5.8.1.1 Approved Water Management System

NPM operations are supported by an extensive existing WMS which includes catch drains, diversion bunds, sediment dams and process water dams that manage water associated with the following three broad onsite water classifications as described further below:

- Clean Water is categorised as surface runoff from areas of the mine site where water quality is unaffected by mining operations and includes runoff from undisturbed areas, rehabilitated areas, topsoil stockpiles and water imported from off site. The clean water system includes the surrounding watercourses and farm dams that are outside of the WMS.

- Dirty Water is categorised as surface water runoff from the catchments draining to the sedimentation basins and farm dams. This runoff may contain sediment and silt, but does not contain contaminated material. All erosion and sediment control measures are carried out in accordance with the relevant guidelines for erosion and sediment control, including Managing Urban Stormwater Soils and Construction (the Blue Book) Volume 1 (Landcom 2004) and Volume 2E Mines and Quarries (DECC 2008). In order to ensure compliance with the NPM conditions of operation and adopted water quality criteria this runoff must be of specified quality prior to being discharged off site into surrounding natural watercourses. The dirty water system includes sediment dams that receive runoff from waste rock stockpile areas and tailings dam walls.

- Contaminated Water is categorised as surface water and groundwater inflows from areas affected by mining and processing operations and normally containing chemicals of various types used in the mining operations. Onsite areas which may contain contaminated water include stilling ponds, sumps, retention ponds, process water dams and tailings impoundments. Process water, rainfall and ensuing runoff from these areas may also be potentially contaminated. Accordingly this water is captured and managed to avoid discharge into the water systems (both dirty and clean). The contaminated water system which includes runoff from open cut mining areas and decant water from the TSFs is managed as a closed circuit (nil discharge), with water being re-utilised in ore processing activities.

The key components of the approved WMS are shown in **Figure 5.20**. A schematic of the existing WMS is included as **Figure 5.21**.

The WMS aims to separate clean, dirty and contaminated water, and in doing so seeks to prevent the contamination of clean water by mining activities and ensure compliance with NPM statutory obligations. To achieve this, the key functions of the existing mine water management system include:

- collecting and storing on-site water as much as possible for reuse in the mining and processing operations;

- diverting clean water around mining operations to prevent the contamination by mining activities;

- controlling the diversion of onsite non-mine impacted waters away from mining activities to reduce the volume of mine impacted water;

- minimising adverse effects on downstream waterways (i.e. hydraulic and water quality impacts);

- collecting and containing all potentially contaminated water on site; and

- reducing the discharge of pollutants from the mine to the environment.

Source: NPM (2013), Google Earth (2006,2010)

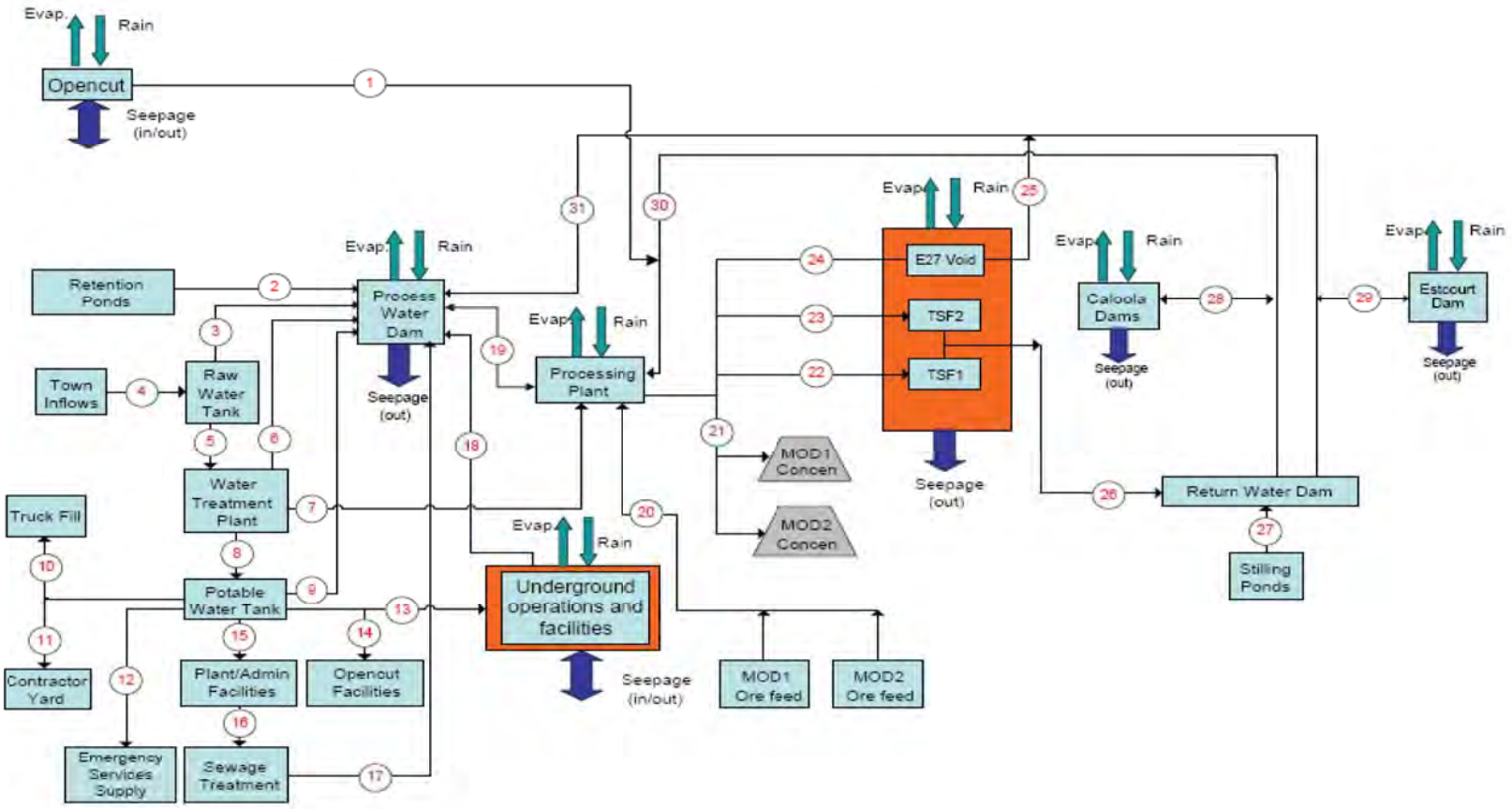
0 0.5 1.0 2.0km
1:40 000

Legend

- Project Area
- Approved Waste Rock Stockpile
- Approved Tailings Storage Facility (Rosedale)
- Existing Tailings Storage Facility
- New Underground Block Cave Mining Area
- Approved Water Management System Area
- Existing Bund
- Catch Drain
- Diversion Bank
- Farm Dams
- Sediment Dams

FIGURE 5.20

Approved Conceptual Water Management System



Flows:
1. Water from Opencut to processing plant
2. Retention ponds pumped to process water dam
3. Overflow from RWT to PWD (including reagent water)
4. Raw water demand from town supply
5. Feed water to the water treatment plant (incl. clarifier)
6. Overflow from water treatment plant to PWD
7. Gland seal water & flocculant water
8. Treated water to potable water tank
9. Overflow from potable water tank to process water dam
10. Truck fill for dust suppression and other activities
11. Potable water to contractor yards for domestic use
12. Emergency services supply in the event of fire
13. Water supply to underground operations and facilities
14. Water supply to opencut facilities
15. Potable water supply to plant and admin for domestic use
16. Sewage from plant and admin facilities
17. Treated sewage return water
18. Return from underground operations
19. Process raw water supply & overflows back to PWD
20. Water in ore feed
21. Interstitial water in product (concentrate)
22. Tailings water discharge to TSF1
23. Tailings water discharge to TSF2
24. Tailings water discharge to E27 void
25. Water reclaimed from the E27 void TSF to PWD
26. Water reclaimed from the TSFs decant and phreatic drains
27. Captured water pumped to RWD
28. Temporary storage water to/from Caloola Dam
29. Temporary Storage water to/from Estcourt Dam
30. Return water to process plant
31. Return water to PWD

FIGURE 5.21

Approved Water Management System Schematic

Source: GHD (2009)

The existing WMS at NPM will continue to be implemented to control and treat runoff from the site, with all pit water and mine surface runoff directed to the mine WMS. Additional controls will be designed to supplement existing controls measures and will be integrated into the existing surface water management control measures at NPM (refer to **Section 5.8.3**).

Existing Surface Water Monitoring

Surface water quality and quantity is monitored in the surrounding drainage system in accordance with the NPM Environmental Monitoring Plan (NPM 2009b). The existing surface water monitoring locations are shown on **Figure 5.22**.

Water monitoring at NPM is undertaken regularly to assess the performance of the WMS and on an as needed basis to provide data for the management of water within the mine and to assess the impacts of NPM operations.

The surface water monitoring data is reported annually as part of the Annual Review for NPM.

5.8.1.2 Water Supply

Water demands at the NPM site include ore processing (including tailings disposal), open cut and underground mining activities, dust suppression, construction activities and potable water requirements. Approximately 80 per cent of the total site water demand is required for ore processing. The water demands on site are met from the capture of surface water runoff from active mining areas and rainfall onto water storages, groundwater inflows into mining operations, and import of licensed water from the Lachlan River, groundwater bores and PSC.

The future annual water requirement at NPM for the current approved operations is summarised in **Table 5.19**.

Table 5.19 – Annual Water Requirement (ML)

Water Source	Current Approved Operations
External	4,416
Recycled [1]	2,091
Surface Water Runoff [2]	400
Groundwater	63
Total	**6,970**

Notes: 1.Recycled water includes direct rainfall onto TSF surface as is located within Contaminated Water System.
2.Surface water runoff includes runoff within the dirty water management system.
Source: GHD 2009.

The currently approved site water balance for NPM indicates that the site currently has a net water deficit of approximately 4400 mega litres (ML) per year which is met by imported water from external sources, in accordance with existing licences and approvals. The historical water volumes and recycled water used to meet the onsite water demands are summarised in **Table 5.20**.

Source: Project Area: NPM (2012), Drainage Lines: LPMA (2011), Aerial: Google Earth (2006)

Legend

- Project Area
- Clean Water Monitoring Site
- Dirty Water Monitoring Site
- Contaminated Water Monitoring Site
- Drainage Line

FIGURE 5.22

Surface Water Monitoring Points

Table 5.20 – Northparkes Mine Water Sources 2008 to 2012

Source	Quantity Used (ML)				
	2012	2011	2010	2009	2008
Freshwater piped from the Lachlan Valley bore field (A)	3,019	2,379	3,141	3,499	3,471
On Site Surface Water Runoff (B)	1,762	1,054	1,627	430	304
Total Water Sourced (A + B)	4,781	3,433	4,768	3,929	3,775
Recycled water	2,188	1,898	1,375	1,797	1,288

As outlined above, NPM relies on external sources of water in meeting operational water deficits. Under average conditions, NPM generally requires in the order of approximately 3000 ML to 4400 ML of imported water from external sources per year. NPM holds a number of water access licences within the Upper Lachlan Alluvial Groundwater source (Zone 3) with current allocations up to approximately 7400 ML per year. In addition, NPM holds approximately 3000 ML of general and high security river allocations from the Lachlan, and has access to at least approximately 1000 ML from PSC through the established joint water supply agreement. As outlined in the **Section 2.2.6**, the external water supply is accessed via the existing PSC bore field and water pipeline infrastructure.

The Upper Lachlan Alluvium has recently become subject to a WSP (2012) which establishes the rules and procedures governing water use within this water source. Overall the WSP sets a sustainable limit for extractions from the aquifer at 94,084 ML per year, of which approximately 87,888 ML being available for irrigation, mining and town water use in any given year. Specifically, Zone 3 of the Upper Lachlan Alluvium has an activated entitlement of approximately 36,000 ML.

Figure 5.23 shows allocation and water use data from the NOW, which shows that during the most recent drought conditions, annual water extractions from with aquifer did not exceed the sustainable yield in any given year.

5.8.2 Surface Water Resources Impacts

The key features of the Project which have the potential to impact on surface waters include the areas of additional disturbance associated with:

- open cut mining;
- extension of tailings facilities; and
- additional/extension of waste rock dumps.

As part of the Project, NPM proposes to modify the existing WMS to effectively manage potential water impacts within additional disturbance areas, as detailed further below.

5.8.2.1 Proposed Modifications to the Water Management System

The proposed modifications to the WMS as shown in **Figure 5.24** and described below.

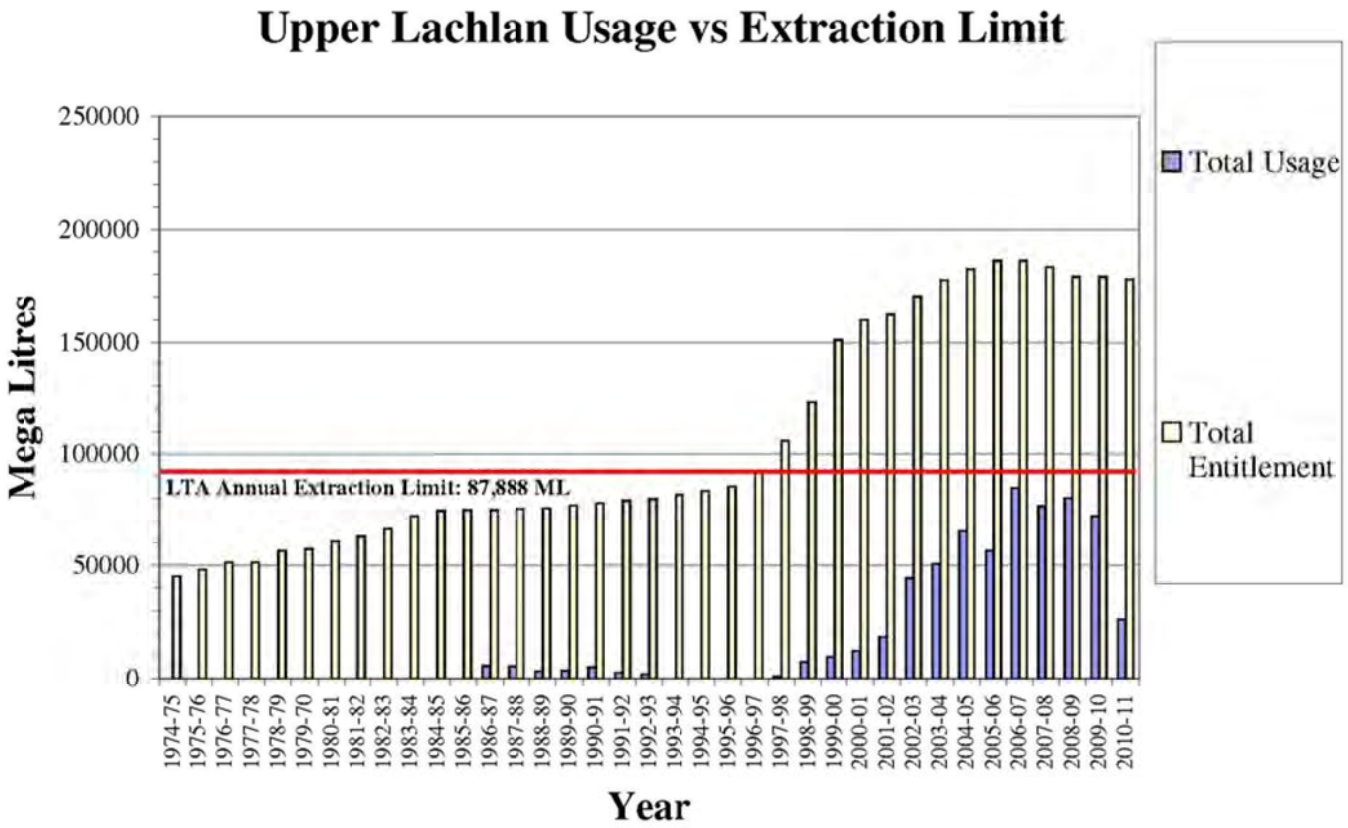
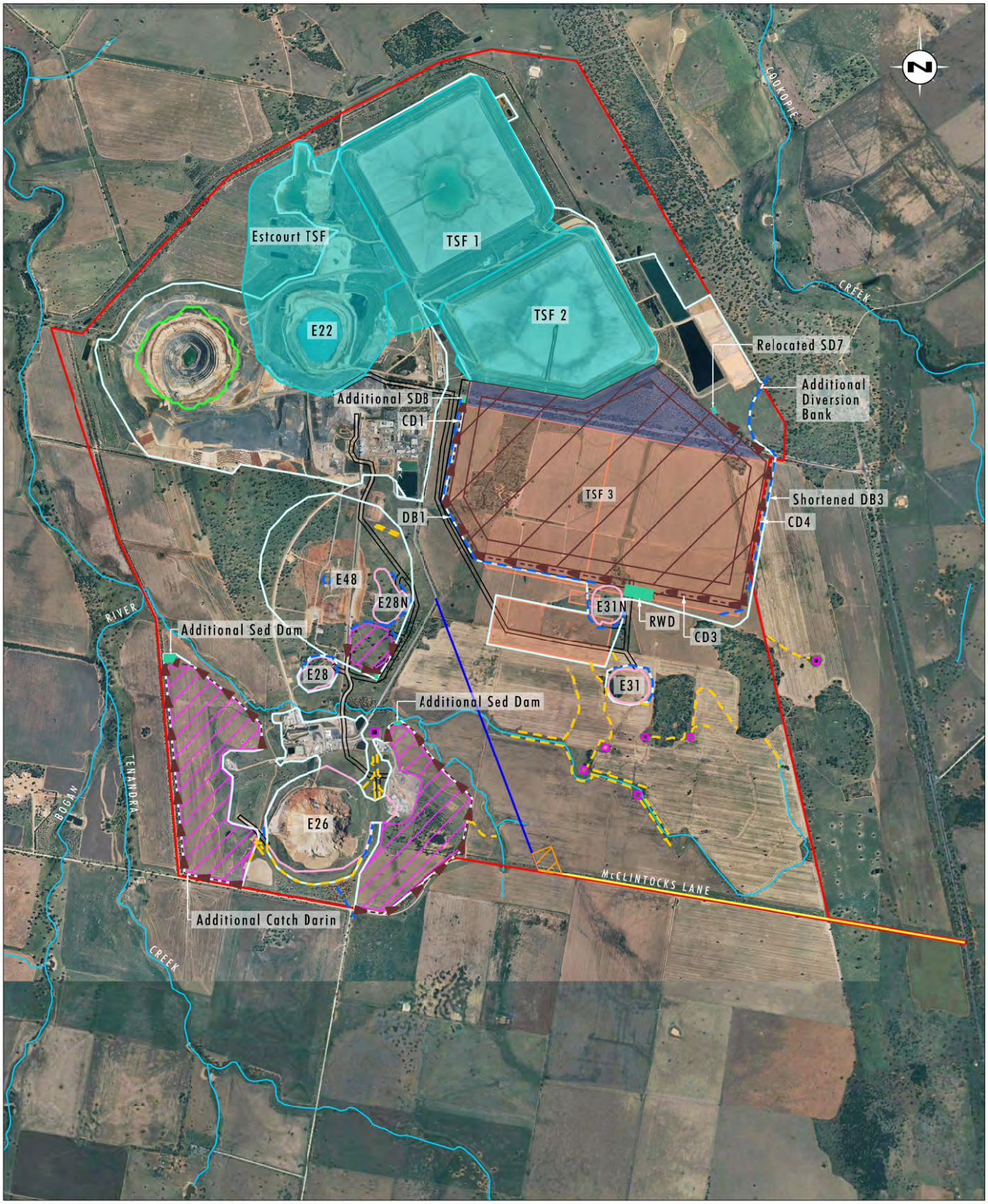


FIGURE 5.23

Long Term Water Usage
Upper Lachlan

Source: NPM (2013)
Note: LTA = Long Term Average



Source: NPM (2013), Google Earth (2006,?010)

0 0.5 1.0 2.0km
1:40 000

Legend

- Project Area
- Approved Tailings Storage Facility (Rosedale)
- Existing Tailings Storage Facility
- Proposed Tailings Storage Facility Extension
- New Underground Block Cave Mining Area
- Proposed TSF3
- Proposed Open Cut Areas
- Proposed Upgrade to McClintocks Lane
- Proposed Access Control and Visitor Car Park
- Proposed Waste Dumps
- Proposed Site Access Road
- Proposed Haul Road
- Proposed Water Management System
- Bund Levee
- Catch Drain
- Diversion Bank
- Farm Dams
- Sediment Dams
- Drainage Line

FIGURE 5.24

Proposed Conceptual Water Management System

File Name (A4): R10/2949_280.dgn
20130703 15.44

Modifications to the Clean Water Management System

The Project requires that the existing NPM clean water management system be augmented to include amended local protections, in the form of clean water diversion bunds, banks and drains to minimise the volume of clean runoff water entering additional disturbance areas. Amended diversion bunds and drains as depicted in **Figure 5.24** will allow runoff from clean catchment areas to be returned to the downstream environment without placing an unnecessary burden on the WMS.

Modification to the Dirty Water Management System

The Project requires amendments to the existing dirty water management system including relocation of existing catch drains and sediment dams within the dirty water system (refer to **Figure 5.24**). Additional catch drains will be developed around operational mining areas (for example the toes of the waste rock stockpiles and tailings facilities) to intercept sediment laden runoff and direct this material to new sediment dams. Consistent with the existing WMS, these works will seek to maintain separation between the three classifications of water onsite (clean, dirty and contaminated water).

Modifications to the Contaminated Water Management System

NPM will continue to manage contaminated water onsite as closed circuit process designed to manage run off up to and including a 1 in 100 year ARI 72 hour design storm event. The Project will require amendments to existing diversion drain, pipes and storage facilities to minimise the potential interaction between this water and other water onsite as shown on **Figure 5.24**. Consistent with the existing WMS, these works will seek to maintain separation between the three classifications of water onsite (clean, dirty and contaminated water).

Management of Construction Impacts

NPM implements various practices to minimise erosion from disturbed areas in accordance with the NPM WMP (2013). All erosion and sediment control measures are carried out in accordance with the relevant guidelines for erosion and sediment control, including the Blue Book.

These controls are aimed at reducing potential sedimentation into nearby waterways and include:

- site disturbance permit process will assess individual clearing activities for their impact on water drainage and include specific controls where necessary;
- run off from disturbed areas are diverted to sediment ponds which are designed to hold the water for a period of time allowing the sediment to drop out prior to a potential release;
- installation and maintenance of drainage lines, diversion bunds and catchment dams;
- minimising cleared areas and promoting progressive rehabilitation; and
- restricted access to rehabilitated areas.

In addition to the above erosion and sediment control measures, construction plans will detail the specific inspection, maintenance and revegetation requirements for each works area where major construction or remediation works are required.

Storm water controls for the construction processes associated with the Project will be designed in accordance with the relevant requirements of the Blue Book. In addition the crossing of Goonumbla Creek will be designed to safely convey the 100 year ARI storm event flood flows.

5.8.2.2 Water Quality Impacts

The existing and proposed components of the WMS will be managed in accordance with the requirements of the Blue Book. As a result, any controlled discharges from the sediment dams will be of a quality consistent with the requirements of the Blue Book.

The contaminated water system components of the WMS, including dams, pipes and pumps have been designed to manage contaminated water generated on site for rainfall events up to and including the 100 year ARI, 72 hour design rainfall event. Contingencies for additional water storage under extreme rainfall conditions include temporarily increasing water storage within the TSFs.

As a result, it is considered that the proposed continuation of operations at NPM is unlikely to have a significant impact on the existing water qualities of the surrounding environment.

5.8.2.3 Water Quantity

Annual Flow Volumes

The Project will result in a reduction in the natural catchment area of the Bogan River by approximately 203 hectares. The total Bogan River catchment area upstream of Bogan Weir is approximately 103,600 hectares, resulting in a net reduction in catchment area as a result of the proposed Project at Bogan Weir of approximately 0.2 per cent.

It is therefore considered that the proposed Project is unlikely to result in significant changes in annual flow volumes within the Bogan River system.

5.8.2.4 Flood Regimes

All of the existing and proposed mining activities and associated infrastructure, including WMS components, are located outside of the 100 year ARI flood extent (refer to **Figure 5.19**). The modelled 100 year ARI flood extent at the closest point extends to within approximately 20 metres of the base of the proposed waste rock stockpiles (refer to **Figure 5.19**). To manage potential flood risk NPM proposes to include a 1 metre high bank at the toe of the proposed waste rock stockpiles which will incorporate the proposed catch drain (refer to **Figure 5.24**). Impacts on flood regimes are therefore considered to be unlikely as a result of the Project.

5.8.2.5 Downstream Water Users

Watercourses within the vicinity of NPM are ephemeral, with periods of limited or no flow during periods of low rainfall. The ephemeral nature would suggest that dependence on flows within these watercourses to downstream agricultural users is likely to be limited. As outlined in **Section 5.8.2.3**, the Project will result in a minimal reduction of catchment (0.02 per cent) which is unlikely to impact on downstream water users.

Specifically, the increases in the catchment area managed within the WMS will occur primarily within the catchment of Cookapie Creek, a tributary of the Bogan River. The portion of Cookapie Creek catchment area that is within the water management system varies depending on the reference point within Cookapie Creek. The proposed modifications to the WMS results in the removal of a maximum of approximately 0.8 per cent of the Cookapie Creek catchment at a point approximately 4.4 kilometres downstream of the confluence with Deception Creek.

There are no known licensed water users within Cookapie Creek downstream of NPM that will be affected by the small reduction in catchment area. Impacts are therefore limited to basic landholder rights to harvest surface water.

The proposed TSF results in minor changes to the flow shadows which has the potential to alter overland flow to surrounding properties. However, no farm dams have been identified offline (i.e. outside of drainage lines) within the flow shadow area (i.e. downslope) of the existing, approved or proposed TSFs. As a result, no changes to inflows into private offline farm dams are expected as a result of the proposed changes to the TSFs.

NPM plans to maintain their existing surface water and groundwater licences and as such there is negligible predicted impact to downstream water users.

5.8.2.6 Water Supply

The predicted annual water demands for NPM will remain consistent with the currently approved water demands (refer to **Section 5.8.1.2**). The Project will increase the area of the currently approved water management system by approximately 203 hectares. As a result of the increase in the water management system catchment area, on site collection of surface water is predicted in an average runoff year to increase from approximately 400 ML per year to 523 ML per year.

In addition, groundwater inflows are predicted to increase from approximately 63 ML per year to 290 ML per year (refer to **Section 5.7**). This predicted increase in groundwater flows are related to the average groundwater inflow from all mining areas at NPM. This reporting differs from historically reported groundwater inflows of approximately 63 ML per year which were associated with the E48 ore body only. As such, the predicted increased inflows are a reflection of amended reporting scope and not an indication of significantly larger groundwater inflow.

The predicted increase in on site water supply volumes is likely to be equivalent to approximately 6 per cent of the annual site water demand of 6290 ML. Accordingly, NPM will continue to maintain a net water deficit of up to 4050 ML per year, over the life of the Project. NPM will continue to manage its existing water deficits through external water sources in accordance with existing licences and approvals (refer to **Section 5.8.1.2**).

Notwithstanding the current surplus external water supply to meet operational needs over the life of the Project, there may be circumstances over the life of the Project that could limit external water supply. This may include extreme climatic changes and/or changes in available allocations under the WSP, for instance growth in use response rules providing for the NOW to limit allocations to be Long Term Average Annual Extraction Limit. Should this affect the security of the external water supply required for operations over the life of the Project, NPM will explore a range of options such as:

- review the availability of other licences within the water supply area for temporary/permanent purchase;
- review operational water usage and investigate options for improving water use efficiency; and
- review operational water usage requirements, and where applicable, adjust processing operations in line with available water allocations.

5.8.3 Surface Water Management and Monitoring Commitments

NPM will continue to manage its operations in accordance with its existing WMP, which will be updated to reflect the proposed amendments to the surface water catchments and additional monitoring and management measures. This will involve updates to the existing NPM water management plan and environmental monitoring program.

It is considered that the current monitoring program as described in **Section 5.8.1** will be sufficient for the Project with all new proposed water management structures to be integrated with existing onsite monitoring points.

5.8.3.1 Licensing Requirements

The WSP for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012 applies to the NPM Project Area. Therefore, the surface waters of the NPM are governed by the WM Act.

NPM plans to maintain their existing surface water and groundwater licences (refer to **Appendix 11**) and do not propose to increase licence limits.

As NPM is managed as a nil discharge site, water discharges are not included in the site EPL.

5.9 Traffic and Transport

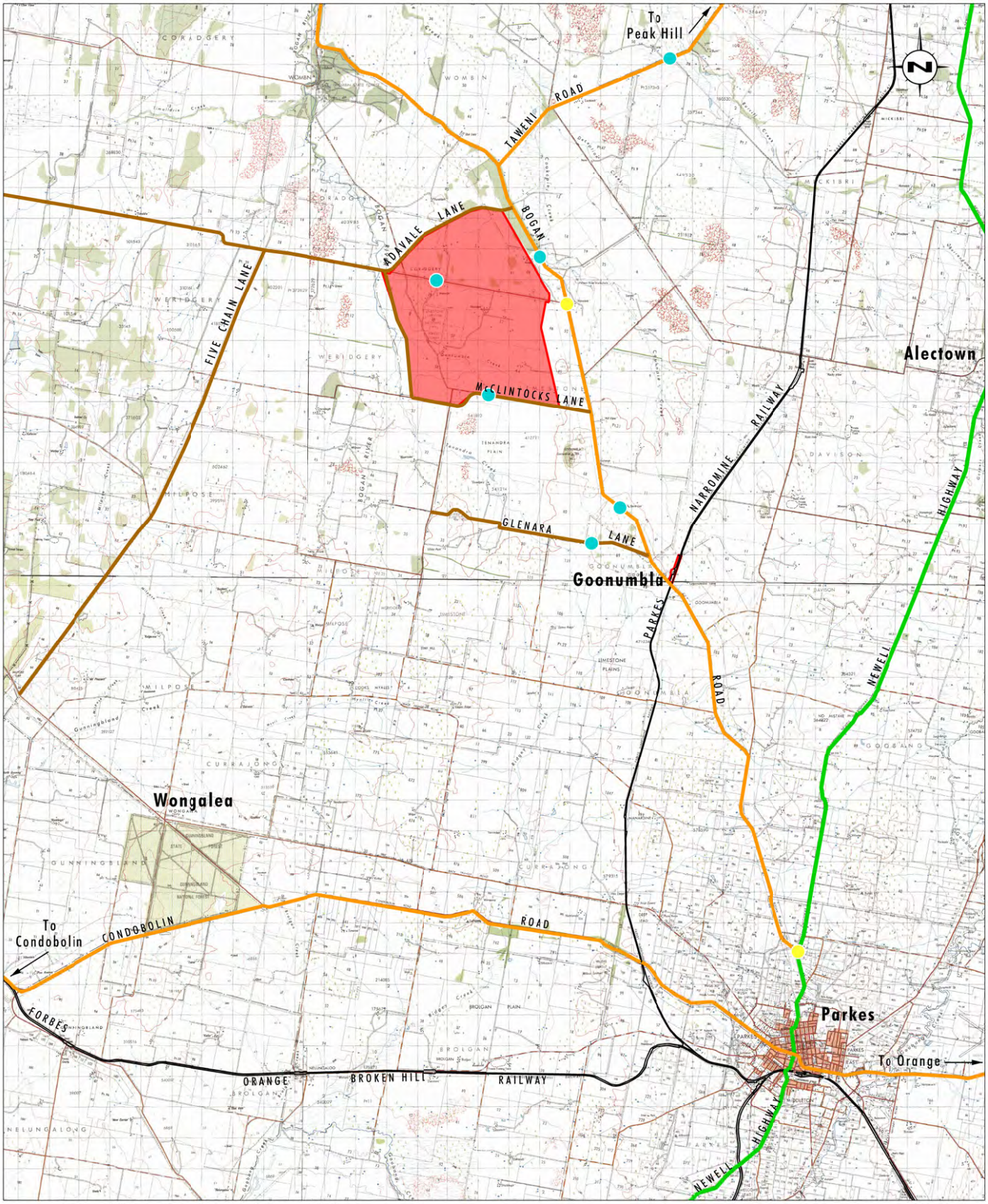
The DGR's for the Project (refer to **Section 1.3**) require a detailed assessment of the potential impacts of the Project on the capacity, efficiency and safety of road movements. A comprehensive Traffic Impact Assessment (TIA) has been prepared by Transport and Urban Planning. This report is included in **Appendix 12** and the key findings are outlined in the following section.

5.9.1 Existing Traffic Network

The local road network surrounding the Project Area is shown on **Figure 5.25**. Access to NPM from Parkes is primarily Bogan Road. Bogan Road is a generally straight and flat two lane sealed rural (local) road with a speed limit of 100 km/h.

Northparkes Lane which adjoins Bogan Road approximately 23 kilometres north-west of the Newell Highway is a two lane sealed road that provides primary site access to NPM. The Northparkes Lane intersection with Bogan Road has a modified seagull arrangement with a left turn deceleration in the Bogan Road southern approach, a right turn bay in the Bogan Road northern approach and a south bound acceleration lane for right turn out of Northparkes Lane for vehicles travelling towards Parkes. The Goonumbla rail siding is located adjacent to Bogan Road approximately 10 kilometres south-east of Northparkes Lane (refer to **Figure 5.25**).

A number of local roads surround the Project Area (refer to **Figure 5.25**), which primarily service neighbouring landholdings. McClintocks Lane is an existing unsealed local road with an approximate width of 7 metres situated adjacent to the southern boundary of the Project Area. The existing intersection of McClintocks Lane and Bogan Road is provided with sight distances in excess of the requirements of the posted 100 km/h speed limit.



Source: NPM (2013), Department of Lands (2006)
Note: Location of traffic counts are approximate only

0 3 6 9km
1:175 000

Legend

- Project Area
- State Highway
- Major Roads servicing NPM
- Secondary Roads
- Railwey Lines
- Principal Intersection (Traffic Count Completed)
- Traffic Count Location

FIGURE 5.25

Existing Road Network Surrounding Project Area

File Name (A4): R10_2949_273.dgn
20130703 15.46