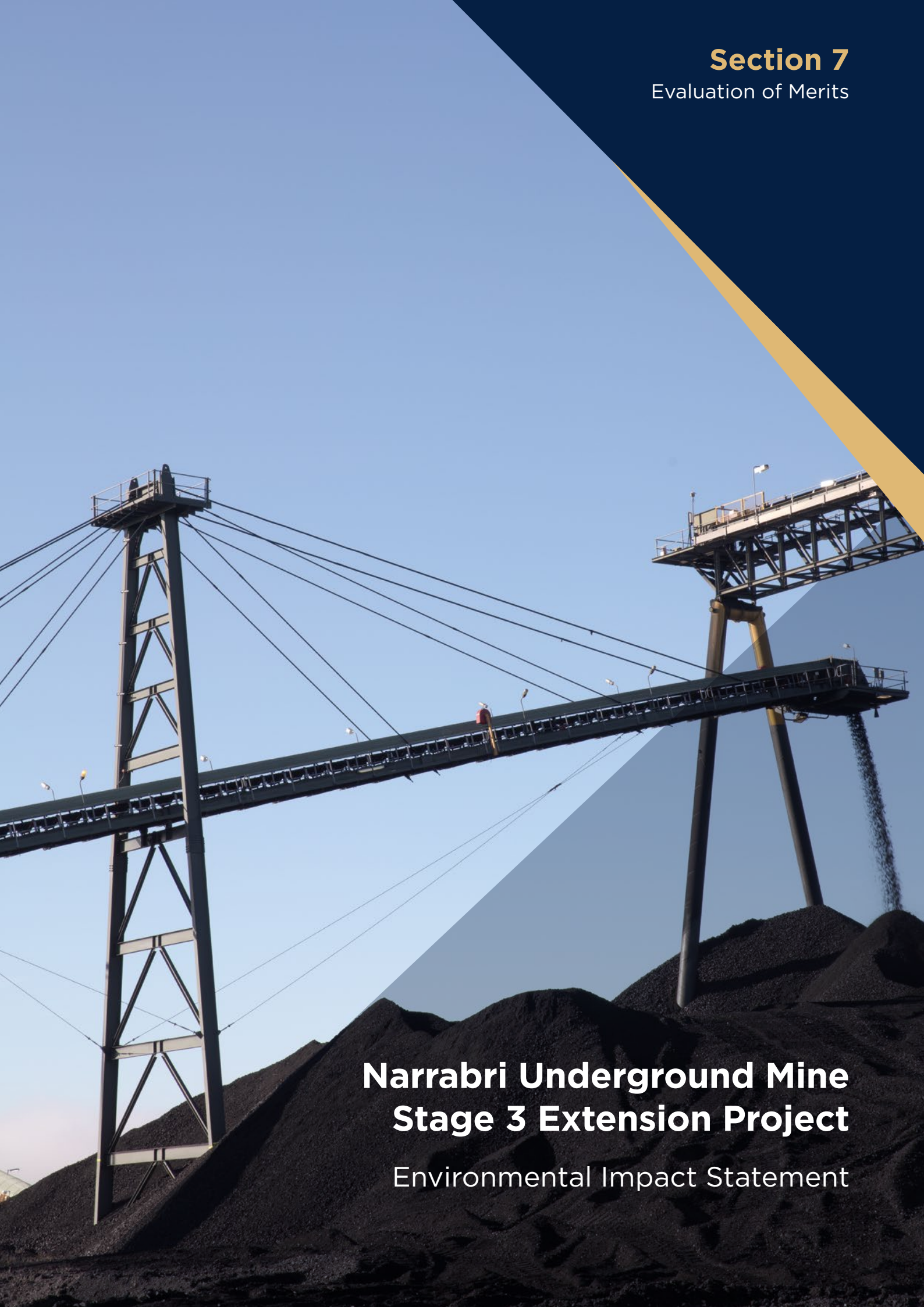
Section 7
Evaluation of Merits



Narrabri Underground Mine Stage 3 Extension Project

Environmental Impact Statement

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7 EVALUATION OF MERITS

This section provides an evaluation of merits of the Project having regard to Section 4.15 of the EP&A Act. As part of this evaluation of merits, consideration has been given to:

- suitability of the site (Section 7.1);
- Project design decisions and consideration of feasible alternatives based on key engagement outcomes (Section 7.2);
- relevant planning and policy objectives (Section 7.3);
- key potential biophysical, social and economic impacts and benefits, including the principles of ESD (Section 7.4); and
- the public interest (Section 7.5).

7.1 SUITABILITY OF THE SITE

This sub-section describes the Project site with respect to key aspects of suitability. However, the remainder of Section 7 also presents additional information that pertains to the suitability of the site and the more general suitability of the Project within the NSW environmental assessment and approval regime.

7.1.1 Mining Tenements

Coal is extracted at the Narrabri Mine from the Hoskissons Coal Seam within ML 1609 using underground longwall mining methods.

The Project would involve the extension of the underground mining areas at the Narrabri Mine to gain access to additional areas of coal reserves within MLAs 1 and 2, which are located within EL 6243. This extension would also include additional mine life, development of additional supporting infrastructure and continued use of existing infrastructure.

Further mineable areas of the Hoskissons Coal Seam have been identified within MLAs 1 and 2 based on more than 100 exploration boreholes that have been drilled within EL 6243. These areas would be targeted for extraction for the Project (Section 2.3.2).

The extension of the existing Narrabri Mine is consistent with the *Strategic Statement on Coal Exploration and Mining in NSW* (Section 3.5.2), including because it is an expansion of an existing mine within an exploration licence area.

7.1.2 Existing Narrabri Mine Infrastructure

Key existing infrastructure at the Narrabri Mine (e.g. CHPP, ROM and product coal stockpiles, and associated coal handling infrastructure) would continue to be used for the Project (Section 3.2.3).

The use of existing/approved Narrabri Mine infrastructure for the Project maximises the potential benefits of previous NCOPL investment and minimises the need for new surface development areas in comparison to a greenfield mine proposal.

In the absence of approval for the Project, this existing/approved infrastructure would be decommissioned at the cessation of the approved Narrabri Mine and the potential benefits of its use would be forgone.

7.1.3 Access to Rail and Port Infrastructure and Markets

NCOPL's existing direct rail access to the Port of Newcastle via the Werris Creek Mungindi Railway facilitates the transport of product coal from the Narrabri Mine to international customers. Accordingly, under the Project, Narrabri Mine product coal would continue to be transported from the Port of Newcastle to international customers.

NCOPL has consulted with the operator of the Hunter Valley coal rail network regarding the Project (Section 5.2.4). The consultation confirmed that there are mechanisms in place to cater for the Project's demand on the rail network.

Similarly, NCOPL has consulted with Newcastle Coal Infrastructure Group Coal Export Terminal (which loads ships for export of coal through the Port of Newcastle) regarding the Project (Section 5.2.4).

7.1.4 Compatibility with Land Uses in the Vicinity of the Project

Existing land uses in the vicinity of the Narrabri Mine are characterised by a combination of coal mining, agricultural enterprises, rural dwellings and forestry operations (Pilliga East and Jacks Creek State Forests).

The majority of the approved Narrabri Mine and the Project is located on NCOPL-owned land (Figures 1-2a and 1-2b). Existing land uses such as grazing and forestry would generally continue, with surface development areas being taken out of production temporarily until the area is rehabilitated to its pre-mining land use.

The Project rehabilitation strategy would include post-mining land uses that would be consistent with surrounding existing land uses (e.g. agricultural enterprises and forestry) (Attachment 5).

Attachment 7 provides a detailed consideration of the compatibility of the Project with existing and approved land uses in the vicinity of the Project, along with any likely preferred land uses. It is considered that the Project would not be materially incompatible with existing, approved or likely preferred uses of land in the vicinity of the Project.

7.2 CONSIDERATION OF FEASIBLE PROJECT DESIGN ALTERNATIVES

Regulatory and public engagement by NCOPL for the Project (Section 5) has identified the following key assessment issues:

- Mine subsidence effects and associated potential impacts on:
  - surface and groundwater resources;
  - biodiversity and heritage values; and
  - land resources.
- Potential impacts of direct surface development on biodiversity and heritage values and land resources.
- Potential impacts of the continuation of existing Narrabri Mine surface infrastructure and the development of new surface infrastructure including amenity impacts such as noise and air quality.
- Potential impacts of greenhouse gas emissions from the Project.
- Potential continuation and extension of the Narrabri Mine's positive impacts on employment, regional expenditure and royalties.

Key potential adverse impacts can be generally grouped into:

- impacts related to underground mining subsidence and associated impacts on the overlying physical environment (including groundwater resources); and
- impacts of the surface activities of the Project that are not related to mine subsidence (noting that the Project maximises the use of the existing surface infrastructure of the Narrabri Mine).

Key potential benefits of the Project identified in engagement were largely socio-economic in nature.

A number of alternatives to the Project have been considered by NCOPL in the development of this EIS in light of feedback from engagement activities.

An analysis of feasible alternatives to the Project considered by NCOPL is provided below, in accordance with clause 7 of Schedule 2 of the EP&A Regulation (Section 4.2.5) and requirements pertaining to assessment under the EPBC Act (Attachment 2).

7.2.1 Mine Subsidence-related Impacts

Concerns relating to mine subsidence effects have been raised by regulatory authorities and members of the public. Key Project alternatives considered with respect to these aspects are discussed below.

Mining Method

The Narrabri Mine currently uses conventional underground longwall mining methods to extract coal from the Hoskissons Coal Seam. The Project would continue to extract coal from the Hoskissons Coal Seam, which could not be mined economically by open cut mining methods given the seam depth. Open cut mining was therefore not considered to be an option for the Project.

While bord and pillar mining is an underground mining method that can be viable for some shallow coal seams, it is generally uneconomic in Australia to use bord and pillar mining as the primary production method at depths from the surface that are greater than about 200 m (DoP, 2008).

Bord and pillar mining is also not the most efficient mining method for thicker coal seams such as the Hoskissons Coal Seam in the Project underground mining area.

The Hoskissons Coal Seam has a maximum recovery section thickness of up to approximately 4.5 m and the depth of the Hoskissons Coal Seam in MLAs 1 and 2 ranges from approximately 180 m to 400 m from the surface (Appendix A).

NCOPL also considered the longwall top coal caving mining method which allows for greater coal recovery by increasing the extraction height. NCOPL concluded that the existing longwall mining method would result in a superior return on capital than the longwall top coal caving mining method that would require the purchase of additional mining equipment and result in additional subsidence effects.

When considering existing Narrabri Mine mining methods, safety, productivity and costs, longwall mining is considered to be the most viable mining method for the Project.

Underground Mine Extent

NCOPL would seek to maximise resource recovery within geological, environmental and tenement constraints.

Thickness and quality characteristics of the coal seams present in MLAs 1 and 2 are such that only the Hoskissons Coal Seam is currently considered to contain coal resources with mining potential.

Development of the underground mine layout has considered the following geological and tenement constraints:

- the existing Narrabri Mine to the north;
- thin coal seam thickness in the east;
- the presence of a Hoskissons Coal Seam split in the south; and
- the EL 6243 boundary in the west.

Underground Mine Geometry

Longwalls 203 to 210 would have overall void widths of approximately 400 m to 415 m, and lengths of between approximately 3,930 m and 10,260 m (Appendix A).

The development of longwalls with optimised dimensions has advantages for a number of aspects of the mining operation, including:

- higher rates of coal extraction are achievable by adopting longer and wider longwalls within a mining domain, hence a greater recovery of the State's coal resource can be achieved;
- depending on layout, the number of longwall moves (i.e. to relocate the longwall at the end of each longwall to an adjacent longwall panel) can be reduced, hence costs, safety hazards and downtime associated with these moves can be minimised;
- the lead-time and capital and operational costs associated with roadway development are balanced with the coal recovered and efficiency of extracting the longwall panels; and
- improved efficiencies (e.g. reduced numbers of longwall moves) allow NCOPL to maximise annual ROM coal production rates, hence improving mining efficiency and associated economic benefits.

Varying the dimensions of the mine layout (such as longwall width, longwall length and pillar width) can affect the development and expression of subsidence effects at the surface. However, it is important to consider whether any such changes would also be accompanied by any material change in the environmental consequences that arise from mine subsidence.

The actual layout of the longwalls may vary (e.g. shortening of longwall panels, development of additional mains/first workings, widening of pillars, direction of extraction) due to localised geological features, detailed mine design and/or adaptive management requirements. As the proposed underground mine geometry maximises resource recovery within the underground mining area, variations to mine geometry are expected to result in a similar or reduced potential for subsidence effects and corresponding environmental consequences.

Consideration of Avoidance or Minimisation of Subsidence Effects on Particular Features

Natural and built features that may experience subsidence effects include (Section 6.3.3):

- drainage lines;
- steep slopes and minor cliff lines;
- vegetation;
- Aboriginal heritage sites;
- domestic power and telecommunications lines;
- State survey control marks; and
- NCOPL and privately-owned infrastructure including dwellings, sheds, rural access roads, fences, water storage tanks, farm dams and groundwater bores.

Existing subsidence effects at the Narrabri Mine have been found to be generally consistent with predictions. Therefore, the Subsidence Assessment (Appendix A) indicates that the levels of impact on these natural and built features can be managed through the preparation and implementation of appropriate management strategies.

In regard to potential impacts on steep slopes, the southern extent of Longwalls 204 and 205 incorporates a setback from Bulga Hill, which is a known topographic feature within MLA 2 that provides habitat for the Large-eared Pied Bat and Eastern Cave Bat (Sections 6.3 and 6.7). The setback distance has been developed in consideration of potential subsidence effects and resultant biodiversity impacts.

The environmental impact assessment and engagement processes did not identify any other potential subsidence impacts on built or natural features that would warrant consideration of avoidance or further minimisation of subsidence effects.

7.2.2 Impacts Associated with Surface Infrastructure and Activities

Regulatory authorities and members of the public raised concerns relating to the continuation and extension of the operation of Narrabri Mine, including impacts associated with Pit Top Area activities, surface infrastructure development areas, ventilation complexes, gas management and greenhouse gas abatement and final land use.

Key Project alternatives considered with respect to these aspects are discussed below.

Production Rate

NCOPL has considered a range of mining and processing rates for the Project. This included consideration of higher rates of ROM coal production than are currently permitted (i.e. greater than 11 Mtpa). However, these increased production rates would be expected to trigger further upgrades to materials handling and/or coal processing infrastructure and increase average daily rail movements off-site. In addition, it is likely that additional mining equipment would be required to mine at a rate greater than 11 Mtpa.

NCOPL concluded that the existing production rate (i.e. 11 Mtpa) would result in a superior return on capital than a higher production rate that would require upgrades to materials handling and/or coal processing infrastructure and potentially the purchase of additional mining equipment.

In consideration of the above, NCOPL has opted to continue to target ROM coal production of 11 Mtpa, consistent with the approved operation. This maximum production rate has been selected to:

- maximise the economic benefits of using the substantial existing Narrabri Mine surface infrastructure; and
- minimise amenity impacts associated with the continuation of coal handling and processing activities at the Narrabri Mine.

Minimising Additional Surface Development Areas

NCOPL has evaluated the relative costs and environmental benefits of a number of alternative mechanisms to reduce the potential additional disturbance areas associated with the Project.

The following refinements and design considerations have resulted in minimising additional surface development and associated impacts on biodiversity, Aboriginal heritage and land resources:

- co-locating multiple surface infrastructure components within the same surface development area (e.g. access tracks and post-drainage corridors would generally include roadways, pipelines, pumps, sediment controls, goaf drainage infrastructure and other ancillary infrastructure) to minimise the overall surface development area;
- adopting the most direct access route for light vehicle tracks, access tracks and service corridors, except where the components have been moved to accommodate topography, or to avoid or minimise impacts on biodiversity or heritage values;
- adopting underground in seam (UIS) pre-drainage rather than SIS pre-drainage where feasible to minimise the overall surface development area;
- minimising impacts on woodland, which includes habitat for relevant threatened fauna species credit species with a high biodiversity risk rating (sensitivity to loss);
- avoiding surface development of rocky outcrops with bat habitat (including Bulga Hill) reported to be used by cave-dwelling bats;
- minimising impacts near creeks and drainage features; and
- surface infrastructure has been located to avoid direct impacts on known Aboriginal heritage values.

The Project surface development area associated with underground mine operations is less than the industry average for similar underground mining operations (Palaris, 2020a).

Southern Pit Top Area

NCOPL in the past has considered the development of an additional pit top area in the southern portion of the underground mining area to provide improved access to the underground workings and increased operational flexibility.

A southern pit top area would include a box cut and drifts to allow for employee, machine and material access and services including ventilation, water and electricity. Other supporting infrastructure would include ROM coal handling infrastructure (including a conveyor linking to the existing Pit Top Area); buildings; service facilities; car park; and access roads.

The construction and operation of a southern pit top area would be expected to result in increased amenity impacts to the south of the Project underground mining area.

NCOPL concluded that the improved access to the underground workings and increased operational flexibility would not justify the additional capital costs and potential increased amenity impacts associated with a southern pit top area.

The decision to not pursue a southern pit top area mitigated community concerns identified through consultation for the Project (Section 5.3).

Ventilation Complexes

Ventilation complexes are located to maximise underground ventilation performance and are required to be located above underground roadways and along the services corridors (resulting in limited flexibility in the siting of the ventilation complexes).

The proposed surface development area for the ventilation complexes is smaller than the industry average for ventilation complex surface development area (Palaris, 2020a).

In addition, to minimise the potential noise impacts associated with the ventilation complexes, the ventilation exhausts would be directed away from privately-owned receptors (i.e. to the north-west).

Gas Management and Greenhouse Gas Abatement

The implementation of gas management techniques would provide significant safety and efficiency benefits for longwall mining operations during the life of the Project (and if the drained gas is suitable for flaring, there would also be potential for reduction in Scope 1 greenhouse gas emissions).

Gas extracted from the Hoskissons Coal Seam associated with the Project area is expected to have a higher methane content but lower total volume than for previous and current mining at the Narrabri Mine (Palaris, 2020b). Gas from the current Narrabri Mine is currently vented to the atmosphere because it is mostly made up of CO_2 and has a low methane content. Ongoing monitoring of gas volumes and composition and investigation of developments in flaring technology would determine whether flaring is a viable option to manage gas associated with the Project. Accordingly, depending on localised gas volumes and composition, there may be opportunities to flare gas for the Project.

The Project greenhouse gas emission estimates conservatively assume no greenhouse gas abatement (i.e. venting as opposed to flaring) (Section 6.17).

On the basis of the gas being highly variable in quantity and content in different parts of the Project area, NCOPL has determined that use of the gas for electricity generation (i.e. gas-fired power station) would not be feasible for the Project.

The surface development area proposed for the gas management is lower than the industry average for gas management surface development area (Palaris, 2020a).

Final Land Use

NCOPL has considered post-mining land uses (e.g. native vegetation, agriculture, forestry), taking into account strategic land use objectives in the vicinity of the Project. The potential benefits of the post-mining land use to the environment, future landholders and the community have also been considered.

NCOPL proposes the post-mining land use of the Project would continue to comprise a combination of native vegetation, agricultural (pasture) and forestry (State Forest) land uses (Attachment 5).

Project infrastructure may be retained for alternate post-mining uses (where agreed with relevant regulatory authorities and landholders).

No Project

Consideration of the potential consequences of not proceeding with the development of the Project is provided in Section 7.4.4.

7.3 CONSIDERATION OF RELEVANT STATUTORY AND STRATEGIC PLANNING AND POLICY OBJECTIVES

7.3.1 Consideration of the Project Against the Objects of the Environmental Planning and Assessment Act 1979

Section 1.3 of the EP&A Act describes the objects of the EP&A Act.

The analysis conducted in this EIS demonstrates that the proposed Project is generally consistent with the objects of the EP&A Act. Further discussion of the Project's alignment with these objectives is presented in Attachment 7.

7.3.2 Considerations of the Project Against the Objects of the Environmental Protection and Biodiversity Conservation Act 1999

Section 3 of the EPBC Act describes the objects of the EPBC Act.

The analysis conducted in this EIS demonstrates that the proposed Project is generally consistent with the objects of the EPBC Act. Further discussion of the Project's alignment with these objectives is presented in Attachment 7.

7.3.3 Evaluation under Section 4.15(1) of the Environmental Planning and Assessment Act 1979

In evaluating the Project Development Application, under section 4.15(1) of the EP&A Act, the determining authority is required to take into consideration a range of matters as they are of relevance to the subject of the application, including:

(a) the provisions of:

(i) any environmental planning instrument, and

(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and

(iii) any development control plan, and

(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),

…

that apply to the land to which the development application relates,

(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,

(c) the suitability of the site for the development,

…

(e) the public interest.

While this is a requirement of the determining authority, this EIS has been prepared to generally address the requirements of section 4.15(1) of the EP&A Act to assist the Minister or the IPC in evaluating the Project, as follows:

- Consideration of the requirements of relevant environmental planning instruments, development control plans and the EP&A Regulation is provided in Sections 3 and 4 and Attachment 7.
- While no planning agreement or draft planning agreement has been developed for the Project to date, NCOPL would consult with NSC in regard to a planning agreement, and consideration of the proposed ongoing community contributions of the Narrabri Mine is provided in Section 5.3.4.
- The predicted impacts of the Project, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality are provided in Appendices A to P and Section 6.
- The suitability of the proposed site for the Project is considered in Section 7.1 and Attachment 7.
- Consideration of whether, on evaluation, the Project is considered to be in the public interest is provided in Section 7.5.

7.3.4 Other Statutory Requirements

Other relevant statutory requirements are described in Section 4 and Attachment 7. The Project is generally consistent with applicable statutory requirements.

7.3.5 Strategic Planning and Policy Objectives

Other strategic planning and policy objectives are described in Sections 3 and 6. The Project is generally consistent with applicable policies and strategic objectives.

7.4 EVALUATION OF KEY IMPACTS AND BENEFITS

7.4.1 Key Potential Impacts

Regulatory and community engagement identified key assessment issues for the Project (Section 5). Key potential direct and indirect adverse impacts associated with the Project are described below.

Potential Adverse Direct Impacts

Key potential adverse direct impacts associated with the Project, and their proposed mitigation measures, include:

- potential subsidence impacts on public and privately-owned infrastructure, which would be managed with standard monitoring and mitigation measures implemented in consultation with relevant infrastructure owners;
- potential subsidence impacts on ephemeral drainage lines, such as ponding, surface cracking and stream channel alignment change, which would not materially affect downstream water quality or flows with the implementation of monitoring and remediation measures;
- potential impacts on privately-owned water supply bores accessing 'less productive' aquifers are predicted to exceed the minimal harm impact criterion (i.e. more than 2 m drawdown), which would be managed in accordance with NSW Government policy (i.e. 'make good' provisions would apply);

- potential noise impacts at a small number of residences, which would be managed in accordance with NSW Government policy;
- potential subsidence impacts on Aboriginal heritage sites, which would be managed in consultation with the Aboriginal community;
- minor changes to road use surrounding the Project, which would not materially affect the capacity, safety or efficiency of the road network;
- minimal additional potential visual impacts;
- potential Scopes 1 and 2 greenhouse gas emissions, which have been minimised or abated to the greatest extent practicable (based on the existing knowledge of gas quantity and content); and
- potential for social impacts (such as stress, anxiety or community conflict) due to uncertainties or concerns about the environmental or social impacts associated with the Project, which would be managed through ongoing community engagement during the life of the Project.

Other potential adverse direct impacts would be mitigated or offset, such that potential impacts would be very low, negligible or nil.

A consolidated summary of proposed mitigation measures for the Project is provided in Attachment 4.

Potential Indirect Impacts

Most potential indirect impacts of the Project identified in Project engagement have been positive in nature (e.g. indirect employment effects and local business benefits).

Consultation undertaken for the Project has identified that some community members have concerns regarding the potential for indirect greenhouse gas emissions (e.g. downstream greenhouse gas emissions associated with the end use of the product coal by export customer organisations) to contribute to global climate change effects (Section 5). These indirect downstream greenhouse gas emissions would be accounted for by customer country international greenhouse gas abatement obligations (e.g. under the *Paris Agreement*) (Section 6.17).

International measures to 'decarbonise' global economies may alter the future demand for, and/or supply of, thermal coal. Expected global trends are factored into coal price forecasts considered in the Economic Assessment (Appendix L). The Economic Assessment also includes sensitivity analysis for variations in export coal prices and the social cost per tonne of carbon emissions. The sensitivity analysis shows that the Project would still generate a substantial net benefit to NSW under the scenarios considered (Appendix L).

NCOPL would manage its contribution to Australian greenhouse gas emissions inventories through participation in the NGERS, as well as other applicable government initiatives and policies implemented to manage emissions at the national level under Australia's progressive NDCs. As mentioned above, the Australian Commonwealth Government has committed to reducing greenhouse gas emissions by 26 to 28% below 2005 levels by 2030 under its first NDC (Commonwealth of Australia, 2015).

7.4.2 Key Potential Benefits

The Project provides for the continuation and extension of underground mining and processing activities at the Narrabri Mine to 2044 as described in Section 2.

The Project maximises the use of existing infrastructure and other supporting facilities and associated returns on existing financial investment.

The Project would result in an additional ROM coal production of 107 Mt compared to the currently approved Narrabri Mine, or an additional 82 Mt relative to the approved limit (Section 2.6).

The Project would include the implementation of environmental mitigation measures (including performance monitoring and adaptive management) to minimise potential impacts on the environment and community (Section 6). A summary of the Project environmental mitigation, monitoring and reporting measures are provided in Attachment 4.

Socio-Economic Benefits

The Project would allow for continued employment of the existing operational workforce (up to approximately 520 full-time equivalent personnel) at the Narrabri Mine.

There would be multiple, short periods of development activity throughout the Project life as infrastructure development occurs, which would require an additional 20 full-time equivalent personnel.

The Economic Assessment indicates the Project would result in a total net benefit to NSW of $599 million in NPV terms, inclusive of estimated costs for environmental externalities and internalisation of environmental management costs by NCOPL. This net benefit comprises (Appendix L):

- $163 million of net producer surplus attributable to NSW;
- $177 million in company tax attributable to NSW; and
- $259 million paid to the NSW Government, in the way of coal royalties.

In addition to these direct economic impacts, the Project would result in positive indirect economic impacts, including employment and business opportunities (Appendix L).

The Project would also allow for the continuation of the NCOPL's proposed ongoing community contributions (Section 5.3.4).

7.4.3 Ecologically Sustainable Development Considerations

Background

The concept of sustainable development came to prominence at the World Commission on Environment and Development (1987), in the report titled *Our Common Future*, which defined sustainable development as:

> *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

In recognition of the importance of sustainable development, the Commonwealth Government developed a *National Strategy for Ecologically Sustainable Development* (NSESD) (Commonwealth of Australia, 1992) that defines ESD as:

> *using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.*

The NSESD was developed with the following core objectives:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential processes and life support systems.

Australia's commitment to the principles of ESD is considered in the EPBC Act, which defines the principles of ESD as:

> *(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;*
>
> *(b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*
>
> *(c) the principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;*
>
> *(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;*
>
> *(e) improved valuation, pricing and incentive mechanisms should be promoted.*

For the purposes of this EIS, the relevant definition of ESD is that found in section 6(2) of the NSW *Protection of the Environment Administration Act 1991*, which is the definition adopted by the EP&A Act. This definition provides as follows:

> *…ecologically sustainable development requires the effective integration of social, economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:*
>
> *(a) the precautionary principle – namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
>
> *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
>
> *(ii) an assessment of the risk-weighted consequences of various options.*
>
> *(b) inter-generational equity – namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
>
> *(c) conservation of biological diversity and ecological integrity – namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
>
> *(d) improved valuation, pricing and incentive mechanisms – namely, that environmental factors should be included in the valuation of assets and services, such as:*
>
> *(i) polluter pays – that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
>
> *(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
>
> *(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

Consideration of Ecologically Sustainable Development for the Project

Project design, planning and assessment have been carried out applying the principles of ESD, through:

- incorporation of risk assessment and analysis at various stages in the Project design and environmental assessment and within decision-making processes;
- adoption of high standards for environmental and occupational health and safety performance;
- consultation with regulatory and community stakeholders; and
- optimisation of the potential economic benefits to the community arising from the development of the Project.

Assessment of potential medium and long-term impacts of the Project was carried out during the preparation of this EIS on aspects of surface water and groundwater, transport movements, air quality emissions (including greenhouse gas emissions), noise emissions, biodiversity, heritage and socio-economics.

The Project design takes into account biophysical considerations, including the principles of ESD as defined in section 6(2) of the *Protection of the Environment Administration Act 1991*.

In addition, it can be demonstrated that the Project can be operated in accordance with ESD principles through the application of mitigation measures, compensatory measures and offset measures that have been developed based on conservative impact assumptions for the Project.
The following sub-sections describe the consideration and application of the principles of ESD to the Project.

Precautionary Principle

Environmental assessment involves predicting the likely environmental outcomes of a development. The precautionary principle reinforces the need to take risk and uncertainty into account, especially in relation to threats of irreversible environmental damage.

An ERA (Appendix O) and PHA (Appendix P) were conducted to identify Project-related risks and develop appropriate mitigation measures and strategies.

The PHA considers off-site risks to people, property and the environment (in the presence of controls) arising from atypical and abnormal hazardous events and conditions (i.e. equipment failure, operator error and external events).

The ERA addressed potential environmental impacts associated with the Project, including long-term effects. In addition, potential long-term risks are considered by the specialist studies conducted in support of this EIS (Section 1.6).

In the Groundwater and Economic Assessments (Appendices B and L), risk and uncertainty have also been taken into account through sensitivity and/or uncertainty analysis. Other specialist studies have accounted for uncertainty by adopting conservative Project assumptions and/or prediction methodologies, such as the Subsidence Assessment, Surface Water Assessment, Noise and Blasting Assessment, Air Quality and Greenhouse Gas Assessment and Road Transport Assessment (Appendices A, C, H, I and J).

Findings of these specialist assessments are presented in Section 6 and relevant appendices. Measures designed to mitigate potential environmental impacts arising from the Project are also described in Section 6, and summarised in Attachment 4.

The specialist assessments, PHA and ERA have evaluated the potential for harm to the environment associated with the development of the Project. A range of mitigation measures have been adopted as components of the Project design to minimise the potential for serious and/or irreversible damage to the environment, including the development of environmental management and monitoring programs, compensatory measures and ecological offsets based on conservative assumptions (Section 6). Where residual risks are identified, contingency controls have been considered (Section 6).

In addition, for key Project environmental assessment studies (i.e. Subsidence Assessment [Appendix A], Groundwater Assessment [Appendix B], Surface Water Assessment [Appendix C] and Biodiversity Development Assessment Report [Appendix D]), peer review by recognised experts was undertaken (Attachment 6).

Social Equity

Social equity is defined by inter-generational and intra-generational equity. Inter-generational equity is the concept that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations, while intra-generational equity is applied within the same generation.

The principles of social equity are addressed through:

- assessment of the social and economic impacts of the Project (Appendices K and L and Sections 6.15 and 6.16), including the distribution of impacts between stakeholders and consideration of the potential social and economic costs of climate change;
- management measures to be implemented in relation to the potential impacts of the Project on land resources, water resources, Aboriginal heritage, noise, air quality, biodiversity, transport, hazards and risks, greenhouse gas emissions, visual character, economics and social values (Section 6);
- implementation of environmental management and monitoring programs (Section 6) to minimise potential environmental impacts (which include environmental management and monitoring programs covering the Project life); and
- implementation of measures during the life of the Project to offset potential localised impacts that have been identified for the development (Section 6).

The Project would benefit current and future generations through the maintenance and expansion of Narrabri Mine employment (up to approximately 520 full-time equivalent personnel). Flow-on employment effects in the region would also be significant (Appendix L).

The Project incorporates a range of mitigation measures to minimise potential impacts on the environment: the costs of these measures would be met by NCOPL and have been included in the Economic Assessment (Appendix L). The potential benefits to current and future generations have, therefore, been calculated in the context of the mitigated Project.

Following the completion of mining, the final landform would generally approximate the pre-mining landscape. Project groundwater impacts on 'less productive' groundwater sources are expected to continue for some time post-mining, before gradually recovering. Predicted impacts on 'less productive' bores exceeding the AIP minimal harm criterion would be subject to 'make good' provisions.

Conservation of Biological Diversity and Ecological Integrity

Biological diversity or 'biodiversity' is considered to be the number, relative abundance, and genetic diversity of organisms from all habitats (including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part) and includes diversity within species and between species as well as diversity of ecosystems (Lindenmayer and Burgman, 2005).

For the purposes of this EIS, ecological integrity has been considered in terms of ecological health and ecological values.

Surveys conducted for the Project have identified threatened ecological communities and habitat suitable for threatened flora and fauna species (Section 6.7). The environmental assessment in Section 6.7 (and Appendix D) describes the potential impacts of the Project on local and regional ecology and associated Project mitigation and offset measures.

Greenhouse Gas Emissions, Biological Diversity and Ecological Integrity

The Narrabri Mine is an existing contributor to NSW and Australian greenhouse gas emissions, and this would continue to be the case for the Project (Appendix I and Section 6.17).

Many natural ecosystems are considered to be vulnerable to climate change. Patterns of temperature and precipitation are key factors affecting the distribution and abundance of species (Preston and Jones, 2005). Projected changes in climate will have diverse ecological implications. Habitat for some species will expand, contract and/or shift with the changing climate, resulting in habitat losses or gains, which could prove challenging, particularly for species that are threatened.

Anthropogenic Climate Change is listed as a key threatening process under the BC Act, and *Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases* is listed as a key threatening process under the EPBC Act.

It is acknowledged that (subject to the efficacy of national and international greenhouse gas abatement measures) all sources of greenhouse gas emissions in NSW, irrespective of their scale, will contribute in some way towards the potential global, national, state and regional effects of climate change.

The Project's contribution to global climate change would be proportional to its contribution to global greenhouse gas emissions. Consistent with the approach adopted for the GHG Protocol (World Business Council for Sustainable Development and World Resources Institute, 2004), the Project's Scope 1 emissions would be attributed to NCOPL, whereas the Project's Scope 2 emissions and Scope 3 emissions are the Scope 1 emissions of another party (e.g. the Project's Scope 2 emissions associated with purchased electricity would be the Scope 1 emissions of the power generator).

At the 21st meeting of the Conference of the Parties (COP) to the UNFCCC in 2015, the *Paris Agreement* was adopted by the COP. The goal of the *Paris Agreement* is to limit global temperature increases to well below 2°C above pre-industrial levels (Article 2[1][a]).

This is to be achieved by NDCs (Article 3), with parties aiming to reach peak global emissions as soon as possible, so as to achieve a "*balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century*" (Article 4[1]).

The *Paris Agreement* does not specify the ways in which global emission reductions are to be achieved. It requires parties to prepare, communicate and maintain NDCs and to pursue domestic measures to achieve the objectives of the NDCs (Article 4[2]). The NDCs are to be communicated every five years, with each successive NDC to represent a progression beyond the previous NDC (Article 4[3], [9]).

To date, 189 parties have ratified the *Paris Agreement* and 186 parties have submitted their first NDCs. Parties' second or updated NDCs are due to be submitted by 2020.

Australia's first NDC submitted to the UNFCCC in August 2015 sets an economy-wide greenhouse gas emission reduction target of 26 to 28% on 2005 levels by 2030 (Commonwealth of Australia, 2015).

A range of policies including the Emissions Reduction Fund, the Safeguard Mechanism, the Renewable Energy Target and the National Energy Productivity Plan have been implemented by the Commonwealth Government to help Australia meet the target in its NDC.

In addition, the NSW Government has released the *NSW Climate Change Policy Framework* (OEH, 2016), which commits NSW to the "aspirational long-term objective" of achieving net-zero emissions by 2050 (Section 3.5.6).

Measures to reduce the Project's direct (Scope 1) greenhouse gas emissions are described in Section 6.17. In particular, in continuing to investigate developments in flaring technology, the Project would be consistent with the *Net Zero Plan Stage 1: 2020-2030* (DPIE, 2020), which includes coal innovation as part of its priority areas to help achieve the State's objective of achieving net zero emissions by 2050. The *Net Zero Plan Stage 1: 2020-2030* also states that NSW's action on climate change should not undermine mining businesses and the jobs and communities they support.

Over 94% of the Project's total Scope 1, 2 and 3 emissions are associated with the end use of the product coal by export customer organisations.

As coal from the Project is expected to be used overseas, emissions associated with the end use of Project coal would be accounted for and managed as Scope 1 greenhouse gas emissions under the NDCs of these countries, in accordance with the international legal framework under the UNFCCC, including the *Paris Agreement*.

Measures to Maintain or Improve the Biodiversity Values of the Surrounding Region

A range of measures would be implemented for the Project to maintain or improve biodiversity values of the region in the medium to long term. As summarised below and detailed in Section 6.7, these measures include impact avoidance, minimisation, mitigation and offsets (for residual impacts).

NCOPL has well established and accepted management practices for operating an underground coal mine in the same environment as the Project. At a broad level, the Project has been designed to avoid or minimise impacts on biodiversity values through (Appendix D):

- the use of underground longwall mining methods, which significantly reduces vegetation and soil disturbance (and impacts on hydrological features) in comparison to open cut mining methods;
- the use of the substantial existing infrastructure at the Narrabri Mine (such as the Pit Top Area and the existing ventilation shafts);
- NCOPL reviewed the positioning of infrastructure to avoid or minimise impacts on native vegetation, threatened species habitat and prescribed impacts in consideration of the results of the detailed ecological survey work, including:
  - co-locating multiple surface infrastructure components within the same surface development area to minimise the overall surface development area;
  - adopting the most direct access route for light vehicle tracks, access tracks and service corridors, except where the components have been moved to accommodate topography, or to avoid or minimise impacts on biodiversity or heritage values;
  - adopting UIS pre-drainage rather than SIS pre-drainage where feasible to minimise the overall surface development area;
  - minimising impacts on woodland, which includes habitat for relevant threatened fauna species credit species with a high biodiversity risk rating (sensitivity to loss);
  - avoiding surface development of rocky outcrops with bat habitat (including Bulga Hill) reported to be used by cave-dwelling bats; and
  - minimising impacts near creeks and drainage features;
- the ability to make minor adjustments to the location of surface infrastructure such as boreholes, service corridors and access tracks to avoid or minimise impacts on biodiversity values.

Section 6.7 summarises a number of Project measures that would assist in maintaining the biodiversity of the region, including measures such as clearance protocols, weed management and rehabilitation of disturbed areas.

Residual impacts of the Project to biodiversity are also provided for by a biodiversity offset that would comply with the BC Act. All residual impacts have been conservatively assessed and an offset strategy is proposed as part of the Project to maintain or improve biodiversity values of the region in the medium to long-term.

Valuation

One of the common broad underlying goals or concepts of sustainability is economic efficiency, including improved valuation of the environment. Resources should be carefully managed to maximise the welfare of society, both now and for future generations.

In the past, some natural resources have been misconstrued as being free or underpriced, leading to their wasteful use and consequent degradation. Consideration of economic efficiency, with improved valuation of the environment, aims to overcome the underpricing of natural resources and has the effect of integrating economic and environmental considerations in decision-making, as required by ESD.

While environmental costs have been considered to be external to project development costs historically, improved valuation and pricing methods attempt to internalise environmental costs and include them within project costing.

The Economic Assessment (Appendix L) has incorporated environmental values via direct valuation where practicable (e.g. greenhouse gas emissions of the Project). Furthermore, wherever possible, direct environmental effects of the Project would be internalised through the adoption and funding of mitigation measures by NCOPL to mitigate potential environmental impacts (e.g. biodiversity offset costs).

Greenhouse gases directly generated by the Project (i.e. Scope 1 emissions) on average are estimated to be approximately 1.04 Mt CO_2-e per year (Appendix I). Indirect emissions associated with the on-site use of electricity (i.e. Scope 2 emissions) are estimated on average to be 0.12 Mt CO_2-e per year (Appendix I).

The Economic Assessment in Appendix L indicates a net benefit of $599 million in NPV terms to the State of NSW would be forgone if the Project is not implemented (i.e. net of the value of externalities including Scope 1 and 2 greenhouse gas emissions).

International measures to 'decarbonise' global economies may alter the future demand for and/or supply of thermal coal. Expected global trends are factored into coal price forecasts considered in the Economic Assessment (Appendix L). The Economic Assessment also includes sensitivity analysis for variations in export coal prices and the social cost per tonne of carbon emissions. The sensitivity analysis shows that the Project would still generate a substantial net benefit to NSW under the scenarios considered (Appendix L).

The Economic Assessment (Appendix L) has been prepared in accordance with the *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government, 2015) and the *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (DP&E, 2018).

The value of externalities from indirect (Scope 3) greenhouse gas emissions are not considered in the net benefit calculation of the Project's impacts on the NSW economy. This is consistent with economic assessment convention, where the potential negative and positive economic impacts of an activity are considered together, in the country where the activity takes place (e.g. economic positives and externalities of Japanese power generation in a customer facility, including the Scope 1 greenhouse gas emissions of that facility). This approach is consistent with the GHG Protocol and the *Paris Agreement* which seek to avoid double counting of emissions (WBCSD and WRI, 2015).

Notwithstanding, Scope 3 greenhouse gas emissions that may be emitted by other parties, such as from the use of the product coal produced by the Project, are considered in this EIS. On average, over the life of the Project, the indirect (i.e. Scope 3) emissions from these activities are estimated to be approximately 19.8 Mt CO_2-e per year (Appendix I).

These greenhouse gas emissions would be accounted for by customer country international greenhouse gas abatement obligations (e.g. under the *Paris Agreement*).

7.4.4 Consideration of the Consequences of Not Carrying Out the Project

Were the Project not to proceed, the following consequences are inferred:

- direct operational employment opportunities would be forgone and the associated flow-on effects would not be created;
- the substantial existing Narrabri Mine surface infrastructure would be decommissioned in 2031 and the potential benefits of its continued use would be foregone;
- the thermal and PCI coal resource would remain available to be extracted by other means; however, the efficiencies associated with access to the Narrabri Mine infrastructure may be lost;
- additional royalties to the State of NSW would not be generated (Appendix L);
- additional tax revenue from the Project would not be generated (Appendix L);
- the potential incremental environmental impacts described in this EIS would not occur;
- economic and social benefits to the region (including to the Narrabri and Gunnedah LGAs) associated with the Project would not be realised; and
- the Project biodiversity offsets would not be established.

7.5 CONCLUSION

The Project is a continuation of the Narrabri Mine that would comply with relevant strategic planning policy objectives and applicable statutory requirements (Sections 3 and 4 and Attachment 7).

The Project would allow for continued employment of the existing operational workforce (up to approximately 520 full-time equivalent personnel) at the Narrabri Mine until 2044. In addition, there would be multiple, short periods of development activity throughout the Project life as infrastructure development occurs, which would require an additional 20 full-time equivalent personnel.

Engagement with members of the public and key regulatory agencies in NSW and at a Commonwealth level has informed NCOPL's design of the Project (such as the setback from the Bulga Hill [Section 7.2.1]).

Potential environmental, social and economic impacts of the Project have been assessed against established thresholds of acceptability contained in relevant guidelines and policies, including for groundwater, surface water, biodiversity, noise and air quality. Potential impacts have been avoided or minimised as far as is reasonable or feasible. Mitigation measures and offset strategies are proposed where residual impacts are predicted.

The site is suitable for the proposed Project use, as underground coal mining by longwall methods is compatible with the existing, approved or likely preferred uses of land in the vicinity of the Project.

Economic benefits potentially forgone if the Project does not proceed amount to a net benefit of $599 million in NPV terms to the State of NSW. This includes an estimated $259 million in royalties and $177 million in company tax in NPV terms.

The Project would be consistent with the *Strategic Statement on Coal Exploration and Mining in NSW* (NSW Government, 2020) as it is (Section 3.5.2):

- an extension to the existing Narrabri Mine to gain access to additional areas of ROM coal reserves that would provide significant benefits to the State and facilitate continued and additional local and regional employment and economic development opportunities;
- utilises existing/approved Narrabri Mine infrastructure to maximise the potential benefits of previous NCOPL investment and minimises the need for new surface development areas in comparison to a greenfield mine proposal; and
- includes environmental, social and economic impact avoidance, minimisation, mitigation and offsets (for residual impacts).

In weighing up the main environmental impacts (costs and benefits) associated with the proposal as assessed and described in this EIS, the Project is on balance, considered to be in the public interest of the State of NSW.