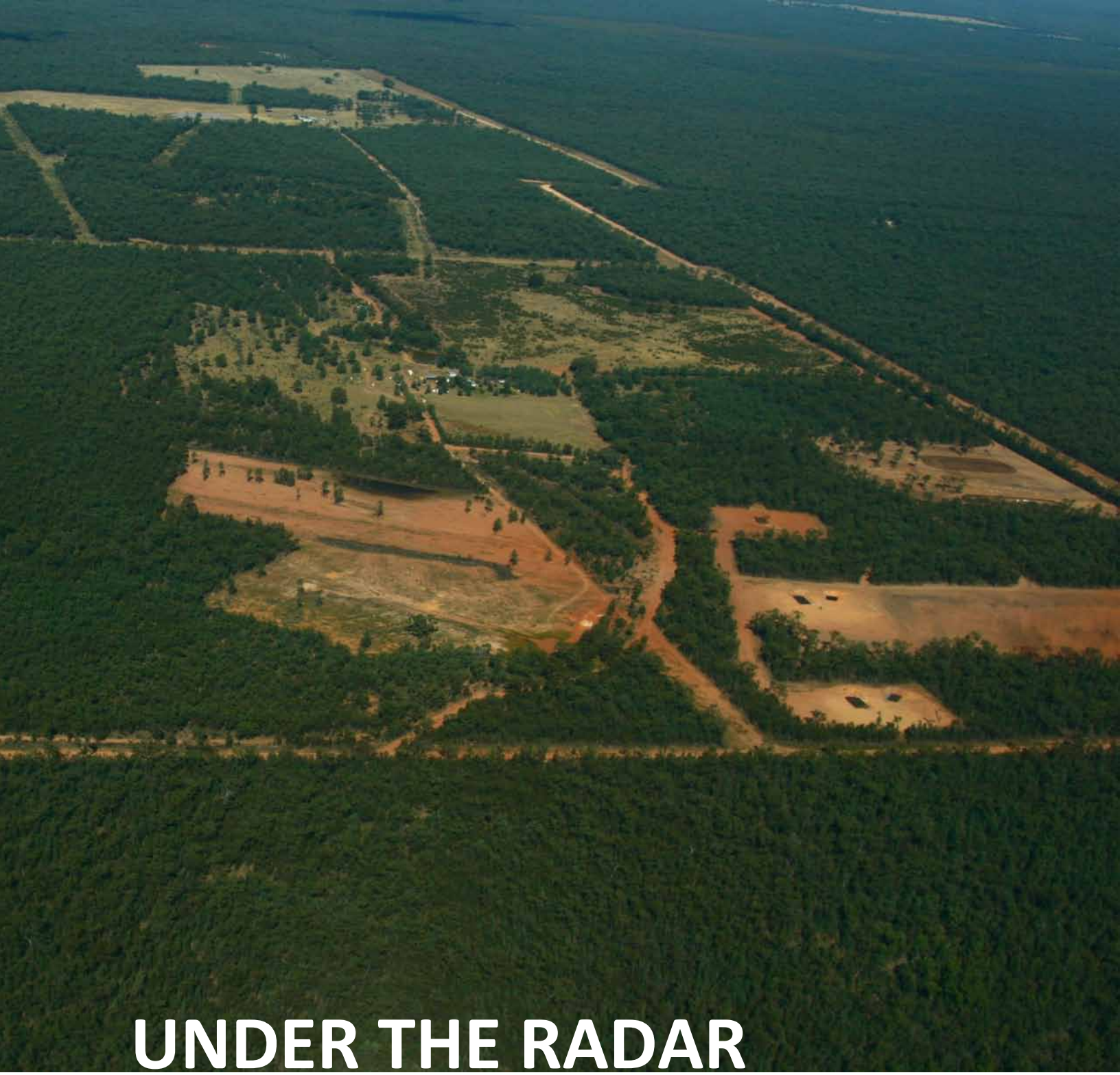

UNDER THE RADAR

HOW COAL SEAM GAS MINING IN THE PILLIGA IS IMPACTING MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

THE WILDERNESS SOCIETY

Nature Conservation Council of NSW
The voice for the environment since 1955

NORTHERN INLAND COUNCIL for the ENVIRONMENT

Under the Radar:
How Coal Seam Gas mining in the Pilliga is impacting matters of national environmental significance

June 2011

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Dewhurst 8. Photo: T.Pickard.

EXECUTIVE SUMMARY

Eastern Star Gas (ESG) is currently conducting coal seam gas exploration and production activities in Petroleum Exploration Licence 238 (PEL238) and Petroleum Assessment Lease 2 (PAL2). These two titles cover an area of approximately 819,234 hectares in north-western NSW around Narrabri[1]. The petroleum titles are centred over the area of forest known as the Pilliga Scrub, or Pilliga Forest. They encompass a number of tenures, including State Forest, State Conservation Areas, other Crown Lands, and private land.

Eastern Star Gas acquired a controlling interest in conventional gas reserves in PEL238 in 2002[2], and acquired an interest in coal seam gas in the PEL in 2004[3]. PAL2 was issued to Eastern Star Gas in October 2007. There were a number of companies with an interest in PEL238 prior to, and concurrently with, Eastern Star Gas, some of whom conducted exploration activities.

ESG and it's predecessors have undertaken a considerable number of exploration and production activities in the petroleum titles, including the drilling of coreholes and pilot production wells; seismic surveys; the construction of gas production and water treatment infrastructure; construction of water impoundments, the discharge of produced water, the creation of access roads, and land clearance for pipeline and production infrastructure construction.

There are at least 24 matters of national environmental significance, as defined by the *Environment Protection and Biodiversity Conservation Act* 1999, which occur within the Pilliga Forest section of PEL 238 and PAL2. These include known, likely, and potential habitat for 15 nationally threatened species (4 endangered, 11 vulnerable), and known or potential habitat for 9 migratory birds listed under international conventions[4].

The EPBC Act 1999 makes it illegal to undertake an activity that has, or is likely to have, a significant impact on these matters of national environment significance. These prohibitions are set down in Part 3 of the EPBC Act 1999, in s16, s18 and s20 respectively.

The Action

The Significant Impact Guidelines (DEH 2006) require that *"The proposed action should be considered at its broadest possible scope.....If the action consists of a series of activities or a number of related activities, you should consider the impacts of each activity, and then consider the combined impacts of those activities".*

In accordance with this requirement, the coal seam gas exploration and production activities undertaken by Eastern Star Gas as one work program in PEL238 and PAL2 should constitute a single action under the EPBC Act 1999.

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1 Derived from data obtained under licence from http://www.dpi.nsw.gov.au/minerals/geological/online-services/minview
2 Eastern Star Gas, n.d: http://www.easternstar.com.au/about.html, (accessed 22.6.11).
3 Eastern Star Gas 2008
4 Tolley (2011)

The scope of the action within PEL238 and PAL2 at its broadest includes:

1. The drilling and on-going management of more than 92 coal seam gas bores and coreholes
2. The conduct of 482km of seismic surveys
3. The construction and management of 56.6km of gas and water gathering pipelines
4. The development and management of five production fields, encompassing 35 production bores
5. The construction and management of a gas-fired power station at Wilga Park, including an upgrade of the station from 10MW to 40MW
6. The construction and operation of 1 reverse osmosis unit
7. The construction and management of 13 major water treatment dams/impoundments and numerous drill ponds
8. The discharge of treated produced water into the Bohena Ck, part of the Murray-Darling Basin.
9. The bull-dozing of numerous roads and tracks to facilitate the construction and operation of works listed above.

However, there is no evidence that the combined impacts of these activities on matters of national environmental significance have ever been considered by Eastern Star Gas. On the contrary, a review of it's considerations as contained in numerous Reviews of Environmental Factors conducted under s111 of the NSW Environmental Planning and Assessment Act 1979, indicates that each small activity has only ever been considered in isolation and the entire action has never been addressed in accordance with the Guidelines.

The entire work program of exploration and production that has been undertaken by Eastern Star Gas and it's predecessors over the last decade or more in PEL238 and PAL 2 is hereafter referred to in this document as 'the action'.

Exemptions

The prohibitions relating to matters of national environmental significance (MNES) in s16, 18 & 20 described above do not apply if:

(a) “an approval of the taking of the action by the person is in operation under Part 9 for the purposes of this section; or

(b) Part 4 lets the person take the action without an approval under Part9 for the purposes of this section; or

(c) there is in force a decision of the Minister under Division 2 of Part 7 that this section is not a controlling provision for the action and, if the decision was made because the Minister believed the action would be taken in a manner specified in the notice of the decision under section77, the action is taken in that manner; or

(d) The action is an action described in subsection 160(2) (which describes actions whose authorisation is subject to a special environmental assessment process)”.

In relation to coal seam gas exploration, production and associated activities in PEL238 and PAL2, it is found that none of these exemptions apply, because:

(a) there is no approval under Part 9
(b) Part 4 does not allow the action to be taken without an approval
(c) no decision has been made by the Commonwealth Minister that the proposed action is not a controlled action
(d) section 160 is not relevant.

The relevant cases set down in Part 4 for which environmental approvals are not needed, are:

i Actions declared by agreement not to need approval (s29)
ii Actions covered by Ministerial declarations and accredited management arrangements or accredited authorisation processes (s32)
iii Actions covered by Ministerial declarations and bioregional plans (s37A)
iv Actions declared by conservation agreement not to need approval (s37M)
v Certain forestry operations in regions covered by a Regional Forest Agreement (s38) or regions subject to the process of negotiating a Regional Forest Agreement (s40)
vi Actions with prior authorisations (s43A); and
vii Actions which are lawful continuations of use of land etc (s43B)

In relation to coal seam gas, exploration, production and associated activities in PEL238 and PAL2 are not covered by any of the agreements set down in -vii above.

Furthermore, the PEL238 and PAL2 coal seam gas operations are not exempt under the prior authorisation provision because prior to the commencement of the EPBC Act 1999, there was not a specific environmental authorisation in the form of an approval under the NSW Environment Planning and Assessment Act 1979 for either coal seam gas exploration or production in PEL238.

Referral

Eastern Star Gas does not have an approval under Part 9 of the Act for any part of 'the action', and as shown above, it is not exempt from requiring an approval under any of the provisions of Part 4. However, it has failed to refer the action in its entirety or even in any of its parts to the Federal Government, despite the identification of known or likely habitat for nationally-listed species within the areas where activities have been undertaken.

Notably, Eastern Star Gas has recently referred a proposal for a large new coal seam gas production project within PEL238 and PAL2 to the Federal Government, identifying a number of MNES that will be affected. This new production proposal encompasses many of the same areas in which the existing actions have occurred within the Pilliga Forest, and affects the same MNES. There is no logical reason as to why the new project should have been referred as one action, when the existing works have not been referred in the same manner.

Eastern Star Gas has previously obtained a small Part 3A approval for the operation of the Wilga Park Power Station and the associated gas flowline and 12 pilot production bores, but it did not refer that development to the Federal Government under the EPBC Act 1999.

We allege that the failure of Eastern Star Gas and it's predecessors to refer the program of coal seam gas exploration and production in the Pilliga Forest in it's broadest sense represents a breach of the EPBC Act 1999, and provides sufficient impetus for the Commonwealth to call-in the action immediately.

Current impacts

Environment groups have conducted a detailed quantitative assessment of the impacts of 'the action' on the environment. It is apparent that 'the action' has resulted in:

- Increased disturbance footprint across an area of approx 44,700 ha of native vegetation
- Increased ignition sources from multiple infrastructure and vehicle movements, and introduction of a flammable gas into an already fire prone environment leading to increased frequency and intensity of fires
- Heavy fragmentation of an area of 1,700 ha of native vegetation, leading to direct impacts on fauna and flora populations and indirect impacts through the spread of invasive species
- Direct destruction of at least 150 ha of native vegetation that is likely habitat for matters of NES.
- Creation of artificial watering points (water impoundments) at more than 13 different locations, plus numerous drill ponds, representing a risk to wildlife
- Introduction of numerous sources of pollution through the use of chemicals and the handling and disposal of produced water (i.e. diesel spills, poor mitigation of flood events)
- Direct alteration of the ecology of a creek system for up to 22km



Bibblewindi 9 complex. Photo: T.Pickard

We have conducted a general assessment of the likely impacts of 'the action' on matters of National Environmental Significance, following the *Guidelines for Significant Impact* set down by DEH (2006). These are the guidelines that were in operation when the majority of the impacts were incurred in PEL238 and PAL2, and that should have been applied by Eastern Star Gas to assess the impacts. These guidelines are near identical in all relevant clauses to the current guidelines, which are also addressed in this document.

These are the same guidelines that should be applied by Eastern Star Gas to assess the impacts. The assessment has involved a substantial literature review, direct analysis of Eastern Star Gas approvals and licences and assessment of all available data in a Geographic Information System.

In relation to the matters set down in the Guidelines (DEH 2006), we have concluded that 'the action' is likely to have a significant impact on matters of National Environmental Significance because of it's intensity, the extraordinary national and international conservation significance of the environment in which it is occurring, the sensitivity of the ecosystem given the scale of extinctions that have already occurred in the mammalian fauna and the scale of decline now evident in the bird fauna, the substantial geographic area affected, the high cumulative impact in the context of other threats (other mining and gas developments, background clearing rates, climate change, invasive species, logging, and high intensity and frequent fires), the low level of confidence with which the impacts are understood, and the context in which they occur of a heavily cleared and highly fragmented landscape with very low levels of reservation.

We have also conducted a more detailed assessment of impact on specific nationally threatened species, and concluded that there is sufficient evidence to conclude that the action is likely to have a significant impact on the Pilliga Mouse, South-eastern Long-eared Bat, Regent Honeyeater and several plant species.

Furthermore, we conclude that the measures put in place by Eastern Star Gas to avoid or mitigate impacts are inadequate to prevent such impacts, and their effectiveness is uncertain and not scientifically established. Most notably, remediation and rehabilitation of sites such as well-heads has not been successful, weed invasions of cleared areas are common, pollution events have occurred and wildlife have been found dead at saline ponds.

Comparison with other referred actions

In order to gauge how the impact of 'the action' compares with other referred actions under the EPBC Act 1999 with regard to both scale and the number of MNES that are affected, we have conducted a review of a random sample of referred actions that are currently on the EPBC referrals website. The results indicate that actions which affect far fewer MNES and which have far fewer impacts in terms of scale and intensity, are routinely referred to the Federal Government under the EPBC Act 1999.

Conclusion

The coal seam gas exploration and production project that has been conducted by Eastern Star Gas and it's predecessors over the last decade in PEL238 and PAL2 is likely to be having a

significant impact on MNES. We believe it should constitute a single action for the purposes of the EPBC Act 1999 and in accordance with the Guidelines for assessing significance. However, neither the action in its entirety nor any of its components has ever been referred to the Federal Government under the EPBC Act 1999.

In this context, the Federal Government must urgently:

1. Call-in the activity to determine whether it is a controlled action,
2. Prevent any further impacts on matters of national environmental significance by exploration or production until the impact has been assessed and a decision made by the Federal Government on the activity.
3. Take immediate compliance action against Eastern Star Gas for the allegedly illegal exploration and production activities undertaken to date.

THE EPBC ACT 1999 AND EASTERN STAR GAS OPERATIONS IN THE PILLIGA

The Action

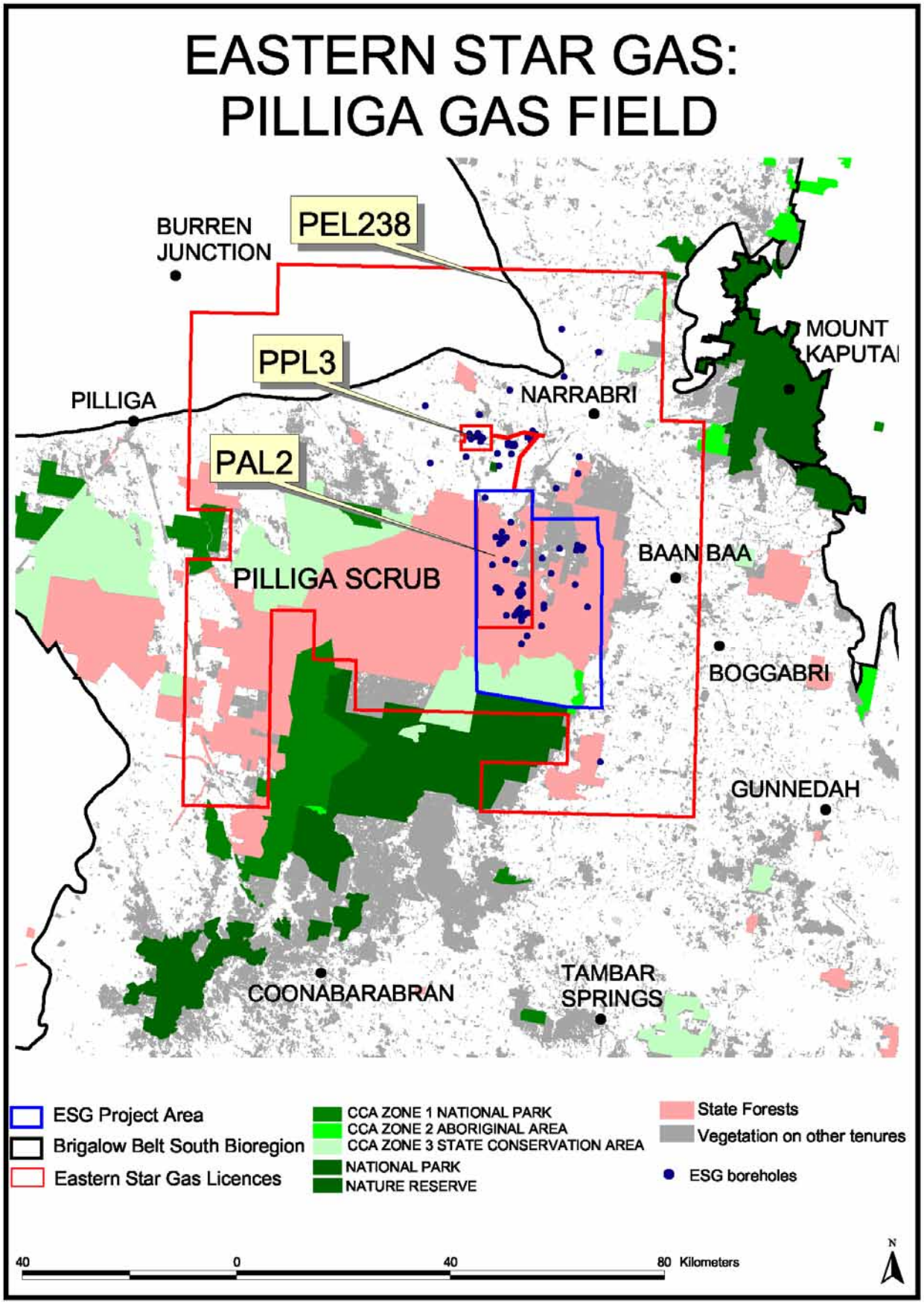
The Significant Impact Guidelines (DEH 2006) require that *"The proposed action should be considered at its broadest possible scope. This includes all stage and components of the action, all related activities, and all related infrastructure such as roads and powerlines, if applicable. If the action consists of a series of activities or a number of related activities, you should consider the impacts of each activity, and then consider the combined impacts of those activities".*

In accordance with this requirement, we contend that the coal seam gas exploration and production activities undertaken by Eastern Star Gas as one work program in PEL238 and PAL2 should constitute a single action under the EPBC Act 1999.

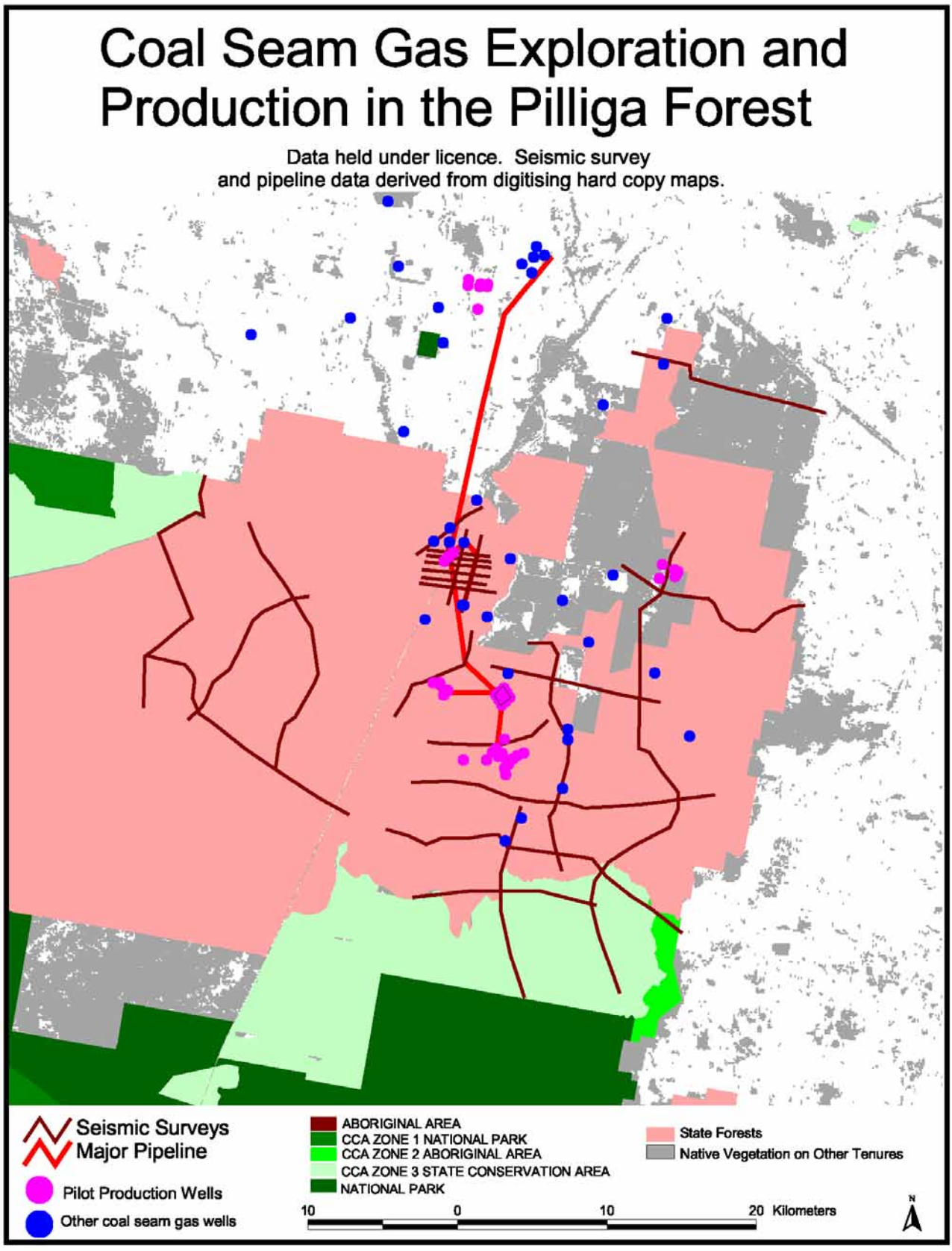
In order to ascertain the true scope of the program, environment groups have conducted a detailed audit and analysis of the scope of the 'action' that has been undertaken by Eastern Star Gas and its immediate predecessor in these two titles in relation to coal seam gas. This analysis has included a literature review of all available consents, licences and instruments under which Eastern Star Gas conduct their operations, a thorough interrogation of publicly available data available from the Department of Trade and Investment in relation to titles and boreholes, and a map-based analysis using a Geographic Information System.

The analysis has led to the conclusion that 'the action' within PEL238 and PAL2 at its broadest scope includes:

1. The drilling and on-going management of more than 92 coal seam gas bores and coreholes
2. The conduct of 482km of seismic surveys
3. The construction and management of 56.6km of gas and water gathering pipelines
4. The development and management of five production fields, encompassing 35 pilot production bores
5. The construction and management of a gas-fired power station at Wilga Park, including an upgrade of the station from 10MW to 40MW
6. The construction and operation of 1 reverse osmosis unit
7. The construction and management of 13 major water treatment impoundments and numerous small drill ponds.
8. The discharge of treated produced water into the Bohena Ck, part of the Murray-Darling Basin.
9. The bull-dozing of numerous roads and tracks to facilitate the construction and operation of works listed above.


EASTERN STAR GAS:
PILLIGA GAS FIELD
BURREN JUNCTION
PEL238
PPL3
PAL2
PILLIGA
NARRABRI
MOUNT KAPUTAI
PILLIGA SCRUB
BAAN BAA
BOGGABRI
GUNNEDAH
COONABARABRAN
TAMBAR SPRINGS
ESG Project Area
Brigalow Belt South Bioregion
Eastern Star Gas Licences
CCA ZONE 1 NATIONAL PARK
CCA ZONE 2 ABORIGINAL AREA
CCA ZONE 3 STATE CONSERVATION AREA
NATIONAL PARK
NATURE RESERVE
State Forests
Vegetation on other tenures
ESG boreholes
40 0 40 80 Kilometers
N

Map 1.


Coal Seam Gas Exploration and Production in the Pilliga Forest
Data held under licence. Seismic survey and pipeline data derived from digitising hard copy maps.
Seismic Surveys
Major Pipeline
Pilot Production Wells
Other coal seam gas wells
ABORIGINAL AREA
CCA ZONE 1 NATIONAL PARK
CCA ZONE 2 ABORIGINAL AREA
CCA ZONE 3 STATE CONSERVATION AREA
NATIONAL PARK
State Forests
Native Vegetation on Other Tenures
10 0 10 20 Kilometers
N

Map 2.

Map 1 depicts the extent of the PEL238 and PAL2 and their location in relation to the Pilliga Forest and Map 2 depicts the extent of 'the action' within the Pilliga Forest, as derived by environment groups using available data sources. It is notable that the majority of the impacts that have occurred are the result of coal seam gas production to supply the Wilga Park Power Station for commercial gain, and have not been incurred through purely exploratory activities.

There is no evidence that the combined impacts of these activities on matters of national environmental significance have ever been considered by Eastern Star Gas. On the contrary, a review of it's considerations as contained in numerous Reviews of Environmental Factors conducted under s111 of the NSW Environmental Planning and Assessment Act 1979, indicates that each small activity has only ever been considered in isolation and the entire 'action' has never been addressed in accordance with the Guidelines.

Attachment 1 provides a fully referenced list of each component of the 'action', and more detail as to their location and characteristics.

Furthermore, there is nothing in the Significant Impact Guidelines that provide any special exemption or apply any lesser considerations to the activity of petroleum exploration. In fact, the Guidelines specifically state that that an action includes petroleum resource exploration and extraction, as follows:

'Action' is defined broadly in the EPBC Act and includes: a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. Actions include, but are not limited to: construction, expansion, alteration or demolition of buildings, structures, infrastructure or facilities; industrial processes; mineral and ***petroleum resource exploration and extraction****; storage or transport of hazardous materials; waste disposal; earthworks; impoundment, extraction and diversion of water; agricultural activities; aquaculture; research activities; vegetation clearance; culling of animals; and dealings with land. Actions encompass site preparation and construction, operation and maintenance, and closure and completion stages of a project, as well as alterations or modifications to existing infrastructure.* [Emphasis added]

An appendix to the Guidelines provides some more detailed advice to proponents in terms of determining in what circumstances, some selected sectoral activity is likely to have a significant impact on a matter of national environmental significance. This includes the provision of additional advice for the mineral exploration sector.

This appendix is not considered relevant for a number of reasons:

1) There is no reference in the appendix to the petroleum exploration sector.
2) It relates only to exploration, and the majority of Eastern Star Gas impacts in the Pilliga forest area are related to commercial production of petroleum for use in the Wilga Park power station.
3) The appendix itself states that '*it should not be taken to be conclusive*' and that '*it should be read in conjunction with the significant impact criteria in the guidelines*'.

Therefore, in this report 'the action', which includes commercial production of coal seam gas and exploration, is assessed in relation to the significant impact guidelines.

Matters of National Environmental Significance

There are 24 matters of national environmental significance, as defined by the *Environment Protection and Biodiversity Conservation Act* 1999, which occur within PEL 238 and PAL2 . These include known, likely, and potential habitat for 15 nationally threatened species (4 endangered, 11 vulnerable), and known or potential habitat for 9 migratory birds listed under the CAMBA and JAMBA conventions.

The EPBC Act 1999 makes it illegal to undertake an activity that has, or is likely to have, a significant impact on these matters of national environment significance. These prohibitions are set down in Part 3 of the EPBC Act 1999, in s16, s18 and s20 respectively, which read as follows:

"Subdivision C—Listed threatened species and communities

18 Actions with significant impact on listed threatened species or endangered community prohibited without approval

(3) A person must not take an action that:
  (a) has or will have a significant impact on a listed threatened species included in the endangered category; or
  (b) is likely to have a significant impact on a listed threatened species included in the endangered category.

(4) A person must not take an action that:
  (a) has or will have a significant impact on a listed threatened species included in the vulnerable category; or
  (b) is likely to have a significant impact on a listed threatened species included in the vulnerable category."

"Subdivision D—Listed migratory species

20 Requirement for approval of activities with a significant impact on a listed migratory species

(1) A person must not take an action that:
  (a) has or will have a significant impact on a listed migratory species; or
  (b) is likely to have a significant impact on a listed migratory species."

Likely significant impact

The meaning of 'significant impact' under the EPBC Act 1999 is not defined in the Act or Regulations. However, SEWPaC (then DEH) has published *Significant Impact Guidelines for Matters of National Environmental Significance*. These guidelines provide the following advice in relation to the 'significance' of an impact:

> *"A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant*

impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance" (DEH 2006).

This report will establish that coal seam gas exploration, production and associated activities in PEL238 and PAL2 are having, or are likely to have, a significant impact on matters of national environmental significance, and that as such, it should be called-in by the Minister for the Environment (if not immediately referred by Eastern Star Gas).

In relation to deciding whether an impact is 'likely', the DEH Guidelines (DEH 2006) specify that:

*To be 'likely', it is **not** necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a **real or not remote** chance or possibility. If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment.*

The report will show that there is a real chance or possibility of significant impacts from that coal seam gas exploration, production and associated activities in the Pilliga Forest. The potential impacts of the action are both serious and irreversible, and given the lack of scientific certainty about the potential impacts of that coal seam gas exploration, production and associated activities in the Pilliga Forest, the precautionary principle must be applied, and the matter urgently referred to the Commonwealth or 'called-in'.

Exemptions

There are a number of potential 'exemptions' to the provisions of the EPBC Act 1999 in relation to matters of national environment significance and to the determination of a matter as a 'controlled action'.

The prohibitions relating to matters of national environmental significance in s16, 18 & 20 described above do not apply if:

(e) "an approval of the taking of the action by the person is in operation under Part 9 for the purposes of this section; or

(f) Part 4 lets the person take the action without an approval under Part 9 for the purposes of this section; or

(g) there is in force a decision of the Minister under Division 2 of Part 7 that this section is not a controlling provision for the action and, if the decision was made because the Minister believed the action would be taken in a manner specified in the notice of the decision under section 77, the action is taken in that manner; or

(h) the action is an action described in subsection 160(2) (which describes actions whose authorisation is subject to a special environmental assessment process)".

In relation to that coal seam gas exploration, production and associated activities in PEL 238, it is found that none of these exemptions apply, because:

(a) there is no approval under Part 9

(b) Part 4 does not allow the action to be taken without an approval

(c) no decision has been made by the Commonwealth Minister that the proposed action is not a controlled action

(d) section 160 is not relevant.

Part 4 sets out a number of cases in which a Part 9 approval is not required. We have addressed each of the relevant cases below to show that none of these circumstances apply to that coal seam gas exploration, production and associated activities in PEL 238, and thus that it is not exempt under that Part.

The relevant cases set down in Part 4 for which environmental approvals are not needed, are:

i Actions declared by agreement not to need approval (s29)
ii Actions covered by Ministerial declarations and accredited management arrangements or accredited authorisation processes (s32)
iii Actions covered by Ministerial declarations and bioregional plans (s37A)
iv Actions declared by conservation agreement not to need approval (s37M)
v Certain forestry operations in regions covered by a Regional Forest Agreement (s38) or regions subject to the process of negotiating a Regional Forest Agreement (s40)
vi Actions with prior authorisations (s43A); and
vii Actions which are lawful continuations of use of land etc (s43B)

Each of these is addressed in turn below, with regard to how they relate to coal seam gas exploration, production and associated activities in PEL 238.

i In January 2007, the Commonwealth and NSW governments signed a Bilateral Agreement which allows the assessment regimes under the Environmental Planning and Assessment Act 1979 (Parts 3A, 4 and 5 of the EP&A Act) to be automatically accredited under the EPBC Act (http://www.planning.nsw.gov.au/environmentalassessment/comm.asp). This means that separate assessment processes are not required. The Bilateral Agreement only covers matters that are determined to be 'controlled actions' by the Commonwealth Government.

However, the 2007 Commonwealth/NSW Bilateral Agreement relates only to assessment regimes, and there is no Bilateral Agreement (nor any clause in the current Bilateral Agreement) which declares that coal seam gas exploration, production and associated activities in PEL 238 is an action, or one of a class of actions, that does not require approval under Part 9 for the purposes of the provision.

ii Coal seam gas exploration, production and associated activities in PEL 238 are not subject to a bilaterally accredited management arrangement or a bilaterally accredited authorisation process exempting them from a need for approval under Part 9.

iii There is no bioregional plan in place and no Ministerial declaration exempting coal seam gas exploration, production and associated activities in PEL 238 from a need for approval under Part 9 with reference to any such plan.

iv There is no conservation agreement in place that exempts coal seam gas exploration, production and associated activities in PEL 238 form the need for approval under Part 9.

v RFAs are not relevant to coal seam gas.

vi The definition of actions with prior authorisation, is set out in section 43A as follows:

"(1) A person may take an action described in a provision of Part 3 without an approval under Part 9 for the purposes of the provision if:

a) the action consists of a use of land, sea or seabed; and

b) before the commencement of this Act, the action was authorised by a specific environmental authorisation; and

c) immediately before the commencement of this Act, no further specific environmental authorisation was necessary to allow the action to be taken lawfully; and

d) at the time the action is taken, the specific environmental authorisation continues to be in force.

(1A) For the purposes of paragraphs (1)(c) and (d), a renewal or extension of a specific environmental authorisation is taken to be a new specific environmental authorisation unless:

a) the action that is authorised by the authorisation following the renewal or extension is the same as the action that was authorised by the authorisation before the commencement of this Act; and

b) the renewal or extension could properly be made or given without any further consideration of the environmental impacts of the action.

Note: If a renewal or extension of a specific environmental authorisation is taken to be a new specific environmental authorisation, the condition in paragraph (1)(c) or (d) would not be met.

(2) In this Act:

***environmental authorisation** means an authorisation under a law of the Commonwealth, a State or a self-governing Territory that has either or both of the following objects (whether express or implied):*

(a) to protect the environment;

(b) to promote the conservation and ecologically sustainable use of natural resources.

***specific environmental authorisation** means an environmental authorisation that:*

(a) identifies the particular action by reference to acts and matters uniquely

associated with that action; or

(b) was issued or granted following a consideration of the particular action by reference to acts and matters uniquely associated with that action".

There was no specific environmental authorisation for coal seam gas exploration, production and associated activities in PEL 238 and PAL2 that was in place before the commencement of the EPBC Act in 2000.

vii The definition of actions which are lawful continuations of use of land are set out in s43B as follows:

"43B Actions which are lawful continuations of use of land etc.

(1) A person may take an action described in a provision of Part 3 without an approval under Part 9 for the purposes of the provision if the action is a lawful continuation of a use of land, sea or seabed that was occurring immediately before the commencement of this Act.

(2) However, subsection (1) does not apply to an action if:

(a) before the commencement of this Act, the action was authorised by a specific environmental authorisation; and

(b) at the time the action is taken, the specific environmental authorisation continues to be in force.

Note: In that case, section 43A applies instead.

(3) For the purposes of this section, neither of the following is a ***continuation*** *of a use of land, sea or seabed:*

(a) an enlargement, expansion or intensification of use;

(b) either:

(i) any change in the location of where the use of the land, sea or seabed is occurring;

or

(ii) any change in the nature of the activities comprising the use;

that results in a substantial increase in the impact of the use on the land, sea or seabed".

Although one or two coal seam gas wells may have been drilled by a predecessor of Eastern Star Gas just prior to the commencement of the EPBC Act in 2000, the actions of each company including Eastern Star Gas since that time represents an enlargement, expansion and intensification of use, and therefore does not constitute a lawful continuation.

Referral

Part 7 of the EPBC Act 1999 designates actions as 'controlled actions' if they are prohibited by Part 3 of the Act (because they have, or are likely to have, a significant impact on matters of national environmental significance). In relation to 'controlled actions', s 67A of the Act states that:

> "A person must not take a controlled action unless an approval of the taking of the action by the person is in operation under Part 9 for the purposes of the relevant provision of Part3".

Furthermore, s68 of the Act requires that:

> "A person proposing to take an action that the person thinks may be or is a controlled action must refer the proposal to the Minister for the Minister's decision whether or not the action is a controlled action".

Eastern Star does not have an approval under Part 9 of the Act, and as shown above, it is not exempt from requiring an approval under any of the provisions of Part 4.

Conclusion

Therefore, we believe the Commonwealth Minister for the Environment must urgently call in existing exploration and pilot production activities being undertaken by Eastern Star Gas in PEL238 and PAL2 as controlled actions under the EPBC Act 1999 (s70).

GENERAL ASSESSMENT OF THE ACTION

The *Significant Impact Guidelines for Matters of National Environmental Significance* (DEH 2006) specify four major elements that should be considered when making a decision about referral of an action to the Minister by a proponent, and provide guidance on how they should be considered.

These are as follows:

> *"1. Are there any matters of national environmental significance located in the area of the proposed action (noting that 'the area of the proposed action' is broader than the immediate location where the action is undertaken; consider also whether there are any matters of national environmental significance adjacent to or downstream from the immediate location that may potentially be impacted)?*
>
> *2. Considering the proposed action at its broadest scope, is there potential for impacts on matters of national environmental significance?*
>
> *If there are matters of national environmental significance in the vicinity of your proposed action, you need to consider whether there is potential for your proposed action to impact upon those matters.*
> *The proposed action should be considered at its broadest possible scope. This includes all stages and components of the action, all related activities, and all related infrastructure such as roads and powerlines, if applicable.*
> *If the action consists of a series of activities or a number of related activities, you should consider the impacts of each activity, and then consider the combined impacts of those activities.*
> *It is also necessary and important to consider off-site and indirect impacts of your proposed action on matters of national environmental significance.*
>
> *3. Are there any proposed measures to avoid or reduce impacts on matters of national environmental significance?*
>
> *It is important to consider the environmental impacts of the proposed action early in the planning of the proposal. Careful planning of the action can avoid, or reduce, the likelihood of a significant impact on matters of national environmental significance. Where possible and practicable it is best to avoid impacts. If impacts cannot be avoided then they should be minimised or mitigated as much as possible.*
> *You should consider impacts on matters of national environmental significance in relation to the following:*
>
> - *site selection and the location of buildings or activities on the selected site;*
> - *the timing of the action or its component activities; and*
> - *the design of any buildings, or other structures or infrastructure.*
>
> *However you should not conclude that a significant impact is not likely to occur because of management or mitigation measures unless the effectiveness of those measures is well-established (for example through demonstrated application, studies or surveys) and there is*

a high degree of certainty about the avoidance of impacts or the extent to which impacts will be reduced.

4. Are any impacts of the proposed action on matters of national environmental significance likely to be significant impacts?

In order to decide whether an action is likely to have a significant impact, it is necessary to take into account the nature and magnitude of potential impacts. In determining the nature and magnitude of an action's impacts, it is important to consider matters such as:

10. *the sensitivity of the environment which will be impacted;*
11. *the timing, duration and frequency of the action and its impacts;*
12. *all on-site and off-site impacts;*
13. *all direct and indirect impacts;*
14. *the total impact which can be attributed to the action over the entire geographic area affected, and over time;*
15. *existing levels of impact from other sources; and*
16. *the degree of confidence with which the impacts of the action are known and understood."*

This report aims to undertake an assessment of whether coal seam gas exploration, production and associated activities in PEL 238 and PAL2 require referral under the EPBC Act 1999, in accordance with the DEH guidelines quoted above. It will show, in relation to these activities and the EPBC Act 1999, that:

1. There are 24 matters of national environmental significance in the area of the action.
2. There is potential for the action to impact on these matters – especially when it is properly considered in terms of the combined impact of a number of related activities including disturbance footprint, area subject to fragmentation, increased fire risk, well-pad clearance, corehole clearance, access track clearance, pipeline clearance, seismic survey clearance, water treatment clearance, produced water disposal, and the creation of impoundments.
3. The measures in place to avoid or reduce impacts are not adequate to prevent such impacts, and their effectiveness is uncertain and not scientifically established.
4. The impacts are likely to be significant impacts because of their intensity, the extraordinary national and international conservation significance of the environment in which they are occurring, the sensitivity of the ecosystem given the scale of extinctions that have already occurred in the regional mammalian fauna and the scale of decline now evident in the bird fauna, the substantial geographic area affected, the high cumulative impact in the context of other threats (other mining and gas developments, background clearing rates, climate change, invasive species, logging, and high intensity and frequent fires), the low level of confidence with which the impacts are understood, and the context in which they occur of a heavily cleared and highly fragmented landscape with very low levels of reservation.

Each of these four considerations is addressed generally below, and where appropriate more specific detail is provided in the following sections on each matter of national environmental significance. The aim has been to replicate the process that Eastern Star should have undertaken to determine whether a referral is necessary under the EPBC Act 1999, and to thus make an

objective determination of the need for referral in accordance with DEWHA Guidelines (DEH 2006).

Matters of national environmental significance

A review of the Atlas of NSW Wildlife, available literature, and Eastern Star Gas documents indicates that there are 24 matters of national environmental significance, as defined by the *Environment Protection and Biodiversity Conservation Act* 1999, for which known or likely habitat occurs within the Pilliga Forest section of PEL 238 and PAL2[5] or, in the case of the Murray Cod, which occurs downstream from the Pilliga Forest and is likely to be affected by the action.

These include:

Regent Honeyeater – Endangered
Malleefowl – Vulnerable
Swift Parrot – Endangered
Superb Parrot - Vulnerable
Pilliga Mouse - Vulnerable
South-eastern Long-eared Bat – Vulnerable
Spotted-tailed Quoll – Endangered
Large-eared Pied Bat – Vulnerable
Grey-headed Flying Fox – Vulnerable
Murray Cod - Vulnerable
Tylophora linearis - Endangered
Collabah Bertya (*Bertya opponens*) - Vulnerable
Philotheca ericifolia - Vulnerable
Cobar Greenhood Orchid (*Pterostylis cobarensis*) - Vulnerable
Rulingia procumbens - Vulnerable

Migratory species

Migratory species that are known or likely to occur within the Pilliga Forest include the following:
Regent Honeyeater (*Xanthomyza Phrygia*)
Swift Parrot (*Lathamus discolour*)
Cattle Egret (*Ardea ibis*)
Fork-tailed Swift (*Apus pacificus*)
Great Egret (*Ardea alba*)
Rainbow Bee-eater (*Merops omatus*)
White-Bellied Sea Eagle (*Haliaeetus leuccogaster*)
Satin Flycatcher (*Myiagra cyanoleuca*)
White-Throated Needletail (*Hirundapus caudacutus*).

5 Eastern Star Gas 2011

Significance of Impacts

Intensity, Magnitude and Geographic Extent

Environment groups have utilised the results of the audit of 'the action' conducted previously in this document to conduct an analysis of the impacts on native vegetation, and thence on MNES. 'The action' has largely taken place in the eastern section of the Pilliga Forest, although there are also components of it that have occurred on cleared land to the north and east.

Map 2 depicts the full extent of 'the action' within the Pilliga forest to date, according to the best available data. This map delineates all of the coreholes that have been drilled, the pilot production wells that are in operation, the gas and water gathering pipelines that have been constructed and the seismic survey lines that have been run.

Utilising this map-based data, the action has been assessed as having the following impacts on the environment:

- Increased disturbance footprint across an area of approx 44,700 ha of native vegetation
- Increased ignition sources from multiple infrastructure and vehicle movements, and introduction of a flammable gas into an already fire prone environment leading to increased frequency and intensity of fires
- Heavy fragmentation of an area of 1,700 ha of native vegetation, leading to direct impacts on fauna and flora populations and indirect impacts through the spread of invasive species
- Direct destruction of at least 150 ha of native vegetation that is likely habitat for matters of NES.
- Creation of 13 major artificial watering points which are predominantly saline, plus numerous additional small drill ponds, representing a risk to wildlife
- Introduction of numerous sources of pollution through the use of chemicals and the handling and disposal of produced water (ie diesel spills, flood overflow events)
- Direct alteration of the ecology of a creek system for up to 22km

Attachment 2 sets out in detail as to how those impacts were quantified.



Bibblewindi Treatment Plant. Photo: T.Pickard.

Sensitivity, value and quality

The Pilliga Forest has outstanding conservation significance. It is the largest temperate woodland left in eastern Australia, and it forms the southern recharge area of the Great Artesian Basin and contributes surface water flows to the Murray-Darling Basin.

The Pilliga Forest is the largest remnant left in the heavily cleared Wheat-Sheep Belt of NSW. It covers an area of approximately 500,000 hectares in size. It is the major biodiversity refuge area for flora and fauna in western NSW and is a critical asset for adaptation to human-induced climate change.

Eastern Star Gas themselves have described the importance of the Pilliga as follows "*The remnant has national, state and regional conservation significance for the protection of biodiversity and threatened species due to its large size (> 500 000 hectares), high threatened species diversity and high quality habitat*"[6].

The Pilliga is recognised internationally as an Important Bird Area under the BirdLife International scheme. The Pilliga Forest is described as follows in the Important Bird Area site fact sheet "*This large block of woodland supports strong populations of the vulnerable Painted Honeyeater and near threatened Diamond Firetail, irregular numbers of the endangered Swift Parrot and Regent*

6 Eastern Star Gas. July 2009. Review of Environmental Factors: 2009 Narrabri Coal Seam Gas Program Dewhurst 8 Lateral Production Pilot.

Honeyeater and the near-threatened Bush Thick-knee, and good numbers of other declining woodland birds"[7].

It goes on to say that "*The woodlands support the largest population of Barking Owls and other declining woodland species in NSW. One hundred and seventy bird species were recorded in the IBA during surveys in 1991-1993 (Date et al. 2002) and in 1999-2000 (NSW NPWS 2000) and over 200 bird species recorded for the Pilliga (D. Johnston pers. comm.)*".

The area has recognised wilderness values, and more than 117,698 hectares have been recognised as meeting the criteria for the National Wilderness Inventory[8] including large areas of the Pilliga East State Forest. The area was nominated close to a decade ago for wilderness identification under the NSW Wilderness Act 1987. However, Legal exemptions and changes have since made it impossible for that nomination to proceed, but the wilderness significance of the area remains.

The area provides habitat for at least 24 matters of national environmental significance, 48 threatened plants and animals under the NSW Threatened Species Conservation Act 1995[9] and at least 5 endangered ecological communities under state or federal legislation as well as numerous regionally significant species.

It provides habitat for the only known population of the endemic Pilliga Mouse, the largest Koala population in NSW west of the Great Divide and one of only two known Black-striped Wallaby populations in NSW. It is recognised as the national stronghold for the South-eastern Long-eared Bat.

Context

The Brigalow Belt South bioregion is recognised by the Federal Government as one of only 15 national biodiversity hotspots within Australia[10]. The bioregion has the highest number of resident bird species of any bioregion in Australia, and it is also one of the top ten bioregions for richness and levels of endemism of the original mammal fauna[11]. It is located in an overlap zone with temperate, semi-arid and sub-tropical influences resulting in high species diversity[12].

The Brigalow Belt South bioregion is very poorly reserved. The bioregion has less than 5% of it's land area within the National Reserve System, and is a recognised high priority nationally for large new reserves[13].

The environment in the BBS region is in severe decline. The region is well recognised as one of the most endangered and heavily cleared bioregions in Australia, with reliable estimates that 70% of the original woody vegetation in the bioregion has been cleared. It is vegetated by temperate

7 http://www.birdlife.org/datazone/sitefactsheet.php?id=23856
8 RACD 2002b
9 Eastern Star Gas 2010. Preliminary Environmental Assessment.
10 http://www.environment.gov.au/biodiversity/hotspots/national-hotspots.html
11 NHT 2002
12 RACD 2002a
13 http://www.environment.gov.au/parks/nrs/science/pubs/ibra_regions.pdf

woodlands that as a broad vegetation formation have had more than 90% of their original distribution cleared across the continent[14].

More than 14 mammal species are already believed to be extinct in the region, which represents one of the highest extinction rates in Australia. Species that are now presumed extinct include the Western Quoll, Red-tailed Phascogale, Western Barred Bandicoot, Bilby, White-footed Rabbit-Rat, Greater Stick-Nest Rat, Brush-tailed Bettong, Burrowing Bettong, Eastern Hare-wallaby, Bridled Nailtail Wallaby, Plains Mouse, Gould's Mouse, Eastern Chestnut Mouse, and Hopping Mouse[15].

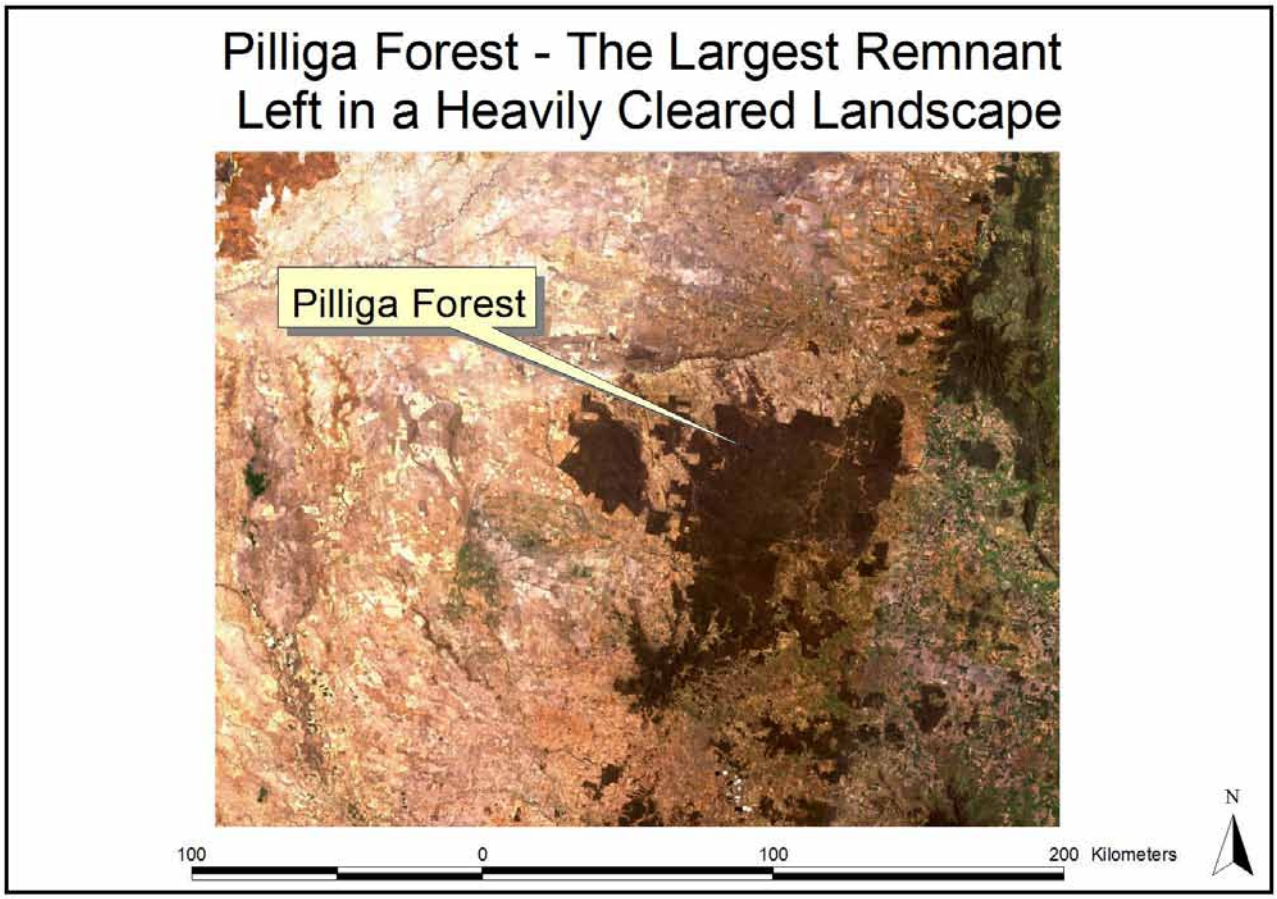
Furthermore, even common mammal species such as the Common Ring-tailed and Common Brush-tailed Possums are thought to have declined and are now uncommon to rare in the BBS study area[16].

Similarly, many woodland birds of the Sheep-Wheat belt are experiencing a wave of local and regional extinctions across their ranges with more than 60 species, or 25% of all woodland bird species, recognised as threatened or declining[17].

Therefore, the Pilliga Forest is located in a landscape which is incredibly diverse and significant, but which is severely threatened and has experienced extreme extinction rates in the past and now faces on-going and protracted declines in fauna and flora. The ecological importance of the 500,000 ha refuge which the Pilliga Forest provides in that context is enormous.

14 http://www.abs.gov.au/ausstats/abs@.nsf/0/9A0C82D0F59158DCCA256BDC0012240D?opendocument
15 RACD 2002a
16 NPWS 2000b, Milledge 2002

17 Reid 1999, Reid 2000, Traill and Robinson 1996



Existing impacts from other sources

The Brigalow Belt South bioregion and the Pilliga Forest both face a number of very serious and on-going threats, which had to a substantial cumulative impact on the environment and matters of NES.

There are four open-cut coal mines currently proposed or approved just east of Narrabri, which will collectively clear at least 5,500 hectares of native vegetation, and there is an estimated background rate of agricultural clearing in the Namoi Catchment of 1-5% of vegetation each year. The Pilliga Forest is also subject to logging for cypress and some limited volumes of ironbark timber and utilised for domestic firewood collection. Climate change is expected to represent a serious and on-going threat to the vegetation of the region. Invasive species and inappropriate fire regimes also represent a grave threat to the future of the Pilliga Forest, with numerous new weed species currently spreading rapidly through the Namoi Catchment and with frequent intense, hot fires having caused considerable degradation already over the last decade.

Confidence levels

The Guidelines require consideration of "*the degree of confidence with which the impacts of the action are known and understood".*

The impacts of the action are very poorly understood. Firstly, the entire action and it's cumulative impact has never been considered. Secondly, the level of knowledge and assessment of the areas

affected by the action are markedly inadequate. Eastern Star Gas themselves acknowledge that the eastern section of the Pilliga Forest where they are undertaking these activities is poorly surveyed.

Eastern Star Gas state that[18]:

"The Pilliga East State Forests have received little detailed attention in terms of botanical surveying to assess the type and quality of floral composition or the presence of threatened floral species, populations or ecological communities and potential habitat for faunal species.

The Pilliga East State Forest has received little detailed attention in terms of systematic fauna surveying to assess the presence of threatened faunal species, populations or ecological communities and potential/actual habitat."

Despite this recognised paucity of knowledge, Eastern Star Gas repeatedly rely on the existing 'knowledge base' as the only grounds for undertaking impact assessments. For example, in relation to the Dewhurst-8 Lateral Production Pilot, they state that:

"The basis for the assessment of impacts on the native flora species and vegetation communities posed by the ongoing exploration activities has been formed from the knowledge base developed from flora impact assessments carried out to date. The following survey reports make up the knowledge base and are considered sufficient to provide an understanding of the actual, likely and potential impacts associated with the proposed activity:
• Clements, A & Moore, R. (2002). Review of Existing Flora Data: PEL238 Pilliga East Seismic Survey, Anne Clements & Associates Pty Ltd, North Sydney, NSW
• Elks, G.N. (2005). PEL238 Coal Seam Gas Flora Survey – Bibblewindi Nine Spot, Idyll Spaces Environmental Consultants, Bonville NSW
• Elks, G.N. (2006). PEL238 Coal Seam Gas Flora Survey – Water Management Facility, Idyll Spaces Environmental Consultants, Bonville NSW
• Elks, G.N. (2007). PEL238 Narrabri Coal Seam Gas Project Pipeline Flora Survey, Idyll Spaces Environmental Consultants, Bonville NSW

The assessment of impacts on the native fauna posed by the Dewhurst-8 pilot relies on the existing knowledge base on fauna impact assessments carried out to date. Survey reports from the following field surveys have been consulted and are considered sufficient to provide an understanding of the actual, likely and potential impacts associated with the proposed activity:
*• **Kendall, K. (2005).** Fauna Study PEL238 Coal Seam Gas Project - Bibblewindi Nine Spot, Kendall & Kendall Ecological Consultants, West Kempsey NSW*
*• **Kendall, K. (2006).** Fauna Study PEL238 Coal Seam Gas Project - Water Management Facility, Kendall & Kendall Ecological Consultants, West Kempsey NSW*
*• **Kendall, K. (2007).** Fauna Study PEL238 Narrabri Coal Seam Gas Project Pipeline, Kendall & Kendall Ecological Consultants, West Kempsey NSW*
*• **Smith, A. 2002.** PEL238 Pilliga East Seismic Survey: Fauna Review, AUSTECO Environmental Consultants, Armidale, NSW."*

18 Eastern Star Gas. July 2009. Review of Environmental Factors: 2009 Narrabri Coal Seam Gas Program Dewhurst 8 Lateral Production Pilot.

However, on closer inspection, it is apparent that the four surveys to which they refer were confined to a very limited geographic area, and were not undertaken anywhere in the vicinity of the Dewhurst-8 Lateral Production Pilot. The same is the case for most, if not all, of the other gas wells, infrastructure and pipelines/gathering systems that have been constructed as part of the action.

It is apparent from all available Reviews of Environmental Factors and other information, that the extent of survey undertaken for the entire extent of 'the action' within the Pilliga forest is extremely restricted to:

- An area of approximately 72 hectares in a single location near the Bibblewindi Nine Vertical Production Pilot
- Along a single pipeline length of approximately 15km
- In relation to one seismic survey conducted in 2002.

This is vastly inadequate, given that an area of 1,700 hectares has been fragmented, a disturbance footprint of 44,700 ha applied, pipelines and seismic surveys covering over 538.6km have been undertaken, and 150ha of native vegetation destroyed.

The level of knowledge on which 'the action' has been taken is demonstrably inadequate to properly assess the impacts with any confidence. The information is clearly an inadequate basis on which to conduct a valid impact assessment.

Measures put in place to avoid or reduce impacts

A review of the operation of Eastern Star Gas operations indicates that the measures that have been put in place to avoid or reduce impacts are inadequate.

In particular, field assessment of Eastern Star Gas operations and advice from local landholders have confirmed that remediation and rehabilitation of sites such as well-heads has been unsuccessful on most occasions, weed invasions of cleared areas are common, pollution events have been recorded and wildlife have been found dead at saline ponds. There have been very significant tree deaths from saline water spillage/leakage at a number of coal seam gas wells in the Pilliga. The worst events occurred in 2001/2002, but there are also contemporary examples. These areas have, to date, not been rehabilitated. Further information can be provided on these specific problems with operation of the exploration and pilot production program. A number of photos of some of these problems are provided in this document.

There has little or no successful rehabilitation of abandoned drill holes and there are numerous serious weed incursions at almost every corehole that has been drilled in the Pilliga forest. This is despite the fact that REFs require 'the removal of imported materials and the rehabilitation of the site',

The standard conditions contained in REFs compiled by ESG for rehabilitation are as follows (ESG 2008):

"*At the completion of the drilling and core collection activities, well logging and the plug and abandonment procedures, rehabilitation activity can commence. The process includes the removal of all imported soil materials, the replacement of sub and topsoils and the return of natural contours to assist with erosion control. The strategy to enhance the natural regeneration of the site involves the retention of all vegetative material removed from the site in addition to the stripping and stockpiling of topsoils. This material is stockpiled during site preparations and re-spread across the site after the topsoils have been replaced; the strategy is designed to provide a physical barrier to the incidental losses of topsoils and seed stock from site during the regeneration period. The encouragement of seed germination and providing additional topsoil stability during regeneration has proven to be an effective method of rehabilitating sites within shorter timeframes where climatic conditions are conducive to regeneration i.e. mild temperatures, average rainfall during summer and when foraging resources are plentiful*".

The fact is that rehabilitation of well sites is not occurring as required within the Pilliga forest and numerous photos are available to confirm this.

We conclude that the measures put in place by Eastern Star Gas to avoid or mitigate impacts are inadequate to prevent such impacts, and their effectiveness is uncertain and not scientifically established.



Dewhust 6c Photo: T.Pickard.

Nationally Threatened Species

Bird Species

The area of Pilliga Forest within PEL238 and PAL2, is likely to contain habitat for the Endangered Regent Honeyeater (*Xanthomyza phrygia*). There is also likely habitat for the Endangered Swift Parrot (*Lathamus discolour*) and Vulnerable Superb Parrot (*Polytelis swainsonii*) to occur in the area. The vulnerable Malleefowl has been known to previously occur in the area, but it has not been recorded for at least a decade. Nevertheless, the area must still be considered as suitable, known habitat for this species which may expand it's range now that the recent drought has broken.

Regent Honeyeater

The Atlas of NSW Wildlife identifies two records of the Regent Honeyeater in the vicinity of the areas where 'the action' has occurred. These records are located in the Pilliga Nature Reserve, and the Pilliga East State Forest.

There exist recorded breeding events for the Regent Honeyeater within Pilliga Nature Reserve. This is significant given that breeding is generally concentrated around a small number of other areas.

The Regent Honeyeater is know to be a nomadic species, and suitable foraging habitat occurs within the area of the Pilliga where 'the action' has been undertaken. The recent EPBC referral for future production projects in PEL238 and PAL2, produced for Eastern Star Gas, state that it is "considered likely that the species occurs" within that area[19].

The direct vegetation clearance, heavy vegetation fragmentation, and extended disturbance footprint that has occurred as a result of 'the action' has all occurred in areas that are likely habitat, and also potentially breeding habitat, for the Regent Honeyeater.

The species is identified in the Regent Honeyeater *(Xanthomyza phrygia)* Recovery Plan 1999-2003[20] as having:

- specialised habitat requirements
- significant reductions in extent of habitat
- demonstrable reduction in habitat quality throughout its range
- apparent reliance on a small number of favoured sites
- clear reduction in range in recent decades (probably on-going in central Victoria)
- low population level
- low population densities over a large proportion of the range with aggregations occurring for breeding

19 Trolley 2011
20 Menkhorst, P., Schedvin, N., Geering, D. (1999)

- [and as having]… no obvious, straightforward or quick solutions to the postulated causes of the population decline. Only long-term changes to land management, on both public and private land, will lead to a significant improvement.

There is a strong possibility that the actions conducted in the PEL238 and PAL 2 area to-date may have impacted and may impact significantly on the Regent Honeyeater.

As likely foraging and potentially breeding habitat for a species that has specialised habitat requirements, and has suffered both quality and extent reductions of its habitat, any impact that reduces the quality of available habitat may impact the viability of the species in the area. As noted in the National Recovery Plan for the Regent Honeyeater:

> *Regent Honeyeaters opportunistically utilise patches of habitat. Therefore, it is essential to maintain adequate patches of suitable habitat to provide for the needs of the species under all contingencies of climate and land use.*

Additionally, as the activities undertaken, particularly in regards to clearing for infrastructure such as well pads, ponds, and water treatment infrastructure, are permanent, or will at least persist over periods of years to decades, the duration of impact is considerable.

There has been no effort made to quantify the overall area of impact or the likelihood of cumulative impacts of multiple projects.

The Pilliga, whilst containing large areas of habitat, is already impacted by a considerable degree of fragmentation due to logging roads, and logging itself. Additional clearance adds to the cumulative impact of previous actions on habitat quality.

There appears to have been limited or in some cases no assessment of the impacts of the various coal seam gas infrastructure projects on the Regent Honeyeater in the area. There also appears to have been limited or in some cases no assessment of the species' use of the area.



Dewhurst Complex. Photo: T.Pickard.



Bibblewind 23 Drill Pond. Photo: T.Pickard.

Mammal Species

Nationally threatened mammal species that are known to occur in the Pilliga Forest within which 'the action' has occurred, include the vulnerable South-eastern Long-eared Bat (*Nyctophilus corbeni*) and the Vulnerable Pilliga Mouse (*Pseudomys pilligaensis*). Other species that are likely to occur include the endangered Spotted-tailed Quoll (*Dasyrus maculates*), the vulnerable Grey-headed Flying Fox (*Pteropus poliocephalus*) and the vulnerable Large-eared Pied Bat (*Chalinolobus dwyeri*).

Pilliga Mouse

The Pilliga Mouse is endemic to the Pilliga Forest, and relies on habitats with a high species richness, moderate to low shrub cover, and a moist groundcover of plants, litter and fungi. A recent EPBC referral document for the new Narrabri Coal Seam Gas production project identified that "*it is likely that the Project area [*which encompasses the same area as 'the action*'] supports part of an important population of Pilliga Mouse given that the population within the project area is near the north eastern limit of the species population range, and the species is restricted to the Pilliga region of NSW*"[21].

21 Tolley 2011

Map 4 shows the modelled distribution of Pilliga Mouse habitat in the Brigalow Belt South, revealing that there are large areas of modelled high probability habitat in the eastern Pilliga Forest where 'the action' has occurred.

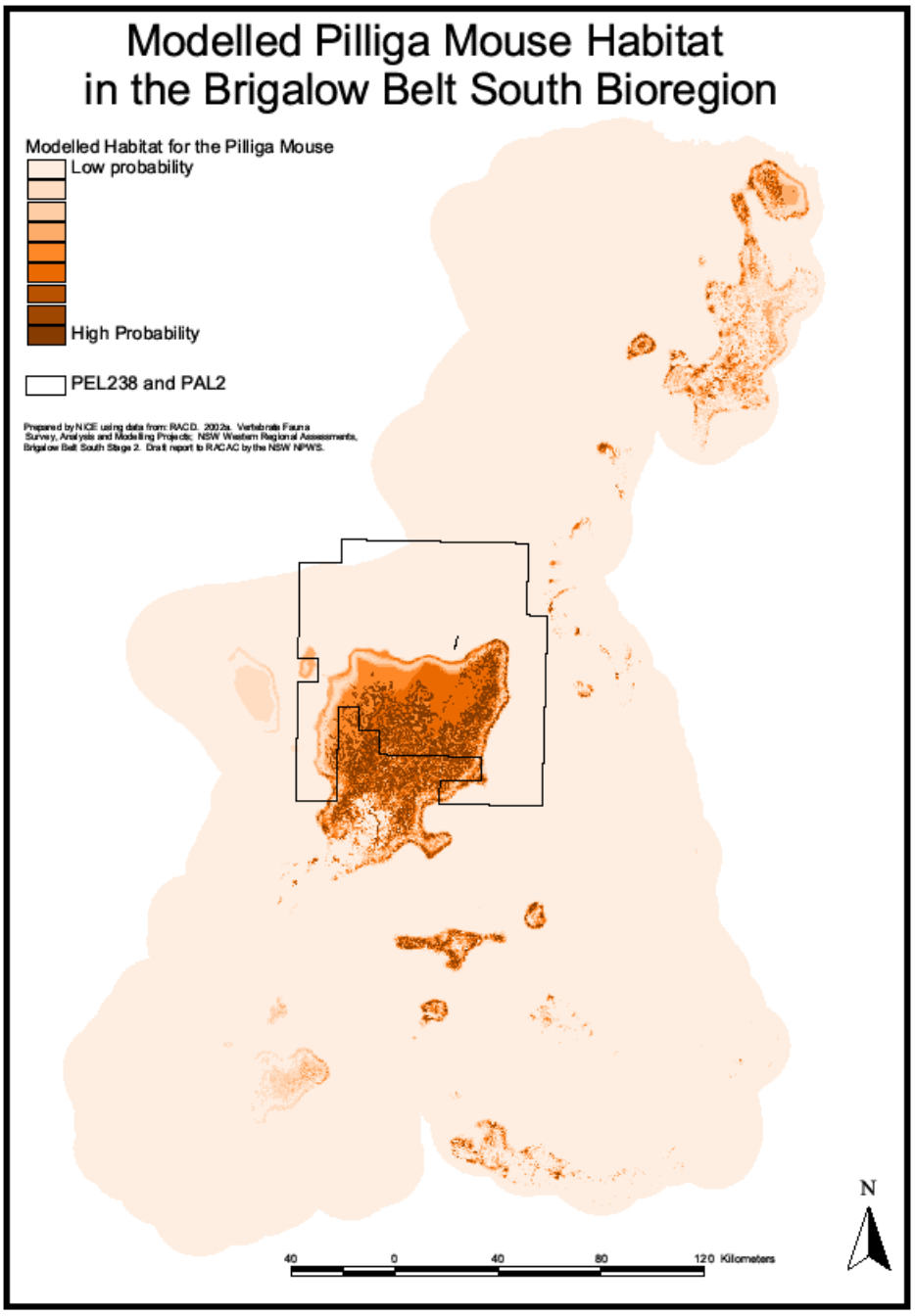
Tolley (2011) identifies a number of potential impacts from the proposed production pilot which apply equally to 'the action' that is already occurring. This includes the potential to increase the spread of invasive predator species, and consequent increased rates of predation; the increased fragmentation from access tracks and dispersed clearance potentially creating unfavourable microclimates, open space, and traffic disturbances (in addition to existing tracks). The loss of habitat would also appear significant.

The susceptibility of the species to clearance, alteration to preferred habitat, and the impacts of fragmentation indicate sensitivity of the species to the action already conducted by Eastern Star Gas. The duration of the impacts (in the order of years to decades for clearance) would also indicate significant impacts.

The species appears to be particularly susceptible to alterations in fire regimes, and any understanding of impacts should require an assessment of the potential for increased or altered fire regimes as a result of developments. The impacts of increased traffic on dispersal should also be addressed.

There is limited knowledge of the species, and little to no assessment of the impacts on the species as a result of individual and cumulative projects undertaken by Eastern Star Gas to date.

The recent assessment by Tolley (2011), in regards to the 2011 Narrabri Coal Seam Gas Project referral, concluded that "*given the population of Pilliga Mouse in the project area is considered an important population and the potential for impacts described above, the development may have a significant impact on the species*". We contend that 'the action' as undertaken to date in a program of exploration and pilot production is likely to have a similarly significant impact, given that it has cast a disturbance footprint of 44,700 hectares, and heavily fragmented 1,700 hectares of vegetation and directly cleared 150 ha, whilst increasing fire risks.



South-eastern Long-eared Bat

The Pilliga, including the Pilliga East State Forest, is the recognised national stronghold of the South-eastern Long-eared Bat *N. timoriensis*[22]. Breeding occurs in tree hollows, and the species forages close to vegetation and around tree trunks, and within a limited range (several kilometres) of roosting sites[23]. Map 5 shows the modelled distribution of South-eastern Long-eared Bat habitat in the Brigalow Belt South, revealing that there are large areas of modelled high probability habitat in the eastern Pilliga Forest where 'the action' has occurred.

22 Turbill and Ellis 2006
23 Ibid

There is strong evidence to show that larger, intact forest remnants are important to the species, with surveys in central western NSW showing '*a tenfold difference in relative abundance between trapping sites within large continuous forest remnants compared to small forest areas*'[24]. In particular, Turbill & Ellis (2006) found that '*While previously captured infrequently and in low numbers, recent surveys have revealed that the large remnants of woodland in the Goonoo, Pilliga West and Pilliga East study areas are a distinct stronghold in the distribution of the south-eastern form of N.timorensis*'. They concluded that "*these larger remnants of box/ironbark/cypress woodland are needed to support high densities of N. timoriensis"*. Other factors that have been implicated in describing its distribution within the scientific literature include warmer over-wintering areas, highly drained soils, and oldgrowth vegetation[5].

It is estimated that within NSW, 75% of the eastern part of this species' range has already been cleared[25]. As noted in the Draft Recovery Plan[26]: *'Habitat loss may have not only removed Southeastern Long-eared Bat habitat such as roosting sites, but also potentially threatens the viability of remaining populations by fragmentation of remaining habitat (see below) and the impacts of dryland salinity.*

While clearing for agriculture has been the greatest reason for clearing mallee and woodland habitat, additional threats are emerging that are targeting remaining areas of habitat, such as various open cut coal, natural gas and mineral sand mining proposals".

Therefore, gas developments have already been recognised as a threat to this species, and the associated habitat fragmentation that the Eastern Star Gas exploration and pilot production program has caused must pose a similarly major threat.

The Draft Recovery Plan states that:

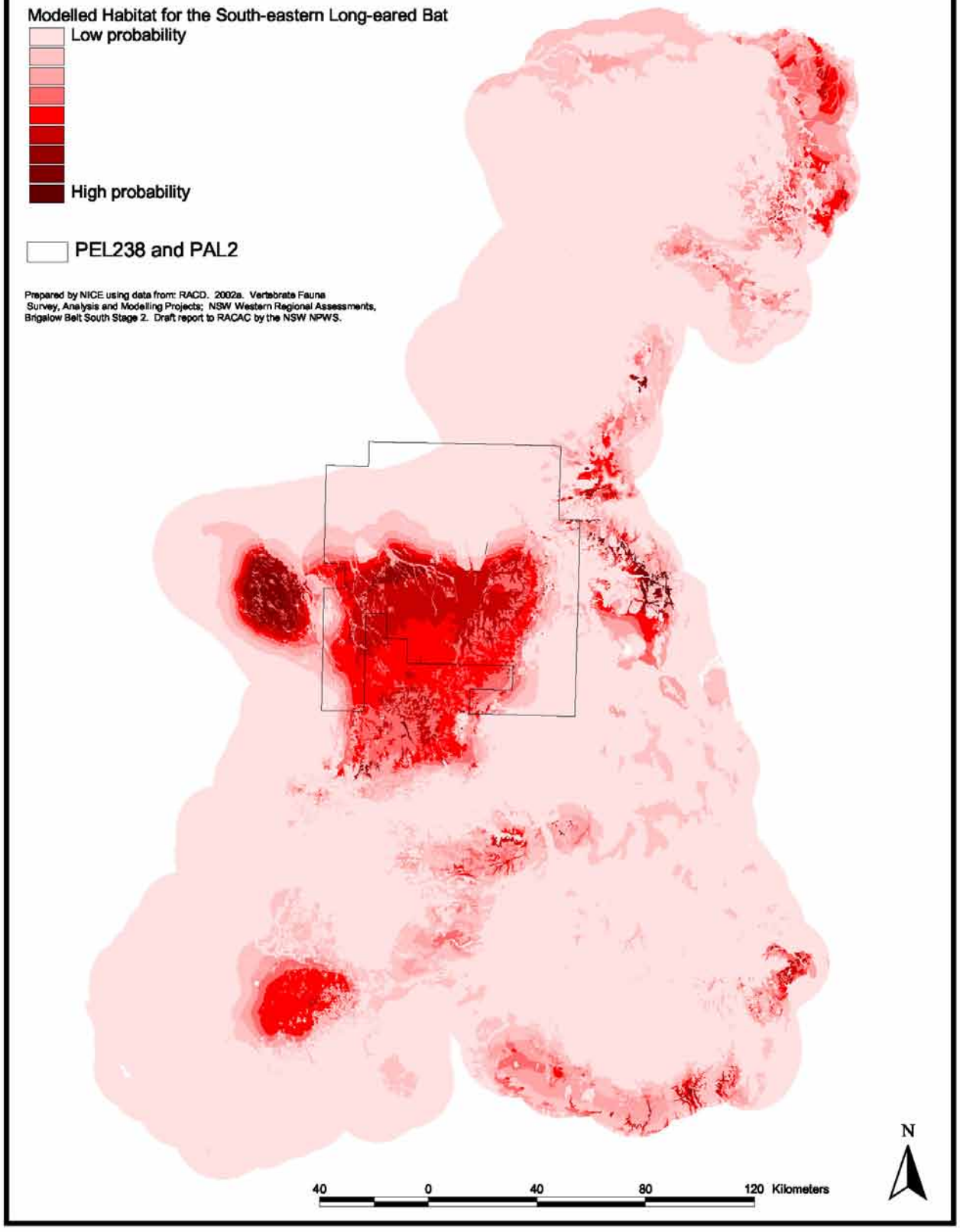
"Before European settlement, mallee and woodland habitats were extensive and nearly contiguous across inland eastern Australia (Specht 1981). However, clearing for agriculture has resulted in fragmentation of suitable habitat for this species. Trapping results and initial modelling strongly suggest this species is affected by fragmentation, with it displaying a preference for larger forest remnants (Pennay 2002; Turbill & Ellis 2006). Small isolated populations may be especially vulnerable to local extinction by a range of processes that may deplete the number of individuals or degrade the overall fitness of each population (Denniston 1978; Shaffer 1981). Fragmentation of South-eastern Long-eared Bat habitats may also exacerbate other threats. For example, foxes and feral cats are probably more abundant near cleared land (Saunders et al. 1995); habitat fragments may be completely burnt by wildfire or control burns, potentially leading to local extinction where sources for recolonisation no longer exist; and fragmentation may increase the exposure of this bat to agrichemicals....."

In addition, the reliance on tree hollows for breeding and roosting, and the limited range of individuals, would suggest that the species may be particularly sensitive to clearing in particular areas and to increased fire risk, with this being exacerbated given the long-term to permanent clearance of areas for infrastructure.

24 Schulz & Lumsden, 2010.
25 Schulz & Lumsden, 2010.
26 Ibid

There is sufficient evidence available on the threats to the South-eastern Long-eared Bat to conclude that the action is likely to have a significant impact on it.

Modelled South-eastern Long-eared Bat Habitat in the Brigalow Belt South Bioregion



Spotted-tailed Quoll

The Spotted-tailed Quoll was recorded in the Pilliga in the 1990s[27]. Whilst there is no recent evidence of the species, the rarity of this species would indicate a need for more substantive surveys.

The NSW Government threatened species profile recognizes the following threatening processes that can be considered likely to have a significant impact on the species[28]:

- Loss, fragmentation and degradation of habitat through clearing of native vegetation and subsequent development, logging and frequent fire (Edgar & Belcher 1995; Dickman & Read 1992; NPWS in prep.)
- Loss of large hollow logs and other potential den sites (Scotts 1992)
- Competition for food and predation by foxes and cats (Edgar & Belcher 1995; Dickman & Read 1992).

It is very difficult to make an informed assessmnt of the likely impact of coal seam gas operations on this species. The fragmentation of habitat, and the creation of access roads and cleared areas is likely to increase the accessibility of the area to competing predators.

Threatened Plants

The following nationally threatened plant species have been identified as known or likely to occur in the Pilliga Forest within PEL238 and PAL2.

Tylophora linearis - endangered
Collabah Bertya (*Bertya opponens*) - vulnerable
Philotheca ericifolia - vulnerable
Cobar Greenhood Orchid (*Pterostylis cobarensis*) - vulnerable
Rulingia procumbens - vulnerable

The endangered *Tylophora linearis* is known to occur in dry woodlands consisting of *Eucalyptus fibrosa, Callitris endlicheri, C. glaucophylla* and *Allocasuarine leuhmannii*, as occurs in the area where 'the action' is occuring. Although there are no records of this species in the area, there is high potential for it to occur.

The largest population of *Bertya opponens* occurs in the Jack's Creek State Forest, just to the north of the PAL 2 area, and it has been observed recently just outside the PAL 2 area[29]. *Philotheca ericifolia* has also been recorded within the Pilliga East State Forest, and *Rulingia procumbens* is known from within the PAL 2 area. No meaningful consideration appears to have been given to the impacts of clearance, fragmentation, increased weed invasion and increased fire risk on these species.

27 Paull, D.C., and Date, E.M. (1999).
28 www.environment.nsw.gov.au/resources/nature/tsprofileSpottedtailedQuoll.pdf
29 Tolley 2011

Comparison with other referred actions

In order to gauge how the impact of 'the action' compares with other referred actions with regard to both scale and the number of MNES that are affected, we have conducted a review of a random sample of five referred actions that are currently on the EPBC referrals website. The results are presented below in Table 1.

Table 1. Profile of a random sample of five referred actions

Project	**Referral Number**	**Disturbance Footprint**	**MNES**
Monomeath Development Pty Ltd, Residential Development	2011/5972	44.8ha mostly cleared	6
Auralandia NL 3 dimension marine seismic survey	2011/5961	1,600km	20
North Tuncurry Mixed Use Development	2011/5954	625 vegetated	19
Mitchell Line to Muswellbrook Power Line Project	2011/5930	39ha	6
Tarrawonga Coal Project	2011/5923	517ha of which 312ha is vegetated	16
Eastern Star Gas Coal Seam Exploration and Pilot Production Program	**Not referred**	**44,700ha disturbance footprint, 1,700 heavy fragmentation, 150 ha direct clearance**	**24**

The results of the comparison indicate that actions which affect far fewer MNES and which have far fewer impacts in terms of scale and intensity are routinely referred to the Federal Government under the EPBC Act 1999.

Conclusion

To restate the Guidelines in relation to assessing a significant impact:

"*A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends*

upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts".

It appears that significant impacts may have occurred, or are likely to occur, on several matters of national environment significance as a result of coal seam gas exploration and pilot production projects in PEL 238 and PAL 2 within the Pilliga Forest.

Detailed review of a number of species conducted above indicates that the threatened species that are most likely to be negatively impacted by 'the action' as it has been undertaken to date are the Pilliga Mouse, South-eastern Long-eared Bat, Regent Honeyeater, Spotted-tailed Quoll and several threatened plant species.

REVISED SIGNIFICANT IMPACT GUIDELINES

This report has primarily assessed 'the action' in relation to the 2006 Significant Impact Guidelines (DEH) because they are the guidelines that were in operation when the majority of the impacts were incurred in PEL238 and PAL2.

However, new guidelines have more recently been released. These 2009 Significant Impact Guidelines Matters of National Environment Significance contain near identical provisions to all of the relevant clauses in the 2006 Guidelines that have been addressed throughout this document. The key clauses from the 2009 Guidelines are provided in full below.

It is apparent from these clauses that applying the 2009 Guidelines to 'the action' leads to the exact same conclusion as does application of the 2006 Guidelines - that it is likely to have a significant impact on MNES, and that it should be referred to the Federal Government immediately, or called-in.

'Action' is defined broadly in the EPBC Act and includes: a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. Actions include, but are not limited to: construction, expansion, alteration or demolition of buildings, structures, infrastructure or facilities; industrial processes; mineral and petroleum resource exploration and extraction; storage or transport of hazardous materials; waste disposal; earthworks; impoundment, extraction and diversion of water; agricultural activities; aquaculture; research activities; vegetation clearance; culling of animals; and dealings with land. Actions encompass site preparation and construction, operation and maintenance, and closure and completion stages of a project, as well as alterations or modifications to existing infrastructure.

A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. You should consider all of these factors when determining whether an action is likely to have a significant impact on matters of national environmental significance.

To be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility. If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment.

To make a decision as to whether or not to refer an action to the Minister, you should consider the following:
1. Are there any matters of national environmental significance located in the area of the proposed action (noting that 'the area of the proposed action' is broader than the immediate location where the action is undertaken; consider also whether there are any matters of national environmental significance adjacent to or downstream from the immediate location that may potentially be impacted)?

2. Considering the proposed action at its broadest scope (that is, considering all stages and components of the action, and all related activities and infrastructure), is there potential for impacts, including indirect impacts, on matters of national environmental significance?
3. Are there any proposed measures to avoid or reduce impacts on matters of national environmental significance (and if so, is the effectiveness of these measures certain enough to reduce the level of impact below the 'significant impact' threshold)?
4. Are any impacts of the proposed action on matters of national environmental significance likely to be significant impacts (important, notable, or of consequence, having regard to their context or intensity)?

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Attachment 1: Audit of Eastern Star Gas activities in PEL238 and PAL2

Component	Details	Reference
Coal seam gas wells	92 coal seam gas wells mapped in PEL238 & PAL2	From data held on MinView, sourced April 2011 http://www.dpi.nsw.gov.au/minerals/geological/online-services/minview
Seismic surveys	94.5km seismic survey, all within the Pilliga Forest	Eastern Star Gas. 2004. 2002 Pilliga East Seismic Survey Report, PEL238 Gunnedah Basin NSW
	180km seismic survey, all within the Pilliga Forest	Eastern Star Gas. May 2008. Review of Environmental Factors: 2008 Narrabri CSG Seismic Survey. PEL238, Gunnedah Basin NSW.
	120km seismic survey	Eastern Star Gas. November 2009. Review of Environmental Factors: 2009 PEL238 Seismic Survey - Coghill, Denison, Dewhurst South, and Edgeroi Prospects. PEL238, Gunnedah Basin NSW.
	87.6km seismic survey	Eastern Star Gas. 2011. Review of Environmental Factors: 2011 Seismic Survey. PEL 6, 238, 427 &428.
Gas and water gathering pipelines	32km buried gas flowline from Bibblewindi/Bohena to Wilga Park power station (20m wide)	Eastern Star Gas. May 2008. Narrabri Coal Seam Gas Utilisation Project: Part 3A Environmental Assessment. PEL238 Gunnedah Basin NSW.
	5.5km gas and water gathering system at the Bibblewindi West lateral pilot (12m wide)	Eastern Star Gas. March 2009. Narrabri Coal Seam Gas Project Review of Environmental Factors: Bibblewindi West Lateral Pilot Gas and Water Gathering System. PAL2 Gunnedah Basin NSW.
	3.5km gas and water gathering system at the Bibblewindi Nine pilot	Eastern Star Gas. May 2008. Narrabri Coal Seam Gas Utilisation Project: Part 3A Environmental Assessment. PEL238 Gunnedah Basin NSW.
	Estimated 5.7km gas and water gathering at the Bibblewindi lateral pilot	Based on maps provided in: Eastern Star Gas. March 2009. Narrabri Coal Seam Gas Project Review of Environmental Factors: Bibblewindi West Lateral Pilot Gas and Water Gathering System. PAL2 Gunnedah Basin NSW.
	1km gas gathering system at the Bohena production pilot	Eastern Star Gas. May 2008. Narrabri Coal Seam Gas Utilisation Project: Part 3A Environmental Assessment. PEL238

		Gunnedah Basin NSW.
	Estimated 7.4km water gathering system at Bohena	Based on maps provided in: Eastern Star Gas. March 2009. Narrabri Coal Seam Gas Project Review of Environmental Factors: Bibblewindi West Lateral Pilot Gas and Water Gathering System. PAL2 Gunnedah Basin NSW.
	1.7km Dewhurst gas and water gathering (10m)	Eastern Star Gas. July 2009. Review of Environmental Factors: 2009 Narrabri Coal Seam Gas Program Dewhurst 8 Lateral Production Pilot.
	Estimated 1.5km Tintsfield gas and water gathering (10m wide)	Eastern Star Gas. February 2010. Tintsfield Water Management Plan. Narrabri Coal Seam Gas Project PEL 238 Gunnedah Basin NSW.
Infrastructure	Wilga Park Power Station	Eastern Star Gas. May 2008. Narrabri Coal Seam Gas Utilisation Project: Part 3A Environmental Assessment. PEL238 Gunnedah Basin NSW.
	Reverse Osmosis Unit at Bibblewindi Treatment Works	Eastern Star Gas. December 2006. Bohena Coal Seam Gas Project Review of Environmental Factors: Water Treatment and Disposal Project. PEL238 Gunnedah Basin NSW.
	Proposed Reverse Osmosis Unit at Wilga Park Water Management Facility	Eastern Star Gas. February 2010. Tintsfield Water Management Plan. Narrabri Coal Seam Gas Project PEL 238 Gunnedah Basin NSW.
	Gas Compression Station at Bibblewindi Nine Vertical Production Pilot	Eastern Star Gas. December 2006. Bohena Coal Seam Gas Project Review of Environmental Factors: Water Treatment and Disposal Project. PEL238 Gunnedah Basin NSW.
	Proposed gas compression station at Bohena CSG Pilot	Eastern Star Gas. December 2006. Bohena Coal Seam Gas Project Review of Environmental Factors: Water Treatment and Disposal Project. PEL238 Gunnedah Basin NSW.
Water Impoundments	Estimated 2.5ha at three water impoundments at Bibblewindi Water Treatment Works	Eastern Star Gas. December 2006. Bohena Coal Seam Gas Project Review of Environmental Factors: Water Treatment and Disposal Project. PEL238 Gunnedah Basin NSW.
	Estimated 2ha across four evaporation ponds at Bohena 3, 6 and Bohena	Eastern Star Gas. March 2009. Narrabri Coal Seam Gas Project Review of Environmental Factors: Bibblewindi West Lateral Pilot Gas

	South 1 (x2)	and Water Gathering System. PAL2 Gunnedah Basin NSW.
	Estimated 2ha at two water impoundments at Dewhurst 8 Lateral Pilot	Eastern Star Gas. July 2009. Review of Environmental Factors: 2009 Narrabri Coal Seam Gas Program Dewhurst 8 Lateral Production Pilot.
	Four water impoundments at Wilga Park Water Management Facility: Production water 3.5ha Concentrate and buffer 3ha Treated water tank dam	Eastern Star Gas. February 2010. Tintsfield Water Management Plan. Narrabri Coal Seam Gas Project PEL 238 Gunnedah Basin NSW.
Pilot Production Fields	Bohena Production Pilot – Bohena 3, 7, 9	Eastern Star Gas. May 2008. Narrabri Coal Seam Gas Utilisation Project: Part 3A Environmental Assessment. PEL238 Gunnedah Basin NSW.
	Bibblewindi Nine Spot Vertical Production Pilot - Bibblewindi 1, 2, 3, 4, 5, 6, 7, 8, 9	Eastern Star Gas. May 2008. Narrabri Coal Seam Gas Utilisation Project: Part 3A Environmental Assessment. PEL238 Gunnedah Basin NSW.
	Bibblewindi Lateral Pilot or Lateral Production Pilot A - Bibblewindi 12, 13, 14, 15, 16, 17, 18H, 19H, 21H, 27H, 28H, 29H	Eastern Star Gas. July 2008. Review of Environmental Factors: Narrabri Coal Seam Gas Lateral Program, Lateral Production Pilot A. PAL2 Gunnedah Basin NSW.
	Bibblewindi West Trilateral Pilot - Bibblewindi 22, 23, 24, 25, 26H	Eastern Star Gas. March 2009. Narrabri Coal Seam Gas Project Review of Environmental Factors: Bibblewindi West Lateral Pilot Gas and Water Gathering System. PAL2 Gunnedah Basin NSW.
	Tintsfield CSG Pilot - Tintsfield 2H, 3H, 4H, 5, 6, 7	Eastern Star Gas. February 2010. Modification to the Tintsfield CSG Pilot, Supplementary Information. Narrabri Coal Seam Gas Project. PEL238 Gunnedah Basin NSW.
	Proposed Dewhurst 8 Lateral Production Pilot* - Dewhurst 13, 14, 15, 16H, 17H, 18H	Eastern Star Gas. July 2009. Review of Environmental Factors: 2009 Narrabri Coal Seam Gas Program Dewhurst 8 Lateral Production Pilot.
Water Discharge	Discharge of up to 1ML per day into Bohena Creek	Eastern Star Gas. December 2006. Bohena Coal Seam Gas Project Review of Environmental Factors: Water Treatment and Disposal Project. PEL238 Gunnedah Basin NSW.

		Eastern Star Gas. March 2009. Narrabri Coal Seam Gas Project Review of Environmental Factors: Bibblewindi West Lateral Pilot Gas and Water Gathering System. PAL2 Gunnedah Basin NSW.
Roads and tracks	Extensive roads and tracks to service all of the above	Generally not explicitly addressed or quantified as part of REFs or other instruments.

*These wells have been drilled but they are not as yet producing gas for consumption.

ATTACHMENT 2: Impacts of 'the action' on the environment

Overall footprint of disturbance on native vegetation

In order to derive an estimate of the total area of native vegetation that has been subject to disturbance as a result of 'the action', we have utilised a GIS to digitise a polygon around the outer extent of all components (apart from stand alone seismic surveys) within the forested area. This indicated that a total area of 44,700 hectares is the overall footprint for disturbance from 'the action'.

Escalation of fire risk

The presence of approximately 29 pilot production wells in the Pilliga Forest represents a major increase in vehicle use and traffic in the area, dramatically increasing ignition sources. Pilot production wells are checked regularly, and additional drilling frequently occurs for pressure control wells and build wells. The extraction of coal seam gas results in a highly flammable gas being brought to the surface, and experience throughout Australia has shown that coal seam gas production is prone to methane leakage from pipes, joints and wellheads. Local landholders have recently recorded a pipeline in the Pilliga Forest leaking methane. Therefore, we estimate that there has been a manifold increase in fire risk in the Pilliga Forest as a result of the 'the action'.

Heavy fragmentation of native vegetation

In order to derive an estimate of the total area of native vegetation that has been subject to heavy fragmentation as a result of 'the action', we have utilised a GIS to digitise a polygon around the outer extent of the five major pilot production fields in the forested area. This indicated that a total area of 1,700ha of vegetation has been heavily fragmented by 'the action' to date.

Weed and feral animal invasions

Local botanists have advised that there are numerous weeds that have taken over areas that have been disturbed by 'the action', particularly well-heads. Feral animal invasions will undoubtedly also be facilitated by increased fragmentation.

Direct clearing of native vegetation

A detailed analysis of the impacts of 'the action' on native vegetation, indicates that it has led to the estimated direct destruction of approximately 151ha in total within the Pilliga forest. The analysis on which this estimate is based is provided below, with each figure sourced directly from the relevant approval or from a Geographic Information System.

Clearing for production wells and coreholes

There are 66 coal seam gas wells within the core forested area of the Pilliga. We have extracted the dimensions of the well-heads from each relevant REF or approval for each well-head, where available. For wells where information is not available, we have utilised a default dimension of 80mx80m. The result of this analysis is as follows:

12 wellheads 0.8ha in size = 9.6ha
15 coreholes 0.25ha in size = 4ha
38 wellheads 0.64ha in size = 24.32ha
Total coal seam gas well clearing = 37.92ha

Clearing for pipelines, water and gas gathering systems

20m wide,15km gas flowline passing through vegetated areas to Wilga Park = 30ha
12m wide, 5.5km gas and water gathering at Bibblewindi West Pilot = 6.6ha
12m wide, 3.5km gas and water gathering at Bibblewindi Nine Pilot = 4.2ha
12m wide, 5.7km gas and water gathering at Bibblewindi Lateral Pilot = 6.8ha
12m wide, 1km gas and water gathering at Bohena Pilot = 1.2ha
10m wide, 1.7km gas and water gathering at Dewhurst Pilot = 1.7ha
Total pipelines and gathering systems = 50.5ha

Clearing for water impoundments

Three Bibblewindi impoundments = 2.5ha
Four Bohena impoundments = 2ha
Two Dewhurst impoundments = 2ha
Total water impoundments = 6.5 ha

Clearing for seismic surveys

2002 seismic survey, 4m width, estimated 32.5km vegetated[30] = 13ha
2008 seismic survey, 4m width, 27.5km vegetated = 11ha
2009 seismic survey, 4m width, 6km vegetated = 2.4ha
Total seismic survey clearance = 26.4ha

Additional vegetation destruction

Tree deaths due to saline water spillage/leadage = estimated from visual inspection 10 hectares
Excess clearing at Dewhurst 8 Lateral Pilot above the 10ha permitted in the REF = estimated from aerial photographs at least 5 hectares
Estimated additional roads and tracks = 15 hectares
Total additional direct vegetation impacts = 30 hectares

Artificial saline watering points and drill ponds

There are 13 major water impoundments, many of which occur within the Pilliga Forest. Creek systems in the Pilliga are ephemeral, and wildlife are known to flock to artificial surface watering points to drink due to the paucity of natural surface during most seasons. There have been records by local landholders of dead kangaroos adjacent to saline ponds in the Pilliga Forest. The water impoundments are not covered, and are not therefore protected from use by bats and

30 Based on analysis of digitised map in GIS, and comparison with road data, it is estimated that 36.6km out of a total of 94.5km required vegetation clearance and was not located along roads.

birds. There are also drill ponds in the Pilliga Forest from which wildlife are not adequately excluded by fences.

Introduction of sources of pollution

The action has introduced numerous sources of pollution through the extensive use of chemicals and the handling and disposal of produced water

There have been recorded overflows of drill ponds in the Pilliga Forest during flood events and recorded chemical spills, as well as extensive saline water leakage leading to tree deaths.

Direct alteration of the ecology of a creek system for up to 22km

The discharge of treated produced water into the Bohena Creek was estimated in 2006 as amounting to up to 1ML per day[31]. Since that time substantially more pilot production wells have come on line, but there is no updated figure available on the volume of water that is being discharged into the creek.

The original modelling and sensitivity analysis conducted by Eastern Star Gas in 2006[32] indicated that 1ML per day of treated water discharge per day could lead to up to 22km of the creek system being subject to changed flow regimes (ie permanent saturation).

31 Eastern Star Gas 2006
32 Ibid