

ASX Release: 18 February 2019

## METALLURGICAL TEST WORK CONFIRMS HIGH RECOVERIES

#### **HIGHLIGHTS**

- New testing program achieves very high rougher flotation recoveries averaging 96.1%
- Results exceed Caravel Copper Project 2016 scoping study results
- Similar high rougher recoveries at a coarse grind of 150um versus 106μm
- Initial cleaner flotation recovery >92%to achieve saleable product grades
- Rapid flotation kinetics with very low reagent usage

Caravel Minerals (ASX: CVV, Caravel or Company) is pleased to announce excellent metallurgical test results from diamond core holes drilled at the Bindi deposit. The flotation results are the first received from a 6-hole diamond drilling program completed at the Caravel Copper Project between September and November 2018.

Two master composite samples from holes 18CADD001 and 18CADD002 were compiled and subjected to several rougher and preliminary cleaner flotation tests utilising different reagents at varying quantities and grind sizes (106 $\mu$  and 150 $\mu$ ) at the ALS Metallurgy laboratory in Perth, Western Australia.

The test work results have exceeded expectations with very fast float times and very good recoveries to the rougher and cleaner concentrate. Importantly, the results provide improved data in comparison to those used in the 2016 Scoping Study. The combination of very high recoveries with a coarser grind size and very low reagent use marks an important milestone for the project, demonstrating the project's potential to operate at low cost and therefore a low cut-off grade. A simple and low-cost process for ore processing is a key element for the successful development of the Caravel Copper Project's large resource base.

### **Rougher Results**

Rougher recoveries varied between 94.1% to 99% with the average of 96.1%. These recoveries exceeded the previous test results carried out on RC samples as part of the Scoping Study which were around 92%.

The majority of tests were carried out at a grind size of  $106\mu m$ , although those carried out at  $150\mu m$  continued to show high recoveries, averaging 95.8% (versus 96.6% for  $106\mu m$ ) indicating that a coarse rougher grind for the project may be possible (Figure 1).

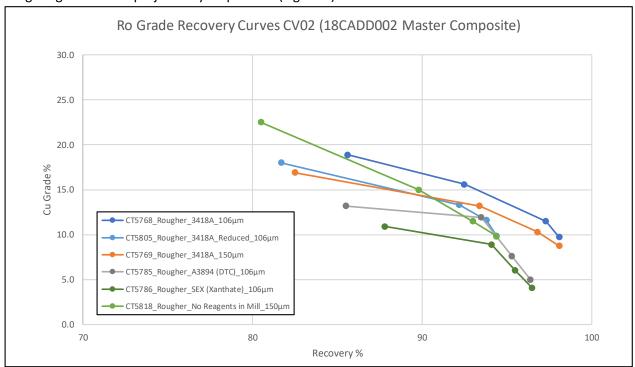


Figure 1: Example of rougher recoveries from CV02 Master Composite

The results also showed high kinetics with 92% (average) of the copper recovered in the first 4 minutes of the tests (Figure 2).

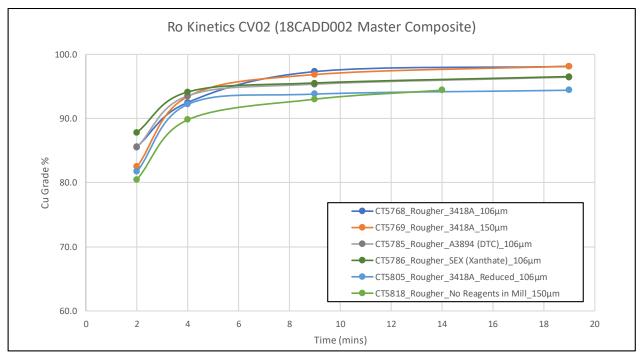


Figure 2: Example of rougher kinetics from CV02 Master Composite



As the tests progressed, it became clear that the copper minerals were highly hydrophobic and required low reagent doses to obtain high recoveries which will assist achieving low processing costs.

#### **Cleaner Results**

Testwork undertaken on cleaner flotation tests to this point in time has only been preliminary However this work did provide 22.9% Copper grades at a high recovery of 92.9% after regrinding to 53µm with no addition of reagents apart from minor lime for pH control. It is envisaged that current program will further refine the cleaner circuit to achieve grades over 25%.

Metallurgical work is ongoing including mineralogy analysis which will further optimise the flotation results. These results will feed into the updated Scoping Study expected to be released in March 2019.

For and on behalf of the board

#### For further information, please contact:

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#### **COMPETENT PERSON'S STATEMENT**

The information in this report that relates to Metallurgical Test Work Results is based on and fairly represents information and test work managed by Mr Stuart Smith (consultant to Caravel Minerals Limited). Mr Smith is a Fellow of the Australian Institute of Mining and Metallurgy and has sufficient experience of relevance for management and interpretation of test work activities undertaken so as to qualify as a Competent Person as defined in the 2012 Edition of the Joint Ore Reserves Committee (JORC) Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Mr Smith consents to the inclusion in this report of the matters based on his information in the form and context in which they appear.



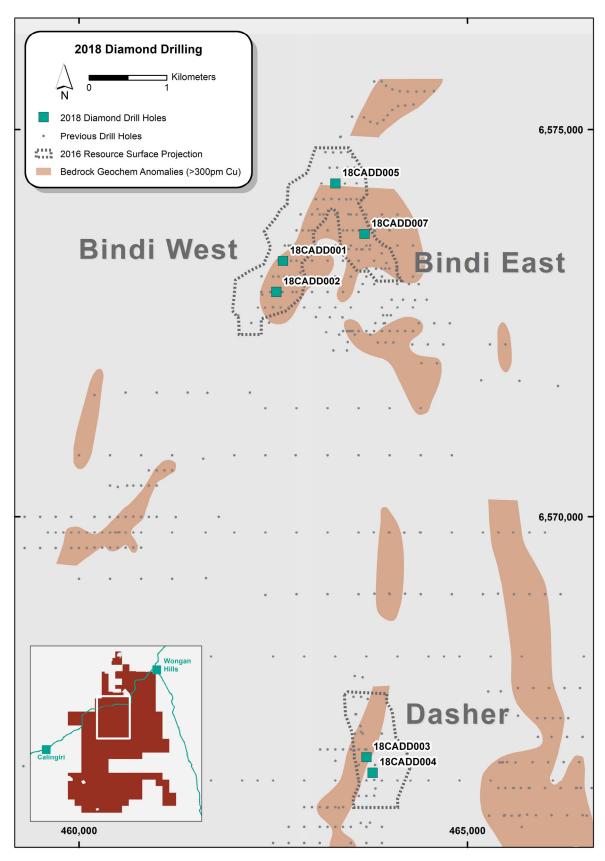


Figure 3: Location of 2018 diamond drill holes at Caravel Copper Project



# **APPENDIX 1 - JORC Compliance Table**

Section 1 Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
Sampling techniques	Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.  Include reference to measures taken to	Drill holes were sampled via conventional Reverse Circulation (RC) or Diamond drilling (DD).  Sampling was carried out under
	ensure sample representivity and the appropriate calibration of any measurement tools or systems used.  Aspects of the determination of mineralisation that are Material to the Public Report.  In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.	Caravel's standard protocols and QAQC procedures and is considered standard industry practice.  Reverse Circulation drilling was used to obtain 1m samples. ~3kg samples were combined to form 2m composite samples for assay. Samples are riffle split to 3.2kg and pulverised to nominal 85% passing 75 microns and sent for assay. Reverse Circulation samples were weighed, dried and pulverized to 85% passing 75 microns to form a sub-sample. All RC samples were sampled on 2m composites and sent for a multi-element suite using multi-acid (4 acid) digestion with an ICP/OES and/or MS finish and selected samples for 50g Fire Assay for gold with an AAS finish.
		HQ3 diamond core was halved at ALS in Perth. Nominal 2m half core samples were collected at ALS Ammtec, where the entire 2m sample was control crushed using a jaw, followed by a cone crusher. A 500g split was collected from the entire crushed sample and submitted to ALS Geochemistry in Perth where samples were weighed and pulverized to 85% passing 75 microns to form a subsample. A multi-element suite was completed using multi-acid (4 acid) digestion with an ICP-OES/MS finish and 50g Fire Assay for gold with an AAS finish.
Drilling techniques	Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).	RC (reverse circulation) drilling was used using a 5 to 5.5 inch face sampling hammer. Diamond drilling was by conventional HQ techniques. HQ triple tube was used in more weathered zones. Core was oriented using a reflex ACT 3 instrument.



Method of recording and assessing core and chip sample recoveries and results assessed.	RC sample recoveries remained relatively consistent throughout the program and are estimated to be
	100% for 95% of drilling. Any poor (low) recovery intervals were logged and entered into the database. Diamond recoveries in fresh rock approximated 100%.
Measures taken to maximise sample recovery and ensure representative nature of the samples.	The RC rotating cone splitter and or riffle splitter was routinely cleaned and inspected during drilling. Care was taken to ensure calico samples were of consistent volume. Diamond samples were cut on the same core side to improve assay representivity.
Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.	There is negligible to no relationship observed between grade and recovery.
Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.	RC and DD holes were logged geotechnically and geologically including but not limited to weathering, regolith, lithology, structure, texture, alteration, mineralisation and magnetic susceptibility. Logging was at an appropriate quantitative standard to support future geological, engineering and metallurgical studies.
Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.	Logging is considered quantitative in nature.
The total length and percentage of the relevant intersections logged.  If core, whether cut or sawn and whether quarter, half or all core taken.  If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.  For all sample types, the nature, quality and appropriateness of the sample preparation technique.	All holes were geologically logged in full.  All core is half cut and sampled.  Duplicate samples were collected by ALS Geochem by splitting the 500g crushed sample submitted for analysis in two and analysing each sample separately.  1 meter RC samples were split off the drill rig into 1 calico bag using a rotating cone or riffle splitter. For each two meter interval, the 1m split samples were fully combined to make one 2m composite. >95% of the samples were dry in nature.  Reverse Circulation samples were weighed, dried, pulverized to 85% passing 75 microns. This is considered industry standard and appropriate.  Diamond Drilling samples were weighed and pulverized to 85%
V S S F T V L I C T T I G I J S S F C	Whether a relationship exists between ample recovery and grade and whether ample bias may have occurred due to preferential loss/gain of fine/coarse material.  Whether core and chip samples have been geologically and geotechnically bogged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.  Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.  The total length and percentage of the guarter, half or all core taken. If non-core, whether riffled, tube ampled, rotary split, etc and whether ampled wet or dry.  For all sample types, the nature, quality and appropriateness of the sample



Criteria	JORC Code explanation	Commentary
	Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.	Caravel has its own internal QAQC procedure involving the use of certified reference materials (standards), blanks and duplicates which accounts for 6% of the total submitted samples. QAQC has been checked with no apparent issues.
	Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.	Field duplicate data suggests there is general consistency in the drilling results. The mineralisation does not appear to be 'nuggety' in nature.
	Whether sample sizes are appropriate to the grain size of the material being sampled.	The sample sizes are considered to be appropriate for the style of base and precious metal mineralisation observed which is typically coarse grained disseminated copper and molybdenum.
Quality of assay data and laboratory tests	The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.	All RC samples were sent for multi- element analysis via multi (4) acid digestion, ICP Atomic Emission Spectrometry (ICP-OES) and/or Mass Spectrometry and selected samples for 50g Fire Assay for gold. All DD samples were sent for multi-element analysis via multi (4) acid digestion, ICP Atomic Emission Spectrometry (ICP-OES) and Mass Spectrometry (MS) and 50g FA/AAS for gold. These techniques are considered appropriate and are considered industry best standard. All assay results are considered reliable and total.
	For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.	No such instruments have been used for reported intersections.
	Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.	Caravel has its own internal QAQC procedure involving the use of certified reference materials (standards), blanks and duplicates which accounts for 6% of the total submitted samples. The certified reference materials used had a representative range of values typical of low, moderate and high grade copper mineralisation. Standard results for drilling demonstrated assay values are both accurate and precise. Blank results demonstrate there is negligible cross-contamination between samples. Duplicate results suggest there is reasonable



Criteria	JORC Code explanation	Commentary
Verification of sampling and assaying	The verification of significant intersections by either independent or alternative company personnel. The use of twinned holes.	No twin holes have yet been drilled for comparative purposes. The diamond holes reported were drilled between two RC holes and intersected mineralisation that compares well with the widths and grades intersected in the RC drilling.
	Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.	Primary data was collected via digital logging hardware using in house logging methodology and codes. The data was sent to the Perth based office where the data is validated and entered into an industry standard master database by Caravel's database administrator.
	Discuss any adjustment to assay data.	There has been no adjustment to assay data.
Location of data points	Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.	Hole collar locations have been picked up by Caravel employees whilst in the field using a GPS accurate to within ± 3m. Easting and Northing coordinates are considered reliable (± 3m). Downhole surveys on all angled RC and DD holes used single shot or multishot readings at downhole intervals at approximately every 30m.
	Specification of the grid system used.	The grid system used for location of all drill holes as shown on all figures is MGA Zone 50, GDA94.
	Quality and adequacy of topographic control.	RL data is considered unreliable at present although topography around the drill areas is relatively flat and hence should not have any considerable effect on the current interpretation of data.
Data spacing and distribution	Data spacing for reporting of Exploration Results.	Drill hole spacing is variable. 2m (RC) drill composite samples were sent for elemental analysis. DD samples were sampled nominally at 1m intervals and between 0.3 and 1.3 mtrs dictated by geological boundaries.
	Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.	Drill and sample spacing is considered sufficient as to make geological and grade continuity assumptions.
	Whether sample compositing has been applied.	2 meter sample compositing (i.e. from two 1 meter samples) of the RC drilling was used.
Orientation of data in relation to geological structure	Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.	The orientation of drilling and sampling is not considered to have any significant biasing effects. The majority of drill holes have been completed perpendicular or oblique to the interpreted mineralised systems.



Criteria	JORC Code explanation	Commentary
	If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	As above
Sample security	The measures taken to ensure sample security.	Chain of custody is managed by Caravel. Sampling is carried out by Caravel's experienced field staff. Samples are stored on site and transported to the Perth laboratory by Caravel's employees.
Audits or reviews	The results of any audits or reviews of sampling techniques and data.	No review has been carried out to date.



## **Section 2 Reporting of Exploration Results**

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.  The security of the tenure held at the	The results relate to 70/2788.  All applicable tenements are held
	time of reporting along with any known impediments to obtaining a licence to operate in the area.	securely by Caravel with no impediments identified.
Exploration done by other parties	Acknowledgment and appraisal of exploration by other parties.	N/A
Geology	Deposit type, geological setting and style of mineralisation.	The mineralisation at all prospects is believed to be of porphyry and/or skarn deposit style which occurs within a possible larger scale Archean subduction related geological setting.
Drill hole Information	A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes, including Easting and northing of the drill hole collar, Elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar, dip and azimuth of the hole, down hole length and interception depth plus hole length. If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	Refer to Tables in announcement above. See representative drill collar plans and cross-section.
Data aggregation methods	In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated. Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail. The assumptions used for any reporting of metal equivalent values should be clearly stated.	Length weighted averages used for exploration results. Cutting of high grades was not applied in the reporting of intercepts.



Criteria	JORC Code explanation	Commentary
Relationship between mineralisation widths and intercept lengths	These relationships are particularly important in the reporting of Exploration Results.  If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').	Downhole lengths are reported in this announcement. Diamond holes reported in this announcement were drilled approximately perpendicular to the interpreted mineralised system and downhole widths are interpreted to approximate true widths.
Diagrams	Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.	Refer to Figures included in the release.
Balanced reporting	Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.	All significant results are reported with no intended bias.
Other substantive exploration data	Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.	Multi-element assaying was conducted on all samples which include potentially deleterious elements including arsenic.
Further work	The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).  Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	Further drilling and geological evaluations are in progress to infill, potentially extend and further understand the Bindi and Dasher deposits, in particular the geological continuity and modelling of higher and lower grade zones within the mineralised systems. Collection of geotechnical data and sample material for metallurgical test-work is also part of the drilling program.

