and low-density particles. High density particles are shown in blue/black, while low density particles are shown in red. This image shows particles from the 8-25mm feed material using contrast XRT.

The sorted material was screened into sorted 8-25mm and +25mm fractions as well as a -8mm unsorted fraction. Post-sorting chemical assays were completed for product and waste fractions as well as unsorted fines (Figures 2,3).

Size	Fraction	Au (ppm)	Ba (%)	Mass (kg)
Head Grade		1.13	12.89	83.28
-8mm	Unsorted Fines	1.27	16.55	5.92
8-25mm	Feed	1.18	12.92	9.46
	Product	2.03	32.20	3.14
	Middlings	1.05	7.35	2.20
	Waste	0.60	1.21	4.12
+25mm	Feed	1.11	12.56	67.90
	Product	1.84	30.80	19.80
	Middlings	1.09	8.62	24.20
	Waste	0.52	1.44	23.90

Figure 2: Assay values for Lottah Mining Mt. Charter fractions. Feed values are back-calculated.

Considerable upgrades in Au were achieved in the XRT high-density product fractions due to the relatively high-density, well-liberated, massive nature of the barite. Both single-stage sorts demonstrated excellent upgrades, achieving >3:1 product-to-waste ratios (Au) and >20:1 product-to-waste ratios for Ba.

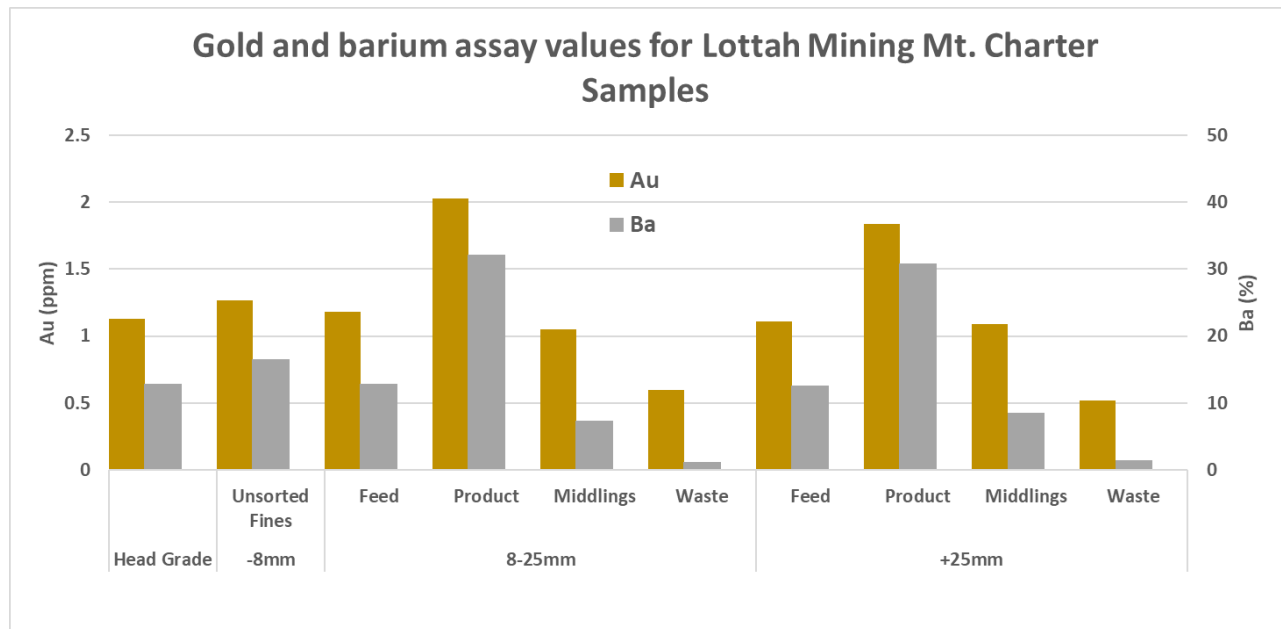


Figure 3: Assay results for sorted and unsorted fractions for Mt. Charter gold ore. Values shown are for Au (ppm) and Ba (%). Feed values are back-calculated.

### 3 DISCUSSION

As the gold in this material is finely disseminated and barite associated, the objective of this testwork was to create a barite concentrate and host-rock waste. It is observable in Figure 3 that the vast majority of barite was ejected to the product/middlings for both size fractions (waste grades of <1.5% Ba for each fraction). Considering that the Au values had higher waste grades and lower upgrades to product, it can be stated that not all of the gold in this sample is barite associated.

It is possible to target other gold-hosting minerals at the same time or in sequential sorts, however this would need a better indication of where non-barite-associated gold is hosted. Furthermore, it is not unlikely that there is a level of background disseminated gold which is too finely disseminated to be detected and separated using sorting technology.

## 4 CONCLUSIONS AND RECOMMENDATIONS

As this material is very reliably sorted using contrast-XRT, we recommend a bulk-sorting test as the next step. For the bulk sort, at least 1000kg is recommended for a full-scale sort and can be shipped to our Sydney-based test center.

It is recommended that for future test work, tight size fractions should be tested at a size fraction ratio of max 1:3 (E.g. 10-30mm). This will ensure more reliable particle classification across the size fraction. Due to the massive nature of the sulphides, this type of ore will likely be very conducive to sorting at any 1:3 size range, although the size fractions used in this set of testwork are very effective.

## 5 APPENDICES

### 5.1 General Introduction TOMRA

TOMRA Sorting Mining designs and manufactures sensor-based sorting technologies for the global mining industry. The company's systems deliver dry material separation of various ores and minerals, including diamonds and other gemstones, in addition to enabling metal recovery from slag. TOMRA Sorting Mining systems have been installed worldwide, each contributing to extending the lifetime of mining operations and increasing the value derived from deposits.

TOMRA Sorting Mining is part of TOMRA Sorting Solutions which also develops sensor-based sorting systems for the recycling and food industries. This powerful combination of technologies makes TOMRA Sorting one of the most advanced providers of sensor-based sorting solutions in the world, with over 10,500 of its systems installed globally. TOMRA Sorting is owned by Norwegian company TOMRA Systems ASA, which is listed on the Oslo Stock Exchange. Founded in 1972, TOMRA Systems ASA has a turnover around €650m and employs over 2,600 people.

## 5.2 Common Belt Sorter

COM Series sorting equipment covers the range of applications with inhomogeneous feed or critical moisture content which require a belt feeding system. The belt principle allows the presentation of a non-uniform feed, and particles can stabilise on the belt before they are scanned by the sensor(s). This principle also allows for a higher surface-moisture content in the smaller grain sizes.

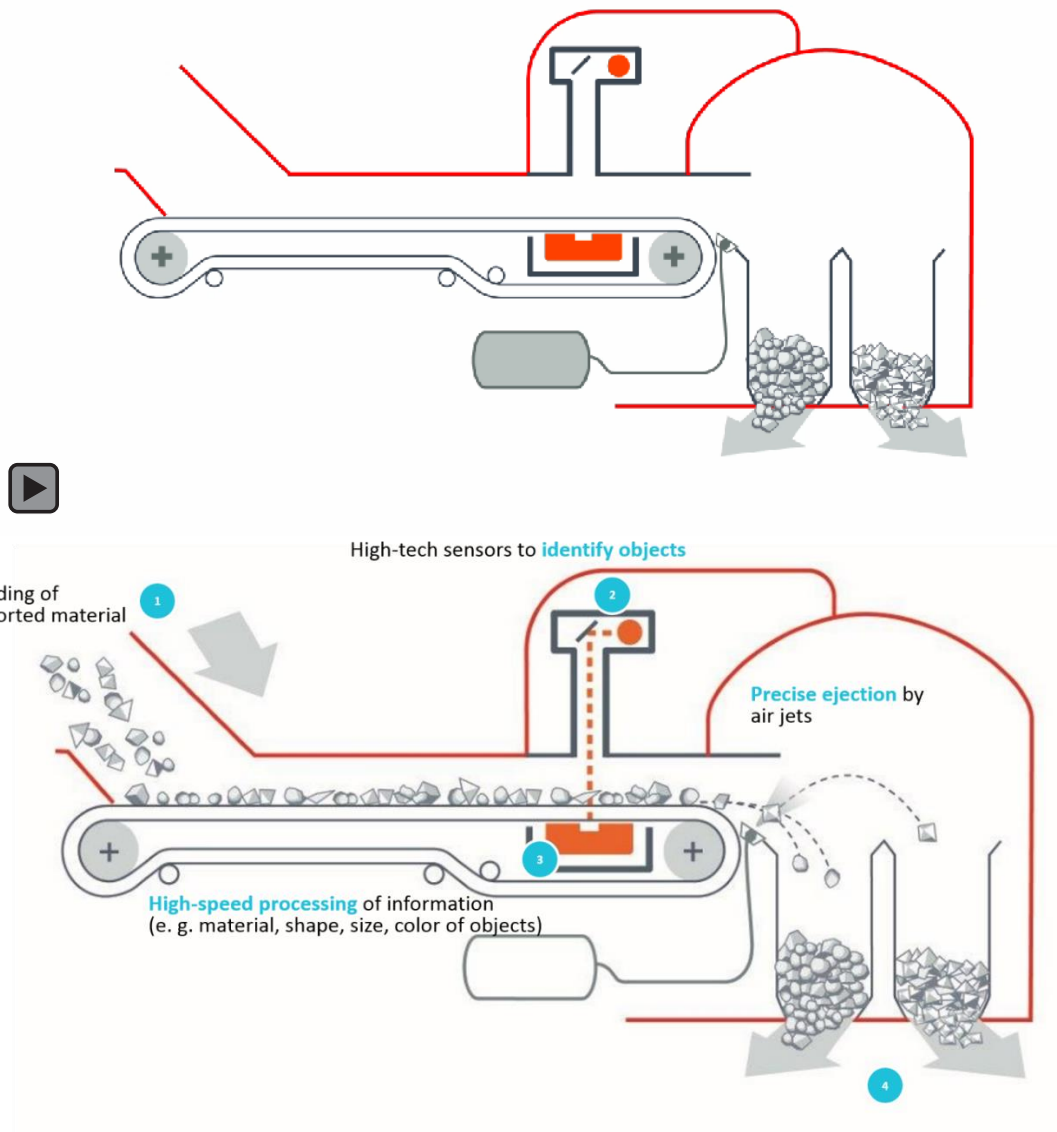


Figure 4: Simplified video / scheme of the COM Series principle.

Figure shows a simplified scheme of the principle of operation of a COM sorting unit. This figure shows a “belt” sorter configuration, which means the unsorted material (1) is fed and moving along with the belt. The actual scanning (2) + (3) is happening while the material is moving along with the belt. After scanning and evaluation of the data, compressed air is used to eject the identified objects to one of the bays of the separation chamber (4). Depending on the classification the selected particles are either “Ejects”, diverted upwards by air jets or “Accepts” in the other stream. It is important to note that “Eject” refers to the material that the system has been configured to blow out of the material stream; this can be either the waste or the product.

### 5.3 Test equipment

The sorter used for the test work documented in this report was the COM Tertiary XRT system as shown in Figure . The COM Tertiary XRT Sorter uses a broad-band electrical x-ray source that is applied to the material to be sorted while it is moving along a belt. The X-ray sensor system below the material produces a digital image of the material, using two different energy bands. The X-ray attenuation through the material is different within the two bands and depends on both, the material thickness and atomic density. Special transformation of the attenuation images of the two bands classifies each pixel per the measured atomic density. Because the X-rays pass through the particles and are a measure of the attenuation through the entire rock, XRT separation is independent of surface quality of the material or its moisture. Surface properties such as colour and texture and/or contaminations such as dirt, dust, paint, etc. are irrelevant to the detection.



Figure 5: COM Tertiary XRT Sorter



## 5.4 Disclaimers

The described test work has been conducted with professionalism and care by trained personnel with multiple years of experience in the sorting industry. Procedures are documented and the sorting software program is copied and stored for future reference.

TOMRA Sorting has not verified the origin of the sample and cannot document the sampling procedure, thus cannot comment on the representativeness of the tested material. An evaluation of the results must be conducted in the context of the mineral deposit and future composition of feed in terms of elemental and mineral composition, long term trends, cycles and general heterogeneity.

The tests conducted resulted in multiple masses/fractions that were packaged and shipped for assaying. TOMRA Sorting cannot verify the methodologies and processes but derives its conclusions purely on the assays results as received.

Tomra Sorting | Mining

A handwritten signature in blue ink, appearing to read 'Chris Corcoran', is positioned above the printed name and title.

Chris Corcoran  
Applications Engineer / Geologist

Sydney, Australia  
18-Oct-18

6 APPENDICES

6.1 Test results

Table 1: Photos taken of all sorted samples for Lottah Mining Mt. Charter.

8-25mm XRT Product / Middlings		
8-25mm XRT Waste		
+25mm XRT Product / Middlings		
+25mm XRT Waste		

-8mm Unsorted Fines

