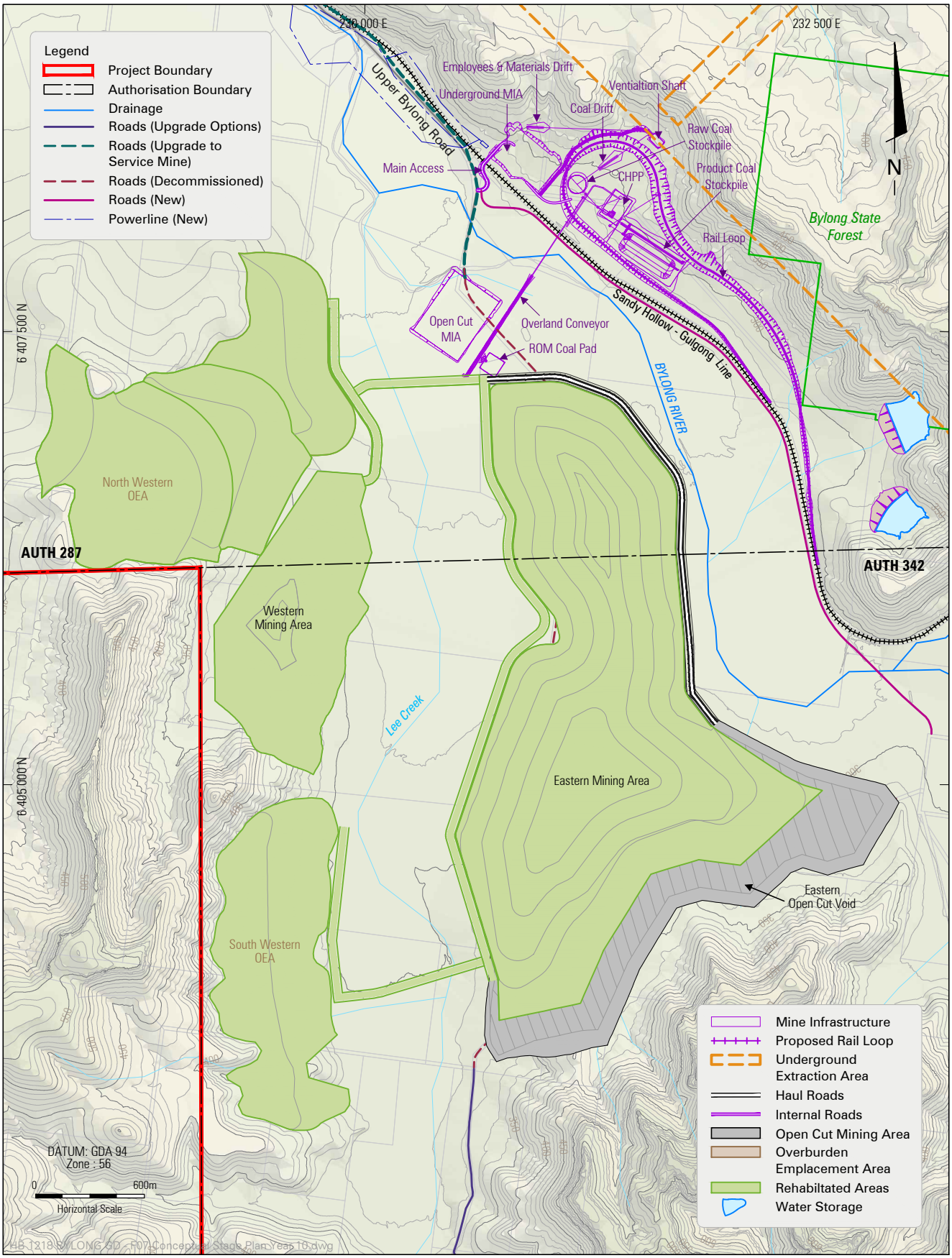
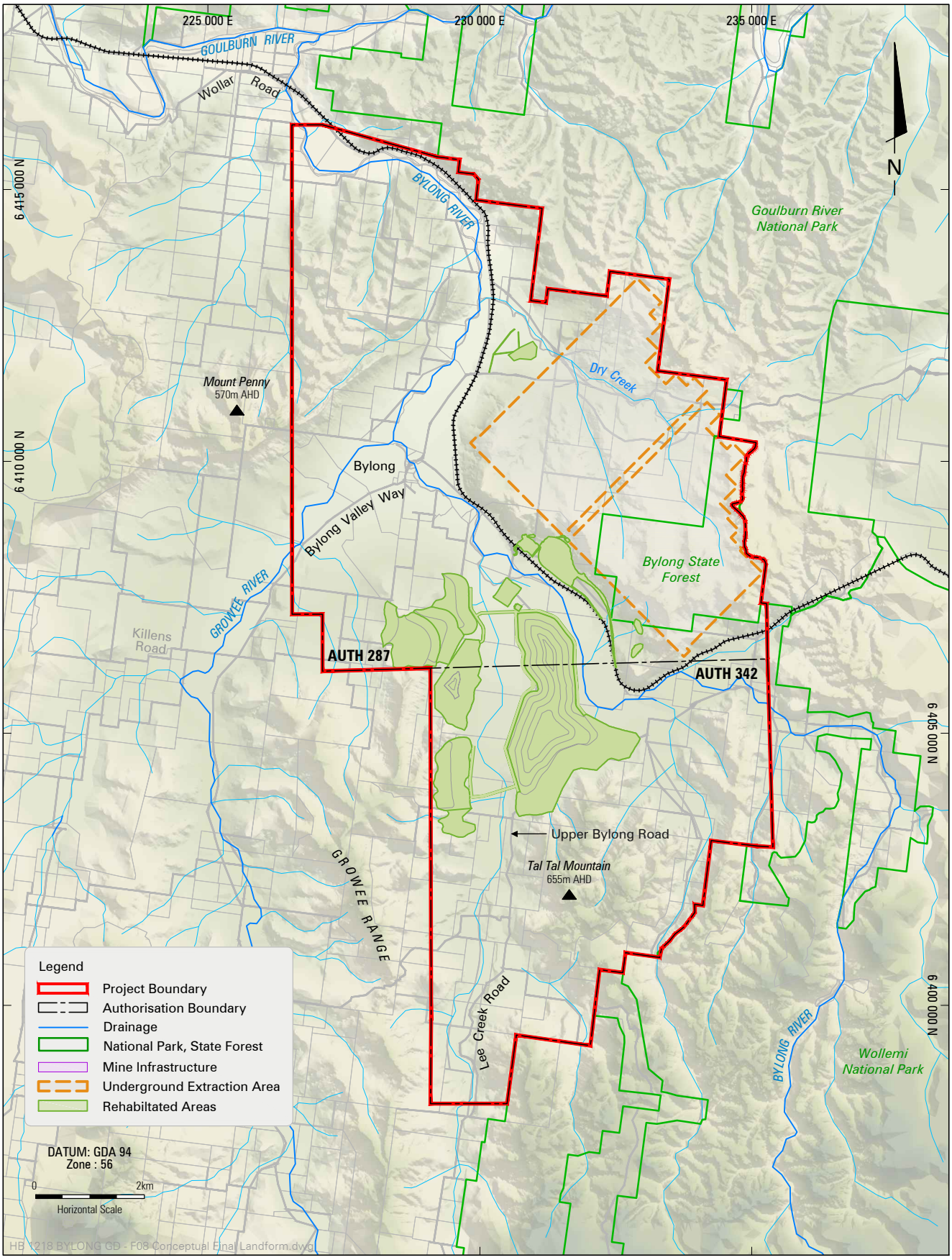



BYLONG COAL PROJECT

Conceptual Stage Mine Plan - Year 10

FIGURE 7

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Conceptual Final Landform

FIGURE 8

### 2.2.2 Underground Mining

The proposed conceptual underground mine plan has been designed based on an extensive assessment of the coal resource within the Project Boundary. The conceptual underground mine plan is located in an area where the geology and sequence of the coal resource allows for the safe and efficient recovery via underground mining methods.

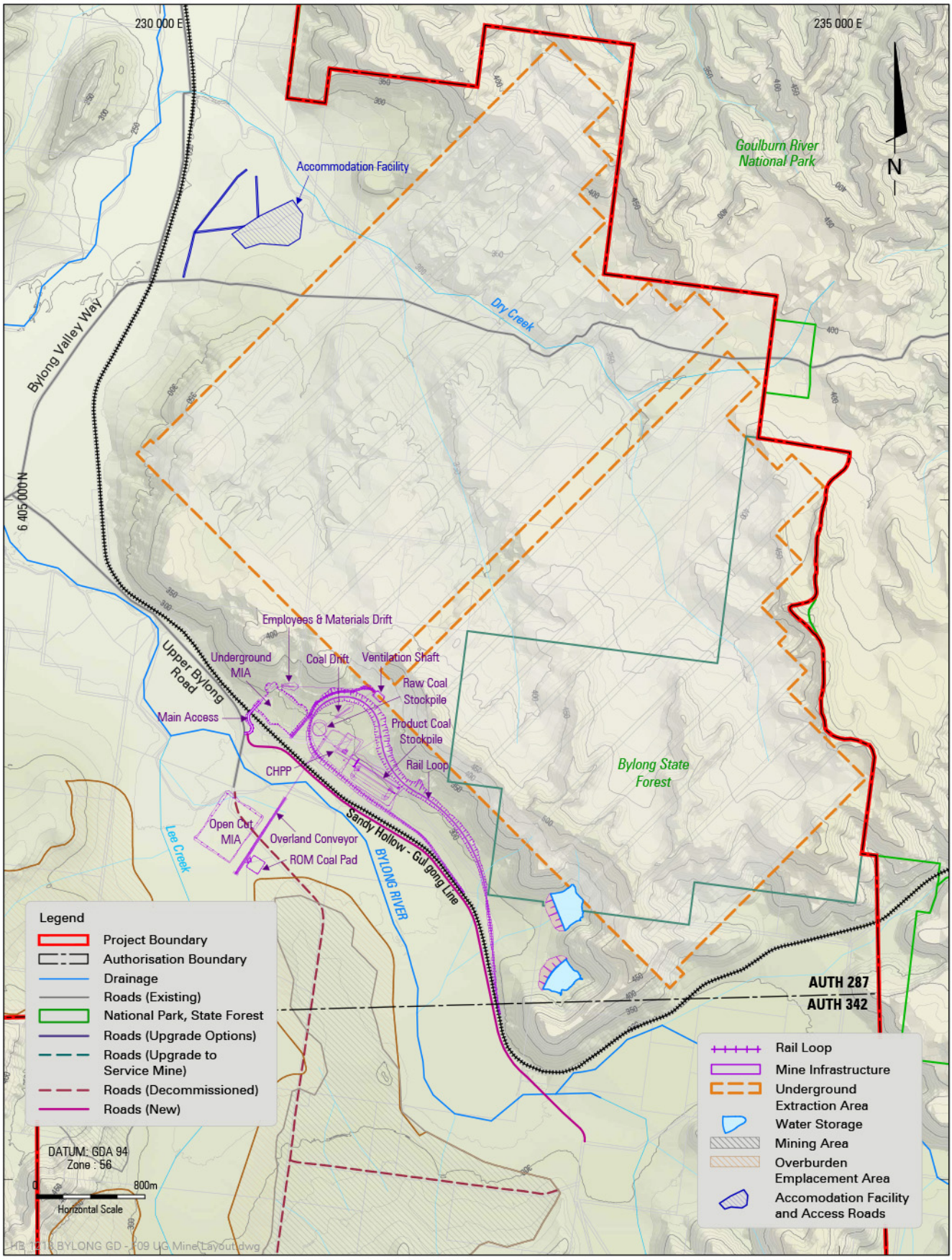
A number of alternative layouts of the underground mine plan have been investigated to ensure that the proposed layout is the most viable option for the Project in conjunction with the open cut mining operations. The mine plan options considered are detailed in **Section 2.7**. The proposed Underground Extraction Area for the Project (Underground Extraction Area) occurs in the more elevated terrain in the north-eastern portion of the Project Boundary as shown on **Figure 3**.

**Figure 9** illustrates the location of the two decline drifts to provide access to the Coggan Seam in the vicinity of the proposed rail loop and Underground Mine Infrastructure Area (MIA) on the northern side of the Sandy Hollow-Gulgong Railway Line. The decline drifts will provide ongoing access to the underground mining operations for coal clearance, materials, ventilation and employees.

As shown on **Figure 9**, the permanent main headings are proposed to be developed in a south-east to north-westerly direction to generally align with the elevated topography leading up from the valley areas (i.e. protection of surface cliffs and steep topography). The main headings will be constructed utilising continuous miners and will provide permanent roadways for employee access, ventilation and mining services throughout the life of the underground mining activities. The development work for the main headings will also be designed such that there will be no material surface subsidence. A ventilation shaft is proposed on the north-eastern side of the proposed rail loop (**Figure 9**).

The conceptual longwall panel design generally follows the easterly dip of the geology within the Underground Extraction Area, with each longwall panel being developed to be extracted from the north-east to the south-west where the permanent main headings have been developed. Underground mining operations are proposed to commence at approximately Year 7 of the Project (approximately Year 5 of open cut mining operations), with initial longwall panel extraction able to commence around two years following the development of the first panel.

Underground mining is proposed to occur under a section of the Bylong Valley Way in the northern portion of the Underground Extraction Area. The indicative equipment fleet for the underground operations includes three continuous miners, a longwall system, ventilation fans, conveyors, electrical and communications systems along with other ancillary supporting equipment.

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Conceptual Underground Mine Plan

**FIGURE 9**

## 2.3 MINE INFRASTRUCTURE

### 2.3.1 Coal Handling and Preparation Plant

The Project will include the construction and operation of a CHPP and associated facilities to enable the handling and processing of approximately 6 Mtpa of ROM coal. The CHPP and associated facilities are proposed to be located in a central location of the Project Boundary at the foothill of the natural escarpment to the north-east of the Sandy Hollow-Gulgong Railway Line. The final location of these facilities has been selected to avoid direct disturbance to alluvial land and BSAL. Additionally, the key components of infrastructure are proposed within the rail loop to reduce environmental impacts (see **Section 2.7.9** for further discussion).

ROM coal from the underground will be delivered by way of conveyor drift to a ROM coal stockpile at the CHPP. The open cut operation will deliver ROM coal by haul trucks to a ROM coal hopper located at the northern extent of the Eastern Open Cut, approximately 1 km south-west of the CHPP. Open cut coal will be primary crushed and conveyed directly to the CHPP.

The ROM coal will be nominally be fed directly to the CHPP, however if required it may be emplaced on the ROM coal stockpiles for subsequent reclaiming and processing. In some instances, the coal quality may be suitable to bypass the CHPP and be sent directly to the product coal stockpile.

The CHPP will wash the ROM coal using a conventional dense-medium cyclone and spiral process to generate two types of coal including: 16% ash (arb), and 22% ash (arb).

Product coal that is processed through the CHPP will be emplaced by a travelling luffing stacker to a linear stockpile and will be reclaimed by dozer and underground tunnel conveyor system, feeding into a train loading bin located over the rail loop adjacent to the CHPP.

All product coal processed through the CHPP will be mechanically dewatered. Fine reject materials will be recovered by a conventional thickener. This material will be dewatered using belt press filters, and then combined with the coarse reject stream from the CHPP process. The combined reject material will be conveyed to a reject bin with an approximate capacity of 700 t and then transported by haul truck to the North-Western OEA during the initial mining years.

When the mining areas have been progressed sufficiently, coarse and fine reject materials will be transported to the open cut mining areas and co-disposed with overburden. Once completed, these areas will be capped and rehabilitated to integrate with the natural landform.

A temporary emergency fine rejects cell will be developed in the near vicinity of the CHPP (should planned maintenance or unforseen events occur that the belt press filters are out of service). Material placed within the emergency fine rejects cell will be allowed to dry sufficiently prior to be excavated and loaded onto haul trucks and co-disposed within overburden within the OEAs. The area for the temporary emergency fine rejects cells will be decommissioned and rehabilitated with the other Project infrastructure following the completion of mining operations.

### 2.3.2 Mine Site Facilities

The Project will require the construction of various items of surface infrastructure to enable the operation of the mine. The main facilities generally include two additional MIAs, rail loop and other associated facilities along with an Accommodation Facility.

There will be two MIAs constructed for the Project as conceptually illustrated on **Figure 3** including temporary Open Cut MIA and the Underground MIA.

The Open Cut MIA is proposed to contain internal mine access roads, light vehicle parking, associated power reticulation and communication infrastructure, administration and bathhouse facilities, sewerage treatment systems, mine workshop, store and laydown and associated facilities, fuel and lubrication station and refuel facility, water management infrastructure and other ancillary equipment and plant. The Open Cut MIA and associated infrastructure will be decommissioned and removed on a progressive basis following the completion of the open cut mining operations. A portion of the hard stand area for the Open Cut MIA will be retained for use as a laydown area.

The Underground MIA will contain (at least) internal mine access road, light vehicle parking, power reticulation infrastructure, mine office, administration and bathhouse facilities, sewerage treatment systems; communications facilities, mine workshop, store and laydown facilities, water management infrastructure, mining area and portals, a ventilation plant and other ancillary equipment and plant.

### 2.3.3 Product Transport

The train loading station will comprise an approximate 300 t capacity batch loading bin which will load the trains at an average rate of approximately 4,000 tph and will allow for the train to remain in motion while being loaded.

The Project will require the construction of a rail loop that connects to the Sandy Hollow–Gulgong Railway Line. The Sandy Hollow–Gulgong Railway Line connects with the Main Northern Railway Line at Muswellbrook, where it continues to the Port of Newcastle.

## 2.4 SITE ACCESS

Access to the Project will generally be via the existing Upper Bylong Road from the Bylong Valley Way. Access to the Open Cut MIA will be via Upper Bylong Road. An upgrade to the Upper Bylong Road and its intersection with Bylong Valley Way will be necessary to support the construction and operational traffic.

The Underground MIA will be accessed via an access road to be constructed over the Sandy Hollow-Gulgong Railway Line, including an upgrade to an existing rail crossing. Various other internal access roads will be constructed to provide routes to access various mining infrastructure, including CHPP, underground mine drifts, ventilation facilities and mine water management system.

The southern reaches of Upper Bylong Road after the Open Cut MIA will need to be decommissioned to facilitate mining operations within the Eastern Open Cut. It is proposed that a realignment of the Upper Bylong Road will occur along the southern side of the Sandy Hollow-Gulgong Railway Line to connect with an existing public road to the east, providing continued access for private landholders to the east of the Project (see **Figure 3**).

For the southern portion of Upper Bylong Road (south of the Project), two options are being considered in relation to providing access for neighbouring landholders. Upper Bylong Road continues to the south as Lee Creek Road, which connects with Bylong Valley Way further to the south of the Project Boundary. Buddens Gap Road intersects Lee Creek Road in the southern part of the Project Boundary and is a more direct but elevated access track to Bylong Valley Way.

KEPCO will upgrade one of these existing public roads (Lee Creek Road or Buddens Gap Road) in order to provide a comparable access for landholders in this area. Further details of the road realignments and upgrades to facilitate access for neighbours will be discussed and described within the EIS.

Access to the Accommodation Facility will be via an upgraded intersection into an existing access to a residence located on the Bylong Station property (owned by KEPCO). The road intersection will be upgraded in accordance with the relevant Government standards and guidelines, as specified by the relevant roads authority. Two access tracks will be constructed from the current access along existing fence lines to the Accommodation Facility.

## 2.5 POWER RETICULATION

Power for the Project will be sourced from upgraded infrastructure and sub-station that is located within the village of Bylong. KEPCO has been liaising with Endeavour Energy over the capacity of the existing power reticulation infrastructure and any requirement for upgrades to this infrastructure. Any required upgrades to the existing infrastructure to the sub-station in Bylong will be the subject of a separate planning approval, as required.

The construction of a 66 kilovolt (kV) transmission line from the Bylong sub-station and upgraded infrastructure will occur as part of the Project to provide the principle power supply for the mining operations. The 66 kV transmission line will be constructed within the Project Boundary, crossing the Bylong Valley Way and travelling adjacent to the upgraded Upper Bylong Road to the Underground MIA.

Various realignments of existing power reticulation infrastructure will be required to accommodate the Project.

## 2.6 WATER MANAGEMENT

The mine water management system will enable the optimal collection, use, recovery and recycling of water within the Project Boundary.

The Project will require a central mine water dam which will be located proximate to the CHPP and the underground portal. Other mine water dams, diversion drains, sedimentation dams and culverts will be sized and located as required to capture runoff from mining and overburden emplacement areas. Detailed requirements for the various mine water structures and erosion and sediment control devices will be developed for the Project and included in the EIS.

Preliminary findings indicate the likely water demands of the Project will be approximately 1,330 megalitres (ML)/year when the open cut and underground operations are operating concurrently. The main uses of water for the Project includes: dust suppression for the open cut mining operations, for surface facilities and within underground operations including the longwall and the continuous miner units, and the make-up water required for the processing of coal in the CHPP.

It is envisaged that the main source of raw water will generally be from the groundwater collected from the open cut and underground operations and supplemented as required from groundwater bores within the neighbouring aquifers. Details of the particular groundwater bores to be used to supplement water for the Project will be further detailed within the EIS.

KEPCO currently holds various water licences as discussed in **Section 5.4** and **6.2** which provide 1,959 units of water allocation from the Bylong River Water Source. KEPCO has also reached agreements with two landholders for land acquisition, which will secure an additional two Water Allocation Licences (WALs) totalling 576 units. Further water allocations are likely to be obtained as the Project progresses.

## 2.7 MINE PLAN JUSTIFICATION AND PROJECT ALTERNATIVES

Since the granting of A287 and A342, an extensive exploration program and series of feasibility studies have been conducted in order to assess the most economic and environmentally responsible mining operation to extract available coal resources.

This process has included the consideration of numerous mine plans, operational methods and infrastructure designs and alternatives.

The primary objective of the studies was to develop an economically viable mine plan that considered the principles of Ecologically Sustainable Development (ESD), minimised potential environmental and social impacts whilst maximising coal recovery. A summary of Mine Plan Justification Reports which have been prepared by Cockatoo Coal and Runge Pincock Minarco is provided in the following sections with a full copy of these reports included in **Appendix C**.

### 2.7.1 Mine Planning Process

The mine planning process has involved the completion of a number of distinct study phases. Each mine planning phase was assessed in terms of key economic criteria set by KEPCO with relevant consideration of all applicable constraints to the Project at that time. The mine planning process that has been or is planned for completion for the Project includes the following:

- Exploration Studies (various since 1984 and are ongoing) have been commissioned to gather the knowledge required on the geology within A287 and A342 in order to complete required mine planning studies;
- Concept Study (March 2011) was undertaken to identify conceptual mine plans and understand the potential of a proposed coal mine;
- Pre-Feasibility Study (PFS) (July 2012) was undertaken to develop several mine plan options (with up to seven open cut mining areas and underground mining areas) and determine the most appropriate option to take forward;

- Option Study (October 2013) to determine the proposed final Project that incorporated significant changes from the PFS in consideration of BSAL, alluvium, CIC and regulatory advice; which resulted in the reduction of five open cut mine areas to two and the relocation of significant surface infrastructure);
- Feasibility Study (currently underway, scheduled for completion June 2014) is being completed to increase levels of understanding and certainty with selected option; and
- Construction (aspiration 2017, pending relevant approvals) will involve the implementation of the preferred mine plan that will hold the relevant planning approvals.

The various mine planning phases conducted to date have been conducted over several years. During this time, the planning approval process has changed according to the evolving understanding, perceptions and expectations by the local community and the Government regulators. The mine planning phases have adapted to the evolving requirements as they have occurred over time.

The Gateway Process has been implemented during critical timing of the associated mining studies (i.e. between completion of the Pre-Feasibility Study and the commencement of the Feasibility Study). As a result, the Project team has understood the requirement of these further considerations and has proactively introduced another layer of study phase to not only address the resulting additional constraints that need to be applied to the mine plan, but quantify the trade off with expected economic benefits.

An Options Study was introduced as an additional step in the mine planning process to supplement the work completed within the Pre-Feasibility Study. This additional step was considered to be required to ensure the preferred option taken into Feasibility Study was both environmentally acceptable to external stakeholders (including the community) as well as being economically viable from an investor/owner's point of view.

Further to this, key study milestones have been tabled with relevant government bodies (during briefings with Department of Planning and Infrastructure (DP&I) and Division of Resources and Energy (DRE)) throughout the duration of mine planning process. This has assisted the Project team to understand and implement relevant changes to the regulator requirements to the mine plans during this time. This approach demonstrates the proactive and iterative mine planning process that has been adopted throughout the initial stages for the Project.

### 2.7.2 Available Coal Resources

As briefly mentioned above, the basic foundation of the mine planning process which subsequently leads on to the determination of the preferred mine plan is dependent on the available coal resources within A287 and A342.

Several coal seams exist within the two authorisations and form part of the Illawarra Coal Measures. Two of these coal seams have been identified as a potential mineable resource within the authorisations. The large majority of the other coal seams that occur within the area are either topographically limited, of a poor quality, or are too thin to warrant extraction via current available mining methods. The two target coal seams that have been subjected to further mine planning studies and associated environmental constraints analysis include the Ulan Seam and the Coggan Seam.

The Ulan Seam is the major economic coal seam that is targeted by neighbouring mining operations within the MWRC LGA. Within A286 and A342, the Ulan Seam is generally comprised of thin, poor quality plies separated by numerous stone partings and is distinctly different from the resource recovered by neighbouring mines.

Within A287 and A342, the Ulan Seam has been identified to be not suitable for recovery utilising underground mining methods. Certain parts of the Ulan Seam where the topography provides minimal depth of cover have been identified most suitable for recovery utilising open cut mining methods.

The Coggan Seam underlies the Ulan Seam and is generally a consistent, thick and good quality coal seam within A287 and A342. The Coggan Seam presented across A287 and A342 contains areas that are suitable for recovery utilising open cut mining methods (where topography allows low depth of cover) and underground mining methods (where the elevated topography provides greater depth of cover). The Coggan Seam has been identified as the primary target coal seam within A287 and A342.

The definition of the coal resources available within A287 and A342 dictates the starting point to confirm where mining could possibly take place in relation to known mining constraints. As indicated above, the coal seam thickness, geological structure (i.e. faulting or intrusions), coal quality and depth of the coal resource also play an important role in determining the location of potential mining operations and the mining method that is most suitable for recovering the resource. The Ulan and Coggan Seams generally exist across the extent of both authorisations.

The mine planning process undertaken adopted a number of constraint layers in association with the location of suitable coal resources and enabled a "*cookie cutter*" approach to take place. This approach assisted in the delineation of coal resources into areas suitable for recovery utilising the two proposed mining methods.

### 2.7.3 Mine Planning Constraints

With the coal resources identified, the appropriate constraints to mining were then applied to responsibly eliminate areas of A287 and A342 considered unacceptable for extraction. This included an environmental perspective and reasonable public perception. The following constraints have been applied (and these include both traditional constraints and those recently implemented via the Gateway Process) to identify appropriate resource extraction areas.

***Traditional Mining Constraints***

Early mine planning studies (i.e. the Concept and Pre-Feasibility Study) utilised a mine stand-off distance of approximately 1 km from the small village of Bylong. To satisfy potential stakeholder concerns (and recent consultation which occurred in December 2013), the most recent studies have increased the distance between mining and the Bylong village to more than 2 km. This has assisted in mitigating other amenity related environmental impacts on residences located within the village.

The main public road that travels through the area is the Bylong Valley Way. The mine planning process has avoided any direct impacts on this main road, with no closures or realignments proposed as part of the Project. This minimises the potential to impact upon any industries within the area and best attempts to maintain the scenic value and cohesion of the area.

Some minor public roads travel through the authorisations, which provide access to the properties that occur in the area. Whilst the minor public roads were recognised as a constraint, there remains potential to realign these roads to provide alternate access to properties outside of the mine plan.

The Sandy Hollow to Gulgong Railway Line travels through the authorisations and provides a primary constraint to the location of the mine plan and associated infrastructure. Open cut mining operations and the Underground Extraction Area has been designed to avoid any direct or indirect impacts as a result of subsidence effects.

Early and subsequent mining studies have systematically taken into consideration the significance of potential agricultural lands and existing alluvial lands that occur within the region. Mine plans have evolved in line with the changing classifications of such agricultural lands (see **Section 2.7.4** for a detailed discussion). KEPCO is committed to facilitating the continuation of agricultural activities on its lands which are not required for mining or mining-related activities.

Any potential open cut mining and associated OEAs have been sufficiently offset from the original Class II Agricultural Land, as defined by the original OEH regional mapping. This mapping was based on the regional alluvial soils adjacent to Bylong River, Lee Creek and the Growee River.

The avoidance of this agricultural land has been the primary point for identifying suitable open cut mining operations. The mine planning process has endeavoured to incorporate revised land capability mapping and the changing definition of SAL as best as possible, considering timing of relevant mining study phases. Substantial areas of initially identified coal resources have effectively been sterilised as a result of applying this constraint to the mine planning process.

The mine planning process in the vicinity of rivers, creeks and alluvials within the authorisations has also considered the requirements within '*Management of Stream/Aquifer Systems Within Coal Mining Developments'* (DIPNR, 2006). The recommended 150 metre (m) stand-off distance between open cut highwall and relevant rivers, creeks and associated alluvials has been applied to the mine planning process. Similarly the recommended offset distances for underground mining operations of greater than 40 m between the anticipated underground subsidence impacts and the edge of the alluvium has been applied.

Flood modelling is another important consideration that has been adopted in the mine planning process to determine the preferred mine plan for the Project. Preliminary flood modelling has been undertaken for a range of rainfall events that may potentially occur in the Bylong River catchment. The preliminary flood modelling indicates that the flood extents for up to a 1 in 1,000 year rainfall events provide similar levels to the mapped alluvials.

Whilst the areas identified as most suitable for underground mining methods do not comprise sensitive surface features, there are some features that require consideration in the mine plan design. From a visual perspective, the cliffs associated with escarpments within the authorisations are anticipated to provide scenic values to the local area. In addition, possible heritage, flora or fauna and other attributes may deem these topographic features to be significant. The mine planning process has taken into consideration the sensitivity of these surface features in the design of the potential underground mine plans.

The visibility and visual impacts of the mine plans has been thoroughly considered throughout the mine planning process. A holistic view has been taken to minimise visual impacts from major public vantage points including from the Bylong village and Bylong Valley Way. During the mine plan and design phase, natural topography has been utilised for screening purposes to limit views of the proposed mine. Examples include the exclusion of potential open cut operations in areas within immediate views from Bylong Valley Way.

***Gateway Process Constraints***

The Equine CIC mapping within the Upper Hunter Region is currently in draft form and has been based on regional mapping criteria. Field work completed within the Project Boundary identified that the dominant land use within it is currently predominantly cattle grazing with some limited Lucerne fodder cropping. There are presently limited equine related activities occurring within the Project Boundary, with only one small stock horse property within this area that also grazes cattle.

However, from a visual perspective and potential industry inconvenience through segregation, every effort has been made to select a mine plan that has the least visual impact to the valley and that provides the opportunity for ongoing use of the land not being utilised for the Project to continue with current agricultural activities in the area.

As outlined above, there has been an evolving shift in expectations of the land that should be afforded protection as agricultural land. During the planning and implementation of the Gateway Process, the NSW Government provided two different maps of BSAL. Further to this, the NSW Government has released a protocol for the verification of BSAL, which has assisted in verifying BSAL within the Project Boundary.

Iterative efforts and consideration of the extents of BSAL has been undertaken to limit impacts of the Project to potential BSAL. By nature of the site verification process, selecting the mine plan is the only time when the actual BSAL footprint can be determined through greater levels of mapping accuracy. This greater level of accuracy mapping being based on proposed areas of greatest impact relating to the selected mine plan. As such, small additional areas of BSAL may have and have eventuated even in light of a responsible and thorough mine planning process.

There has been conflict between the preferred mine plan chosen in relation to a number of constraints as per the final Options Study and the final mapped BSAL. Areas of coal resource available for recovery have been designed by considering all other constraints including the extent of alluvial soils. Inevitably where the coal resource exists and other constraints have been considered, potential open cut mining areas have been defined.

Mine infrastructure and OEAs have been designed in consideration of the location that best satisfies the coal resources and the preferred mine plan coupled with the overarching constraints to the Project. Generally the location of this infrastructure can be variable and as such every effort has been made during the mine planning process to limit impacts on BSAL.

The Bylong Valley is heavily constrained by way of topography and the traditional mining constraints outlined above. Accordingly the placement and selection of appropriate locations for infrastructure and OEAs is comprehensively limited within the authorisations.

Relatively small BSAL impacts have been realised by nature of mine infrastructure requirements such as roads joining specifically constrained areas. Other unavoidable site specific BSAL impacts exist in small areas of planned OEAs. Subsequent redesign and trade off studies have been conducted to ascertain alternative OEA locations, however greater levels of different environmental impacts are observed along with detrimental effects on the overall viability of the Project.

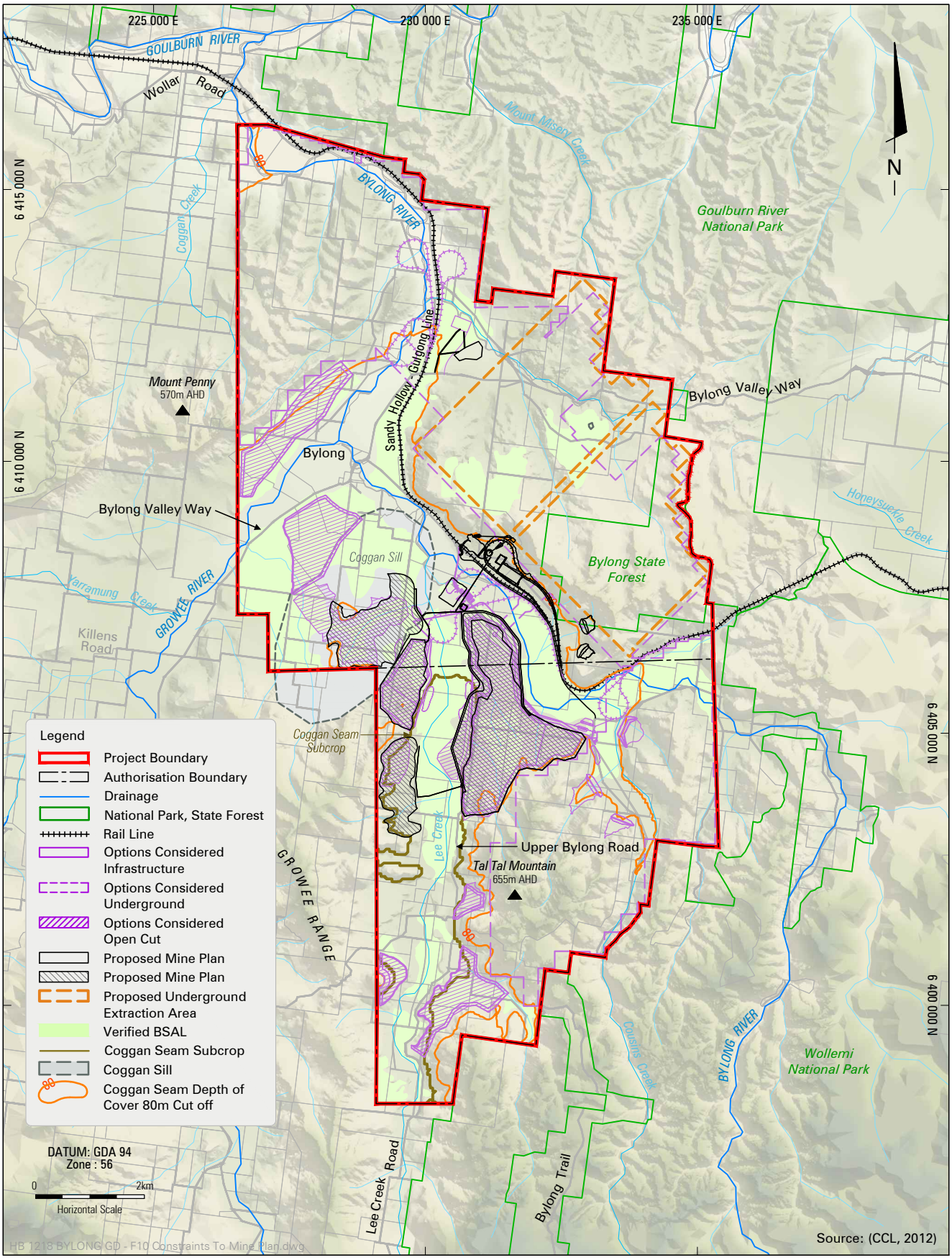
The preferred mine plan and associated infrastructure design is the most balanced approach (in terms of reduced impacts to BSAL whilst maintaining economic viability) and has a small, but unavoidable, residual impact on BSAL. Mitigation in the form of reinstatement of BSAL for this residual impact is discussed in **Section 7.2.2**.

Alluvial aquifers along with underlying coal seams have been considered as the main groundwater aquifers within A287 and A342. As outlined above, potential open cut and underground mining areas were constrained to be sufficiently offset from known alluvial boundaries to limit potential groundwater impacts.

Preliminary modelling of potential groundwater impacts for the initial mine plans produced as part of the Pre-Feasibility Study showed that there were likely to be detrimental impacts in terms of the '*Aquifer Interference Policy*' (AIP) (NOW, 2012). This was generally associated with extent of mining across the Bylong Valley, including the number of open cut mining areas and underground mining beneath alluvials at shallow depths of cover. The subsequent Options Study phase included consideration of potential groundwater impacts and a substantial reduction to the mine plan has been proposed.

### 2.7.4 Alternatives Considered

The various Project alternatives that were considered during the mine planning process are summarised below. **Figure 10** illustrates the alternatives and constraints considered during the development and selection of the preferred option (i.e. the Project). Overall, the goal to maximise resource utilisation has been tested with overarching requirements and expectations of the evolving approval processes.




BYLONG COAL PROJECT

Constraints to Mine Plan and Alternatives Considered

FIGURE 10

### 2.7.5 Option 1 – Pre-Feasibility Mine Plan

The Pre-Feasibility Study identified a potential 10 Mtpa operation comprising up to 7 open cut areas and extensive underground operations with multiple working areas. This mine plan considered both open cut and underground operations operating in parallel. This option presents the largest possible footprint of coal mining within the authorisations and was identified to exhibit substantial environmental constraints.

Having identified the various environmental constraints, including the additional requirements from the Gateway Process, the mine plan has been proactively modified through the completion of an additional Options Study.

### 2.7.6 Option 2 – Underground Only Operation

Option 2 involved considering the development of an underground only mining operation utilising bord and pillar and/or longwall methods. Whilst this option would minimise the extent of surface disturbance within the Project Boundary, there are other constraints that were identified.

Consistent with **Section 2.2**, there are areas within the Project Boundary where the coal resource is too shallow to enable the safe recovery of coal. Hence, this option would sterilise a coal resource that can only be safely and efficiently recovered by open cut mining methods.

For the thermal coal deposit that exists within the Project Boundary, the economics of a stand-alone bord and pillar operation presented limited value and would sterilise large areas of the coal deposit within those areas suitable for recovery by underground mining methods. Alternatively, a stand-alone longwall operation was considered, but presented with limited economic potential. A financial analysis confirmed that an underground only option is not economically feasible for this application.

Further to the above, an underground only scenario presents environmental constraints relating to the challenges surrounding the disposal and containment of coarse and fine reject materials from the CHPP within an appropriate facility. Option 2 was rejected on the grounds of economic and environmental issues.

### 2.7.7 Option 3 – Open Cut Only Operation

The topography and resulting depth of the coal resource within the Project Boundary effectively divides the resource into areas that can only be recovered via underground mining methods and areas that can only be recovered by open cut mining methods. The potential to mine the coal resource solely by open cut mining methods has been investigated.

Adopting this would result in the sterilisation of a significant amount of coal resource that can only practically be achieved by underground mining methods. It would also result in a significant modification to the landform within the Bylong Valley and result in greater environmental and social impacts to local stakeholders (particularly in relation to amenity impacts).

Recovery of the entire coal resource that is suitable for open cut mining operations would result in significant disturbance to areas of agricultural land, ecology, items of heritage significance and also result in impacts to water resources due to the immediate vicinity of these coal resources to existing surface water and groundwater resources.

Various mine plan options for the open cut mining operations were reviewed and refined in order to minimise the impacts on the identified sensitive environmental constraints, where possible.

Option 3 was rejected as it neither adequately satisfied the principles of ESD, nor did it appropriately address the Objects of the EP&A Act. Iterative processes were adopted to ascertain the appropriate balance of open cut mining within the Project Boundary. The extensive coal sterilisation that would result from adopting this option was not deemed acceptable to KEPCO.

Proactive meetings with both the DP&I and DRE have been conducted to understand perceptions and devise an appropriate strategy to best satisfy the needs of relevant stakeholders.

### 2.7.8 Option 4 – The Project

The preferred alternative is the Project as it is proposed, a 27 year mining operation including initial open cut mining technology within two refined areas over a period of 8 years and then a 23 year underground longwall mining operation within the Underground Extraction Area. This option will maximise the safety, social and economic benefits from the Project whilst minimising impacts on environmental aspects such as alluvial floodplains, sandstone outcrops and escarpments, surface water and groundwater resources, ecology, heritage items and agricultural lands and soils (SAL).

Significant mine planning was undertaken to minimise impacts to BSAL from open cut mining areas and the positioning of OEAs. This early identification and avoidance of alluvial lands was prioritised during the early mine planning phase of the Project. Mineable coal resources were determined to be preferably left in situ in consideration of the principles of ESD and the recently introduced NSW '*Strategic Regional Land Use Policy for the Protection of Strategic Agricultural Land'* (DP&I, 2012b).

Some BSAL (derived from sedimentary material) which exhibits the lowest fertility is utilised for less intensive grazing purposes only (not highly productive crops or farming) and remains within the Eastern Open Cut (see **Section 5.1** for further detail). Extensive deliberations were given to the benefits of the extracting the coal resource compared to the current and agricultural potential of this area.

Option 4 also presents an opportunity to recover additional coal resources beyond the life of the Project, subject to future feasibility studies and the grant of the relevant approvals. For all of the reasons discussed above, it is considered to be the best alternative in terms of meeting the principles of ESD and the Objects of the EP&A Act.

### 2.7.9 Project Related Infrastructure

A number of alternative locations were considered to accommodate the infrastructure required for the Project. Certain alternatives were rejected on the grounds of economic, environmental and/or social grounds throughout the planning and design phase.

A summary of each option considered is provided in the following sections.

### *Accommodation Facilities*

Various options for accommodation for each of the construction and operations' workforces have been considered for the Project. A detailed consideration of the potential labour pool with an approximately 1 hour drive of the Project (considered a safe drive time consistent with industry standards for fatigue management) has shown that the labour force presently seeking full time employment is few. Experienced mining sector employees presently reside largely outside this area. In addition to training local workers, some sourcing of employees from outside the area will be required.

If an Accommodation Facility were not constructed as part of the Project, there would be significant additional pressure on local infrastructure and accommodation facilities in the immediate area. This would also significantly increase traffic volumes on key local roads, travel times for workers and potentially increase the safety risk for workers and other road users.

An Accommodation Facility for the full term of the Project was considered, however initial stakeholder analysis indicated that this may be unfavourable by key stakeholders. However, discussions with MWRC have confirmed that a longer term Accommodation Facility may be acceptable in the circumstances where appropriate commitments have been implemented by KEPCO to avoid potential impacts on the local community. An Accommodation Facility is currently proposed, with plans to conduct further consultation throughout the planning approval's process with the local community and MWRC in order to identify other opportunities to accommodate Project employees.

Other opportunities may include developing strategies with MWRC and the local community to endeavour to employ local workers where possible and to encourage workers that are recruited from outside the local region to progressively permanently reside and integrate within the local community within an acceptable travel distance of the Project. The demand for the Accommodation Facility will generally be highest during the early years of the Project life for construction activities and the initial years of open cut mining operations.

KEPCO intends to encourage the longer term employees to relocate their families to reside within the local community to minimise the demand on the Accommodation Facility.

The location of the Accommodation Facility was originally proposed further to the west (see **Figure 10**). Following the completion of mapping of areas of BSAL within the Project Boundary, the proposed locality has been moved further east to avoid an area mapped as BSAL. Further, it has been located on and around existing farm access infrastructure to further reduce disturbance impacts.

Consideration was also given to ensuring that the Accommodation Facility was located in an area that was remote from privately owned residences, including the town of Bylong. Ongoing consultation with stakeholders will continue in relation to this Project aspect of the Project, during the preparation of the EIS.

***Rail Loop***

Due to the Project being remote from other mining projects within the region, it was deemed that a standalone rail loop or rail load out facility will be required.

Various engineering and cost preferred locations were proposed for the rail loop, including on private land and within the alluvial floodplain. The final location was determined in consideration of avoidance of the above.

Additionally, the CHPP and its associated facilities have been proposed to be constructed within the rail loop with an aim to minimise disturbance to BSAL and native vegetation.

***66 kV Transmission Line***

The conceptual alignment of the proposed 66 kV transmission line has been determined within the vicinity to public road easements to minimise impacts on land that has been identified by Government for potential CIC and also to reduce the impacts of fragmentation to existing agricultural enterprises, external to the Project.

# 3 EXISTING ENVIRONMENT

*This section provides relevant information in relation to the existing environment as it relates to agricultural land in the vicinity of the Project. It describes land ownership, land use, soils, groundwater and surface water.*

## 3.1 LAND OWNERSHIP

Land ownership within and surrounding the Project Boundary is shown on **Figure 11**. KEPCO has a total land holding of 3,423 hectares (ha) within and surrounding the Project Boundary. Of the 10,317 ha of the total land within the Project Boundary, around 3,139 ha (or 30%) is owned by KEPCO.

KEPCO has recently reached Agreements with the landholders of two additional properties to purchase land within the vicinity of the Project as illustrated on **Figure 11**. Upon finalisation of the acquisition of these properties, KEPCO will hold 6,307 ha (or 61%) of total land within the Project Boundary. KEPCO will hold 78.9% of freehold land within the Project Boundary. KEPCO will continue to facilitate agricultural activities on its land which is not required for mining or mining related purposes.

The remaining 20% of land within the Project Boundary is made up of Crown Land and State Forest. There are 23 parcels of Crown Land located in the north, south and south-west of the Project Boundary. The Bylong State Forest covers 6% of land to the north-east of the Project Boundary. The Goulburn River and Wollemi National Parks border the eastern side of the Project Boundary.

## 3.2 LAND USE

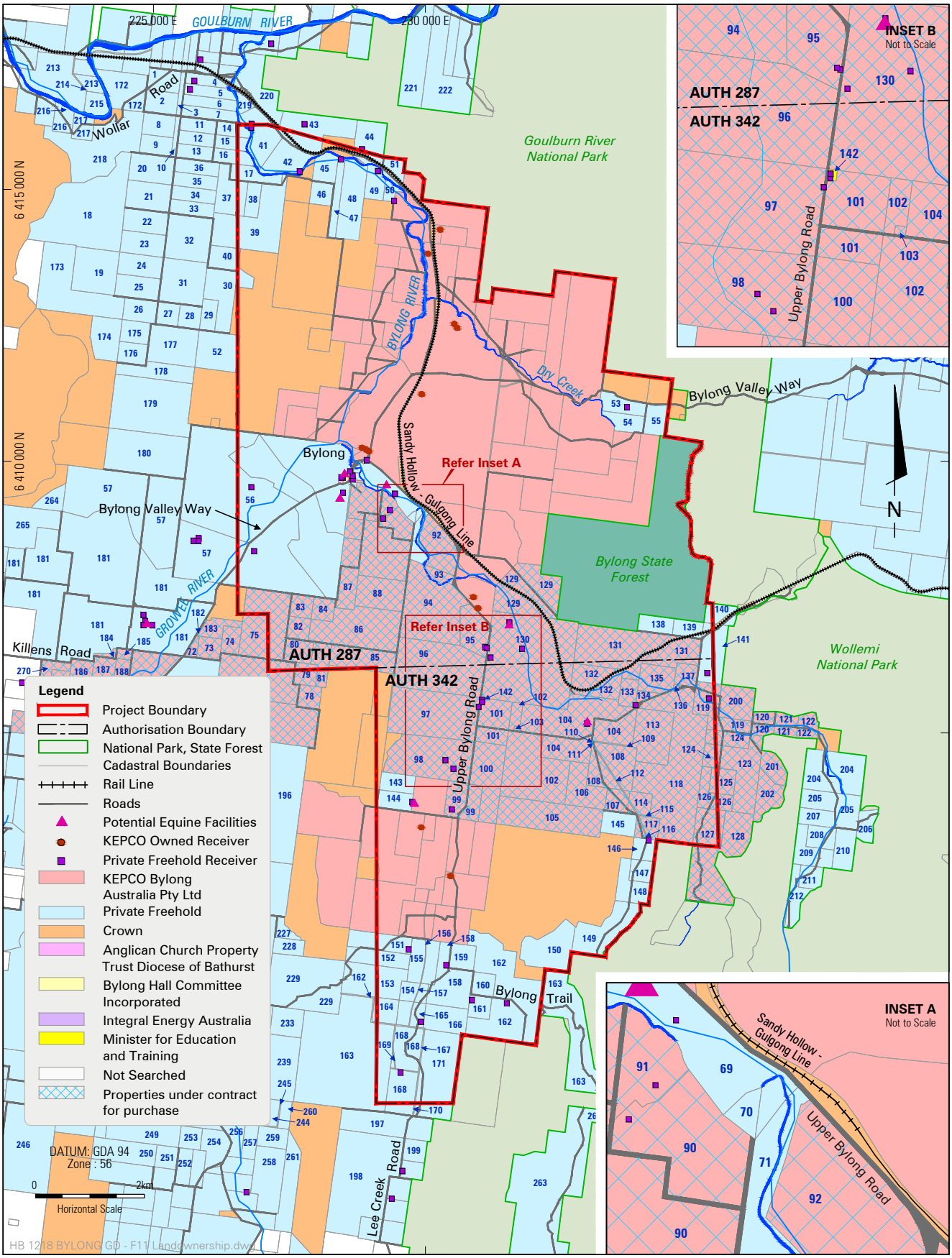
### 3.2.1 Background

The Project Boundary contains the cleared agricultural land within the lower valley areas associated with Lee Creek and the Bylong River. Native vegetation constitutes the remaining area, predominately within the more elevated landforms of the Bylong State Forest and other portions of Crown Land. The Goulburn River National Park and the Wollemi National Park border the eastern parts of the Project Boundary which exist on elevated and heavily vegetated land.

As shown in **Figure 12**, Bylong River and Lee Creek run through the Project Boundary and historically played an important role to the region's agricultural enterprises. Cropping within the Bylong Valley is a common land use on floodplains associated with the Bylong River and Lee Creek which have historically supported the production of Lucerne, rye prairie and English grasses. Leading up from the floodplains, the lower slopes and the upper hills have generally been used for grazing activities where areas have been cleared of native vegetation.

### 3.2.2 Mining and Other Related Activities

The MWRC LGA also supports a number of coal mining related developments as shown on **Figure 2**. The Mount Penny Project is owned by Cascade Coal and is located immediately to the north-west of the Project Boundary.

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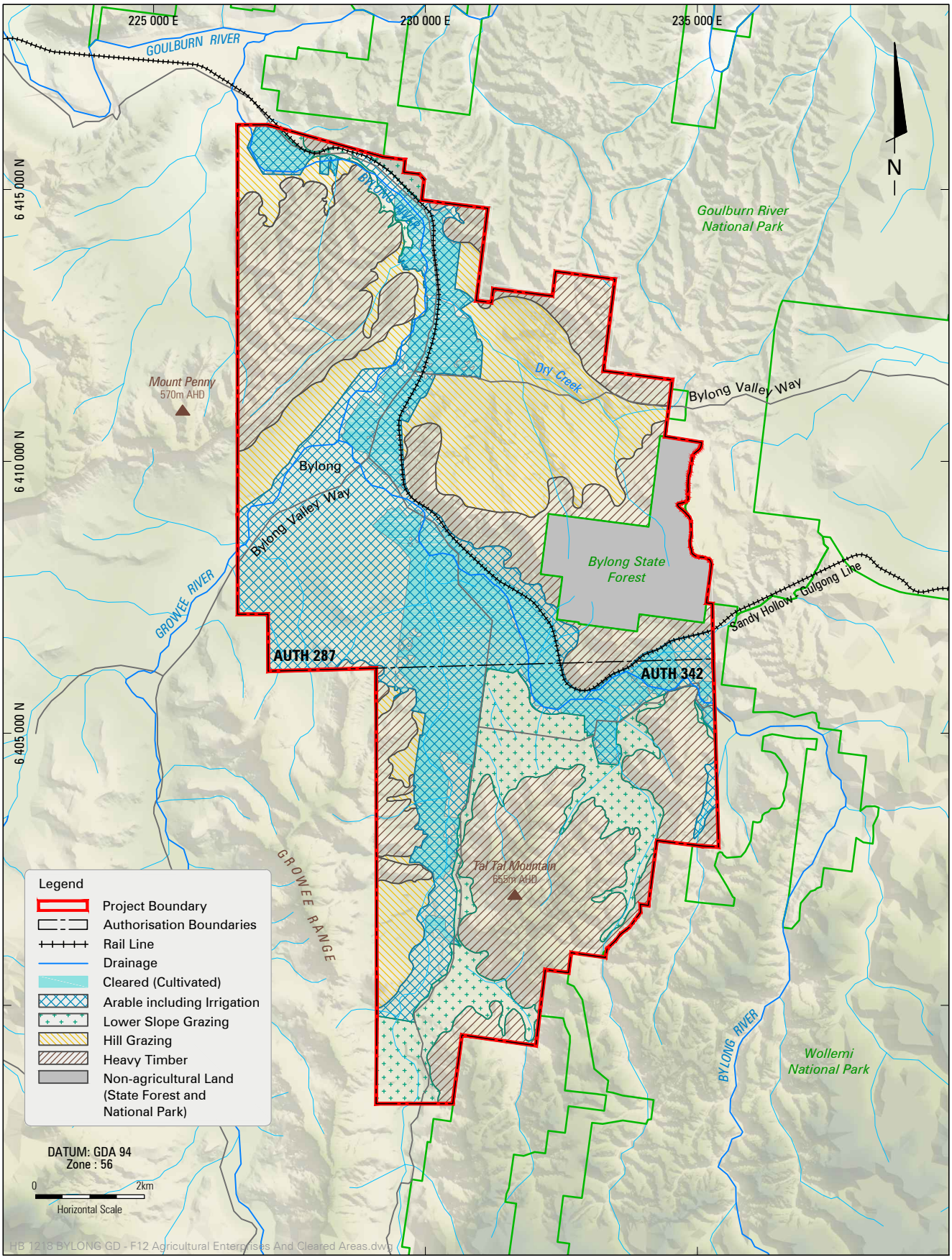
Land Ownership in Proximity to the Project

FIGURE 11

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Current Land Use within the Project Boundary

FIGURE 12

Operating coal mines which are located to the north-west of the Project Boundary include Wilpinjong Coal Mine (24 km), Ulan Coal Mine (40 km) and Moolarben Coal Mine (36 km). A small rock quarry is currently in operation within the north-eastern portion of A287, which is proposed to continue operations during the life of the Project. The Bowden Silver Project owned by Kingsgate Consolidated Limited is located approximately 35 km south-west of the Project Boundary. A number of wind farm projects, including Uungula Wind Farm, Liverpool Range Wind Farm and Crudline Ridge Wind Farm, are also located within the broader vicinity of the Project in the MWRC LGA.

### 3.2.3 Agriculture

***Enterprises within the Locality***

The main agricultural activities within the immediate locality (i.e. within 2 km of the Project Boundary) and the broader Bylong Valley is cattle breeding. It is estimated that 6,000 breeding cows within the extended Bylong Valley produce an approximate 4,800 progeny (mainly for the European market – 550 kg live weight) and 2,000 head of trading stock is grown out from 240 kg live weight to be turned off at 460 kg live weight (*pers. comm.* DPI, 2013).

Other agricultural enterprises in the locality and the broader Bylong Valley include:

- Lucerne hay production for onsite grazing and supplementary feed of livestock, stock feed market or Sydney horse market and Oaten hay production;
- Forage millets for hay and sorghum forages (grown under irrigation in summer);
- Opportune wheat and oat grain crops (restricted to the alluvial flats of the Bylong and Upper Bylong Valley and associated creek flats); and
- Horse breeding and husbandry (generally associated with stock horses).

***Enterprises within Project Boundary***

Agricultural enterprises within the Project Boundary reflect the general agricultural land use of the locality. The spatial distribution and quantum of these enterprises is shown in **Figure 12** and **Table 6** respectively. The predominant enterprise within the Project Boundary is beef cattle grazing supported by fodder cropping (oats, Lucerne, millet and forage sorghum) and improved pastures on the better quality land and larger holdings. It is estimated that the Project Boundary could carry approximately 1,992 beef breeders, turning off 1,653 sale cattle per year plus opportune trading cattle as warranted by seasonal and market conditions.

There are no thoroughbred breeding enterprises currently within the Project Boundary. There are a number of properties within the Project Boundary (including an Australian Stock Horse stud) that comprise of equine related infrastructure and have historically been utilised for equine related activities. The existing dominant land use for these properties is beef cattle grazing with limited equine related activities occurring. These properties are discussed further in the context of the equine CIC in **Section 4.5.4**.

**Table 6**
**Current Agricultural Enterprises within the Project Boundary**

| Enterprise | Area | | DSE*/ha | DSE* |
|---|---|---|---|---|
| | (ha) | (%) | | |
| Arable including irrigation areas | 3,331 | 32 | 10 | 33,298 |
| Lower slope grazing only | 1,007 | 10 | 7 | 6,546 |
| Hill grazing | 1,763 | 17 | 3 | 6,169 |
| Heavily timbered | 3,691 | 36 | 0 | 1,107 |
| Non-agricultural use | 525 | 5 | 0 | 0 |
| **Total** | **10,317** | **100** | **-** | **47,120** |

**DSE – Dry Sheep Equivalent*

## 3.3 SOILS

### 3.3.1 Soil Landscapes

A total of 40 soil units, 14 soil-phases and seven soil landscapes were identified within the Project Boundary. These were classified broadly into seven '*Australian Soil Classification'* (ASC) system (Isbell, 2002) orders, including chromosols, dermosols, kandosols, rudosols, sodosols, tenosols and vertosols. The soil landscape units are illustrated on Figure 2.4 in **Appendix D**. A summary of the seven soil landscapes identified within the Project Boundary is provided below.

***Bald Hill Soil Landscape***

The Bald Hill soil landscape covers 1,782 ha or 17% of the land within the Project Boundary and is typically associated with low hillocks and basalt or dolerite caps. It overlies the Tertiary basalt geological unit with the parent rock being olivine basalt and dolerite. Elevations across the soil landscape range from 240 m to 1,000 m and slope gradients vary between 5% and 50%.

The major soil unit within the Bald Hill soil landscape is a red dermosol, which generally has deep to moderate soil depth, is non-sodic and non-saline.

***Benjang Soil Landscape***

The Benjang soil landscape covers 518 ha or 5% of the land within the Project Boundary and is typically associated with rounded rolling hills within large open valleys and some sandstone cliffs. It overlies the Illawarra Coal Measures geological unit with the parent rock being shale, sandstone, conglomerate, mudstone, coal, tuff and some basalt. Elevations across the soil landscape range from 240 m to 440 m and slope gradients vary between 10 and 25%.

The major soil unit within the Benjang soil landscape is a brown chromosol, which generally has deep soil depth, is non-saline in the top soil, moderately saline in the subsoil and non-sodic.

***Bylong Soil Landscape***

The Bylong soil landscape covers 1,664 ha or 16% of the land within the Project Boundary and is typically associated with alluvial flats and low terraces of the Growee River and at Bylong. It overlies the Quaternary alluvium geological unit with the parent material being the alluvium.

Elevations across the soil landscape range from 260 m to 320 m with the landform consisting of low (less than 10 m) alluvial terraces with swampy hollows and abandoned channels.

There are two major soil units within the Bylong soil landscape, including:

- A black dermosol, which generally has a deep soil depth and is slightly to moderately saline; and
- A black dermosol overlying a sandy, stratic rudosol, which generally has a deep soil depth and variable salinity.

***Growee Soil Landscape***

The Growee soil landscape covers 2,298 ha or 22% of land within the Project Boundary and is typically associated with undulating rises and low hills, with broad, widely spaced shallow valleys. It overlies the Illawarra Coal Measures geological unit with the parent rock being shale, sandstone, conglomerate, coal, tuff and clay. Slopes across the soil landscape are generally less than 10%.

There are two major soil units within the Growee soil landscape, including:

- A red chromosol, which generally has shallow to deep soil depth, is typically non-saline and non-sodic (although some units are slightly saline); and
- A brown chromosol, which generally has shallow to deep soil depth, is typically non-saline and non-sodic (although some units are slightly saline).

***Lees Pinch Soil Landscape***

The Lees Pinch soil landscape covers 2,541 ha or 25% of the land within the Project Boundary and is typically associated with rolling hills to steep mountains. It overlies the Narrabeen Group geological unit with the parent rock being lithic and quartz sandstone, conglomerate, green and red claystone, shale and siltstone. Elevation across the soil landscape ranges from 180 m to 800 m with slope gradients up to 90%.

The major soil unit within the Lees Pinch soil landscape is a clastic rudosol, which generally has shallow to very shallow soil depth, is generally sodic and slightly to moderately saline.

***Ogilvie Soil Landscape***

The Ogilvie soil landscape covers 1,382 ha or 14% of the land within the Project Boundary and is typically associated with steep hills and escarpments. It overlies the Narrabeen Group geological unit with the parent rock being sandstone, shale and conglomerate. Elevation across the soil landscape ranges from 180 m to 620 m and slope gradients vary between 15% and 60%.

There are two major soil units within the Ogilvie soil landscape, including:

- A brown sodosol, which generally has moderate to shallow soil depth and is typically saline.
- A clastic rudosol, which generally has moderate to deep soil depth.

***Sandy Hollow Soil Landscape***

The Sandy Hollow soil landscape covers 132 ha or approximately 1% of the land within the Project Boundary and is typically associated with undulating terrain and smooth, gentle rises. It overlies the Quaternary colluvium derived from the Narrabeen Group with the parent rock being sandstone, shale and conglomerate. Slopes across the soil landscape are generally less than 10%.

The major soil unit within the Sandy Hollow soil landscape is a red sodosol, which generally has deep soil depth and moderate salinity at depth.

## 3.4 GROUNDWATER

### 3.4.1 Hydrological Regime

Douglas Partners was engaged by Cockatoo Coal (as managers of the Project) in December 2011 to commence hydrogeological field investigations within the Project Boundary to assist in gathering detailed baseline data and assisting in an understanding of the regional hydrological regime.

With the information collected to date through the field investigation program and '*Preliminary Hydrogeological Assessment and Water Monitoring Plan'* (WMP) (Douglas Partners, 2013) (as discussed in **Section 4.4.2**), the following hydro-stratigraphical units have broadly been identified within and immediately surrounding the Project Boundary:

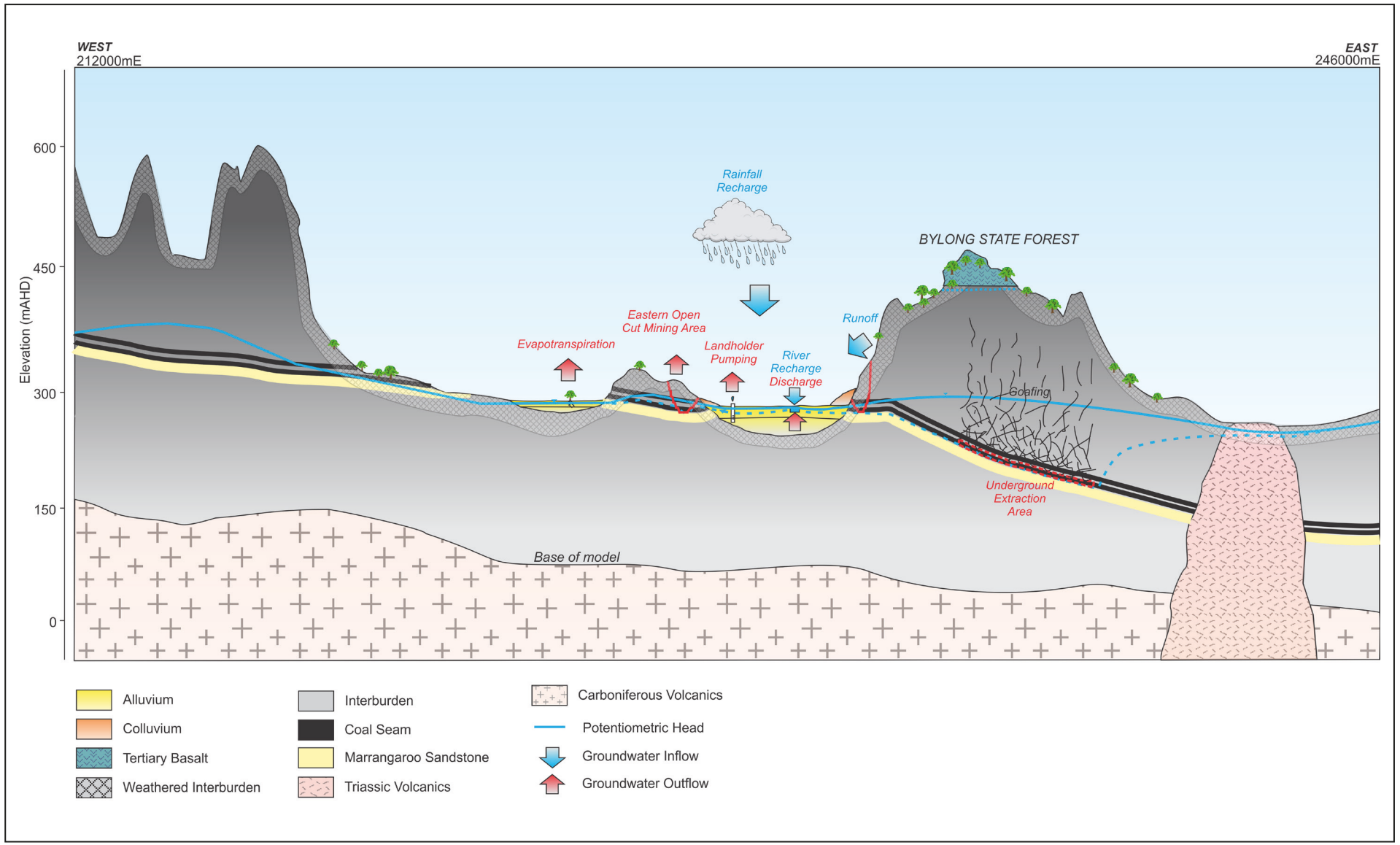
- Alluvium and Colluvium;
- Weathered Permian bedrock;
- Permian coal seams; and
- Marrarangaroo Sandstone.

A cross section illustrating the key aquifer systems within the Project Boundary and how they interact is illustrated in **Figure 13**. The groundwater recharge to these hydro-stratigraphical units is also discussed below.

***Alluvium and Colluvium***

The alluvium and colluvium occurs along the valley floors adjacent to the Bylong River, Growee River, Lee Creek and other minor tributaries of the Bylong Valley. Local scale mapping of the alluvial and colluvial boundary replaced the 1:100,000 scale data from the Singleton Geological Sheet. The proposed open cut mining areas have been designed to remain more than 150 m from the alluvium. In addition, the open cut mining areas are up to 180 m from the alluvium, 190 m of the Bylong River and 260 m from Lee Creek.

The alluvium is predominantly permeable sand and gravels and provides a groundwater source to the majority of registered bores within the area. Investigative drilling has indicated that these sediments consist of an upper layer of sand/silt/clay overlying a basal layer of sand and gravel. Whilst the upper sediments in the alluvial sequence are commonly fine grained, groundwater levels respond rapidly to rainfall indicating recharge readily infiltrates the upper sequence.

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Cockatoo Coal Limited

KEPCO KOREA ELECTRIC POWER CORPORATION BYLONG AUSTRALIA

Hansen Bailey ENVIRONMENTAL CONSULTANTS

Conceptualised Hydrogeology Schematic

**FIGURE 13**

Hydraulic testing suggests that the hydraulic conductivity of the alluvium is generally moderate to high ranging from 0.04 m/day to 14 m/day. The basal gravelly sand reports the highest values. Water quality monitoring has shown that electrical conductivity (EC) for the alluvium ranges from relatively fresh (277 µS/cm) to slightly saline (2,547 µS/cm). The hydraulic conductivity and quality of the water generally makes the alluvial aquifer a reliable and useful water resource.

***Weathered Permian Bedrock***

The weathering of the Tertiary and Permian strata within the Project Boundary ranges from 5 m to 30 m below ground surface. This zone of weathering likely acts as a zone of enhanced permeability in the weathered rock matrix. However this unit has been identified to be unsaturated in the elevated terrain.

Regional groundwater monitoring has identified that the weathered zone above the proposed Underground Extraction Area is potentially unsaturated. Weathered formations in elevated areas to the south-east have also been found to be unsaturated. In the lower lying valley floor areas, the weathered zone rock that is adjacent to and underlies the alluvium is saturated.

This is of particular interest in the region between the proposed open cut mining areas and the alluvials associated with the Bylong River and Lee Creek where the weathered zone may yield groundwater to the open cut mining areas during mining. The potential for the weathered zone to act as a conduit for flow through from the alluvium during mining appears high in the northern portion of proposed Eastern Open Cut and the eastern edge of the proposed Western Open Cut.

***Permian Coal Seams***

The Ulan and Coggan Coal Seams are the main economic targets for mining and represent the most permeable units within the Permian strata. There are several coal seams overlying the Ulan and Coggan Coal Seams (including the Farmers Creek, State Creek Mine Seam and Goulburn Seam). These upper seams are likely to be unsaturated over most of the Project Boundary but may contain groundwater at lower elevations below around 250 mAHD further to the north-east.

The sandstone, interbedded siltstone and claystone of the Permian interburden, overburden and unweathered overburden constitute lower permeability units and are considered aquitards.

Packer testing has been completed on selected exploration holes to provide an estimate of the hydraulic conductivity of the consolidated hydrostratigraphic units within the Project Boundary. Testing focused on overburden and coal seams in areas where underground mining is proposed. Rising head tests within the Coggan Coal Seam have indicated that the hydraulic conductivity of the coal seams can be high compared to interburden and overburden with the coal seams with a median hydraulic conductivity of 0.05 m/day.

Water quality monitoring for the Permian Coal Measures has identified the water quality is relatively fresh to slightly saline ranging from an EC of 1,042 µS/cm to 2,774 µS/cm. This low salinity for the Permian Coal Measures suggests that the alluvium is a recharge area to the Permian sequence.

***Marrangaroo Sandstone***

The Marrangaroo Sandstone underlies the Coggan Coal Seam across most of the area within the Project Boundary. Further assessment and testing of the Marrangaroo Sandstone is being completed to determine if this formation is a geotechnical or hydrogeological risk to mining operations.

Packer testing to date has focused on the upper section of the Marrangaroo Sandstone, which is typically of low permeability with a hydraulic conductivity of less than 0.001 m/day.

***Groundwater Recharge***

Recharge to the groundwater system within the Project Boundary can be characterised from two major sources, including:

- Direct rainfall recharge through the soil zone to the water table, which will only be possible when soil moisture deficits are overcome and the soil profile reaches saturation (field capacity); and
- Infiltration of surface water through the beds of rivers and creeks, which is only likely to be significant when rivers are flowing and when surface water levels are higher than groundwater levels.

Recharge processes are highly likely to form an important component in the site water balance for the regional hydrological system. An effort has been made to investigate the recharge process using available baseline data. Further investigations are ongoing to further refine the recharge processes within the catchment.

Recharge to the Permian coal measures is presumed to be through lateral migration along dip where units sub-crop near the surface, particularly in low lying areas underneath or adjacent to alluvium. Due to the low bulk vertical hydraulic conductivity in the Permian overburden, downward recharge through the Permian sequence to the Ulan and Coggan Coal Seams will be very limited. This theory is supported by evidence of perching in elevated terrain above the proposed Underground Extraction Area.

Groundwater monitoring shows that groundwater levels (particularly in the alluvium) rise rapidly in the order of 0.5 m to 1.0 m in response to significant climatic events within the region. Groundwater levels also demonstrate that recharge episodes are infrequent, leading to long term declines in groundwater levels over prolonged dry periods.

### 3.4.2 Groundwater Users

***Water Sharing Plans***

NSW Office of Water (NOW) has developed Water Sharing Plans (WSPs) under the provisions of the *Water Management Act 2000* (WM Act) to establish rules for sharing water between the environmental needs of the river or aquifer and water users, and between different types of water use such as town supply, rural domestic supply, stock watering, industry and irrigation. NOW is progressively developing WSPs for rivers and groundwater systems across NSW following the introduction of the WM Act.

The purposes of the WSPs are to protect the health of rivers and groundwater, while also providing water users with perpetual access licences, equitable conditions, and increased opportunities to trade water through separation of land and water.

The *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources* (Hunter Unregulated and Alluvial WSP) applies to the aquifers that may potentially be affected by the Project.

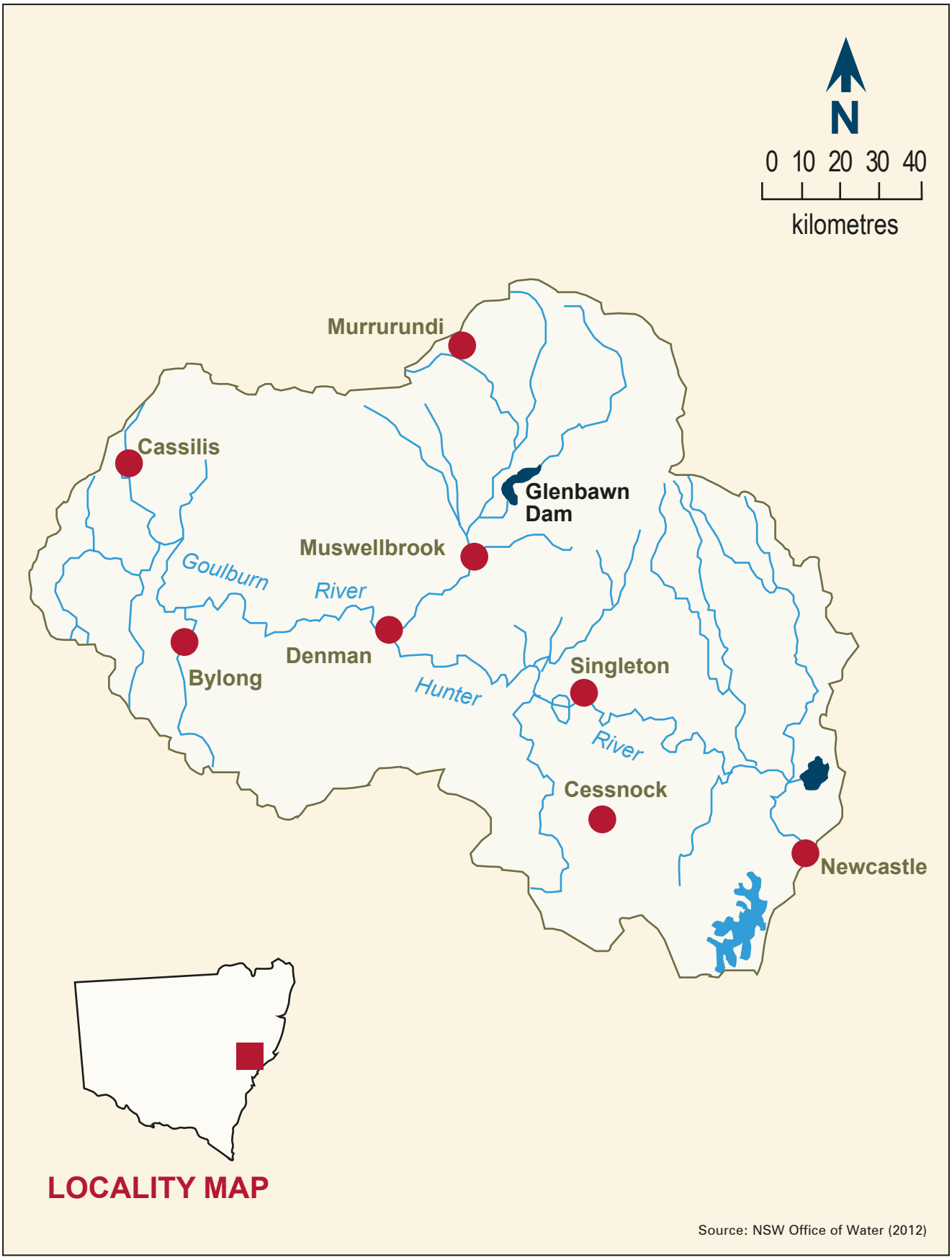
The Hunter Unregulated and Alluvial WSP commenced on 1 August 2009 and applies for a period of 10 years to 31 July 2019. It is a legal document made under the WM Act. **Figure 14** shows the area to which the Hunter Unregulated and Alluvial WSP applies.

The objectives of the Hunter Unregulated and Alluvial WSP are to:

> *"(a) protect, preserve, maintain or enhance the important river flow dependent and high priority groundwater dependent ecosystems of these water sources,*
>
> *(b) protect, preserve, maintain or enhance the Aboriginal, cultural and heritage values of these water sources,*
>
> *(c) protect basic landholder rights,*
>
> *(d) manage these water sources to ensure equitable sharing between users,*
>
> *(e) provide opportunities for market based trading of access licences and water allocations within sustainability and system constraints,*
>
> *(f) provide recognition of the connectivity between surface water and groundwater,*
>
> *(g) provide sufficient flexibility in water account management to encourage responsible use of available water, and*
>
> *(h) adaptively manage these water sources.*
>
> *Note. For the purposes of the Inter-governmental Agreement on the National Water Initiative (2004), the environmental and other public benefit outcomes provided under this Plan include:*
> *1. the important river flow dependent environmental, Aboriginal, cultural and heritage values of these water sources are protected, preserved, maintained or enhanced,*
> *2. these water sources are managed to ensure equitable sharing between users, and*
> *3. basic landholder rights of owners, or occupiers, of land are protected."*

The Project Boundary is located within the Goulburn Extraction Management Unit of the Hunter Unregulated and Alluvial WSP and more specifically is in the catchment covered under the "*Bylong River Water Source"*.

The report card for the Bylong River Water Source details that the catchment of this water source is 697 $km^2$ with around 63% of the catchment being forested.




Source: NSW Office of Water (2012)

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Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources

**FIGURE 14**