4 Modification description

4.1 Overview

Xstrata Mangoola has identified an opportunity to improve efficiency and resource utilisation and is seeking the proposed modification primarily aimed at increasing the maximum capable throughput of the CHPP. Approval is also sought for other associated modifications.

No increase or extension to the approved project disturbance boundary is sought as part of the proposed modification.

A comparison of the current operations and proposed modification is summarised in Table 4.1. The key components of the proposed modification are shown in Figure 1.2.

Table 4.1 Overview of proposed modification

Aspect	Current operations	Proposed modification
Extraction limit	10.5 Mtpa.	13.5 Mtpa.
Project approval term	21 years (to Nov 2029).	No change.
Operating hours	Seven days per week, 24 hours per day.	No change.
Number of employees (operation only)	Operational workforce of 300 personnel.	Increase from 300 operational employees to 450 FTE operational employees, plus up to 90 contractors (as required).
Mining methods	Open-cut truck and shovel operation.	No change to method, but a change in the total equipment fleet.
Mining areas	Within approved project disturbance boundary.	No change.
Infrastructure	As identified in Table 3.2.	The following alterations to infrastructure are sought under the proposed modification: • Approval for re-defining one temporary ROM stockpile to a permanent (life-of-mine) ROM stockpile.
		• Approval for discharge of site water to the Hunter River under the rules and regulations of the HRSTS utilising the existing Hunter River Pipeline and Hunter River Pump Station. • Minor additional water management infrastructure such as pumping equipment at the PWD and relocation/realignment of some small sediment dams would be required within the approved project disturbance boundary.
		• Approval for utilisation of suitable mined waste rock for on-site gravel production, including crushing of up to 50,000 tpa of gravel for use on-site.
External coal transport	Transport of coal via rail, maximum of 10 trains per day.	No change in maximum daily number of trains.

4.2 Increased extraction rate

Xstrata Mangoola proposes to increase mining intensity from the current maximum extraction rate of 10.5 Mtpa of ROM coal up to a maximum 13.5 Mtpa of ROM coal. If the proposed maximum rate of extraction is sustained throughout the mine life, the time required to extract the coal resource within the approved project disturbance boundary could reduce from 15 years to a minimum of 12 years. However, as the extraction rate will vary depending on market and other factors, no reduction in the current project approval term (21 years) is sought to enable responses to market conditions and operational needs.

The increased extraction rate will result in minor changes to the design of the final landform due to overburden handling requirements and staging (refer to Figure 4.4). However, these changes will be consistent with the approved conceptual final landform, and no changes are sought to the final land use or rehabilitation outcomes, or maximum height of 240 m RL. The final landform is described in Section 4.11.

4.3 Conceptual mine plan staging

The progression of mining within the approved project disturbance boundary would remain generally in accordance with the current approved conceptual mine plan, but would progress at a faster rate. The conceptual mine plan scenarios utilised in this EA include:

- Year 2 (end 2015) – coal extraction in the north-east area of the mine (the Northern Pit) and progressing in a south-easterly direction towards the mine infrastructure area. The overburden emplacement area is established behind the general progression of the pit;
- Year 5 (end 2018) – coal extraction in the north-west area (the Main Pit) and southern area (the Southern Pit) of the mine. The Main Pit progresses in a south-west direction around Anvil Hill and the Southern Pit in a north-west direction; and
- Year 10 (end 2023) – one active pit in the south-western area of the mine (the Southern Pit). The majority of the mined land is rehabilitated by this time and represents the end stage of the mine life.

The proposed conceptual mine plans are shown in Figures 4.1 – 4.3. The proposed conceptual final landform, which is generally consistent with the approved conceptual final landform, is presented in Figure 4.4.

4.4 Coal handling and processing

The intensity of extraction will be achieved through efficiencies already realised in the operation of the existing CHPP and a change in plant and equipment used in the mining and recovery of coal (refer Section 4.8).

A schematic diagram of coal handling and processing is shown in Figure 4.7.

4.5 Re-definition of ROM coal stockpile areas

One temporary ROM stockpile will be redefined as a permanent (life-of-mine) ROM stockpile, as shown in Figure 4.6. This current temporary stockpile is near the CHPP and mining infrastructure area. This stockpile was approved under Modification 4 as a temporary stockpile, but is required as a permanent stockpile under the proposed modification.

The footprint of the stockpile has been slightly reduced from the approved temporary footprint to avoid encroachment on the PWD and to allow the PWD to continue to operate at its maximum operating level.

4.6 On-site gravel production

Approval is sought for utilisation of suitable mined waste rock for on-site gravel production. Up to 50,000 tpa of gravel from the stripped overburden in the pit areas may be crushed for use on-site. The gravel would be used for blast stemming gravel and other on-site activities as required.

The gravel crushing plant will be mobile and follow pit progression to minimise travel distance between the source of gravel production and where it will be used. The unit will generally be positioned on a subsurface level or within a bunded area and will operate during daylight hours only to minimise noise emissions.

4.7 Coal transport

Coal will continue to be transported by rail to market via the Mangoola Coal rail loop and spur connected to the Muswellbrook-Ulan railway. The increase in extraction rate to 13.5 Mtpa will not result in an increase in the approved daily maximum of 10 trains.

4.8 Plant and equipment

The proposed increase in the extraction rate of ROM coal will require a change to plant and equipment utilised in mining coal. This will typically include an additional excavator, haul trucks and ancillary equipment. Operational requirements may vary from time to time due to constraints such as weather conditions, and will also depend on maintenance and repair works. The technical assessments undertaken as part of this EA have assumed an indicative fleet of mine equipment for the purposes of modelling, which is likely to represent worst case operations at the peak ROM coal extraction rate. It is noted that the fleet modelled for the proposed modification differs from the fleet modelling in previous technical assessments; however, it is considered that the modelled fleet more accurately reflects the actual equipment fleet under current operations.

4.9 Water management

4.9.1 Saline discharges to the Hunter River

Approval is sought for the ability to discharge saline site water to the Hunter River utilising Mangoola Coal's existing Hunter River Pipeline and Hunter River Pump Station (refer Figure 4.5). Discharge of saline water would be from the saline water zone on-site in accordance with the rules and regulations of the HRSTS which was developed by the NSW Government to manage the discharge of saline water to the Hunter River through the allocation of credits to licence holders. Xstrata Mangoola currently holds HRSTS credits which would be used under the proposed modification. Further information about the HRSTS is provided in Section 11.2.

Under the current operations, the capacity of existing surface water management infrastructure has the potential to limit operations under certain climatic conditions, as there is predicted to be a lack of storage space for excess water when operating at maximum capacity. The current contingency, should the water storages reach their capacity during periods of high, prolonged rainfall, is to pump water into the Tailings Dam or into the active pit. This lack of water storage was identified in previous surface water assessments for Mangoola Coal (Umwelt 2006a; Umwelt 2010a), which noted the possible requirement for discharges during prolonged wet periods. However, saline discharges to the Hunter River do not form part of current operations.

The ability to discharge to the Hunter River under the HRSTS would provide additional flexibility to the existing water management system at the site, particularly during periods of prolonged or extreme rainfall as identified previously (Umwelt 2006a, Umwelt 2010a). Although the mine is currently a net water user (recycling the water that is available), and normally does not need to discharge water off-site, having this contingency will provide greater assurance during extreme or prolonged high rainfall periods in managing the risk of uncontrolled discharges or spills from the saline water zone.

Mangoola Coal currently uses the existing Hunter River Pipeline and Hunter River Pump Station for licensed extraction of water from the Hunter River. The pump station and pipeline has two-way flow capabilities and is capable of both water extraction and discharge. The existing pump station infrastructure includes a discharge outlet to the Hunter River which is not currently used, but is proposed to be used for discharges under the proposed modification. This outlet is referred to as the proposed discharge point (refer Figure 4.5). Use of this discharge point would be in accordance with HRSTS requirements.

A surface water assessment and site water balance (refer Chapter 11 and Appendix H) has been undertaken for the proposed modification to assess potential impacts to the Hunter River associated with discharge of saline water in accordance with the HRSTS.

4.9.2 Ancillary water management infrastructure

Alterations to the location or layout of approved water infrastructure are proposed due to minor layout changes of the overburden emplacement areas under the proposed modification. The alterations include relocation/realignment of some smaller sediment dams within the approved project disturbance boundary. Further information on these alterations is provided in Section 11.3.

Ancillary water management infrastructure, such as additional pumping equipment, would be required at the PWD to facilitate the discharge of saline site water proposed under the HRSTS. Telemetry and monitoring equipment as required under the HRSTS would be installed at the proposed discharge point. This additional infrastructure will be within the approved project disturbance boundary.

4.10 Workforce

The proposed increased mining intensity would necessitate an increased workforce. It is proposed to increase the current workforce of 300 personnel to 540 personnel which would typically be comprised of 450 employees and 90 FTE contractors at peak extraction and production. The operational component of this workforce will be split over four shifts (with two shifts per day) as per current operations.

4.11 Rehabilitation and final landform

The area within the approved project disturbance boundary would continue to be progressively rehabilitated in accordance with PA 06_0014 and the conceptual final landform as soon as practicable following disturbance, and generally in accordance with the stage plans for Years 2, 5 and 10 (refer to Figures 4.1 – 4.3). Rehabilitation of the disturbance area would continue to be undertaken progressively, but may occur at a faster rate due to the increased maximum rate of extraction.

Modification 6 does not seek to amend the project disturbance boundary or maximum RL of 240 m in relation to mine rehabilitation. While no changes are proposed to the overall maximum height of emplacement (240 m RL), a greater portion of the overburden emplacement area will be established at this maximum height (refer Figure 4.4).

The conceptual landform design presented for Years 2, 5 and 10 and the final landform (Figures 4.1 – 4.4) is based on standard engineering principles which allow waste overburden to be progressively placed, shaped, topsoiled and rehabilitated to create a stable landform design consistent with final land use objectives and regulatory requirements.

The final landform and final void would remain consistent with the current operations and the rehabilitation principles contained within PA 06_0014, the Landscape Management Plan and Rehabilitation and Offset Management Plan, which would be updated to reflect the proposed minor alterations to the final landform, if required.

4.12 Development of project design

Through its ongoing stakeholder engagement processes since commencement of operations in September 2010, Xstrata Mangoola has an understanding of issues within the community relating to mining and the operation of Mangoola Coal. As part of the SIOA for the proposed modification, a review of Xstrata Mangoola's communication register was undertaken, including an analysis of type and frequency of issues raised by the community. Impacts associated with noise and air quality, as well as mitigation of these impacts are the most frequently identified issues associated with Mangoola Coal's current operations.

During consultation for the proposed modification near neighbours primarily raised existing impacts from current operations that they believed may be exacerbated by the proposed modification, including specific impacts of noise and dust as well as perceived impacts on water supply (ie impacts to water quality that may affect downstream users) associated with proposed discharges to the Hunter River.

Accordingly, the proposed modification has been designed with the expectation that noise, air quality (dust) and water, in particular, would be key concerns for the local community generating a need to consider these aspects in the design of the proposed modification. To this end, the environmental assessment process for noise, air quality and water tested a range of measures as part of modelling to reduce off-site impacts where possible.

The key issues raised in relation to the proposed modification and how these have been considered in the EA are presented in Table 4.2.

Table 4.2 Amendments to the proposed modification in response to key issues

Key issues raised	Amendments to the proposed modification in response to issues raised
Noise	
General noise from the mine impacting on households, rural amenity, impacts of night time noise on sleep and well-being, and noise from trains and mining trucks.	Consideration was given to a range of measures to minimise noise impacts at receptors including: • location of gravel crushing plant – placement of gravel crushing equipment on a subsurface level; • site-specific measurement of noise sources – to improve the accuracy of the modelled noise predictions, and ensure the modelling reflects actual noise emissions generated at the site, measurements of noise sources were undertaken at Mangoola Coal, including measurement of noise from the CHPP, rail load-out infrastructure (while loading), ROM hopper, ROM sizing station, dozers, excavators and haul trucks. In some instances this resulted in higher sound power levels than previously modelled, and in other instances measured sound power levels were less than previously modelled. • pro-active and predictive modelling and management – to improve adaptability of mining operations in response to meteorological conditions, the NMP has been updated to consider pro-active and predictive modelling and management, and protocols for managing noise during adverse meteorological conditions including use of real time noise monitoring and personnel observations. • orientation of overburden dumps – consideration was given to re-orientation of overburden dumps to act as a shield to minimise noise emissions. However, given the relatively shallow nature of Mangoola open-cut areas compared to the surrounding topography, modelling of this management option was not successful in reducing noise level predictions at receptors.
Air quality	
Increase in dust from the mine perceived to be causing residents to have to clean more often, keep windows shut to prevent dust entering the house, dust impacts on drinking water, impacts on human health and/or the health of animals and livestock.	Xstrata Mangoola implements a range of air quality mitigation measures that are reasonable and feasible and can achieve a standard of mine operation consistent with current best practice for the control of dust emissions from coal mines in NSW which are detailed in Table 9.2. The measures applied to the proposed modification reflect those outlined in the recent NSW EPA document, 'NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining', prepared by Katestone Environmental (Katestone 2010). XCN also initiated the AQMP in 2010 to align and maximise dust management practices to respond to government and community concerns regarding the impacts of mining on regional air quality in the Hunter Valley. This program involved research into best practice dust management technique and the implementation of controls and staff guidance on being proactive to minimise dust. Mitigation measures including installation of first flush systems on residential rain water tanks (at the request of landowners) has been expanded to include landowners within 6 km of the approved project disturbance boundary. This includes periodic cleaning of rain water tanks and replacing filters on rainwater filtration systems once per year within 4 km and once every two years within 6 km. A comprehensive monitoring program is implemented at Mangoola Coal to minimise impacts which allows reactive management measures to be implemented in the event that dust levels exceed relevant air quality goals. Further detail on Mangoola Coal's monitoring program and air quality management measures is provided in Section 9.2.

Table 4.2 Amendments to the proposed modification in response to key issues

Key issues raised	Amendments to the proposed modification in response to issues raised
Water supply and quality	
Contingencies during prolonged wet or dry periods.	Contingencies to ensure adequate water supply during prolonged wet or dry periods are incorporated into the proposed modification. They include: • during prolonged wet periods – discharges to the Hunter River under the HRSTS. • during prolonged drought periods – reduction in site water demands or investigate using existing groundwater licences held by Mangoola Coal.
Impacts on water supply (ie impacts to water quality that may affect downstream users) associated with proposed saline water discharges to the Hunter River under the HRSTS	Consideration was given to a range of water balance modelling scenarios to manage water, and minimise the potential for water quality impacts off-site. Scenarios modelled included: • operation of the site water management system both with and without discharges under the rules and regulations of the HRSTS. Inclusion of HRSTS discharges ultimately reduced the likelihood of uncontrolled spills/discharges from on-site dams which reduces the potential for impacts to off-site water quality; • use of the tailings dams as a contingency for water storage during periods of water surplus, instead of HRSTS discharges. This would reduce the available tailings storage capacity and impact mining operations. Inclusion of HRSTS discharges eliminates the need to find alternative tailings storage capacity if taken up by water storage; • varying water demand scenarios to understand impacts of both high and low CHPP water demand. Consideration was also given to creating additional water storage outside the approved project disturbance boundary to avoid the need to discharge under the rules and regulations of the HRSTS; however, this was considered to have greater environmental impacts. An assessment of impacts to water quality in the Hunter River has been undertaken as part of the surface water assessment which concludes that downstream users would not be adversely impacted.

4.13 Alternatives considered

4.13.1 Overview

Xstrata Mangoola has continually reviewed its operations and mine plans to identify opportunities for efficiencies. This section briefly describes the alternatives that were considered in identifying opportunities for improved efficiencies and optimisation, which led to the development of the proposed modification as described in this chapter. A justification for the preferred option is provided in Chapter 18.

The alternatives considered include:

- Extraction rate:
  - Option 1 – do nothing (ie extraction remains as approved at 10.5 Mtpa);
  - Option 2 – increase extraction rate to 13.5 Mtpa;
- Alterations to the water management system to include discharges to the Hunter River:
  - Option 1 – do nothing (ie no Hunter River discharge);

- Option 2 – construct additional on-site water storage;
- Option 3 – Hunter River discharge;

- Gravel crushing:
  - Option 1 – do nothing (ie no gravel crushing); and
  - Option 2 – gravel crushing.

4.13.2 Extraction rate increase

i Option 1 – do nothing

Under PA 06_0014, extraction would continue at a maximum rate of 10.5 Mtpa for a nominal period of 15 years if the maximum extraction rate is sustained. While the mine plan has undergone some optimisation with relocation of the ETL, inefficiencies associated with the operation remain if extraction is limited to 10.5 Mtpa. Since commencement of mining operations, optimisation of the operation of the CHPP has occurred, and an opportunity has been identified to operate the plant at a higher throughput. Therefore, if extraction was to remain at 10.5 Mtpa, there would be a lost opportunity to operate the CHPP at its maximum capable throughput.

Furthermore, restricting extraction to the current approved maximum rate of 10.5 Mtpa would result in an opportunity cost associated with not responding to changes in market demand for coal from time to time. Therefore, remaining at a maximum extraction rate of 10.5 Mtpa when existing coal handling and processing infrastructure is capable of a higher throughput would represent an identified inefficiency of the operation.

For the reasons outlined above, this option was not considered further.

ii Option 2 – Increase extraction rate to 13.5 Mtpa

As discussed above, existing infrastructure at Mangoola Coal is capable of a higher throughput, which provides an opportunity to respond quickly to shifting market demands for coal. Remaining at a maximum extraction rate of 10.5 Mtpa when existing coal handling and processing infrastructure is capable of a higher throughput would represent an identified inefficiency of the operation.

The proposed modification would have economic opportunities and benefits associated with the current and forecast market price of coal, including opportunities associated with earlier extraction of the resource, increased employment and benefits to the regional and state economies. An economic assessment has been undertaken for the proposed modification which predicts additional economic benefits as a result of the increased maximum extraction rate.

The proposed modification maximises the efficiencies realised at the CHPP, which has demonstrated that it can be operated to achieve a higher throughput, as well as maximising operation of the existing fleet of mine vehicles and equipment.

Furthermore, these additional benefits are able to be realised within the approved project disturbance boundary with minimal environmental consequences beyond current operations.

4.13.3 Alterations to the water management system

i Option 1 – Do nothing

As discussed in Section 4.9.1, under the current operations there is predicted to be a lack of storage space for excess water which has the potential to reduce operational flexibility. The current operations have adequate capacity to store water on-site under typical climatic conditions. During periods of high, prolonged rainfall the current contingency, should the water storages reach their capacity, is to pump water into the Tailings Dam or into the active pit. This would result in reduced water quality in the saline water zone, reduce tailings storage areas, and compromise the operation of active pits.

ii Option 2 – Construct additional on-site water storage

Construction of additional on-site water storage within the approved project disturbance boundary was considered. The construction of additional water storage would result in the sterilisation of some of the coal resource, which reduces the economic viability of the operation. Consideration was given to an increase in the approved project disturbance boundary; however, this option was discounted as it would involve disturbance of biodiversity offset areas and additional environmental impacts associated with this disturbance. For these reasons this option was not considered desirable from a resource utilisation or environmental perspective.

iii Option 3 – Hunter River discharge

The opportunity to discharge to the Hunter River is governed by the HRSTS. Approval to discharge saline water to the Hunter River under the HRSTS would allow greater operational flexibility when water storages are operating near or at capacity. In particular, during periods of high rainfall when conditions may be favourable for discharge under the HRSTS and any additional capacity in the site water management system would be consumed by rainfall and runoff. The likelihood of discharges would further depend on the year of operations and site water demands as detailed in Section 11.3.3.Discharges under the HRSTS would also have benefits associated with a decreased risk of uncontrolled release from the saline water zone. The augmentation of the surface water management system with the ability to discharge to the Hunter River would have reduced environmental impacts compared to increasing the capacity of water storage areas outside the approved project disturbance boundary. Due to the increased operational flexibility, it is considered that the introduction of the ability to discharge into the Hunter River under the HRSTS can improve water management on-site.

It is important to note that limitations with water storage during certain climatic conditions are predicted to occur under current operations. Discharges under the HRSTS will ensure greater operational flexibility and reduce the risks of uncontrolled releases and pit inundation, irrespective of the proposed increase to the maximum extraction rate from 10.5 Mtpa to 13.5 Mtpa.

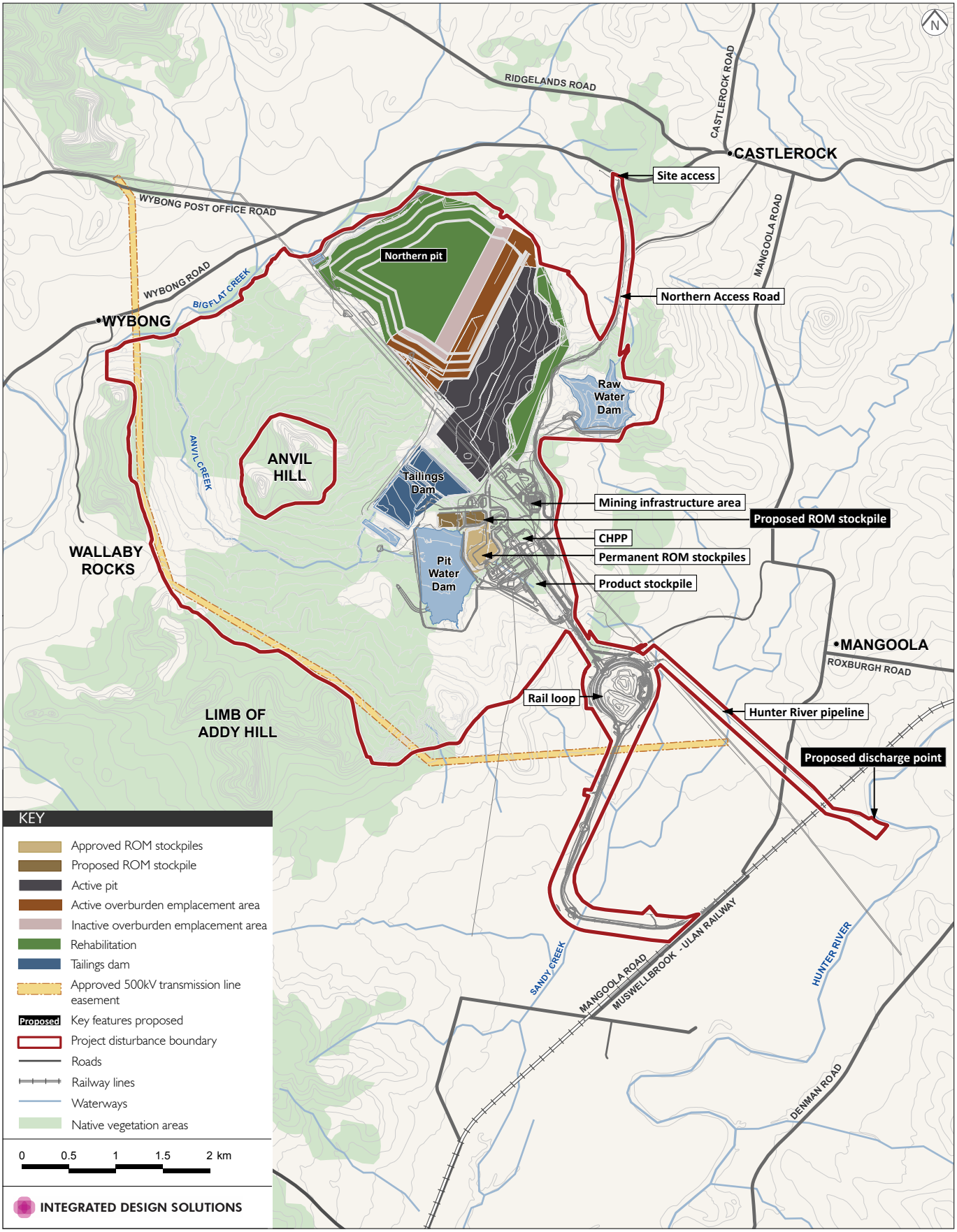
4.13.4 Gravel crushing

i Option 1 – Do nothing

Under current operations, waste rock is consumed in overburden dumps. This option would continue to result in a potential resource (ie gravel from waste rock) being consumed in overburden dumps on-site. Under this option, all gravel would continue to be transported to Mangoola Coal by truck, generating heavy vehicle movements to and from Mangoola Coal.

ii Option 2 – Gravel crushing

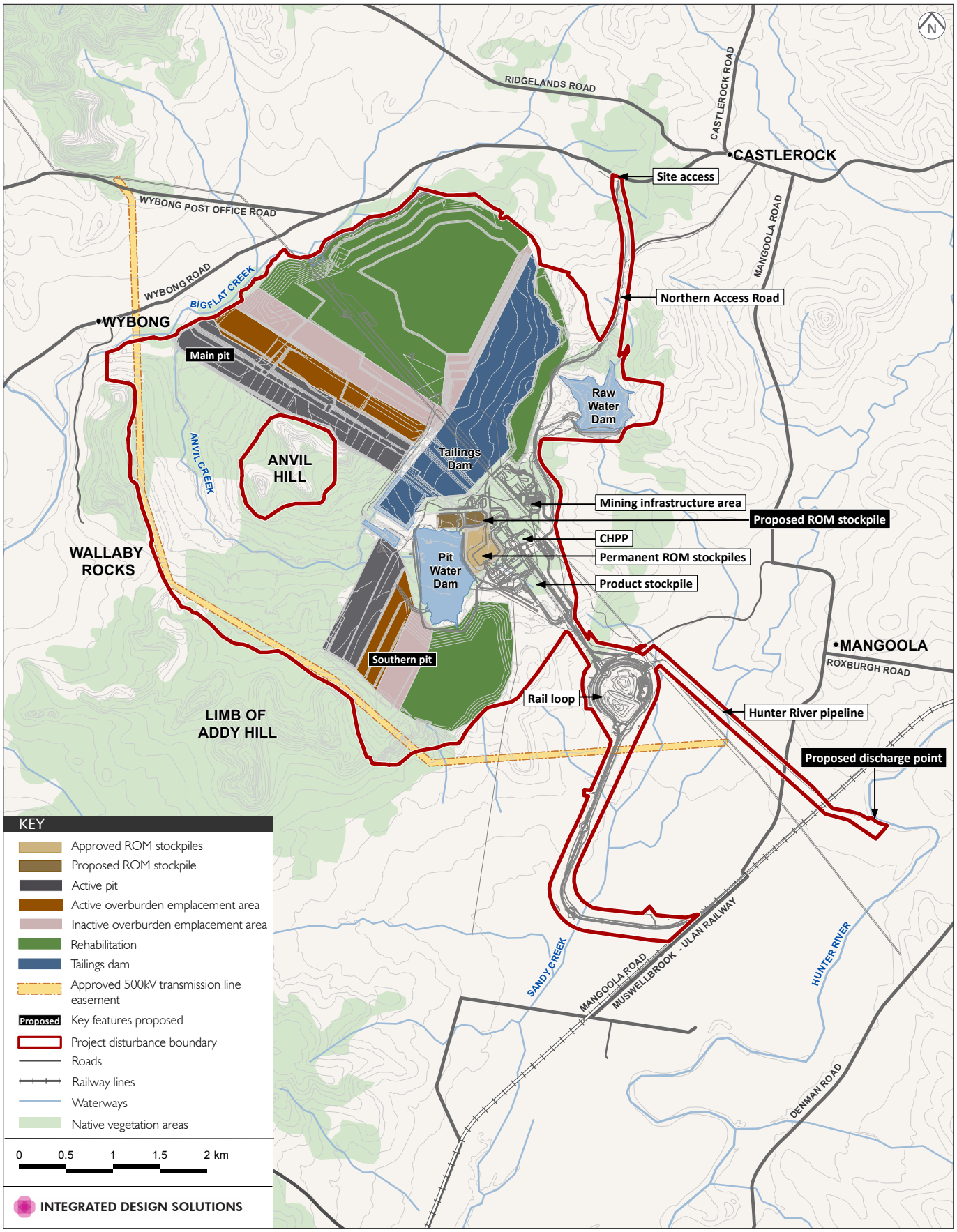
Whilst assessing the feasibility of the proposed modification, the utilisation of suitable mined waste rock for on-site gravel production was seen as an opportunity to maximise resource recovery and beneficial reuse of waste rock. It would also reduce the need to import gravel to site which will, therefore, reduce heavy vehicles associated with gravel transport.



Conceptual mine plan - Year 2

Mangoola Coal Modification 6 Environmental Assessment

Figure 4.1



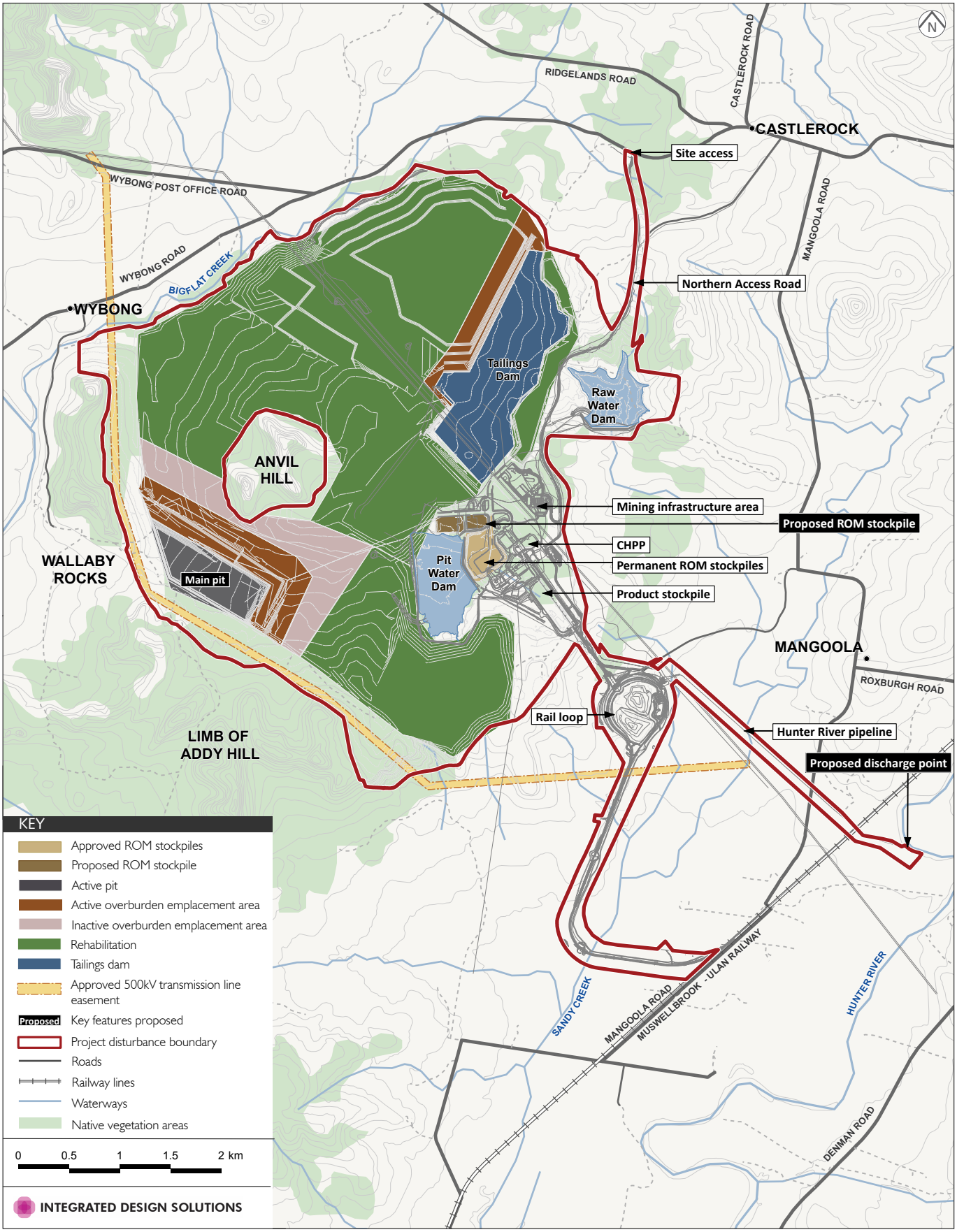
xstrata coal mangoola coal

EMM

Conceptual mine plan - Year 5

Mangoola Coal Modification 6 Environmental Assessment

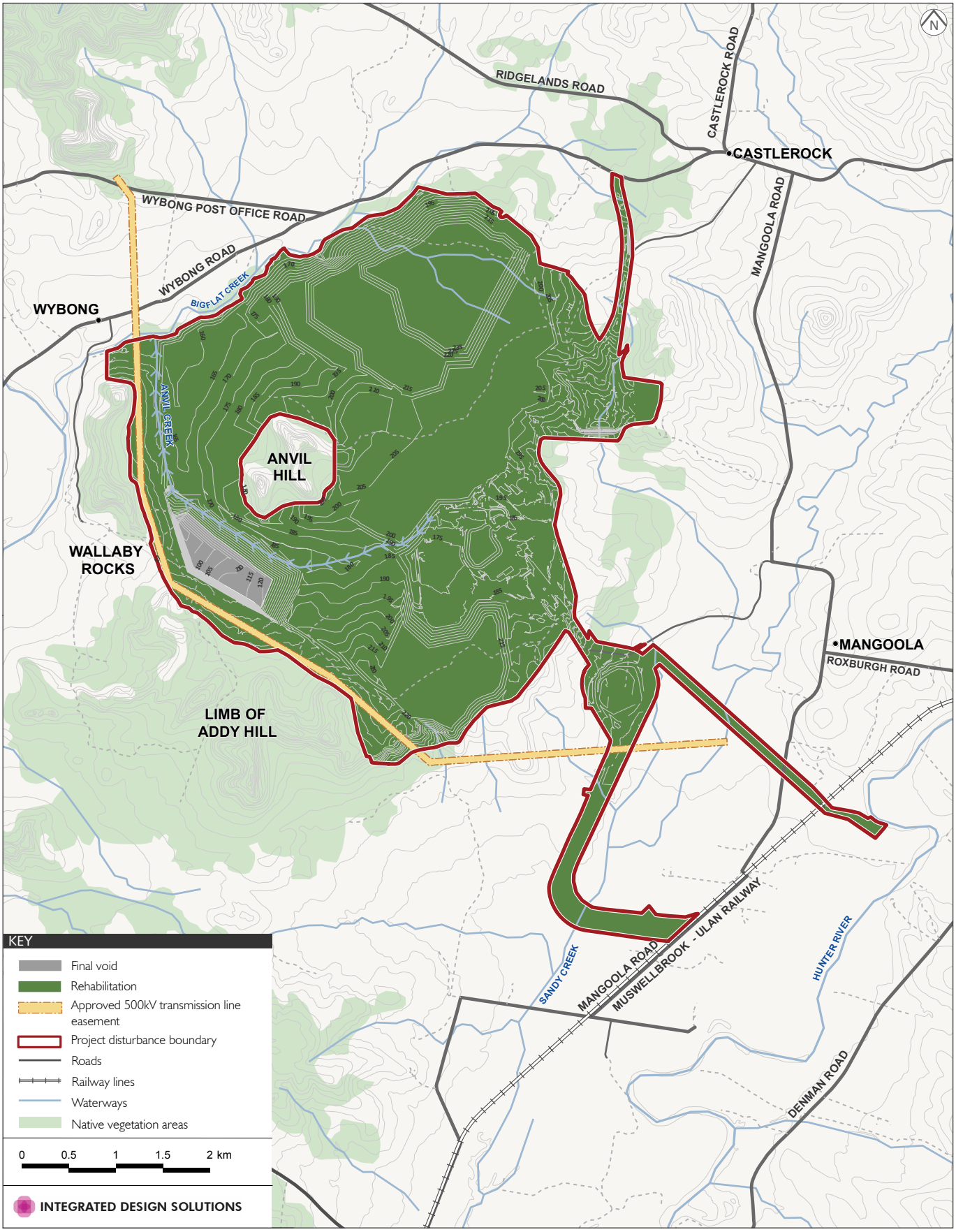
Figure 4.2



Conceptual mine plan - Year 10

Mangoola Coal Modification 6 Environmental Assessment

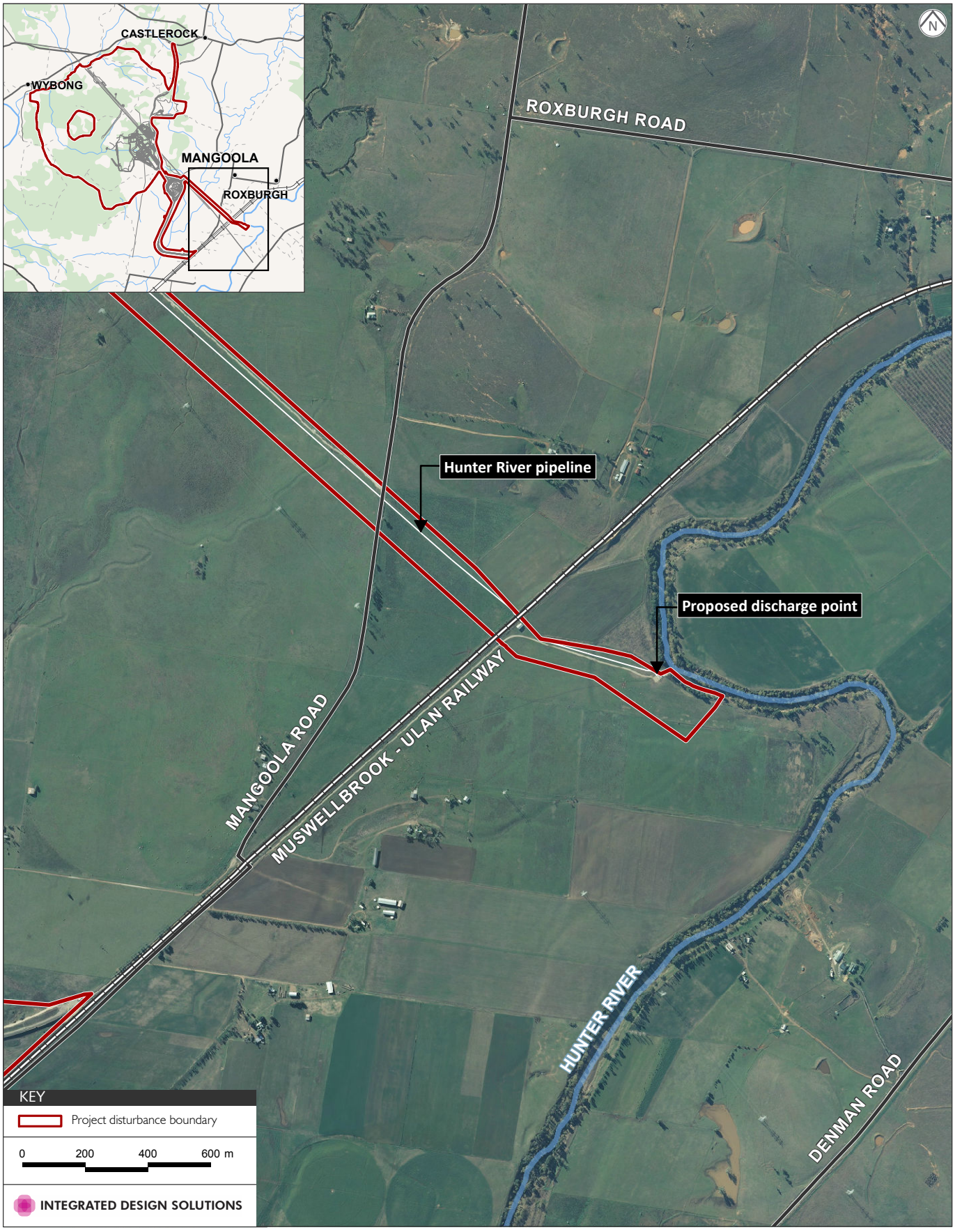
Figure 4.3



Proposed mine plan - Final landform

Mangoola Coal Modification 6 Environmental Assessment

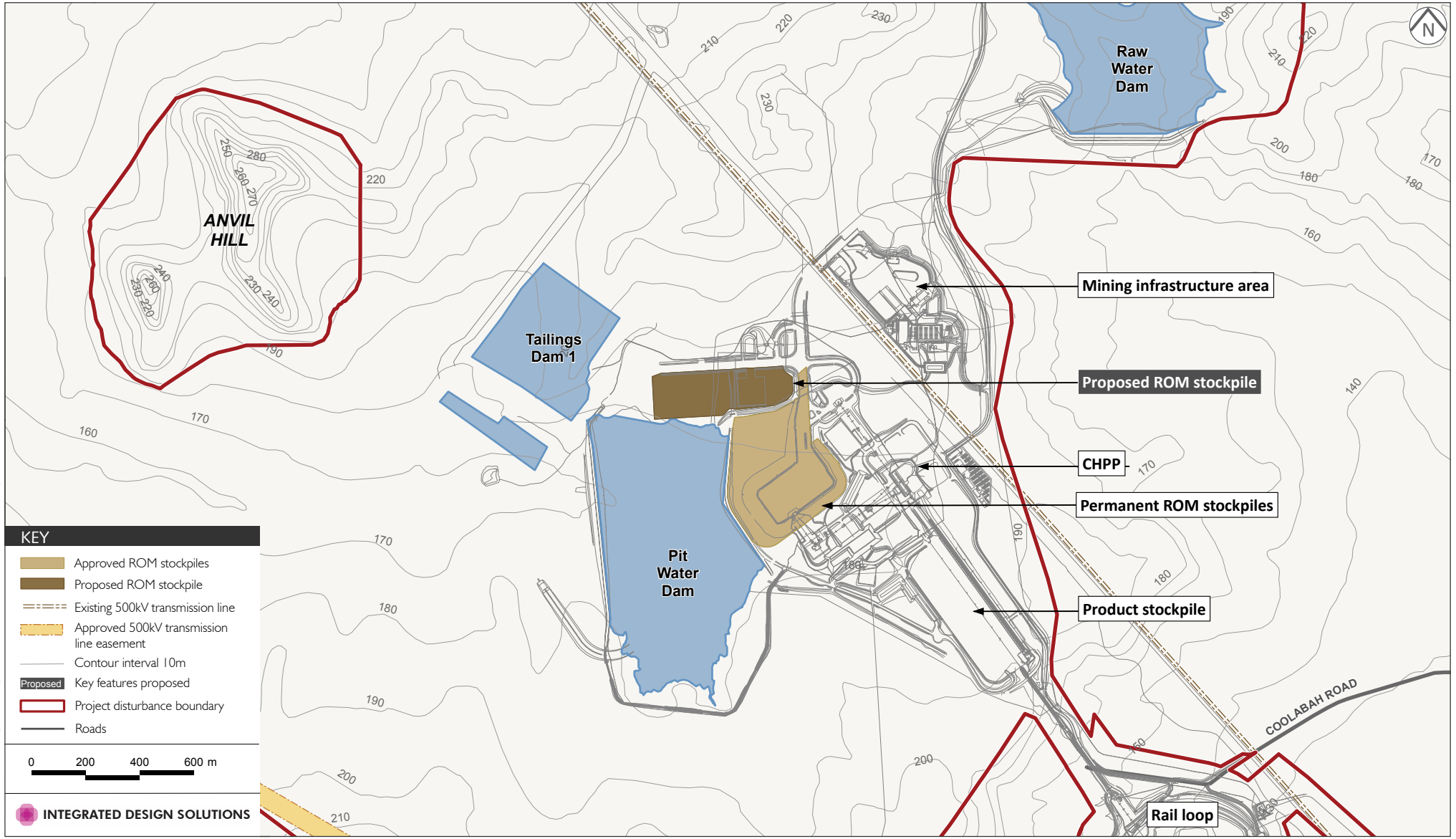
Figure 4.4



Location of proposed Hunter River discharge point

Mangoola Coal Modification 6 Environmental Assessment

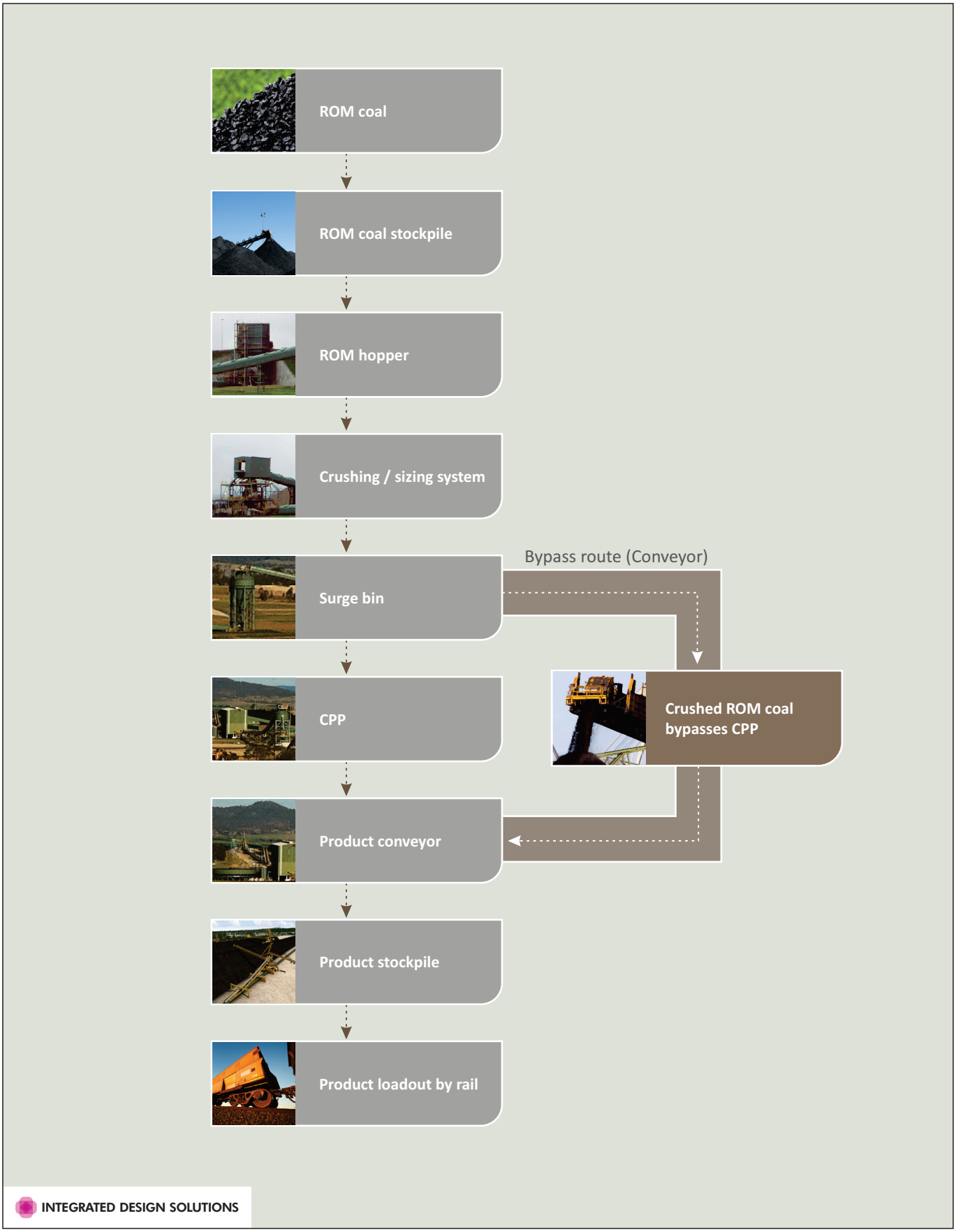
Figure 4.5



Location of proposed ROM coal stockpile

Mangoola Coal Modification 6 Environmental Assessment

Figure 4.6



Coal handling and processing system

Mangoola Coal Modification 6 Environmental Assessment

Figure 4.7