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MOUNT OWEN CONTINUED OPERATIONS PROJECT

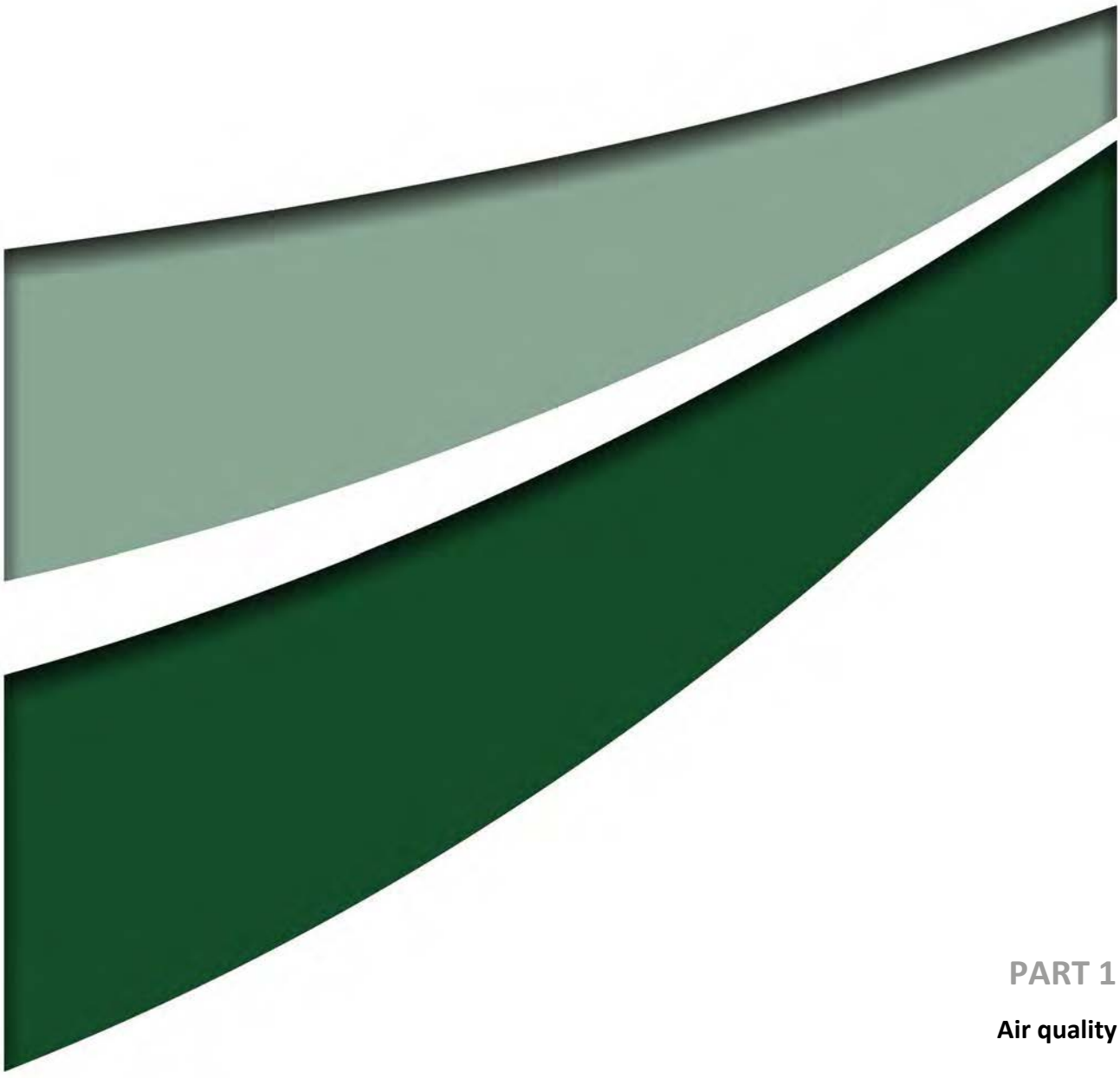
Response to Queries Raised by Agencies Following Response to Submissions

November 2015

1.0 Introduction

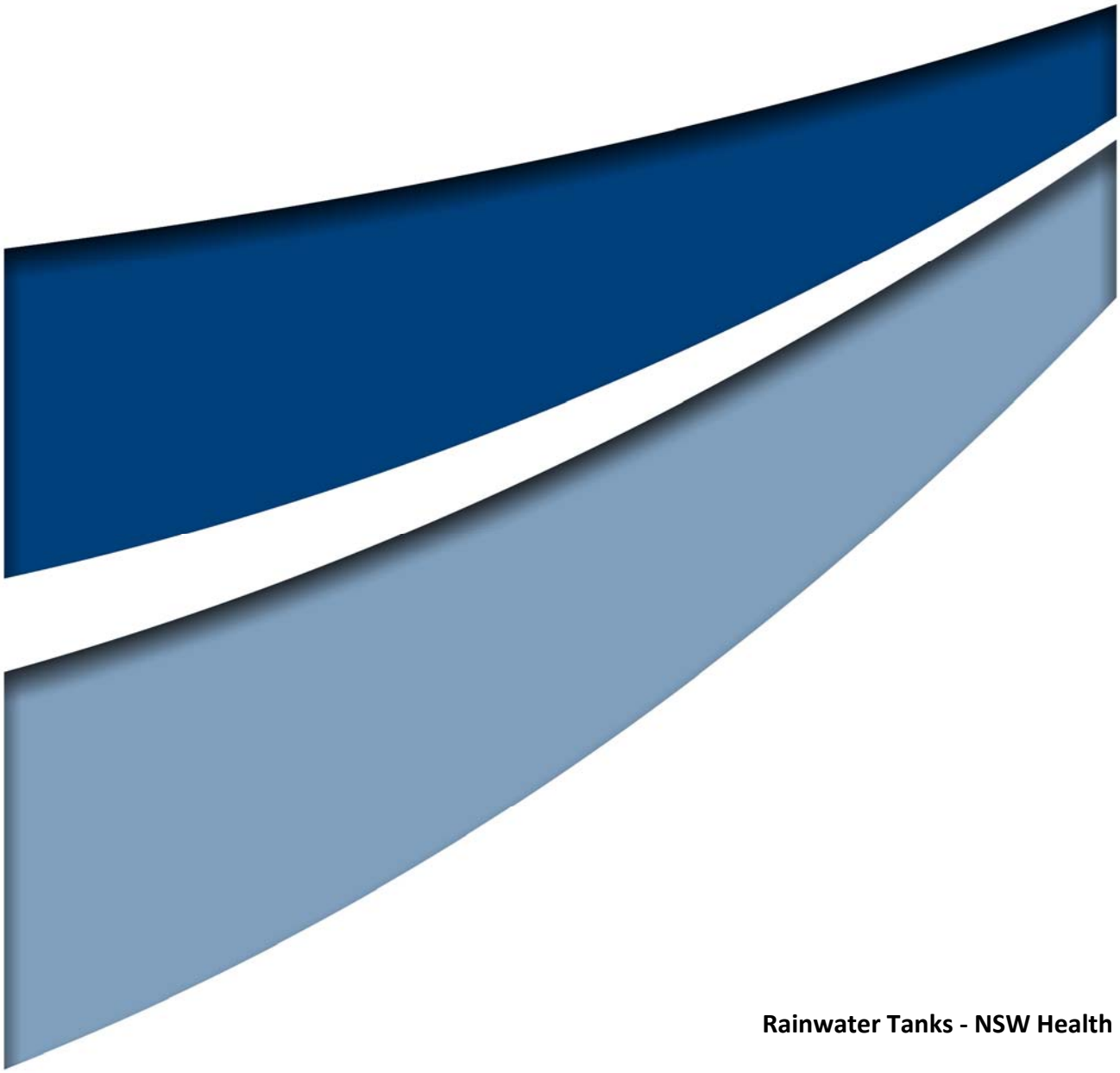
This document consolidates a number of individual responses provided to the Department of Planning and Environment (DP&E) on behalf of Mount Owen Pty Limited (Mount Owen), following submission of the Response to Submissions. The responses relate to queries raised by DP&E and other agencies including NSW Health, Environment Protection Agency (EPA), Office of Environment and Heritage (OEH) and Department of Primary Industries (NSW Office of Water) (DPI (NOW)). Generally the queries raised are noted in bold followed by the response in normal type.

In addition, responses have been prepared to the DP&E commissioned peer reviews of the air quality and economic assessments and are provided to DP&E as separate reports.



PART 1

Air quality



Rainwater Tanks - NSW Health

Rainwater Tanks

The revised commitment to inspect rainwater tanks at privately owned residences within four kilometres of the approved mining limit at least every two years, with cleaning being carried out should the inspection identify this requirement is accepted. However, there was no comment in the RTS regarding the possibility of installing rainwater tank first flush diverters to reduce the amount of sediment entering the tanks.

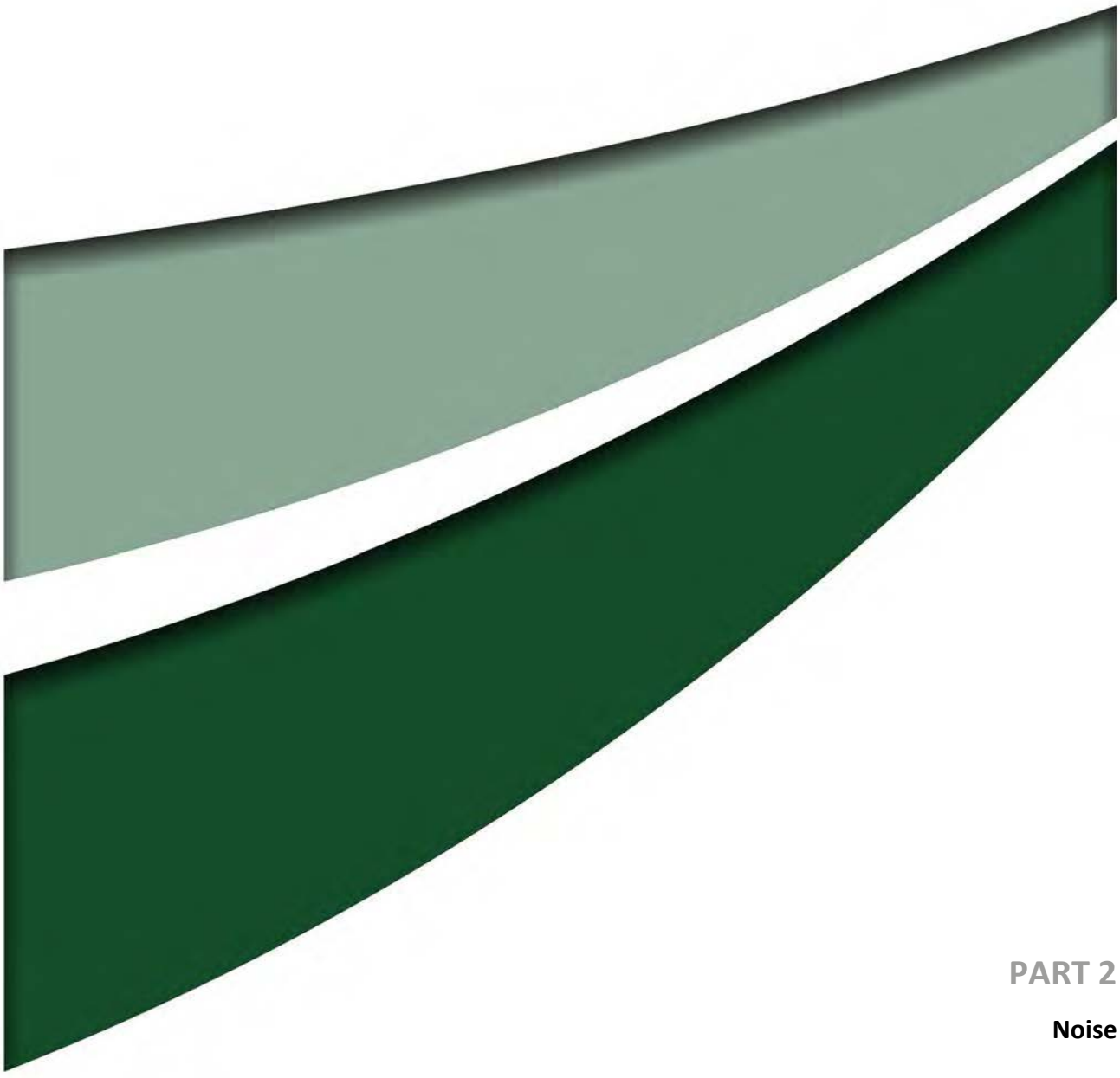
As identified in Section 4.1.3 of the RTS, Mount Owen is committed to continued consultation with the surrounding privately owned properties in order to develop and implement reasonable and feasible management measures to minimise air quality impacts.

While the purpose of first flush diverter systems is to capture and therefore reduce sediment entering rainwater tanks, Glencore's experience at other operations has shown that these systems have some disadvantages which make them less feasible than tank cleaning and other measures. The disadvantages include:

- Reduced rainwater capture by tanks; and
- High maintenance costs.

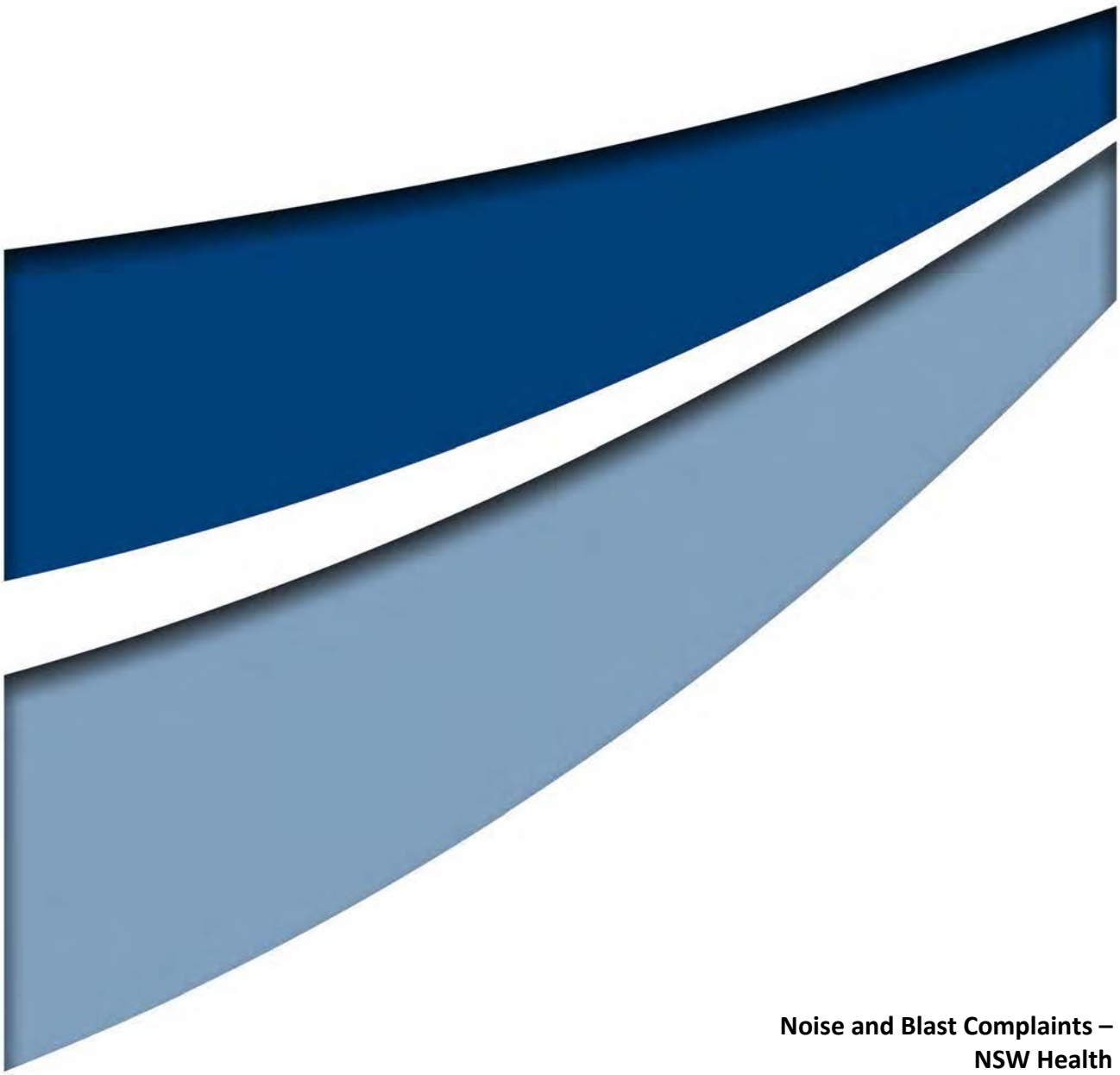
At Glencore's Mangoola Mine, ongoing liaison between the mine and landholders has indicated a preference for a combination of regular tank inspections and cleaning where necessary and the installation of inline filters between the tank and the house/shed which can be easily cleaned and/or replaced by the landholder at relatively low cost. Accordingly, while first flush systems are not ruled out as an option for managing sediment issues associated with depositional dust, mandating this as a requirement for potentially impacted properties is not considered to represent the most effective (in terms of cost efficiency, water capture and ease of maintenance) means of managing these impacts.

Mount Owen propose to contact all residences within 4 kilometres of the approved Project area within 6 months of project approval and discuss the inspection and cleaning of tanks. Residents will also be advised that additional management options are available if cleaning alone is not adequate in managing the impacts and further management measures are required.



PART 2

Noise



Noise and Blast Complaints –
NSW Health

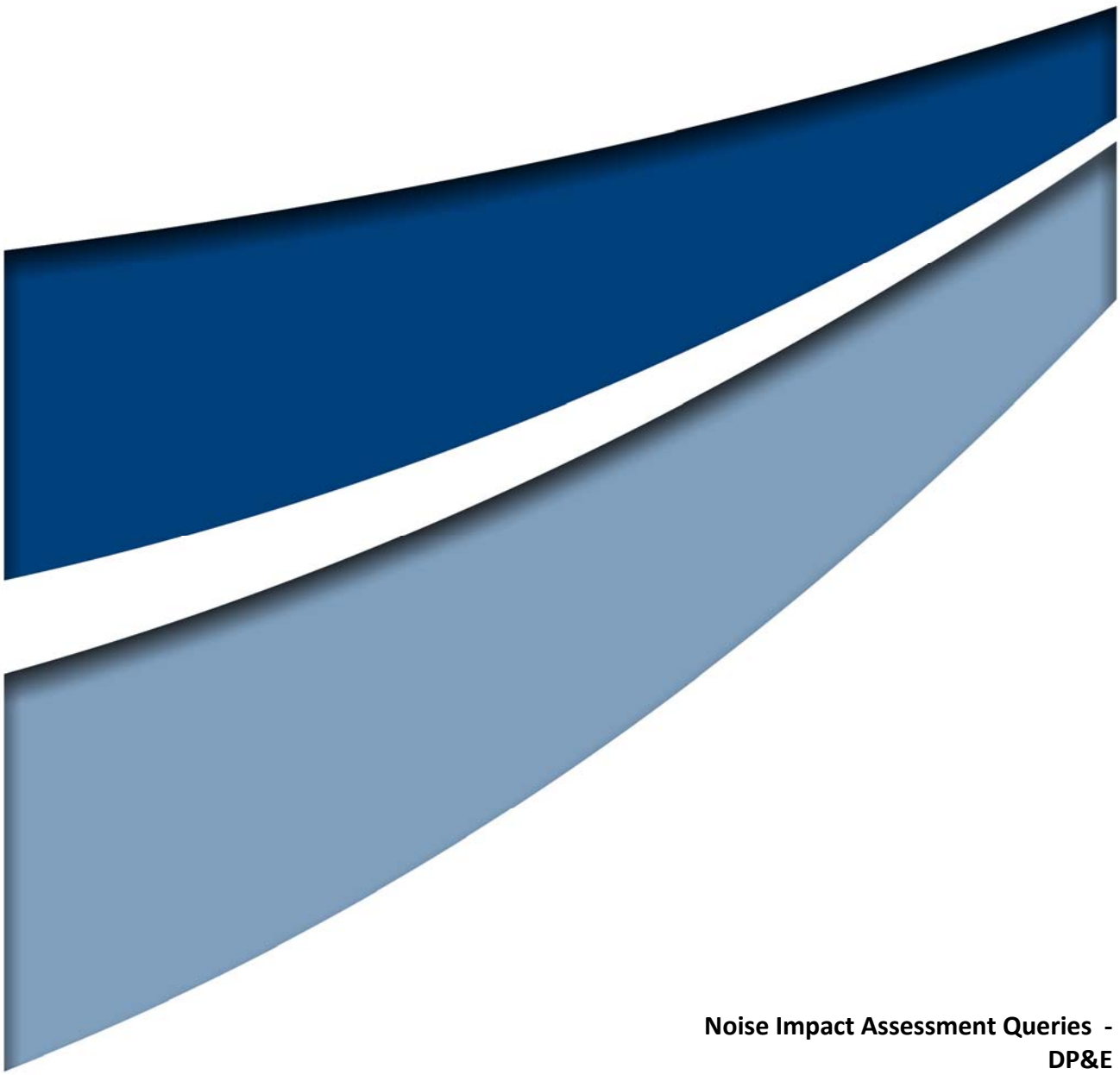
Noise and Blast Impacts

We were concerned that the majority of complaints received during the 3 years to June 2014 related to noise and blasting, despite approved limits for blasts being met. The RTS did not address the fact that approved limits are still having an impact.

As discussed in Section 4.2 of the RTS Report A, it is important to note that the relevant criteria in relation to noise does not relate to whether noise generated by a project is audible; rather it relates to the potential impact of the predicted noise levels compared to criteria contained in the INP and Voluntary Land Acquisition and Mitigation Policy. Additionally vibration as a result of blasting can be detected by the surrounding community without exceeding the relevant criteria.

Section 5.1 of the Social Impact and Opportunities Assessment undertaken to support the Project (refer to Appendix 5 of the EIS) provides a complaints analysis for the three year period between July 2011 and June 2014. This analysis indicated there were 15 complaints within this period, with 12 relating specifically to either noise or blasting. Over half of the complaints received (8) came from two households with one household being specifically concerned regarding noise and the other regarding blasting. The complaints received were actioned in accordance with the complaints procedure detailed in the Mount Owen Complex Environmental Management Strategy.

The Mount Owen Complex complaints register shows a record of the complaints received and how these complaints were actioned. In one instance the Mount Owen Environment and Community Manager visited the complainant to investigate the issue and discussed the installation of a real time noise monitor in the area and, in another instance, management measures were implemented at the mine to manage noise levels. Despite there being no actual exceedances, Mount Owen has a strong record of implementing reasonable and feasible measures to further reduce the level of impact the operations have on the surrounding community.



Noise Impact Assessment Queries - DP&E

In an email dated 26 October 2015, the NSW Department of Planning & Environment requested some additional information and material from Mount Owen regarding potential noise impacts associated with the Project. The requests and response are set out below.

Request 1

A single figure or small range that describes the general change in noise environment in Area 3 and Area 4 under the project vs the existing approved operations (NB: this is not receiver specific but a broader description of these catchments – ie the Falbrook and Middle Falbrook areas would be expected to experience X dB(A) of additional noise);

The difference in noise impacts in surrounding areas is variable and strongly related to local terrain features. To provide an illustration of the variability, **Table 1** presents a comparison of the predicted noise impacts in the 2003 Mount Owen EIS against the predicted impacts for the Project under worst case prevailing weather conditions. The Properties selected are located in the Middle Falbrook area and have been chosen due to the availability of data from the 2003 impact predictions. Despite slightly different modelling techniques being adopted for the two assessments, the Project impact predictions at these residences have been drawn from the models such that the predictions are directly comparable. As discussed in the RTS Report A, there is a good correlation between model predictions and actual noise levels experienced.

Table 1 - like for like comparison under worst case prevailing weather conditions

Project Property ID	Mount Owen Approval ID	Met Condition	Year 10 Approved	Project Year 1	Project Year 5	Project Year 10
Area 3						
37*	66	3m/s NW Wind	43	45	47	41
		3degInv 2m/s NW Drainage Flow	45	46	48	44
Area 4						
25*	87	3m/s NW Wind	37	42	39	38
		3degInv 2m/s NW Drainage Flow	38	43	40	39
10	101	3m/s NW Wind	29	31	30	29
		3degInv 2m/s NW Drainage Flow	31	31	31	30
21	93	3m/s NW Wind	33	34	33	33
		3degInv 2m/s NW Drainage Flow	35	34	34	34
23	40	3m/s NW Wind	34	33	33	32
		3degInv 2m/s NW Drainage Flow	35	34	33	33
Area 7						
7	96	3m/s NW Wind	32	34	33	29
		3degInv 2m/s NW Drainage Flow	33	34	33	30

*Property 37 and 25 are mine owned properties.

The results in **Table 1** indicate that noise levels could increase up to 5 dB at properties close to the mine (illustrated by the data for residences 25 and 37). All properties with this level of predicted increase in impacts are already mine owned. As identified in **Table 1**, the predicted change in noise impacts is variable across the site. In the Middle Falbrook area the noise impacts are predicted to increase by up to 2 dB at some locations (e.g. 7 and 10), while at other locations which are shielded by natural terrain features (e.g. Residences 21 and 23, both of which are located closer to the proposed mining operations than Residences 7 and 10), the predicted noise impacts associated with the Project are unlikely to differ significantly from those of the existing approved operations. Accordingly, it is not possible to provide a general statement regarding the general changes to predicted impacts other than to say that noise levels in the Middle Falbrook area are predicted to increase by up to 2dB in locations more exposed to noise from the Project. Residences in the Falbrook area (all of which are mine owned) are predicted to have increased noise levels of up to 5dB as a result of the Project.

Request 2

Can you please fill in the below table:

All residences with mitigation rights in relation to predicted noise impacts under the Existing Mount Owen and Ravensworth East approvals are now owned by Glencore. Vacant lots 15C and 174 remain privately owned and are within the area where predicted noise impacts from existing approved operations would trigger mitigation rights should a dwelling be erected on them. The Table below has been completed to include the data for these two vacant lots which were predicted in the 2003 Mount Owen EIS to have noise impacts above the PSNL during the Year 10 (approximately current) and Year 17 operations.

Operational Noise Criteria		**Approved Mount Owen and Ravensworth East Operations**	
		Year 10	**Year 17**
Marginal Exceedance (1-2 dB(A) above PSNLs)	Receivers	15C*, 174*	15C*, 174*
	Total	2	2
Moderate Exceedance (3-5 dB(A) above PSNLs)	Receivers	-	-
	Total	0	0
Significant Exceedance (>5 dB(A) above PSNLs)	Receivers	-	-
	Total	0	0
All Exceedances		2	2

* Vacant land with no residence >25%

Request 3

A list that identifies which nearby residences have existing mitigation and/or acquisition rights under the current Mt Owen/Ravensworth East consents, or from another nearby mining project (including the mine name). While I recognise that Glencore has provided a similar list of all current acquisition rights, this slightly more detailed list would be appreciated.

Table 3 presents a list of properties and residences in the area of potential affection by the Project that have existing mitigation and/or acquisition rights under the current Glencore related consents, or from another nearby mine that are still in private ownership.

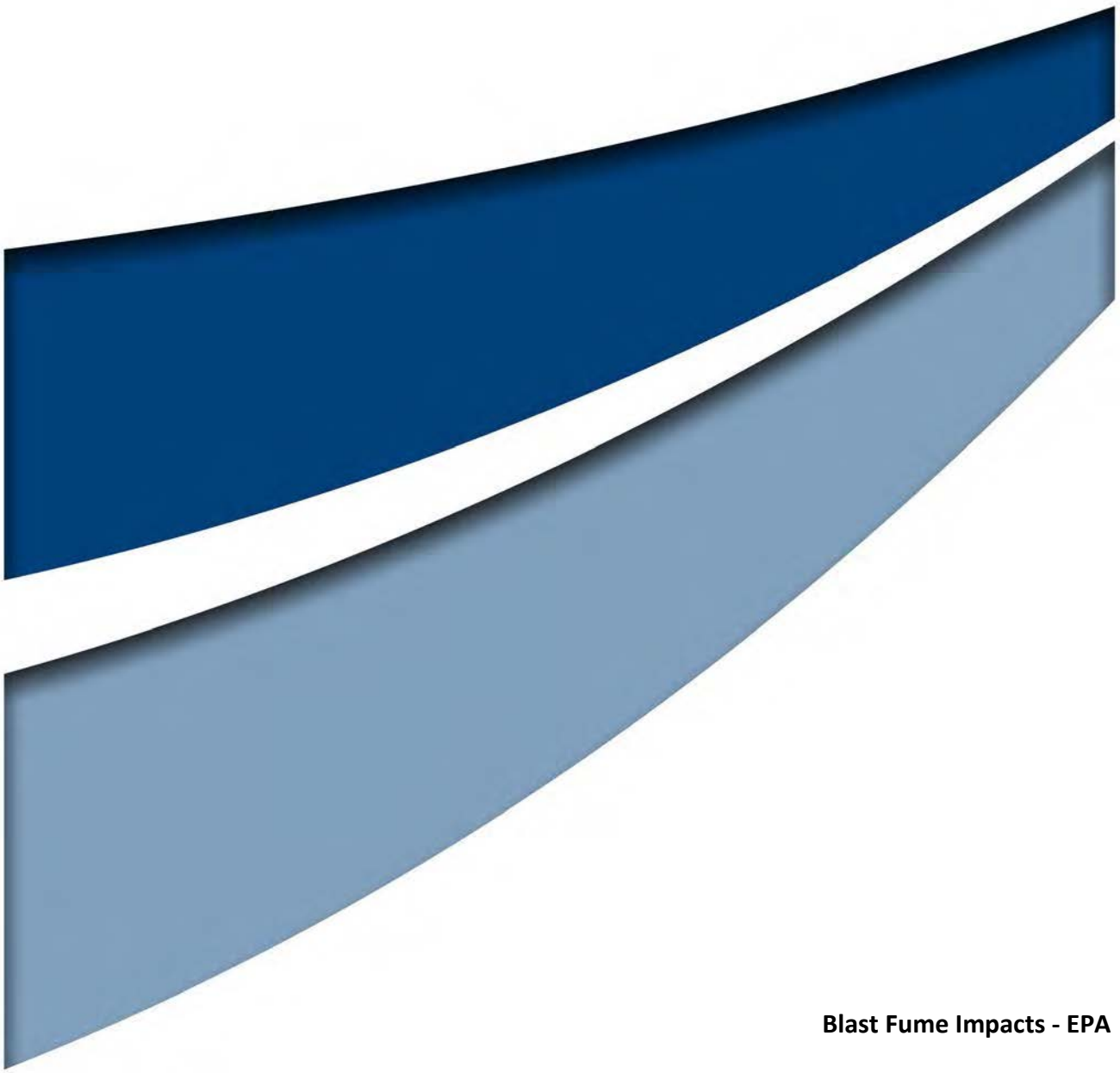
Table 3 – Existing Mitigation and Acquisition Rights

Project Property Id	Rights	Related Mining Operation
122	Acquisition	Glendell
127a	Acquisition	Glendell
127b	Acquisition	Glendell
105	Acquisition	Integra
5	Acquisition	Integra
111	Acquisition	Integra – Noise and Air Quality
146	Acquisition	Integra – Noise and Air Quality
147	Acquisition	Integra – Noise and Air Quality
148	Acquisition	Integra – Noise and Air Quality
10	Mitigation	Integra
144a (Dairy)	Acquisition	Ravensworth Operations – Air Quality South East Open Cut – Noise and Air Quality
144b	Acquisition	South East Open Cut – Noise and Air Quality
144c	Acquisition	South East Open Cut – Noise and Air Quality
145	Acquisition	South East Open Cut – Noise and Air Quality
143	Acquisition	South East Open Cut – (Noise Trigger Only)
150	Acquisition	South East Open Cut – (Noise Trigger Only)
152	Acquisition	South East Open Cut – (Noise Trigger Only)
154	Acquisition	South East Open Cut – (Noise Trigger Only)
155	Acquisition	South East Open Cut – (Noise Trigger Only)
156	Acquisition	South East Open Cut – (Noise Trigger Only)

As noted in Request 2 above, all properties with mitigation rights in relation to predicted noise impacts from existing approved Mount Owen and Ravensworth East operations are mine owned.

PART 3

Blasting/Blast Fume



Blast Fume Impacts - EPA

Blast Fume

In regard to the EPA's previous comments on blast fume emissions , specifically the potential impacts to private residences R114 and R116, the RTS report notes that if the project is approved both R114 and R116 will be afforded acquisition rights due to predicted air quality (PM10) exceedances. While these properties may be subject to acquisition rights based on PM10 criteria, this does not appear to provide any further protections or response actions in response to blast fume emissions, i.e. oxides of nitrogen (NOx).

The proponent states that blast fume emission exceedances at off-site receptors are predicted to be unlikely to occur and can be appropriately managed through the site's various management plans, e.g. a Blast Fume Management Plan.

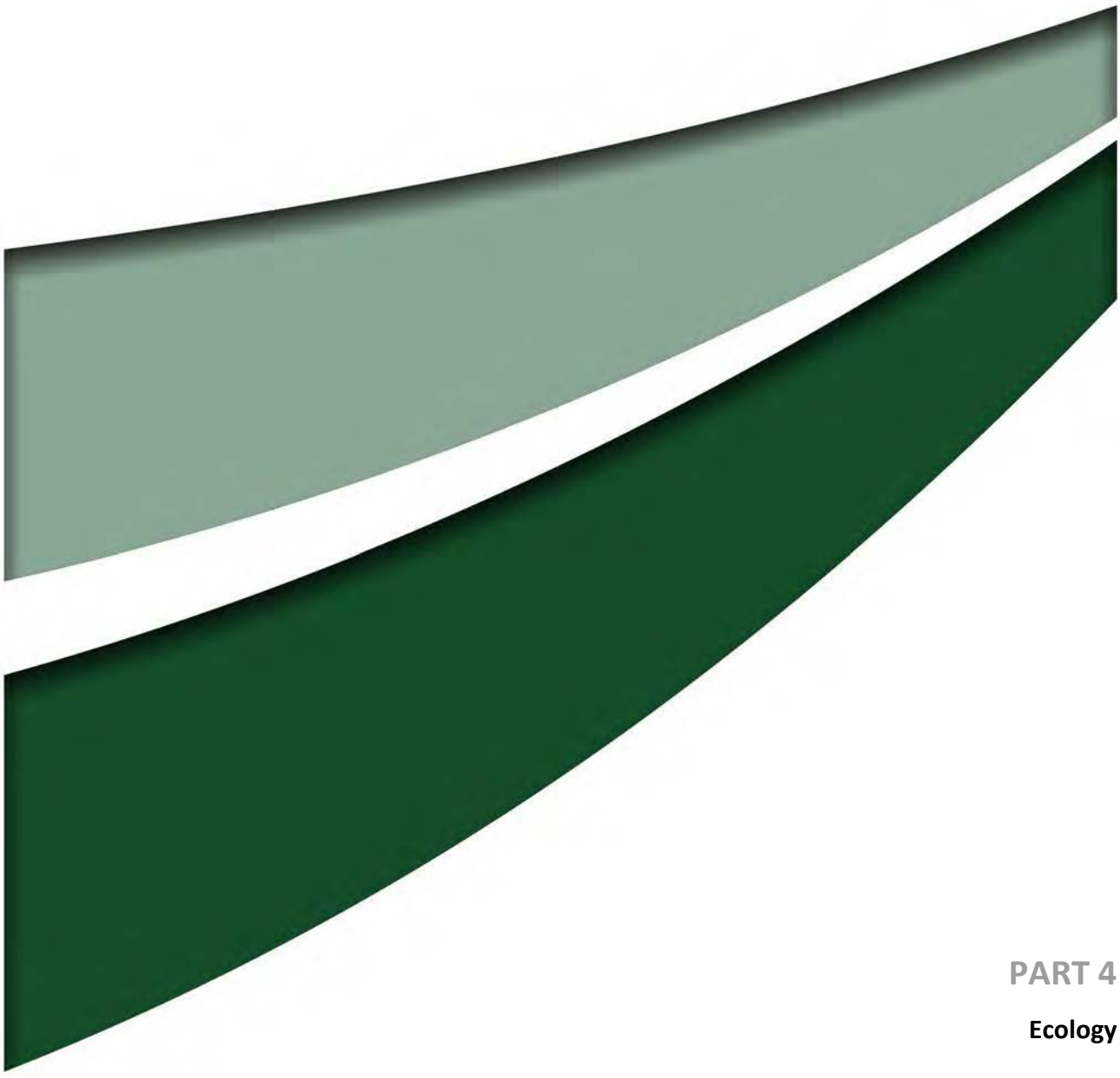
If project approval is granted the resulting Environment Protection Licence for the site will include conditions making it an offence to emit offensive blast fume from the premises and as such, the onus is on the licensee to ensure that blast fume emissions do not leave the premises. If offensive blast fumes are emitted from the premises the EPA may take regulatory action, including penalty notices and/or prosecution.

As discussed in the RTS Report, Mount Owen is committed to updating the Blast Fume Management Plans to restrict blasting to periods when meteorological conditions are not conducive to fume dispersal towards residential receivers. By identifying the conditions where a worst case blast scenario in specific areas may result in exceedances of criteria at the nearest residences and including management controls which prevent blasting in these areas during these conditions, the potential for an exceedance at these residences or any residences further away is reduced to as low as reasonably practicable.

Additionally, blast design and management measures play an important role in minimising the likelihood of the occurrence of higher category blast fume events. Controls of this nature are already incorporated into the relevant Blast Fume Management Plans and will continue to be used for the Project. Additional reasonable and feasible measures may also be implemented as further knowledge and technology regarding blast fume generation becomes available. Mount Owen will also continue to operate the notification system to advise residents of all proposed blasts.

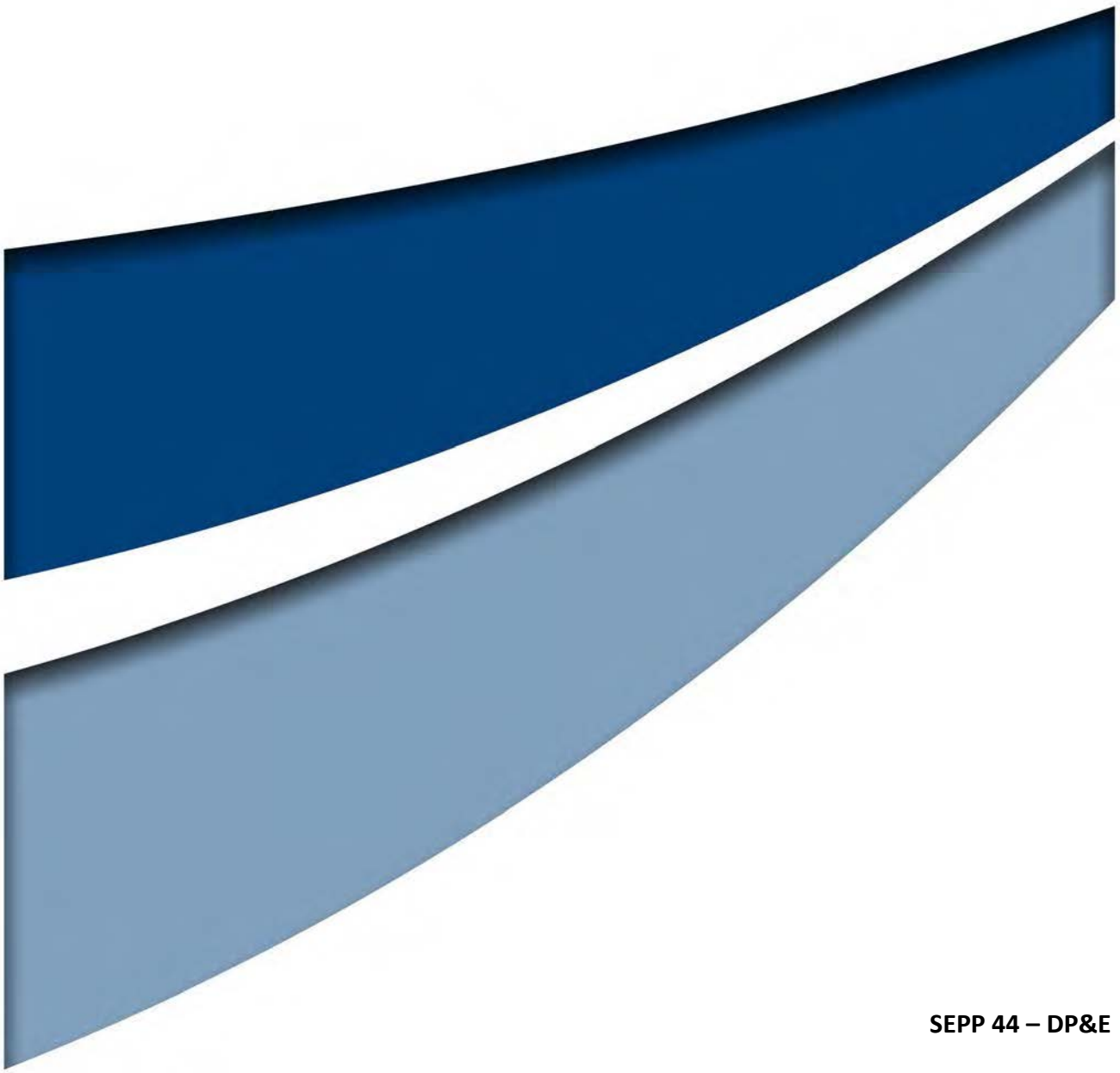
Mount Owen accepts that the EPA will apply conditions to the EPL for the Project if approval is granted, provided the wording of the condition is consistent with the wording of the current Mangoola Coal Operations EPL (12894), provided below:

> *L4 - Blasting*
> *L4.6 – Offensive blast fume must not be emitted from the premises.*
>
> *Definition – Offensive blast fume means post-blast gases from the detonation of explosives at the premises that by reason of their nature, duration, character or quality, or the time at which they are emitted, or any other circumstances:*
>
> 1. *Are harmful to (or likely to be harmful to) a person that is outside the premises from which it is emitted, or*
> 2. *Interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted.*



PART 4

Ecology



SEPP 44 – DP&E

State Environment Planning Policy No: 44 (Koala Habitat Protection) (SEPP 44)

Section 4.2.5 of the Ecological Assessment accompanying the MOCO EIS states that "No potential koala habitat was recorded within the Proposed Disturbance Area as defined by SEPP 44 as Schedule 2 species listed under the policy were either not recorded or recorded in densities less than 15 per cent of all overstorey species within each community."

Can you please provide two simple clarifications for my records:

1) ***that the above statement relates to all preferred feed trees cumulatively (ie all preferred feed species combined < 15%), rather than the individual feed trees identified in Schedule 2 comprising < 15% per species; and***
2) ***that the combined species listed in Schedule 2 comprise less than 15% of total trees in both the upper and lower strata of the native vegetation within the disturbance area. While I appreciate this is likely the intention of the above statement regarding 'overstorey species', I need to clarify that preferred tree species comprise less than 15% of the upper or lower strata of the tree component within each vegetation community in the disturbance area.***

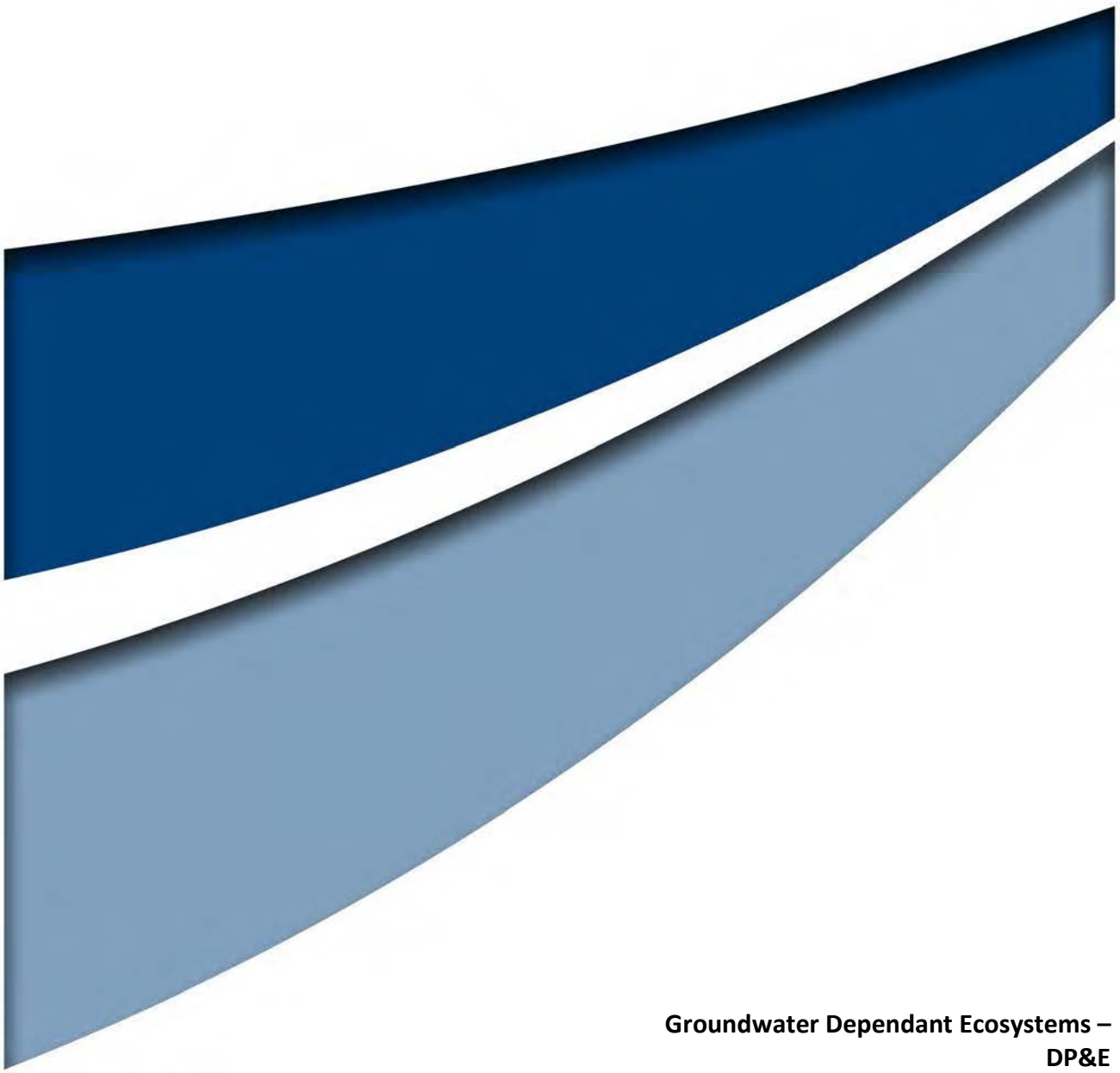
The excerpt from the Section 4.2.5 of the Ecological Assessment refers to cumulative and individual koala feed trees recorded across the proposed disturbance area. Of the 18 flora quadrats surveyed within the Proposed Disturbance Area, no feed trees listed in Schedule 2 of SEPP 44 were recorded. In each quadrat, the number of trees in the lower and upper stratum were counted. In this case, as no koala feed trees were recorded within these quadrats, the proportion was always zero for individual and cumulative feed species. Refer to Table 1 below.

Table 1 – Koala feed trees in Proposed Disturbance Area Quadrats

Quadrat (in Proposed Disturbance Area)	Tree Species in Upper and Lower Stratum	Koala Feed Species	Proportion of Koala Feed Trees
Q1	*Corymbia maculata* *Eucalyptus fibrosa* *Eucalyptus moluccana*	None	0%
Q3	*Allocasuarina luehmannii*	None	0%
Q4	*Casuarina glauca* *Angophora floribunda*	None	0%
Q10	*Corymbia maculata* *Eucalyptus fibrosa* *Eucalyptus moluccana*	None	0%
Q11	*Corymbia maculata* *Eucalyptus crebra* *Eucalyptus fibrosa*	None	0%
Q12	*Corymbia maculata* *Eucalyptus fibrosa*	None	0%
Q13	*Allocasuarina luehmannii*	None	0%
Q14	*Allocasuarina luehmannii*	None	0%
Q15	NA – grassland	None	0%
Q16	*Corymbia maculata* *Eucalyptus fibrosa*	None	0%
Q17	NA – grassland	None	0%
Q18	*Allocasuarina luehmannii*	None	0%
Q19	*Allocasuarina luehmannii* *Eucalyptus crebra*	None	0%

Quadrat (in Proposed Disturbance Area)	Tree Species in Upper and Lower Stratum	Koala Feed Species	Proportion of Koala Feed Trees
Q20	*Allocasuarina luehmannii*	None	0%
Q23	*Casuarina glauca*	None	0%
Q100	NA – grassland	None	0%
Q101	*Corymbia maculata* *Eucalyptus fibrosa* *Allocasuarina luehmannii*	None	0%
RavP06	*Corymbia maculata* *Eucalyptus crebra* *Eucalyptus fibrosa*	None	0%

It is noted that, a single forest red gum (*Eucalyptus tereticornis*) was recorded outside flora quadrat 22 within the Central Hunter Grey Box – Ironbark Woodland community outside the Proposed Disturbance Area in the southern portion of the Project Area near the proposed Mt Owen rail line. Koala feed trees listed under Schedule 2 of SEPP 44 therefore occur in very low densities within the Proposed Disturbance Area and represent less than 15 per cent of both the upper and lower strata in the vegetation communities, thereby indicating that potential (or core) koala habitat in accordance with SEPP 44 does not occur. Forest red gum and grey gum (*E. punctata*) are known to occur in the wider locality (outside the Proposed Disturbance Area) including within the planted New Forest Area and riparian vegetation along Yorks Creek, however these areas will not be impacted by the Project.



Groundwater Dependant Ecosystems – DP&E

GDEs

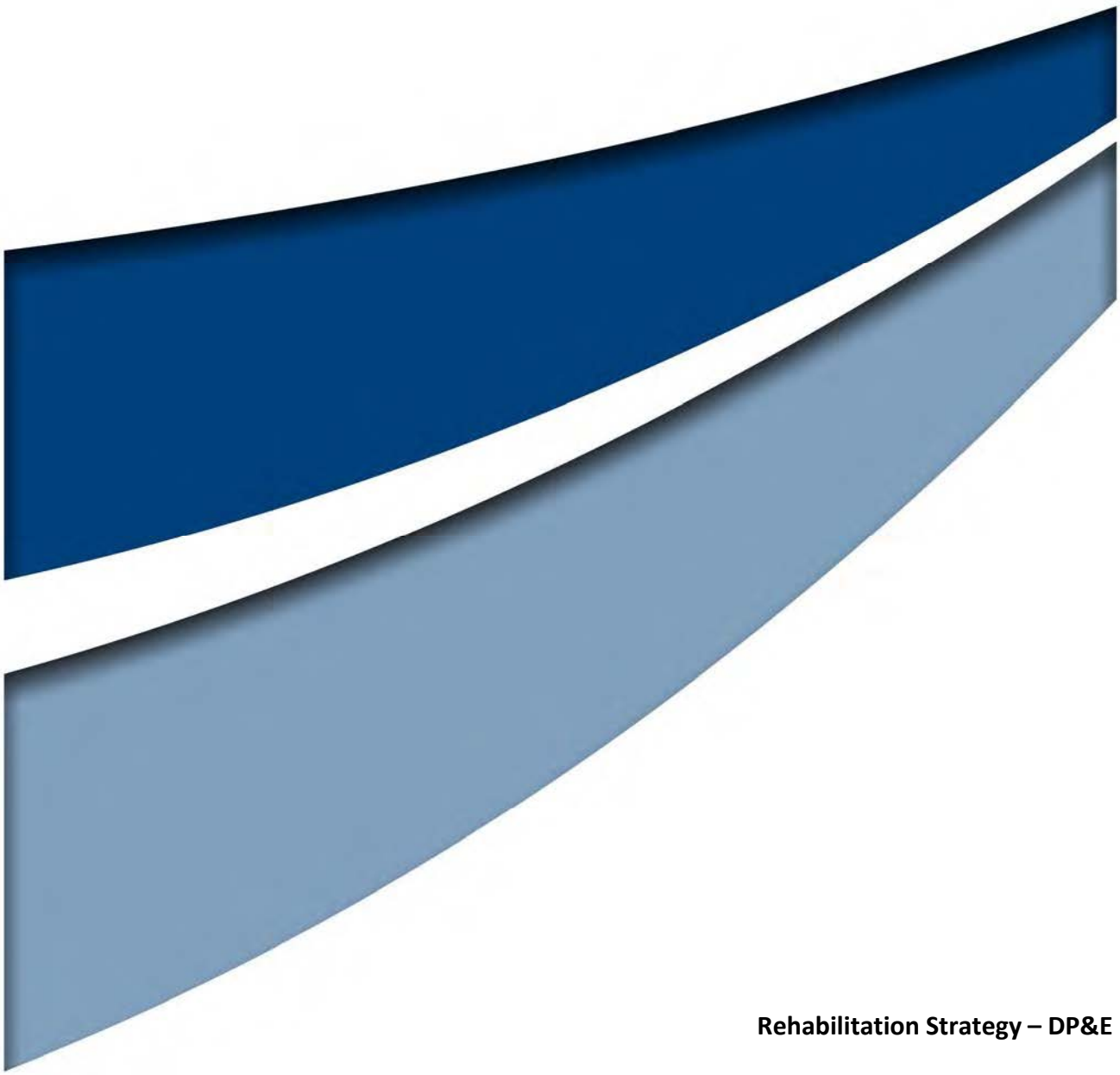
Further to the above, the Department notes that the surface water assessment states there are 3 downstream GDEs and the groundwater assessment states there are 4. Can you please confirm this figure, whether all communities are downstream (ie not on site) and whether this figure includes/excludes the Central Hunter Swamp Oak Forest GDE (discussed in response to the IESC's comments on the project).

The surface water assessment does not make reference to the number of GDEs downstream of the Project Area. The Groundwater Impact Assessment states *'as outlined in the Ecology Assessment completed as part of the EIS, there are four terrestrial vegetation communities that are expected to be dependent on shallow groundwater resources during periods of reduced surface water flow'*.

The Ecological Assessment (Appendix 11 of the EIS), identifies Bowmans Creek and Glennies Creek as the only two GDEs identified within the vicinity and downstream of the Project Area which includes the following associated three terrestrial vegetation communities which may be dependent on shallow groundwater resources (where present) during periods of reduced surface water flow:

- Central Hunter Swamp Oak Forest;
- Hunter Lowland Red Gum Forest EEC; and
- Hunter Valley River Oak Forest.

Section 2.4 of the response To Submissions Report B contains a detailed discussion of the Project's potential impacts on water dependant ecosystems.



Rehabilitation Strategy – DP&E

The Department is currently undertaking its preliminary assessment of the MOCO Project based on information provided in the EIS, as well as a range of information available in approved management plans and biodiversity offset strategies for the complex. This includes information relating to the total area of grassland and woodland communities required to be established and conserved in and around the Mt Owen complex.

To supplement the EIS and ensure the figures derived from the above sources are consistent with the proposed project, the Department is seeking confirmation of the total hectares (ha) and vegetation types to be established at the Mt Owen Complex. It is requested that Glencore provide a response to each of the below dotpoints and clearly differentiate between native woodland and grassland communities. (NB: Please indicate "0 ha" where an offset is not required against any of the below dotpoints)

Existing Environment

<u>Glendell</u>

- ***Rehabilitation – confirmation of the total areas (ha) and composition (woodland vs grassland)***
- ***Offsets – confirmation of total offset areas (ha) and composition (woodland vs grassland)***

<u>Ravensworth East</u>

- ***Rehabilitation – confirmation of the total areas (ha) and composition (woodland vs grassland)***
- ***Rehabilitation– confirmation of whether the response to the above dotpoint includes rehabilitation of the former Swamp Creek Mine (and if not the additional ha associated with this rehabilitation)***
- ***Offsets – confirmation of total offset areas (ha) and composition (woodland vs grassland)***

<u>Mt Owen</u>

- ***Rehabilitation – confirmation of the total areas (ha) and composition (woodland vs grassland)***
- ***Offsets – confirmation of total offset areas (ha) and composition (woodland vs grassland)***

Additional Areas under the proposed Mt Owen Continued Operations Project

<u>Mt Owen & Ravensworth East Mines</u>

- ***Rehabilitation – confirmation of the total areas (ha) and composition (woodland vs grassland)***
    - ***NB: This should clearly identify the net change in the final rehabilitation area and composition (ie stipulate what the target communities would have been for the existing 70 ha of rehab to be cleared, so this can be subtracted from the total woodland vs grassland figures for the complex)***
- ***Offsets – confirmation of total offset areas (ha) and composition (woodland vs grassland), as per EIS***

Total – Existing and approved

- ***Total area of rehabilitation and biodiversity offsets at the consolidated Mt Owen mine (ie Mt Owen and Rav East) – including composition (ha of woodland and grassland)***
- ***Total area of rehabilitation and biodiversity offsets at the Mt Owen Complex (ie Mt Owen, Rav East and Glendell) – including composition (ha of woodland and grassland)***

Table 1 –Vegetation in Approved Rehabilitated Landform for the Project and Mount Owen Mining and Offset Areas

Project Component	Woodland /Open Forest (Ha)	Grassland (Ha)	Treed Rehab (Ha)	Pit Lake (Ha)	Comment
Approved Rehabilitation Strategy for existing disturbance area					
Mount Owen (including MIA, WOOP Emplacement Area) – excludes voids	1076	155	N/A	44	As per Approved 2015 Mining Operations plan
Ravensworth East (including TP1, TP2 and stage 3 and RW pit)	107	503	N/A	2	As per Approved 2015 Mining Operations plan
Glendell (excludes TP2)	N/A	523	296#	12	As per Approved 2015 Mining Operations plan
Vegetation in Approved and Existing Proposed Offset Areas+					
Existing Approved Offset Areas					
Northwest Offset	45	23	0		
Northeast Offset	32	52	0		
Forest East Offset	25	86	0		
Travelling Stock Reserve (TSR) Offset	24	1	0		
Southeast Offset	16	58	0		
Southeast Corridor Offset	27	31	0		
Southern Remnant Offset	4	0	0		
Proposed Offset Areas					
Esparanga*	211	91	0		
Cross Creek*	52	315	0		
Stringybark Creek*	28	59	0		
Existing Vegetation in Proposed Disturbance Area					
Proposed Disturbance Area	228	224^			Excludes approximately 32 hectares of disturbed land
Project Total – Ravensworth East/Mount Owen (including proposed offset areas)	**1874**	**1599**	**0**	**46**	**Excludes approximately 32 hectares of existing disturbed land and dams in Proposed Disturbance Area**
Total – Mount Owen Complex (inc Glendell)+	**1874**	**2122**	**296**	**58**	

#Commitment in EIS is to Treed Areas only
+Does not include Bettys Creek Rehabilitation Area
*Areas are existing vegetation in offset areas as mapped in EIS, refer to EIS for proposed management objectives for offset areas which will change vegetation composition.
^Includes 86.9 hectares of grassed mine rehabilitation

Table 2 –Vegetation in Proposed Rehabilitated Landform for the Project and Mount Owen Mining and Offset Areas

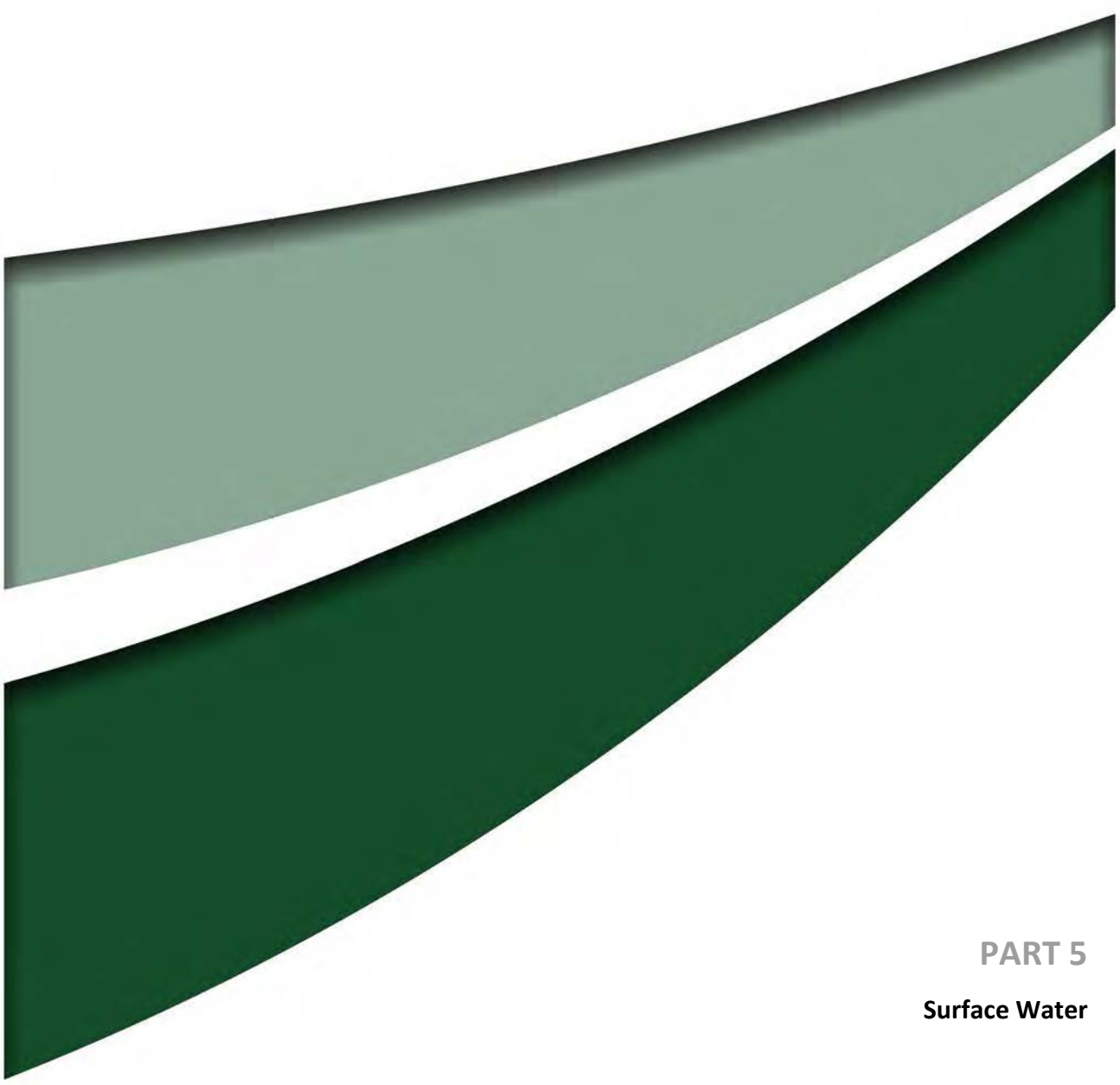
	Woodland (Ha)	Grassland (Ha)	Treed Rehab (Ha)	Pit Lake/ Dams (Ha)	Comment
Proposed Rehabilitation under the proposed Mt Owen Continued Operations Project					
Mount Owen	1107	169	N/A		
Mount Owen Continued Operations Project Proposed (additional) Disturbance Area	347	37	N/A	88	Excludes approximately 13 hectares of continuing disturbance area associated with Hebden Road works
Ravensworth East	284	325	N/A	2	Grassland area includes area identified as grassland for stabilisation.
Glendell (excludes TP2)	364	444	0	23	RERR final void located in Glendell approval area used for calculations
Vegetation in Approved and Existing Proposed Offset Areas[+]					
Existing Approved Offset Areas					
Northwest Offset	45	23	0		
Northeast Offset	32	52	0		
Forest East Offset	25	86	0		
Travelling Stock Reserve (TSR) Offset	24	1	0		
Southeast Offset	16	58	0		
Southeast Corridor Offset	27	31	0		
Southern Remnant Offset	4	0	0		
Proposed Offset Areas					
Esparanga	303	0	0		
Cross Creek	367	0	0		
Stringybark Creek	95	0	0		
Project Total – Ravensworth East/Mount Owen (including proposed offset areas)	**2674**	**783**	**N/A**	**90**	**Excludes approximately 13 hectares of disturbance associated with Hebden Road works**
Total – Mount Owen Complex (excluding offset areas)	**3038**	**1227**	**N/A**	**112**	
Mine Rehabilitation Vegetation disturbance as part of Project					
Existing[#]		86	N/A		
Proposed rehabilitation	21	55	N/A		

[+] Does not include Bettys Creek Rehabilitation Area

*Areas of vegetation proposed as part of proposed Biodiversity Offset Strategy

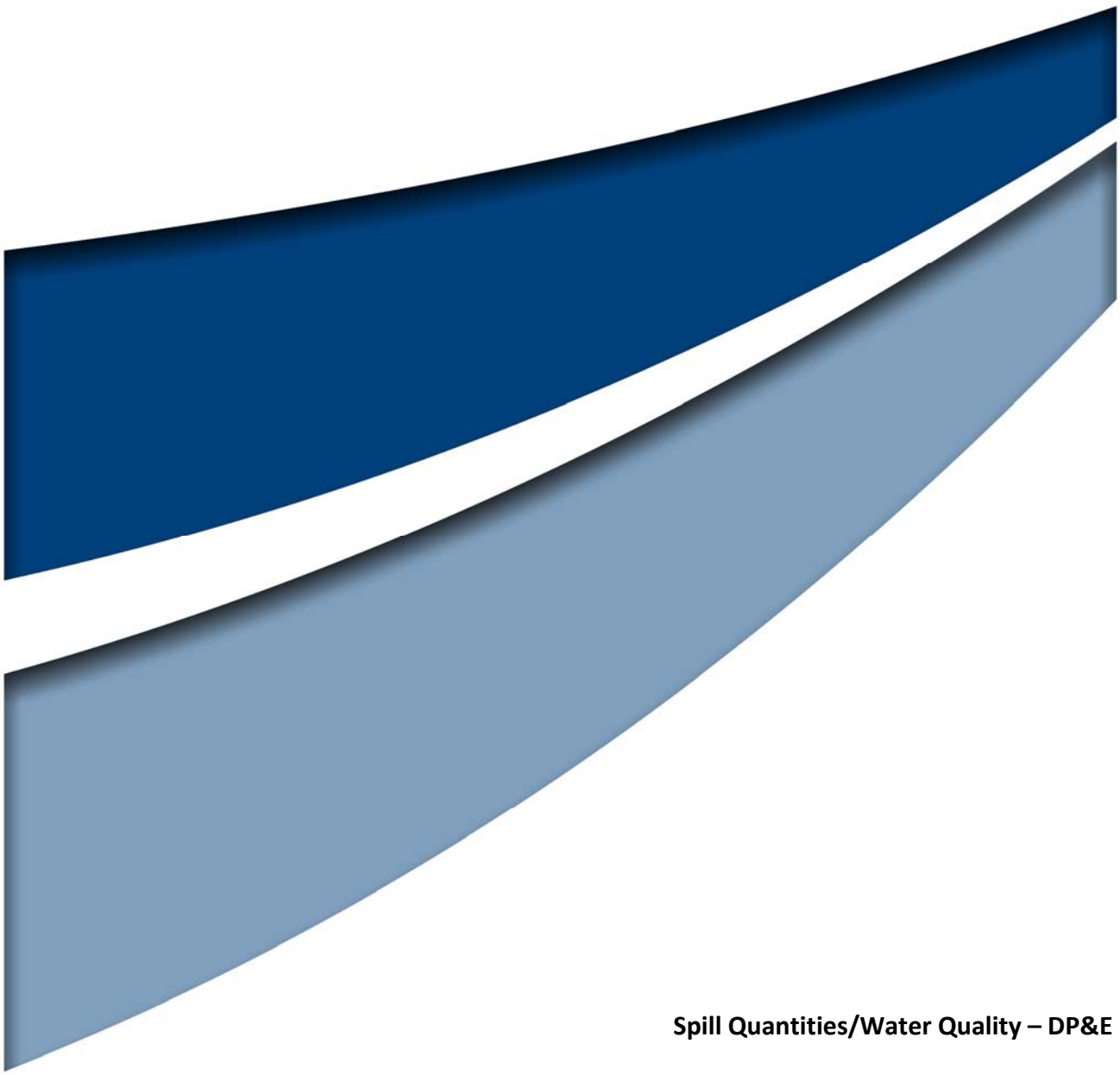
^Includes 4.7 hectares Kunzea Shrubland

[#] Note – will include areas of existing approved North Pit Final Void



PART 5

Surface Water



Spill Quantities/Water Quality – DP&E

Predicted spill quantities

Table 5.10 of the Surface Water Assessment (EIS) predicts the following quantities of water would spill from sediment dams under high rainfall conditions:

Yr 1 – 527 ML avg, 4,116 ML max
Yr 2 – 534 ML avg, 4,173 ML max
Yr 10 – 478 ML avg, 3,765 ML max

These appear to be very large quantities of water. The RTS indicates that 9 of the 18 sediment dams would spill to the water management system (Table 2.11, RTS Report B). It is unclear whether the predicted quantities of water spills from the EIS represent the total that may enter the local creek systems, or whether a portion would be detained in the WMS. If the quantities in the EIS are expected to enter the local creek systems, what measures have been considered to avoid or minimise this impact?

The purpose of the sediment dams within the dirty water management system is to manage runoff from disturbed areas. The dirty water management system is, and will continue to be, designed in accordance with *Managing Urban Stormwater: Soils and Construction* (the Blue Book), Volumes 1 and 2E - Mines and Quarries (Landcom 2004 and DECC 2008) to manage runoff from the 5 day, 95th percentile rainfall event (i.e. a rainfall depth of 51.3 mm). The selected design criteria is in excess of the minimum recommended design criteria for sediment dams as outlined in Volume 2E of the Blue Book (DECC, 2008) which is the 5 day, 90th percentile rainfall event (i.e. a rainfall depth of 35.9 mm). Volume 2E of the Blue Book (DECC, 2008) indicates that for the 95th percentile design storm event the indicative average annual sediment basin overflow frequency will be 1 to 2 spills per year. The predicted 1 to 2 spillages per year from sediment dams identified in the Site Water Balance (refer to Appendix B of the Surface Water Assessment) is associated with this design criteria. These spills will only occur from sediment dams within the dirty water system and not from the mine water system (i.e. runoff from areas exposed to coal or water used in coal processing or from coal stockpile areas), which is contained on the mine site within systems designed to a higher design criteria. The design criteria for mine water is containment for events up to and including the 1 per cent Annual Exceedance Probability (AEP) 24 hour storm event.

The spill volumes presented in Table 5.10 of the Surface Water Assessment (SWA) (in Appendix B – Water Balance Assessment) consider all modelled spills from dams for three mine stages for the full range of historical rainfall conditions (i.e. 116 years of rainfall data). These numbers represent the full predicted spills over the range of meteorological conditions and include spills that would be detained within the WMS, as opposed to solely the volumes of spills that may enter the local creek systems.

As discussed in the RTS (Table 2.11 RTS Report B), 9 of the 18 sediment dams identified within the conceptual WMS (refer to Figures 4.1 to 4.5 of the Surface Water Assessment) will spill to internal storages within the WMS, including mining pits and mine water dams.

The data presented in Table 5.10 includes the modelled average spill volumes and maximum spill volumes in the WMS for the three modelled mining scenarios (Year 1, Year 5 and Year 10). This is based, as described above and in the Water Balance Assessment, on modelling the full range of historical rainfall events in calendar years since 1898. During this period (as presented in Table 3.1 of the Water Balance Assessment) the average annual rainfall was 646 mm/year and ranged between 429 mm/year for the 10th percentile to 829 mm/year for the 90th percentile. It should also be noted that the maximum annual rainfall recorded since 1898 was 1,191 mm which occurred in 1950. The historical rainfall record also includes prolonged and major rainfall events. For example, the modelling includes three large rainfall events during 1904, one of which was equivalent to approximately the 1.5 per cent AEP (i.e. 65 year Average Recurrence Interval (ARI)) storm event, and also includes the 2007 Pasha Bulka storm event that was approximately equivalent to the 1.4 per cent AEP (i.e. 70 year ARI) storm event.

As discussed above, the spill volumes presented in the Surface Water Assessment (Table 5.10 of Appendix B – Water Balance Assessment) were based on a worst case analysis for the WMS. The maximum water management system catchment modelled was approximately 2,150 hectares in Year 5. The modelled volumes of spills from the 9 sediment dams (identified in Table 2.11 RTS Report B) that will spill to downstream creek systems are presented in **Table 1**. The catchment areas of these dams, at their maximum total catchment area, is approximately 880 hectares in Year 10.

Table 1 – Annual Environmental Spill Volumes

Scenario	Predicted Annual Spill Volumes (ML)		
	Year 1	Year 5	Year 10
10th Percentile	0	0	0
50th Percentile	46	51	52
90th Percentile	311	343	348
Average	114	126	128
Maximum	902	1,008	1,034

Chart 1 shows the full range of modelled environmental spill volumes and the associated correlation between the probability of total modelled annual spill volumes from the nine sediment dams that release water off site. For example (refer to **Chart 1**) there is a 15 per cent probability during Year 1 of the Project that the total annual spill volume from the sediment dams to downstream creek systems will be approximately 200 ML.

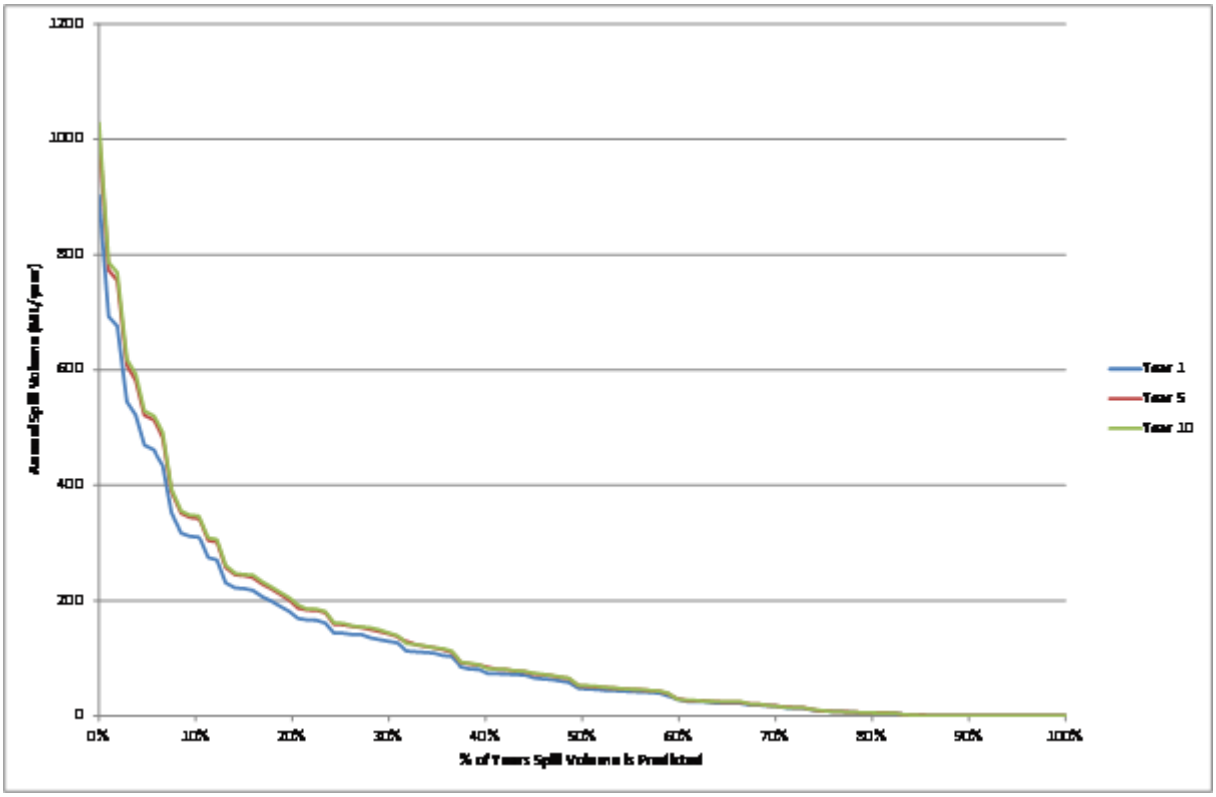


Chart 1 – Probability Analysis of Annual Spill Volume

The maximum predicted spill volumes relate to the modelled year that uses the 1904 historical rainfall data. During 1904 there were three major storm events including the 1.5 per cent AEP event discussed above. **Table 2** presents the rainfall depth and ARI of these storm events, and also includes the modelled spill volumes in Year 10 for sediment dams that will spill to downstream creek systems. It should be noted that during these events these creek systems would already be subject to high flows as a result of natural catchment runoff.

Table 2 – Maximum Modelled Spill Volumes Analysis – 1904 Rainfall Year

Storm Event	Total Rainfall (mm)	Equivalent ARI Storm Event	Predicted Spill Volume (ML)
February 1904	180.3	65 year 48 hour	442
March 1904	80.8	1 year 24 hour	45
July 1904	210.4	30 year 24 hour	547
Total	471.5		1,034

Note: Design rainfall depth for 95th percentile 5 day Blue Book is 51.3 mm

In the data presented above the larger predicted spill volumes occur during rainfall events that significantly exceed the Blue Book sediment dam design criteria. In addition, 63% of the total predicted spill volume (refer to Table 5.10 in Appendix B of the Surface Water Assessment) will spill to the mine water system. As such only a small proportion of the total spills are predicted to potentially enter the downstream creek systems.

Final voids

> ***The BNP final void is not expected to increase in EC levels above a post-mining level of 1,000 uS/cm (4.1.1.3 GWA in EIS). Based on the predicted increases in EC levels in the other two final voids (north pit and RERR) and the background EC level in the hard rock aquifer varying between 5,000 – 15,000 uS/cm, it is unclear how an increase in EC levels in the BNP final void would not be expected.***
>
> ***In addition, there are large spikes predicted in the EC of all of the proposed final voids in their early years. There is no discussion of this result, or how EC levels would be expected to reduce following these initial spikes.***

Bayswater North Pit (BNP)

Groundwater modelling predicts that there will be no inflow of groundwater into the BNP final void. Rather the modelling predicts that seepage from the BNP into the water table will occur, even at a base level of 45 mAHD. Therefore only runoff from the surrounding catchment, that is estimated to have a relatively low total dissolved solids (TDS) concentration of approximately 320 mg/L (equivalent to an electrical conductivity (EC) of 500 mS/cm), will flow into the BNP. Evaporation will concentrate the TDS within the BNP water body until the volume/concentration relationship reaches an equilibrium. At this point the TDS in the outflow seepage to the groundwater table is equal to the TDS in the catchment runoff. At the same time the volume of outflows (seepage to the groundwater table and evaporation) is equivalent to the volume of catchment runoff.

TDS Spikes

The initial spikes in TDS/EC are a function of low water volume and the impacts of evaporative concentration. The impact of evaporation on a small volume with even low TDS concentration will result in large variations in TDS concentration. As the volumes of the final voids increase, short term variations in TDS caused by evaporative concentration are buffered. For example, if two separate water bodies of volumes 1000 kL and 2000 kL with a TDS of 500 mg/L were to both lose 200 kL to evaporation without any inflows, the TDS for the resulting 800 kL and 1800 kL water bodies would be 625 mg/L and 555 mg/L respectively. As this example demonstrates, the TDS concentration (and EC) in a smaller volume of water will be more sensitive to short term variations in evaporation and rainfall.

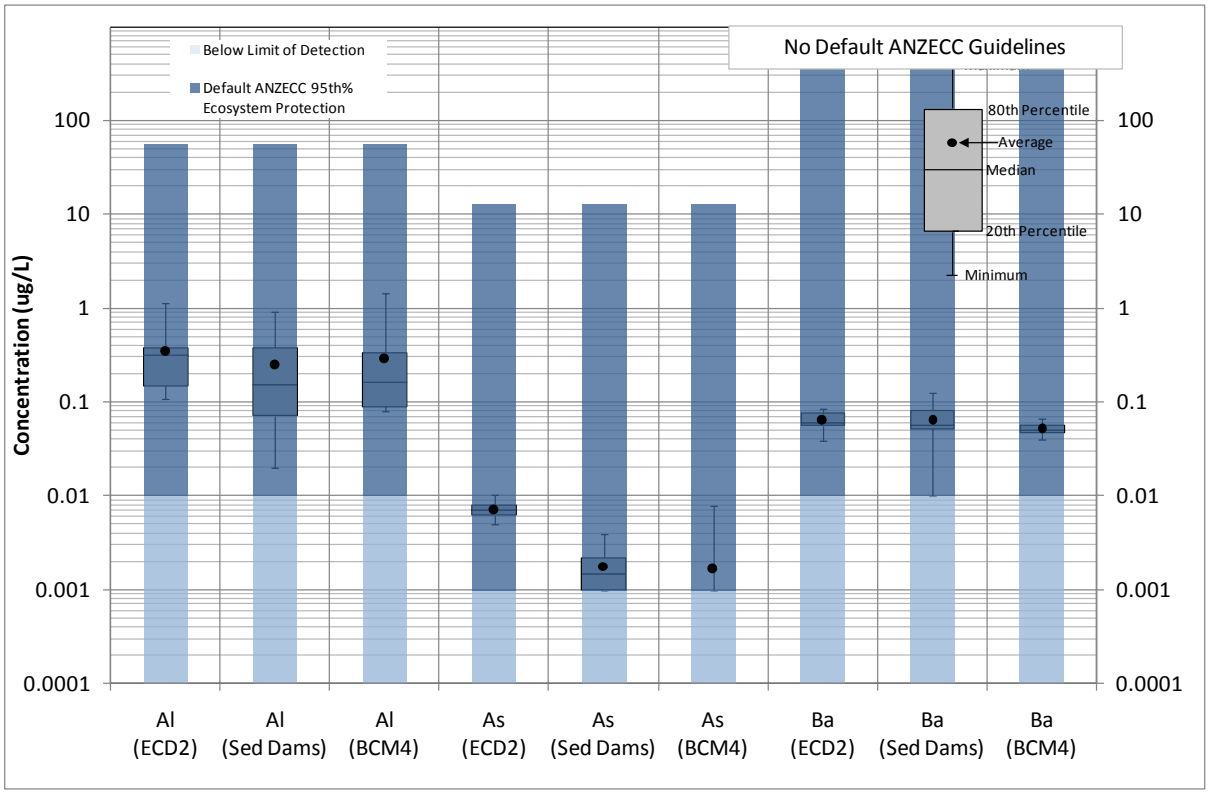
Water quality monitoring data

> ***The water quality monitoring data presented under 2.2.5.2 (Report B, RTS) indicates some metal and other parameters appear to be elevated in their concentration including NOx, Mn, Fe and TDS but these have not been discussed. It would be useful to know when this data was collected. In addition, these graphs use the measurement unit mg/L which is inconsistent with ANZECC guidelines use of ug/L-1.***

The error noted was the result of an incorrect labelling of axis units. The graphs have been updated and provided below.

The sampling of ECD2 (Mine Water Dam) and BCM4 (Bowmans Creek) used in the graphs was taken from 12 sampling results over the period 20 March 2014 to 18 August 2014 except for EC, NOx, pH, P, TDS and TSS in the ECD2 results which are from 53 samples taken over the period 5 January 2010 to 18 August 2014.

The 'Sed Dams' data is taken from single samples taken from 10 sed dams at the Mount Owen Complex (covering a range of catchment types including disturbed, partially rehabilitated and established rehabilitation areas) on 21 July 2015.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No Default ANZECC Guidelines
80th Percentile
Average
Median
20th Percentile
Minimum
Concentration (ug/L)
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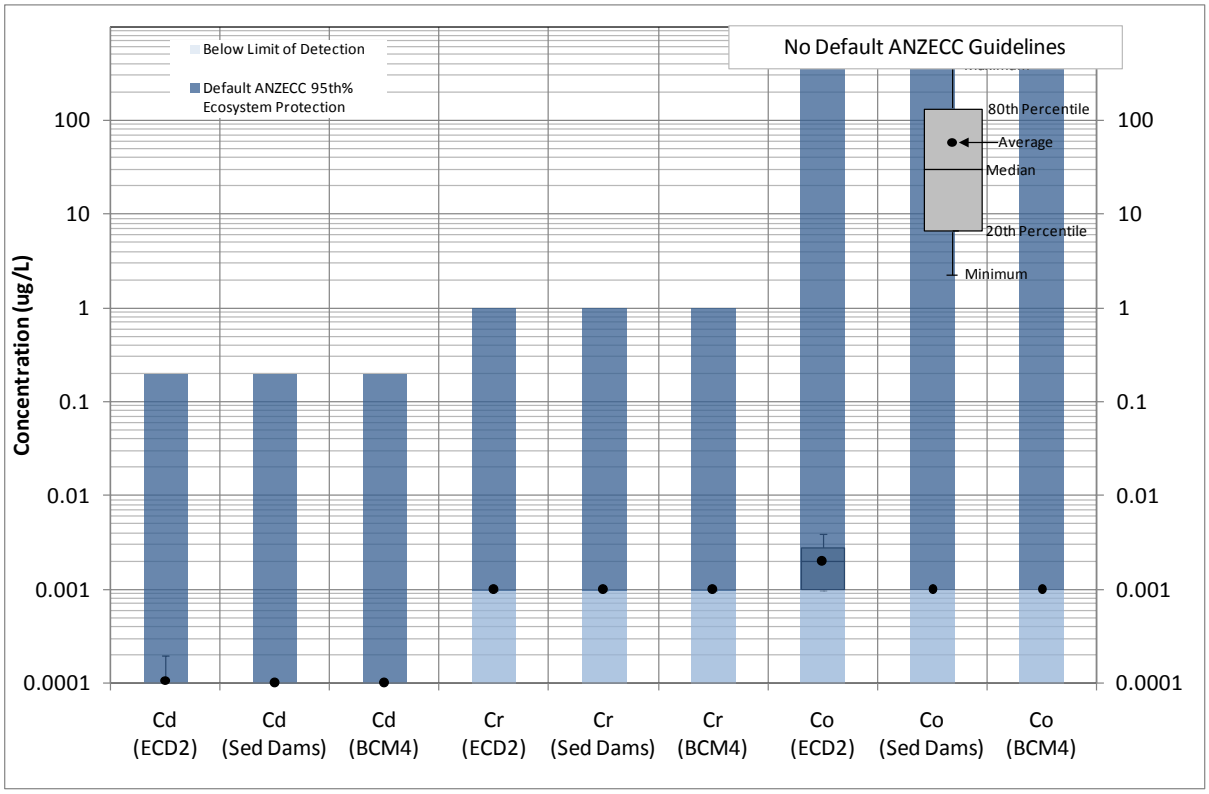
Al (ECD2)
Al (Sed Dams)
Al (BCM4)
As (ECD2)
As (Sed Dams)
As (BCM4)
Ba (ECD2)
Ba (Sed Dams)
Ba (BCM4)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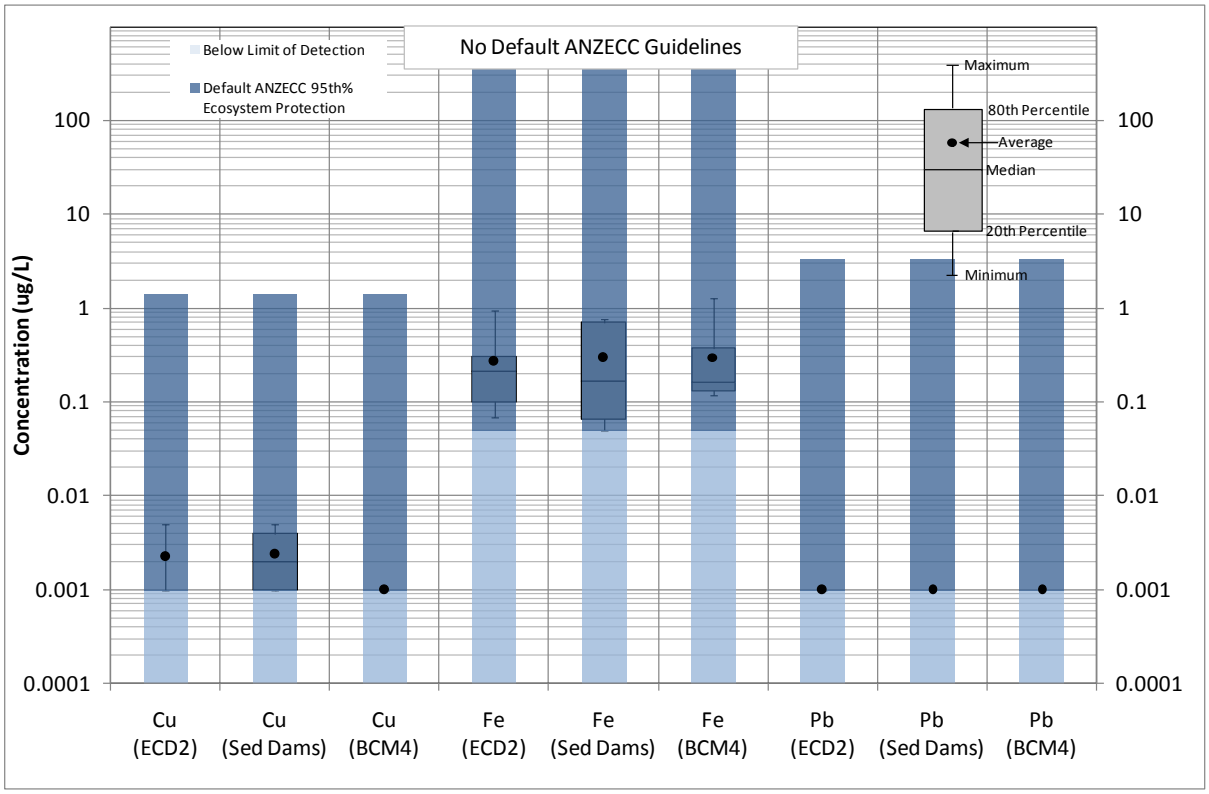
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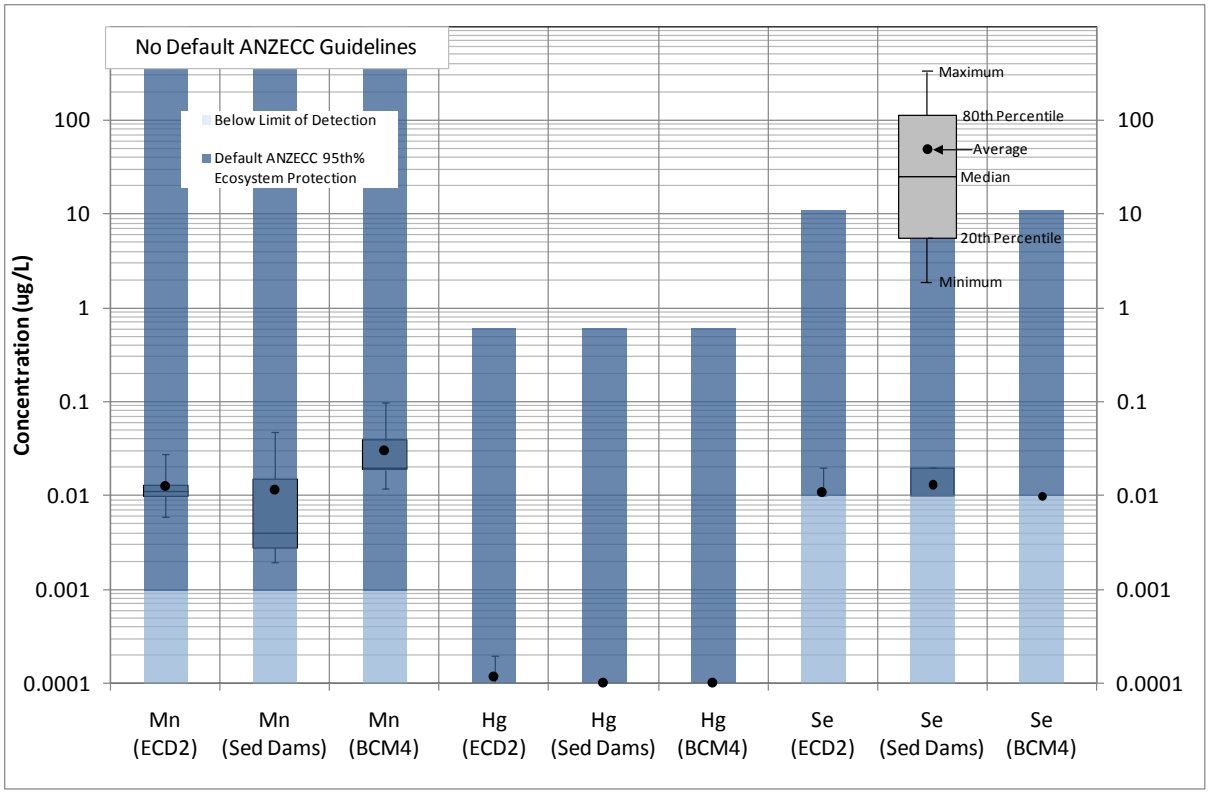
Cu (ECD2)
Cu (Sed Dams)
Cu (BCM4)
Fe (ECD2)
Fe (Sed Dams)
Fe (BCM4)
Pb (ECD2)
Pb (Sed Dams)
Pb (BCM4)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Mn (Sed Dams)
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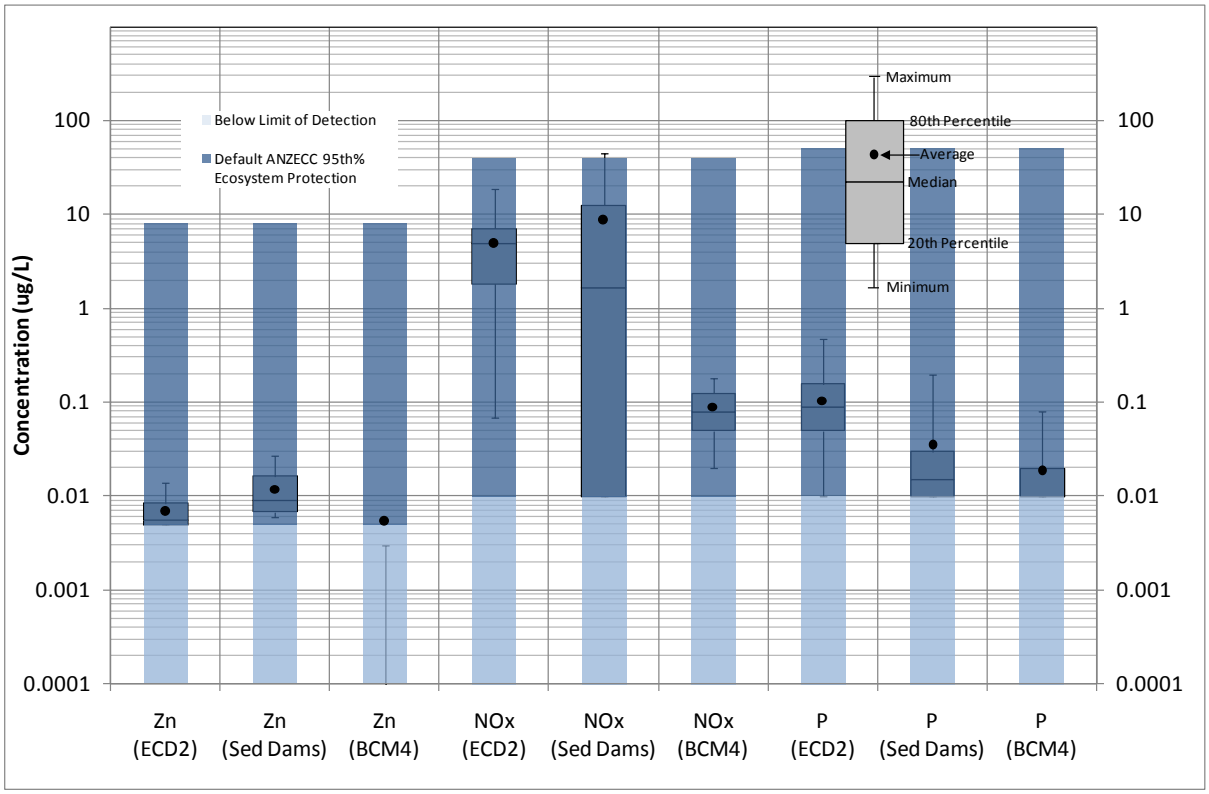
Hg (BCM4)
Se (ECD2)
Se (Sed Dams)
Se (BCM4)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Concentration (ug/L)
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Zn (Sed Dams)
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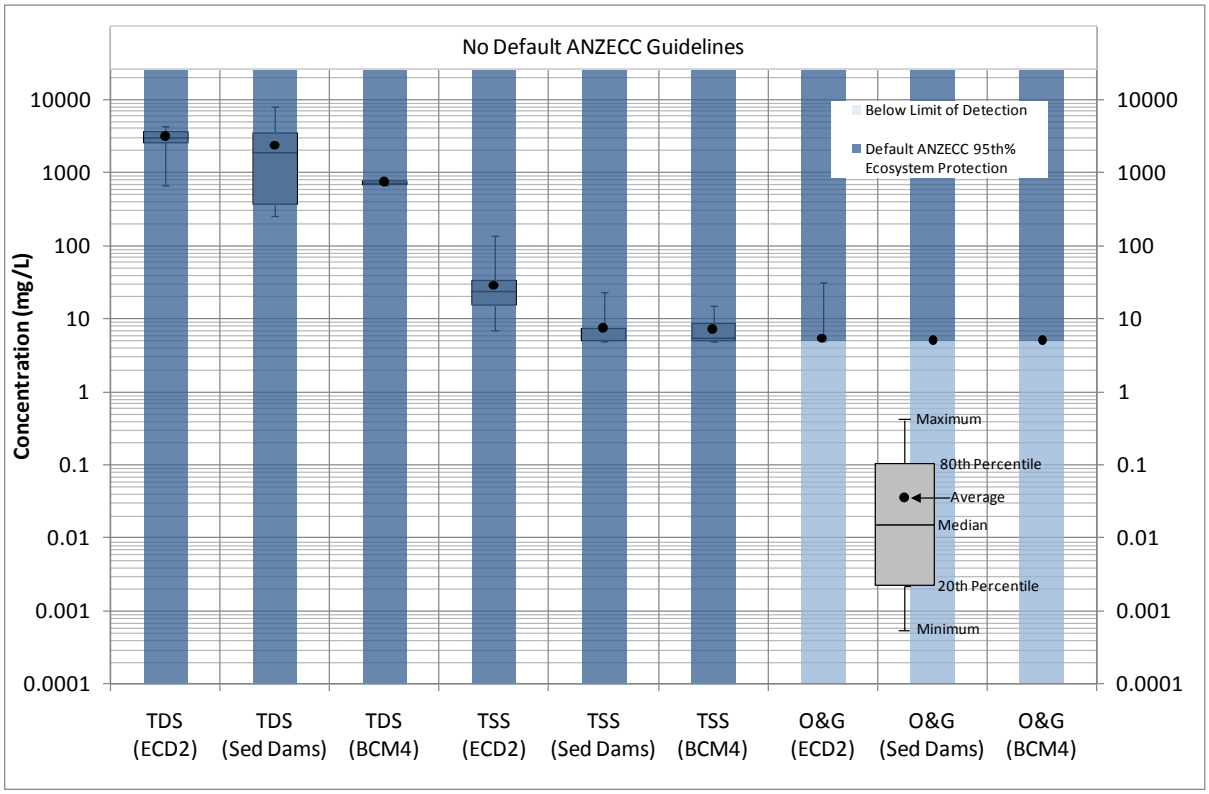
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Minimum
Concentration (mg/L)
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1000
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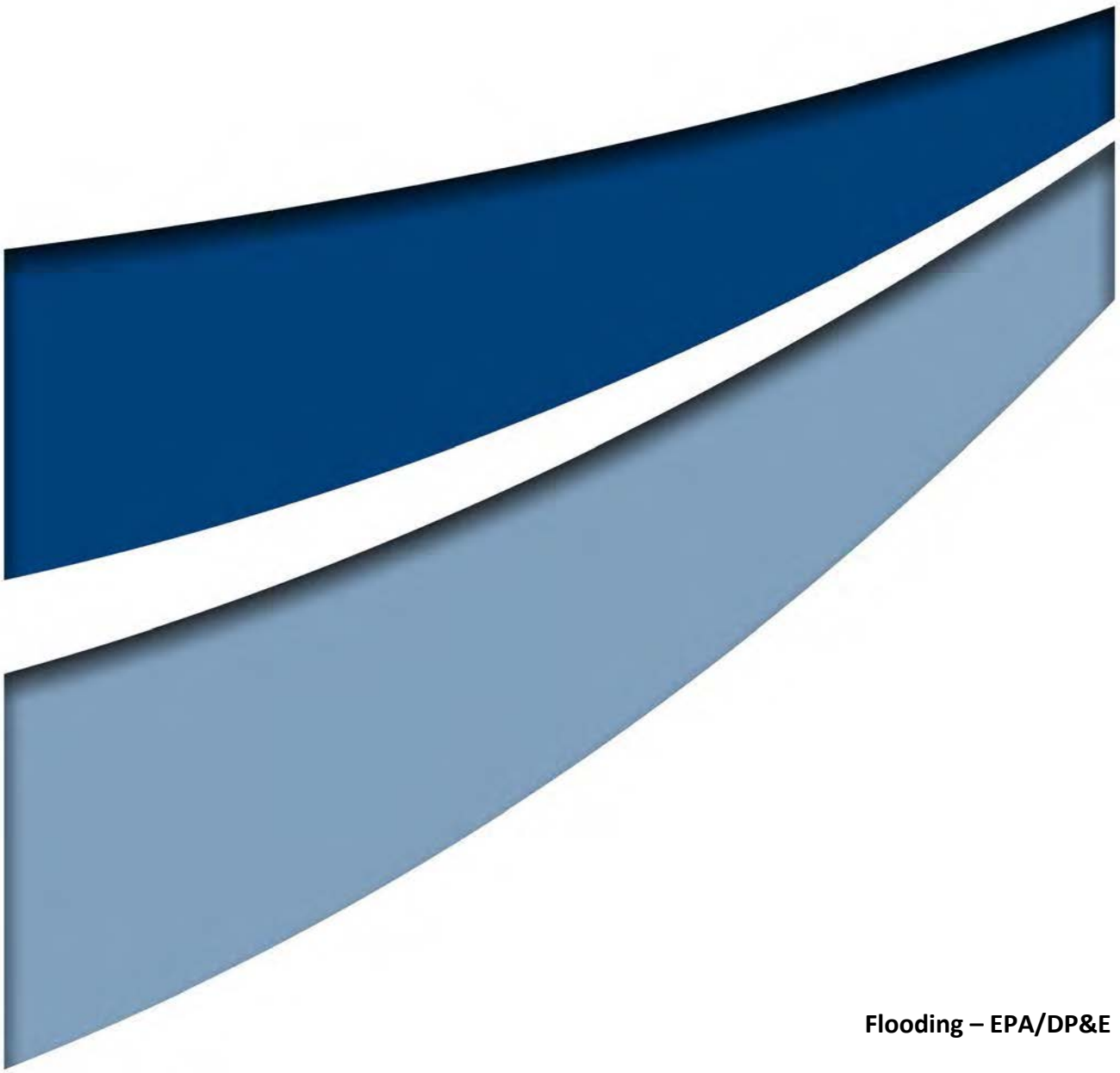
0.01
0.001
0.0001
TDS (ECD2)
TDS (Sed Dams)
TDS (BCM4)
TSS (ECD2)
TSS (Sed Dams)
TSS (BCM4)
O&G (ECD2)
O&G (Sed Dams)
O&G (BCM4)



Flooding – EPA/DP&E

Item 1

Increase in peak flood depths upstream of proposed Bowmans Creek Bridge affects one parcel of land owned by a government authority .

The owner of this land has only been identified as 'government authority' and OEH is not aware of their identity. The government authority should be notified and consulted regarding the impacts of increased flood depths on their land. OEH is not the owner of the land and as such cannot support the development proposal if it has adverse flooding impacts on properties not owned by the proponent. It is up to the proponent and the affected land owner as to what impacts are acceptable and what mitigation measures will be required to a level that is considered satisfactory to both parties. Therefore this mitigation must ensure that the state government is indemnified against any claims for flooding that may be expected in the future as a result of this development

As stated in Section 5.5.6.2 of the EIS, dynamic flood modelling of the waterways and catchments surrounding the Mount Owen Complex was undertaken as part of the Surface Water Assessment. Flood events that were simulated included the 10 per cent, 5 per cent and 1 per cent Annual Exceedance Probability (AEP) events. The flood analysis indicated that increases in flood levels are predicted on Bowmans Creek on Hebden Road associated with the proposed Bowmans Creek Bridge and along Yorks Creek associated with the increased area of the catchment from Year 5 of the Project. In regards to private properties, the analysis indicates that, except for three parcels of land (two of which are adjacent to each other), that are government owned, that flood impacts are limited to mine owned properties. The flood modelling also indicated that the Project will have minimal impact on watercourse stability within the channels of Bowmans Creek and Yorks Creek.

The following additional information is provided regarding the modelled flood depth impacts for the three government owned land parcels. Lot 4 DP 232149 and Lots 1 and 3 DP 561235 are shown on **Figure A**.

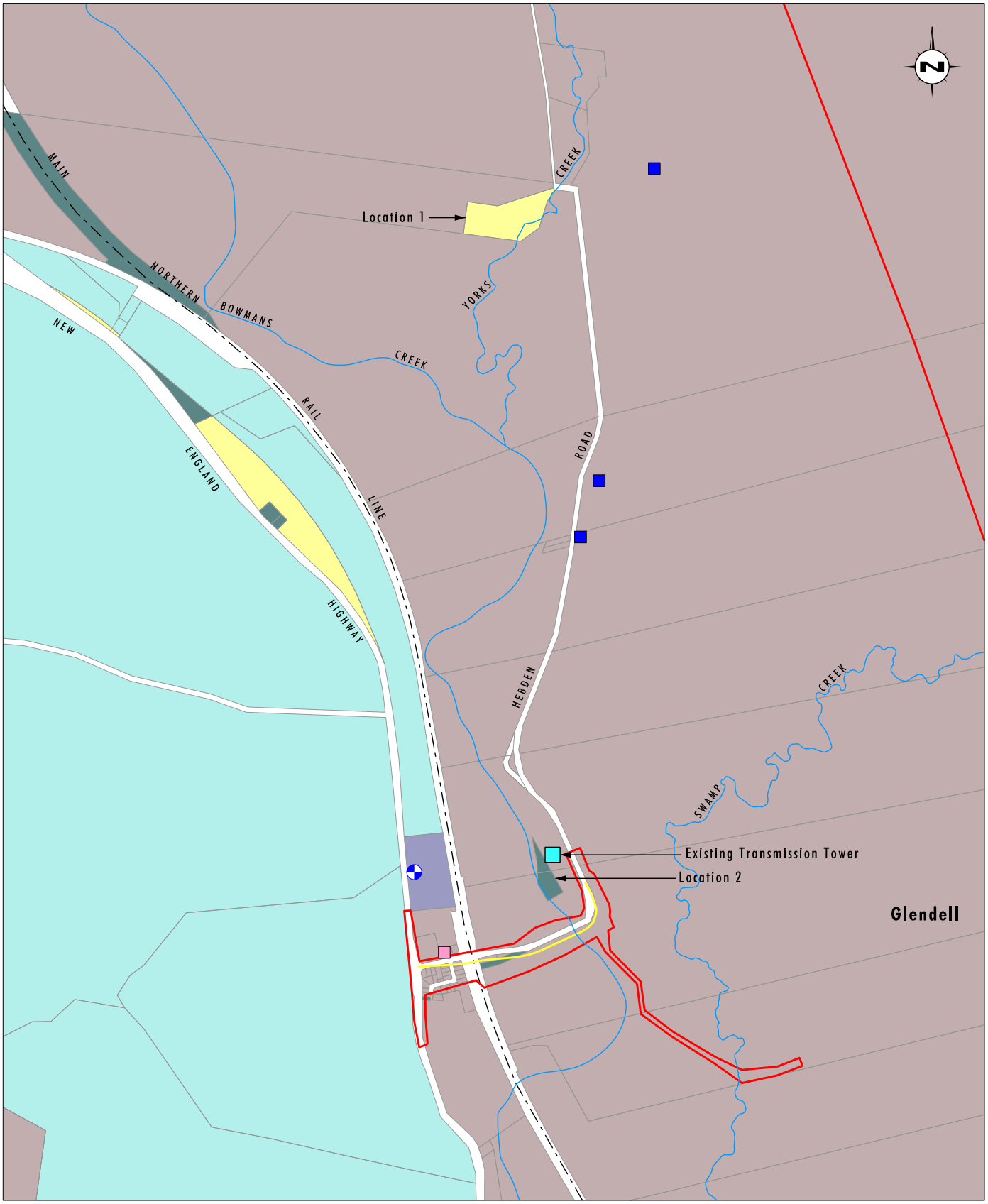
The first parcel of land, Lot 4 DP 232149, is located adjacent to Yorks Creek downstream of the Hebden Road crossing (referred to below and on **Figure A** as Location 1). This lot is registered as being owned by the State of New South Wales and was formerly part of Vol 2701 Fol 95 owned by the Electricity Commission of NSW. Following subdivision in 1967, Lot 4 DP 232149 reverted to Crown Land on 8 April 1967. There is no built infrastructure on this property.

The second and third parcels of land, Lots 1 and 3 DP 561235 (collectively referred to as Location 2 on **Figure A**), are owned by the 'Water Conservation and Irrigation Commission' and are located adjacent to Bowmans Creek upstream of the Hebden Road Bridge. There is no built infrastructure on these properties.

Location 1

Location 1 is located on the western bank of Yorks Creek immediately downstream of Hebden Road (refer to **Figure A**). Flood modelling results were extracted from the Surface Water Assessment flood models for the representative reach in the modelling. These results are considered representative of the flood elevations for Location 1.

Flood modelling results for the current approved final landform and the proposed final landform (representing the Project stages for which the largest catchment area contributes flow to Yorks Creek) are included in **Table 1**. Stage (i.e. elevation) hydrographs for the current approved final landform and the proposed final landform are presented in **Charts 1**, **2** and **3** for the 10 per cent, 5 per cent and 1 per cent AEP storm events respectively. A summary of the modelled impacts to peak flood depths and the duration of out of bank flooding are shown in **Table 2**.



Data Source: Mount Owen (2014), Department of Lands (2009)

0 0.25 0.5 1.0km

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Legend

- Project Area
- Proposed Hebden Road Upgrade Works
- Crown Land
- Government Authority
- Macquarie Generation
- Private
- Daracon Site Office
- Mine Owned Residence - Derelict
- Mine Owned Residence - Vacant
- Existing Transmission Tower
- Drainage Line

FIGURE A

Government Owned land affected by Flooding

Table 1 – Location 1 – Flood Modelling Results

Storm Event	Landform	Peak Depth(m)	Peak Velocity(m/s)	Peak Flow(m^3/s)
10% AEP	Approved Final	2.73	1.18	30.6
	Proposed Final	2.88	1.19	36.4
5% AEP	Approved Final	2.91	1.18	37.5
	Proposed Final	3.02	1.19	43.1
1% AEP	Approved Final	3.29	1.18	71.5
	Proposed Final	3.30	1.20	70.9

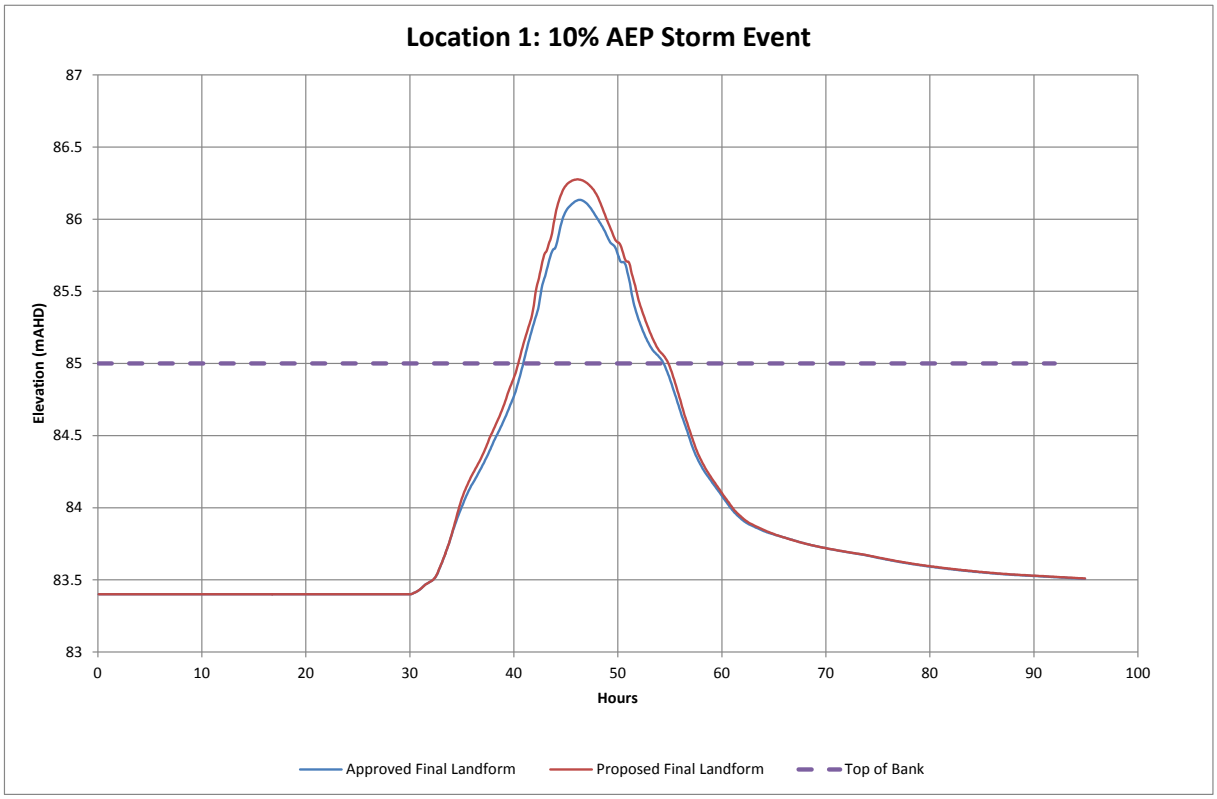

Chart 1 – Location 1 – Stage Hydrograph – 10% AEP Storm Event

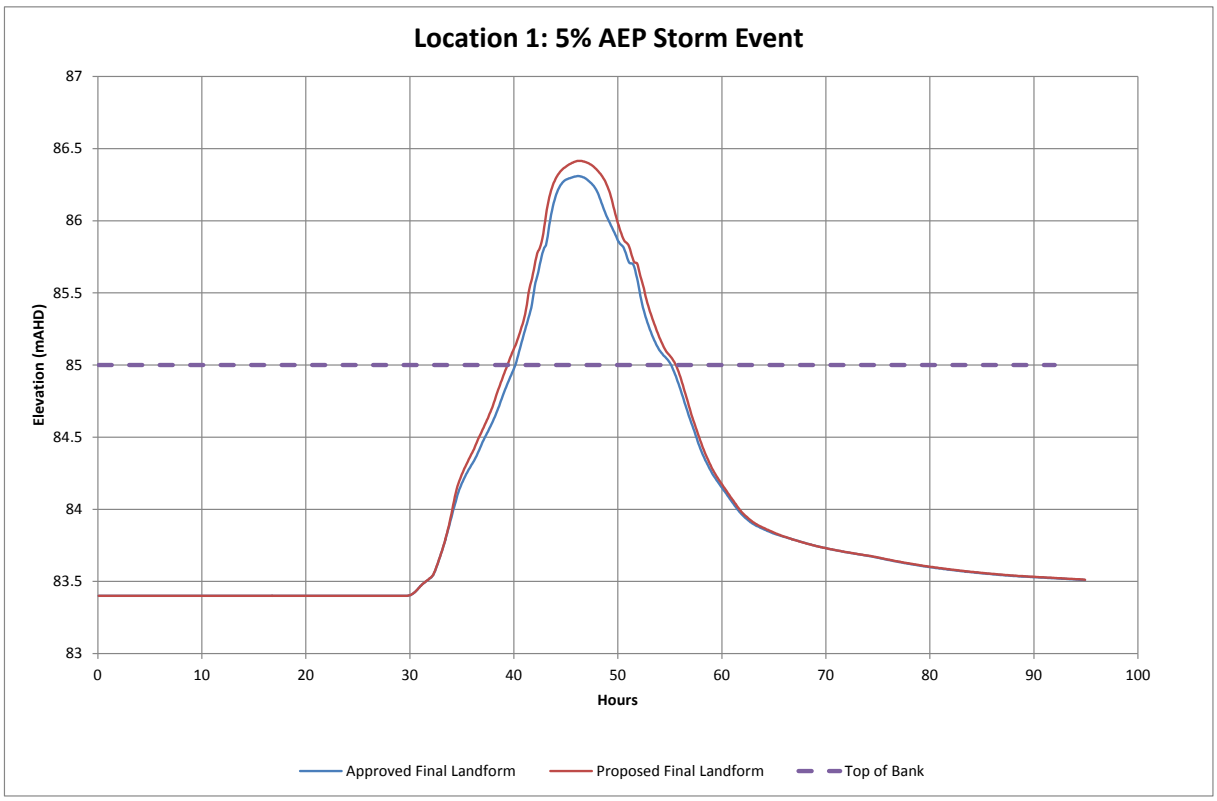

Chart 2 – Location 1 – Stage Hydrograph – 5% AEP Storm Event

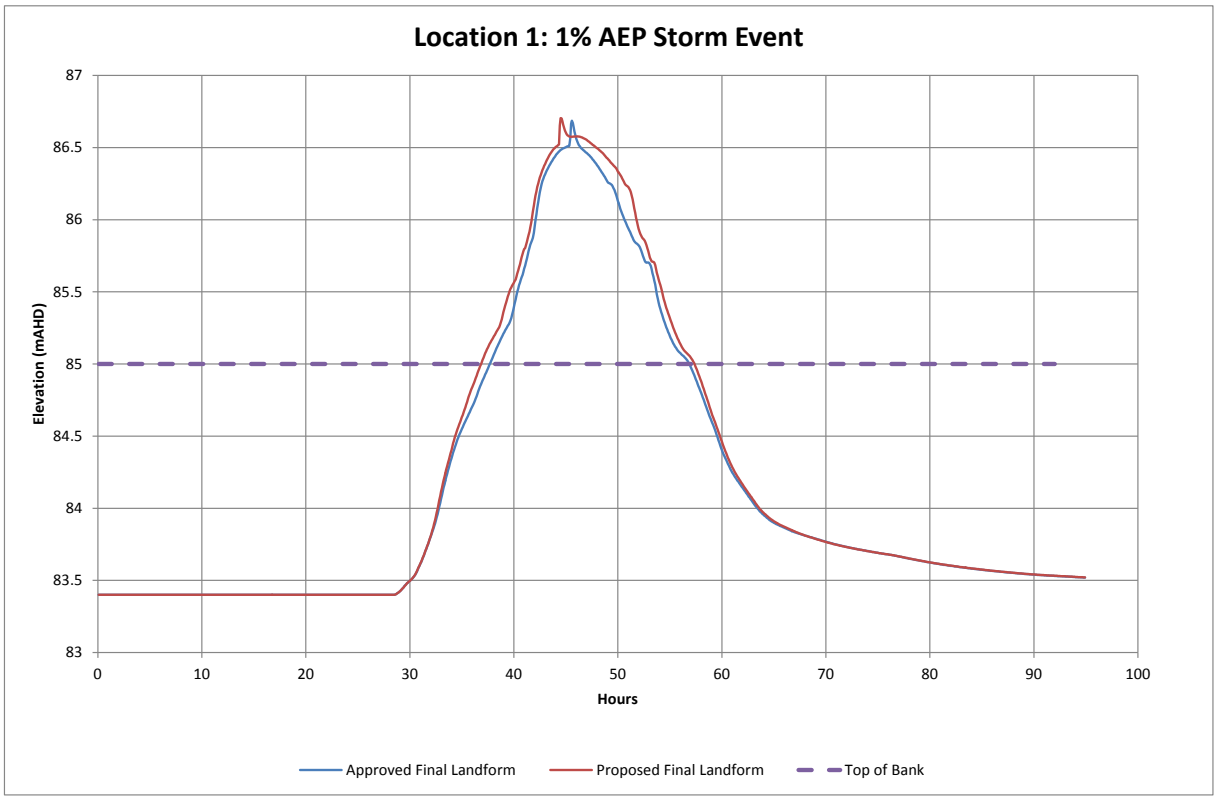

Chart 3 – Location 1 – Stage Hydrograph – 1% AEP Storm Event

Table 2 – Location 1 – Flood Modelling Results – Impact Summary

Storm Event	Change in Peak Flood Depth (m)	Change in Out of Bank Flood Duration (h:min)
10% AEP	0.15	0:55
5% AEP	0.11	0:55
1% AEP	0.01	0:55

The predicted change in modelled flood extent during the 1 per cent AEP storm event at Location 1 is shown on **Figure B**. The figure indicates that the change in the extent of flooding from the approved final landform to the proposed final landform is negligible.

As is shown on **Figure B** and in the data presented above the flooding impacts at Location 1 will result in a small additional flood extent with negligible to minor increases in flood depths ranging between 0.01 metres to 0.15 metres and minor increases in flooding durations of approximately 55 minutes. To put this increase in context, the modelled results indicate that the property would experience flooding for durations ranging between approximately 15 hours for the 10 per cent AEP storm event to approximately 20 hours for the 1 per cent AEP storm event in relation to the currently approved final landform.

Location 2

Location 2 is located on the eastern bank of Bowmans Creek immediately upstream of the Hebden Road Bridge (refer to **Figure A**). Flood modelling results were extracted from the Surface Water Assessment flood models for the representative reach in the modelling. These results are considered representative of the flood elevations for Location 2.

Flood modelling results for the current approved final landform and the proposed final landform are included in **Table 3**. Stage (i.e. elevation) hydrographs for the current approved final landform and the proposed final landform are presented in **Charts 4**, **5** and **6** for the 10 per cent, 5 per cent and 1 per cent AEP storm events respectively. A summary of the modelled impacts to peak flood depths and the duration of out of bank flooding are shown in **Table 4**.

Table 3 – Location 2 – Flood Modelling Results

Storm Event	Landform	Peak Depth(m)	Peak Velocity(m/s)	Peak Flow(m^3/s)
10% AEP	Approved Final	3.70	2.30	382
	Proposed Final	3.78	2.30	383
5% AEP	Approved Final	4.13	2.30	467
	Proposed Final	4.13	2.30	473
1% AEP	Approved Final	4.30	2.30	677
	Proposed Final	4.67	2.29	684

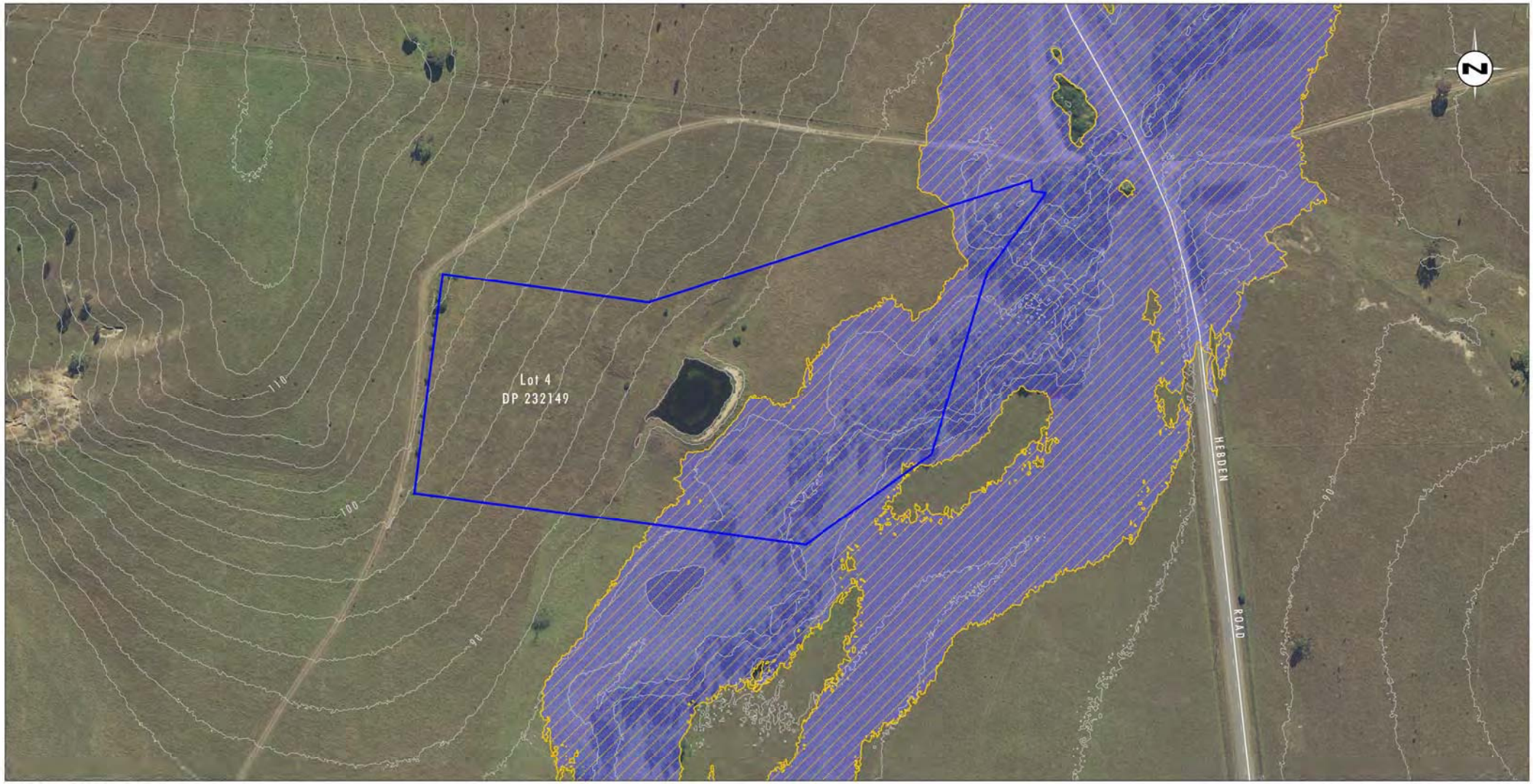

Image Source: Mount Owen (2015)
Note: Contour Interval 2m

0 50 100 150m
1:3 000

Legend

- Location 1 Boundary
- 1% AEP Event Maximum Flood Extent - Final Approved Landform
- 1% AEP Event Maximum Flood Extent - Final Proposed Landform

FIGURE B

Location 1, Yorks Creek, 1% AEP
Storm Event Maximum Modelled Flood Extent
Final Approved Landform and Final Proposed Landform

File Name (A4): R18/3109_1070.dgn
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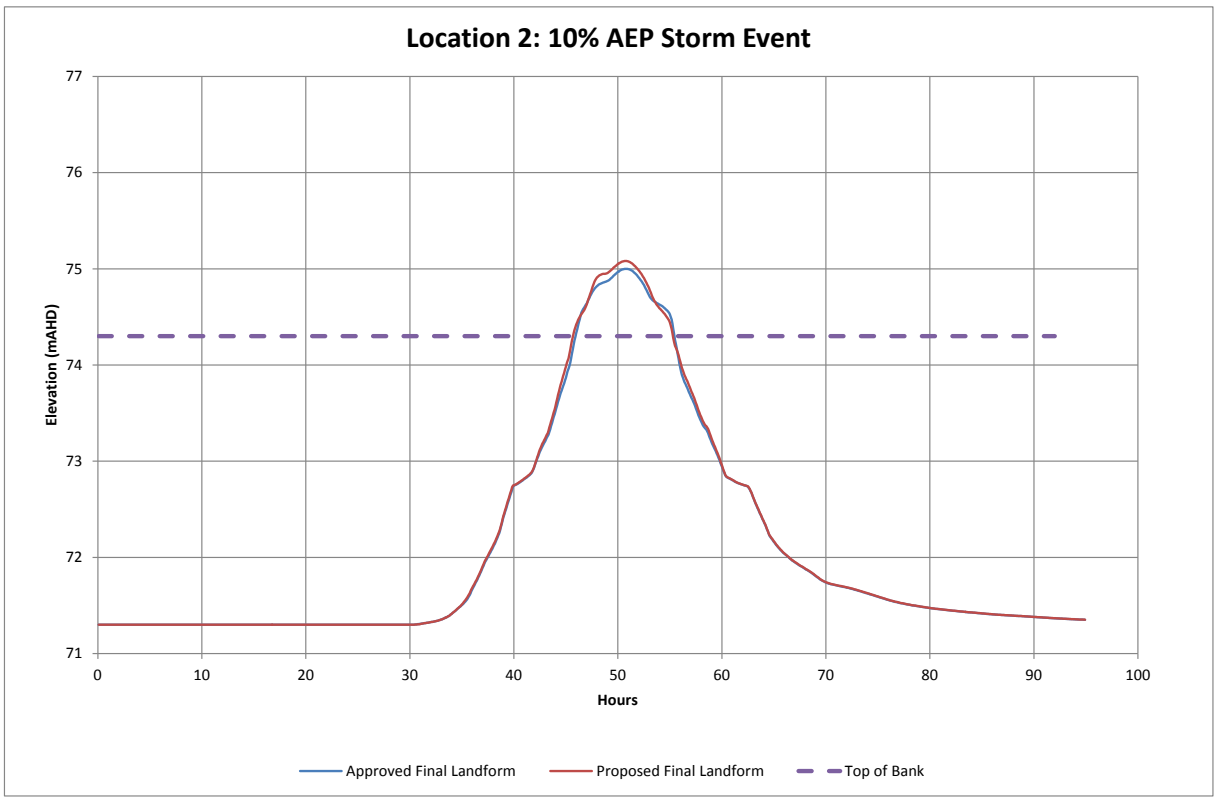

Chart 4 – Location 2 – Stage Hydrograph – 10% AEP Storm Event

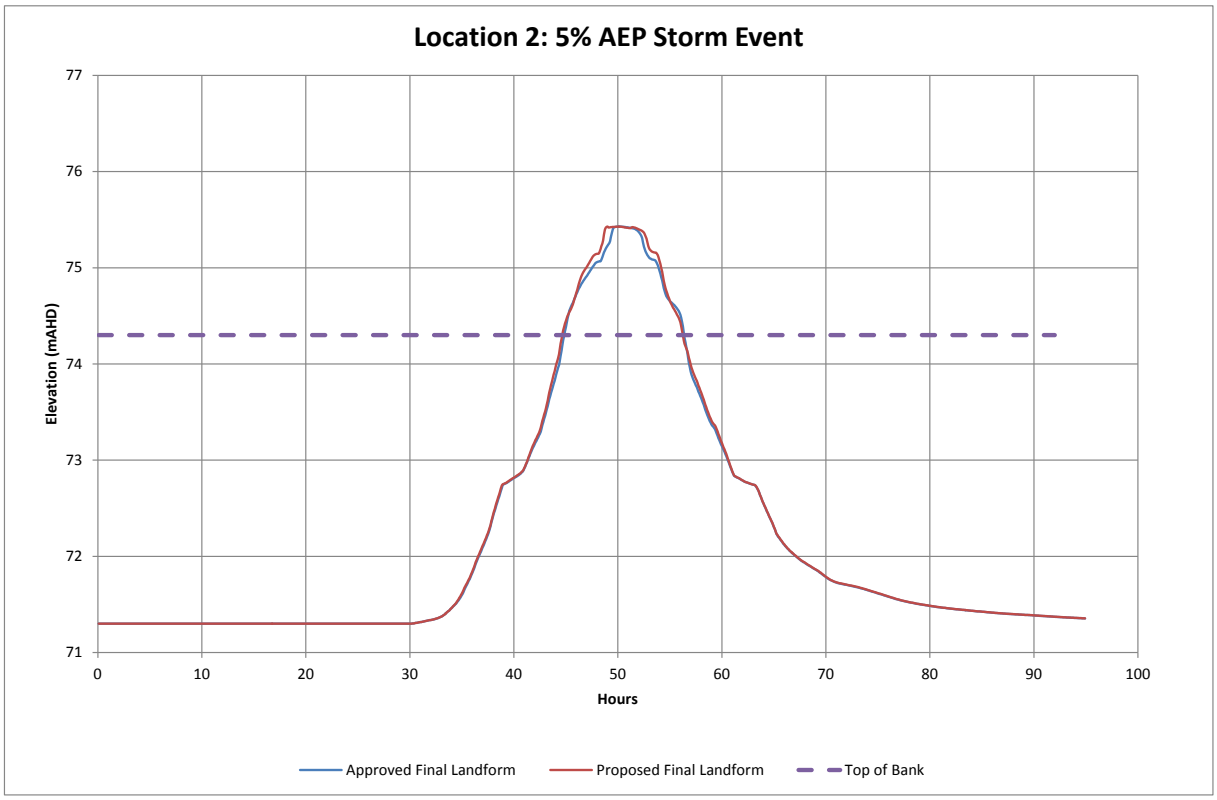

Chart 5 – Location 2 – Stage Hydrograph – 5% AEP Storm Event

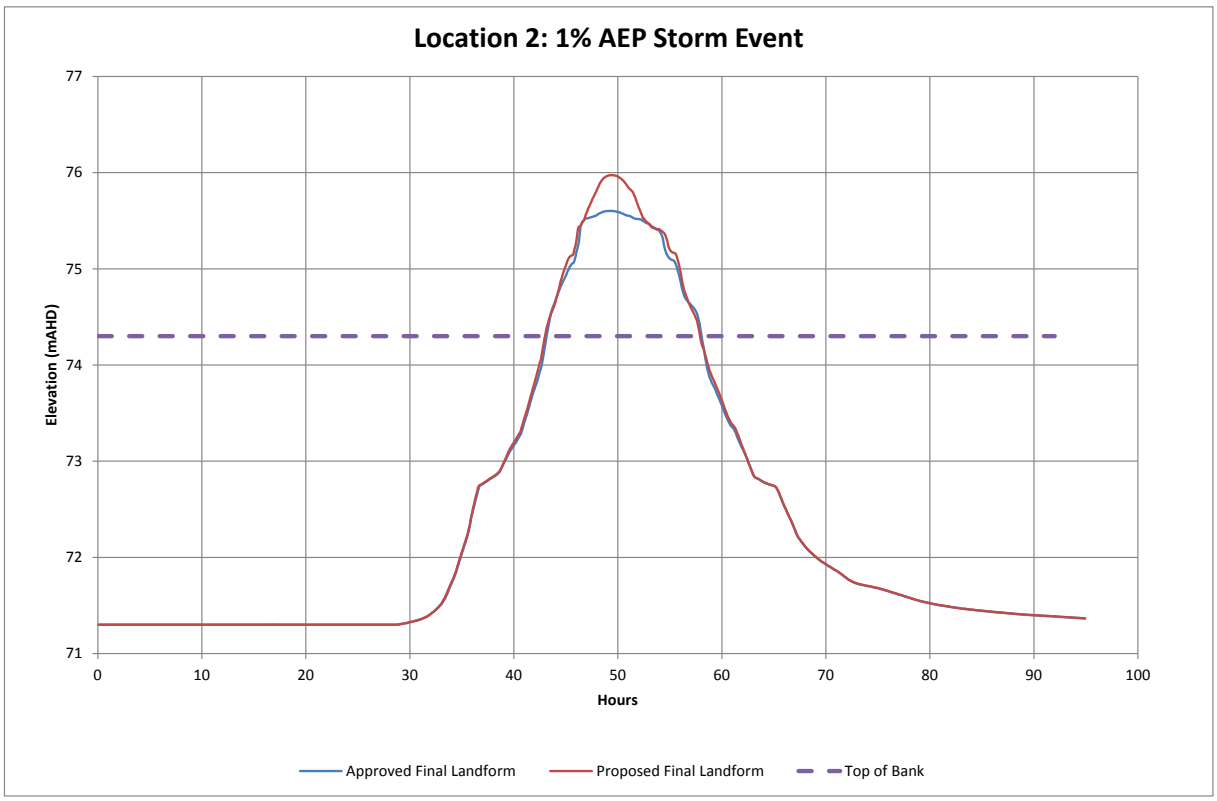

Chart 6 – Location 2 – Stage Hydrograph – 1% AEP Storm Event

Table 4 – Location 2 – Flood Modelling Results – Impact Summary

Storm Event	Change in Peak Flood Depth (m)	Change in Out of Bank Flood Duration (h:min)
10% AEP	0.08	0.05
5% AEP	0.00	0.05
1% AEP	0.37	0.00

The predicted change in modelled flood extent during the 1 per cent AEP storm event at Location 2 is shown on **Figure C**.

Figure C indicates that Location 2 is already almost completely inundated by flooding during the 1 per cent AEP storm event for the approved final landform and the small area remaining above the modelled 1 per cent AEP storm event flood level is isolated by flooding from adjoining land. The modelling indicates that with the proposed final landform, all of Location 2 would be fully inundated by flooding during the 1 per cent AEP storm event. The modelled increased depth of water over Location 2 during the 1 per cent AEP storm event for the proposed final landform is approximately 0.37 metres. There is no infrastructure located on the area of Location 2 that would be inundated during the 1 per cent AEP storm event for the proposed final landform scenario.

In addition the modelling indicates that the duration of flooding over these lots will increased by a negligible amount with increases in flooding durations of up to approximately 5 minutes. To put this increase in context, the modelled results indicate that Location 2 would experience flooding for durations ranging between approximately 10 hours for the 10 per cent AEP storm event to approximately 14 hours for the 1 per cent AEP storm event in relation to the currently approved final landform.

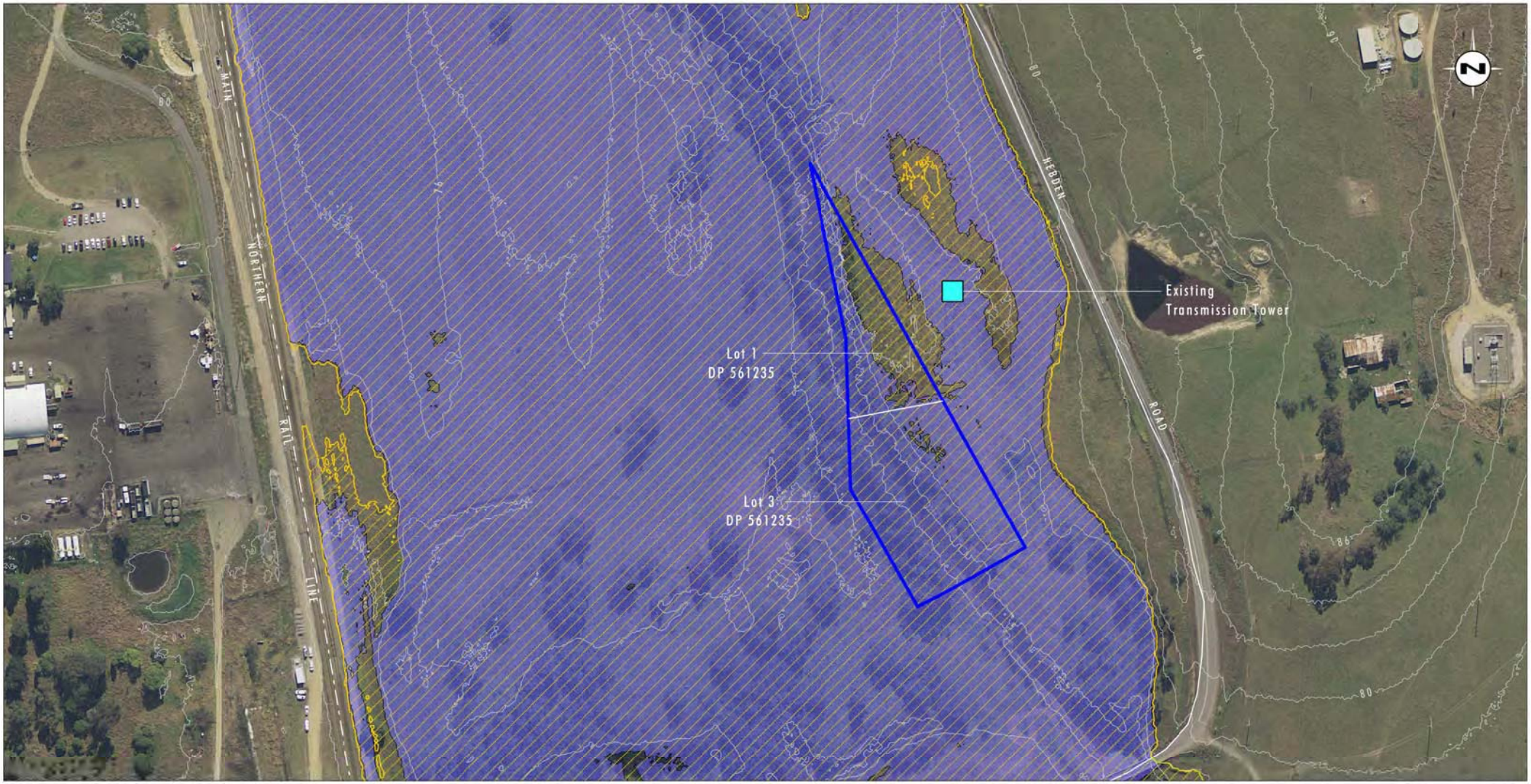

Image Source: Mount Owen (2015)
Data Source: Mount Owen (2015)
Note: Contour Interval 2m

0 50 100 150m
1:3 000

Legend

- Location 2 Boundary
- 1% AEP Event Maximum Flood Extent - Final Approved Landform
- 1% AEP Event Maximum Flood Extent - Final Proposed Landform
- Existing Transmission Tower

FIGURE C

Location 2, Bowmans Creek, 1% AEP StormEvent Maximum Modelled Flood Extent Final Approved Landform and Final Proposed Landform

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20151029 10:12

Transmission Tower upstream of Hebden Road Bridge over Bowmans Creek.

In the meeting held at the Department of Planning and Environment (DP&E) office on 15 September 2015, a query was raised regarding the predicted flooding impacts at the transmission tower on land adjacent to Location 2 (refer to **Figure A**). As shown on **Figure C**, modelling indicates that the base of this transmission tower would already be inundated by flooding during the 1 per cent AEP storm event. Changes to depth of inundation and peak velocity of flood waters as a result of the Project would be similar to those shown for Location 2 in **Table 3** (i.e. an increase in flood depth of approximately 0.37 metres and a minor reduction in peak velocity (from approximately 2.30 m/s to approximately 2.29 m/s). These changes in predicted impacts are considered unlikely to affect the operation or structural integrity of the transmission tower.

Item 2

Increase in depth, hazard category and duration of inundation for the Hebden Road crossing of Yorks Creek.

Hebden Road is a public road. Any adverse change to existing depth or period of inundation of this roadway provides an increased risk to road users and the emergency services in flood events. The proponent is required to demonstrate no additional adverse effects on public infrastructure as a result of the development.

An on-site detention pond and additional culverts under Hebden Road were previously approved to mitigate the effect of increased flows in Yorks Creek and on Hebden Road for the existing approved development footprint. The design of these items should be updated to ensure that there is no increase in depth or duration of inundation of Hebden Road for events up to and including the 1% Annual Exceedance Probability (AEP) event as a result of the proposed additional development. Review of the design could make it possible to ensure that a condition of no increased offsite impacts are met.

As discussed both in the EIS and the Response to Submissions, the Surface Water Assessment determined that mitigation measures are required to mitigate potential flood impacts on Yorks Creek associated with the increased area of this catchment from Year 5 (refer to Section 6.2.2.1 of the Surface Water Assessment). The increased catchment area is associated with the return of runoff from rehabilitated areas to downstream catchments. The proposed mitigation measures include construction of additional off-line detention capacity adjacent to the Ravensworth East Mining Infrastructure Area (MIA) and flow conveyance at Hebden Road. The assessment indicates that the changes to the catchment area of Yorks Creek will not influence flood flows and levels within Bowmans Creek and that impacts of the Project on flood flows in the Yorks Creek catchment will be limited to Yorks Creek.

An assessment of the Hebden Road crossing over Yorks Creek with the proposed flood mitigation measures (refer to Section 6.2.2.1 of the Surface Water Assessment) indicates no change in the maximum flood hazard category for the 1 per cent AEP and 10 per cent AEP storm events relative to the existing approved final landform. The modelling indicates an increase in maximum flood hazard category for the 5 per cent AEP storm event relative to the existing approved final landform. The change in maximum flood hazard category at the Hebden Road crossing over Yorks Creek for the 5 per cent AEP storm event is primarily driven by an increase in the maximum flood depth over the road due to the additional catchment area associated with the return of runoff from rehabilitated areas to downstream catchments. Hebden Road is currently impassable to vehicles during the 5 per cent AEP event. With the Project there will be a small period where the road is also impassable to pedestrians. It should be noted that this is a rural road with no footpath provided and pedestrian traffic along the road in this area is highly unlikely given the distance to the nearest residence (approximately 8 kilometres by road).

Analysis of the modelling results also indicates an increase in the duration that the Hebden Road crossing over Yorks Creek would be impassable to vehicles (based on the flood hazard category analysis) during the 1 per cent AEP storm event from 6 hours 45 minutes to 7 hours 35 minutes (i.e. an increase of 50 minutes) and 5 per cent AEP storm event from 3 hours 20 minutes to 4 hours 30 minutes (i.e. an increase of 70 minutes).

As discussed in the Response to Submissions, the Project is not expected to place any extra requirements on the SES for assistance during flooding times.

Further to discussions with DP&E, Mount Owen, in consultation with Singleton Council, proposes to install flood warning signs along Hebden Road near the Yorks Creek crossing. These signs will be NSW Roads and Maritime Service (RMS) standard warning signs to advise drivers that the road ahead may be covered in floodwaters and flood depth signs to show the depth of floodwaters across the road (refer to **Plate 1**). The signs would be placed, in accordance with RMS standards to the north and south of the Yorks Creek crossing on Hebden Road (outside of the 1 per cent AEP storm event flood extent).

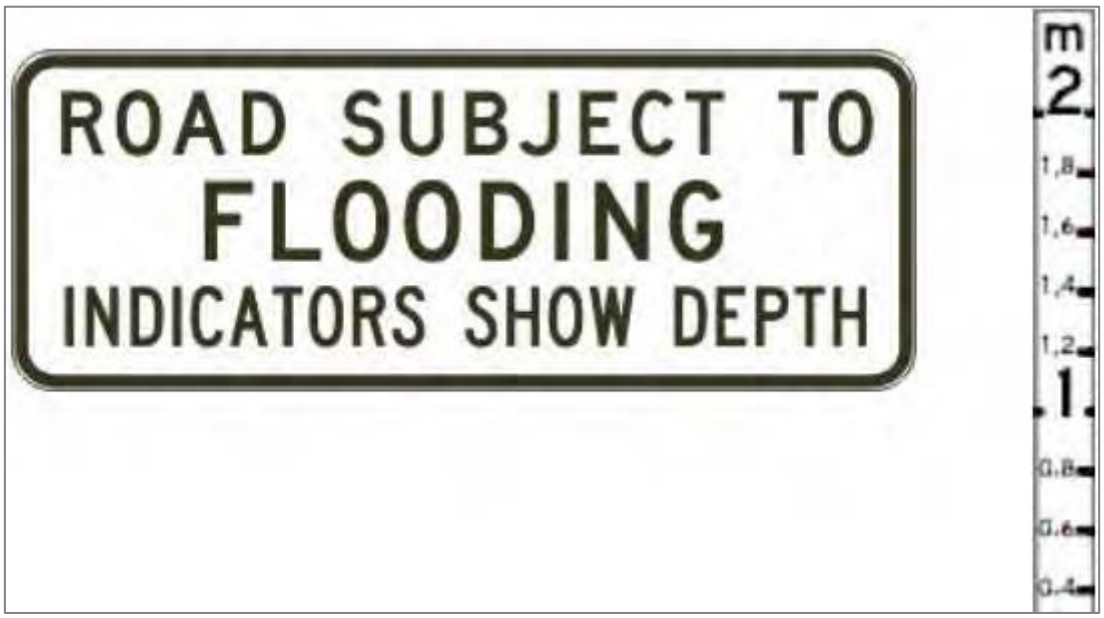
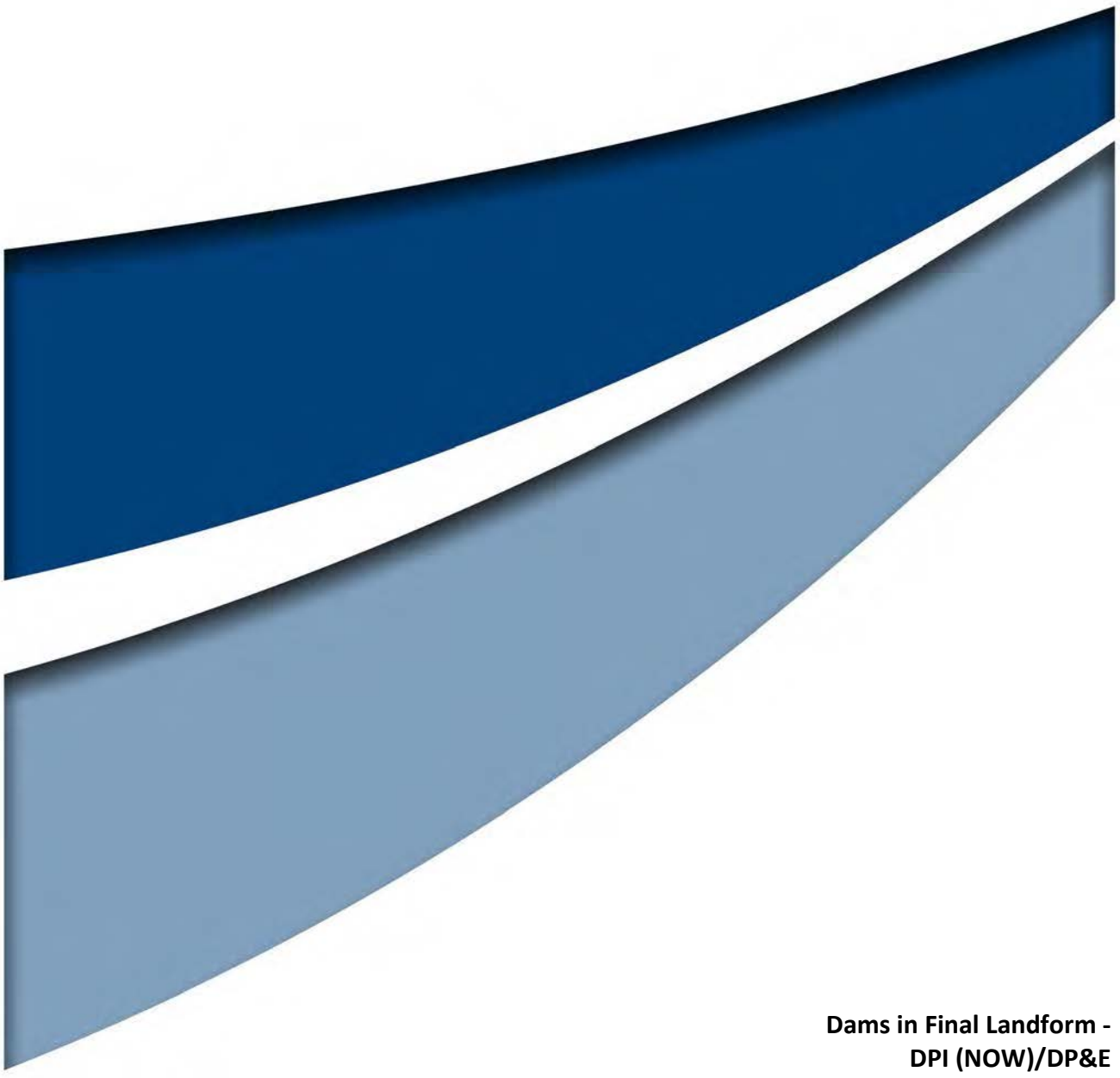


Plate 1 – Flood Warning Signs
(Source: RMS)



Dams in Final Landform -
DPI (NOW)/DP&E

Water

The review should include a specific section focusing on the management of water resources in the final landform. This section should address DPI Water's concerns regarding the ability of Glencore to license the water take in the final landform and provide details on:

· the number and volume of dams in the final landform;

· licensing requirements for any post-mining water take (including take associated with the proposed final dams and voids);

· a specific plan detailing how Glencore would acquire adequate surface water and groundwater licences to account for the above take; and

· any amendments to the long term surface flows or water take that may arise as a result of the above reviews of the final landform.

Dams may be required in the final landform for a number of reasons with the three primary purposes being:

- Long term management of drainage in the final landform (for example, their ongoing use as detention areas to reduce flow velocities downslope and continue the operation of the established clean water management systems whilst maintaining drainage and creek line stability)

- Use to support final land uses in the Project area (e.g. farm dams for stock watering or water storages for other uses)

- Environmental purposes (for example, the retention of dams with developed ecosystems will have biodiversity value in the final landform).

The number of dams in the final landform will depend on the final details of final land use and landform which will be progressively developed and refined over the life of the Project.

All dams to be retained in the final landform will be fully licensed in accordance with licensing requirements in force at the time. Dams which cannot be licensed due to limitations on available water allocations or other reasons will be removed prior to closure using the procedures identified in Section 3.0 of the Mine Closure and Rehabilitation Strategy (Appendix 18 of the EIS).

The primary water "use" identified for the dams at this stage consists of evaporation and stock watering. The water usage and volumetric licensing requirements for these dams are estimated in **Table 1** below for both the Glennies Water Source and Jerrys Water Source (Hunter Unregulated and Alluvial Water Source Water Sharing Plan). **Table 1** also includes average predicted drawdown in alluvial systems associated with the Project to provide a complete picture of potential licensing requirements from these water sources.

Table 1 – Estimated Water Use

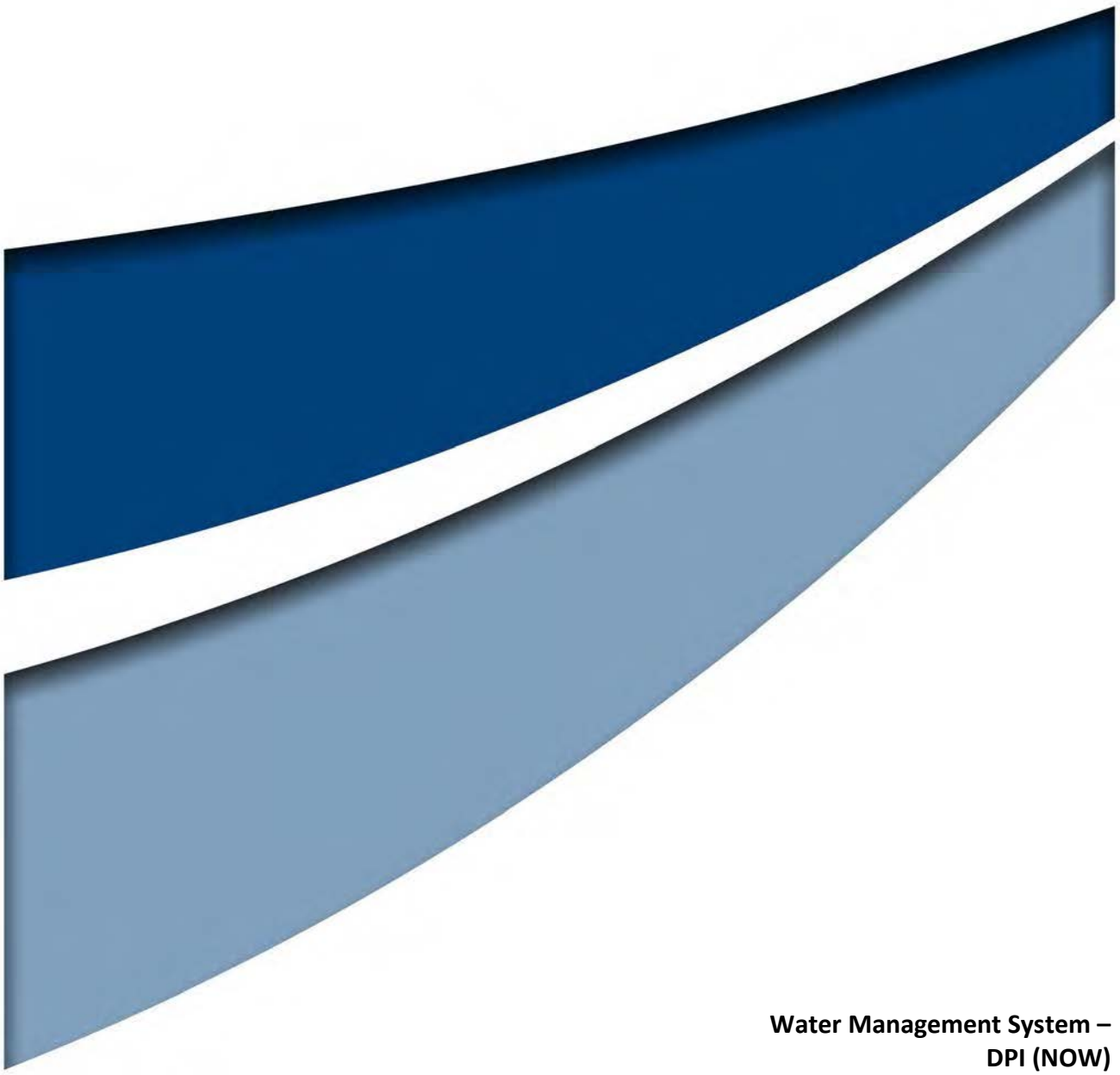
Estimated Usage	**Water Source**	
	Jerrys	**Glennies**
Open Grassland (ha)	596	0
Average Stock Numbers*	295	0
Average Stock Water Demand (ML/year)*	7.9	0
Total Dam Surface Area (ha)	45.1	2.7
Evaporative Water Losses (ML/year)	492	29
Average predicted alluvial drawdown (ML/year)	6	15
Total Average Water Use (ML/year)	**506**	**47**

* estimate based on Agriculture Impact Assessment

This estimate is based on retention of all dams shown on **Figure A** which assumes the mine water dams, ECD1, ECD2 and the CHPP Raw Water Dam, will be removed as part of the mine closure process. The estimate is considered to be conservative as, in reality, many of the sediment dams included in the estimate are likely to be removed as part of the mine closure process and development of a final landform sympathetic with the surrounding topography.

Mount Owen currently holds 200 unit shares within the Jerrys Water Source and has access to 450 unit shares within Glennies Water Source (under the Hunter Unregulated and Alluvial Water Source) as part of Glencore's acquisition of Integra Underground Operations (refer to previous response regarding water licensing for proposed drawdown impacts in alluvial aquifers). In addition, the total landholdings of Mount Owen are approximately 4,913 hectares which equates to approximately 344 ML/year in Harvestable Rights Provisions. Note that this does not include the Ravensworth State Forest Land Holdings. Dam K, Dam J, ECD3, Dam 5 and part of Dam 6 lie within the boundary of the Ravensworth State Forest. These dams are all likely to be retained in the final landform due to the need to divert water around the North Pit Overburden Emplacement Areas and to retain the habitat that is established in these dams.

Should all of these dams be retained in the final landform, Mount Owen would be able to utilise the existing unit shares in the Jerrys Water Source and the Glennies Water Source (under the Hunter Unregulated and Alluvial Water Source) (respectively) to meet future water access licence requirements. The information presented above indicates that a combination of the existing held unit shares for the Jerrys Water Source and harvestable rights provisions would be sufficient to meet all water access licence requirements for the Jerrys Water Source (i.e. licence requirements related to surface and alluvial 'usage' associated with the Project in the Bowmans Creek catchment area). Similarly, the information above indicates that the current held unit shares for the Glennies Water Source will be sufficient to meet all water access licence requirements in this water source (i.e. licence requirements related to the surface and alluvial 'usage' associated with the Project and Integra Underground Operations in the Glennies Creek catchment area).



Water Management System –
DPI (NOW)

The following comments are in reference to Figures 4.1 – 4.5 in Appendix 9, Surface Water Assessment, of the EIS and Figures 4.6 – 4.8 in the RTS in relation to the clean water management system. DPI Water requires further consultation in development of the Surface Water Management Plan prior to commencement in regards to these comments:

- ***In Year 1 of the project, there are clean water diversions north-west of Ravensworth East into Dam X (as shown in Figure 4.2 of the EIS), which is a dirty water dam. Further explanation of this clean water capture in dirty water dams is required.***

  This area, while planted, is still in a rehabilitation establishment phase and runoff from this area is not predicted to be of sufficient quality to discharge to the environment until closure.

  This flowpath has been updated to be shown as a dirty water drain in Figures 4.2 and 4.4 in the Surface Water Assessment. The characterisation of the catchment as being part of the water management system in Figures 4.6, 4.7 and 4.8 of the RTS Report A is correct.

- ***In Year 1 of the project there are clean water diversions into dam AG (as shown in Figure 4.2 of the EIS), which is a dirty water dam. Further explanation of this clean water capture in dirty water dams is required.***

  This flowpath has been updated to be shown as a dirty water drain in Figure 4.2 as it manages runoff from rehabilitated areas which, while planted, are still in establishment phase. Runoff from this area is not predicted to be of sufficient quality to release to the environment until approximately Year 5 of the Project. The characterisation of the catchment as being part of the water management system in Figure 4.6 of the RTS Report A is correct.

- ***In Years 1, 5 and 10 there appears to be a larger area of clean water runoff south of the southern remnant offset that flows into Dam AC and the Freshwater Dam and subsequently into the Rail Loop Dam (mine water dam) (as shown in Figures 4.2, 4.3 and 4.4 of the EIS). This area of clean water capture does not appear to be shown in Figures 4.6, 4.7 and 4.8 of the RTS.***

  The rehabilitated areas shown on Figures 4.2, 4.3 and 4.4 to the south-east of the Freshwater Dam have been planted but are still in a rehabilitation establishment phase. Runoff from this area is not predicted to be of sufficient quality to discharge to the environment until closure. These flowpaths have been updated to be shown as dirty water drains on the figures.

- ***In Years 5 and 10 there are clean water diversions from Ravensworth East into Dam X (as shown in Figures 4.3 and 4.4 of the EIS), which is a dirty water dam. Further explanation of this clean water capture in dirty water dams is required.***

  See earlier response.

- ***In years 5 and 10 there appears to be additional area of clean water capture north of Dam BB that flows into ECD1. This area of clean water capture does not appear to be shown in Figures 4.7 and 4.8 of the RTS.***

  The clean water drains identified in Figures 4.3 and 4.4 of the SWA have been inadvertently left off Figure 4.2 however it should be noted that Figure 4.2 includes dirty water drains in this location which is an accurate characterisation of the catchment. The characterisation of the catchment as being part of the water management system in Figure 4.7 and 4.8 of the RTS Report A is correct.

- ***In Year 10 there appears to be clean water captured in Dam AD (subsequently going into ECD1) that is not shown in the area of clean water capture in Figure 4.8.***

  This area, while planted, is still in the rehabilitation establishment phase and runoff from this area is not predicted to be of sufficient quality to discharge to the environment until closure.

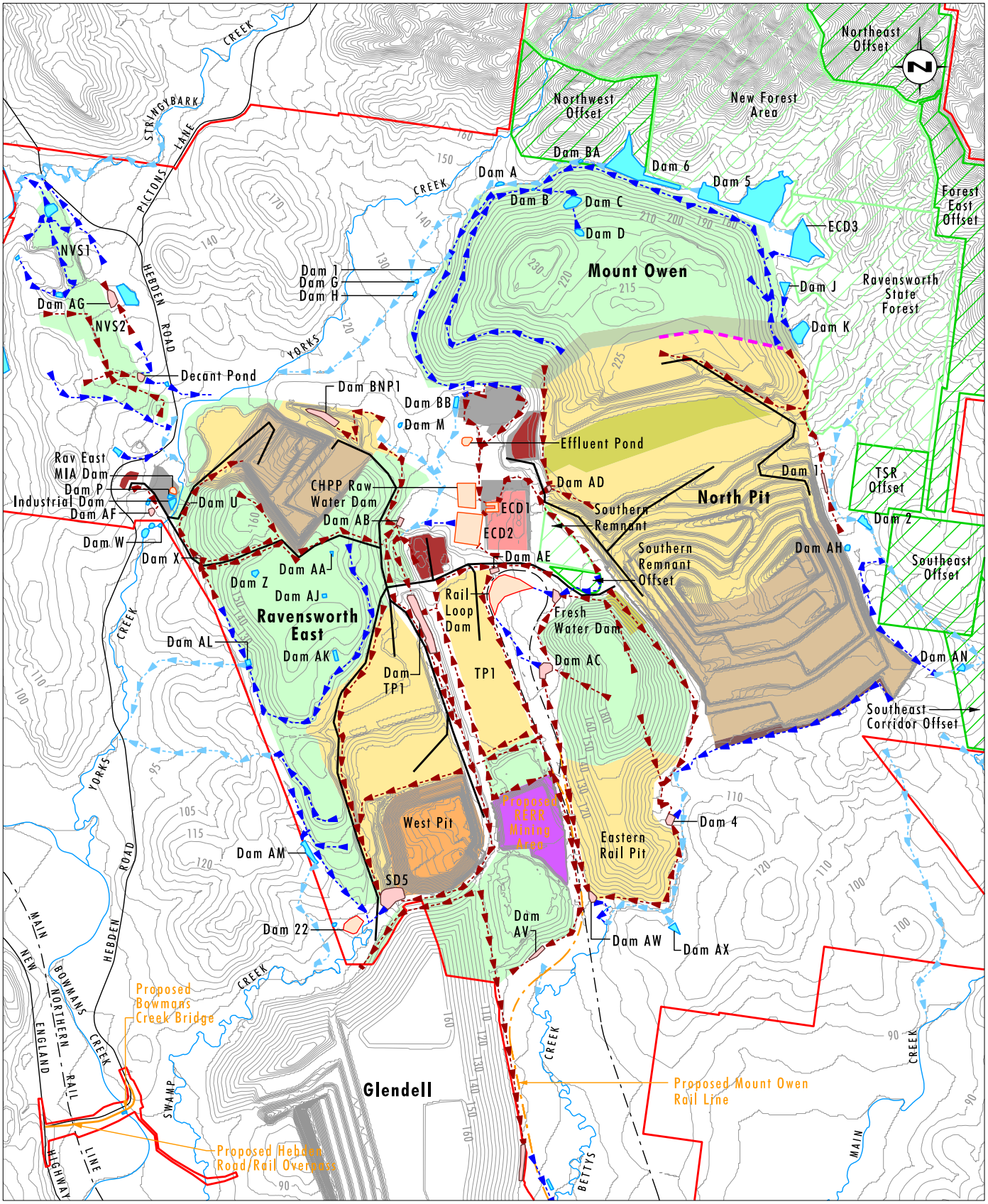
This flowpath has been updated to be shown as a dirty water drain in Figures 4.2 and 4.4 in the Surface Water Assessment. The characterisation of the catchment as being part of the water management system in Figure 4.8 of the RTS Report A is correct.

- ***In year 10 there are clean water diversions into SOS (as shown in Figure 4.4 of the EIS), which is a dirty water dam. Further explanation of this clean water capture in dirty water dams is required.***

  The rehabilitated areas of the catchment of SD5, while planted, is unlikely to be of sufficient standard that the runoff from these areas will be of sufficient quality to discharge to the environment. All flowpaths shown as flowing to SD5 should be shown as dirty water drains.

  The characterisation of the catchment as being part of the water management system in Figure 4.8 of the RTS Report A is correct.

Updated water management **Figures 4.2** to **4.4** reflecting the above are enclosed with this response. There are no changes to Figures 4.6 to 4.8 in the RTS Report A.



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD). Subject to refinement as part of WMP process

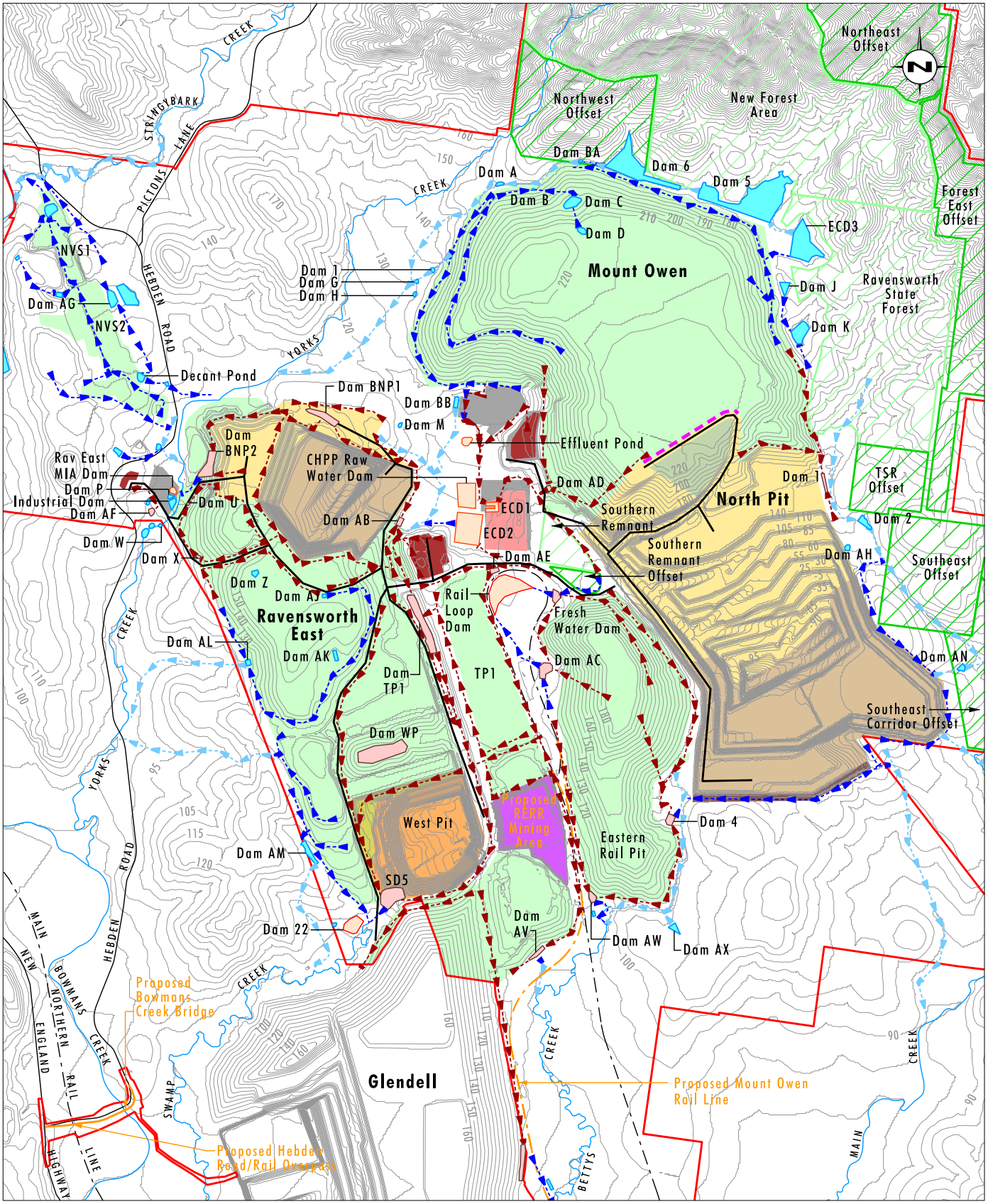
Legend

- Project Area
- Existing Biodiversity Offset Areas
- Ravensworth State Forest
- Existing Railway
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Clean Water Dam
- Sediment Dam
- Mine Water Dam
- Existing Flow Path
- Clean Water Diversion Drain
- Dirty Water Drain
- Windrow
- Drainage Line
- Haul Road
- Active Mining Area
- Active Overburden Emplacement Area
- Topsoil Removal
- Coal Stockpile - Product
- Coal Stockpile - ROM
- Infrastructure
- Proposed RERR Mining Area
- Rehabilitation - Complete
- Rehabilitation - Temporary
- Shaped Not Seeded
- Tailings Placement

FIGURE 4.2

Conceptual Surface Water Management Year 1

File Name (A4): R18/3109_1080.dgn
20140916 10.29



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD). Subject to refinement as part of WMP process

0 0.5 1.0 2.0km
1:40 000

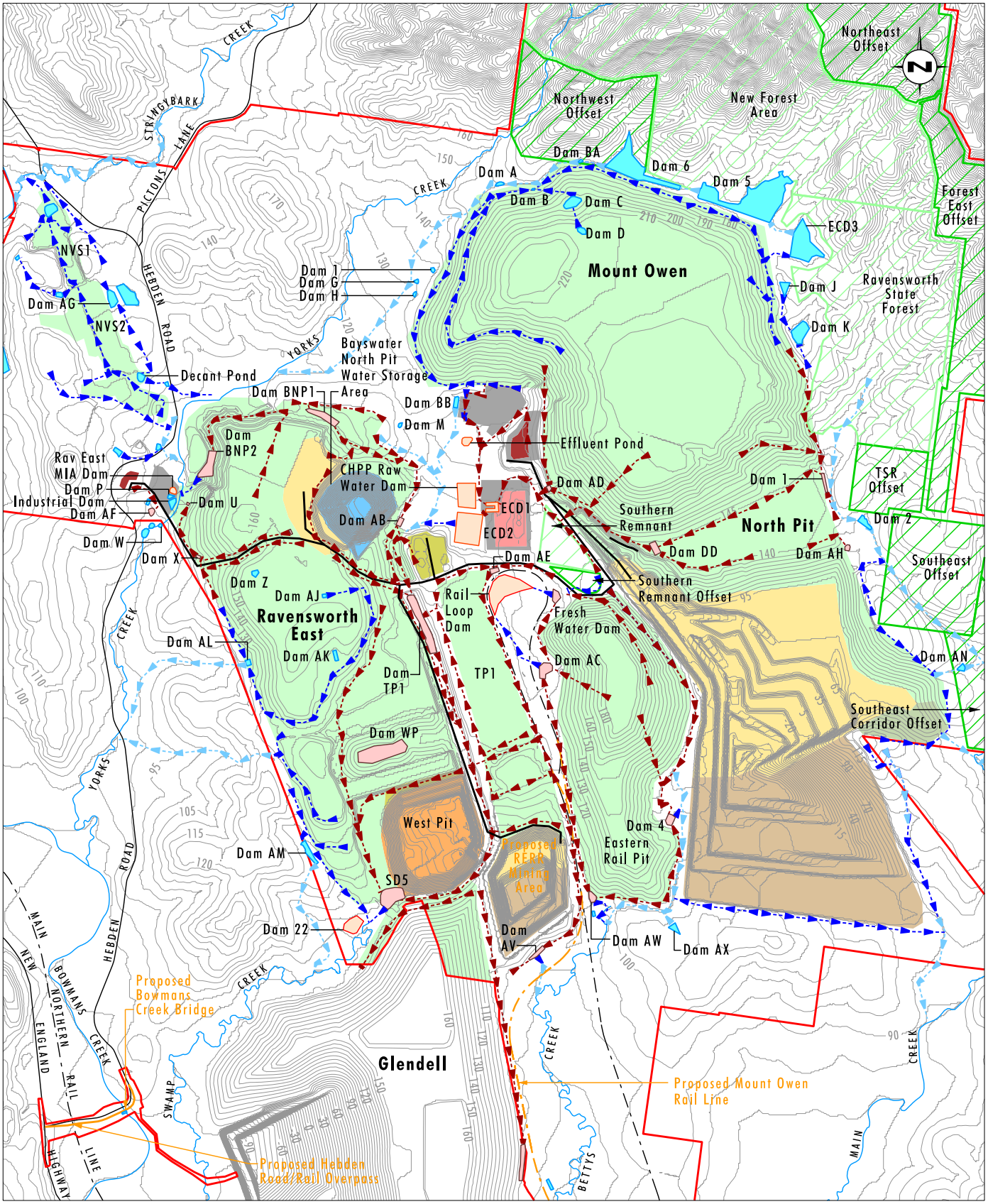
Legend

- Project Area
- Existing Biodiversity Offset Areas
- Ravensworth State Forest
- Existing Railway
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Clean Water Dam
- Sediment Dam
- Mine Water Dam
- Existing Flow Path
- Clean Water Diversion Drain
- Dirty Water Drain
- Windrow
- Drainage Line
- Haul Road
- Active Mining Area
- Active Overburden Emplacement Area
- Topsoil Removal
- Coal Stockpile - Product
- Coal Stockpile - ROM
- Infrastructure
- Proposed RERR Mining Area
- Rehabilitation - Complete
- Rehabilitation - Temporary
- Shaped Not Seeded
- Tailings Placement

FIGURE 4.3

Conceptual Surface Water Management Year 5

File Name (A4): R18/3109_1081.dgn
20140916 10.36



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD). Subject to refinement as part of WMP process

0 0.5 1.0 2.0km
1:40 000

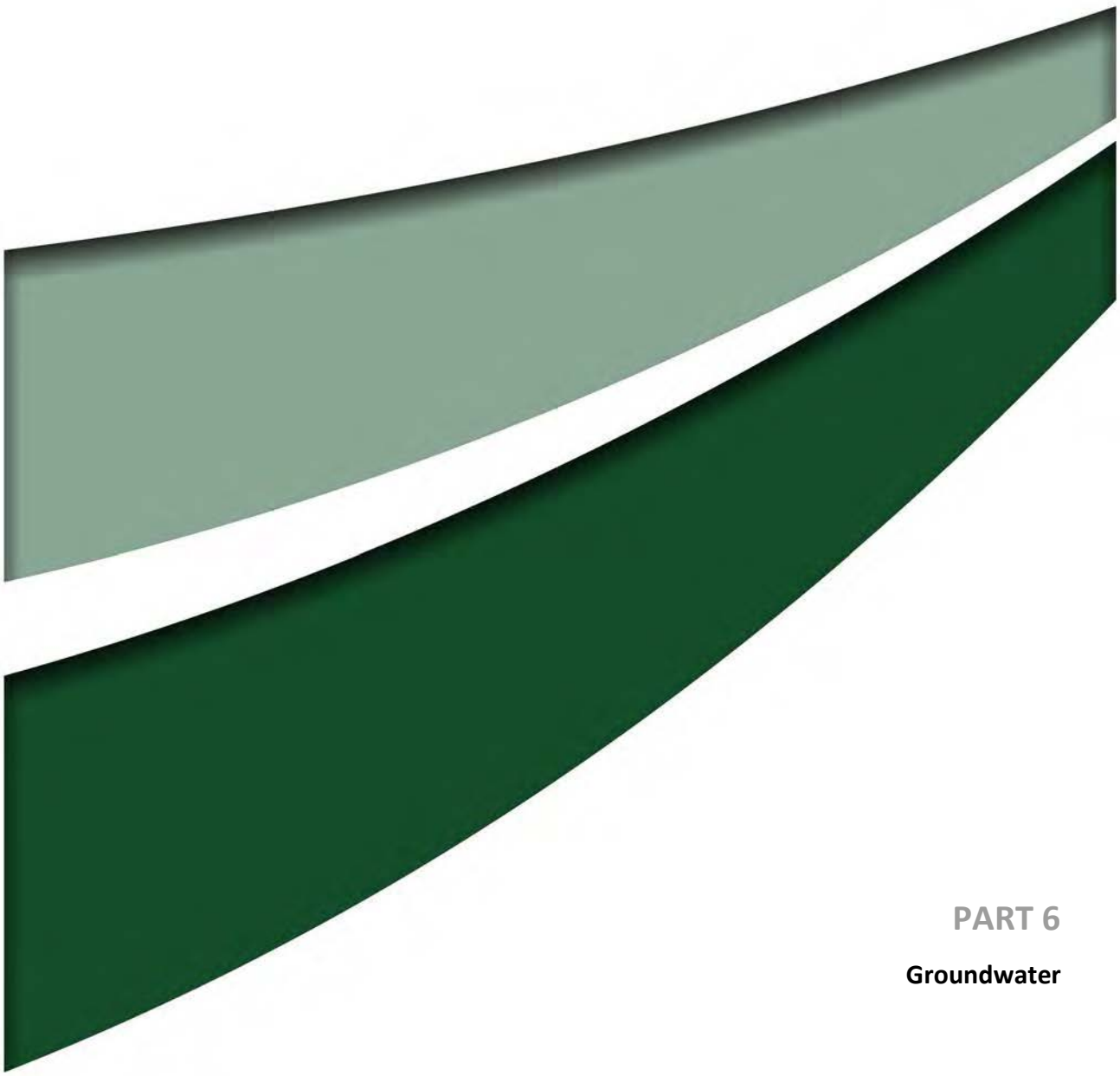
Legend

- Project Area
- Existing Biodiversity Offset Areas
- Ravensworth State Forest
- Existing Railway
- Proposed Rail Upgrade Works
- Proposed Hebden Road Upgrade Works
- Clean Water Dam
- Sediment Dam
- Mine Water Dam
- Existing Flow Path
- Clean Water Diversion Drain
- Dirty Water Drain
- Drainage Line
- Haul Road
- Active Mining Area
- Active Overburden Emplacement Area
- Coal Stockpile - Product
- Coal Stockpile - ROM
- Infrastructure
- Rehabilitation - Complete
- Rehabilitation - Temporary
- Shaped Not Seeded
- Tailings Placement
- Water Storage Area

FIGURE 4.4

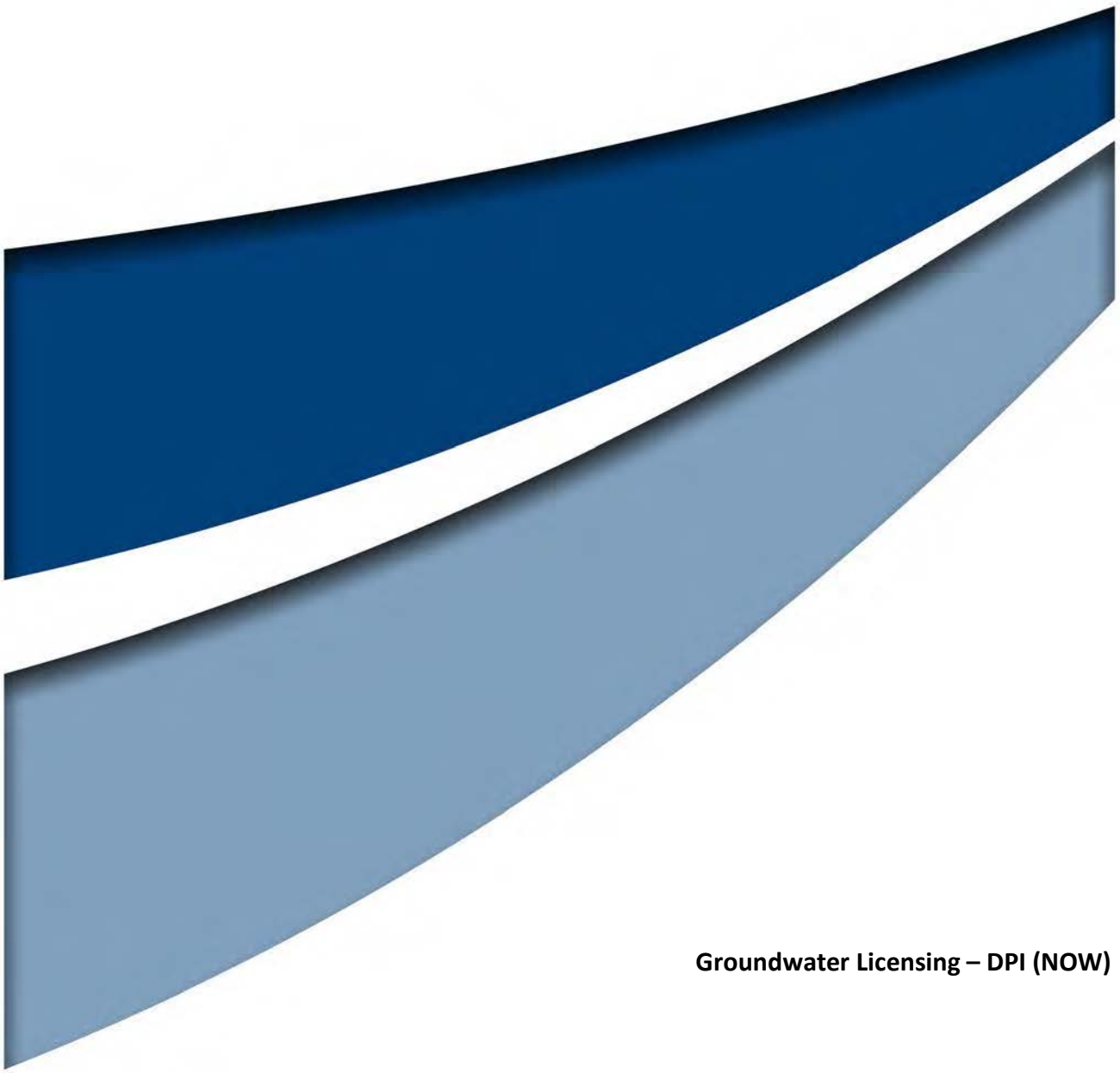
Conceptual Surface Water Management Year 10

File Name (A4): R18/3109_1082.dgn
20140916 10.43



PART 6

Groundwater



Groundwater Licensing – DPI (NOW)

DPI Water - Groundwater

Groundwater licences

Predicted peak take from alluvial aquifers is 6 ML from Betty's Creek alluvium (Jerry's Water Source) and 15 ML from Main Creek alluvium (Hunter Regulated River Alluvial Water Source within the Hunter Unregulated and Alluvial Water Sharing Plan (WSP)).

Mount Owen states that the project is not predicted to have any impact on alluvial aquifers in the Bettys Creek alluvium and Main Creek Alluvium until 2021 and 2023 respectively, and that requiring Mount Owen to hold these licences prior to any impacts occurring would effectively sterilise 21 ML of water in this system in the intervening period, creating a greater impact on available water resources in these alluvial aquifers.

DPI Water requires a written strategy prior to commencement outlining the timing and mechanisms for how this entitlement will be acquired before any take of water from the alluvial aquifers occurs. This should include a comprehensive analysis of the proposed water supply arrangements against the rules for access licences and requirements of the Hunter Unregulated WSP, including analysis of the market depth within the relevant water sources that displays the ability to acquire the necessary entitlements and also the ability to carry out a "dealing" to transfer the water under the rules of the WSP.

Extractions from the Bettys Creek alluvium is regulated as part of Jerrys Water Source. Mount Owen currently hold 200 shares in the Jerrys Water Source which is sufficient to cover the predicted drawdown from the Bettys Creek alluvium and all other approved extractions from this water source.

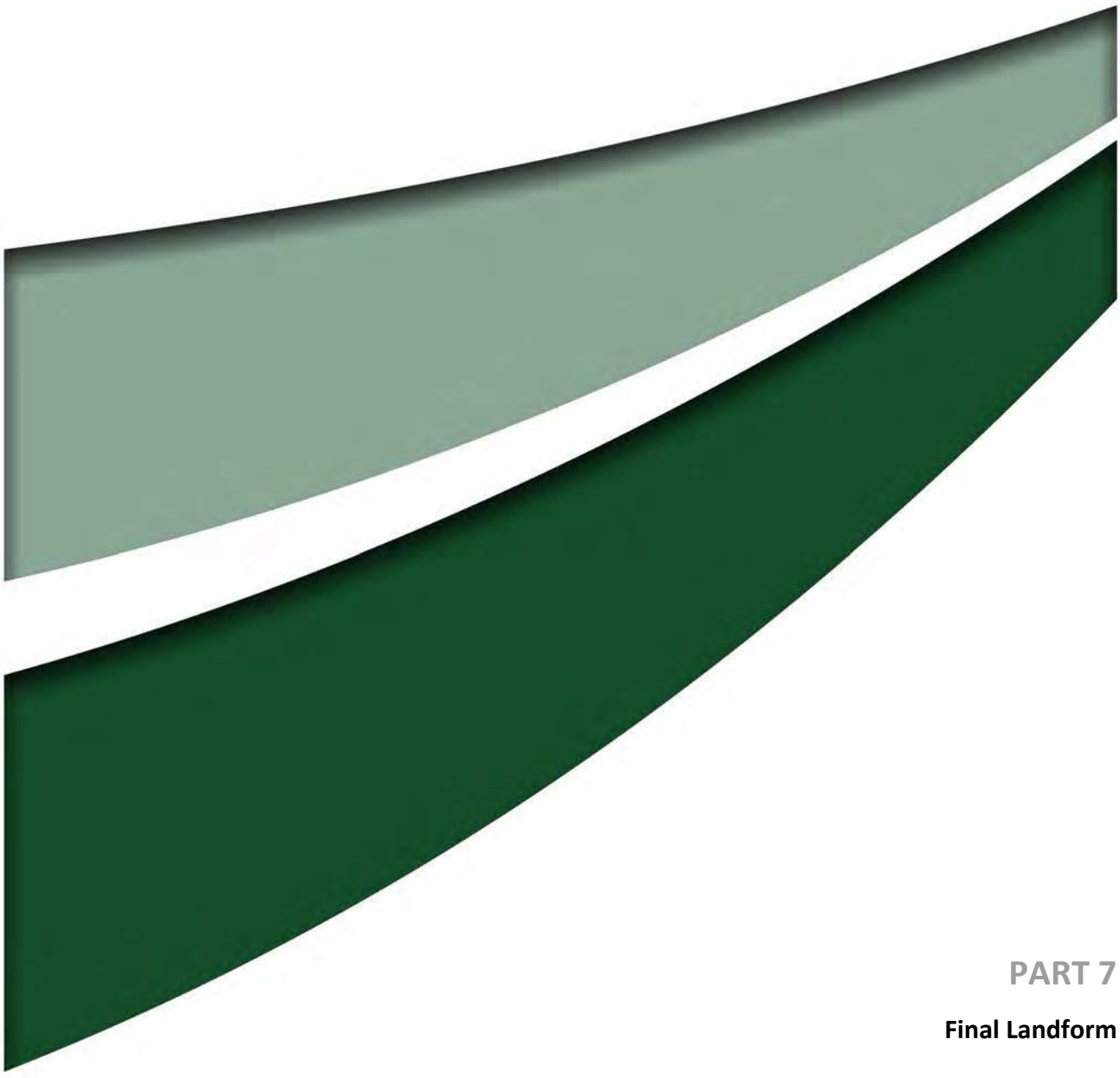
The Main Creek Alluvium is regulated as part of the Hunter Unregulated and Alluvial Water Source. Glencore recently signed a binding agreement to acquire the Integra Underground Operations, which are situated adjacent to Mount Owen, from Vale S.A. Included in the sale agreement is transfer of all related approvals, leases and licences, including Water Access Licence (WAL) 17999 which provides for the extraction of 450 units from the Hunter Unregulated and Alluvial Water Source. This licence is sufficient to cover both the predicted drawdown from both Integra Underground Mine and the predicted drawdown from Main Creek as a result of the Project. A transfer of the necessary units from WAL 17999 to Mount Owen will occur prior to any predicted drawdown in the Main Creek alluvium as a result of the Project.

Recommended Conditions of Approval:

- ***The Groundwater Management Plan must include:***
  - ***baseline data on groundwater levels and quality,***
  - ***a program to monitor groundwater levels and quality,***

    groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts,
  - ***a protocol for the investigation and mitigation of identified exceedances of the groundwater impact assessment criteria.***
  - ***a protocol for periodic review of groundwater model calibration and verification of groundwater take predictions and groundwater impacts.***

Mount Owen has no objection to the proposed condition.



PART 7

Final Landform

The following comments are provided in response to a request for further information regarding the proposed final landform for the Mount Owen Continued Operations Project (the Project).

1. Final Voids

Current Approvals

The current approved Mount Owen Complex Mining Operations Plan (MOP, approved 25 June 2015), identifies that there will be three final voids across the Complex – North Pit (Mount Owen), Bayswater North Pit (BNP, Ravensworth East) and Barrett Pit (Glendell Mine).

The current development consents for Mount Owen (DA 14-1-2004) and Ravensworth East (DA 52-03-99) require that a Mine Closure Strategy and Final Void Management Plan be prepared 5 years prior to the cessation of mining. At that time, the depth and area of the final voids and options for the future use of the final voids are to be investigated.

Proposed Approval

The Mount Owen Continued Operations Project (the Project) proposes mining within the Ravensworth East Resource Recovery (RERR) Mining Area following the cessation of mining within the BNP. This area of the Ravensworth East Mine is currently a former shallow pit mining area known as Tailings Pit 2 (TP2) and has been partially utilised for the emplacement of overburden from the Glendell Mine. The Project allows for coal extraction within the RERR Mining Area down to a depth of approximately 200m and emplacement of overburden within the BNP void.

Following Project approval, the current approved MOP will be varied to include the increased depth of the RERR Mining Area void, the reduced size of the BNP void as a result of partial filling with overburden from the RERR Mining Area and amended location and dimensions of the North Pit void. The currently approved surface area and volumes of each final void is compared with that proposed by the Project in **Table 1.1** below.

Table 1.1: Currently Approved and Proposed Final Voids (Mount Owen and Ravensworth East)

	Currently Approved			Proposed in Project		
	Void Volume (Mm^3)	Void Surface Area (ha)	Pit Lake Surface Area (ha)	Volume (Mm^3)	Surface Area (ha)	Pit Lake Surface Area (ha)
North Pit	137	130	56	140	240	88
Bayswater North Pit	9	33	11	9	33	11
RERR Mining Area	0	0	0	28	39	2

Option Considerations

As described in Section 2.5.3.3 of the Environmental Impact Statement (EIS) for the Project, Mount Owen reviewed a number of initial conceptual final landform options as part of the Project. The objectives of the review were to maximise in-pit overburden emplacement, provide a safe and stable landform and provide opportunities for sustainable post-mining land use. The result is that of a total of estimated 623 Mbcm of overburden to be moved in the process, 600 Mbcm will be placed within pit (North Pit, BNP and RERR Mining Area), with the remainder to be used as capping material for the

Eastern Rail Pit (ERP) at the southern end of the Western-out-of-Pit (WOOP) Emplacement Area, Tailings Pit 1 (TP1) and RW Pit.

In this process, Mount Owen reviewed a number of potential options to reduce the need for final voids, including use of material from the rehabilitated WOOP Emplacement Area to backfill the proposed final voids. This review identified that this option which involves disturbance of a currently rehabilitated area would add an additional five years to the Project without any economic return in that period, prolonging air quality and noise impacts and severely impacting the economic viability of the Project.

In line with the current development consents in relation to final landform and voids, Project commitments include development of a detailed Mine Closure Plan at least five years to the cessation of mining and continued consultation with the Department of Industry – Division of Resources (DRE) to further develop the conceptual final landform design through the MOP process.

Visual Assessment of Final Voids

Section 5.13 of the EIS identified four viewing locations (numbered 3 to 6) that have the highest potential for visual impact from the Project, namely:

- Viewing Location 3 - Private residence 095 (Thomas Lane);
- Viewing Location 4 – Private residence 111 (Stony Creek Road);
- Viewing Location 5 – Middle Falbrook Road and Glennies Creek Road intersection; and
- Viewing Location 6 – Hebden Road and New England Highway intersection.

Figures 1.1 to **1.4** are radial analyses showing areas in the final landform which are from these viewing locations. As can be seen from these figures, the high wall of the North Pit final void can only be seen from Viewing Location 5. The view of the high wall from this location will be similar to that depicted in the photo montage for Year 10 of the Project at Figure 5.50 of the EIS and will be further mitigated over time through growth of vegetation on the upper benches. There are no private residences located at Viewing Location 5.

As can be seen from **Figure 1.2**, a small area of the northern BNP void slopes may potentially be visible from Viewing Location 4. This location is a private residence (Dulwich Homestead) which is located approximately 9.2 km form the BNP and immediately adjacent to (within approximately 500m) the Integra Open Cut Mine. Over time, the BNP final void slopes will be rehabilitated to grassland and are likely to naturally transition to woodland and be difficult to distinguish from surrounding landforms over this distance.

The RERR Mining Area final void is shielded by local topography and is not visible from any of the Viewing Locations.

Proposed Refinements

In consideration of what form the North Pit final void should take, a comprehensive regional groundwater model was developed for the Project. This model predicts a final water level in the North Pit void of approximately 20 m AHD with an approximate surface area of 88 hectares. Subsequently, the focus of the final landform design is aimed at ensuring that the landform above the final water level integrates into the surrounding landscape as much as possible and is safe and stable. As discussed in Section 4.15 of the Response to Submissions (RTS) Report A, the overburden fill slopes above the water level will be vegetated to assist to incorporate the void into the surrounding landscape.

Notwithstanding the negligible visual impacts associated with the North Pit void, Mount Owen has now undertaken a review of options for further refinement of the landform above the final water level. The final high walls have been designed with a curved south-west wall intersection and a reduced batter slope between 18 and 25 degrees (see **Figure 1.5**). This change would result in approximately 70,000 tonnes of coal resource that would have otherwise been extracted remaining in-situ and not being mined.

Potential Future Beneficial Reuse

The Glencore mining operations within the Greater Ravensworth Area (Mount Owen, Ravensworth Operations and Liddell Coal Operations) lodged a s75W modification application (Part3AMod 15_7393) with the DP&E on 13 November 2015 to allow for deposition of tailings from the Ravensworth and Liddell Coal Handling Preparation Plants (CHPPs) into the Ravensworth East West Pit to accelerate the process of refilling this void. The Environmental Assessment notes that the use of the West Pit in this way is the first stage in a program of applications to deposit tailings strategically into voids across the Greater Ravensworth Area. This strategic approach will result in filling voids using tailings in a shorter timeframe than if a separate approach is taken by individual operations.

The Greater Ravensworth Area tailings strategy proposal is consistent with the final landform shown in the EIS for the Project, which shows the West Pit being filled with tailings and rehabilitated.

Therefore, there is potential for future beneficial reuse of both the BNP and RERR Mining Area voids for tailings emplacement as part of the Greater Ravensworth Area tailings management strategy. This potential future use will be an ongoing consideration as part of the life of mine planning process for each operation.

2. Micro-Relief

Section 5.19.4.1 of the EIS outlines a proposed process for refinement of the conceptual final landform to a natural landform design incorporating micro-relief principles through the life of the Project. The refinements will be made as part of the detailed mine planning process and reflected in a revised Mount Owen Complex MOP following approval of the Project. The key objectives of such an approach will include:

- the drainage density of the final landform is to reflect the dendritic nature of the surrounding landform;
- steeper slopes are to be located higher in the catchment (that is, where water flows are smallest), with slope gradients flattening out downstream;
- drainage lines will have both a channel and floodplain components to provide stability during both frequent and flood events; and
- gentle flow transitions which emulate natural transitions and maintain a balance between scour risk and sediment load.

The micro-relief design process also results in a more natural looking landform, which reduces the visual impact of the final landform. Similar management commitments were made and are now successfully being implemented at Glencore's Mangoola Mine. The detailed design of the natural landform implemented at Mangoola has been developed progressively as part of the detailed mine planning process and is included in the staged rehabilitation plans included in the Mining Operations Plan. The progressive development of micro-relief in the landform as part of the detailed mine planning process is necessary to ensure that overburden material is efficiently handled and the drainage in the rehabilitated final landform works effectively as part of the mine water management system.

Figure 2.1 shows an example of what the landform in the rehabilitated North Pit area may look like with detailed natural landform features incorporated into the final landform design. **Figure 2.1** is illustrative of what can be achieved with the final landform at Mount Owen and is illustrative of the type of landform that is proposed as part of the detailed mine planning process, the detail of which will be reflected in the Mining Operation Plan for the Project.

It is proposed that Mount Owen's approach to the development of detailed final landform design will be similar to that currently applied at Mangoola and will have the benefit of assimilating learnings from Mangoola and Glencore's other operations where similar approaches are also being applied.

3. Future Land Use

Figure 3.1 shows the conceptual final landform as shown in Figure 2.12 of the EIS, overlain with the proposed final land use and revegetation strategy for the Mount Owen Complex. This conceptual final landform and land use plan has been designed in accordance with current approved commitments and as such, provides for pockets of grassland within the flatter areas where grazing is a potentially viable end land use. The lower slopes of the rehabilitated North Pit, mine infrastructure area and rail loop, capped tailings facilities and flatter areas near the tops of overburden emplacement areas are likely to provide the best opportunity for rehabilitation to grazing land. The slopes of the BNP and North Pit voids will be initially grassed as part of rehabilitation activities, however it is expected that these areas will be largely unsuitable for grazing due to the limitations that the slopes will impose on management and will transition to woodland communities over time through natural regeneration.

The overall objective of the rehabilitation strategy for the Project is to develop a final landform which will provide for a sustainable final land use which will be compatible with the current surrounding land uses. As discussed in Section 5.19 of the EIS the applicable opportunities and constraints to the feasibility of the proposed final land use options for the site will be investigated as part of the detailed mine closure planning process.

Proposed Refinements

The proposed rehabilitation strategy for the West Pit overburden emplacement area has been amended to that presented in the EIS to extend the area of woodland rehabilitation to the western edge of the Project Area (refer to **Figure 3.1**). This change has been made as the area has partly been revegetated with woodland species and there are slopes which are potentially unsuitable for grazing. This modification improves the width of the vegetation corridors along the western edge of the Project Area, which in turn improve the linkages between vegetation along Bowmans Creek and Liddell Coal Operations revegetation and offset areas to the northwest and the remnant vegetation along Bettys Creek and proposed woodland areas in the Glendell final landform (refer to **Figure 3.2**). These proposed linkages and the revegetation proposed as part of the Project rehabilitation strategy and Biodiversity Offset Strategy will significantly improve habitat value in the area over the medium to long term.

As discussed in Section 4.7 of the RTS Report A, land ownership currently restricts Mount Owen from providing an extended vegetation corridor to the west of the proposed Stringybark Creek Habitat Corridor. However, as described above, the native woodland areas proposed to be established will provide for vegetated corridors between Bowmans Creek and Ravensworth State Forest through Ravensworth East.

4. Water

Dams may be required in the final landform for a number of reasons with the three primary purposes being:

- long term management of drainage in the final landform (for example, their ongoing use as detention areas to reduce flow velocities downslope and continue the operation of the

established clean water management systems whilst maintaining drainage and creek line stability);
- use to support final land uses in the Project area (e.g. farm dams for stock watering or water storages for other uses); and / or
- environmental purposes (for example, the retention of dams with developed ecosystems will have biodiversity value in the final landform).

The number of dams in the final landform will depend on the final details of final land use and landform which will be progressively developed and refined over the life of the Project.

Mount Owen previously provided a response relating to the management of water and licensing requirements associated with dams in the final landform. That response is reproduced within this document for completeness.

All dams to be retained in the final landform will be licensed in accordance with licensing requirements in force at the time. Dams which cannot be licensed due to limitations on available water allocations or other reasons will be removed prior to closure using the procedures identified in Section 3.0 of the Mine Closure and Rehabilitation Strategy (Appendix 18 of the EIS)

The primary water "uses" identified for the dams at this stage consists of evaporation and stock watering. The water usage and volumetric licensing requirements for these dams are estimated in **Table 4.1** below for both the Glennies Water Source and Jerrys Water Source (*Hunter Unregulated and Alluvial Water Source Water Sharing Plan*). **Table 4.1** also includes average predicted drawdown in alluvial systems associated with the Project to provide a complete picture of potential licensing requirements from these water sources.

Table 4.1 – Estimated Water Use

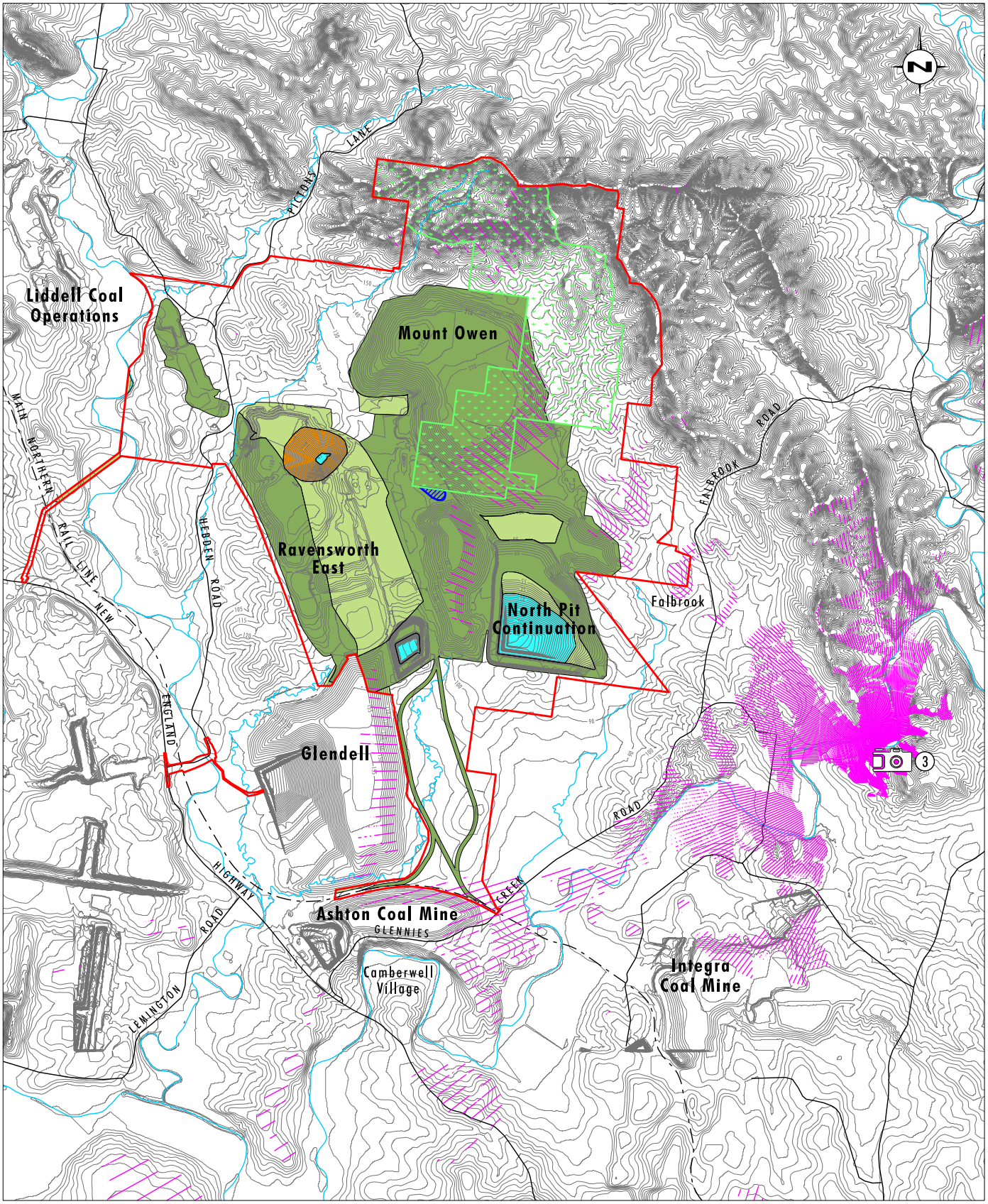
Estimated Usage	Water Source	
	Jerrys	Glennies
Open Grassland (ha)	596	0
Average Stock Numbers*	295	0
Average Stock Water Demand (ML/year)*	7.9	0
Total Dam Surface Area (ha)	45.1	2.7
Evaporative Water Losses (ML/year)	492	29
Average predicted alluvial drawdown (ML/year)	6	15
Total Average Water Use (ML/year)	**506**	**47**

* Estimate based on Agricultural Impact Assessment (Appendix 12 of EIS)

This estimate is based on retention of all dams shown on **Figure 4.1** which assumes the mine water dams, ECD1, ECD2 and the CHPP Raw Water Dam, will be removed as part of the mine closure process. The estimate is considered to be conservative as, in reality, many of the sediment dams included in the estimate are likely to be removed as part of the mine closure process and development of a final landform sympathetic with the surrounding topography.

Mount Owen currently holds 200 unit shares within the Jerrys Water Source and has access to 450 unit shares within Glennies Water Source as part of Glencore's acquisition of Integra Underground Operations (refer to previous response regarding water licensing for proposed drawdown impacts in alluvial aquifers). In addition, the total landholdings of Mount Owen are approximately 4,913 hectares which equates to approximately 344 ML/year in Harvestable Rights Provisions. Note that this does not include the Ravensworth State Forest Land Holdings. Dam K, Dam J, ECD3, Dam 5 and part of Dam 6 lie within the boundary of the Ravensworth State Forest. These dams are all likely to be retained in the final landform due to the need to divert water around the North Pit Overburden Emplacement Areas and to retain the habitat that is established in these dams.

Should all of these dams be retained in the final landform, Mount Owen would be able to utilise the existing unit shares in the Jerrys Water Source and the Glennies Water Source (under the Hunter Unregulated and Alluvial Water Source) (respectively) to meet future water access licence requirements. The information presented above indicates that a combination of the existing held unit shares for the Jerrys Water Source and harvestable rights provisions would be sufficient to meet all water access licence requirements for the Jerrys Water Source (i.e. licence requirements related to surface and alluvial 'usage' associated with the Project in the Bowmans Creek catchment area). Similarly, the information above indicates that the current held unit shares for the Glennies Water Source will be sufficient to meet all water access licence requirements in this water source (i.e. licence requirements related to the surface and alluvial 'usage' associated with the Project and Integra Underground Operations in the Glennies Creek catchment area).



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD)

0 1.0 2.0 4.0km
1:80 000

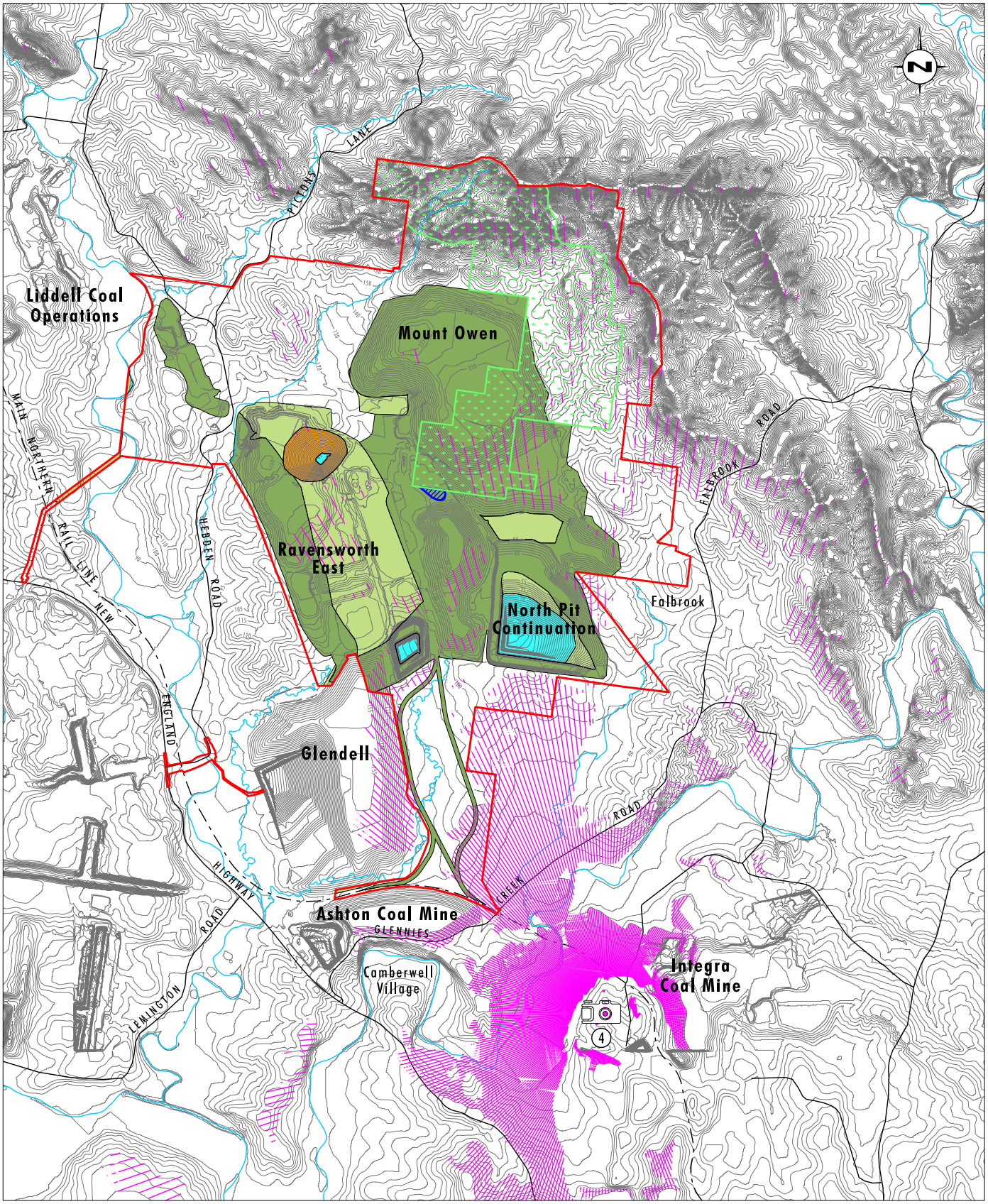
Legend

- Project Area
- Ravensworth State Forest
- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Grassland for Stabilisation
- Southern Remnant Biodiversity Offset Area
- Drainage Line
- Visible Surface
- Viewing Location

FIGURE 1.1

Viewing Location 3 - Radial Analysis
Proposed Final Landform
From Residence 95

File Name (A4): R18/3109_1076.dgn
20151104 9.57



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD)

0 1.0 2.0 4.0km
1:80 000

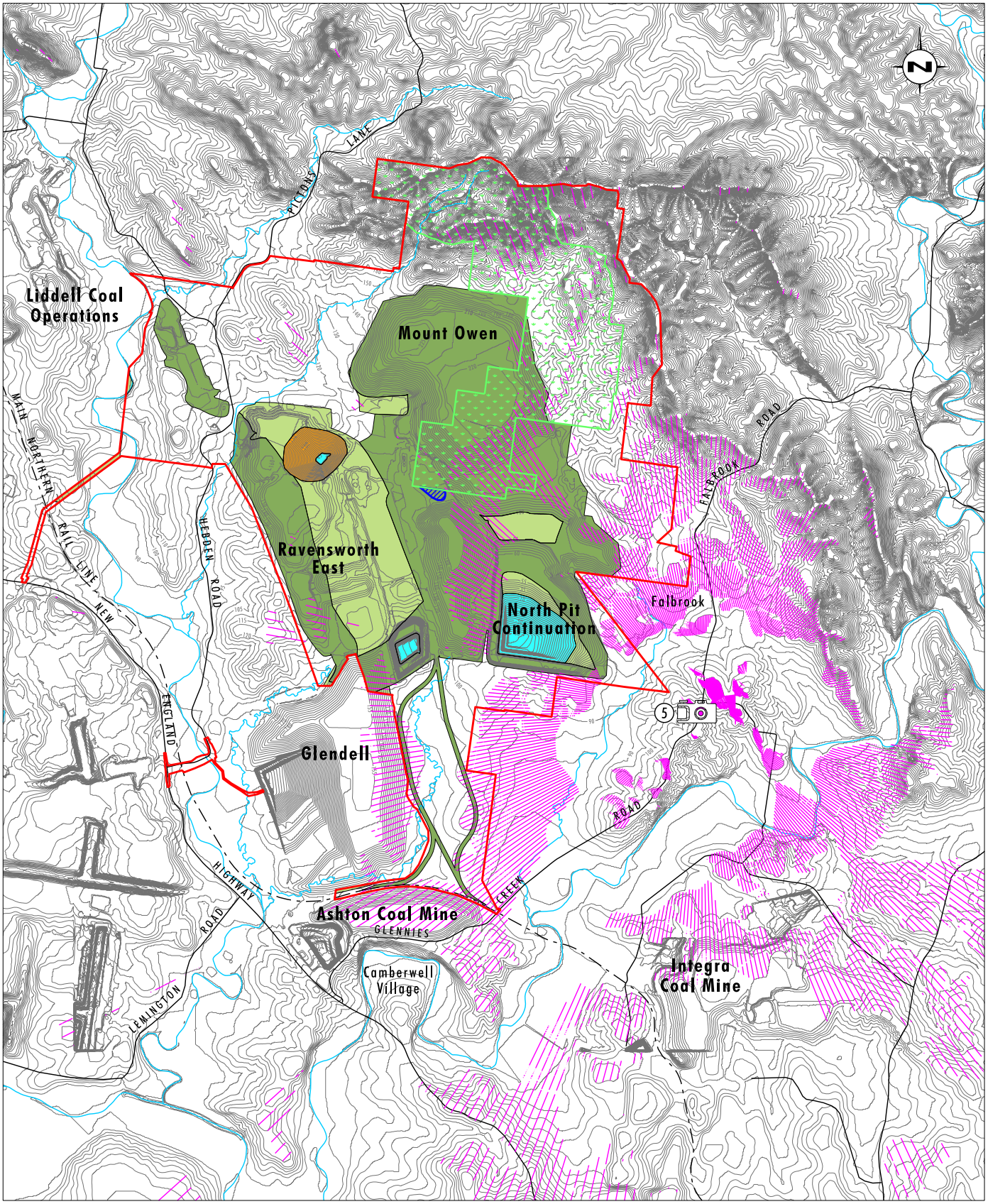
Legend

- Project Area
- Ravensworth State Forest
- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Grassland for Stabilisation
- Southern Remnant Biodiversity Offset Area
- Drainage Line
- Visible Surface
- Viewing Location

FIGURE 1.2

Viewing Location 4 - Radial Analysis
Proposed Final Landform
From Residence 111

File Name (A4): R18/3109_1077.dgn
20151104 9.54



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD)

0 1.0 2.0 4.0km
1:80 000

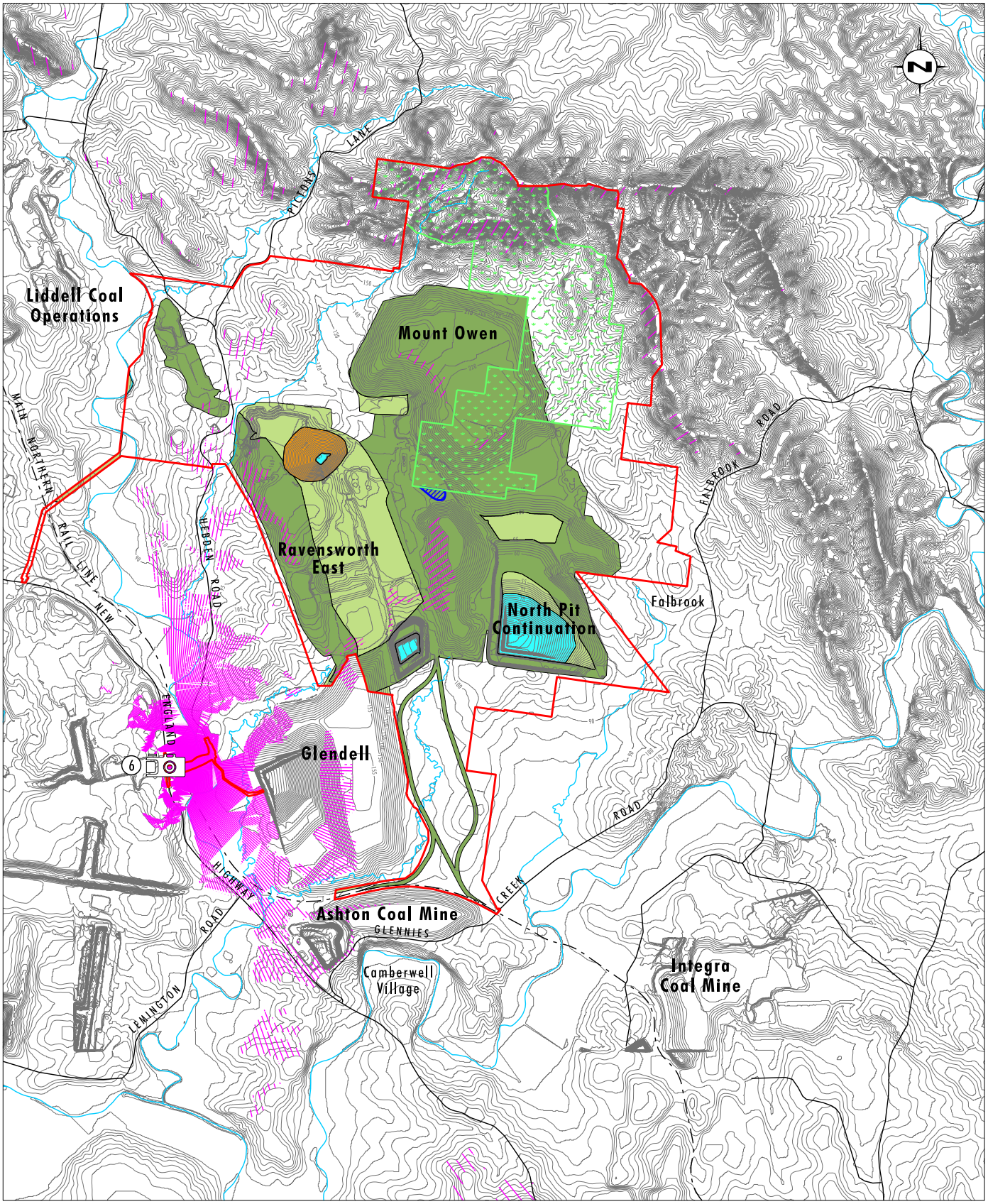
Legend

- Project Area
- Ravensworth State Forest
- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Grassland for Stabilisation
- Southern Remnant Biodiversity Offset Area
- Drainage Line
- Visible Surface
- Viewing Location

FIGURE 1.3

Viewing Location 5 - Radial Analysis Proposed Final Landform From Intersection of Middle Falbrook Road and Glennies Creek Road

File Name (A4): R18/3109_1078.dgn
20151104 9.43



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD)

0 1.0 2.0 4.0km
1:80 000

Legend

- Project Area
- Ravensworth State Forest
- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Grassland for Stabilisation
- Southern Remnant Biodiversity Offset Area
- Drainage Line
- Visible Surface
- Viewing Location

FIGURE 1.4

Viewing Location 6 - Radial Analysis Proposed Final Landform From Intersection of Hebden Road and New England Highway

File Name (A4): R18/3109_1079.dgn
20151104 9.45

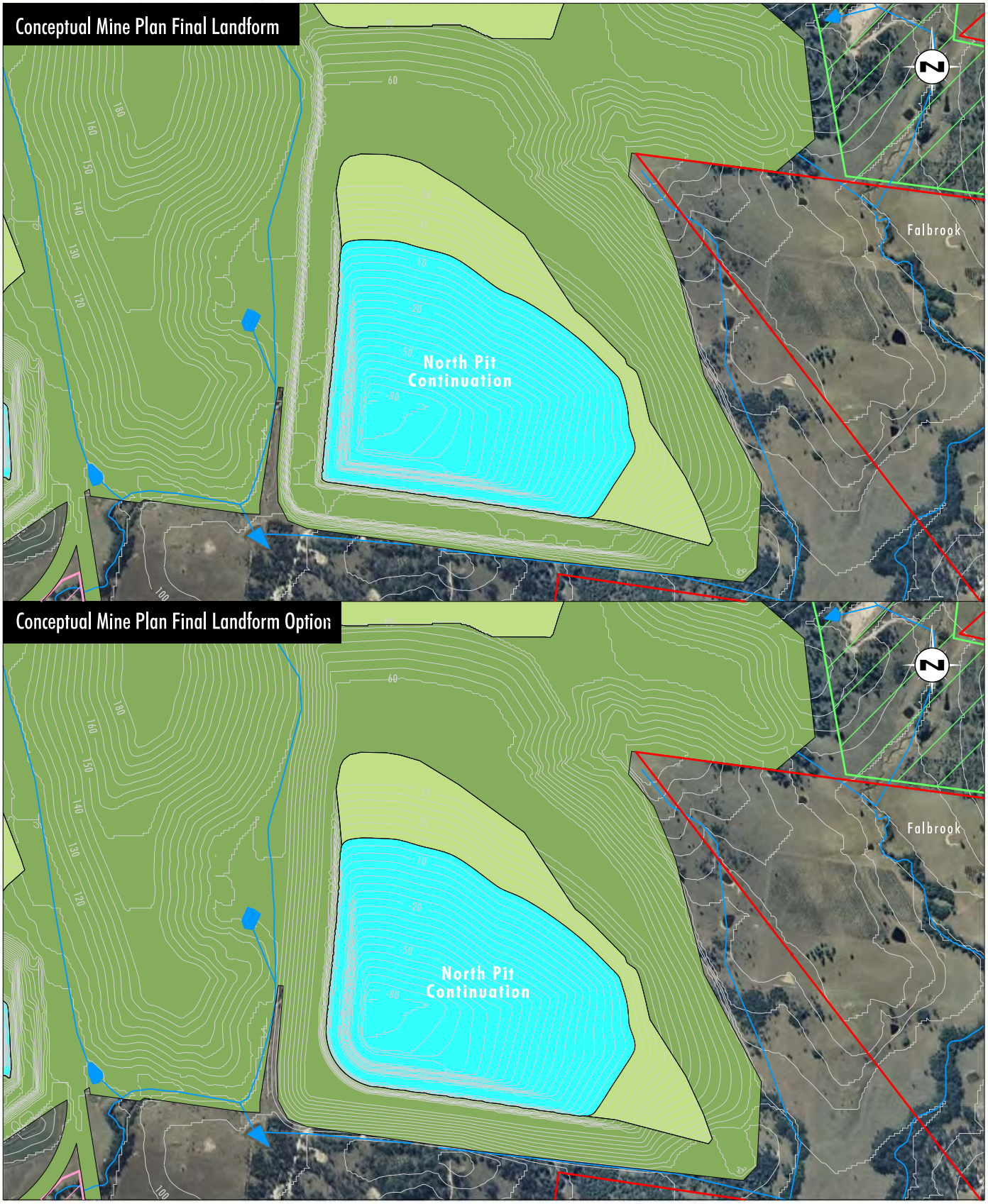


Image Source: Mount Owen (2012-2013)
Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD). Subject to refinement as part of WMP process

0 0.25 0.5 1.0km
1:20 000

Legend

- Project Area
- Yorks Creek VCA
- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Existing Biodiversity Offset Area
- Drainage Line

FIGURE 1.5

Mount Owen Continued Operations Project Proposed Final Landform and Option

File Name (A4): R18/3109_1083.dgn
20151123 13.57

Image Source: Mount Owen (2012-2013)
Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD). Subject to refinement as part of WMP process

0 0.5 1.0 1.5km
1:30 000

Legend

- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Water Storage
- Detention Pond
- Drainage Line

FIGURE 2.1

Example of Potential Micro Relief in North Pit Landform

File Name (A4): R18/3109_1072.dgn
20151029 15.39

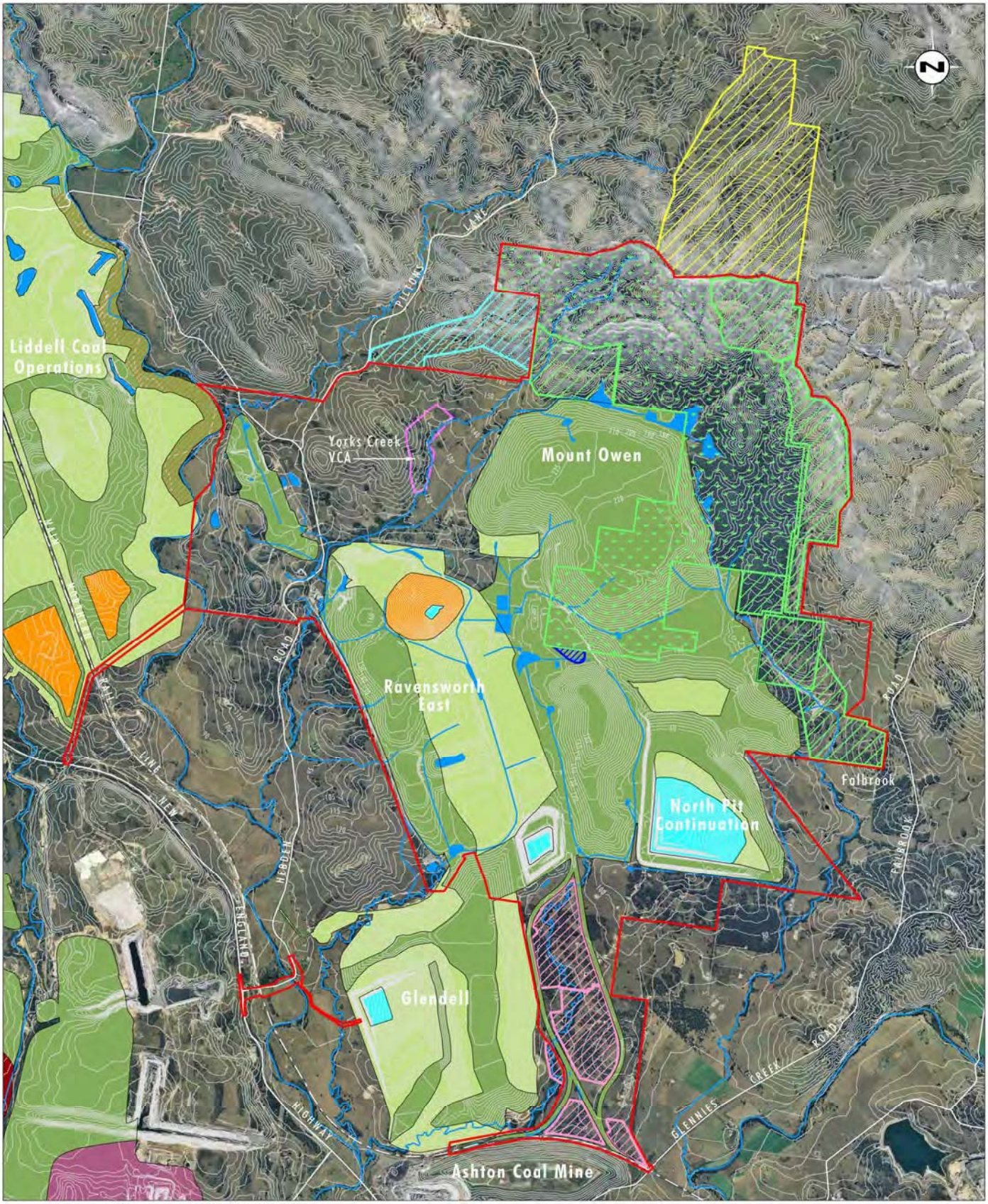


Image Source: Mount Owen (2012-2013)
Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD). Subject to refinement as part of WMP process

0 1.0 2.0 3.0km
1:65 000

Legend

- Project Area
- Yorks Creek VCA
- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Grassland for Stabilisation
- Water Storage
- Ravensworth State Forest
- Proposed Corridor Habitat Enhancement on Non-Mined land (Liddell Coal Operations)
- Existing Biodiversity Offset Area
- Proposed Cross Creek Biodiversity Offset Area
- Bettys Creek Habitat Management Area
- Southern Remnant Biodiversity Offset Area
- Stringybark Creek Habitat Corridor
- Grazing
- Riparian / Wetland
- Drainage Line

FIGURE 3.1

Mount Owen Continued Operations Project Proposed Final Landform

File Name (A4): R18/3109_1073.dgn
20151029 15.46

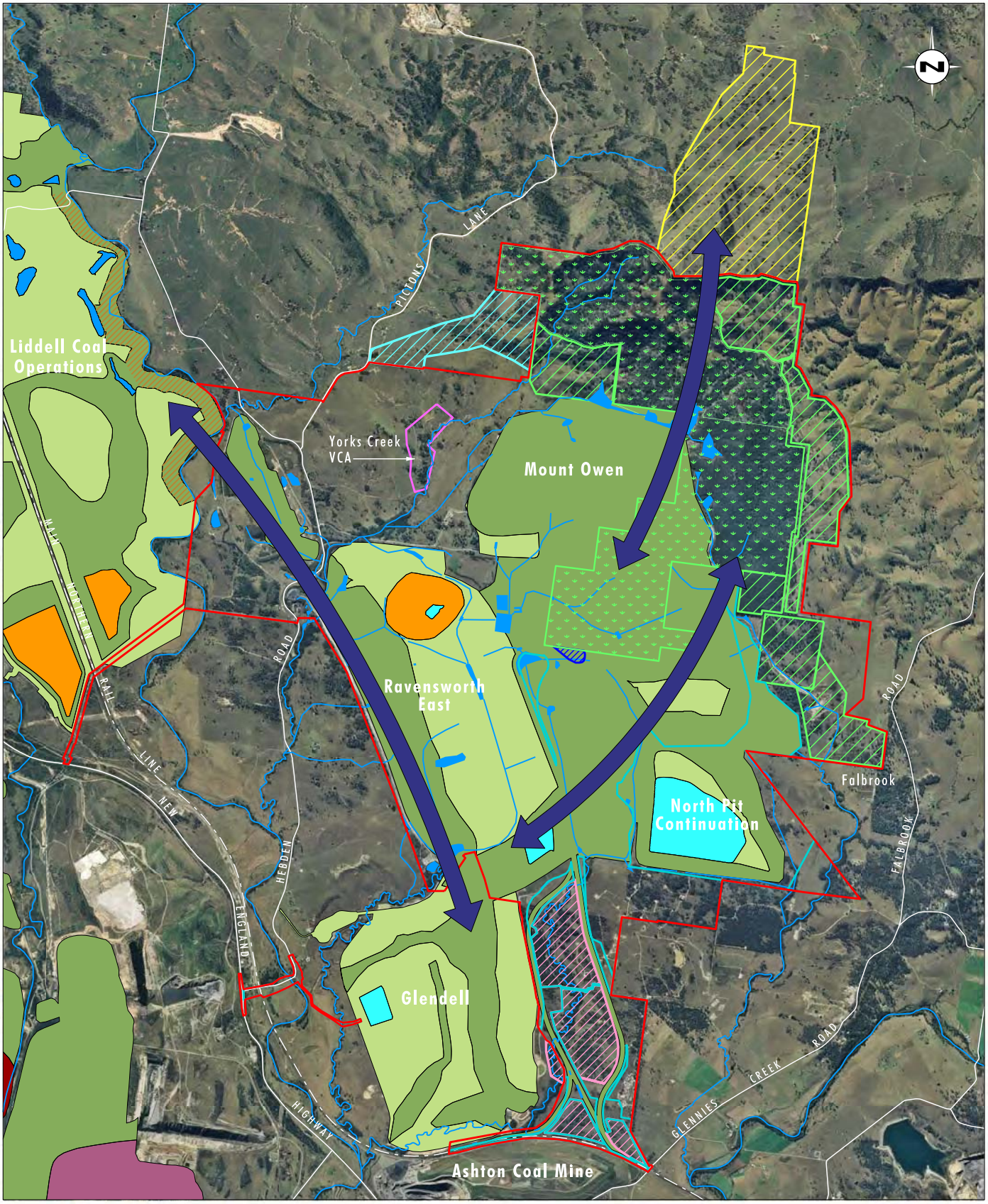


Image Source: Mount Owen (2012-2013)
Data Source: Mount Owen (2014), LPI (2015)

0 1.0 2.0 3.0km
1:65 000

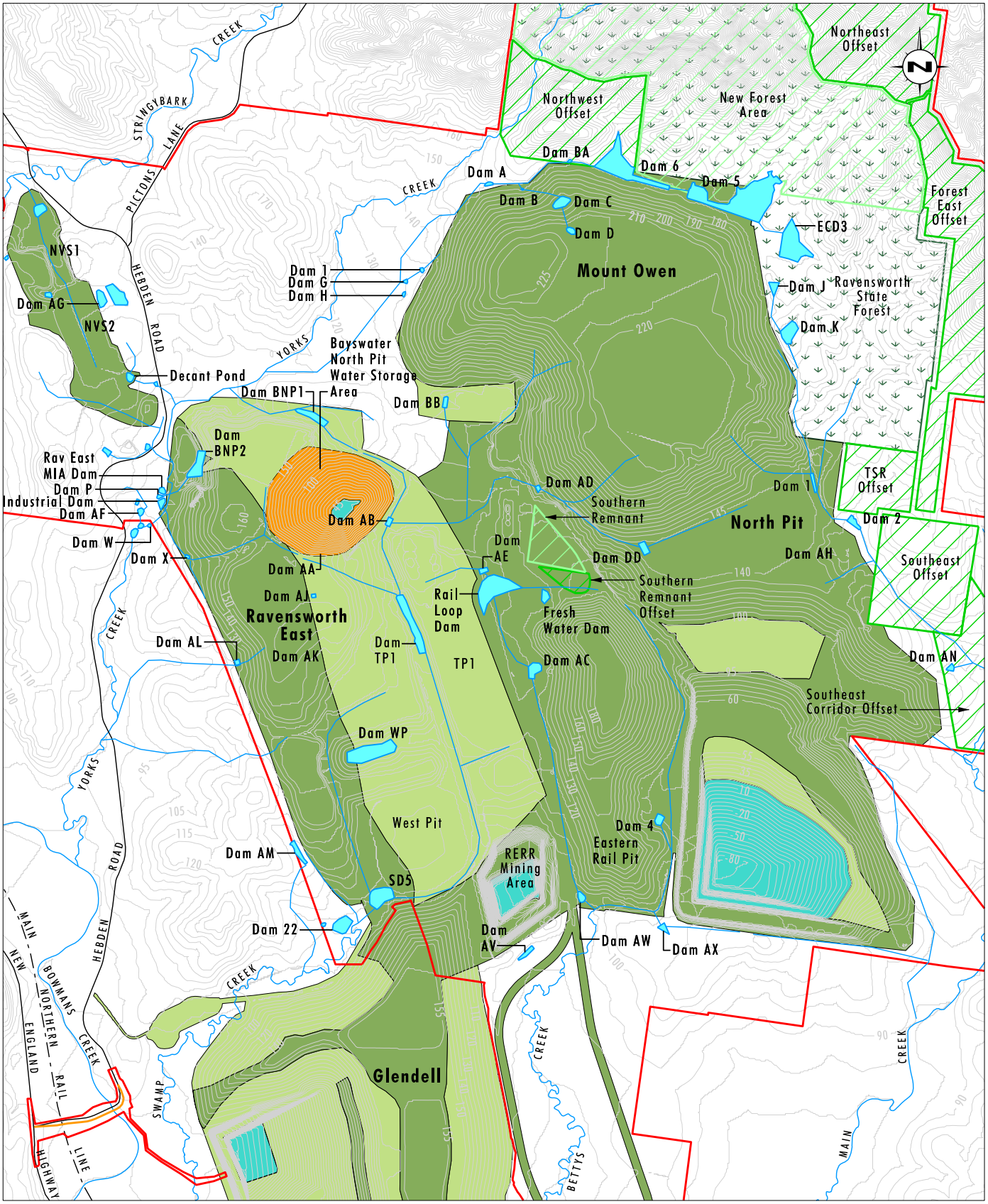
Legend

- Project Area
- Proposed Disturbance Area
- Yorks Creek VCA
- Final Void Water Level
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Grassland for Stabilisation
- Ravensworth State Forest
- Proposed Corridor Habitat Enhancement on Non-Mined land (Liddell Coal Operations)
- Existing Biodiversity Offset Area
- Proposed Cross Creek Biodiversity Offset Area
- Bettys Creek Habitat Management Area
- Southern Remnant Biodiversity Offset Area
- Stringybark Creek Habitat Corridor
- Grazing
- Riparian / Wetland
- Water Storage
- Drainage Line
- Connectivity Corridor

FIGURE 3.2

Mount Owen Continued Operations Project Habitat Linkages

File Name (A4): R18/3109_1075.dgn
20151104 8.44



Data Source: Mount Owen (2014)
Note: Contour Interval 5m(AHD). Subject to refinement as part of WMP process

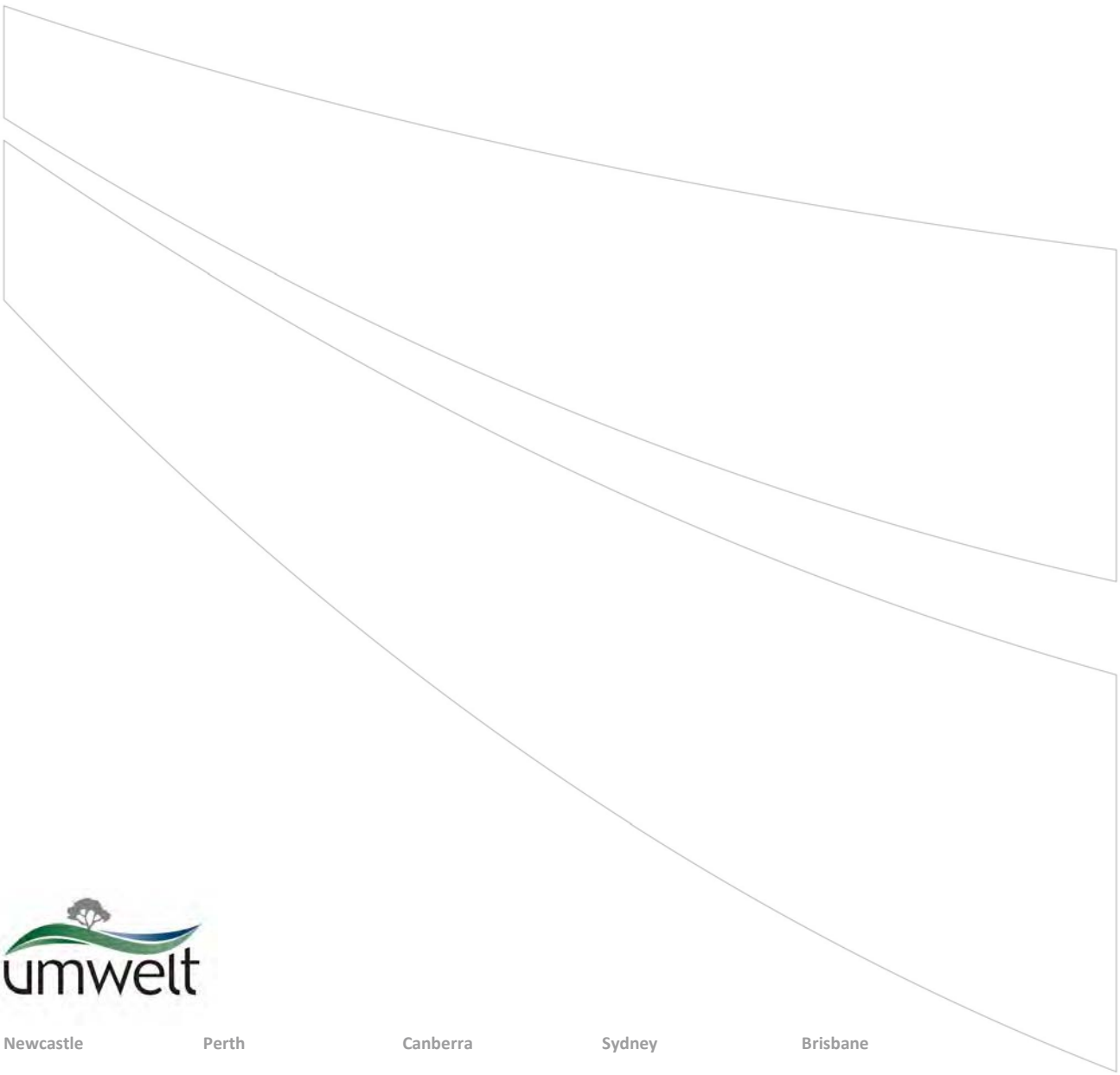
0 0.5 1.0 2.0km
1:40 000

Legend

- Project Area
- Existing Biodiversity Offset Areas
- Ravensworth State Forest
- Proposed Hebden Road Upgrade Works
- Final Void Water Level
- Clean Water Dam
- Native Woodland
- Open Grassland (Potential grazing areas) with pockets of Native Vegetation
- Grassland for Stabilisation
- Drainage Line

FIGURE 4.1

Dams in Conceptual Final Landform



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