



ASX Release

20 July 2017

## FEED optimisation reduces Colluli recovery pond area

### Key Points

- FEED optimisation process has improved Colluli recovery pond footprint size relative to DFS
- Recovery pond area reduced by 20% relative to DFS for project start up period, despite increase in processing plant production rate
- Colluli demonstrates industry leading pond area on a per tonne of production basis
- Processing plant production rate increased from 425kt per annum to 472kt per annum following debottlenecking work completed in optimisation phase
- Cut, fill and surface preparation requirements currently under evaluation
- FEED phase well advanced with evaluation of processing plant and non-processing infrastructure bids underway

Danakali Limited (**ASX: DNK**) and its joint venture partner, the Eritrean National Mining Corporation (**ENAMCO**), are pleased to announce that following a comprehensive optimisation programme, the recovery pond area for the Colluli Potash project in Eritrea has been reduced. The recovery ponds form a key sub-set of the processing plant configuration and allow higher potassium yields by capturing and evaporating waste brines exiting the processing plant.

The reduction in pond area has been achieved despite an increase in the processing plant throughput relative to the definitive feasibility study (**DFS**)<sup>1</sup>, and is the result of design enhancements in the brine circuit configuration. The pond designs are also underpinned by over four years of comprehensive local weather data collection and evaporation tests.

Processing plant throughput was increased from 425kt per annum to 472kt per annum following a debottlenecking exercise that was completed in May 2017<sup>2</sup>.

*Managing Director, Paul Donaldson commented “We are very pleased with the positive outcomes of the optimisation work on the recovery ponds and expect that there will be flow on benefits to the construction earthworks. The Colluli DFS demonstrated evaporation pond sizes significantly smaller than SOP brine projects as a direct consequence of the potassium salts being extracted from the resource in solid form. This benefit is unique to the Colluli resource. We are also very happy that the results from the FEED work are now flowing through, and we look forward to further results in the upcoming weeks”.*

<sup>1</sup> ASX announcement, Colluli Definitive Feasibility Study Results, 30 November 2015

<sup>2</sup> ASX announcement, FEED optimisation increases planned Sulphate of Potash production capacity at Colluli, 3 May 2017



---

## **The physical state of the raw feed is a key determinant of pond size**

One of the distinguishing features of the Colluli resource is that the potassium salts used for sulphate of potash (SOP) production are present in solid form, allowing immediate processing following extraction from the resource using open cut mining techniques. This eliminates the need for pre-production evaporation ponds, allowing for significant savings in cost and time.

Primary resources for SOP production are typically potassium and sulphur rich brines, the processing of which commences with the generation of a harvest salt. This harvest salt is typically generated as the product of a multi-stage evaporation and precipitation process which progressively concentrates potassium and sulphur by selectively removing calcium, sodium and magnesium salts in early stage pre-production evaporation ponds.

Harvest salt production rates from brines are influenced by local weather conditions and potassium yields decrease with progressively increasing pond sizes (for unlined ponds) and the number of steps required to generate harvest salts.

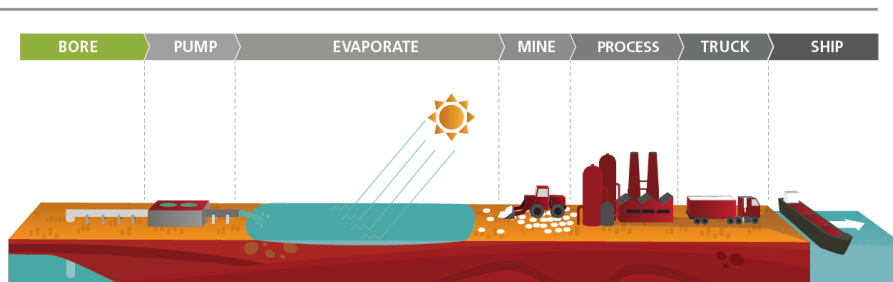
The final potassium rich harvest salt generated as above is reclaimed and fed into a processing plant for conversion to SOP. Depending on the chemistry of the feed material fed into the processing plant, brines exiting the plant may be captured and directed to a set of recovery ponds to improve the overall potassium yield. These are small relative to pre-production evaporation ponds used in brine extraction.

Figure 1 shows the key differences between the process requirements for a brine and a salt in solid form.



DANAKALI

## BRINE



## SOLID SALTS

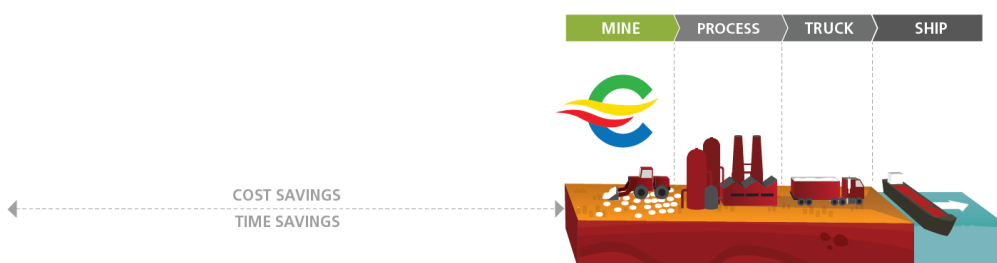


Figure 1: Extraction of salts in solid form negates the need for large evaporation ponds prior to processing

Figures 2 and 3 show the Colluli feed material which will be extracted from the resource and available for immediate conversion to SOP in the processing plant and a potassium rich brine prior to multi-stage evaporation and precipitation respectively.



Figure 2: Potassium feed from Colluli<sup>1</sup>



Figure 3: Potassium feed from brine resource<sup>2</sup>

<sup>1</sup> Kainite core from the Colluli resource

<sup>2</sup> Salt Lake Potash ASX announcement, 25 January 2017



## Pond Size Equivalent (472kt/yr)<sup>1</sup>

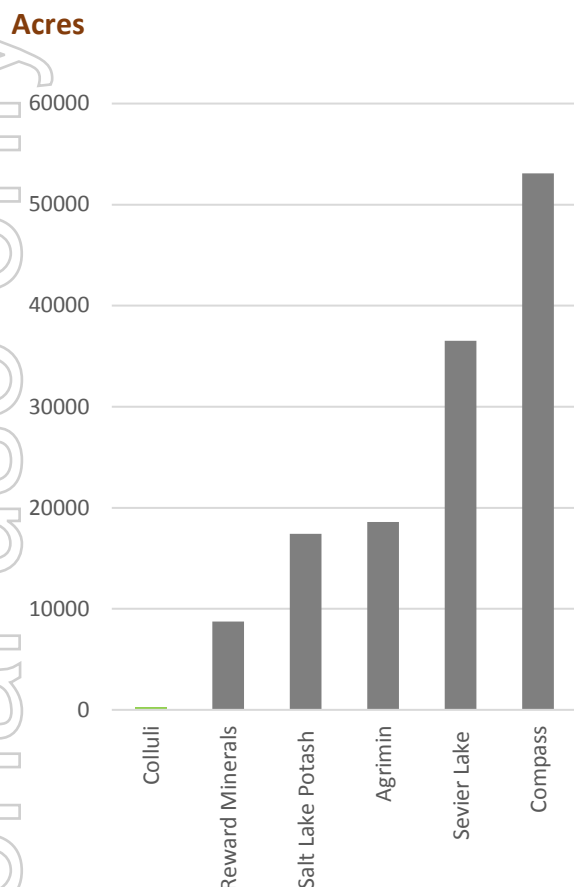


Figure 4 shows pond area requirements for SOP brine projects relative to the Colluli Project.

Pond area requirements have been adjusted for an equivalent production rate of 472kt per annum. Pond sizes are influenced by form of raw material, chemistry and weather conditions.

The substantially lower surface area requirements for Colluli are a direct consequence of:

- Physical form of the potassium extracted from the resource
- Highly favourable ambient conditions

Figure 4: Pond surface area versus SOP project<sup>1</sup>

### Smaller pond size for Colluli is a key contributor to industry leading capital intensity

The Colluli DFS demonstrates industry leading capital intensity as a result of both the salts presenting in solid form and the exceptionally high ore grade. Figure 5 shows capital intensity versus other advanced stage SOP projects. Low surface area recovery ponds is a key contributor to lower capital intensity.

<sup>1</sup> Source: Company websites, DNK Analysis



### Capital Intensity (\$US/tonne)<sup>1</sup>

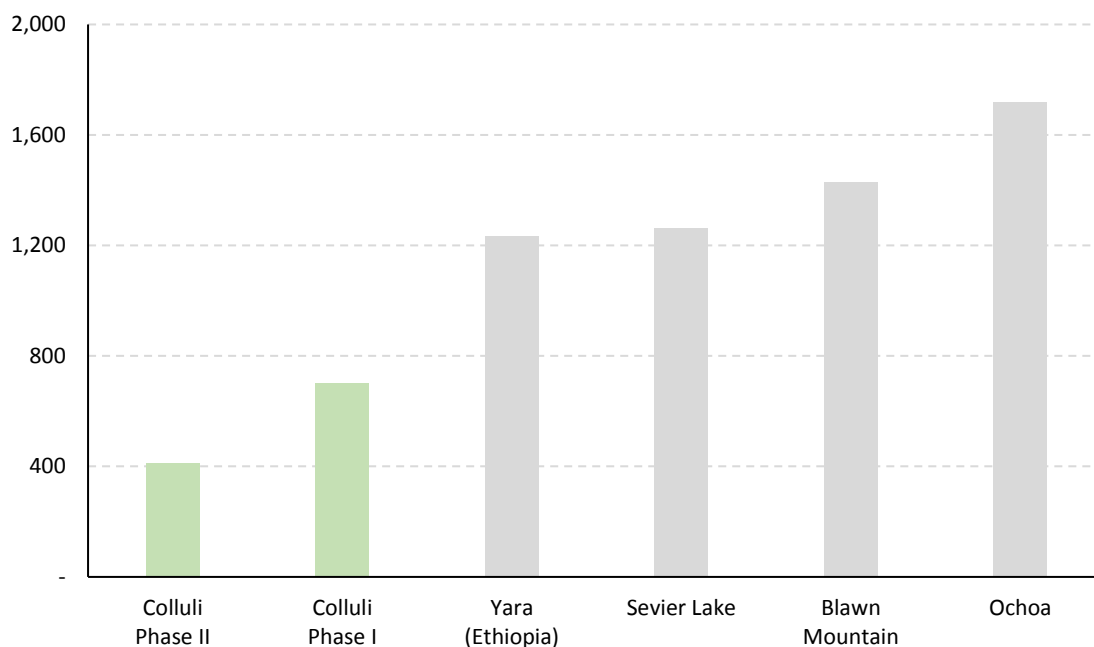


Figure 5: DFS Capital Intensity by SOP Project<sup>1</sup>

### Cut, fill and surface preparation volumes under evaluation

The cut, fill and surface preparation evaluation for the recovery ponds and overall site is currently underway. Results are expected within the next two weeks for direct comparison with the DFS.

### FEED process well advanced

The front-end engineering design is well advanced. To date, 23 of 25 bids have been received and are currently under evaluation. The preferred power supplier for the project has been identified. Turner & Townsend are currently working on the EPC bidding framework and mining contract tendering will commence shortly.

### For more information, please contact:

Paul Donaldson  
Managing Director  
+61 8 6315 1444

<sup>1</sup> Source: DNK Company announcements, Company websites



### About Danakali Ltd

Danakali is an ASX listed company and 50% owner of the Colluli Potash Project in Eritrea, East Africa. Danakali is currently developing the Colluli Potash Project with its joint venture partner Eritrean National Mining Corporation (ENAMCO). Danakali and ENAMCO each have a 50% ownership interest in the joint venture company, the Colluli Mining Share Company (CMSC).

The project is located in the Danakil Depression region of Eritrea, and is ~75km from the Red Sea coast, making it one of the most accessible potash deposits globally. Mineralisation within the Colluli resource commences at just 16m, making it the world's shallowest potash deposit. The resource is amenable to open pit mining, which allows higher overall resource recovery to be achieved, is generally safer than underground mining and is highly advantageous for modular growth.

The company has completed a definitive feasibility study for the production of potassium sulphate, otherwise known as SOP. SOP is a chloride free, specialty fertiliser which carries a substantial price premium relative to the more common potash type; potassium chloride. Economic resources for production of SOP are geologically scarce. The unique composition of the Colluli resource favours low energy input, high potassium yield conversion to SOP using commercially proven technology. One of the key advantages of the resource is that the salts are present in solid form (in contrast with production of SOP from brines) with which reduces infrastructure costs and substantially reduces the time required to achieve full production capacity.

The resource is favourably positioned to supply the world's fastest growing markets.

Our vision is to bring the Colluli project into production using the principles of risk management, resource utilisation and modularity, using the starting module as a growth platform to develop the resource to its full potential.

### Competent Persons Statement (Rock Salt Resource)

Colluli has a JORC 2012 compliant Measured, Indicated and Inferred Mineral Resource estimate of 347Mt @97% NaCl. The resource contains 28Mt @ 97% NaCl of Measured Resources, 180Mt @ 97% NaCl of Indicated Resources and 139Mt @ 97% NaCl of Inferred Resources.

The information relating to the Colluli Rock Salt Mineral Resource estimate was compiled by Mr. John Tyrrell. Mr. Tyrrell is a member of the Australasian Institute of Mining and Metallurgy (AusIMM) and a full-time employee of AMC. Mr. Tyrrell has more than 25 years' experience in the field of Mineral Resource estimation. He has sufficient experience relevant to the style of mineralisation and type of the deposit under consideration, and in resource model development, to qualify as a Competent Person as defined in the JORC Code.

Mr Tyrrell consents to the inclusion of the information relating to the rock salt Mineral Resource in the form and context in which it appears.

### Competent Persons Statement (Sulphate of Potash Resource)

Colluli has a JORC 2012 compliant Measured, Indicated and Inferred Mineral Resource estimate of 1,289Mt @11% K<sub>2</sub>O. The resource contains 303Mt @ 11% K<sub>2</sub>O of Measured Resources, 951Mt @ 11% K<sub>2</sub>O of Indicated Resources and 35Mt @ 10% K<sub>2</sub>O of Inferred Resources.

The information relating to the 2015 Colluli Mineral Resource estimate was compiled by Mr. John Tyrrell, under the supervision of Mr. Stephen Halabura M. Sc. P. Geo. Fellow of Engineers Canada (Hon), Fellow of Geoscientists Canada, and as a geologist with over 25 years' experience in the potash mining industry. Mr. Tyrrell is a member of the Australian Institute of Mining and Metallurgy and a full-time employee of AMC. Mr. Tyrrell has more than 25 years' experience in the field of Mineral Resource estimation.

Mr. Halabura is a member of the Association of Professional Engineers and Geoscientists of Saskatchewan, a Recognised Professional Organisation (RPO) under the JORC Code and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code). Mr. Tyrrell & Mr. Halabura consent to the inclusion of information relating to the 2015 Resource Statement in the form and context in which it appears.

### Competent Persons Statement (Sulphate of Potash Reserve)

The November 2015 Colluli Ore Reserve is reported according to the JORC Code and estimated at 1,113Mt @10% K<sub>2</sub>O Equiv. The Ore Reserve is classed as 286Mt @ 11% K<sub>2</sub>O Equiv Proved and 827Mt @ 10% K<sub>2</sub>O Equiv Probable. The Competent Person for the estimate is Mr Mark Chesher, a mining engineer with more than 30 years' experience in the mining industry. Mr. Chesher is a Fellow of the AusIMM, a Chartered Professional, a full-time employee of AMC Consultants Pty Ltd, and has sufficient open pit mining activity experience relevant to the style of mineralisation and type of deposit under consideration to qualify as a Competent Person as defined in the JORC Code. Mr Chesher consents to the inclusion of information relating to the Ore Reserve in the form and context in which it appears.

In reporting the Mineral Resources and Ore Reserves referred to in this public release, AMC Consultants Pty Ltd acted as an independent party, has no interest in the outcome of the Colluli Project and has no business relationship with Danakali Ltd other than undertaking those individual technical consulting assignments as engaged, and being paid according to standard per diem rates with reimbursement for out-of-pocket expenses. Therefore, AMC Consultants Pty Ltd and the Competent Persons believe that there is no conflict of interest in undertaking the assignments which are the subject of the statements.



### Quality Control and Quality Assurance

Danakali Exploration programs follow standard operating and quality assurance procedures to ensure that all sampling techniques and sample results meet international reporting standards. Drill holes are located using GPS coordinates using WGS84 Datum, all mineralisation intervals are downhole and are true width intervals.

The samples are derived from HQ diamond drill core, which in the case of carnallite ores, are sealed in heat sealed plastic tubing immediately as it is drilled to preserve the sample. Significant sample intervals are dry quarter cut using a diamond saw and then resealed and double bagged for transport to the laboratory.

Halite blanks and duplicate samples are submitted with each hole. Chemical analyses were conducted by Kali-UmwelttechnikGmbH Sondershausen, Germany utilising flame emission spectrometry, atomic absorption spectroscopy and ionchromatography. Kali- Umwelttechnik (KUTEC) Sondershausen1 have extensive experience in analysis of salt rock and brine samples and is certified according to DIN EN ISO/IEC 17025 by the Deutsche AkkreditierungssystemPrüfwesen GmbH (DAR). The laboratory follows standard procedures for the analysis of potash salt rocks chemical analysis ( $K^+$ ,  $Na^+$ ,  $Mg^{2+}$ ,  $Ca^{2+}$ ,  $Cl^-$ ,  $SO_4^{2-}$ ,  $H_2O$ ) and X-ray diffraction (XRD) analysis of the same samples as for chemical analysis to determine a qualitative mineral composition, which combined with the chemical analysis gives a quantitative mineral composition.

### Forward Looking Statements and Disclaimer

The information in this document is published to inform you about Danakali Limited (the "Company" or "DNK") and its activities. DNK has endeavoured to ensure that the information enclosed is accurate at the time of release, and that it accurately reflects the Company's intentions. All statements in this document, other than statements of historical facts, that address future production, project development, reserve or resource potential, exploration drilling, exploitation activities, corporate transactions and events or developments that the Company expects to occur, are forward-looking statements. Although the Company believes the expectations expressed in such statements are based on reasonable assumptions, such statements are not guarantees of future performance and actual results or developments may differ materially from those in forward-looking statements.

Factors that could cause actual results to differ materially from those in forward-looking statements include market prices of potash and, exploitation and exploration successes, capital and operating costs, changes in project parameters as plans continue to be evaluated, continued availability of capital and financing and general economic, market or business conditions, as well as those factors disclosed in the Company's filed documents.

There can be no assurance that the development of the Colluli Project will proceed as planned. Accordingly, readers should not place undue reliance on forward looking information. Mineral Resources and Ore Reserves have been reported according to the JORC Code, 2012 Edition. To the extent permitted by law, the Company accepts no responsibility or liability for any losses or damages of any kind arising out of the use of any information contained in this document. Recipients should make their own enquiries in relation to any investment decisions. Mineral Resource, Ore Reserve and financial assumptions made in this presentation are consistent with assumptions detailed in the Company's ASX announcements dated 25 February 2015, 4 March 2015, 19 May 2015, 23 September 2015, 30 November 2015, 15 August 2016 and 1 February 2017 which continue to apply and have not materially changed. The Company is not aware of any new information or data that materially affects assumptions made.