# Namib Lead & Zinc Mine

# Updates Resources and Reserves

*20 October 2017*

North River Resources plc ("North River", "NRR" or the Company) is very pleased to announce the completion of an updated feasibility study for its brownfield Namib Lead and Zinc Mine ("NLZM") in Namibia. North River is now fully focussed on finalising the funding for the development of the mine, with construction expected to commence in early 2018.

**Highlights:**

- Total JORC Mineral Resource of 1.12m tonnes at 6.6% zinc, 2.3% lead and 46g/t silver.
- JORC Ore Reserve of 611k tonnes at 6.6% zinc, 2.3% lead, and 48g/t silver.
- NRR proposes a staged development approach with an initial annual target production of 9,700t of Zn & Pb metal in concentrate with 135koz Ag by-product.
- Future expansion from additional underground resources and tailings retreatment.
- Construction period of less than 1 year and payback within 1.5 years.
- With a construction capital of US$12.9m, the project has an after-tax IRR of 81% and $NPV_{10}$ of US$34.9m. The commodity price assumption was based on the forward curve at 5 October for 2018 to 2021 and held flat thereafter; $1.23/lb for Zn and $1.16/lb for Pb.
- A mine life of 8 years from the current resource base.

Since the completion of the Feasibility Study in late 2014, NLZM undertook several optimisation studies to improve the project economics and reduce associated development risks. These included several programmes of metallurgical testwork and infill diamond drilling to collect fresh ore samples for testing and better understand orebody variability and reduce the risks in the initial mining period. New Mineral Resource and Ore Reserve Statements were made by the respective consultants. NRR produced an updated mine development plan as an update to the previous Feasibility Study.

The mine construction program has now been substantially de-risked in the new project development plan.

- The geological drilling of North has added substantially to information in the initial mining areas of North (35% more drilling), providing more confidence in the designs and mining methods proposed.
- NRR proposes a staged mine production development, with a reduced construction capital, ramping up in accordance with the resource expansion resulting from ongoing exploration activities.
- Initial development focuses on opening up North orebodies only.
- Optimise the mining layout by designing North independent from the old South Mine.

- Metallurgical testwork on fresh North ore samples increases confidence in the extraction process designed.
- The haulage development that was completed in March 2016 by mine personnel gives confidence that an owner mining team can be established, built-up and trained to meet the production requirements of the new mine plan.

**Geology and Mineral Resources**

CSA Global completed a JORC 2012 compliant Mineral Resource Estimate, on which the mine plan and Reserves are based.

The NLZM is hosted within the thinly interbedded clastics and carbonates of the Arises Marble unit of the Karibib Formation of the Swakop Group, which in the vicinity of the mine displays complex folding and deformation. The mineralised massive "Mine Marble" unit within the Karibib Formation is a weakly banded and coarse grained marble.

Structurally, mineralisation occurs in NE-SW striking tabular lodes that occur in the axial zone and limbs of a ductile SW-plunging anticlinal fold closure. The lodes have similar orientation around the fold closure and are therefore not folded. They are stratabound within the host Mine Marble unit but are very oblique to this enclosing envelope. As a result, the lodes typically have short strike lengths but much greater down-plunge continuity. Lodes do occur which are elongated along the Mine Marble strike, but this is less common.

The lodes within the deposit are assigned to four zones relative to their position in the fold closure, the North, South, N20 and Junction.

In-situ Classified Mineral Resource Estimate for the NLZM, as at August 2017.

| **Mineral Resource Estimate of NLZM, August 2017** | | | | | | |
|---|---|---|---|---|---|---|
| **Classification** | **Area** | **Tonnes** | **Zn (%)** | **Pb (%)** | **Ag (g/t)** | **Bulk Density** |
| Indicated | North | 522,700 | 7.26 | 2.47 | 53 | 3.53 |
| | South | 187,600 | 6.36 | 2.22 | 43 | 3.49 |
| | Subtotal | 710,300 | 7.02 | 2.40 | 50 | 3.52 |
| Inferred | North | 193,300 | 5.73 | 1.61 | 29 | 3.40 |
| | South | 215,500 | 6.16 | 2.64 | 47 | 3.48 |
| | Subtotal | 408,700 | 5.96 | 2.16 | 38 | 3.44 |
| **Total Resource** | | **1,119,100** | **6.63** | **2.31** | **46** | **3.49** |

**Mining and Ore Reserves**

Bara Consulting updated the mine layout and schedule to consider the new geological resource as well as optimised the production rate. The mining methods were also reconsidered to include the preferred sub-hole open stoping where the orebody geometry allows in preference to the historical manual shrinkage and down-dip methods.

The mine design has been updated to cater for the revised mineral resource estimate. The mine layout was revised to include the following changes:

- The focus of early mining is in the North mine, with the unmined portions of the South mine only being mined later in the life of the mine.
- The level spacing in the North mine has been normalised. Main levels are 30m apart with one sublevel between main levels.
- The predominant mining method has been changed to sub-level open stoping (SLOS).

The mine production rate has been optimised to an initial nominal 10,000 tonnes per month. This results in a mine life of seven years at steady state production. The capital and operating have been updated to reflect the new mine design and production rate.

The cost base has been updated to September 2017. A JORC 2012 compliant Ore Reserve has been declared based on the work completed in this revised mine plan. The Ore Reserves are tabled below.

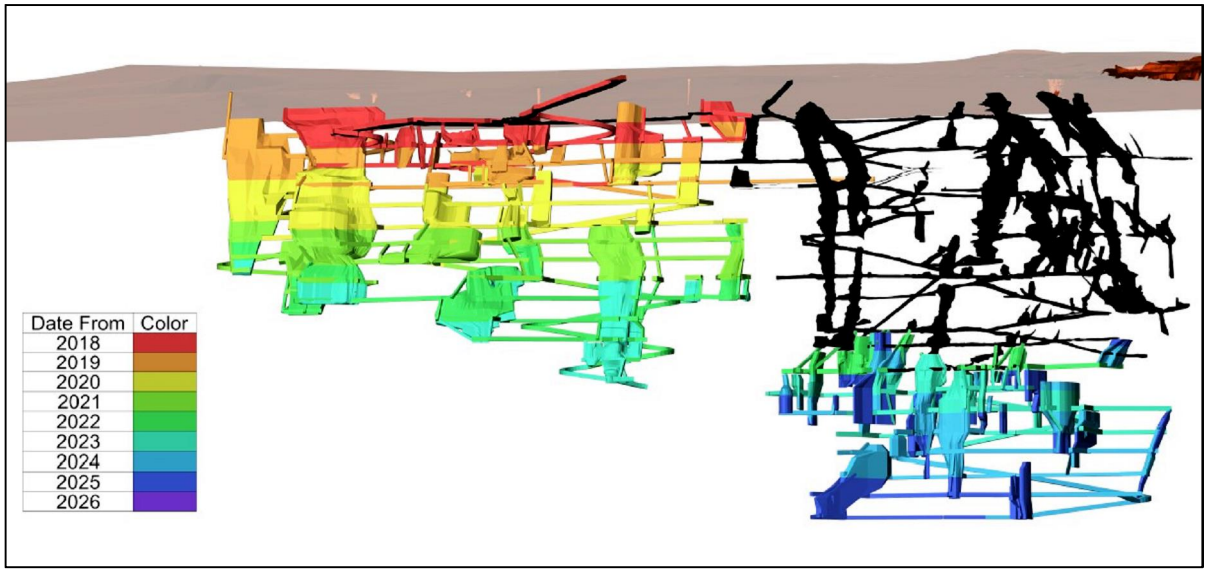
| **Ore Reserve Estimate of NLZM, October 2017** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Mass (t)** | **Pb (%)** | **Zn (%)** | **Ag (g/t)** | **Contained Pb (t)** | **Contained Zn (t)** | **Contained Ag (Oz)** |
| Proven Ore Reserves | - | - | - | - | - | - | - |
| Probable Ore Reserves | 611 000 | 2.3 | 6.6 | 48.5 | 14 000 | 40 000 | 952 000 |
| **Total Ore Reserves** | **611 000** | **2.3** | **6.6** | **48.5** | **14 000** | **40 000** | **952 000** |

*Mineral Resources are reported inclusive of Ore Reserves*

The mining inventory by resource class is shown below. Although Inferred Mineral Resources are included in the life of mine design they are not included in the Ore Reserve statement above nor are they required to demonstrate the economic viability of the project. The conversion of Inferred Mineral Resources to Indicated Resources, resulting from continuous infill drilling following the primary development, will be an ongoing operational practice. As such, NRR has used the mine's entire resource base for the life-of-mine planning. Further exploration on each development level represents upside potential in ore reserves, within the envelope of the current North and South orebodies.

| **Mining Inventory by Resource Categorization** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Mass (t)** | **Pb (%)** | **Zn (%)** | **Ag (g/t)** | **Contained Pb (t)** | **Contained Zn (t)** | **Contained Ag (Oz)** |
| Indicated | 610,859 | 2.35 | 6.66 | 49.1 | 14,381 | 40,695 | 964,748 |
| Inferred | 273,884 | 2.38 | 6.23 | 40.5 | 6,510 | 17,052 | 356,665 |
| **Total Inventory** | **884,743** | **2.36** | **6.53** | **46.5** | **20,891** | **57,747** | **1,321,414** |

The figure below illustrates the mine layout and schedule coloured by year.




**Metallurgical Testwork**

A comprehensive test program was conducted on North ore core from the 2016/17 drill program at ALS Global in Burnie, Tasmania in mid-2017. This forms the basis of the process plant design.

The work, summarized in a formal report from ALS, comprised of:

- Mineragraphic and mineralogical examination
- Flotation batch tests to examine grind and flotation responses to varying conditions
- Concentrate filtration tests
- Product settling tests
- Oxidation tests
- Seawater response
- Concentrate minor element analyses

Eight composite samples representing discreet elements of the orebody were prepared. These samples were subjected to mineragraphic and mineralogical examination. Two weighted composites of the entire sample suite were then prepared of “typical ore” and “high zinc grade” ore for general testwork.

Batch flotation tests were conducted using a variety of reagents and circuit modifications. From this, a robust set of operating conditions and reagent additions was achieved. In addition, testing of physical parameters as well as total analyses of final concentrates was carried out. The key results / conclusions from this work are:

- Flotation responses are robust and predictable even with variations in head grade metal ratios.
- Cyanide addition to depress sphalerite in lead flotation is far superior to the use of zinc sulphate. The use of cyanide also has a tangible effect on the depression of both pyrite and pyrrhotite to the extent that flotation response appears to be independent of the relative proportions of pyrite/pyrrhotite in the ore.
- Settling rates for all products are extremely fast; presenting no problems for dewatering. Predictably, filtration tests demonstrated rapid dewatering.

- The use of seawater for flotation is a possibility if necessitated. Testwork indicated that rougher performance is not comprised by use of seawater. However, further work is required to assess the optimum configuration of the cleaner zinc circuit. Performance will not be affected providing that the zinc cleaner circuit uses fresh water make-up.
- The cadmium level in the final zinc concentrate was 0.22%. There are no other deleterious elements in the concentrates.
- Locked cycle testing showed no unmanageable build up within recycle streams.
- Regrind of the zinc flotation intermediate streams is essential.
- There are no significant quantities of soluble salts that could cause problems with concentrate production.
- Heavy liquid separation testing of ore to determine if pre-concentration was an option, proved unsuccessful in that the "reject" stream carried too much metal to be economically discarded.
- Metal recoveries will be 91% zinc, 90% lead and 75% silver.
- The zinc concentrate will contain 53% Zn, 0.8% Pb and 11% Fe.
- The lead concentrate will contain 67% Pb, 3.7% Zn, 6.4% Fe and 1,090g/t Ag.

**Processing**

The plant circuit is entirely conventional in terms of a crushing, grinding, flotation operation for a lead/zinc orebody. Bond Equipment is the preferred supplier of plant equipment.

Ore from the ROM pad will be fed by FEL to a bin, apron feeder and grizzly, which feeds a jaw crusher in closed circuit with a scalping screen. The crushing plant is a two-stage unit with intermediate screening and the ability to reject or recirculate coarse, potentially waste, material. An impact crusher was chosen as the second stage to take advantage of the high reduction ratio to provide suitable feed stock for the small-scale ball mill. Impact breakage suits grain boundary cleavage and avoids 'squashing' softer minerals like galena. Surge storage is handled via a fine ore bin and overflow stockpile.

A single stage ball mill was selected for its simplicity and suitability for the mineralogy, specifically the liberation sizes of galena and sphalerite. The inevitable overgrinding effect of heavier minerals is utilised to good effect in that an overall grind of $P_{80}$ 100µm gives a mineral product of $P_{80}$ 70µm which fits the galena release curve very well but leaves the sphalerite requiring further liberation in a selective regrind to achieve the optimal concentrate grade. Galena present in the ore is relatively competent and no evidence of 'sliming' was encountered in any testwork, past and present.

The flotation circuit provides flexibility to deal with both elevated head grades and circuit modifications. The circuit was designed to maximise the use of gravity, eliminating the need for pumps and increasing the plants ability to deal with variability.

The lead roughers are 3 x 8$m^3$ cells with additional cross launders to give enhanced lip length to cope with elevated head grades and thinner froths common with the selective collector used. The lead cleaner capacity can cope with elevated head grades.

The lead rougher tails form the feed to the zinc conditioner. The zinc roughing cells are 6 x 8$m^3$ units, being conservative to allow for easy reconfiguration should a larger scavenging duty be required which will build up a recirculating load and thereby reduce the actual residence time.

The zinc circuit is equipped with cross launders to facilitate higher weights pulls. The froth constraints are not as severe as in lead flotation but again commonalty of equipment was considered.

The zinc cleaner circuit incorporates a regrind facility to complete the effective liberation of the available sphalerite particles. In so doing a circulating load will arise, so an element of conservatism was adopted in cleaning capacity which also allows for ready conversion to a full two stage process if required.

The final concentrates flow at launder density at +30% solids to surge tanks which in turn feed the horizontal belt filters. It was considered undesirable to further thicken the pulp as the design of a very small but variable throughput thickener was complicated and would require considerable instrumentation.

Oversized horizontal vacuum filters were chosen as a means of simplifying the operation as well as allowing considerable air-drying time to comply with transportable moisture limitations, should bulk transport be considered for the zinc concentrate (lead concentrate will be bagged but still requires good handling characteristics).

The lead concentrate will be packaged into bulk bags to minimise any open piles and either load a container on site or transport the bags to Walvis Bay to load the containers. The zinc concentrate will be directly loaded onto trucks or bulk loaded into plastic lined containers on site with the addition of a small shuttle conveyor.

A tailings thickener is incorporated into the design to reduce water consumption. Settling tests indicated an 8 to 10m diameter unit but as a standard 12m unit gave similar costings this was chosen.

****ENDS****

For further information please visit www.northriverresources.com or contact: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North River Resources plc is a multi-asset mining exploration and development company with projects located in Namibia and Mozambique. The Company's primary focus is bringing its flagship Namib project into production. The Namib project is the restart of a high grade zinc-lead underground mine located in Namibia.