7 ESTIMATION METHODOLOGY SUMMARY

7.1 Mineral resources

The resource estimation process for mineral resources under Exxaro's control is governed by the group's resource estimation procedure and aligned to the SAMREC Code and SANS 10320:2004 standard. The data used for resource estimation is managed by separate commodity-specific procedures through which core recovery and logging, sampling, quality assurance and quality control, relative density determination and wireline logging standards are enforced.

For coal resources, relative density (air-dried) is determined by accredited laboratories using the Archimedes method in all instances except for Grootegeluk mine and the Thabametsi project, where relative density is determined using a field application of the Archimedes method. A comparative study between the field and laboratory methods was undertaken in 2015, and results indicated there is no significant difference.

Item	Description
Resource fact pack	Lists new information since last estimation, together with a reconciliation between predicted MTIS and actual MTIS. Recommendations from internal/external audits are included.
Technical data validation	Technical validation of data to be used for resource estimation, including collar validation, gaps and overlaps checks, data distribution, etc.
Data analysis	Entails a review and analysis of the geological integrity and continuity of data in a spatial and geostatistical sense. Includes domaining and structural interpretations.
Data modelling	Geovia Minex is used for coal modelling and the Minex growth algorithm is the preferred interpolation technique. ESRI ArcGIS is used for modelling structural features. Sable Data Warehouse (SDWh) or Minex is used for coal compositing and, in both instances, representative substitute values are used for unsampled non-coal material. The geological model and structural interpretation is presented by the resource competent person, aided by the relevant technical specialists, to a panel comprising Exxaro lead CP and domain experts for sign-off and approval. Concept-level geological models, where applicable, are compiled for alternative interpretations and evaluated during sign-off. Feasibility-level and/or LoMP-level geological models are based on reviewed and signed-off interpretations.
Resource classification	Resource classification is undertaken as per Exxaro estimation procedure and aligned with SANS 10320:2004. Anomalous drillhole data and structurally complex areas are accounted for and resource classification is used to control the adequacy of drillhole data. Separate confidence zones are determined for structural features based on a matrix approach. The effect of extrapolation is controlled by resource classification in which classification domains are not extrapolated beyond half the average drillhole spacing for the classification category. Only points of observation with applicable quality data are used for classification.
Estimation and reporting	Resource reporting uses approved cut-offs and geological loss domains followed by completing all necessary reports and audit trails. Exxaro currently uses a systematic review process that measures the level of maturity of exploration work done, the extent of geological potential, security of tenure and associated geological risks to establish an eventual extraction outline (EEO).
Review and consolidation	Individual reports are reviewed and corrections effected if necessary. Reports are endorsed by management and used to compile the consolidated mineral resource and ore reserves report.

A formal, annually compiled and signed-off exploration strategy outlines planned activities to investigate areas of low confidence and/or geology or structural complexities to ensure resources with a high level of geological confidence are considered for mine planning. Exploration plans are available as supplementary information to the competent person's report (CPR).

The reserve estimation process is summarised below and applies to all coal operations and projects under Exxaro's management control. The resource competent person (CP) is actively involved throughout the process and no resource data is included/excluded without consent from the CP.

7.2 Ore reserves

Ore reserves have the same meaning as mineral reserves as defined in the applicable reporting codes. Ore reserves are estimated using the relevant modifying factors at the time of reporting (mining, metallurgical, economic, marketing, legal environmental, social and regulatory requirements). Modifying factors are signed off before and after reserve estimation by the persons responsible for ensuring that all factors are timeously

and appropriately considered. Comprehensive modifying factor sign off and reserve fact packs that record losses, recoveries/ yields and other factors applied are documented in each independent CP's report.

Exxaro is keenly aware of the importance of its mineral assets, both for the short-term profitability of its operations and the sustainability of the company. The optimisation of mineral assets beyond what is generally referred to as mineral resource management is being driven as a priority. Changes in the resources market, increased awareness of protecting the natural environment and changing legislation and statutory requirements demand a change in the utilisation strategy and execution of mining operations. Exxaro continuously assesses the various life-of-mine strategic plans to consider the best way of addressing these challenges.

For reserve estimates to be compliant with the life-of-mine policy, the following supporting inputs are required for all reserve estimates: survey, rock engineering, infrastructure and an environmental as well as reserve estimation scoping report.

The following outputs are generated after successfully completing the procedure: validation and verification report, mining block model, exploitation strategy report, mining schedule and equipment strategy report, and reserve estimation report.

At the start of the estimation process, the applicable reserve CP must compile, for every operation, a reserve fact pack report outlining the standards and norms of that operation as well as all relevant planning standards. Also considered are all standards and norms and planning parameters, the geological model, infrastructure and environmental plans together with the structural plan, geotechnical review report, and others. The market strategy, supply contracts and planned volumes drive the schedule. All operations standards must be signed off by the applicable mine management and reserve CP. A similar procedure is followed for projects, with the project steering committee fulfilling the role of mine management.

Reserve estimation may be conducted either as required, eg for a project-stage evaluation, or as part of the annual mineral resource and ore reserve estimation process. The data conversion, validation and verification report are the first outputs of this procedure.

On receipt of the geological model, the validation procedure is run, and the model is converted into a mining model, after which a report is compiled with possible geological model anomalies, and a comparison of volumes in the geological model and mining model to confirm data conversion has been carried out correctly. This information is signed off as acceptable by the resource CP and manager: strategic mine planning and design.

The following components are included in the LoMP and reserve estimation: exploitation strategy, operational methodology and pit shell.

The exploitation strategy needs to broadly demonstrate the pit/mining economics, in terms of resource boundaries, legal scheduling and other, ie servitudes.

Operational methodology takes cognisance of:
› Material flow explains the flow of material over time, ie open-pit – ex-pit, distances horizontal and vertical; underground – geographical expansion versus stoping; and deep pit – push-back strategy, minimum and maximum stripping curves
› Equipment explains the size and type of equipment for the design, including the life of equipment, major interventions and/or major changes (ie open-pit to underground) over the life of the resource
› Waste dumps (size and position), rehabilitation (main issues and interventions) together with legal and other – indicates licences obtained and required
› Pit shell is the final delineation or envelope of the resource that will be converted to a reserve. The LoMP pit shell is the foundation of the business case and, as such, is based on the most accurate information available at that time

› Measured and indicated resources are used as basis for conversion. The first five years of the LoMP must be covered by at least 80% measured.

Resource volumes/tonnages are converted to reserve tonnages by applying the following mining modifying factors:
› Mining efficiency losses – as per average cut thickness. This factor is applied to account for net losses of reserves due to mining equipment selection and mining method. The efficiency factor also accounts for the thickness of the selected RoM and waste horizons relative to selected mining equipment
› Layout losses account for the loss of reserves due to actual mining activities not reaching the defined reserve boundary or due to the geometry of the reserve block
› RoM extraction accounts for losses incurred using the selected mining method
› Contamination accounts for waste or inter-burden material unintentionally added to the mining horizon as a result of mining operations and equipment used
› Free moisture accounts for the change in the reserve tonnage due to the addition of moisture from bench-mining operations.

The reserve classification methodology for mineral reserves under Exxaro's control is governed by the Exxaro reserve estimation procedure and aligned to the SAMREC Code and SANS 10320:2004 standard. In most instances, measured resources are converted to proved reserves and indicated resources are converted to probable reserves. If an operation or project has additional constraints, however, ie a supply agreement that has not been finalised or a sales/marketing strategy that limits the profitability of the mine, the measured resources can be downgraded to probable reserves. In situations where this has been applied, it is clearly stated in the footnotes for the reserves tables.

Where inferred resources were considered for LoMPs, the amount (Mt) and effect is always clearly stated. When inferred resources are included in the LoMP, these tonnages are never scheduled in the first five years of mine life. The rationale for considering inferred resources' inclusion is explained and actions to address this issue are stated. Exxaro generally attempts to limit the inferred resources to less than 15% of total resources to be considered for LoMPs. Any inclusion of inferred resources must be explained and modifying factors and assumptions that were applied to the indicated and measured resources to determine the ore reserves must be equally applied to the inferred resources. However, inferred resources are not converted to mineral reserves and are not stated as part of the mineral reserve. The amount of inferred resources considered for the reported LoMP is included in the reserve statement.