CADIA

HOLDINGS

PTY LIMITED

TRADING AS
CADIA VALLEY OPERATIONS

ABN 95 062 648 006

28 March 2018

Mr David Kitto
Executive Director, Resource Assessments and Business Systems
Department of Planning & Environment
GPO BOX 39
SYDNEY NSW 2001

Cadia Valley Operations
Cadia Hill Tailings Modification - Statement of Environmental Effects

Dear David,

The Cadia Valley Operations are located approximately 25 kilometres (km) south-west of Orange, in the Central Tablelands of New South Wales (NSW) (Figure 1 – Enclosure 1).

Cadia Holdings Pty Limited (CHPL) is the owner and operator of the Cadia Valley Operations and is a wholly owned subsidiary of Newcrest Mining Limited.

Project Approval (PA 06_0295) for the Cadia East Project was granted by the NSW Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 6 January 2010 (PA 06_0295).

PA 06_0295 includes all components of the Cadia Valley Operations including the Cadia East underground mine, the Cadia Hill open pit mine, the Ridgeway underground mine, the concentrate dewatering facilities in Blayney, and a wide range of ancillary and supporting infrastructure. These integrated operations are herein referred to as the Cadia Valley Operations.

PA 06_0295 has been modified on a number of occasions, with the Determination of Modification 9 most recently occurring in April 2017.

CHPL has also recently prepared an Environmental Assessment (EA) for the proposed Molybdenum Recovery Plant Relocation Modification (Modification 10). Modification 10 is a relatively minor change and is currently being assessed by the NSW Government (yet to be determined).

Background

As you are aware, on Friday 9 March 2018 CHPL identified a limited breakthrough of tailings material at the embankment of the Northern Tailings Storage Facility (NTSF).

The slumping of the embankment was fully contained within the Southern Tailings Storage Facility (STSF) that is located immediately downstream. No external environmental impacts arose from the incident (i.e. all tailings and waste rock material in the slumping area were wholly contained within the STSF).

Notwithstanding, CHPL stopped depositing tailings into both tailings storage facilities on 9 March 2018 as a precaution, and operations at the Cadia Valley Operations were suspended. To date ore processing operations at the Cadia Valley Operations have not re-commenced, with flow-on consequences for CHPL's many employees, contractors and suppliers and mining which was suspended until 27 March is presently confined to Panel Cave 1 only.

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It is anticipated that deposition of tailings into the STSF will allow the progressive re-commencement of Cadia Valley Operations processing operations. However, it is anticipated tailings deposition in the STSF alone will restrict the rate of ore processing operations for an extended period while the NTSF embankment breakthrough area is investigated and then repaired.

Cadia Hill Tailings Modification

In order to facilitate the timely and orderly recommencement of full mining and ore processing activities at the Cadia Valley Operations, and hence facilitate re-instatement of the full operational workforce, engineering studies have identified an opportunity to deposit some tailings within the completed Cadia Hill open pit (Figure 2 – Enclosure 1).

The depth of the Cadia Hill open pit (approx. 500 metres [m]) readily provides for in-pit tailings deposition, while still maintaining the approved Cadia Hill open pit closure strategy (i.e. final pit void lake).

The proposed Cadia Hill Tailings Modification (the Modification) would not involve any change to the approved Cadia Valley Operations except with respect to tailings transfer, deposition and water return.

The proposed Modification would include:

- deposition of Cadia Valley Operations tailings in the completed Cadia Hill open pit (i.e. in-pit deposition) commencing in 2018 and occurring up to a final elevation of 420 m Australian Height Datum (AHD), once consolidated (i.e. approximately 30 million tonnes [Mt] tailings);
- associated upgrades to tailings distribution systems and water management infrastructure to facilitate transfer of tailings to the open pit, within the pit and associated decant water return; and
- supporting infrastructure (e.g. extensions to or duplication of on-site electrical distribution, access tracks, tailings and return water pump stations and pipelines) in support of the Modification.

It is anticipated that the construction of the additional tailings pipelines and associated pumps, water return pipelines and infrastructure would require a construction workforce of up to 50 people over a period of some weeks.

All Modification components would be located wholly within the extent of the approved Cadia Valley Operations (i.e. no additional land disturbance is required).

This construction activity would coincide with a period of subdued operational activity (i.e. no net increase in Cadia Valley Operations traffic would occur).

Table 1 provides a comparative summary of the proposed modified operations against the currently approved Cadia Valley Operations.

Key elements of the proposed Modification are shown on Figures 2 and 3 (Enclosure 1).

Table 1
Snapshot of Proposed Changes to Currently Approved
Cadia East Project

Project Development Component	Currently Approved [1]	Cadia Hill Tailings Modification
Mining Methods	Cadia Hill - conventional open pit mining methods. Ridgeway - underground sublevel and block caving with development of associated surface subsidence zone. Cadia East - underground panel caving with development of associated surface subsidence zone.	No change.
Life of Mine Cadia East Ore Production	Approximately 456 Mt.	No change.
Life of Mine CVO Ore Production	Approximately 562 Mt.	No change.
Waste Rock Management	Deposition in the North and South Waste Rock Dumps and mined-out void of the Cadia Extended open pit. Cadia East waste rock to be deposited in the South Waste Rock Dump.	No change.
Life of Mine	Mining up until approximately 2030. Project Approval to 2031.	No change.
Tailings Management	Use of the Northern Tailings Storage Facility (NTSF) and Southern Tailings Storage Facility (STSF) and raising of these storages via upstream embankment lifts.	30 Mt of tailings disposal in Cadia Hill open pit. Total tailings disposal volume unchanged.
Ore Processing	On-site processing of up to 32 million tonnes per annum (Mtpa) of gold and copper ore.	No change.
Concentrate Transport and Dewatering	Gold/copper concentrate is transported from the ore processing facilities via a concentrate pipeline to the Blayney Dewatering Facility. Construction of CVO Dewatering Facility to the east of Blayney and eventual decommissioning of the existing Blayney Dewatering Facility. Installation of a new concentrate pipeline from the CVO to the CVO Dewatering Facility. Transport of dewatered mineral concentrate by rail to the eastern seaboard.	No change.
Water Supply and Management	Water supply sourced from the Cadiangullong Dam, Flyers Creek Weir, Cadia Creek Weir, Orange Sewage Treatment Plant treated effluent, Blayney Sewage Treatment Plant treated effluent, on-site groundwater bores, Belubula River and site runoff. Development of additional pipeline/pumping systems and raising of the Rodds Creek Water Holding Dam. Contingent transfer of supernatant tailings water from STSF and NTSF to Cadia Hill open pit for water management.	No change to water supply. Additional internal tailings return water pipeline and pumping systems from Cadia Hill open pit.
Operational Employment	An average of 880 employees up to a maximum of approximately 1,300 employees.	No change.
Final Landforms	Includes South Waste Rock Dump, North Waste Rock Dump, NTSF, STSF, Cadia East Subsidence Zone, Ridgeway Subsidence Zone, Cadia Hill open pit, Cadia Extended open pit, Cadiangullong Dam, Rodds Creek Holding Dam and other water management infrastructure.	No material change to approved final landform. Tailings deposition up to approximately 245 m below surface of equilibrium final waterbody.

[1] PA 06_0295 for the Cadia East Project, as modified by 75W modifications numbered 1-9.

Environmental Review

There are no proposed changes to the physical extent of the approved Cadia Valley Operations or operational workforce.

Consequently, there would be no material alteration to the approved impacts of the Cadia Valley Operations on the following aspects:

- ecology;
- heritage (Aboriginal/Historical);
- visual amenity;
- road network; and
- population, employment and community infrastructure demand.

To evaluate the potential environmental implications of the proposed changes to tailings and water management on-site the following specialist environmental reviews have been completed (Enclosures 2 to 4 respectively):

- Groundwater Review – Australasian Groundwater and Environmental Consultants (AGE).
- Final Void Water Balance and Water Management Review – Hydro-Engineering Consultants (HEC).
- Expert Opinion – Dr Noel Merrick (HydroSimulations/HydroAlgorithmics).

<u>Groundwater Review</u>

In the Cadia East EA (CHPL, 2009), it was identified that the Cadia East underground mine subsidence zone would eventually intersect the Cadia Hill open pit, and the open cut and underground voids would then combine to form an integrated post-mining landform, with a single final void waterbody.

Mining in the Cadia Hill open pit ceased in 2012. The Cadia Hill open pit is hosted in competent Ordovician volcanic rocks and has been subject to long term monitoring of groundwater impact propagation, and also geotechnical evaluation with respect to pore pressures in the pit walls (i.e. for pit safety/stability purposes).

AGE (2018) (Enclosure 2) concluded the following with respect to the very low inherent permeability of the Cadia Hill open pit host rock into which the tailings would be deposited under the Modification:

> *The most recent update to the groundwater model adopted a hydraulic conductivity for the Ordovician rock mass of between 5 x 10^{-12} to 6 x 10^{-11} m/sec to achieve calibration with estimated and observed groundwater inflows to the mining areas.*

The groundwater review conducted by AGE (Enclosure 2) considered the potential groundwater implications of the proposed deposition of some 30 Mt of tailings in the Cadia Hill open pit and concluded the following:

> *The available information on the groundwater regime indicates that there is no potential for connectivity between the tailings emplacement proposed within Cadia Hill Open Pit and the surrounding groundwater regime because:*
>
> - *Tailings will be some 300 m lower than the invert of Cadiangullong Creek at 708 mAHD …*
> - *After closure the recovered water level within the Cadia Hill Open Pit and Cadia East subsidence zone combined final void will reach an equilibrium of 670mAHD, which is lower than the groundwater level measured within piezometers in the surrounding rock mass, and means the inward hydraulic gradient towards the pit shell that has developed will remain during deposition of the tailings and continue post mining.*
> - *Tertiary basalt and Silurian limestones that can form aquifers within the region have not been intersected by the Cadia Hill pit shell and the hydraulic gradients will not promote flow in the direction of these aquifers.*
>
> *Given the lack of connectivity the risk to the groundwater regime from the tailings emplacement is considered negligible.*

With respect to potential impacts on groundwater quality, AGE (Enclosure 2) also concluded:

> *Previous studies also identified that the water quality of the combined Cadia Hill and Cadia East final void will be affected by the long term evapo-concentration of salts and also acidic drainage of potentially acid forming Ordovician host rock affecting pH and dissolved metal concentrations. The addition of the tailings solids to the Cadia Hill Open Pit would not affect the long term water quality of the recovered groundwater table or combined final void, as the void water quality would continue to be an outcome of evapo-concentration of salts and the geochemistry of the Cadia East host rock, both of which would be unchanged by the Modification.*

Based on the above it can be concluded from a groundwater perspective that there would be minimal environmental impacts arising from the proposed tailings storage in the Cadia Hill open pit, as there would be no mechanism for an increase in potential impacts.

This is particularly the case as the quality of water in the approved Cadia Hill open pit and Cadia East combined final landform waterbody would be dominated by the evaporative concentration of salts in the long term, and the consolidated tailings would be some 245 m below the equilibrium surface level of this waterbody.

The above groundwater review conclusions from AGE are supported by the expert opinion of Dr Noel Merrick (HydroAlgorithmics, 2018), who concluded (Enclosure 4):

> *Based on the documents cited, the reviewer holds the following opinions:*
>
> - *The evidence for ongoing behaviour of the Cadia Hill pit as a groundwater sink is compelling.*
> - *A predicted ultimate freeboard in excess of 50 m indicates negligible risk of spilling outside the Cadia Hill – Cadia East continuum.*
> - *The usual requirement of 10^{-9} m/sec as the permeability of a liner/container, for prevention of leakage/seepage, is irrelevant when the fluid feature is a gaining system (a sink).*
> - *The model-calibrated hydraulic conductivity of $5x10^{-12}$ to $6x10^{-11}$ m/sec is credible; however, the magnitude is inconsequential as only the rate of filling would be affected in a gaining system.*
> - *The barrier/conduit status of intersected faults is irrelevant while the pit remains a groundwater sink (with hydraulic gradients towards the pit).*
>
> *In particular, the reviewer concurs with AGE that "the risk to the groundwater regime from the tailings emplacement is considered negligible."*

Groundwater monitoring at the Cadia Valley Operations during the in-pit deposition of tailings at the Cadia Hill open pit would be undertaken in accordance with CHPL's existing Water Management Plan.

The current groundwater monitoring programme is extensive (Figure 4 – Enclosure 1). However, CHPL would review, and where necessary revise, the number of groundwater bores proximal to the Cadia Hill open pit, to verify the ongoing hydraulic gradient towards the areas of historical and current mining. Any such monitoring improvements would be documented in a revision to the Water Management Plan.

Final Void Water Balance and Water Management

The final void water balance review conducted by HEC (2018) (Enclosure 3) considered the potential final void water balance implications of the proposed deposition of some 30 Mt of tailings in the bottom of the Cadia Hill open pit and concluded the following:

> *… the water in both the Cadia Hill open pit and the Cadia East subsidence zone void is predicted to reach an oscillating equilibrium level around the level of the saddle (670 m AHD), which is approximately 51 m below the lowest point on the perimeter of the Cadia Hill open pit. This level is unchanged from previous Cadia East modelled long term equilibrium levels.*
>
> *Minor fluctuations in the water level around the level of the saddle are expected thereafter in response to climatic conditions. The results indicate that void surface waters would continue to be isolated from Cadiangullong Creek even under extremely wet climatic conditions. The results also indicate that the tailings proposed to be deposited to 420 m AHD would remain submerged by up to approximately 245 m of final void water.*

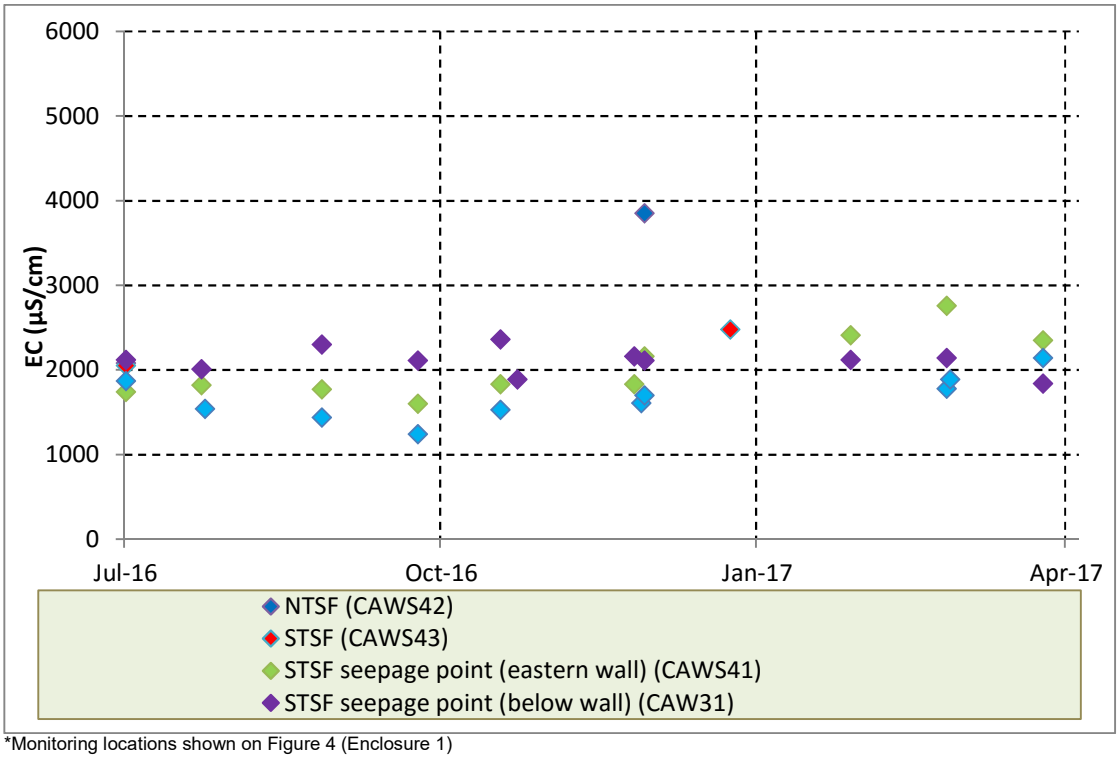
With respect to potential impacts on final void water quality, HEC also concluded (Enclosure 3):

- *Cadia Valley operations is already approved to transfer tailings storage supernatant water to the Cadia Hill open pit under high rainfall scenarios as may be required for operational water management purposes.*
- *The approved final Cadia Hill and Cadia East subsidence zone void lake would concentrate salts over time due to evaporation from the surface of the waterbody.*
- *The combination of acidic drainage generated from the oxidation of potentially acid forming Ordovician volcanic material within the Cadia East cave zone and the long term evapo-concentration of salts would be key drivers of the final void water quality of the approved Project.*
- *Both of these key drivers of final void water quality would be unchanged by the proposed Modification.*

At the Cadia Valley Operations, tailings are produced from the grinding of mineralized gold and copper ore in the processing plant, where the target minerals are separated from the tailings via flotation before the concentrated minerals are dewatered for export. The remaining tailings that report to the NTSF and STSF are typically low in sulphur and are non-acid forming as the sulphide mineralization is largely extracted in processing and therefore reports to the concentrate product.

It is also noted that tailings supernatant water that is approved to be transferred to the open pit is typically in the electrical conductivity (salinity) range of 1,500-2,500 microsiemens (Graph 1). This is significantly lower salinity than long term water quality predicted for approved final void.

Graph 1
Recent Monitored* Electrical Conductivity of Tailings Water/Seepage



*Monitoring locations shown on Figure 4 (Enclosure 1)

Based on the above, it can be concluded from a surface water perspective that there would be minimal surface water impacts from the Modification, as no impacts would occur during mining (i.e. one approved tailings deposition location would be substituted for another), and the post-mining final void water quality and final waterbody equilibrium level would be unchanged.

CHPL would manage water accumulating in the Cadia Hill open pit from tailings supernatant water and rainfall runoff by pumped recovery to the water management system for re-use in ore processing, consistent with the approach for the STSF and NTSF.

Pumping rates would be set to match the adopted tailings deposition rate and anticipated rainfall runoff. Reclaim from the Cadia Hill open pit would be given the same use priority as the other operational tailings storages.

Consistent with the recommendations of HEC (Enclosure 3), CHPL would also extend the current surface water monitoring network to include the following additional monitoring during Cadia Hill open pit tailings deposition:

- weekly monitoring of tailings water level;
- annual monitoring of tailings beach profile; and
- daily volumes of water pumped.

Final Landform

The Modification would not alter the final Cadia Hill and Cadia East subsidence zone void lake equilibrium level and the tailings would lie some 245 m below this surface as described above (Figures 3 and 5 – Enclosure 1). It has also been concluded that the Modification would have no adverse impact on regional groundwater quality or final void waterbody quality in the long term.

It can therefore be concluded that the Modification would result in no material change to the approved final landform for the Cadia Valley Operations, and hence minimal environmental impact. Safety management measures at the combined Cadia Hill and Cadia East subsidence zone void would be unchanged by the Modification (i.e. exclusion by safety bunding/fencing).

In addition, as the tailings in the Cadia Hill open pit would be submerged by water, there would be no need to install a soil cover on the tailings, as will be the case with the approved NTSF and STSF at closure.

Hazard and Risk

The Cadia Hill open pit is a 500 m deep mine void, located in hard rock and upstream of the existing approved ore processing facilities, STSF and NTSF.

The new tailings and water return pipelines and associated pumps and electrical reticulation to be constructed in support of the Modification would be located within the existing development corridor between Cadia Hill open pit and the ore processing facilities.

This infrastructure would also be wholly within existing contained water management areas and would be managed consistent with the leakage detection and shutdown measures employed for the existing tailings and water transfer pipelines at the Cadia Valley Operations.

Deposition of tailings in the Cadia Hill open pit therefore would not result in any adverse change to the likelihood or consequences of a hazardous event at the Cadia Valley Operations.

Other Environmental Considerations

Consideration of other potential environmental impacts arising from the Modification is provided below:

- **Land Resources and Downstream Water Quality** - no implications as tailings deposition wholly within an approved open pit and no credible solute seepage pathway to the exterior environment.
- **Greenhouse Gas Emissions** – while pumping electricity demand may marginally increase due to the increased water return pumping head from the open pit, these changes would not be material to total Greenhouse Gas Emissions over the life of the Cadia Valley Operations.
- **Operational Noise and Air Quality** - Due to the modest scale and location of the proposed additional infrastructure in the central site area (Figure 2 – Enclosure 1) there would be no material implications for off-site air quality or noise during operations.
- **Construction Controls** – With the implementation of standard air quality, noise and water management controls there would be no material off-site impacts arising from Modification construction activities. Construction traffic deliveries would be well below previous Cadia Valley Operation construction and operational delivery peaks.
- **Workforce Demand and Accommodation** – A construction workforce of up to 50 people would be required to install the additional pump and piping infrastructure. This is well within previous construction peaks at the Cadia Valley Operations and would not place undue demand on regional accommodation.

Potential for Ore Sterilisation

The Division of Resources and Geoscience have been consulted with respect to the potential for sterilisation of ore reserves due to the deposition of tailings in the Cadia Hill open pit, including the potential for sterilisation of future Cadia East underground ore reserves.

All currently available information indicates that the deposition of tailings in the Cadia Hill open pit would not sterilise any economically viable ore reserves.

Cadia East Underground Mine Safety

CHPL has developed and refined a site specific calibrated subsidence model for the Cadia East underground mine. The calibrated model indicates there would be no extension to the subsidence zone that was previously predicted and approved for the Cadia East Project.

Based on the proposed Modification consolidated tailings deposition level of 420 m AHD, calibrated subsidence modelling and the very low permeability host rock, CHPL does not have any underground mine safety concerns with the storage of tailings and tailings supernatant water in the Cadia Hill open pit.

Notwithstanding, CHPL would continue to implement its operational safety management systems, including ongoing monitoring and risk assessments.

Consultation

CHPL has undertaken consultation with a wide range of stakeholders since the NTSF tailings embankment incident, including a range of NSW Government regulatory agencies, the Dams Safety Committee, Orange Shire Council and had also hosted an on-site inspection and briefing with approximately 50 local landholders, and also briefed the Belubula Landholders Association. CHPL is also in the process of preparing information leaflets to distribute to local stakeholders.

The Department of Planning and Environment also hosted a group NSW Government agency briefing to discuss the proposed Modification on 22 March 2018.

Agencies and Authorities that attended this briefing included representatives of:

- the Department of Planning and Environment;
- the Division of Resources and Geoscience;
- Environment Protection Authority;
- Dams Safety Committee; and
- Department of Industry – Lands and Water.

CHPL separately briefed the Cabonne and Blayney Shire Councils on the proposed Modification and has also made statements to the Australian Stock Exchange and media outlets with respect to the proposal in the week commencing 26 March.

Letters provided by the three local Councils in response to CHPL consultation on the Modification are provided in Enclosure 5.

It is anticipated that the consultation undertaken to date would be ongoing with all key stakeholders during the conduct of stabilisation and repair measures to the NTSF, as well as during the implementation of the Modification, should it be approved.

It is also noted that a number of the consultees, including the Environment Protection Authority, have been generally supportive of in-pit tailings deposition.

Assessment Pathway

Environmental Planning and Assessment Act, 1979

Legislative amendments to the EP&A Act (i.e. under the *Environmental Planning and Assessment Amendment Act, 2017*) removing the ability of proponents to access the section 75W modification pathway previously used to modify the Cadia East Project Approval have recently been proclaimed.

Following review of the potential environmental impacts of the Modification, approval for the Modification is therefore formally sought to Project Approval PA 06_0295 under section 4.55(1A) of the EP&A Act.

Section 4.55(1A) of the EP&A Act relevantly provides:

> *(1A)* ***Modifications involving minimal environmental impact***
>
> *A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:*
> *(a) it is satisfied that the proposed modification is of minimal environmental impact, and*
> *(b) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all), and*
> *(c) it has notified the application in accordance with:*
> *(i) the regulations, if the regulations so require, or*
> *(ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and*
> *(d) it has considered any submissions made concerning the proposed modification within any period prescribed by the regulations or provided by the development control plan, as the case may be.*
> *...*

Further, clause 3BA of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation, 2017*, specifies how section 4.55(2) of the EP&A Act applies to previous transitional Part 3A projects (such as the Cadia East Project):

> ***3BA Winding-up of transitional Part 3A modification provisions on cut-off date of 1 March 2018 and other provisions relating to modifications***
> *...*
> *(6) In the application of section 4.55 (2) of the Act (formerly section 96 (2)) to the following development, the consent authority need only be satisfied that the development to which the consent as modified relates is substantially the same development as the development authorised by the consent (as last modified under section 75W):*
>
> *(a) development that was previously a transitional Part 3A project and whose approval was modified under section 75W,*
> *...*

It is noted that section 4.55(1A) modifications do not have the benefit of clause 3BA(6). Therefore the consent authority is required to satisfy itself that any proposed modification under section 4.55(1A) of the EP&A Act would result in the Cadia East Project remaining substantially the same development as originally approved in 2010, inclusive of consideration of the changes arising from the previously approved modifications.

A comparative analysis is provided in Enclosure 6 that outlines the key elements of the approved modifications 1-9, including the key environmental assessment outcomes.

Consideration of the key comparatives detailed in the draft guideline *Modifying an Approved Project* (NSW Government, 2017) when considering whether the Modification could be considered to be "substantially the same" is provided in Table 2.

Table 2
Summary Evaluation for 'Substantially the Same' Test

Key Comparatives[2]	**Cadia Hill Tailings Modification Plus Modifications 1-9*** **Change to Originally Approved**
Development size, scale and footprint	No material increase.
Intensity including rates of production	Approx. 19% increase in ore processing rate and concentrate production (Mod 6).
Primary, secondary and ancillary use	Secondary use of completed open pit for supernatant tailings water storage (Mod 6) and tailings solids storage (current Modification). Otherwise Nil.
Project life and hours of operation	Nil.
Extent, duration and severity of impacts.	No material change.

* Refer Enclosure 6.

Enclosure 6 demonstrates that all previous modifications have not materially altered the essence of the Cadia Valley Operations, nor have the approved environmental impacts of the operations been materially altered. This would also remain the case if modification 10 is approved.

The Cadia Valley Operations has demonstrably remained a very large copper/gold mining complex that incorporates the following key elements approved under PA 06_0295 in 2010 (Figures 1 and 2 [Enclosure 1] and Tables 1 and 2):

- three individual gold/copper mines;
- major ore handling and processing facilities;
- mineral concentrate transfer, dewatering, storage and transportation facilities;
- extensive water supply and water management systems;
- major waste rock dumps and tailings storages that comprise very extensive mine landforms in the Cadia Valley; and
- a wide range of supporting infrastructure and facilities.

This would also clearly continue to be the case if the Modification was approved (Table 2) and therefore the consent authority can be satisfied that the Cadia Valley Operations incorporating the Modification would remain "substantially the same".

Environment Protection and Biodiversity Conservation Act, 1999 (Cth)

Given the location and nature of the proposed modification (i.e. no additional land disturbance, beneficial use of a completed open pit for tailings deposition) CHPL is satisfied that the Modification would not have a significant impact on any relevant Matter of National Environmental Significance under the *Environment Protection and Biodiversity Conservation Act, 1999*.

[2] NSW Government (2017) *Modifying an Approved Project Impact Assessment Guidance Series June 2017*

Summary

The Modification does not propose any increase to the approved rates of mining, ore processing or tailings emplacement at the Cadia Valley Operations. Nor would it alter the project operational workforce.

The Cadia East Project would remain substantially the same as originally approved under the Cadia East Project Approval (PA 06_0295), inclusive of the proposed Modification and the previously approved modifications.

In order to assess the potential environmental impacts of the proposed Modification a number of environmental reviews were completed. These reviews and the other assessments detailed above have concluded that the Modification would have minimal environmental impact.

With some minor extensions to the existing environmental monitoring network, the Cadia Valley Operations environmental management and monitoring measures already being applied by CHPL would continue to be applied to minimise the potential impacts on existing environmental values.

It is noted that in accordance with Clause 117 of the *Environmental Planning and Assessment Regulation, 2000* there is no applicable public notification requirement for a modification made under section 4.55(1A) of the EP&A Act. Given the extensive and ongoing consultation with a wide range of regulatory stakeholders and local landholders, and the negligible environmental impacts that would arise from the Modification, CHPL suggests that the Department of Planning and Environment should exercise its discretion to proceed directly to assessment of the proposal.

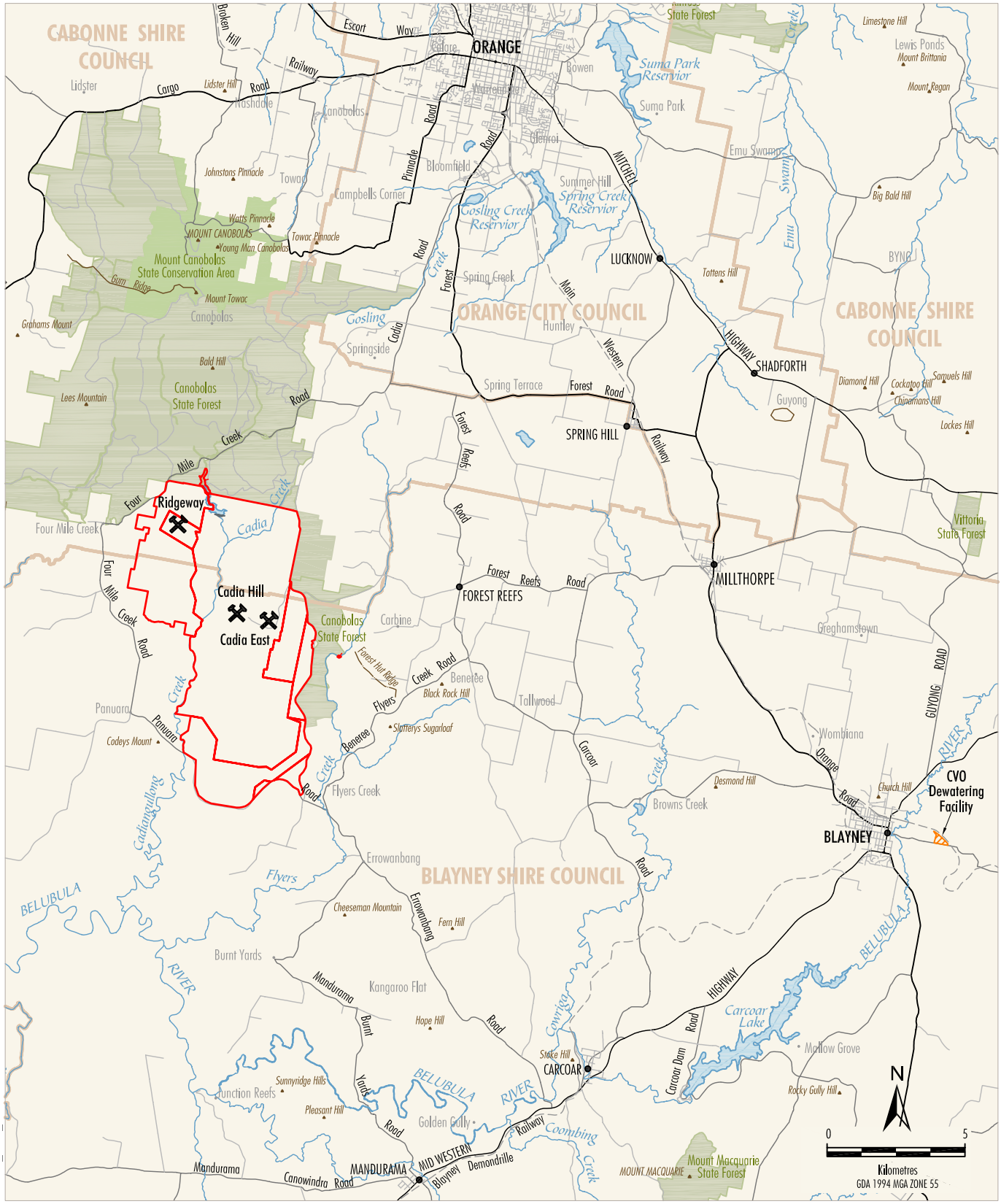
Please do not hesitate to contact me on (02) 6366 6320 if you would like to discuss.

Yours sincerely

Andrew Wannan
Approvals Manager
Cadia Valley Operations

Enclosure 1 Figures
Enclosure 2 Groundwater Review
Enclosure 3 Final Void Water Balance and Water Management Review
Enclosure 4 Expert Opinion
Enclosure 5 Correspondence from Local Councils
Enclosure 6 Summary of Previous Cadia East Modifications 1-9

ENCLOSURE 1
FIGURES



LEGEND

- Mining Lease/Mining Lease Application Boundary
- Local Government Area
- Road
- Railway
- NSW State Forest
- NPWS Reserve

Source: Department of Lands NSW (2006); Department of Industry (2017)

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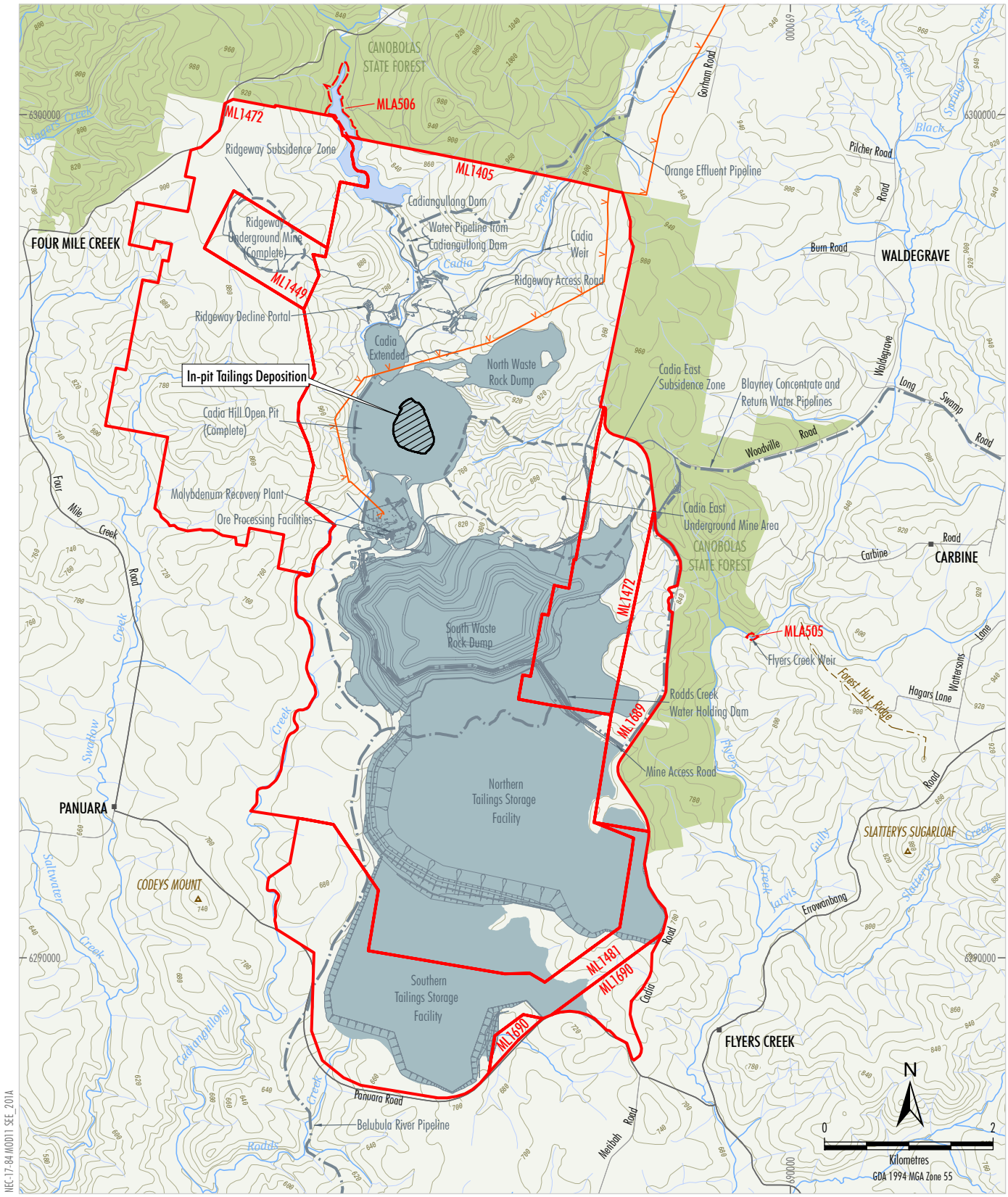
Regional Location

Figure 1

NEC-17-84_MOD11_SEE 101A



NEC-17-84 MOD11 SEE_201A

LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- State Forest
- Powerline
- Existing/Approved Mine Infrastructure and Landforms

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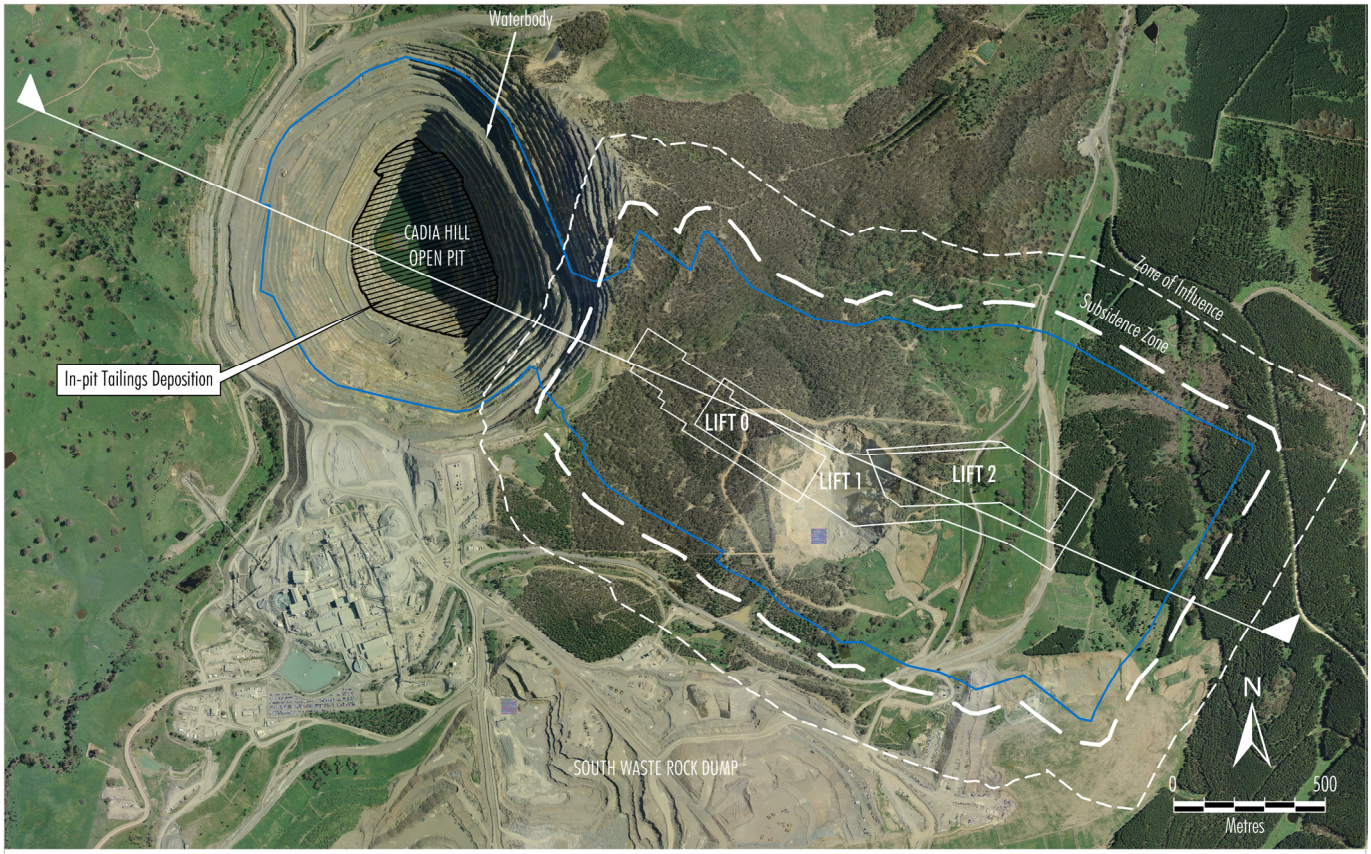
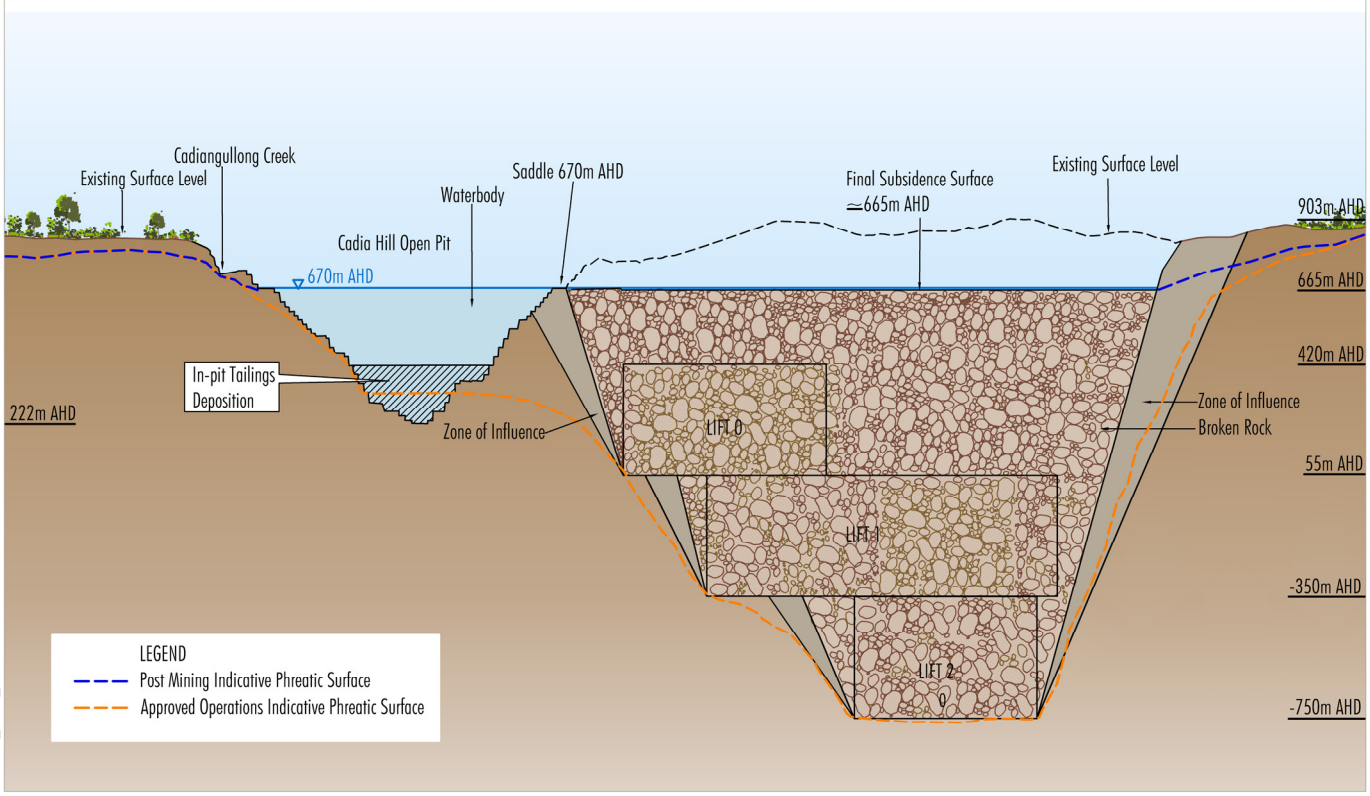
Modification Location

Source: Land and Property Information (2017);
NSW Planning & Environment Resource & Energy (2017)
CHPL (2018)

Figure 2





NEC-17-84_MOD11_SEE 102A

Source: CHPL (2008) ; After AGE (2018)

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Conceptual Long Section of the
Cadia Hill Open Pit and the Cadia East
Subsidence Zone

Figure 3

LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- State Forest
- Powerline
- Groundwater Bore
- Tailings Water Quality Location

Source: Land and Property Information (2017);
NSW Planning & Environment Resource & Energy (2017)
CHPL (2018)

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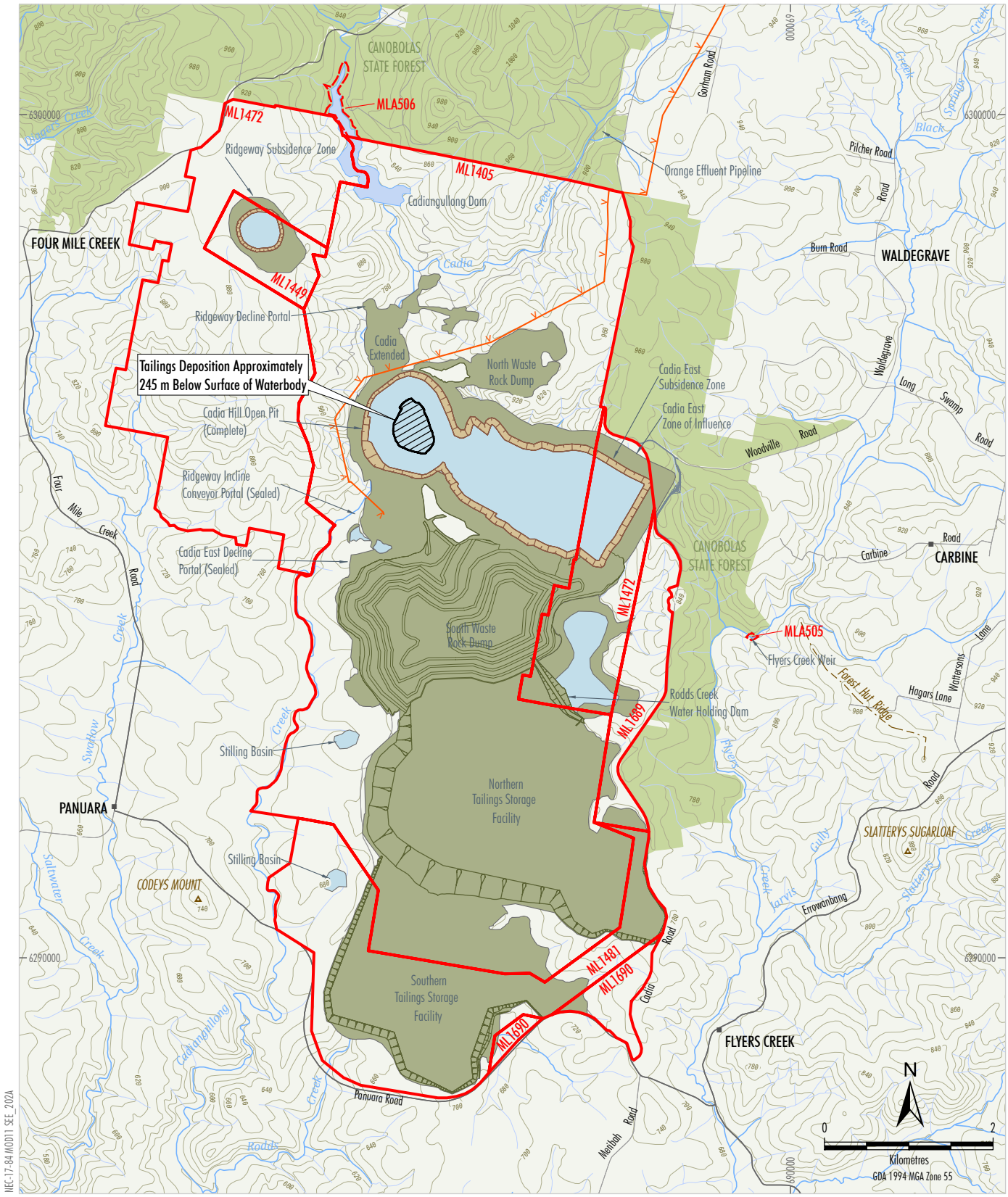
CADIA VALLEY OPERATIONS

Cadia Vallley Operations
Groundwater Bore and
Tailings Water Quality Locations

Figure 4



NEC-17-84 MOD11 SEE_202A

LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- State Forest
- Powerline
- Revegetated/Rehabilitated Area
- Waterbody

NEWCREST MINING LIMITED

CADIA VALLEY OPERATIONS

Post Mining Landforms

Source: Land and Property Information (2017);
NSW Planning & Environment Resource & Energy (2017)
CHPL (2018)

Figure 5

ENCLOSURE 2
GROUNDWATER REVIEW

Australasian Groundwater
and Environmental Consultants Pty Ltd
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JST:tb(G1383M.CadiaMOD10)
21 March 2018

Mr Andrew Wannan
Manager Environment

Cadia Valley Operations – Newcrest Mining Limited
via email

Dear Andrew,

RE: Cadia Hill Tailings Deposition – Groundwater Assessment

1 Introduction and scope of work

The Cadia Valley Operations (CVO) are located approximately 25 kilometres south-west of Orange, in the Central Tablelands of New South Wales (NSW), and comprises one open cut mine (Cadia Hill), and two underground mines (Ridgeway and Cadia East). Cadia Holdings Pty Limited (CHPL) owns and operates the CVO and is a wholly owned subsidiary of Newcrest Mining Limited.

CHPL deposits tailings from the ore processing facilities in the Northern Tailings Storage Facility (NTSF) and the Southern Tailings Storage Facility (STSF). CHPL is currently re-evaluating long term tailings storage options following a limited breakthrough of tailings material from the NTSF embankment into the STSF on 9 March 2018.

In order to facilitate the timely and orderly re-instatement of full mining and ore processing activities at the Cadia Valley Operations, engineering studies have identified an opportunity to also deposit tailings within the completed Cadia Hill Open Pit.

Because of the depth of the Cadia Hill Open Pit (approx. 220m Australian Height Datum [AHD]) in-pit tailings deposition could readily be achieved while still maintaining the approved closure strategy for Cadia Hill (i.e. final pit void lake).

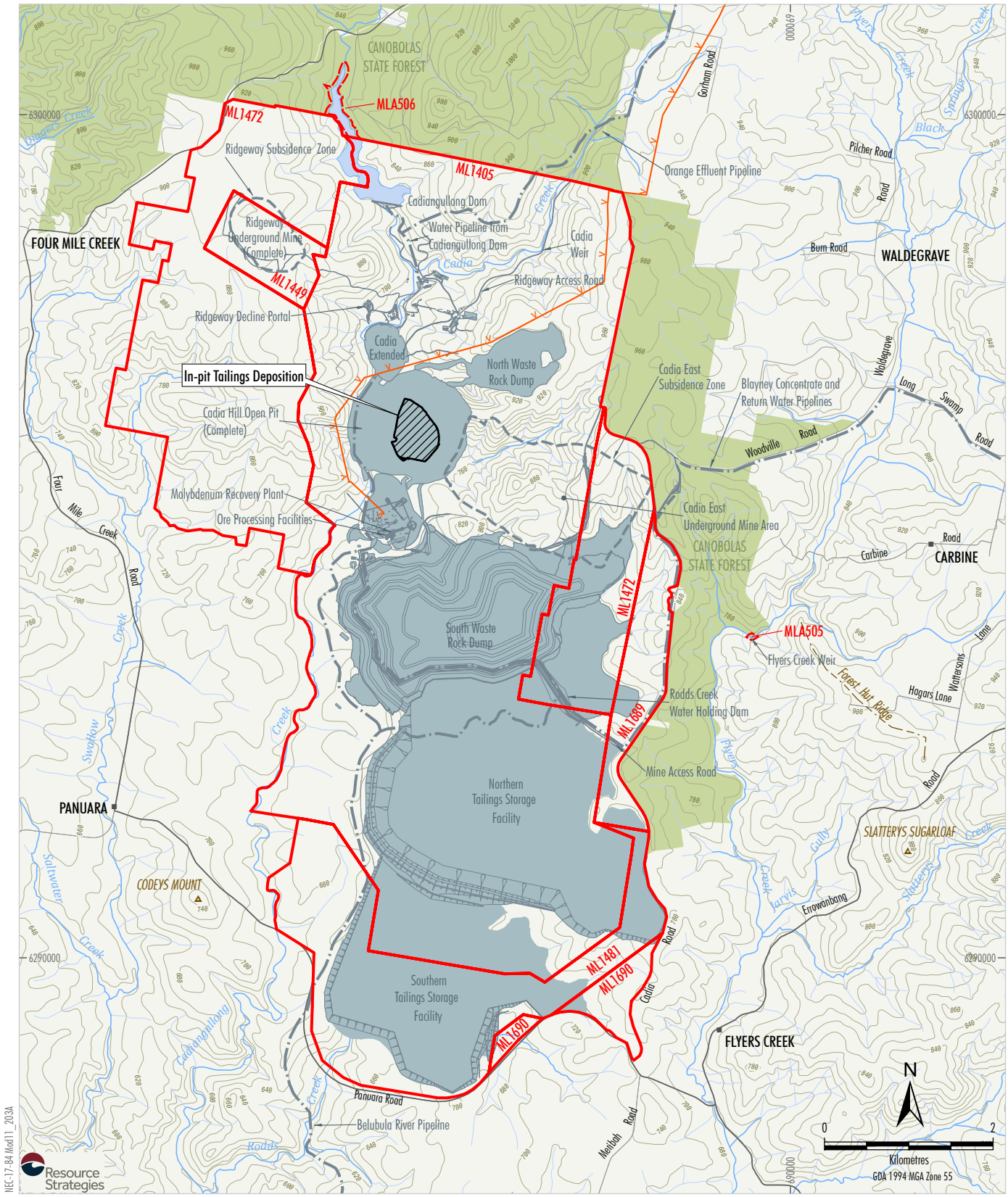
The proposed Tailings Deposition Modification (the Modification) would not involve any change to the approved Cadia Valley Operations except with respect to tailings transport, deposition and water return.

The proposed Modification would include:

- Deposition of Cadia Valley Operations tailings in the completed Cadia Hill Open Pit (i.e. in-pit deposition) commencing in 2018 and occurring up to a maximum elevation of 420 metres AHD, once consolidated (i.e. approximately 30Mt tailings or less than one year's duration at permitted annual ore processing rates).
- Associated upgrades to tailings distribution systems and water management infrastructure to facilitate transfer of tailings to the open pit, and within the pit as required.
- Supporting infrastructure (e.g. extensions to or duplication of on-site electrical distribution, access tracks and tailings and return water pump stations and pipelines) in support of the Modification.

Figure 1 shows the locations of Cadia Hill Open Pit and the footprint of the proposed tailings emplacement. Figure **2** includes a long section through Cadia Hill Open Pit and Cadia East. It shows the proposed in-pit tailings emplacement, the current conceptual phreatic groundwater surface and the long term modelled recovered water levels within the Cadia Hill Open Pit and Cadia East subsidence zone and the combined final void waterbody (and associated final conceptual phreatic surface). It also illustrates the relationship of the tailings emplacement with the Cadia East underground mine and the surrounding environmental features including Cadiangulong Creek.

CHPL engaged Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) to assess the impacts of the tailings emplacement within Cadia Hill Open Pit on the groundwater regime. This letter reviews the groundwater systems in the area of the Cadia Hill Open Pit and discusses the potential groundwater related impacts of the proposed tailings emplacement. The impacts are also compared with the Minimal Impact Considerations of the *NSW Aquifer Interference Policy* (AIP) (NSW Office of Water [NOW], 2012) for completeness.



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- State Forest
- Powerline
- Existing/Approved Mine Infrastructure and Landforms

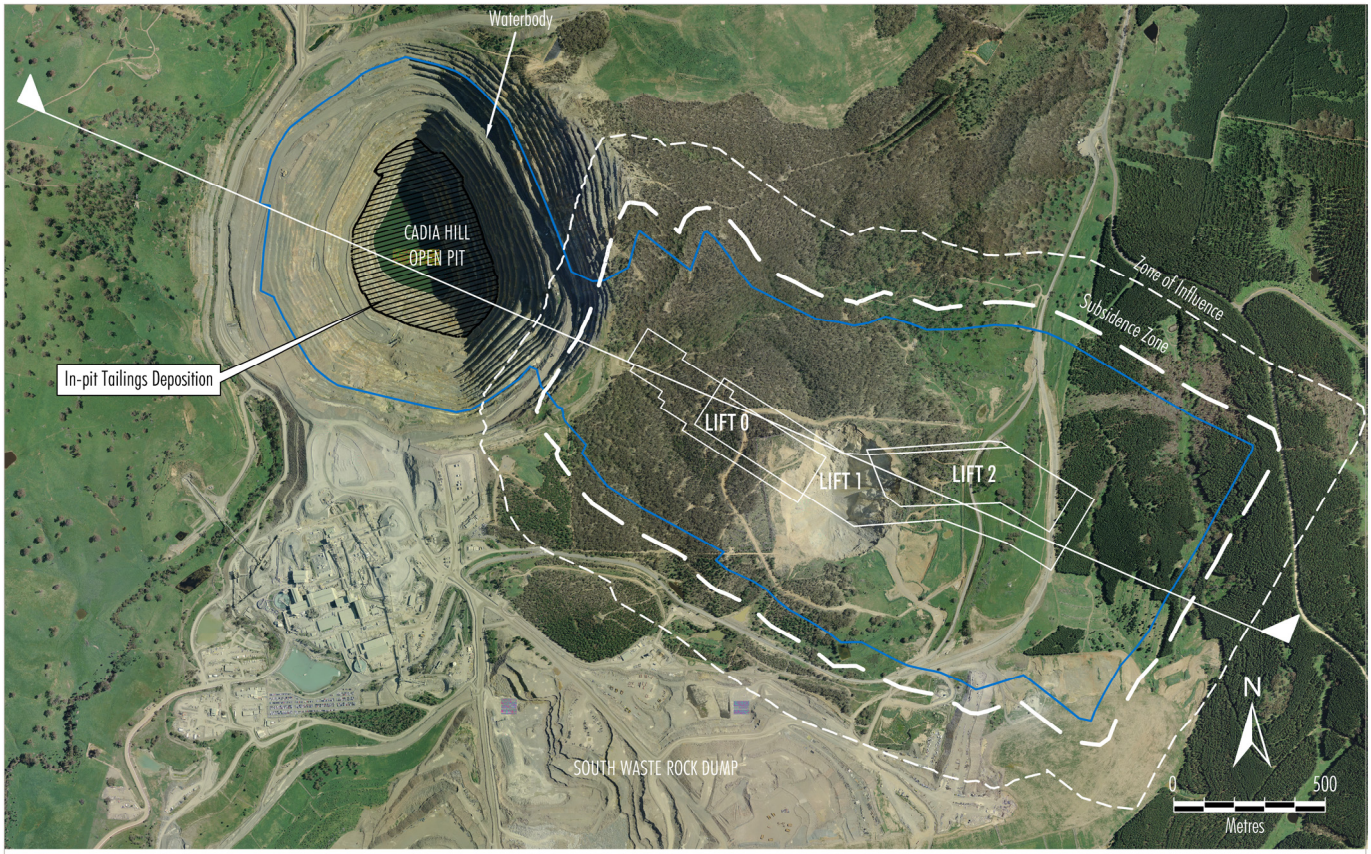
NEWCREST MINING LIMITED

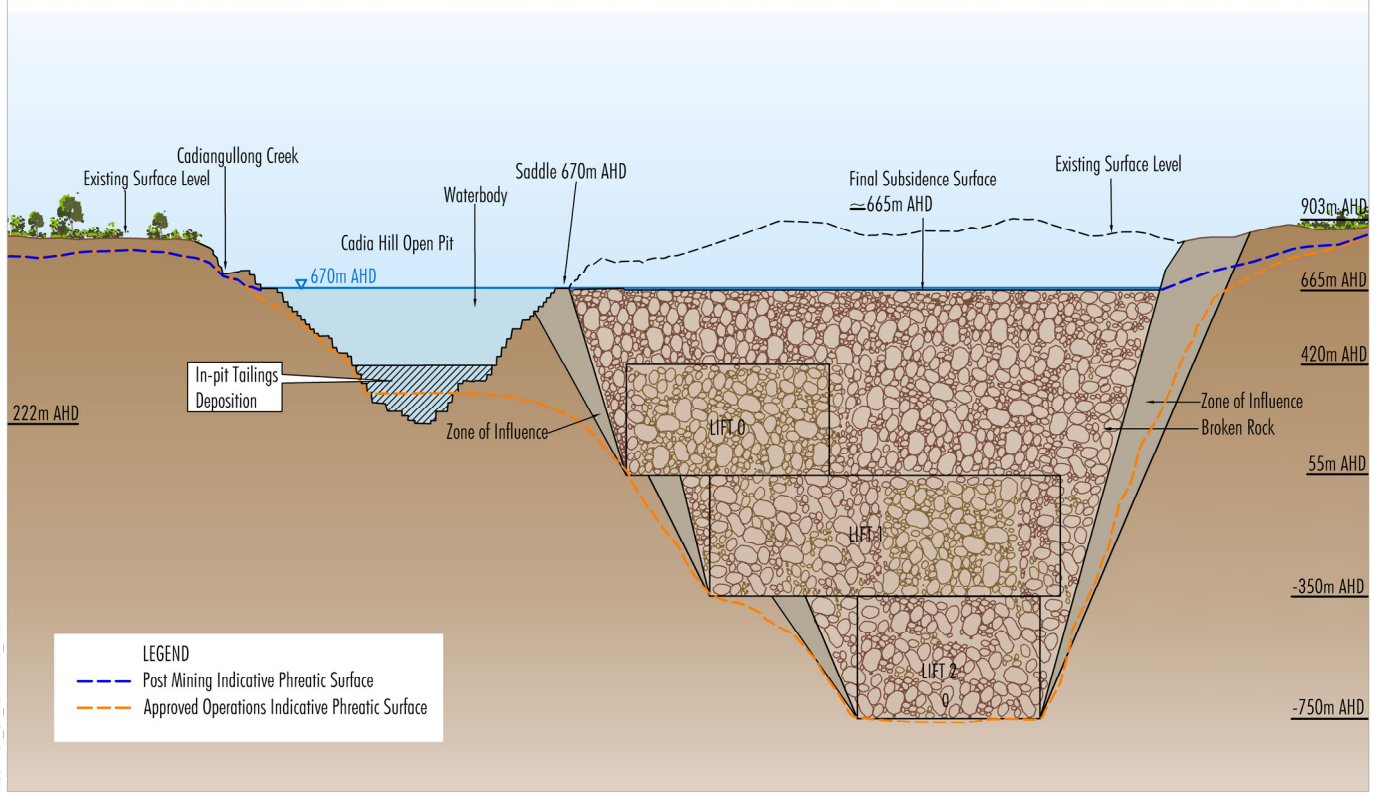
CADIA VALLEY OPERATIONS MODIFICATION 11

Modification Location

Source: Land and Property Information (2017);
NSW Planning & Environment Resource & Energy (2017)
CHPL (2018)

Figure 1





NEC17-84_GW_Let March18_102A

Source: CHPL (2008) ; After AGE (2018)

NEWCREST MINING LIMITED

CADIA VALLEY OPERATIONS

Conceptual Long Section of the Cadia Hill Open Pit and the Cadia East Subsidence Zone

Figure 2

2 Groundwater regime of Cadia Hill

There are three major hydrostratigraphic units that occur at CVO and within the surrounding region:

- Tertiary basalt, which forms a productive aquifer utilised by surrounding properties with varying yields from low to high and consistently fresh water suitable for potable use;
- the underlying Silurian sediments sequence which is more variable in permeability but form a low yield aquifer from fractured sandstone and siltstones, with locally high yields where fractured limestones are present towards the base of the sequence; and
- the Ordovician volcaniclastic basement rocks which have a widely spaced and poorly interconnected fracture network and therefore form an aquitard with very low yields and slightly brackish water quality.

Cadia Hill Open Pit operated between 2002 and 2012 extracting mineralised gold-copper porphyry deposits from the Ordovician bedrock down to a level of approximately 220 mAHD, which is approximately 500 m below the pit crest at 721 mAHD. A small area of Silurian sediments were exposed in the north-east wall of Cadia Hill Open Pit and comprise alternating units of sandstone and siltstone. The limestone unit that can form an aquifer at the base of the Silurian sequence was not encountered at Cadia Hill. Likewise Tertiary basalt flows that form an aquifer system further to the north and east of CVO were also not encountered within the pit shell.

Geotechnical investigations conducted during mining (Newcrest 2006) noted Cadia Hill Open Pit occurs within a low permeability rock mass, and groundwater ingress was generally only evident in localised areas through structures. A number of faults intersect Cadia Hill Open Pit with visual examinations summarised by AGE (2009) indicating the faults are between 0.5 m and 20 m wide and characterised by milled rock and clay gouge infill with fractured wall rocks. During mining, the faults did not produce problematic volumes of groundwater with the clay gouge material expected to retard water movement through the fault plane.

During mining, CVO monitored pore pressure within the pit walls using a series of geotechnical piezometers. The data from the piezometers indicate a very steep hydraulic gradient and therefore a limited cone of groundwater depression formed within the rock mass surrounding the pit shell. Due to the limited drainage of groundwater, horizontal drain holes were the most effective method for reducing pore pressure and the risk of slope failures.

During operations groundwater inflow into Cadia Hill Open Pit could not be directly measured as it occurred as slow seepages across the pit walls that mixed with runoff, or was readily evaporated, or bound by capillary action to the excavated ore and waste rock. Figure 3 below illustrates the typically dry nature of the rock mass and the localised seepage zones.

Figure 3 Photo within Cadia Hill Pit showing limited and isolated seep zones

CVO used a water balance method to back calculate the volume of groundwater entering the pit from the total volume of water pumped from the pit. The water balance method estimated a groundwater ingress to the Cadia Hill Open Pit of <0.7 ML/day.

The general lack of significant aquifer systems and limited groundwater ingress to Cadia Hill Open Pit means that CVO have located groundwater monitoring bores where the more sensitive and productive Tertiary basalt and Silurian aquifer systems occur beyond the limit of the pit shell to the north and east of Cadia Hill. Cadia Hill is situated within the Cadiangullong Creek catchment which is drained by Cadiangullong Creek which flows southward to the Belubula River. The creek has been diverted around the western edge of the Cadia Hill for a distance of approximately 2 km. The predominance of the low permeability bedrock in the Cadiangullong Creek catchment in the vicinity of the mine means there is limited discharge of groundwater to the creek as baseflow, particularly during dry periods.

3 Previous modelling

The impact of the Cadia Hill Open Pit, Cadia East underground mine and Ridgeway underground mine on the groundwater regime has been assessed using numerical groundwater flow models. AGE (2009) describes the numerical model developed for the Cadia East Environmental assessment which was approved in 2009. The groundwater model has been updated on two occasions since this time in accordance with Schedule 3, Condition 34(d) of PA 06_0295 (AGE 2013, 2016).

As noted previously, due to the very low inherent host rock permeability (Newcrest 2006, 2015), Cadia Hill Open Pit experienced very low groundwater inflows over its life. AGE (2009) constructed a 3D numerical groundwater flow of CVO that included Cadia Hill Open Pit. The model was constructed using the MODFLOW-SURFACT software and represented the three key regional hydrostratigraphic units,
being the Tertiary basalts, Silurian sediments and Ordovician volcaniclastics.

The model was calibrated to average water level measurements. Calibration was achieved by adopting a horizontal hydraulic conductivity for the Ordovician rock mass of 1 x 10^{-8}m/sec. Subsequent updates to the numerical model (AGE 2013, 2016) adopted lower hydraulic conductivity values for the Ordovician rock mass to improve the ability of the model to replicate the groundwater ingress estimated for Cadia East and Cadia Hill Open Pit. The most recent update to the groundwater model adopted a hydraulic conductivity for the Ordovician rock mass of between 5 x 10^{-12} to 6 x 10^{-11} m/sec to achieve calibration with estimated and observed groundwater inflows to the mining areas.

The groundwater modelling has consistently predicted a relatively steep cone of depression and limited zone of drawdown within the rock mass around the Cadia Hill pit shell (and the Cadia East underground mine). This has been confirmed by monitoring within geotechnical piezometers installed within the Cadia Hill pit walls that have retained high pore pressures.

The AGE (2009) numerical model provided an estimate of groundwater inflow rate to the Cadia Hill Pit of 1.5 ML/day reducing to 1.3 ML/day when Cadia East mine was developed. As noted, subsequent updates to the groundwater model have reduced the bedrock hydraulic conductivity to achieve a better match to the estimate of groundwater inflow to Cadia Hill from the pit water balance of <0.7 ML/day (AGE 2016).

Gilbert & Associates (2009) assessed the long term behavior of the waterbody that will form in Cadia Hill using a water balance model. Groundwater inflows predicted by AGE (2009) were represented in the model along with surface runoff from the adjacent catchment, incident rainfall and evaporation from the surface of the Cadia Hill Open Pit and Cadia East subsidence zone combined final void waterbody. The modelling indicated Cadia East would slowly fill over a period of 150 to 160 years before spilling into the Cadia Hill Open Pit and eventually reaching a combined equilibrium water level of 670 mAHD at around 330 years. The model was subsequently updated using a Cadia Hill Open Pit groundwater influx of 0.7 ML/day and Cadia East underground influx of 1.5 ML/day to better represent the estimates of the pit water balance and observed underground inflows. The updates had no effect on the equilibrium level, but extended the period to equilibrium to approximately 900 years (HEC, 2018).

At equilibrium, the 2009 modelling indicated the evaporation rate from the final void would average 12.5 ML/day, which is significantly in-excess of the groundwater ingress. AGE (2009) concluded the evaporative pumping effect of the final void waterbody will result in the water level remaining below pre-mining levels forming a 'groundwater sink' which will continue to draw groundwater into the void over time. While 2018 revised modelling conducted by HEC indicates that the final void evaporation rates would be closer to 10 ML/day, it remains much more than groundwater inflows and the predicted long term equilibrium water level would be unchanged (HEC, 2018).

The effect of this will be to concentrate salt within the void waterbody, preventing movement of void water into the rock mass surrounding the pit shell. Further, it is noted that the quality of the final void waterbody is also predicted to be affected by the geochemistry of the host rock mass, with acidic drainage generated from the oxidation of potentially acid forming Ordovician volcanic material within the cave zone likely to reduce the pH and increase dissolved metal concentrations in the water (Gilbert & Associates, 2009).

4 Impact assessment

The impact of depositing tailings within Cadia Hill on the groundwater regime depends on the potential for tailings water to leak from the pit shell into the surrounding rock mass and then to move receptors such as aquifers or streams. The movement of tailings water into or out of the pit shell is controlled by the difference in the water level within the pit shell, and the groundwater level in the rock mass immediately outside the pit shell. The proposed modification comprises deposition of approximately 30 Mt of tailings from the pit floor (approximately 220 mAHD) up to a consolidated tailings level of 420 mAHD. During operations the maximum water level within the pit shell is unlikely to exceed 420-475 mAHD (subject to the status of the overall water balance as the open pit is a site contingency water storage). Should emplacement cease at a consolidated tailings level of 420m, post mining the void will flood with water submerging the tailings and recovering to an estimated final void equilibrium level of level of 670mAHD (HEC, 2018).

The available information on the groundwater regime indicates there is no potential for material transport of tailings solutes between the tailings deposited in Cadia Hill Open Pit and the surrounding groundwater regime. This is a function of the lower level of tailings and water within the Cadia Hill pit shell compared to the water levels within the surrounding rock mass. The tailings emplacement is some 300 m lower than the invert of Cadiangullong Creek at 708 mAHD (Figure 2). Whilst the tailings are being emplaced into Cadia Hill Open Pit this will mean there is no potential for flow of tailings water into the creek. After closure, rainfall and groundwater seepage over an extended period will fill the void to an estimated level of 670mAHD, which is some 40 m lower than the base of Cadiangullong Creek again preventing any mechanism for flow of tailings solutes into the creek.

Numerical modelling and pressures measured within geotechnical piezometers have indicated groundwater levels within the rock mass surrounding Cadia Hill pit are higher than the level of the tailings and the equilibrium water level post mining. Groundwater flows from areas of high pressure/level to low pressure/level meaning the inward hydraulic gradient towards the pit shell that has developed will remain during deposition of the tailings and also remain post mining.

There is also no potential for direct connectivity with the Tertiary basalt and Silurian limestones that can form aquifers within the region because these units have not been intersected by the Cadia Hill pit shell, and the hydraulic gradients will not promote flow in the direction of the aquifers.

The Cadia East Project was assessed and approved in 2009 prior to the enactment of the Aquifer Interference Policy (AIP) (NOW, 2012). CHPL hold groundwater extraction licences to account for the groundwater ingress into mining areas. The proposed tailings emplacement will not increase the volume of groundwater entering Cadia Hill Open Pit during operations. The reverse is expected because the tailings will be in the range of 40% to 45% water (i.e. 55% to 60% solids) which will reduce the time to fill the final void to the equilibrium level of 670 mAHD. Therefore there would be no net increase to the predicted groundwater take or licenced allocations required as a result of the modification.

It is noted that the inclusion of tailings in Cadia Hill Open Pit would have no material impact on the long term recovery of regional groundwater tables or long term water quality in the final void waterbody, as these would be dominated by the Cadia East underground groundwater inflow rates, incident rainfall, host rock geochemistry and evapo-concentration of salts at the surface of the waterbody.

Notwithstanding, a comparison of the CVO including proposed modification against the AIP (NOW, 2012) is provided in the attached tables. It should be noted that much of the information in the tables is based on the updated modelling presented by AGE (2016), and therefore, describes the impacts of the entire CVO in comparison to the proposed modification.

5 Conclusions

The available information on the groundwater regime indicates that there is no potential for connectivity between the tailings emplacement proposed within Cadia Hill Open Pit and the surrounding groundwater regime because:

- Tailings will be some 300 m lower than the invert of Cadiangullong Creek at 708 mAHD (Figure 2).
- After closure the recovered water level within the Cadia Hill Open Pit and Cadia East subsidence zone combined final void will reach an equilibrium of 670mAHD, which is lower than the groundwater level measured within piezometers in the surrounding rock mass, and means the inward hydraulic gradient towards the pit shell that has developed will remain during deposition of the tailings and continue post mining.
- Tertiary basalt and Silurian limestones that can form aquifers within the region have not been intersected by the Cadia Hill pit shell and the hydraulic gradients will not promote flow in the direction of these aquifers.

Given the lack of connectivity the risk to the groundwater regime from the tailings emplacement is considered negligible.

Previous studies also identified that the water quality of the combined Cadia Hill and Cadia East final void will be affected by the long term evapo-concentration of salts and also acidic drainage of potentially acid forming Ordovician host rock affecting pH and dissolved metal concentrations. The addition of the tailings solids to the Cadia Hill Open Pit would not affect the long term water quality of the recovered groundwater table or combined final void, as the void water quality would continue to be an outcome of evapo-concentration of salts and the geochemistry of the Cadia East host rock, both of which would be unchanged by the Modification.

A supplementary review of potential impacts associated with the modification against the AIP's Minimal Impact Considerations also indicates that the modification is acceptable.

6 References

Australasian Groundwater and Environmental Consultants Pty Ltd, (2009), "Cadia East Project Groundwater Assessment", April 2009, Project Number G1383.

Australasian Groundwater and Environmental Consultants Pty Ltd, (2013), *"Cadia East Mine Update to Groundwater Model",* June 2013, Project Number G1383A.

Australasian Groundwater and Environmental Consultants Pty Ltd, (2016), *"Cadia Mine Update to Groundwater Model",* August 2016, Project Number G1383C.

Gilbert Associates (2009). "Cadia East Project, Surface Water Assessment" Prepared for: Cadia Holdings Pty Limited, May 2009.

Hydro Engineering Consultants (2018) "Cadia Hill Tailings Disposal: Final Void Water Balance and Water Management" Prepared for: Cadia Holdings Pty Limited, March 2018.

Newcrest (2006) *Cadia Hill Pit Geotechnical Report.*

Newcrest (2015) *Cadia Hill Pit Cutback 4 Geotechnical Pre-Feasibility Study.*

New South Wales Office of Water, (2012), *"Aquifer Interference Policy".*

Please contact the undersigned should you have any queries or require clarification.

Yours faithfully,

JAMES S. TOMLIN
Principal Hydrogeologist/Director
Australasian Groundwater and Environmental Consultants Pty Ltd

Attachment Responses to AIP requirements

AIP requirement		Response	
		Approved operations	Proposed modification
1	Described the water source (s) the activity will take water from?	• Lachlan Fold Belt MDB Groundwater Source • Orange Basalt Groundwater Source	No change due to Modification
2	Predicted the total amount of water that will be taken from each connected groundwater or surface water source on an annual basis as a result of the activity?	• Lachlan Fold Belt MDB Groundwater Source – 792 ML/yr • Orange Basalt Groundwater Source – 289 ML/yr average	No additional take due to Modification
3	Predicted the total amount of water that will be taken from each connected groundwater or surface water source after the closure of the activity?	Peak will occur during mining, and reduce post mining	The evaporative pumping effect from the Cadia Hill and Cadia East subsidence zone combined final void post mining will be unchanged due to the Modification
4	Made these predictions in accordance with Section 3.2.3 of the AIP? (page 27)	Numerical model used subjected to 3D transient calibration – refer AGE (2016)	Modification will not result in significant change to environmental impacts therefore no additional modelling required
5	Described how and in what proportions this take will be assigned to the affected aquifers and connected surface water sources?	• Lachlan Fold Belt MDB Groundwater Source – 792 ML/yr • Orange Basalt Groundwater Source – 289 ML/yr average	No additional take due to Modification
6	Described how any licence exemptions might apply?	N/A	N/A
7	Described the characteristics of the water requirements?	Yes – refer AGE (2016)	No additional water requirements due to Modification
8	Determined if there are sufficient water entitlements and water allocations that are able to be obtained for the activity?	Yes: • WAL31702 - Units 371 ML, Lachlan Fold Belt MDB Groundwater Source • WAL36229 - Units 931ML, Lachlan Fold Belt MDB Groundwater Source • WAL31062 - Units 196ML, Orange Basalt Groundwater Source	No additional take due to Modification
9	Considered the rules of the relevant water sharing plan and if it can meet these rules?	Yes	No change for Modification
10	Determined how it will obtain the required water?	Yes	No additional water required for Modification

AIP requirement		Response	
		Approved operations	Proposed modification
11	Considered the effect that activation of existing entitlement may have on future available water determinations?	N/A	N/A
12	Considered actions required both during and post-closure to minimize the risk of inflows to a mine void as a result of flooding?	Post mining the Cadia Hill and Cadia East subsidence zone combined final void will flood and lakes will form in the subsidence voids	No change due Modification
13	Developed a strategy to account for any water taken beyond the life of the operation of the project?	Surrendering of water licenses post mining if required	No change due to Modification
	Will uncertainty in the predicted inflows have a significant impact on the environment or other authorized water users? *Items 14-16 must be addressed if so.*		No - tailings emplacement will reduce inflow to Cadia Hill Open Pit
14	Considered any potential for causing or enhancing hydraulic connections, and quantified the risk?		No potential to cause or enhance hydraulic connections
15	Quantified any other uncertainties in the groundwater or surface water impact modeling conducted for the activity?	Yes - sensitivity analysis undertaken by AGE (2016)	Pit water balance updated for proposed tailings emplacement modification – refer HEC (2018)
16	Considered strategies for monitoring actual and reassessing any predicted take of water throughout the life of the project, and how these requirements will be accounted for?	Yes ongoing monitoring and routine updates to groundwater model in accordance with Schedule 3, Condition 34(d) of PA 06_0295	No additional strategies beyond those outlined within the Water Management Plan considered necessary

Determining water predictions in accordance with Section 3.2.3

AIP requirement		Response	
		Approved operations	Proposed modification
1	Addressed the minimum requirements found on page 27 of the AIP for the estimation of water quantities both during and following cessation of the proposed activity?		The proposed tailings emplacement is not expected to change previously predicted water quantities

Other requirements to be reported on under Section 3.2.3

AIP requirement		Response	
		Approved operations	Proposed modification
1	Establishment of baseline groundwater conditions?	Yes previously provided	Yes known from monitoring – no change from Modification
2	A strategy for complying with any water access rules?	Yes refer Water Management Plan	Not applicable as no additional water take expected
3	Potential water level, quality or pressure drawdown impacts on nearby basic landholder rights water users?	Yes predictions provided in previous approval documents	No additional impact on nearby basic landholder rights water users predicted
4	Potential water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources?	Yes predictions provided in previous approval documents	No additional impacts on licensed water users in connected groundwater and surface water sources predicted
5	Potential water level, quality or pressure drawdown impacts on groundwater dependent ecosystems?	Yes predictions provided in previous approval documents	No additional drawdown impacts predicted
6	Potential for increased saline or contaminated water inflows to aquifers and highly connected river systems?	Yes predictions provided in previous approval documents- previous predictions that the Cadia Hill and Cadia East subsidence zone combined final void will form an evaporative sink concentrating salts and may include ARD	No change due to Modification
7	Potential to cause or enhance hydraulic connection between aquifers?	Yes predictions provided in previous approval documents	No potential for cause or enhance hydraulic connection between aquifers
8	Potential for river bank instability, or high wall instability or failure to occur?	N/A	N/A
9	Details of the method for disposing of extracted activities (for CSG activities)?	N/A	N/A

Addressing the minimal impact considerations

Aquifer	Fractured Rock - Orange Basalt	
Category	**Highly productive**	
Level 1 minimal impact consideration	**Previous assessment**	**Proposed modification**
<u>Water Table</u> Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. **OR** A maximum of a 2 m water table decline cumulatively at any water supply work.	**Acceptable** • No high priority groundwater dependent ecosystems or culturally significant sites have been identified within the predicted zone of depressurisation. • Updated model indicates no private water supply bores predicted to be impacted by drawdown in excess of 2 m.	• No additional drawdown predicted due to proposed Modification. • No change due to Modification.
<u>Water pressure</u> A cumulative pressure head decline of not more than a 2 m decline, at any water supply work.	**Acceptable** • Updated model indicates no private water supply bores predicted to be impacted by drawdown in excess of 2 m.	• No change due to Modification.
<u>Water quality</u> Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.	**Acceptable** • Groundwater flow is towards Cadia Hill and Cadia East - therefore, there will be no change in the beneficial use category of the basalt. • Post mining ,the Cadia Hill and Cadia East subsidence zone combined final void will remain a permanent sink to groundwater and therefore the flow will be into the void and there will be no change in the beneficial use category of the basalt. • Previous predictions that the Cadia Hill and Cadia East subsidence zone combined final void will form an evaporative sink concentrating salts and may include ARD. • Transfer of tailings supernatant water to the open pit is approved.	• No change due to the Modification

Aquifer	Porous rock or fractured rock – Silurian and Ordovician Bedrock - Lachlan Fold Belt MDB Groundwater Source		
Category	**Less productive**		
Level 1 Minimal impact consideration		**Previous Assessment**	**Proposed Modification**
<u>Water Table</u> Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. **OR** A maximum of a 2 m water table decline cumulatively at any water supply work.		**Acceptable** • No high priority groundwater dependent ecosystems or culturally significant sites have been identified within the predicted zone of depressurisation – • Updated model indicates no private water supply bores predicted to be impacted by drawdown in excess of 2 m –	• No change due to Modification • No change due to Modification
<u>Water pressure</u> A cumulative pressure head decline of not more than a 2 m decline, at any water supply work.		**Acceptable** • Updated model indicates no private water supply bores predicted to be impacted by drawdown in excess of 2 m –	• No change due to Modification.
<u>Water quality</u> Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.		**Acceptable** • Groundwater flow is towards Cadia Hill - therefore, there will be no change in the beneficial use category of the water source. • Post mining the Cadia Hill and Cadia East subsidence zone combined final void will remain a permanent sink to groundwater and therefore the flow will be into the void and there will be no change in the beneficial use category of the water source. • Previous predictions that the Cadia Hill and Cadia East subsidence zone combined final void will form an evaporative sink concentrating salts and may include ARD. • Transfer of tailings supernatant water to the open pit is approved.	• No change due to the Modification

ENCLOSURE 3
FINAL VOID WATER BALANCE AND WATER MANAGEMENT REVIEW

HYDRO ENGINEERING & CONSULTING PTY LTD

27 March 2018

Approvals Manager
Cadia Valley Operations – Newcrest Mining Limited

via Email
Attention: Andrew Wannan

Andrew,

Re: Cadia Valley Operations – Cadia Hill Tailings Disposal: Final Void Water Balance and Water Management

We understand that Cadia Holdings is currently re-evaluating long term tailings storage options following a limited breakthrough of tailings material from the Northern Tailings Storage Facility embankment into the Southern Tailings Storage Facility on 9 March 2018.

In order to facilitate the timely and orderly re-instatement of full mining and ore processing activities at the Cadia Valley Operations, engineering studies have identified an opportunity to also deposit tailings within the completed Cadia Hill open pit.

Because of the depth of the Cadia Hill open pit (approx. 220m AHD) in-pit tailings deposition could readily be achieved while still maintaining the approved closure strategy for Cadia Hill (i.e. final pit void lake).

The proposed tailings deposition would not involve any change to the approved Cadia Valley Operations except with respect to tailings transport, deposition and water return.

The proposed Modification would include:

- deposition of Cadia Valley Operations tailings in the completed Cadia Hill Open Pit (i.e. in-pit deposition) commencing in 2018 and occurring up to a maximum elevation of 420 metres AHD, once consolidated (i.e. approximately 30 Mt tailings or less than one years' duration at permitted annual ore processing rates);
- associated upgrades to tailings distribution systems and water management infrastructure to facilitate transfer of tailings to the open pit and within the pit as required; and
- supporting infrastructure (e.g. extensions to or duplication of on-site electrical distribution, access tracks and tailings and return water pump stations and pipelines) in support of the Modification.

Further to our recent correspondence we have undertaken a review and update of the final void water balance model for the Cadia Hill open pit and Cadia East subsidence zone.

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Carindale QLD 4152
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ABN 11 247 282 058

The final void water balance model was originally developed as part of the Cadia East Project Environmental Assessment[1]. The model has been updated to assess the final void water balance inclusive of deposition of some 30 Mt of mine tailings in the Cadia Hill open pit up to a nominal consolidated tailings level of 420 m AHD. Note that the inclusion of tailings up to 420 m AHD represents approximately 10% of the total volume of Cadia Hill open pit.

A conceptual longitudinal section of the Cadia Hill open pit and the Cadia East subsidence zone at the end of mining is given in Figure 1. The post-mining surface subsidence area would be approximately 255 ha and would resemble a dish shaped depression surrounded by steep slopes on the margin. A surrounding 'zone of influence' would occupy a further 150 ha. The predicted minimum final subsidence surface within the void is at 665 m AHD.

Part of the Cadia East subsidence zone would overlap the eastern edge of the Cadia Hill open pit. The predicted level of the topographic saddle between the two voids would be at a level of approximately 670 m AHD. The lowest point on the perimeter of the Cadia Hill open pit is estimated to be at 721 m AHD, near the south-western side of the open pit adjacent to Cadiangullong Creek. Given that this level is significantly higher than the projected saddle between the open pit and the subsidence zone, a single final void water body was identified as forming, spanning both the Cadia Hill open pit and the Cadia East subsidence zone[2].

The same water balance model methodology has been used as in the Cadia East Project Environmental Assessment[3] in order to predict post-mining water level behaviour in the Cadia Hill open pit and the Cadia East subsidence zone inclusive of the proposed Cadia Hill tailings deposition.

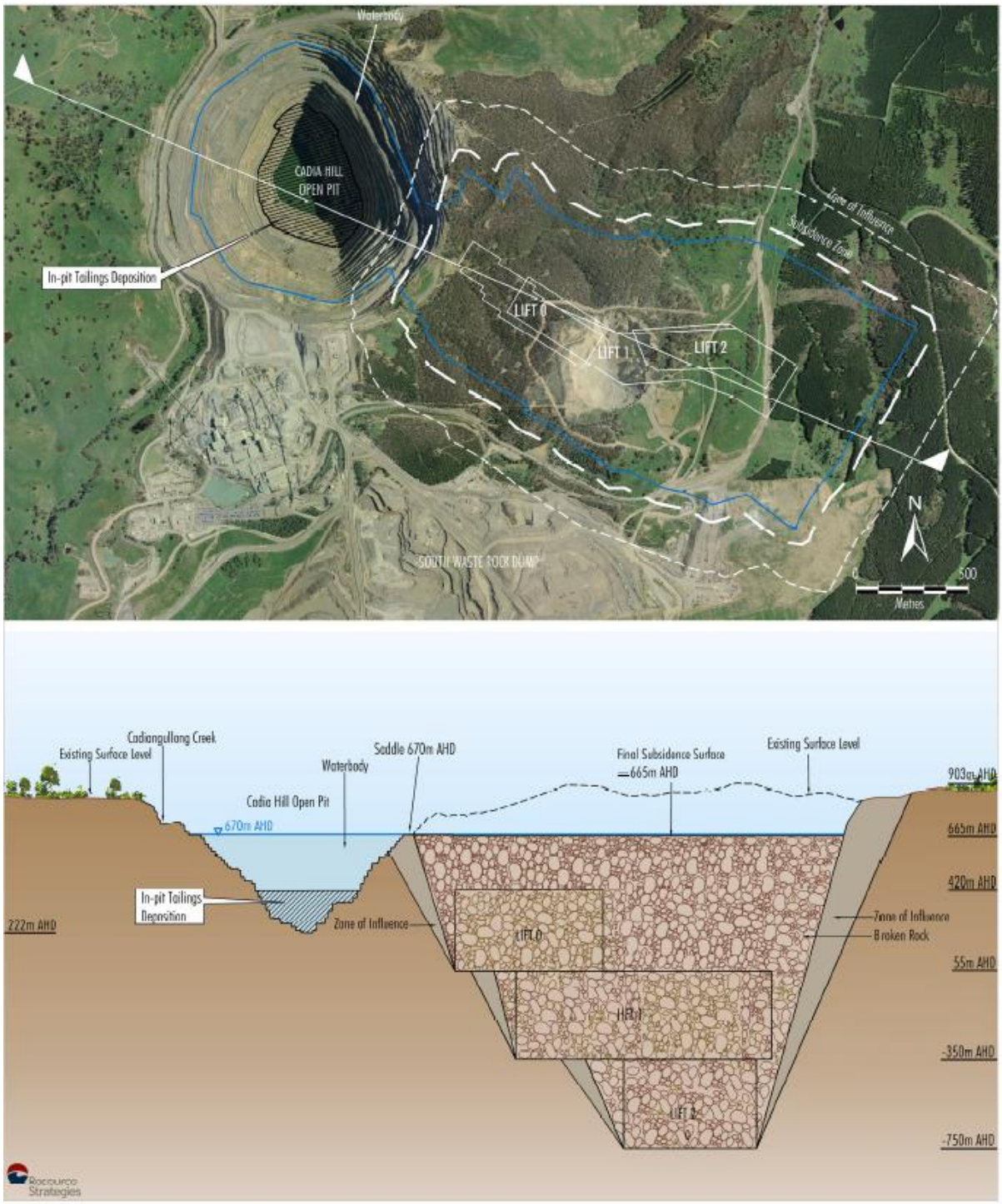
Groundwater inflows to this void would contribute significantly to the level of the final void waterbody. Surface runoff from the adjacent catchment and incident rainfall would also contribute to total inflows. Water would be lost through evaporation from the surface of the final void waterbody (averaging some 10 ML/day in the long term). In the long term the final water level in the void would reflect an average balance between residual inflows and outflows.

Updated groundwater inflow estimates at different final void waterbody water levels have been provided by Australasian Groundwater and Environmental Consultants (AGE) and used in the updated final void water balance modelling. Simulations have been undertaken using a long sequence of daily rainfall and evaporation data to provide an indication of the likely filling rates and ultimate equilibrium level with and without the proposed deposition of tailings in the Cadia Hill open pit.

[1] Gilbert & Associates Pty Ltd (2009). "Cadia East Project Surface Water Assessment". Report prepared for Cadia Holdings Pty Limited, April, as *Appendix F – Cadia East Project Environmental Assessment.*

[2] Ibid.

[3] Ibid.



Source: Umwelt (2008)

Figure 1 Conceptual Long Section of the Cadia Hill Open Pit and the Cadia East Subsidence Zone

The following model updates and changes have occurred:

1. Updated rainfall runoff model parameters – using values derived from recent calibration of the Cadia Valley Operations water balance model.
2. Updated daily rainfall data using the 129 years available from the SILO Data Drill[4] for the site location. The data was repeated several times over to generate a long sequence of rainfall for the simulation.
3. Updated daily pan evaporation data for 129 years (also from the SILO Data Drill), which was adjusted on basis of 12 years of site evaporation data and then multiplied by regional pan factors[5]. The data was repeated several times over to generate a long sequence of evaporation for the simulation.
4. Revised groundwater inflow rates versus water level in both the Cadia Hill open pit and the Cadia East subsidence zone provided by AGE.
5. An updated storage level-volume-area relationship for the Cadia Hill open pit derived from available digital terrain data.
6. Either a tailings deposit in the base of the Cadia Hill open pit up to 420 m AHD, or alternatively a Cadia Hill pit water starting elevation of 300 m AHD (as is currently the case).

Otherwise the model assumptions are unchanged from those used in the Cadia East Project Environmental Assessment.

The results of the simulations are shown in Figure 2.

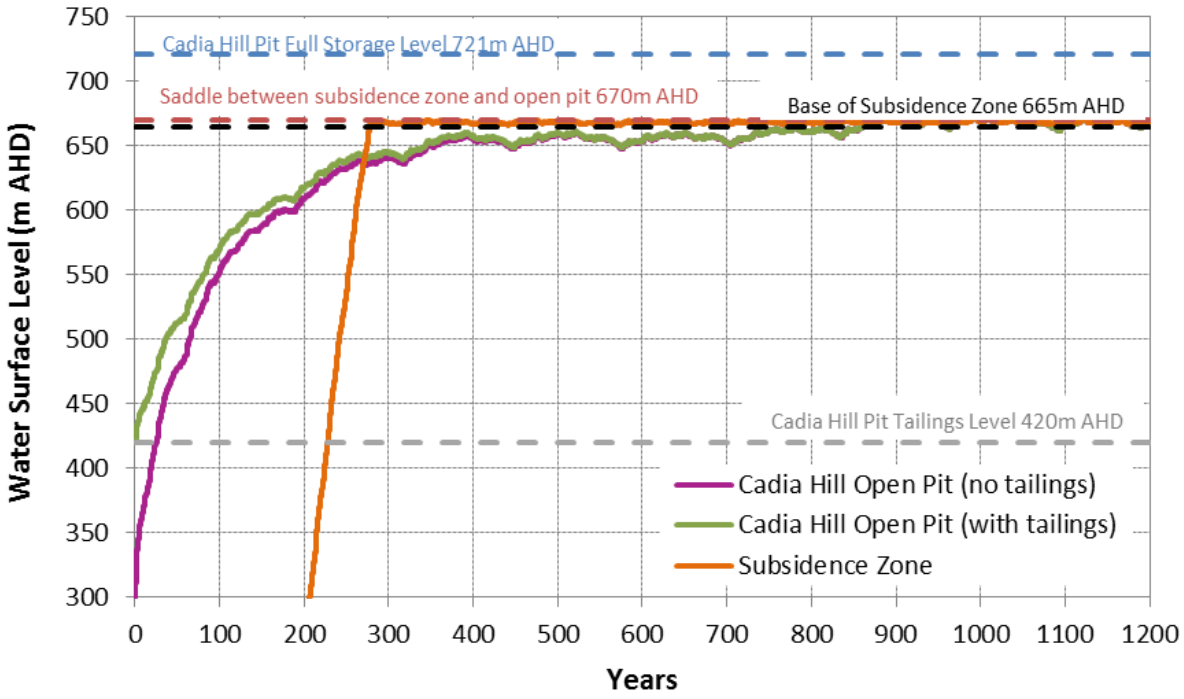


Figure 2 Simulated Final Void Filling Behaviour

[4] The Data Drill is a system which provides synthetic data sets for a specified point by interpolation between surrounding point records held by the Bureau of Meteorology. Refer https://legacy.longpaddock.qld.gov.au/silo/datadrill/

[5] McMahon, TA, Peel, MC, Lowe, L, Srikanthan, R & McVicar, TR (2013). 'Estimating actual, potential, reference crop and pan evaporation using standard meteorological data: a pragmatic synthesis'. Hydrology and Earth System Sciences, vol. 17, pp. 1331-1363.

The simulation indicates an estimated time required for a void water body to initially form within the Cadia East subsidence zone (i.e. to fill the void spaces of the subsidence zone) of approximately 270 to 280 years. After approximately 730 years, water from the subsidence zone is predicted to reach and overtop the 'saddle' between the Cadia Hill open pit and the Cadia East subsidence zone void. After approximately 880 years the water in both the Cadia Hill open pit and the Cadia East subsidence zone void is predicted to reach an oscillating equilibrium level around the level of the saddle (670 m AHD), which is approximately 51 m below the lowest point on the perimeter of the Cadia Hill open pit. This level is unchanged from previous Cadia East modelled long term equilibrium levels[6].

Minor fluctuations in the water level around the level of the saddle are expected thereafter in response to climatic conditions. The results indicate that void surface waters would continue to be isolated from Cadiangullong Creek even under extremely wet climatic conditions. The results also indicate that the tailings proposed to be deposited to 420 m AHD would remain submerged by up to approximately 245 m of final void water.

It should be noted that the above predictions forecast final void filling over a very long time period. The forecast is dependent on the future rainfall and evaporation data which has been assumed to be the same as that recorded for the last 129 years, which is consistent with assumptions in the Cadia East Project Environmental Assessment.

With respect to potential impacts on final void water quality, the following is noted:

- Cadia Valley operations is already approved to transfer tailings storage supernatant water to the Cadia Hill open pit under high rainfall scenarios as may be required for operational water management purposes.
- The approved final Cadia Hill and Cadia East subsidence zone void lake would concentrate salts over time due to evaporation from the surface of the waterbody.
- The combination of acidic drainage generated from the oxidation of potentially acid forming Ordovician volcanic material within the Cadia East cave zone and the long term evapo-concentration of salts would be key drivers of the final void water quality of the approved Project.
- Both of these key drivers of final void water quality would be unchanged by the proposed Modification.

In terms of the operational water management of the Cadia Hill open pit during tailings deposition, water which may accumulate within the Cadia Hill open pit from tailings supernatant water and rainfall runoff, would be managed by pumped recovery to the CVO water management system and would be re-used in the Process Plant. The pump rate would be set to match the adopted tailings deposition rate, water liberation rate and anticipated rainfall runoff. Pumped water reclaim from the Cadia Hill open pit would be given the same priority within the water management system as the other operational tailings storages.

The following recommendations are made with regard to surface water monitoring of the Cadia Hill open pit during tailings deposition:

- Weekly monitoring of pond water level;
- Annual monitoring of tailings beach profile (both underwater and above water);
- Daily volumes of water pumped.

[6] Gilbert & Associates Pty Ltd (2009). "Cadia East Project Surface Water Assessment". Report prepared for Cadia Holdings Pty Limited, April, as *Appendix F – Cadia East Project Environmental Assessment.*

Please contact the undersigned if you have any queries.

Yours faithfully,

Tony Marszalek
Director

ENCLOSURE 4
EXPERT OPINION

HydroAlgorithmics Pty Ltd ● ABN 25 163 284 991
PO Box 241, Gerringong NSW 2534. Phone: (+61 2) 4234 3802

noel.merrick@hydroalgorithmics.com

DATE: 27 March 2018

TO: Andrew Wannan
Manager Environment
Cadia Valley Operations – Newcrest Mining Limited
(via email)

FROM: Dr Noel Merrick

RE: Cadia Hill – Tailings Deposition Modification –
Expert Opinion

YOUR REF: Email 13 March 2018

OUR REF: HA2018/06

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1. Introduction

This report provides an expert opinion on the Tailings Deposition Modification at Cadia Hill, a completed open cut mine adjacent to two underground mines, one completed (Ridgeway) and the other in operation (Cadia East), located about 25 km south-west of Orange NSW. Approval for the Modification is being sought following a limited breakthrough of tailings material from the Northern Tailings Storage Facility on 9 March 2018.

The substance of the Modification is:

- *deposition of Cadia Valley Operations tailings in the completed Cadia Hill Open Pit (i.e. in-pit deposition) commencing in 2018 and occurring up to a maximum beach elevation of 420 metres AHD (i.e. approximately 30Mt tailings);*
- *associated upgrades to tailings distribution systems and water management infrastructure to facilitate transfer of tailings to the open pit, and within the pit as required; and*
- *supporting infrastructure (e.g. extensions to or duplication of on-site electrical distribution, access tracks and tailings and return water pump stations and pipelines) in support of the Modification.*

Dr Noel Merrick of HydroAlgorithmics Pty Ltd has been engaged to provide an expert opinion based on completed hydrogeological and hydrological assessments, and on previous experience at the site in the capacity of a peer reviewer.

2. Documentation

The expert opinion is based on the following two letter reports:

1. Australasian Groundwater and Environmental Consultants Pty Ltd (AGE), 2018, Cadia Hill Tailings Deposition – Groundwater Assessment. Letter JST:tb(G1383M.CadiaMOD10) to Andrew Wannan, Cadia Valley Operations – Newcrest Mining Limited, 21 March 2018. 15p.

2. Hydro Engineering & Consulting Pty Ltd (HEC), 2018, Cadia Valley Operations - Cadia Hill Tailings Disposal: Final Void Water Balance and Water Management. Letter J1310-6.I1c.docx to Andrew Wannan, Cadia Valley Operations – Newcrest Mining Limited, 27 March 2018. 6p.

An earlier peer review of the groundwater assessment conducted by AGE for the Cadia East underground project was conducted in 2009:

3. Merrick, N.P., 2009, Review of the Cadia East Groundwater Assessment. Access:UTS Report C06/44/005 for Cadia Holdings Pty Ltd, 22 October 2009. 15p.

This earlier review was based on the following report:

4. AGE, 2009, Cadia East Project Groundwater Assessment. Report G1383/D for Cadia Holdings Pty Ltd, April 2009. 112p + 5 Attachments.

The reviewer also participated in a Key Agency Briefing by Newcrest Mining Limited at the premises of the Department of Planning and Environment on 22 March 2018.

Document #1 has the following sections:

1. Introduction and scope of work
2. Groundwater regime of Cadia Hill
3. Recalibration
4. Previous modelling
5. Impact Assessment
6. Conclusions
7. References

Attachment: Response to AIP Requirements

Document #2 is a free-form report inclusive of two figures:

1. Conceptual Long Section of the Cadia Hill Open Pit and the Cadia East Subsidence Zone
2. Simulated Final Void Filling Behaviour

3. Groundwater Model Status

The main findings of the previous review in 2009 were:

1. Groundwater modelling was undertaken competently.
2. Model predictions were expected to be conservative as the modelling relied on steady-state simulation and structural controls were excluded.
3. Transient calibration should be undertaken as the model is revised progressively.
4. There is uncertainty as to the significance of geological structures.
5. There is uncertainty as to the assumed permeabilities in the Cadia East subsidence zone.

It is understood (from Document #1) that AGE has revised the groundwater model twice via transient re-calibration and transient simulation of predictions. During that time, the horizontal hydraulic conductivity of the Ordovician rock mass was reduced from 10^{-8} m/sec to (5-60)x10^{-12} m/sec to account for ongoing Cadia Hill inflow of about 0.7 ML/day and Cadia East inflow of about 1.5 ML/day.

Document #1 also reports on experience with the interception of structures (e.g. faults), being characterised by 0.5-20 m thickness, clay gouge infill, and insignificant water make.

The steep cone of depression around the Cadia Hill pit shell, predicted in Document #4, has been confirmed by geotechnical piezometers in the pit walls [Document #1].

4. Reported Assessments

Impact assessments for the Modification are summarised in Document #1 and Document #2.

The key findings in Document #2 are:

1. The Cadia Hill pit currently holds about 80 m depth of water.
2. The proposed tailings deposition “could readily be achieved while still maintaining the approved closure strategy”.
3. The proposed volume of tailings would occupy “approximately 10% of the total volume of Cadia Hill open pit”.
4. Part of the Cadia East subsidence zone would overlap the eastern edge of Cadia Hill, but only late in time, with a common saddle at elevation 670 mAHD (approximately).
5. As the lowest point on the rim of Cadia Hill is 721 mAHD, an eventual fluid surface in the Cadia Hill pit of approximately 665 mAHD would not spill, except into the Cadia East subsidence zone. Accordingly, Cadiangullong Creek is not at risk of contamination.
6. The equilibrium fluid elevation would not be reached for many centuries, and is independent of whether tailings are or are not deposited in the Cadia Hill pit.
7. Eventually, the Cadia Hill pit and the Cadia East subsidence zone would form a continuous volume of open fluid and/or saturated rubble.
8. The salinity of the fluid in the Cadia Hill pit would increase for many centuries due to evaporative concentration.
9. Acidic drainage from Ordovician rocks would contribute to evolving fluid chemistry.

The key findings in Document #1 are:

1. With the deposition of tailings as proposed, the Cadia Hill pit would act as a groundwater sink in the short-term
2. At late time, many centuries in the future, the Cadia Hill pit would still act as a groundwater sink when equilibrium fluid levels are reached.
3. A freeboard of more than 50 m is anticipated as a protection from external spillage.
4. Due to behaviour of the pit as a groundwater sink, there is “no potential for material transport of tailings solutes” to the surrounding groundwater system, or surface watercourses.
5. As the more permeable Tertiary basalts and Silurian limestones have not been intersected by the Cadia Hill open cut, they are not at risk of contamination.
6. With the deposition of tailings as proposed, there would be a slight reduction in groundwater inflow to the Cadia Hill pit.
7. “Given the lack of connectivity the risk to the groundwater regime from the tailings emplacement is considered negligible.”

5. Additional Observations

Without exception, this reviewer concurs with the assessments and findings proffered by AGE and HEC in Document #1 and Document #2, respectively.

The following additional observations are made here:

- The current 80 m depth of water in the Cadia Hill pit would reduce by about 30% (to about 55 m) due to expansion of pit surface area with altitude. This would promote enhanced evaporation and slowing of the current rate of rise in fluid level.
- The deepest bore in the existing groundwater monitoring network is at a depth of approximately 200 m. Such a depth would be more than sufficient on the rim of the Cadia Hill pit and the Cadia East operations due to the observed and simulated very steep cone of depression.

Groundwater Monitoring is carried out across a bore network at more than a hundred sites:

1. Regional Bores (7) – Historical bores, used to measure potential impacts to ground water due to mining activities

2. Ridgeway Bores (17) – Protocol bores and used to measure the impact to groundwater due to subsidence.

3. Cadia Bores (51) – MB series, used to measure potential impacts to groundwater due to mining activities.

4. Cadia East Bores (31) – Baseline data prior to Cadia East development and ongoing potential impacts to groundwater due to mining activities.

Of particular relevance are those bores in the Ordovician volcanics around the rim of Cadia Hill and Cadia East. There are 18 bores targeting this lithology, with hole depths ranging from 17 m to 136 m, with a median depth of 50 m. Their placement should be examined to ensure they are sufficient to verify the expected ongoing hydraulic gradient towards the areas of historical and current mining.

6. Opinions

Based on the documents cited, the reviewer holds the following opinions:

- The evidence for ongoing behaviour of the Cadia Hill pit as a groundwater sink is compelling.
- A predicted ultimate freeboard in excess of 50 m indicates negligible risk of spilling outside the Cadia Hill – Cadia East continuum.
- The usual requirement of 10^{-9} m/sec as the permeability of a liner/container, for prevention of leakage/seepage, is irrelevant when the fluid feature is a gaining system (a sink).
- The model-calibrated hydraulic conductivity of $5x10^{-12}$ to $6x10^{-11}$ m/sec is credible; however, the magnitude is inconsequential as only the rate of filling would be affected in a gaining system.
- The barrier/conduit status of intersected faults is irrelevant while the pit remains a groundwater sink (with hydraulic gradients towards the pit).

In particular, the reviewer concurs with AGE that “the risk to the groundwater regime from the tailings emplacement is considered negligible.”

Yours sincerely

Dr Noel Merrick

ENCLOSURE 5
CORRESPONDENCE FROM LOCAL COUNCILS

ORANGE
CITY COUNCIL

D18/15211
F879

23 March 2018

Mr Peter Sharpe
General Manager
Cadia Valley Operations
1460 Cadia Road
ORANGE NSW 2800

Dear Mr Sharpe

DEPOSIT OF TAILINGS INTO CADIA HILL PIT

Orange City Council is aware of the limited slump of the Northern Tailings Storage Facility (NTSF) embankment at Cadia Valley Operations (CVO) that occurred on 9 March 2018.

Council has been made aware of the proposal by CVO to deposit tailings into the Cadia Hill pit on an interim basis, to allow for recovery measures to be put in place at the NTSF.

Council recognises the importance of Cadia Valley Operations to the Orange economy and the valuable number of jobs it provides. Council understands the need for CVO to find alternatives to ensure the ongoing operation of the site.

It is understood that the NSW Government Department of Planning and Environment will be required to determine the impacts of this proposal including an appropriate assessment of environmental factors and other issues.

Based on the above factors, Orange City Council supports the application for the interim deposition of tailings into the Cadia Hill pit to maintain the stability of the Orange economy.

Yours faithfully

Garry Styles
GENERAL MANAGER

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Telephone 1300 650 511 Fax 02 6393 8199
www.orange.nsw.gov.au email: council@orange.nsw.gov.au

Blayney Shire Council
Council Office 91 Adelaide Street, Blayney **Postal Address** PO Box 62, Blayney NSW 2799
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Web www.blayney.nsw.gov.au
ABN 47 619 651 511

26 March 2018

The General Manager
Cadia Valley Operations
1460 Cadia Road
ORANGE NSW 2800

Dear Peter

RE: Northern Tailings Storage Facility – Embankment Movement

As a significant stakeholder in Cadia Valley Operations (CVO) Blayney Shire Council was informed of the northern tailings dam embankment failure on 9 March 2018 and assisted with road safety closure operations. The ongoing engagement, notifications and consultation with myself, the General Manager and Council staff by CVO management has been appreciated.

Council is cognisant of the importance of the mining sector in Blayney which generates $663 million (42%) of total annual gross revenue output from the shire. The mining sector in Blayney Shire provides over 700 jobs (24% of total employment) contributing $87million (35%) of total wages and salaries into the local economy (ABR Data Dec 2017, Remplan).

The containment and risk management strategies implemented is reassuring to Council however the long term suspension of mining and processing operations is a concern. This is simply a matter of the positive economic benefit and social impact of gold mining operations at Cadia which is now wholly within Blayney Shire.

The proposal to deposit tailings into the Cadia Hill Pit provides an opportunity to recommence mining operations for an interim period of approximately 12 to 18 months to allow for recovery measures to be determined. Council understands the proposal to deposit 30 million tonnes of tailings into the pit is less than 15% of the volumetric capacity of Cadia Hill pit to a level some 300m below the pit rim. The approved final void lake would be retained for end of mine closure.

Blayney Shire Council is supportive of CVO liaising with government agencies to facilitate a timely approvals pathway for this proposal for Cadia Hill Pit tailings.

Yours faithfully

Scott Ferguson
Mayor

CABONNE COUNCIL
THE OFFICE OF THE MAYOR
POST OFFICE BOX 17
MOLONG 2866

Phone: 02 6392 3208
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Contact: Stephen Harding

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Email: council@cabonne.nsw.gov.au

Doc ID: 906756
Your Ref:
ABN: 41992 919 200

26 March 2018

General Manager
Cadia Valley Operations
1460 Cadia Road
ORANGE NSW 2800

Dear Peter

Northern Tailings Storage Facility – Embankment Movement

As a significant stakeholder in Cadia Valley Operations (CVO), Cabonne Council was informed of the northern tailings dam embankment failure on 9 March 2018 and has received, and appreciated, ongoing engagement since the incident.

Cabonne Council is aware of the ongoing consultation between Blayney Shire Council and CVO regarding a proposal to deposit tailings into the Cadia Hill Pit to provide the opportunity to recommence mining operations for an interim period of approximately 12 to 18 months to allow recovery measures to be determined.

Cabonne Council is supportive of CVO liaising with government agencies to facilitate a timely approvals pathway for this proposal for Cadia Hill Pit tailings.

Yours faithfully

Kevin Beatty
MAYOR

ENCLOSURE 6
SUMMARY OF PREVIOUS CADIA EAST MODIFICATIONS 1-9

Summary Comparison Table - Cadia Valley Operations (CVO) Cadia East Project and Modifications 1 – 9 [1]

Approval or Modification	Mining Methods	Life of Mine Ore Production	Waste Rock Management	Life of Mine	Tailings Management	Ore Processing	Concentrate Dewatering and Transport	Water Supply and Management	Operational Employment	Other	Key Changes to Approved Cadia East Environmental Impacts
Cadia East Project (incorporating all previously approved Cadia Valley Operations [CVO])	Cadia Hill - conventional open pit mining methods. Ridgeway - underground sublevel and block caving and associated surface subsidence zone. Cadia East - underground panel caving and associated surface subsidence zone.	Cadia East - approx. 449.5 Mt. CVO - Approx. 561 Mt.	Deposition in the North and South Waste Rock Dumps and mined-out void of the Cadia Extended open pit. Cadia East waste rock to be deposited in the South Waste Rock Dump.	Mining up until approx. 2030. Project Approval to 2031.	Use of the Northern Tailings Storage Facility (NTSF) and Southern Tailings Storage Facility (STSF). Raising of these storages via upstream embankment lifts.	Processing of up to 27 Mtpa of gold and copper ore.	Transport of dewatered mineral concentrate by rail. Gold/copper concentrate transported from the ore processing facilities via a concentrate pipeline to the Blayney Dewatering Facility. Construction of new CVO Dewatering Facility and concentrate pipeline.	Cadiangullong Dam, Flyers Creek Weir, Cadia Creek Weir, Rodds Creek Water Holding Dam, Orange Sewage Treatment Plant treated effluent, Blayney Sewage Treatment Plant treated effluent, on-site groundwater bores, Belubula River, site runoff and pipeline/pumping systems.	Average 880 to max approx. 1,300.	Not Applicable.	Not Applicable.
Mod 1 Cadia Hill Decline	Underground decline from Cadia Hill open pit, including bulk samples and ventilation.	0.02 Mt of additional ore.	Additional 0.8 Mt of waste rock.	No change.	No change.	No change.	No change.	No change.	No change.	Not Applicable.	No material environmental implications.
Mod 2 Blayney Dewatering Facility	No change.	No change.	No change.	No change.	No change.	No change.	Upgrade to dewatering facility capacity in Blayney and extending the life of the facility by two years.	No change.	No change.	Related to delay in establishment of CVO Dewatering Facility.	Addition of acoustic control elements which resulted in a decrease in local operational noise levels.
Mod 3 Cadia Road Pipeline Relocations	No change.	No change.	No change.	No change.	No change.	No change.	Realignment of concentrate and return water pipelines to follow existing Cadia Road rather than realigned route.	No change.	No change.	Option retained to relocate to originally approved alignment.	Minor reduction in approved land disturbance.
Mod 4 Pre-conditioning by Hydraulic Fracturing	Preconditioning of the Cadia East host rock from the surface using hydraulic fracturing.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	Not Applicable.	Negligible impacts on groundwater above those already approved. Noise impacts associated with drilling operations were temporary and limited.
Mod 5 Pre-conditioning by Blasting	Preconditioning of the Cadia East host rock from the surface using blasting techniques.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	Not Applicable.	Negligible impacts on groundwater above those already approved. Complied with existing blasting criteria. No additional noise impacts to those already assessed and approved.
Mod 6 Processing Rate Modification	No change.	Cadia East - approx. 456 Mt. CVO - Approx. 562 Mt.	No change.	No change.	Minor upgrades to tailings infrastructure.	Processing of up to 32 Mtpa of gold and copper ore.	No change.	Contingent transfer of tailings water to Cadia Hill open pit for water management.	No change.	Upgrades to ore handling and processing facilities and associated increase in electricity demand. Other administrative updates.	Negligible noise emissions and no change to criteria. Negligible impacts on water supply.
Mod 7 Biodiversity Offset Modification	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	Modification of approved Biodiversity Offset Area.	Nil.
Mod 8 Administrative Modification	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	Updating Project Approval schedule of lands.	Nil.
Mod 9 Surface Pre-conditioning and On-Site Warehouse	Additional preconditioning of Cadia East host rock from the surface using hydraulic fracturing.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	No change.	Included on site warehouse.	Negligible impacts on groundwater above those already approved. Cumulative noise emissions compliant with noise limits.

NTSF - Northern Tailings Storage Facility
STSF - Southern Tailings Storage Facility

[1] Details provided on the Department of Planning and Environment Major Projects website for the Cadia Valley Operations: http://majorprojects.planning.nsw.gov.au/