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20 February 2014

Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: Mike Young

Dear Mike,

RE: MURRAY-DARLING BASIN OPERATIONS MODIFICATION

Cristal Mining Australia Limited (Cristal Mining) owns and operates mineral sands mining and processing operations in the Murray Darling Basin region of western New South Wales (NSW) that are collectively known as the Murray-Darling Basin Operations (MDBO). The MDBO include:

- Broken Hill Mineral Separation Plant (MSP) – approved under Part 4 of the NSW *Environmental Planning & Assessment Act, 1979* (EP&A Act) in 2002 (Development Consent DA 345-11-01);
- Ginkgo Mine – approved under Part 4 of the EP&A Act in 2002 (Development Consent DA 251-09-01); and
- Snapper Mine – approved under Part 3A of the EP&A Act in 2007 (Project Approval 06_0168).

Cristal Mining prepared the *Murray-Darling Basin Operations Modification Environmental Assessment* (the EA) to support three modification applications under Section 75W of the EP&A Act for proposed changes to the MDBO to allow for the integration of the proposed Atlas-Campaspe Mineral Sands Project (SSD-5012) with the MDBO.

Responses to Submissions

The EA was placed on public exhibition by the NSW Department of Planning and Infrastructure (DP&I) from 20 November 2013 to 13 December 2013. During this period, government agencies, members of the public and other relevant stakeholders were invited to provide submissions on the EA to the DP&I.

A total of six submissions were received for the MDBO Modification, including:

- NSW Environment Protection Authority;
- NSW Roads and Maritime Services;
- NSW Department of Primary Industries – Office of Water;
- NSW Office of Environment and Heritage;
- NSW Division of Resources and Energy within the NSW Department of Trade and Investment, Regional Infrastructure and Services; and
- Broken Hill City Council.

No submissions were received from any members of the public.

No submissions objecting to the MDBO Modification were received.

It is understood that the DP&I has not received a submission from the Wentworth Shire Council.

Cristal Mining's responses to the submissions received to date are presented in Attachment 1.

MSP Process Fuel Types Review

The MDBO Modification proposed the use of the following process fuel types at the MSP (described in Section 3.1.5 of the EA):

- Liquefied Petroleum Gas (LPG) – leucoxene, ilmenite, rutile and zircon dryers.
- Brown Coal Briquettes – ilmenite kiln/roaster.

Since the submission of the EA, Cristal Mining has been reviewing the proposed process fuel type for the leucoxene, ilmenite, rutile and zircon dryers (i.e. LPG) and preliminary findings indicate that Liquefied Natural Gas (LNG) may be a viable alternative to LPG.

As the process fuel type review is not yet complete, Cristal Mining is seeking approval to use either LPG or LNG as the process fuel type for the leucoxene, ilmenite, rutile and zircon dryers at the MSP.

No change to the process fuel type for the ilmenite kiln/roaster (i.e. brown coal briquettes) is being considered in the review of process fuel types.

Environmental Review

The MSP Air Quality Assessment prepared for the MDBO Modification (Appendix A of the EA) considered the use of LPG to fuel the leucoxene, ilmenite, rutile and zircon dryers and concluded the following (Pacific Environment, 2013):

- The estimated particulate matter less than 10 microns (PM_{10}) and oxides of nitrogen (NO_x) in-stack concentrations for all stacks would comply with the relevant limits in the MSP Environment Protection Licence and the *Protection of the Environment Operations (Clean Air) Regulation, 2010*.
- There were no predicted Project-only or cumulative exceedances of relevant Environment Protection Authority PM_{10} and nitrogen dioxide (NO_2) criteria at any of the nearby receptors.

Cristal Mining commissioned Pacific Environment to review the potential air quality impacts associated with the proposed use of LNG as a process fuel for the leucoxene, ilmenite, rutile and zircon dryers at the MSP (Attachment 2). Pacific Environment concluded (emphasis added):

> *As a result of the lower LNG emission factors and fuel consumption, the estimated PM_{10} and NO_x emissions from the combustion of LNG are lower than those for LPG. Similarly, the derived in-stack PM_{10} and NO_x concentrations from LNG combustion would also be lower than those for LPG.*
>
> *Given the above, the conclusions in the AQA for the MDBO Modification (Pacific Environment, 2013) would not change should LNG replace LPG as the fuel used in the dryers at the MSP.*

Cristal Mining requests approval to use either LPG or LNG as the process fuel type for the leucoxene, ilmenite, rutile and zircon dryers at the MSP.

Modified Ginkgo and Snapper Mines Biodiversity Offset Boundaries

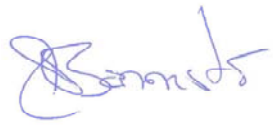
Cristal Mining lodged Change of Lease Purpose applications with the Crown Lands Directorate (Catchment and Lands Division) last year to achieve the long-term security of the Ginkgo and Snapper Mines' biodiversity offsets (as outlined in Cristal Mining's letter to the DP&I on 2 December 2013). During this process, the Crown Lands Directorate (Catchment and Lands Division) has requested that the boundaries of the biodiversity offsets be modified slightly to reflect boundaries of the relevant Western Lands Leases (i.e. WLL 913 and WLL 4087).

The modified biodiversity offset boundaries are provided in Attachment 3.

Cristal Mining requests that the modified biodiversity offset boundaries are incorporated in the modified Ginkgo Mine Development Consent DA 251-09-01 and Snapper Mine Project Approval 06_0168.

Please do not hesitate to contact me on (07) 3010 9363 if you have any queries.

Yours sincerely,



Joe Bannister
Development Manager
Cristal Mining Australia Limited

ATTACHMENT 1

RESPONSES TO SUBMISSIONS

Table A1-1
Responses to Submissions

<table>
<tr><th>Number</th><th>Individual/ Organisation</th><th>Submission</th><th>Cristal Mining Response</th></tr>
<tr><td>EPA-1</td><td>Environment Protection Authority (EPA)</td><td>We have reviewed the information provided and determined that <u>we can support the proposed modifications</u> ….</td><td>Acknowledged.</td></tr>
<tr><td>EPA-2</td><td>EPA</td><td>Where modified development consents for the mineral separation plant and two (2) associated mineral sand mines is granted an application for a variation to Environment Protection Licence No's 12314, 12264 and 12799 held by Cristal Mining will be required to be submitted to the EPA prior to any construction work or activities associated with the proposal.</td><td>Cristal Mining Australia Limited (Cristal Mining) will submit variation applications to the EPA for the Ginkgo Mine, Snapper Mine and Broken Hill Mineral Separation Plant (the MSP) Environment Protection Licences.</td></tr>
<tr><td>EPA-3</td><td>EPA</td><td>The EPA proposed the following draft conditions:
Operational
…
Processing of mineral sands and associated activities must not occur post 31 December 2032.
The premises must not process more than 1,200,000 tonnes of mineral sand in any 12 month period.</td><td>Acknowledged.</td></tr>
<tr><td>EPA-4</td><td>EPA</td><td>The EPA proposed the following draft conditions relating to noise for the MSP:
<u>Noise mitigation measures</u>
• Upon receiving a written request for noise mitigation measures from the owner of the property described as 'R3 – Smith' in Appendix B (MSP Noise Assessment) … the applicant must arrange the commencement of the physical implementation of noise mitigation measures at that property within 3 months. …</td><td>Acknowledged.
Cristal Mining cannot determine the timing of the commencement of the implementation of noise mitigation works at a private receiver. To respect the private landholder decision-making role with respect to whether and when mitigation works should occur, Cristal Mining proposes that within 3 months of the private landholder requesting the implementation noise mitigation measures, Cristal Mining would provide an offer for the implementation of the noise mitigation measures.</td></tr>
<tr><td></td><td></td><td><u>Noise limits</u>
• The applicant must ensure that noise associated with the development does not exceed the noise limits at surrounding residential premises detailed in the Table below.
<table><tr><th>Location</th><th>Day / Evening / Night (excluding temperature inversions) dB(A) LAeq (15 minute)</th><th>Day / Evening / Night with temperature inversion dB(A) LAeq (15 minute)</th></tr><tr><td>R3 – Smith</td><td>35</td><td>39</td></tr><tr><td>All other residential premises</td><td>35</td><td>35</td></tr></table></td><td>The noise limits recommended by the EPA are consistent with the noise predictions presented in Appendix B to the Murray-Darling Basin Operations Modification Environmental Assessment (the EA).
It is expected that, consistent with other contemporary development consents/project approvals, the noise limits in any modified Development Consent for the MSP would specify consented noise limits for day, evening and night at residential receiver locations under all assessable meteorological conditions (i.e. as opposed to separate noise limits for various meteorological conditions).</td></tr>
</table>

Table A1-1 (Continued)
Responses to Submissions

Number	Individual/ Organisation	Submission	Cristal Mining Response
EPA-4 (continued)	EPA	• *Compliance noise monitoring must be undertaken at the location known as 'R3 – Smith' within 12 months after the commissioning of all approved development at the Broken Hill mineral separation plant.*	Acknowledged.
		Operating noise conditions • *All external auxiliary equipment identified as being noise generating must be acoustically treated with cladding or be enclosed.* • *The approved zircon, rutile and ilmenite kiln/roaster circuits must be constructed so as to be housed within a building.* • *Any front end loader operating in the night time period must be fitted with a noise suppression kit.*	As described in Section 4.3.2 of the EA, the front end loader operating during the night-time would be retrofitted with a noise suppression kit once the MSP begins to receive trains from the Atlas-Campaspe Mineral Sands Project (i.e. as this is when the potential change in noise emissions at the MSP would occur in comparison to the current operations).
		Construction noise • *All construction work at or associated with the development must only be conducted between the following hours:* *7.00am to 6.00pm Monday to Friday, and* *8.00am to 1.00pm Saturdays.*	Acknowledged.
EPA-5	EPA	The EPA proposed the following draft condition relating to the disposal of MSP process waste at the Ginkgo and Snapper Mines: *Waste able to be disposed;* *1. Waste generated outside the premises from the processing of mineral concentrates produced at the Snapper Mine, the Ginkgo Mine or the Atlas-Campaspe Mine, AND* *2. Waste that is assessed as General Solid Waste (non-putrescible), following the technical procedure outline in Waste Classification Guidelines, Part 1:Classifying Waste or that is specified as General Solid Waste (non-putrescible), in Schedule 1 of the Protection of the Environment Operations Act 1997; OR* *3. Waste that is assessed as hazardous waste on the basis it contains radioactive substances and except for this radioactive component would be classified as General Solid Waste (non-putrescible), following the technical procedure outline in Waste Classification Guidelines, Part 1:Classifying Waste.* *Note: Waste permitted to be disposed at the premises must comply with item 1 and at least one other item in this at either item 2 or 3.*	Acknowledged.

Table A1-1 (Continued)
Responses to Submissions

Number	Individual/ Organisation	Submission	Cristal Mining Response
RMS-1	Roads and Maritime Services	*Given the above, Roads and Maritime will not object to the proposed development subject to the following condition:* • *Heavy vehicle movements are to be kept to a minimum. Process waste for transport by road from the MSP, is to be transported by the heavy vehicles otherwise transporting mineral and heavy mineral concentrates, as backloads on return trips.* *All other recommendation relating to the operation of Ginkgo Mineral Sands Mine, Snapper Mine and the Broken Hill MSP provided by Roads and Maritime in previous submission still stand and should be retained in modified consents issued.*	Acknowledged. As described in Section 4.6.2 of the EA, the Modification would not result in changes to the frequency of approved mineral concentrate/HMC transport movements or approved MSP process waste transport movements.
DPI-1	Department of Primary Industries (DPI) - Office of Water	*… It is recommended any requirement for additional water sources be confirmed with the relevant suppliers and to ensure it is permissible within any licence conditions.*	Acknowledged. The Modification would not result in an increase in the approved MSP water demand and or a change in the MSP water supply (i.e. the MSP water supply would continue to be sourced from the Wills Street Waste Water Treatment Plant and the BHCC mains water supply) (Section 3.1.9 of the EA).
DPI-2	DPI – Office of Water	*It is recommended a condition of approval be included to review the existing management plans related to waste management impacts at the relevant sites.*	Acknowledged. The MSP Waste Management Plan, Transport of Hazardous Materials Plan, Ginkgo Mine Landfill Management Plan and Snapper Mine Waste Management Plan would be reviewed and, if necessary, revised for the Modification (Sections 4.4.2 and 5.2.2 of the EA).
OEH-1	Office of Environment and Heritage	*OEH has reviewed the Environmental Assessment and determined that we are able to support the Modification to increase processing capacity at the Broken Hill Mineral Separation Plant and increase waste disposal at the existing approved Ginkgo and Snapper Mineral Sand Mines and proposed Atlas-Campaspe Miner Sand Mine (SSD-5012).*	Acknowledged.
DRE-1	Division of Resources and Energy within the NSW Department of Trade and Investment, Regional Infrastructure and Services	*… there will be no comment from the DTIRIS Division of Resources & Energy.*	Acknowledged.
BHCC-1	Broken Hill City Council	*… You are advised that Broken Hill City Council has reviewed the documentation and determined that there will be minimal impacts on the City of Broken Hill Local Government Area and as such will not be making a submission. …*	Acknowledged.

ATTACHMENT 2

REVIEW OF POTENTIAL AIR QUALITY IMPACTS

Pacific Environment Limited

Consulting • Technologies • Monitoring • Toxicology

Cristal Mining Australia Limited
Joe Bannister,
Development Manager

11 February 2014

Re: Murray-Darling Basin Operations Modification – MSP Process Fuel

1 BACKGROUND

Cristal Mining Australia Limited (Cristal Mining) owns and operates mineral sands mining and processing operations in the Murray Darling Basin region of western New South Wales (NSW) that are collectively known as the Murray-Darling Basin Operations (MDBO). The MDBO include:

- **Broken Hill Mineral Separation Plant** (MSP) – approved under Part 4 of the NSW *Environmental Planning & Assessment Act, 1979* (EP&A Act) in 2002 (Development Consent DA 345-11-01);
- **Ginkgo Mine** – approved under Part 4 of the EP&A Act in 2002 (Development Consent DA 251-09-01); and
- **Snapper Mine** – approved under Part 3A of the EP&A Act in 2007 (Project Approval 06_0168).

Cristal Mining submitted the Murray-Darling Basin Operations Modification Environmental Assessment (the EA) in November 2013 to support three modification applications under Section 75W of the EP&A Act for proposed changes to the MDBO (the MDBO Modification).

An Air Quality Assessment (AQA) was completed by **Pacific Environment (2013)** that assessed the potential MSP air quality impacts associated with the MDBO modification. The AQA concluded that there would be no predicted Project-only or cumulative exceedances of relevant NSW Environmental Protection Authority (EPA) particulate matter less than 10 microns (PM_{10}) or nitrogen dioxide (NO_2) air quality criteria at any of the nearby receptors. The estimated in-stack PM_{10} and oxides of nitrogen (NO_x concentrations for all stacks also complied with the relevant limits in the MSP Environmental Protection Licence and the *Protection of the Environment Operations (Clean Air) Regulation, 2010*.

Since the submission of the EA, Cristal Mining has reviewed the proposed process fuel type for the leucoxene, ilmenite, rutile and zircon dryers and preliminary findings indicate that Liquefied Natural Gas (LNG) may be a viable alternative to the previously assessed Liquefied Petroleum Gas (LPG). As a result of the findings, Cristal Mining is seeking approval to use either LPG or LNG as the process fuel type for the leucoxene, ilmenite, rutile and zircon dryers.

This letter reviews the conclusions of the AQA with consideration of the proposed use of LNG as a process fuel at the MSP.

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North Sydney, NSW 2060

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2 COMPARISON OF ESTIMATED EMISSIONS

Emissions of PM_{10} and NO_X from LNG combustion have been compared with emissions from LPG combustion (as presented in **Pacific Environment, 2013**) (**Table 1**).

Table 1: Comparison of Emission Factors for the Dryer Stacks using LPG and LNG Process Fuel

Stack	LPG Combustion Rate (tpa)	Energy (GJ/annum) Based on LPG Combustion Rate[1]	LNG Combustion Rate (tpa)[2]	Emission Factor			
				LPG (Propane) (kg/t)		LNG (kg/t)	
				NO_x	PM_{10}	NO_x	PM_{10}
Leucoxene Dryer	1,512	70,006	1,409	4.5	0.3	3.7	0.2
Ilmenite Dryer	4,158	192,515	3,874	4.5	0.3	3.7	0.2
Zircon Dryer	328	15,186	306	4.5	0.3	3.7	0.2
Rutile Dryer	302	13,983	281	4.5	0.3	3.7	0.2

Note: 1 Calculated based on an LPG energy content of 46.3 GJ/t ((LHV)

Note 2: Calculated based on an LNG energy content of 49.7 GJ/t (LHV)

The emission factors for LPG (industrial propane) and LNG (as natural gas, tangential fired) have been sourced from the *National Pollutant Inventory Emission Estimation Techniques (EET) Manual for Combustion in Boilers* (**Department of the Environment, Water, Heritage and the Arts** [**DEWHAB, 2010**]). **Table 1** shows that the emission factors for LNG are lower than those used for LPG.

The required fuel consumption for LPG and LNG is also presented in **Table 1**. LNG consumption is estimated based on the quantity required to achieve an equivalent energy to the approved LPG consumption rate. Based on LNG's higher energy content (Lower Heating Value [LHV]), less LNG fuel is required to produce the same energy as LPG (i.e. less LNG would be consumed compared to LPG).

As a result of the lower LNG emission factors and fuel consumption, the estimated PM_{10} and NO_x emissions from the combustion of LNG are lower than those for LPG (refer **Table 2).** Similarly, the derived in-stack PM_{10} and NO_x concentrations from LNG combustion are lower than those for LPG (refer **Table 2**).

Table 2: Comparison of Emission Rates and Derived in-Stack Concentrations for the Dryer Stacks using LPG and LNG Process Fuel

Stack	Emission Rate (kg/yr)				Emission Rate (g/s)				Derived In-Stack Concentration (mg/Nm³)			
	LPG		LNG		LPG		LNG		LPG		LNG	
	NO_x	PM_{10}	NO_x	PM_{10}	NO_x	PM_{10}	NO_x	PM_{10}	NO_x	PM_{10}	NO_x	PM_{10}
Leucoxene Dryer	6,744	393	5,184	225	0.21	0.01	0.16	0.01	107	6	82	4
Ilmenite Dryer	18,545	1,081	14,255	620	0.59	0.03	0.45	0.02	86	5	66	3
Zircon Dryer	1,463	85	1,124	49	0.05	0.003	0.04	0.002	40	2	31	1
Rutile Dryer	1,347	79	1,035	45	0.04	0.002	0.03	0.001	15	1	11	1

3 CONCLUSIONS

This letter reviews the conclusions of the AQA for the MDBO Modification (**Pacific Environment, 2013**) with consideration of the proposed use of LNG as a process fuel at the MSP. The AQA for the MDBO Modification (**Pacific Environment, 2013**) concluded that:

- There were no predicted Project-only or cumulative exceedances of relevant EPA PM_{10} and NO_2 criteria at any of the nearby receptors.
- The estimated in-stack PM_{10} and NO_x concentrations for all stacks would comply with the relevant limits in the MSP Environmental Protection Licence and the *Protection of the Environment Operations (Clean Air) Regulation, 2010*.

As a result of the lower LNG emission factors and fuel consumption, the estimated PM_{10} and NO_x emissions from the combustion of LNG are lower than those for LPG. Similarly, the derived in-stack PM_{10} and NO_x concentrations from LNG combustion would also be lower than those for LPG.

Given the above, the conclusions in the AQA for the MDBO Modification (**Pacific Environment, 2013**) would not change should LNG replace LPG as the fuel used in the dryers at the MSP.

4 REFERENCES

Department of the Environment, Water, Heritage and the Arts (2010). "National Pollutant Inventory Emission Estimation Technique Manual for Combustion in Boilers". Version 3.2.

Pacific Environment (2013) "Murray-Darling Basin Operations Modification – Broken Hill Mineral Separation Plant Air Quality Assessment" Prepared for Cristal Mining Australia Limited by Pacific Environment, November 2013.

ATTACHMENT 3

MODIFIED GINKGO AND SNAPPER MINE
BIODIVERSITY OFFSETS

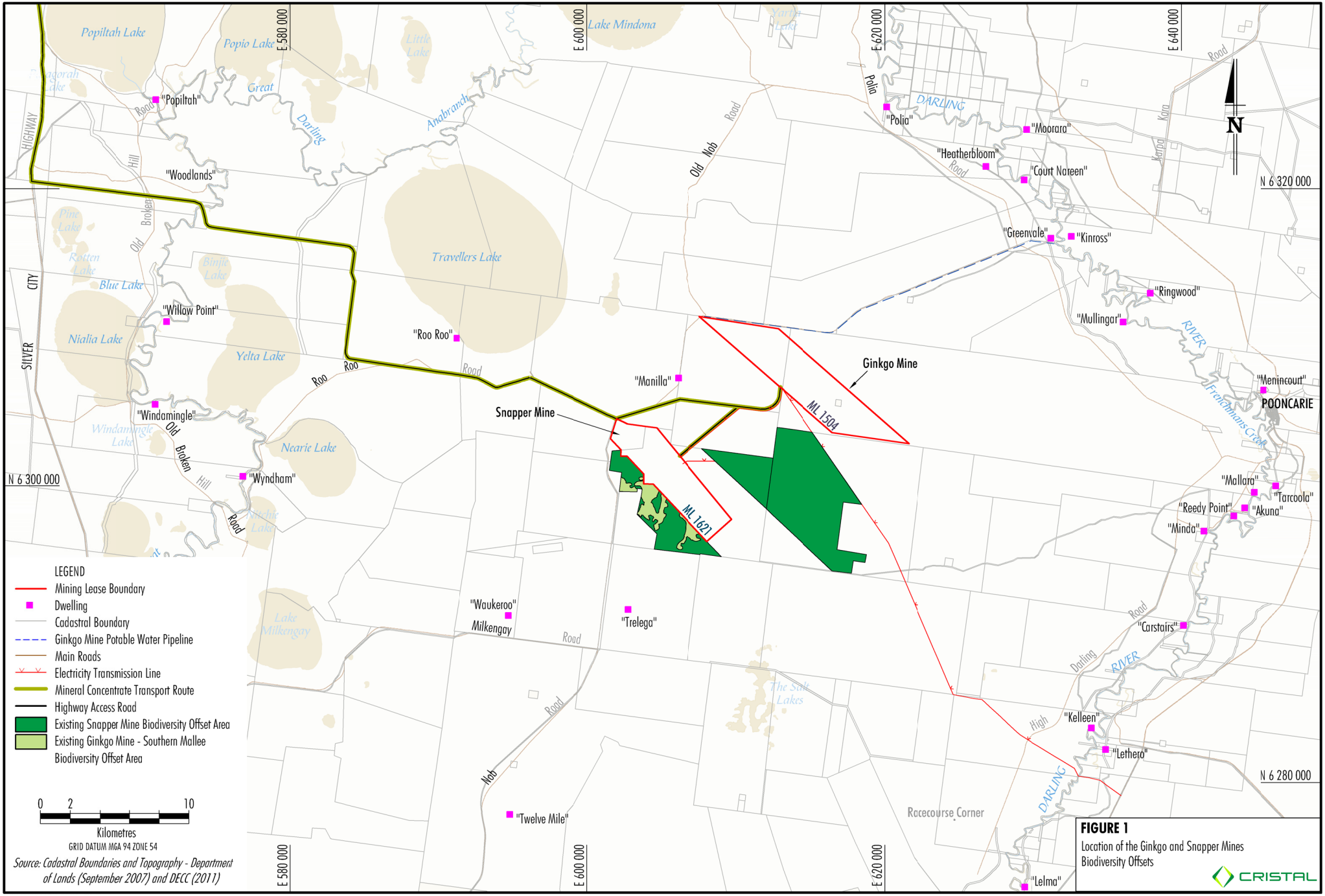

FIGURE 1
Location of the Ginkgo and Snapper Mines Biodiversity Offsets

CRISTAL

CMA-13-03 BOM_ WKDwg101C