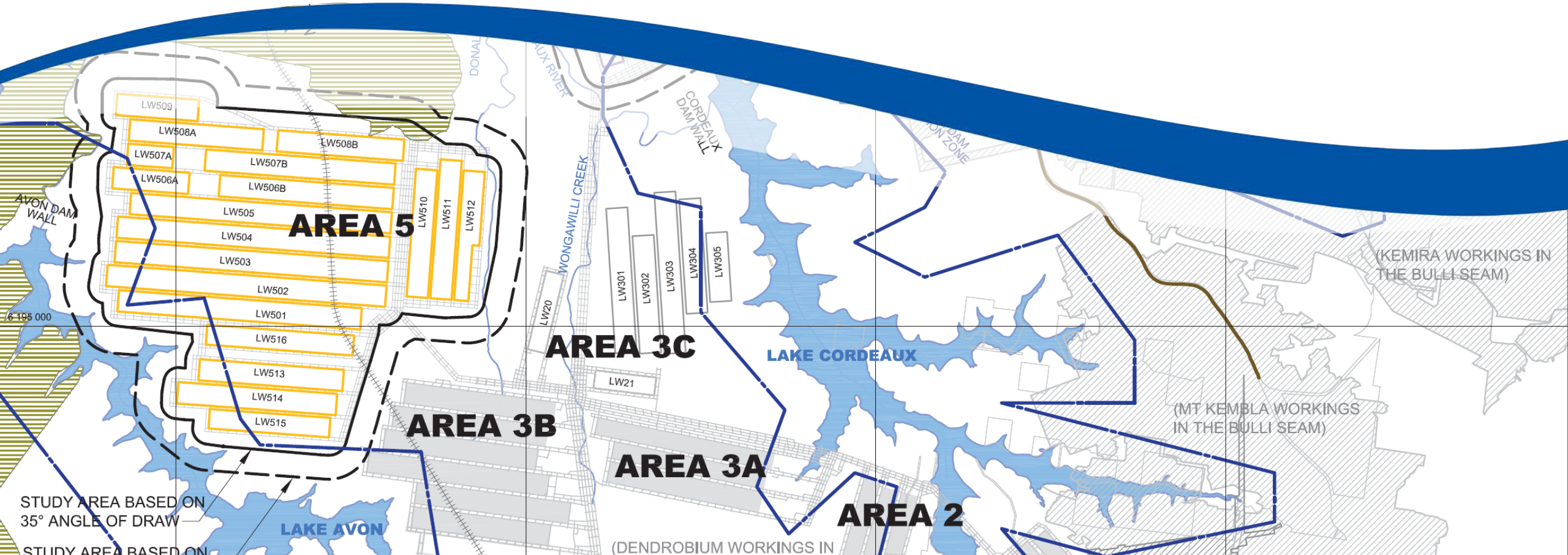
# Dendrobium Extension Project

## Residual Questions



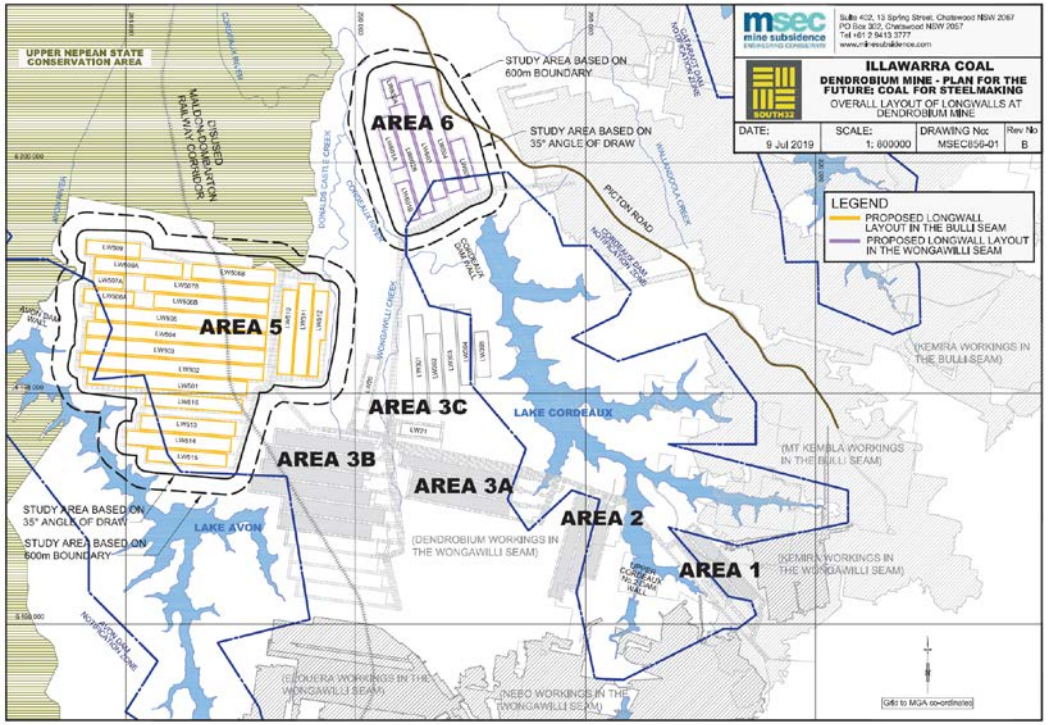
# Structure

## Context

- WaterNSW statutory responsibilities
- Mining Principles
- Previous submissions

## 8 residual questions

- Water quantity
- Water quality
- Stream impacts
- Swamps



# Context

## Our role

To protect the catchments that supply water to around 5 million people

## Water NSW Act 2014

- **Principal objective:**

  "*ensure that declared catchment areas … are managed and protected so as to promote water quality … and the protection of the environment*" (s. 6)

- **Listed function:**

  "*protect and enhance the quality and quantity of water in declared catchment areas*" (s. 7)

- **Special Areas:**

  "*maintaining the ecological integrity*" (s. 47)

## Sydney Drinking Water Catchment SEPP

- **NorBE test:**

  "*A consent authority must not grant consent … unless it is satisfied that the carrying out of the proposed development would have a neutral or beneficial effect on water quality.*"

# Context

## Mining Principles (new)

1. **Water supply infrastructure** – mining must not result in the integrity of water supply infrastructure being compromised
2. **Water quantity:**
   - leakage from reservoirs as a result of mining activities must be avoided, and
   - regional depressurisation and diversion of surface water flows must be avoided and minimised by adopting a precautionary approach to mine design
3. **Water quality** – all mining activities must have a neutral or beneficial effect on water quality
4. **Ecological integrity** – the ecological integrity of the Special Areas must be maintained and protected

- **Background point**
  - The Mining Principles were updated following the final report of the IEPMC, because of the significant improvements in scientific understanding that the reports captured

# Context

## Previous submissions

- **3 submissions**: 20/9/19, 6/3/20 and 17/9/20
- **Key issues**:

  Water quantity

  – predicted up to 3.3 GL/year catchment water loss

  – during drought, 3.9% and 2.9% reduction in Avon Reservoir and Pheasant's Nest Weir catchments

  Water quality

  – extensive stream fracturing (9 major watercourses and over 100 tributaries) will mobilise metals

  Swamps

  – major impacts to 25 endangered swamps

  Project design

  – South32 has not sufficiently considered alternative mine designs that would reduce height of cracking

  Subsidence

  – higher than recorded figures at any other mine in the Southern Coalfield

- **Background points:**

  New policy settings (since last mining DA in catchment)

  – Surface water licences (Aquifer Interference Policy 2012)

  – NorBE test (SDWC SEPP 2011)

  – Swamps protection (*Biodiversity Conservation Act 2016* and offsets policy)

  Improved scientific understanding (captured in IEPMC reports and following a range of other work)

  – methods to predict height of fracturing

  – the potential for height of fracturing to extend to the surface and surface water losses

  – the increased likelihood of swamp impacts overlying longwall mining

  – the difficulty of remediating mining-related damage to watercourses and swamps

  – the extent of non-conventional subsidence impacts e.g. valley closure and far-field movements

# Overview – 8 questions

## Water quantity

1. Are the predicted catchment water losses accurate and reliable?
2. What are the catchment water losses post-mining?
3. Are the likely catchment water losses considered acceptable?
4. Can catchment water losses be avoided or minimised?
5. Is there a viable mine plan with reduced catchment impacts?

## Water quality

6. What are the post-mining impacts on water quality?

## Stream impacts

7. What streams should be considered ‘significant’?

## Swamps

8. What is the worst case scenario for swamps?

# 1. Are the predicted catchment water losses accurate and reliable?

## Key issue

- There are still outstanding questions about whether the groundwater model provides accurate worst-case predictions, particularly in relation to the proportion of surface water in predicted inflows

## Explanation

- Proportion of surface water in predicted mine water inflows – discrepancy between IEP's 40-50% estimate and South32's 'conservative' 25%
- This would almost double surface water losses – IAP has not commented on this
- DPIE Water (16/9/20) also requested further "*pre-approval*" information on more conservative model runs

## Notes

- **Dr Col Mackie**: in 2016, calculated that the proportion of surface water in Dendrobium's mine inflows between 2010 and 2015 was approximately 44%
- **IEPMC**: estimated that 40 to 50% of previous inflows to mine workings is from surface water
- **IAP**: *"It is not possible, at this stage, to be comfortable that the worst-case losses from the surface water regime have been identified."*
- **DPIE Water**: "*This is particularly important to surface water, which cannot be assessed by the groundwater model due to scale, precision, and accuracy considerations*."
- **Historical context**: South32's model has substantially increased its predictions of surface water losses at the existing mine, from 272 ML/year in 2014, to 330 ML/year in 2016, to 683 ML/year in 2018, to 1,372 ML/year in 2019.

# 2. What are the catchment water losses post-mining?

## Key issue

- The IAP has drawn attention to a 'new' major issue re. whether the mine can be sealed + fully recharged, hence whether surface water losses will eventually cease

## Explanation

- 2 main concerns if the mine can't be sealed:
  - 'Permanent' loss of catchment water, which is unacceptable to WaterNSW
  - Insufficient offset / compensation package

## Notes

- **IAP**: "*Based on the Panel's review of the EIS and discussions with the Proponent, these types of issues are yet to be fully investigated and assessed. Therefore, the Panel cannot form a view on the impacts and consequences associated with both the option to seal and flood Dendrobium Mine and the option to allow water to continue to discharge freely from the mine at seam level.*"
- WaterNSW considers that further information is required from South32:
  - If yes (mine can be sealed), then the acceptability of losses and appropriateness of offsets can be assessed
  - If no (mine can't be sealed), then further assessment of total losses and recalculation of offset package is required

# 3. Are the likely catchment water losses considered acceptable?

## Key issue

- WaterNSW has provided in-principle support for 'offsets' based on 'avoid, minimise, offset' hierarchy
- WaterNSW considers that project losses (as currently proposed) from the catchment are unacceptable, and that they could be avoided or minimised

## Explanation

- WaterNSW considers predicted losses of up to 3.3GL/year to be unacceptable, particularly taking into account existing losses
- In drought, 3.9% reduction in Avon Reservoir catchment and 2.9% in Pheasant's Nest catchments
- Also needs to be viewed in context of historical and cumulative losses
  - Originally approved on basis of no losses
  - This project would more than double
  - Mine would account over 75% of all mining-related losses in the Special Areas

## Notes

- **Cumulative**
  - **IEPMC**: current Special Area losses are 8ML/day, with 5ML/day from Dendrobium alone (which South32 disputes)
  - **Dendrobium proportion**: project contributes extra 5ML/day i.e. Dendrobium would cause 10 of the 13 ML/day losses

- **Drought**
  - **IAP**: "*questions the conclusion* "This represents a likely indiscernible impact to Lake Avon inflow*", since 3.9% may well be discernible under dry conditions. The significance of losses in extreme drought conditions that are relevant to security yield is not considered in this report."*
  - **IESC**: "*While the estimated losses are small relative to the volume of reservoir inflows under median rainfall conditions, it is likely that these losses are proportionally more significant under the 10th percentile (dry) rainfall conditions. This requires further discussion considering that most of the sub-catchments within Area 5 are predicted to cease flowing under the 10th percentile (dry) rainfall conditions*"

# 4. Can catchment water losses be avoided or minimised?

## Key issue

- Narrower longwalls (and/or lower mining height) could prevent 'connective cracking', which has the following benefits:
    1. reduces catchment losses
    2. reduce stream impacts, and
    3. improves chance of remediation success

## Explanation

- WaterNSW agrees that surface cracking is likely to occur even with narrower longwalls
- However, there is still an opportunity to reduce the height of free drainage and establish a 'constrained zone' between 'surface cracking zone' and 'fractured zone' (above coal seam)
- Further, there are likely significant benefits to streams and potential remediation

## Notes

- **IEPMC:**
    - **"***A considerable reduction in short term and long term environmental impacts may be realised by preventing the height of free drainage in the Special Areas from intersecting the surface either directly or indirectly by interaction with surface fracture networks."*
    - *"the Panel considers that it would be wise to adopt a precautionary approach and base mine design on preventing the height of free drainage in the Special Areas from extending to the surface or interacting with surface fracture networks."*
- **IAP:** *"While the same type of impact (cracking) due to conventional subsidence may occur as longwall panel widths become narrower, the intensity of the impacts (fracturing width, frequency and depth) can be expected to reduce. This may have important implications for the volume of surface water that can be diverted into the subsurface, and into the mine through connected fractures."*

# 4. Can catchment water losses be avoided or minimised?

# 5. Is there a viable mine plan with reduced catchment impacts?

## Key issue

- Key assumption underlying potential economic impacts is that there is no other viable mine plan
- But is there a viable mine plan with narrower panels (and/or a lower mining height) that prevents connective cracking?

## Explanation

- South32 has refused to present or assess alternative mine plans with narrower panels – "*there is no definitive methodology to estimate surface water losses at alternative panel widths*" and "*estimating surface water losses for panel widths less than 305 m will be inherently uncertain*"
- Basic analysis of Tammetta formula indicates that a constrained zone of 50m+ can be retained with variable longwalls ranging from 200-275m in width (approx. half at 250-275m and the other half at 200-250m)

## Notes

**IAP***:*

- *"The Panel has serious reservations as to whether the mine layout put forward as the Maximum Case constitutes a realistic point of reference for a contemporary mining approval …*
- *The Base Case may be more realistic of the upper bound today for a mine layout in the Sydney Water Catchment than of an economically viable layout that takes ecological and mine closure implications into account.*
- *The Minimum Case is not particularly helpful as it is not based on objective or agreed environmental targets and is not related to an economic appraisal."*

**IAP:**

- *"The assumption of full connection of fractures to surface above the mine over all panels is stated to be conservative for both groundwater and surface water impacts. It represents, in principle, a worst case for groundwater inflows to the mine workings.*
- *This may be true but it doesn't allow for sensitivity of mine inflows to mine geometry (longwall width and extraction height) to be explored. "*

# 5. Is there a viable mine plan with reduced catchment impacts?

EIS

RTS

# 6. What are the post-mining impacts on water quality?

## Key issue

- Residual uncertainty about post-mining groundwater repressurisation and discharge of contaminated groundwater
- Therefore, WaterNSW maintains that NorBE has not (yet) been adequately demonstrated

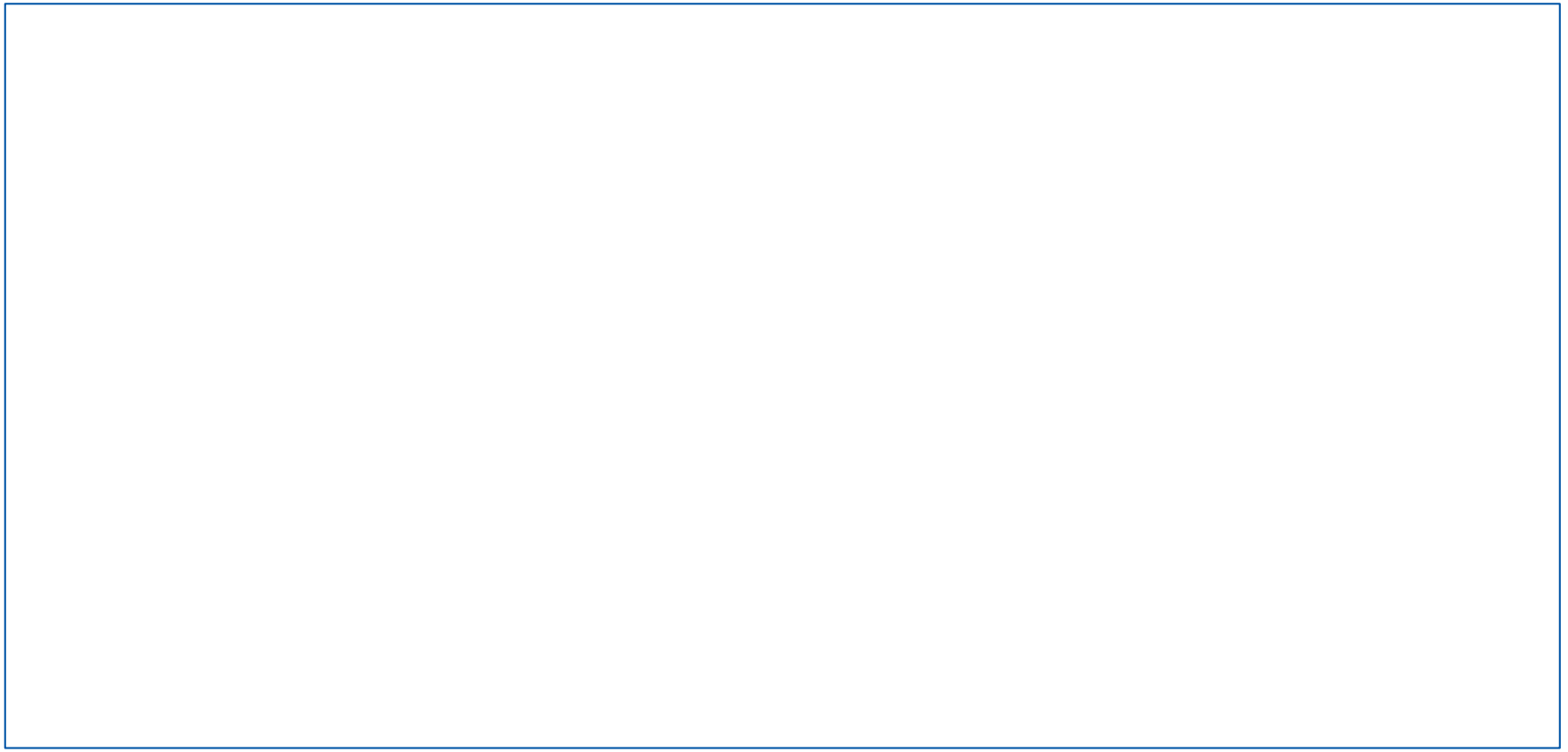
## Explanation

- Legal questions on clause 11A of the SDWC SEPP:
  - what are 'similar conditions' for continuing development (noting original approval granted on basis of zero impacts)
  - should the existing conditions simply be transferred across, or can additional/similar conditions be inserted for new mining area (e.g. similar defined points on key watercourses)
  - is the drafting of 'similar conditions' sufficient in itself (i.e. no assessment of actual water quality), or is an assessment on whether those conditions can be met required?
- Factual question about whether project's additional post-mining outflows may be the 'tipping point' for a 'negligible impact' test in the reservoir (or at any other defined point)

## Notes

- **NorBE test**: a precondition of approval
- **IAP**: "*If it proves impossible or impractical to satisfactorily seal Dendrobium Mine, important questions arise in relation to matters such as … ongoing management and funding (in perpetuity) for treating mine water discharge. The latter may apply even if the mine is effectively sealed should significant upward leakage and contaminant flux occur.*"
- **Existing conditions:** require negligible impacts in Avon/Cordeaux reservoirs + at confluence of Wongawilli Creek/Cordeaux River
- **'Tipping point':** contribution of project's ~7ML/day on top of existing/'approved' ~8.5ML/day
- **Offsets**: WaterNSW does not support proposed water quality offsets – not like-for-like or commensurate with potential impacts

# 6. What are the post-mining impacts on water quality?



# 7. What streams should be considered ‘significant’?

## Key issue

- Further consideration of ‘special significance’ of streams/sections/features based on IAP’s risk assessment approach is warranted

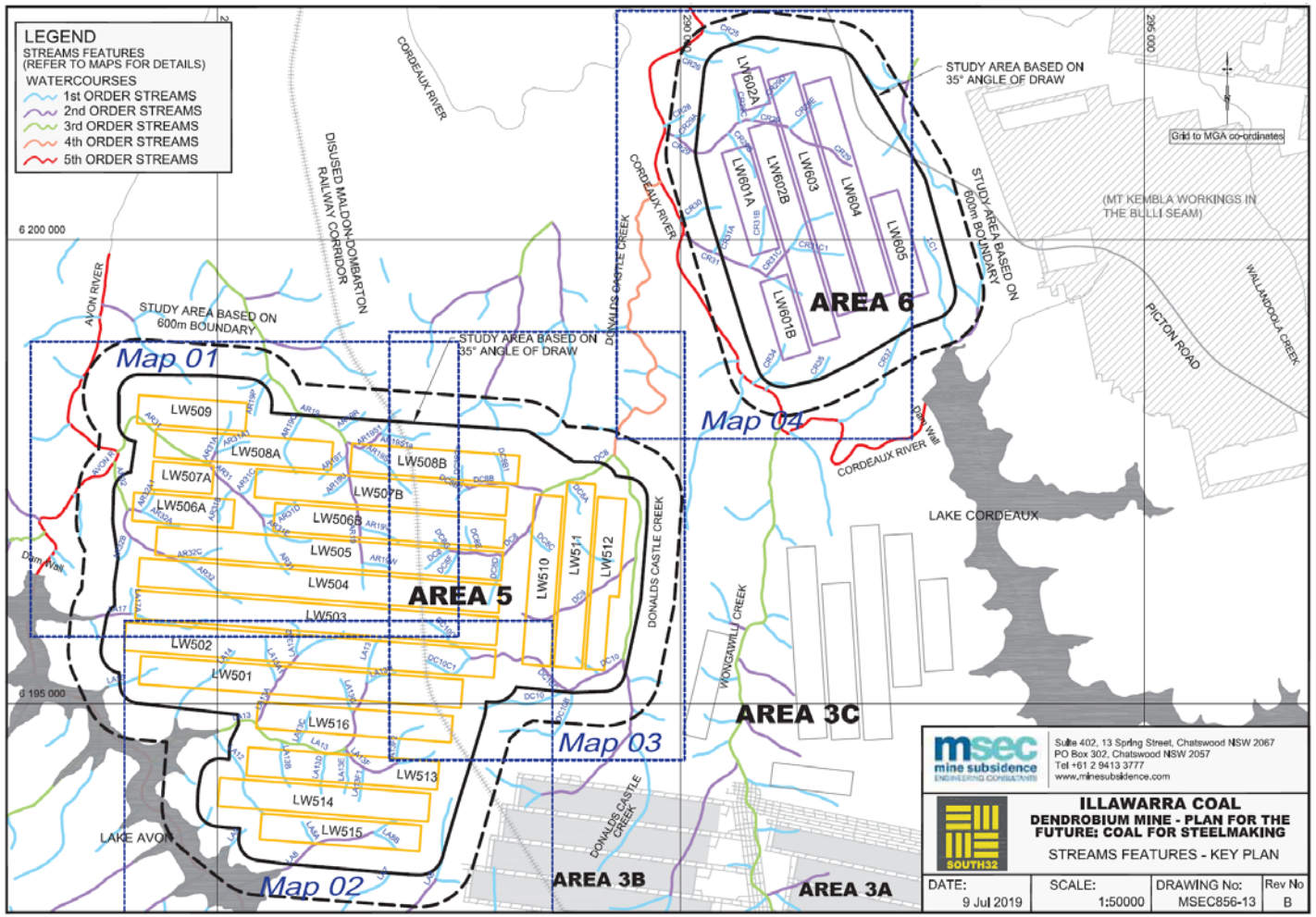
## Explanation

- WaterNSW does not agree that unnamed necessarily means not significant (i.e. DC8, AR19, AR31 and LA13)
- WaterNSW has previously suggested further protection for key 3rd order watercourses
  - shifting the western end of LW509 by approximately 150 m to the east (AR31)
  - shifting the western end of LW516 by approximately 100 m to the east (LA13)
  - shifting the northern end of LW510 by approximately 400 m to the south (DC8).
- Aerial assessment would be useful in any assessment

## Notes

- **IAP**: “*Although the EIS is supported by a document titled Stream Risk Assessment it does not constitute a risk assessment that is consistent with the intent of recommendations over the past decade of a number of Panels concerned with mining in the Southern Coalfield or with Australian and international standards and guidelines for risk assessment*”
- “*As a matter of due diligence, the consent authority should confirm the scope and appropriateness of the selected key stream features. In respect of stream classification, whether any of the streams impacted by the proposed mining warrant classification as being of special significance*.”
- **DPIE Water** recommended pre-approval: “*A commitment to complete further watercourse assessments to identify the values of all watercourses to be undermined, and a proposal to monitor, minimise and mitigate these watercourse impacts. An objective of maintaining flow and connectivity within these systems is recommended*”

# 7. What streams should be considered ‘significant’?



# 8. What is the worst case scenario for swamps?

## Key issue

- 25 swamps will likely experience serious or irreversible damage from the project due to fracturing of the bedrock beneath the swamps
- South32 has not calculated worst-case scenario for predicted impacts, which should account for increased bushfire risk

## Explanation

- The swamps will be more fire-prone
- WaterNSW considers potential impacts of fire should be factored into 'maximum potential impact' (i.e. worst-case scenario)
- BCD also does not agree with swamp impact calculation or quantum of proposed offsets

## Notes

- WaterNSW has a role to maintain ecological integrity in the Special Areas
- Metropolitan Special Areas has avoided major burns in recent times, partly due to WaterNSW's fire management efforts
- However, the 2019-20 bushfires burnt 90% of Warragamba Special Areas, and Metropolitan only narrowly avoided impacts
- Recent independent Bushfire Inquiry has highlighted the increased risk of fires due to climate change
- IAP (including swamp expert) did not comment on South32's estimate of maximum potential impact (including fire risk) or proposed offsets

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- South32 should provide more information

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- Independent Advisory Panel should provide advice

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- South32 should provide more information
- Independent Advisory Panel should provide advice

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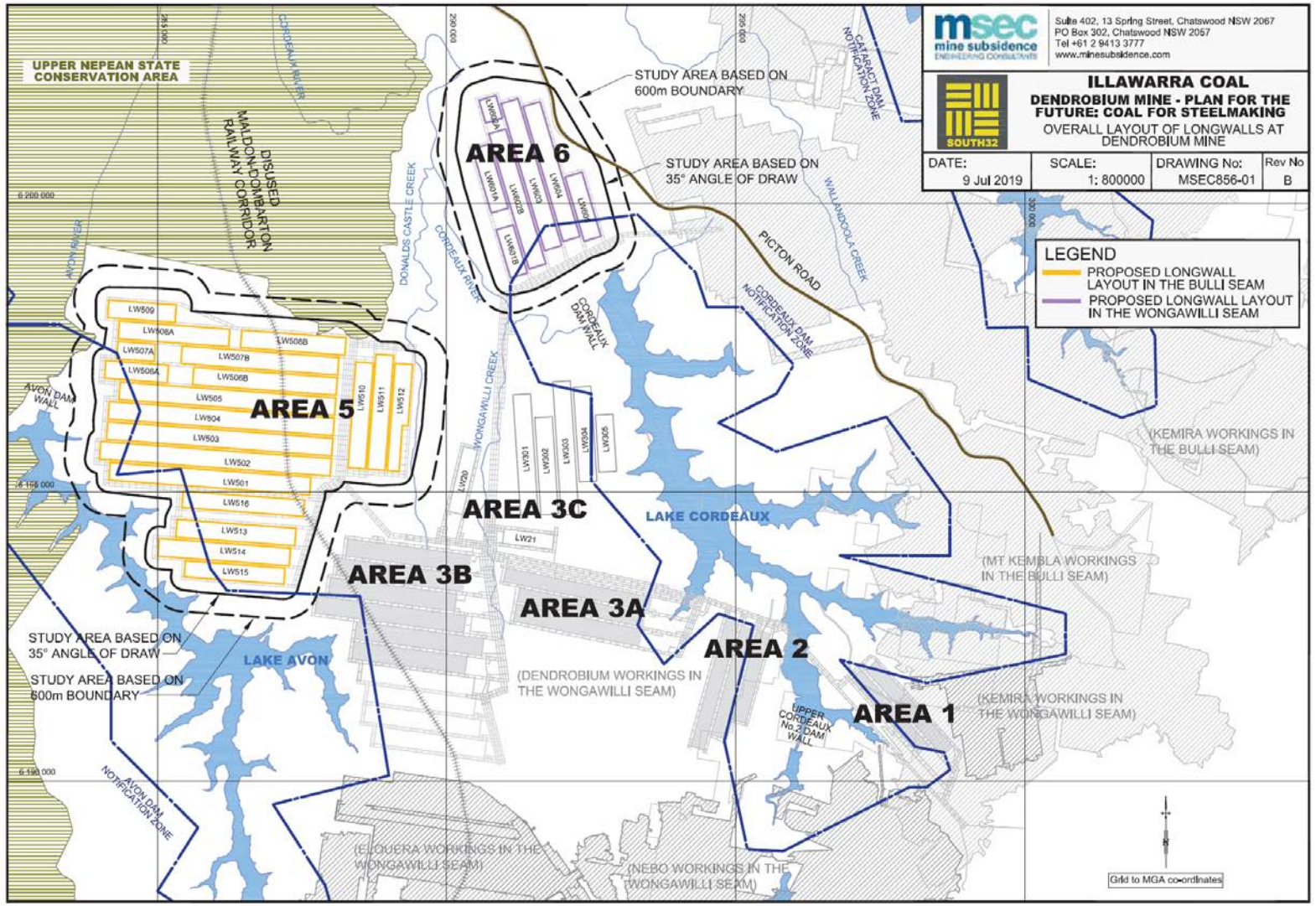
# Thanks – questions?

# Maps


msec mine subsidence ENGINEERING CONSULTANTS
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www.minesubsidence.com
SOUTH32
ILLAWARRA COAL
DENDROBIUM MINE - PLAN FOR THE FUTURE: COAL FOR STEELMAKING
OVERALL LAYOUT OF LONGWALLS AT DENDROBIUM MINE
DATE: 9 Jul 2019
SCALE: 1: 800000
DRAWING No: MSEC856-01
Rev No B
LEGEND
PROPOSED LONGWALL LAYOUT IN THE BULLI SEAM
PROPOSED LONGWALL LAYOUT IN THE WONGAWILLI SEAM
UPPER NEPEAN STATE CONSERVATION AREA
DISUSED MALDON-DOMEARTON RAILWAY CORRIDOR
AREA 6
AREA 5
AREA 3C
AREA 3B
AREA 3A
AREA 2
AREA 1
STUDY AREA BASED ON 600m BOUNDARY
STUDY AREA BASED ON 35° ANGLE OF DRAW
LAKE CORDEAUX
LAKE AVON
PICTON ROAD
(KEMIRA WORKINGS IN THE BULLI SEAM)
(MT KEMBLA WORKINGS IN THE BULLI SEAM)
(DENDROBIUM WORKINGS IN THE WONGAWILLI SEAM)
(KEMIRA WORKINGS IN THE WONGAWILLI SEAM)
(ELOUERA WORKINGS IN THE WONGAWILLI SEAM)
(NEBO WORKINGS IN THE WONGAWILLI SEAM)
Grid to MGA co-ordinates

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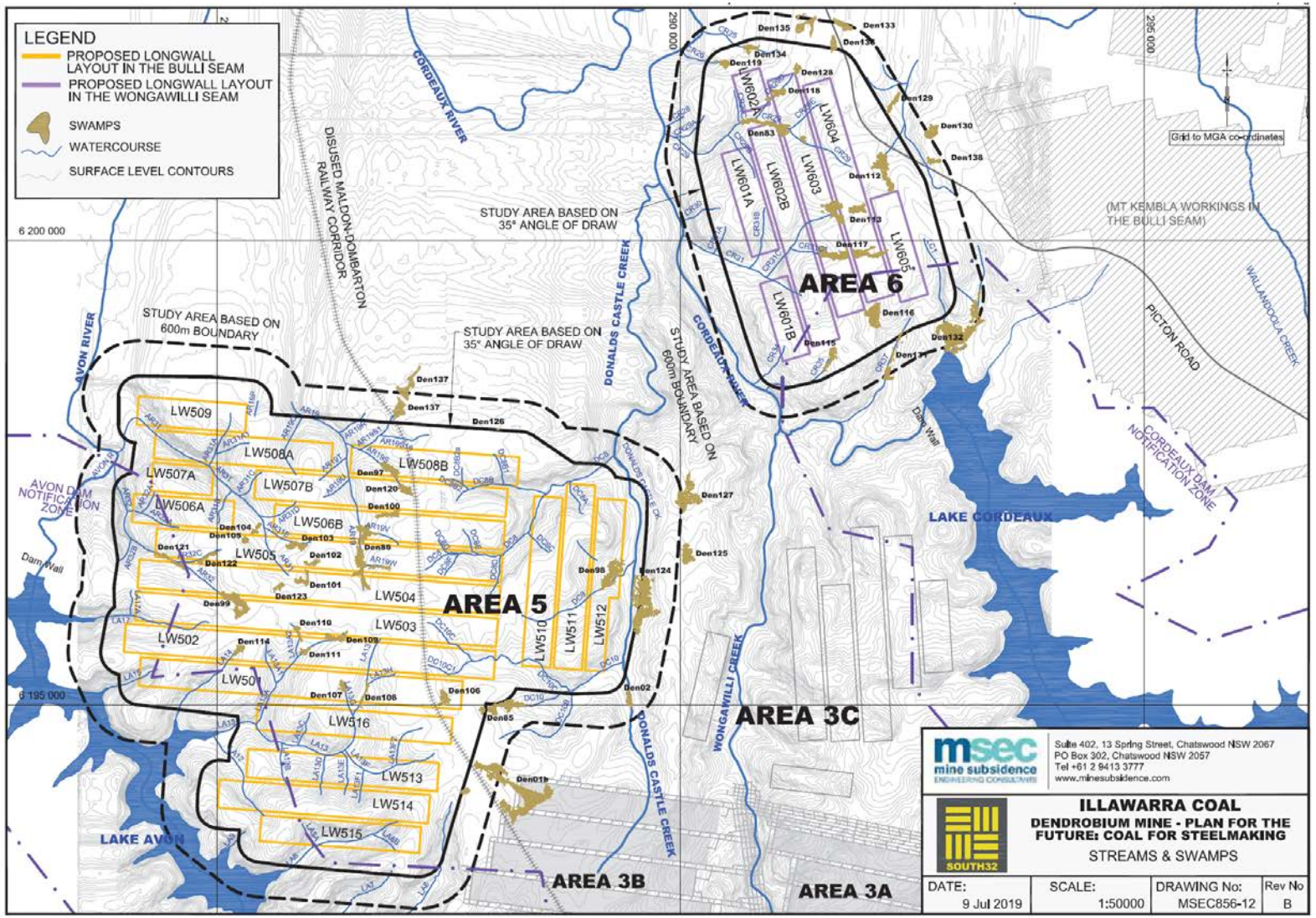
LEGEND
PROPOSED LONGWALL LAYOUT IN THE BULLI SEAM
PROPOSED LONGWALL LAYOUT IN THE WONGAWILLI SEAM
SWAMPS
WATERCOURSE
SURFACE LEVEL CONTOURS
STUDY AREA BASED ON 600m BOUNDARY
STUDY AREA BASED ON 35° ANGLE OF DRAW
AREA 5
AREA 6
AREA 3A
AREA 3B
AREA 3C
LW501
LW502
LW503
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6 200 000
6 195 000
290 000
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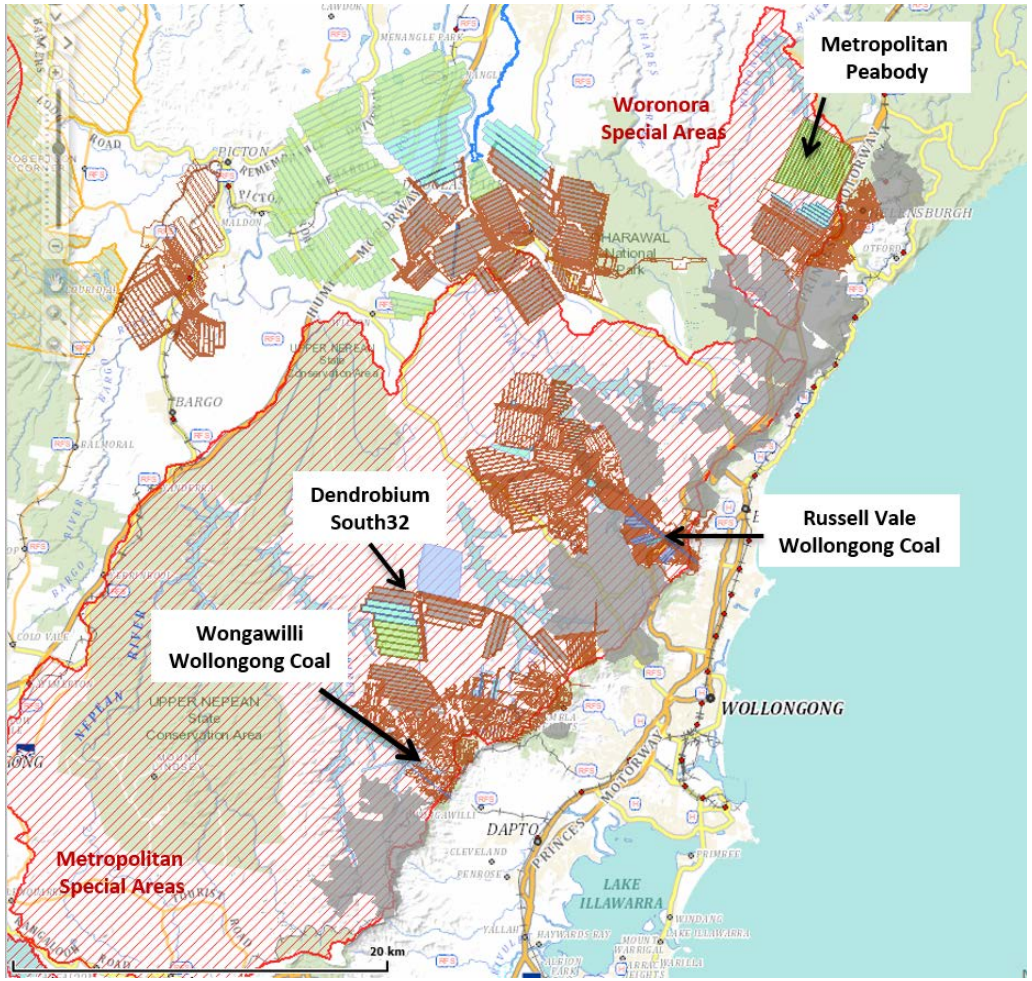


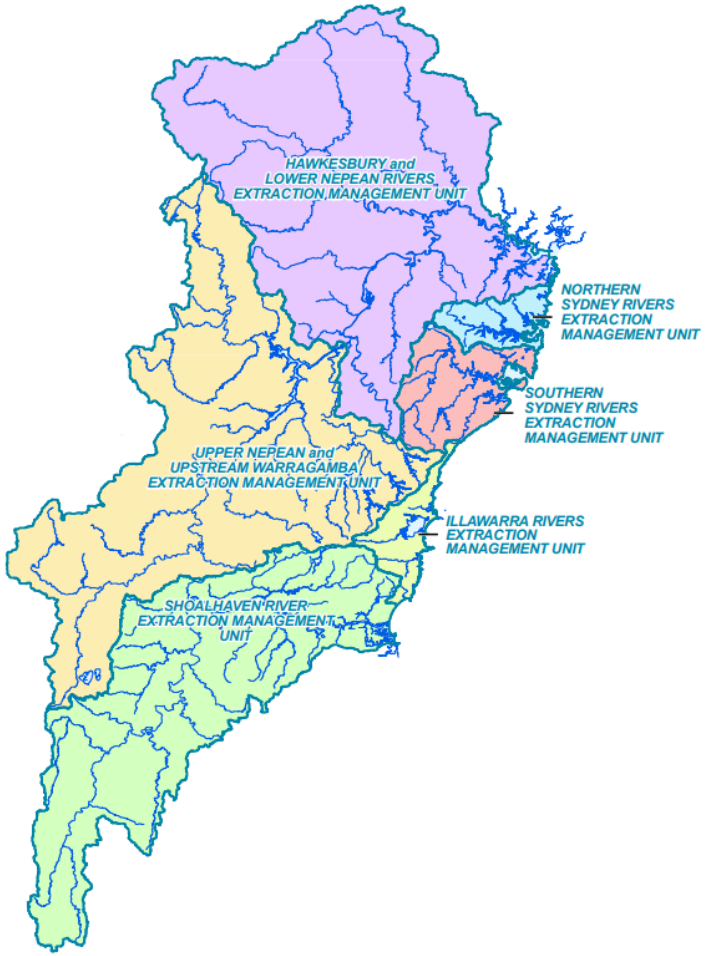


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