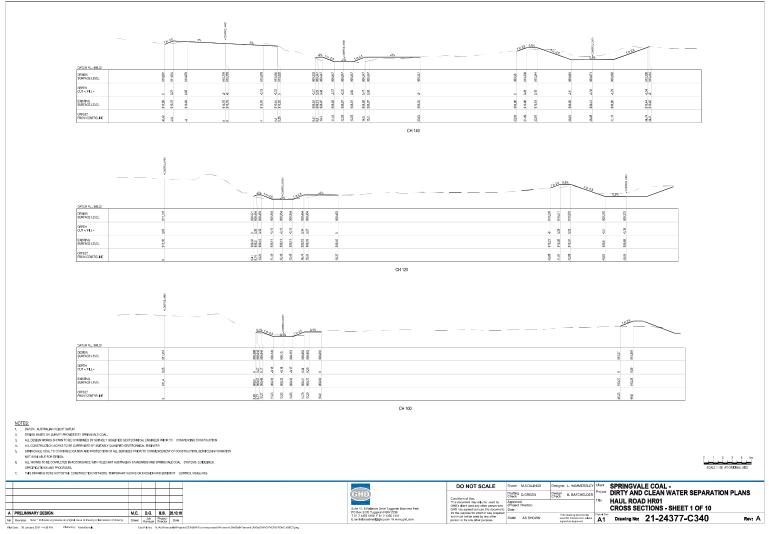
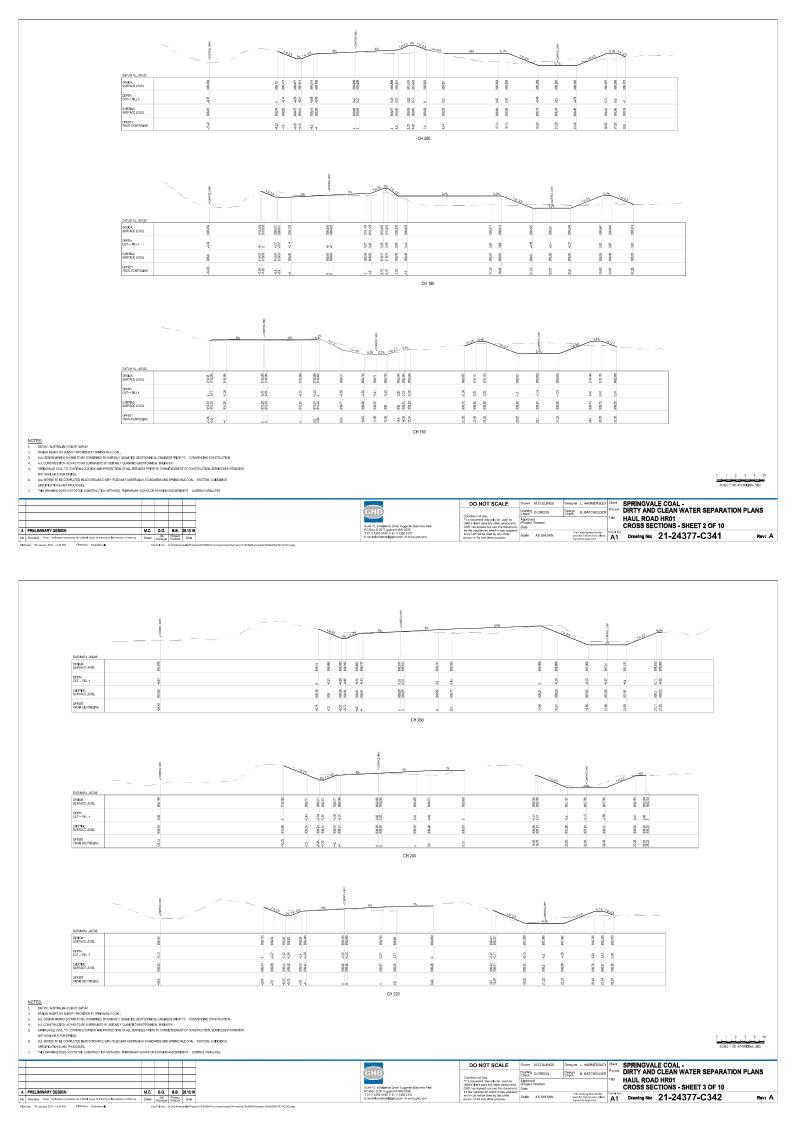


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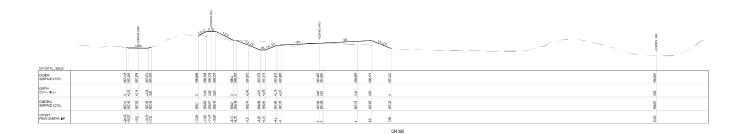
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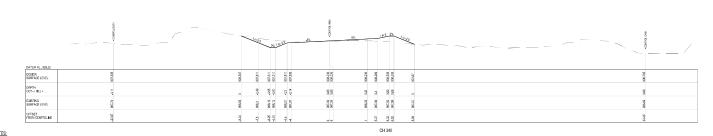


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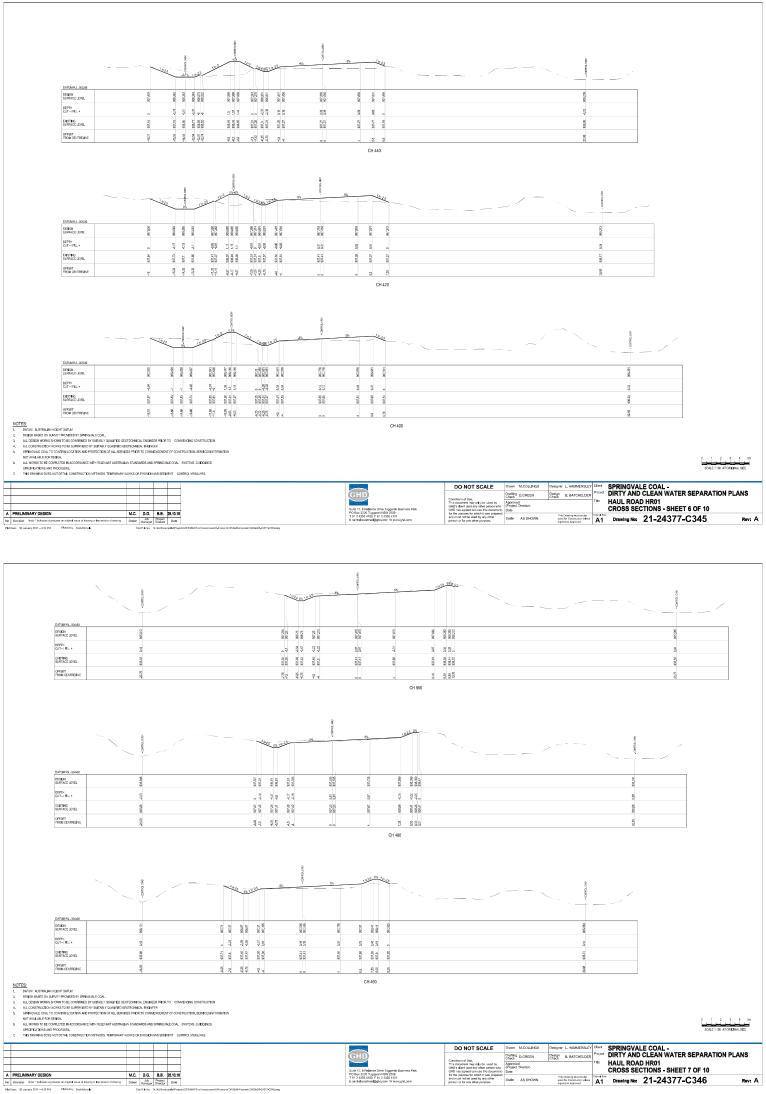
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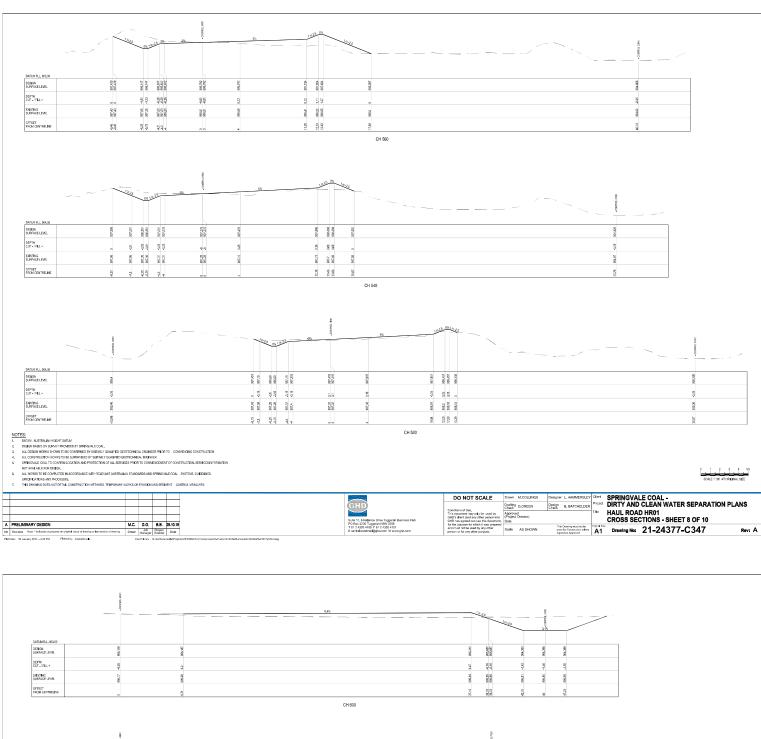
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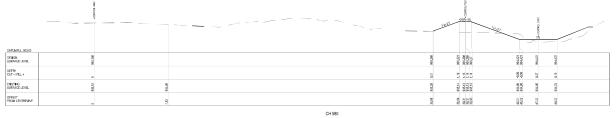
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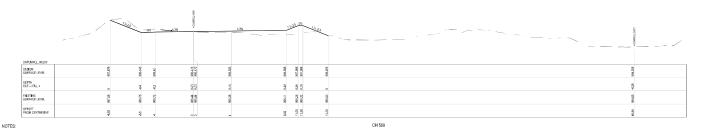
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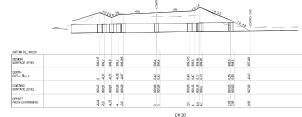


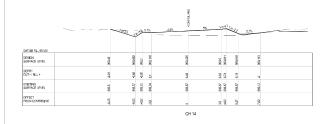


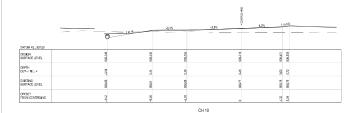
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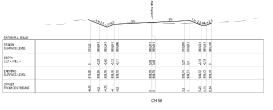
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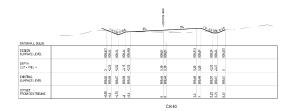


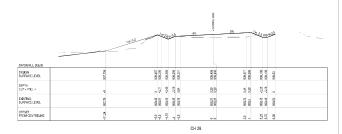












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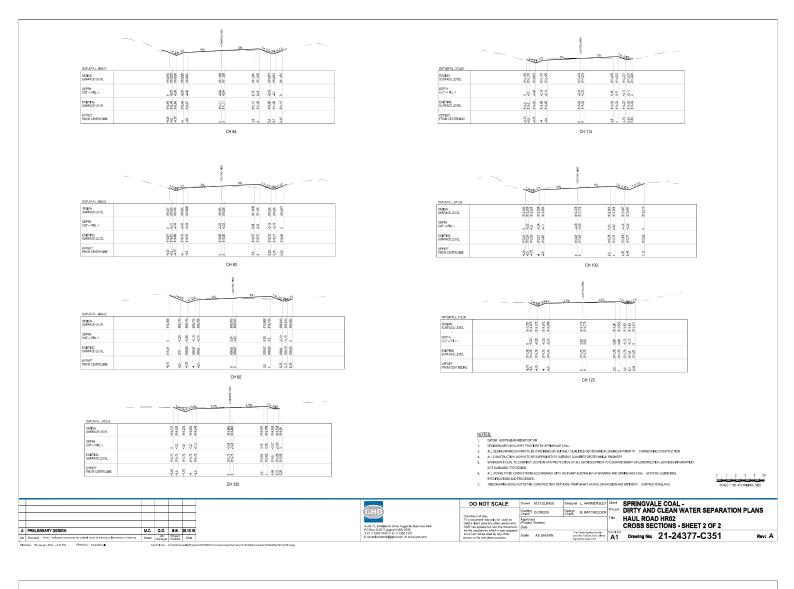
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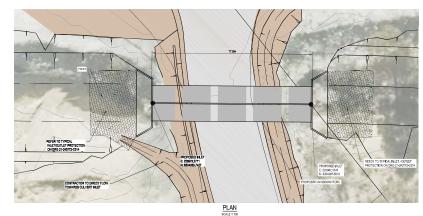
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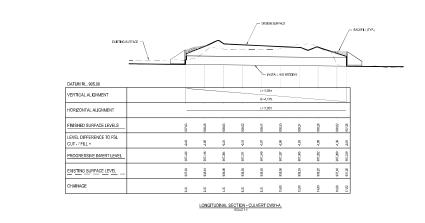
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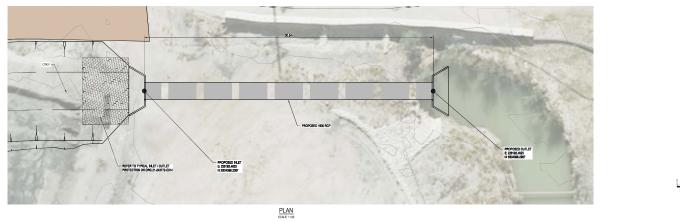
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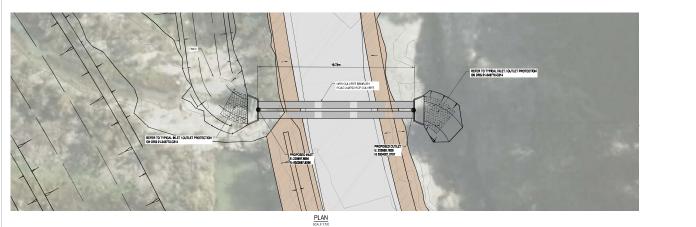
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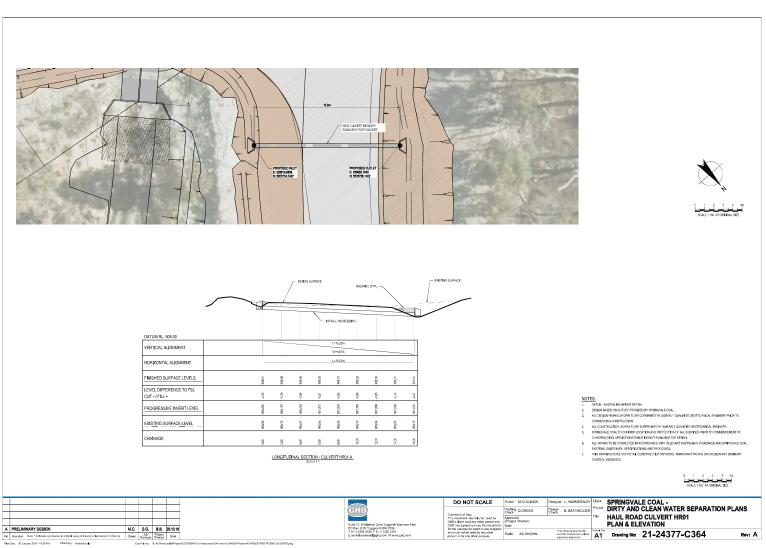
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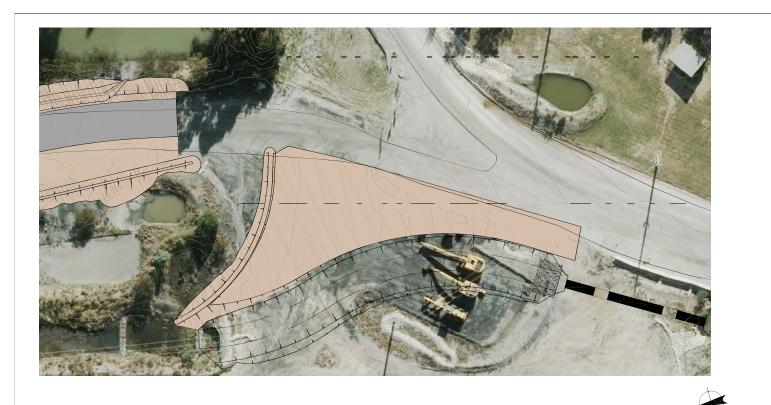
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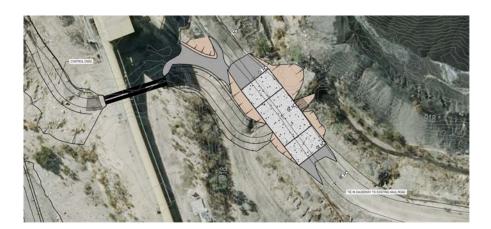
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27 February 2017

Nagindar Singh Environmental Projects Coordinator - West Springvale Coal Pty Ltd 1384 Castlereagh Highway LIDSDALE NSW 2790 Our ref: Your ref:

2218584-65623

Dear Nagindar

Modification for Water Treatment Plan Residuals Water and Salt Balance Model Sensitivity

1 Background

Springvale Coal Pty Limited is seeking a modification (MOD 1) to State Significant Development consent SSD-5579 to address operational interactions with the proposed Springvale Water Treatment Project (SWTP). The modification is to allow for the receipt of residuals stream from the water treatment plant and emplacement within the existing reject emplacement area at the Springvale Coal Services site (SCSS).

A water and salt balance model was developed for the Coxs River catchment to assess the impact of the SWTP and the emplacement of residuals at the SCSS. The residuals stream was modelled using a maximum flow rate of 0.43 ML/day and maximum electrical conductivity (EC) of 2,500 μ S/cm. These parameters were based on conservative estimates which have since been reviewed. The predicted volume of residuals is expected to range from 0.16 ML/day to 0.35 ML/day, with an EC between 1,100 μ S/cm and 1,200 μ S/cm.

This letter details the methodology and results of water and salt balance modelling for the Coxs River catchment to provide a sensitivity analysis of the parameters used to model the residuals stream from the SWTP to the SCSS.

2 Methodology

The water and salt balance model was developed as part of the Water Resources Impact Assessment for the Western Coal Services Project Modification 1. Note that this same model has been updated to assess the amended SWTP and considers the transfer of excess treated water from the water treatment plant to Thompsons Creek Reservoir. As a result, some modelling predictions will vary from those presented in the Western Coal Services Project Modification 1 impact assessment. However, this does not affect results for Wangcol Creek catchment.

A number of scenarios were modelled with varying flow and EC for the residuals stream, as shown in Table 2-1. Note that Scenario 1 is the same as the results presented in the Western Coal Services Project Modification 1 and amended SWTP impact assessments using the maximum flow and EC values.

GHD Pty Ltd ABN 39 008 488 373 Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300 PO Box 5403 Hunter Region Mail Centre NSW 2310 Australia T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com

Table 2-1 Modelling scenarios

Scenario	Flow (ML/day)	EC (μS/cm)
Scenario 1	0.43	2,500
Scenario 2	0.35	1,200

The following operational conditions were modelled, all with a 50% power generation requirement at Mount Piper Power Station:

- Existing conditions based on site conditions in the year 2016.
- Future conditions based on site conditions following the implementation of improvements to the clean water management system at the SCSS.
- Proposed conditions based on site conditions following the commissioning of the SWTP and residuals emplacement at the SCSS.

3 Results

Average annual results of flow and EC are presented for the following locations in the Coxs River catchment:

- 1. LDP006 discharge to Wangcol Creek from the SCSS.
- 2. Wangcol Creek at the confluence with the discharge from LDP006.
- 3. Wangcol Creek at the confluence with the Coxs River.
- 4. Coxs River at the inflow to Lake Wallace.
- 5. Coxs River at the inflow to Lake Lyell.
- 6. Coxs River at the inflow to Lake Burragorang.

3.1 Scenario 1

Summaries of the change in average results between existing, future and proposed conditions for Scenario 1 are presented in Table 3-1, Table 3-2 and Table 3-3 for the water volume, salt load and EC respectively. This scenario modelled the residuals stream from the SWTP with the maximum flow rate of 0.43 ML/day and EC of 2,500 μ S/cm.

	Existing	Future	Proposed	(Change betweer	า
Location	conditions (ML/year)	conditions (ML/year)	conditions (ML/year)	Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	848	441	570	-48%	-33%	29%
2	2,719	2,659	2,791	-2%	3%	5%
3	3,027	2,965	3,097	-2%	2%	4%
4	23,174	23,400	15,490	1%	-33%	-34%
5	33,616	33,826	25,848	1%	-23%	-24%
6	123,418	123,560	122,737	0%	-1%	-1%

Table 3-1 Summary of change in water volume results for Scenario 1

Table 3-2	Summary of change in salt load results for Scenario 1
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				с	hange betwee	en
Location	Existing conditions (tonnes/year)	Future conditions (tonnes/year)	Proposed conditions (tonnes/year)	Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	1,521	1,107	1,446	-27%	-5%	31%
2	1,815	1,553	1,892	-14%	4%	22%
3	1,838	1,575	1,915	-14%	4%	22%
4	10,221	10,174	4,008	0%	-61%	-61%
5	11,391	11,334	5,306	-1%	-53%	-53%
6	14,315	14,305	12,630	0%	-12%	-12%

	Existing	Future	Proposed	(Change betweei	า
Location	conditions (µS/cm)	conditions (µS/cm)	conditions (µS/cm)	Existing and future conditions	Existing and proposed conditions	Future and proposed conditions
1	2,680	3,750	3,790	40%	41%	1%
2	1,000	870	1,010	-13%	1%	16%
3	910	790	920	-13%	1%	16%
4	660	650	390	-2%	-41%	-40%
5	510	500	310	-2%	-39%	-38%
6	170	170	150	0%	-12%	-12%

Table 3-3 Summary of change in electrical conductivity results for Scenario 1

As shown in Table 3-1, the emplacement of residuals at the SCSS was modelled to increase LDP006 discharge by 29% compared to future conditions. However, the increase in LDP006 discharge is compensated by the installation of clean water diversions at the site, with an overall decrease in LDP006 discharge of 33% when compared to existing conditions.

Flow is increased slightly in Wangcol Creek under proposed conditions by 3% and 5% at the confluence with the discharge from LDP006 compared to existing and future conditions respectively and by 2% and 4% at the confluence with the Coxs River compared to existing and future conditions respectively.

The results for proposed conditions compared to existing and future conditions indicate a decrease in inflows to Lake Wallace of up to 34% and to Lake Lyell of up to 24%. This is due to the commencement of the SWTP, which involves the cessation of discharges from Springvale Mine's LDP009 to the catchment, with mine water make transferred to the SWTP for use at Mount Piper Power Station.

The salt load of LDP006 discharges under future and proposed conditions was predicted to decrease by 27% and 5% respectively compared to existing conditions, as shown in Table 3-2. However, due to the associated decrease in water volume, the EC of LDP006 discharges was predicted to increase by up to 41% compared to existing conditions, as shown in Table 3-3. This was due to modelled improvements in the separation of the clean and dirty water management systems at the SCSS, resulting in clean water reporting to Wangcol Creek rather than LDP006. The impact of emplacing residuals from the SWTP at the SCSS under proposed conditions was modelled to increase the salt load at LDP006 by 31%, as shown in the comparison with future conditions, which resulted in a slight increase in EC of 1%.

The salt load and EC in Wangcol Creek was predicted by the water and salt balance modelling to decrease under future conditions compared to existing conditions, due to a reduction in salt yield from disturbed areas as they are rehabilitated and the future improvements in clean water management at the SCSS, with increase clean water contributing directly to Wangcol Creek rather than LDP006. The increase in EC modelled at LDP006 was predicted to increase the EC in Wangcol Creek by 16%

compared to future conditions. However, the changes to the clean water management system were found to mitigate the majority of this increase, with only a 1% increase in EC for proposed conditions compared to existing conditions.

The future changes to water management at SCSS was predicted to result in a negligible to slight decrease in the salt load and EC of the Coxs River at the inflow to Lake Wallace, Lake Lyell and Lake Burragorang compared to existing conditions. A more significant decrease in salt load and EC was observed under proposed conditions compared to both existing and future conditions. This occurred as a result of the SWTP under proposed conditions, with the treatment of mine water make using reverse osmosis processes to decrease EC and the reuse of this water at Mount Piper Power Station.

3.2 Scenario 2

Table 3-4, Table 3-5 and Table 3-6 present the changes in average results for existing, future and proposed conditions for Scenario 2 for water volume, salt load and EC respectively. This scenario modelled a reduced flow rate of 0.35 ML/day and reduced EC of 1,200 μ S/cm for the residuals.

	Existing conditions (ML/year)	Future	Proposed	(Change between		
Location		conditions (ML/year)	conditions (ML/year)	Existing and future conditions	Existing and Future and proposed proposed conditions conditions		
1	848	441	544	-48%	-36%	23%	
2	2,719	2,659	2,766	-2%	2%	4%	
3	3,027	2,965	3,072	-2%	1%	4%	
4	23,174	23,400	15,465	1%	-33%	-34%	
5	33,616	33,826	25,822	1%	-23%	-24%	
6	123,418	123,560	122,727	0%	-1%	-1%	

Table 3-4 Summary of change in water volume results for Scenario 2

Table 3-5 Summary of change in salt load results for Scenario 2

				с	Change between		
Location	Existing conditions (tonnes/year)	Future conditions (tonnes/year)	Proposed conditions (tonnes/year)	Existing and future conditions	Existing and proposed conditions	Future and proposed conditions	
1	1,521	1,107	1,379	-27%	-9%	25%	

	Existing conditions (tonnes/year)	Future conditions (tonnes/year)		с	Change between		
Location			Proposed conditions (tonnes/year)	Existing and future conditions	Existing and proposed conditions	Future and proposed conditions	
2	1,815	1,553	1,825	-14%	1%	18%	
3	1,838	1,575	1,848	-14%	1%	17%	
4	10,221	10,174	3,941	0%	-61%	-61%	
5	11,391	11,334	5,246	-1%	-54%	-54%	
6	14,315	14,305	12,606	0%	-12%	-12%	

Table 3-6 Summary of change in electrical conductivity results for Scenario 2

	Existing conditions (µS/cm)	Future	Proposed	Change between			
Location		conditions (µS/cm)	conditions (µS/cm)	Existing and future conditions	uture proposed propos		
1	2,680	3,750	3,780	40%	41%	1%	
2	1,000	870	980	-13%	-2%	13%	
3	910	790	900	-13%	-1%	14%	
4	660	650	380	-2%	-42%	-42%	
5	510	500	300	-2%	-41%	-40%	
6	170	170	150	0%	-12%	-12%	

Comparison of the results in Table 3-1 and Table 3-4 indicates that the reduced residuals flow rate from the SWTP to the SCSS was modelled to reduce LDP006 discharges slightly, by 25 ML/year on average. LDP006 discharges under proposed conditions compared to future conditions were predicted to increase by 23% (compared to 29% for Scenario 1). For proposed conditions compared to existing conditions, the overall decrease in LDP006 discharges was 36% for Scenario 2 (compared to a decrease of 33% for Scenario 1). The reduced residuals flow rate used in Scenario 2 was estimated to have a limited impact on the flow of Wangcol Creek compared to the results for Scenario 1, with no impact on results for the inflows to Lake Wallace and Lake Lyell.

The reduced flow rate and EC for the residuals stream modelled in Scenario 2 resulted in a reduced salt load for LDP006 discharges compared to Scenario 1, as shown in Table 3-5, and a corresponding decrease in EC of 10 μ S/cm, as shown in Table 3-6. The EC of Wangcol Creek under proposed conditions compared to existing conditions was modelled to decrease by between 1% and 2% for Scenario 2 (compared to an increase of 1% for Scenario 1). As with the results for water volume, modelling of Scenario 2 indicated limited sensitivity for the salt load and EC of inflows to Lake Wallace, Lake Lyell and Lake Burragorang.

Sincerely GHD Pty Ltd

L. Hammerster

Lachlan Hammersley Senior Water Engineer +61 2 4979 9993



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