Lock the Gate Alliance Research Note

Future Hazards:

Will the Adani Carmichael Coal mine meet mining industry rehabilitation standards?

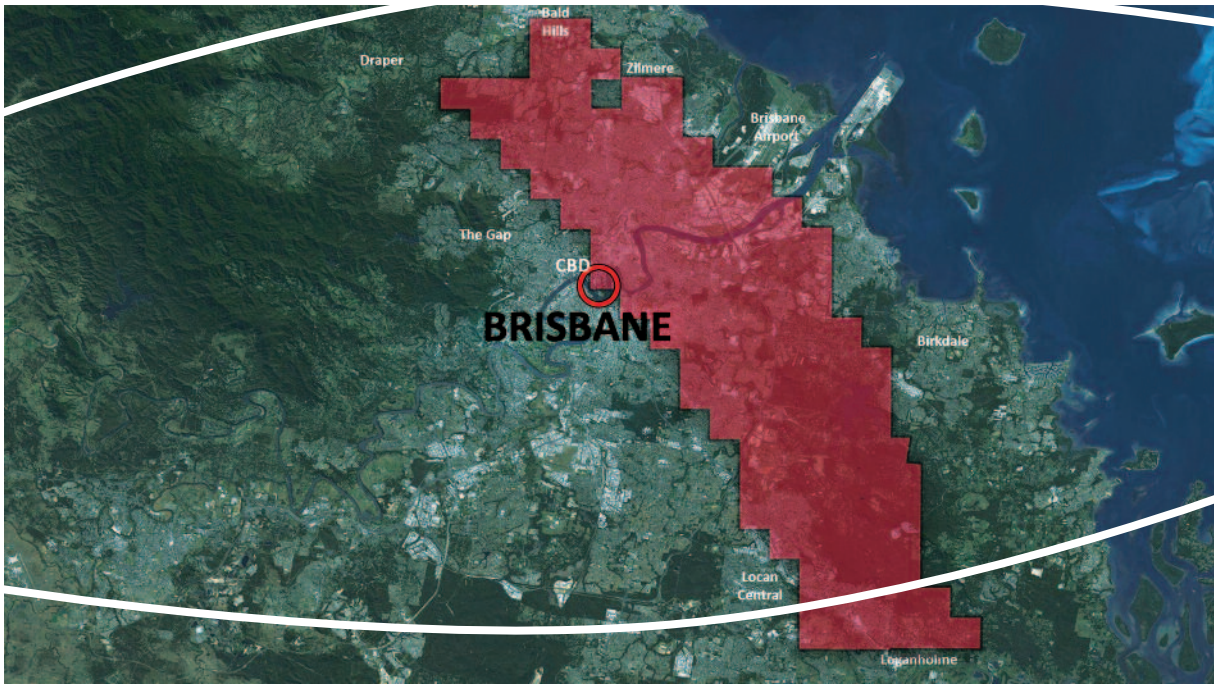
LOCK THE GATE

EXECUTIVE SUMMARY

The Carmichael Coal mine will have a disturbance footprint of 28,000 hectares[1], which is an area greater in size than North Stradbroke Island.

The mine will permanently alter the landscape – leaving behind extensive waste dumps that are at risk of failing in the long-term alongside final voids that are predicted to drain adjoining groundwater permanently.

The land use capability will be reduced, placing suitability for future productive use at risk.



The scale of the Adani Carmichael Coal Mine Lease compared to Brisbane

This research note assesses the proposed rehabilitation strategies for the Adani Carmichael coal mine against the stated standards and commitments of the mining industry internationally in Australia and the USA.

All of the information contained in this research note describing the proposed rehabilitation of the Adani Carmichael mine is derived from official documents prepared by Adani and consultants on the proposed final landform and rehabilitation strategies.

The proposed rehabilitation framework for the Adani Carmichael coal mine clearly does not meet mining industry standards and commitments. The key weaknesses of the rehabilitation program against those standards include:

[1] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014), page 11*

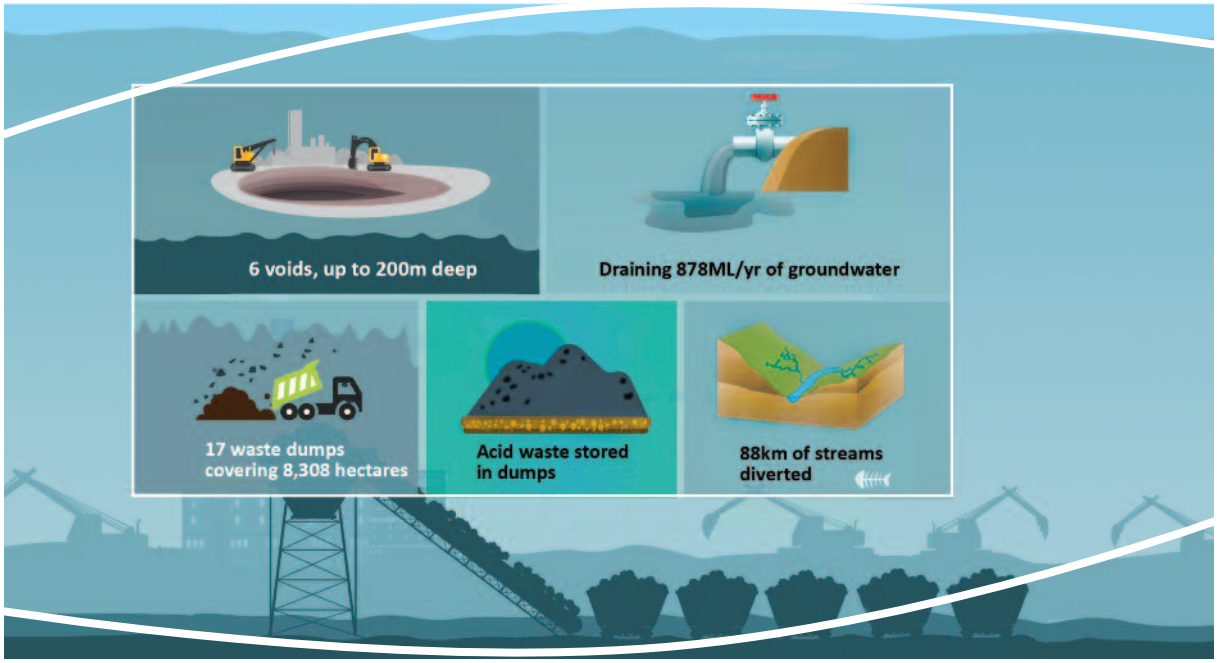
- It does not involve rehabilitation actions '*across the full lifetime of an operation*' but instead waits 10 years before commencing rehabilitation of spoil dumps and waits 39 years before commencing rehabilitation of voids.

- It does not return mined areas to a '*pre-existing condition or better*' but instead reduces the land capability categorisation and acknowledges that it has yet to assess future suitability for grazing.

- It does not '*minimise risk over the life of the operation*' because it is weak on progressive rehabilitation, leaves rehabilitation of dumps and voids until late in the program, and does not implement best practice for managing acid mine waste.

- It does not '*restore the approximate original contour*' of the land, but instead leaves 6 unfilled voids that are predicted to drain 878ML/annum groundwater permanently.

- It does not '*minimise disturbances to the hydrologic system*' because it will disturb 88km of streams which it does not intend to restore.



Carmichael Coal Mine legacies

If Adani were made to adopt and enforce the mining industry's own leading practice guidance and commitments on mine site rehabilitation, closure planning, progressive rehabilitation and closure cost estimation then it would require substantial amendments to its proposed rehabilitation strategy.

As it is, the proposed rehabilitation plan for the Carmichael coal mine is vastly inadequate to protect Australian's from a hazardous, long-term environmental legacy.

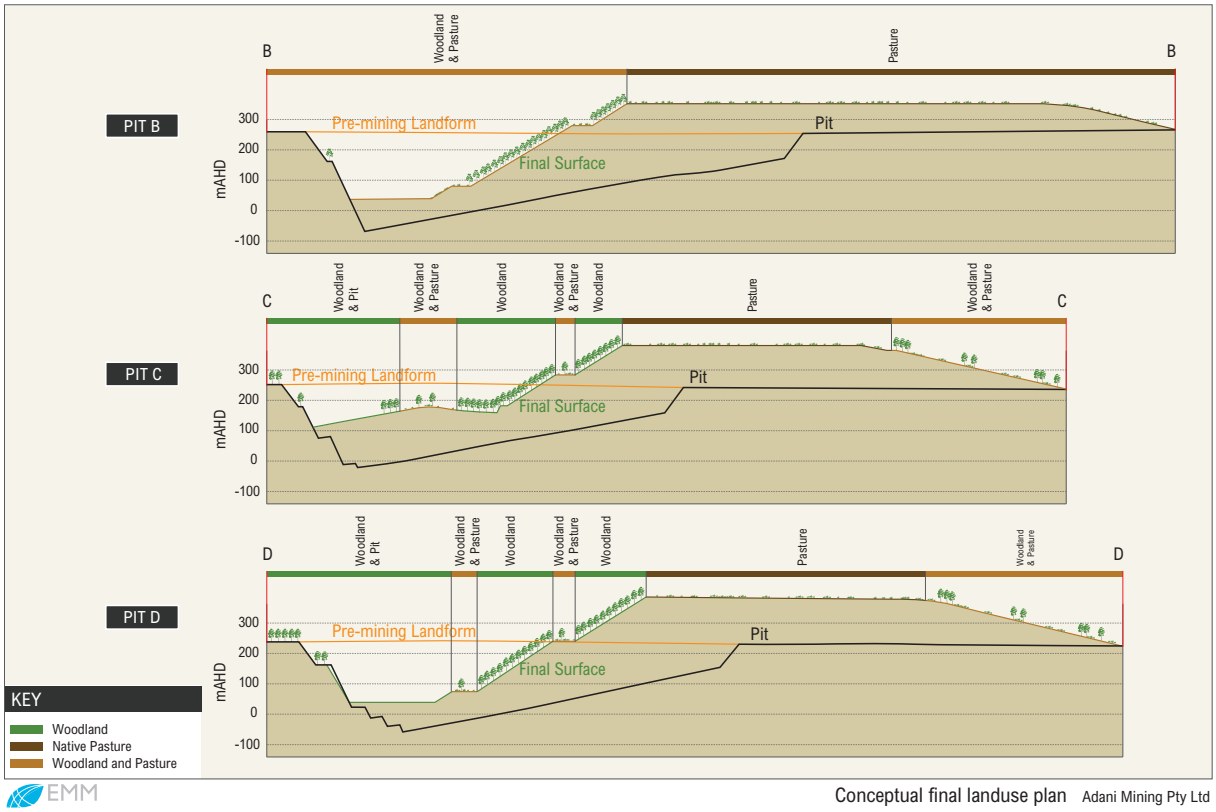
CARMICHAEL REHABILITATION PLANS

Final Pit Voids

Adani intends to leave 6 final voids after mining operations - holes that will be left as permanent hazards in the landscape .

They are leaving one void behind for each open-cut pit which they mine – meaning they are not returning a single pit to anything close to a natural landform.

The largest of these voids will be 200m deep[3]. The total area that will be left as unfilled voids is 3,346 hectares[4] – an area almost 30 times the size of the Brisbane CBD. Progressive rehabilitation will not commence on these voids until 39 years after mining commences[5].



EMM

Conceptual final landuse plan Adani Mining Pty Ltd

The voids that will be left will act as permanent sinks for groundwater[6]. Groundwater is predicted to permanently flow into the pits and evaporate, acting as a drain on affected aquifers.

Adani estimates that the groundwater inflow to final void areas will amount to 2,372 million litres per annum at the end of the operational life of the mine, and 878 million litres per annum in the long-term[7].

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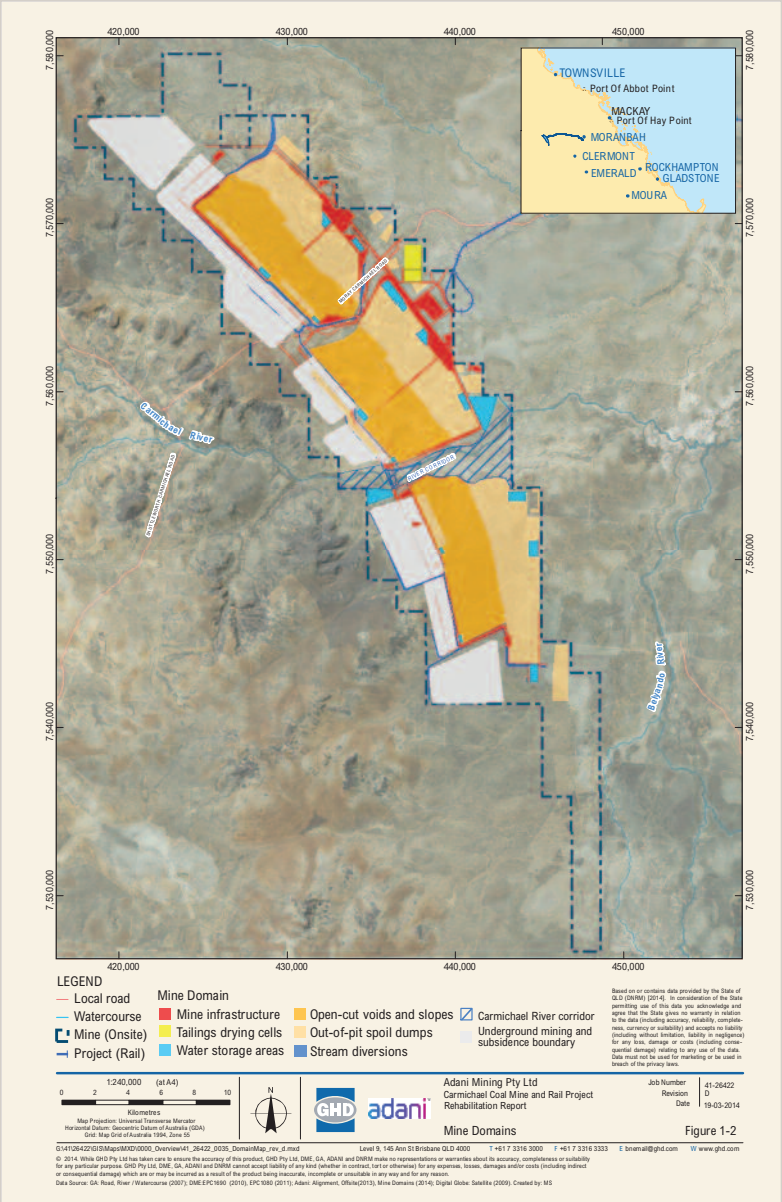
[2] *Carmichael Coal SEIS 2013, Appendix K1, Mine Hydrogeology Report, Section 5.7.1, p108*
[3] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014) Figure 4.2 Conceptual Final Landuse Plan*
[4] *Carmichael Coal Mine and Rail Project SEIS (Nov 2013) Mine Hydrogeology Report, Appendix K1. Page 108*
[5] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014), page 11*
[6] *Carmichael Coal Mine and Rail Project SEIS (Nov 2013) Mine Hydrogeology Report, Appendix K1. Page 108*
[7] *Carmichael Coal Mine and Rail Project SEIS (Nov 2013) Mine Hydrogeology Report, Appendix K1, gives daily figures for inflows which we have converted to annual inflows. Page 108*

Extensive Spoil Dumps

Adani will leave 17 waste dumps as part of the final landform[8]. Project documents indicate that there will be 5 very large out of pit waste dumps, and 12 smaller out of pit waste dumps, covering a total area of 8,308 hectares[9].



Progressive rehabilitation will not commence on spoil dumps and slopes until 10 years after mining commences[10].

There are significant volumes of potentially acid forming material that will be present in the spoil, leading to genuine risks of acid mine drainage.

Project documents estimate that that there will be 1.8 billion cubic metres of waste rock produced by the mining process which will be potentially acid forming[11]. This material is dispersed through the mine spoil.

Acidic or toxic tailings will be dried in the tailings drying cells then removed and will be encapsulated in out of pit dumps adjacent to pits D and E requiring engineered covers designed to permanently isolate this material from the surrounding environment[12].

However the cover design proposed[13] seems to be the lowest cost option compared to fully engineered store and release covers such as those installed at the Century Zinc Mine site[14].

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[8] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014) Figure A-4*
[9] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014) Table 3.1*
[10] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014), page 11*
[11] *Carmichael Coal Mine and Rail Project 41/25215/442155 Volume 2 Section 13 Environmental Management Plan (Mine) p.13-134*
[12] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014), page 15*
[13] *Ibid Fig 6.2 page 67*
[14] *Pers comm Rick Humphries with Matt Lord MMG Ltd 2014*

There is a long-term risk of failure and leakage from these dumps as no man-made structures particularly the design chosen by Adani, are infallible over time particularly those in the harsh climate of Central Queensland.

Adani only intends to monitor these dumps for a period of 5 years[15] after closure which is completely inadequate as these structures will need to be monitored and maintained in perpetuity.

They have not yet conducted studies to determine if any of the areas will be suitable for grazing after mining, which will instead be determined 'at a later date' [16].


Doongmabulla Cattle Station

Watercourse Diversions

At least 88km of watercourses[17] will be diverted for the mine and there will be no attempt made to restore them after the project ends:

> *As permanent changes to the landform will have occurred as a result of mining, and given that only minor, ephemeral watercourses are to be diverted, it is not intended to restore original flow path[18].*

Adani intends to apply the lowest cost option to stream diversions by covering the banks with 0.2m of top soil and then reseeding with grasses and tree species[19].

The likelihood of failure of these poorly rehabilitated water courses is high given local climatic conditions which limit vegetation re-establishment and stability of the stream banks will be challenged by the regions low frequency, high volume rains events.

Adani are only proposing to monitor the stream diversions for 5 years post closure[20].

Post mining land productivity

Adani predicts that there will be a loss of landscape functionality and land use utility across all land classes after mining - even if the proposed rehabilitation is successful[21]. However, the actual productivity of land post-mining is highly questionable, and elsewhere in their documents they indicate that they have not yet assessed whether spoil dumps may be suitable for grazing[22].

[15] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014) page 66*
[16] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014) page 48*
[18] *Ibid page79*
[19] *Ibid page 79*
[20] *Ibid page 74*
[21] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014), page 25*
[22] *Carmichael Coal Mine Closure and Rehabilitation Strategy (EMGA Mitchell McLennan March 2014) page 48*

Table 4.2 **CONCEPTUAL POST-MINE LAND USE SUMMARY**

Domain	Pre-mining GQAL (ha)	Post-mining GQAL (ha)	Description/reason for loss/gain of GQAL
open-cut voids and slopes	C-8,331.54	C/D-8,331.54	No net gain of class A or class B GQAL. Aim is to return land to low ranking class C or class D land.
underground mining areas	B-3.37 C-7,508.7	C/D-7,512.07	No net gain of class A or class B GOAL. Aim is to return land to low ranking class C or class D land.
Min: infrastructure	C-1,161.50	C/D-1,161.50	No net gain of class A or class B GOAL. Aim is to return land to low ranking class C or class D land.
out-of-pit spoil dumps	C-8,308.69	C/D-8,308.69	No net gain of class A or class B GOAL. Aim is to return land to low ranking class C or class D land.
water stonge areas	C-817.53	C/D-817.53	No net gain of class B GQAL. Aim is to return land to low ranking class C or class Oland.
stream versions	C/D 472.68	C/D 472.68	to be advised.
tailings drying cells	B-203.40 C-12.77	C/D-216.17	to be advised.
Carmichael River corridor	C-1,799.02	C/D-1,799.02	No net gain of class C GQAL. Aim is to return land to low ranking class C or class D land.

MINING INDUSTRY COMMITMENTS AND STANDARDS

The mining industry has developed a raft of internal standards, guidance notes and technical papers to inform its own practitioners in regards to managing mine closure and rehabilitation risks. These relate to matters such as mine closure planning, closure cost estimation, and rehabilitation techniques including mitigation of key environmental risks such as acid mine drainage.

Some of the key mining industry commitments and standards include:

1. The International Council on Mining and Minerals (ICMM) commits its members to;

> *"mining companies have a responsibility to work towards land rehabilitation – the return of disturbed land to a stable and productive condition. . . .*
>
> *Rehabilitation of the land disturbed by mining needs to not be an afterthought, only starting towards the end of an operation but should instead be a continual activity. Responsible mining companies should undertake rehabilitative actions, including remedy of environmental risks, return of disturbed land and stabilisation of creeks and drainage channels across the full lifetime of an operation*[23].

The ICMM has also developed a mine closure toolkit[24] which is a framework to implement best practice mine closure and rehabilitation.

[23] *https://www.icmm.com/en-gb/society-and-the-economy/mine-closure/land-rehabilitation*
[24] *https://www.icmm.com/website/publications/pdfs/310.pdf*

2. The Minerals Council of Australia has committed the industry to the following;

Clermont open cut coal mine

"The minerals industry recognises that while some previously mined areas are rehabilitated to pre-existing condition or better, other mined areas result in substantial transformation of the landscape. It is the minerals industry's goal to ensure that this land is available for subsequent economic activities, conservation or community use."

"Responsible environmental management over the life of a mining operation is essential for successful rehabilitation. Companies are careful to avoid disturbing land unnecessarily and to minimise the footprint of operations. This reduces the scale and complexity of rehabilitation requirements, and lowers the cost to companies. Furthermore, rehabilitation is undertaken not only at the end of a mine's life, but progressively during the mining process. This enables companies to meet rehabilitation obligations and minimise risk over the life of the operation ."

3. The Surface Mining Reclamation and Control Act (SMCRA) was passed in the USA by Federal Congress in 1977 and estab¬lishes minimum federal standards for the regulation of coal mining.

SMCRA requires mining operators to restore affected land to a condition capable of supporting the uses it could support before mining, or to "higher or better uses". The operator must also:

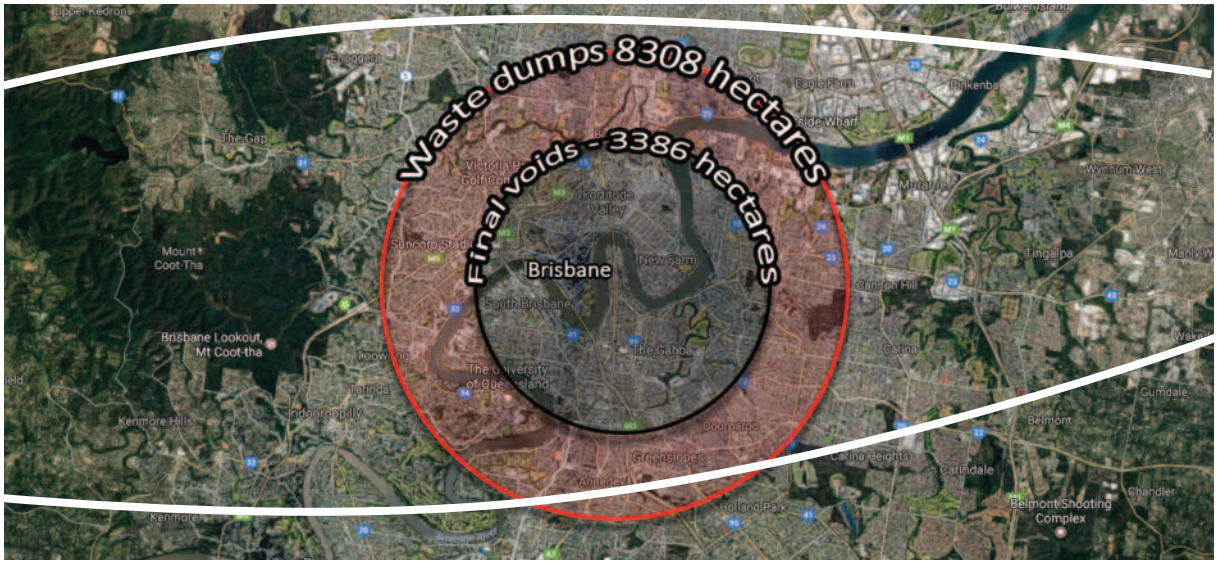
1. restore the approximate original contour (AOC) of the land by backfilling, grading, and compacting;
2. minimize disturbances to the hydrologic system by avoiding acid mine drainage and preventing additional contributions of sus¬pended solids (sediments from erosion) to nearby streams and other water bodies;
3. reclaim the land as soon as practicable after the coal has been extracted, and even as the mining operation moves forward; and
4. establish a permanent vegetative cover in the affected area.

[25] *http://www.minerals.org.au/file_upload/files/resources/MCA_Stewardship_Policy_2012.pdf*
[26] *Mine rehabilitation in the Australian minerals industry, MCA, 2016 page 4*
[27] *https://sites.google.com/site/stripmininghandbook/a-brief-review-of-smcra*

CARMICHAEL ASSESSED AGAINST INDUSTRY STANDARDS

The proposed rehabilitation framework for the Adani Carmichael coal mine clearly does not meet the mining industry standards and commitments articulated above. The key weaknesses of the rehabilitation program against those standards include:

- It does not involve rehabilitation actions 'across the full lifetime of an operation' but instead waits 10 years before commencing rehabilitation of spoil dumps and waits 39 years before commencing rehabilitation of voids.
- It does not return mined areas to a 'pre-existing condition or better' but instead reduces the land capability categorisation and acknowledges that it has yet to assess future suitability for grazing.
- It does not 'minimise risk over the life of the operation' because it is weak on progressive rehabilitation and leaves rehabilitation dumps and voids until so late in the program.
- It does not 'restore the approximate original contour' of the land, but instead leaves 6 unfilled voids that are predicted to drain 878ML/annum groundwater permanently.
- It does not 'minimise disturbances to the hydrologic system' because it will disturb 88km of streams which it does not intend to restore.



The scale of the Carmichael final voids and waste dumps compared to Brisbane CBD

If Adani were made to adopt and enforce the mining industry's own leading practice guidance and commitments on mine site rehabilitation, closure planning, progressive rehabilitation and closure cost estimation then it would require substantial amendments to its proposed rehabilitation strategy. As it is, the proposed rehabilitation plan is wholly inadequate to protect Australian's from a hazardous, long-term environmental legacy.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