



Statement of Reasons

Variation to Endeavour Coal Pty Limited's Environment Protection Licence No. 2504 for West Cliff Mine



Licensed discharge point 10, which discharges into Brennans Creek, a tributary of the upper Georges River (Photo: Jen Byrne)

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1. Introduction

Endeavour Coal Pty Ltd (ACN 099 830 476), a wholly owned subsidiary of BHP Billiton Illawarra Coal Holdings Pty Ltd (ACN 093 857 286), holds environment protection licence No. 2504 (EPL) that authorises, among other things, the carrying out of coal works and mining for coal at West Cliff mine.

At West Cliff mine, surplus water comprising underground mine water, washery process water, emplacement area waste water, rainfall and runoff is directed to Brennans Creek Dam where it is stored and discharged in accordance with EPL conditions. The existing EPL regulates the discharge from Brennans Creek Dam via licensed discharge point 10. Discharge point 10 discharges into Brennans Creek, a tributary of the upper Georges River ([Figure 1](#)).

At discharge point 10, the existing EPL limits pH to the range 6.5 to 9.0, Total Suspended Solids (TSS) to 50 mg/L and Oil and Grease to 10 mg/L. Endeavour Coal is required to monitor the concentration of pH, TSS, Oil and Grease, Conductivity, Arsenic, Copper, Nickel and Zinc. Discharge point 10 has been the subject of a number of Pollution Reduction Programs in the past.

Approximately 500 metres downstream of discharge point 10, Brennans Creek enters the upper Georges River. The existing EPL requires monitoring of pH and Conductivity both upstream of the confluence of Brennans Creek and the upper Georges River at discharge point 11, and downstream of the confluence of Brennans Creek and the upper Georges River at discharge point 12.

2. Endeavour Coal's licence variation application

On 14 September 2012, Endeavour Coal applied to the Environment Protection Authority (EPA) under Section 58 of the *Protection of the Environment Operations Act 1997* (POEO Act) to vary their EPL.

L2.4 Concentration limits – discharge point 10

Endeavour Coal sought to add the following parameters and limits to discharge point 10.

Pollutant	Units of Measure	90 percentile concentration limit	100 percentile concentration limit
Oil and Grease	mg/L		10
pH	pH		6.5 – 9.0
Total suspended solids	mg/L		50
Aluminium (filterable)	µg/L	1000	
Nickel (filterable)	µg/L	200	
Zinc (filterable)	µg/L	100	
Copper (filterable)	µg/L	10	
Arsenic (filterable)	µg/L	20	

Lead (filterable)	µg/L	16	
Salinity	µS/cm	<2500 (>1.5ML/day) ≥2500 (≤1.5ML/day)	
Chemical Oxygen Demand (COD)	mg/L	50	
Total Dissolved Solids (TDS)	mg/L	<1425 (>1.5ML/day) ≥1425 (≤1.5ML/day)	

Pollution Reduction Programs

Endeavour Coal also applied to have a Pollution Reduction Program added to the EPL, in order to determine the need or otherwise of setting concentration limits for Cadmium, Chemical Oxygen Demand (COD), Cobalt, Manganese and Ammonia.

3. Public exhibition of the application and public submissions

The EPA considered its obligations under section 58(6) of the POEO Act and invited public submissions on Endeavour Coal's application. Key steps in the public exhibition process were as follows:

- The EPA placed Endeavour Coal's application on public exhibition between 19 September and 26 October 2012.
- The EPA placed advertisements inviting public submissions in the Sydney Morning Herald, Daily Telegraph, Illawarra Mercury, Campbelltown Macarthur Advertiser, Wollondilly Advertiser and St George and Sutherland Leader on 25 September and 26 September 2012.
- The EPA held public information sessions on 18 October 2012. Dr Ann Young, Dr Ian Wright, Georges River Environment Alliance, Rivers SOS, National Parks Association, Campbelltown City Council, Wollondilly Shire Council and Georges River Combined Councils' Committee were in attendance. Save our Water Catchment Areas, NSW Office of Water, NSW Environmental Defenders Office (on behalf of Macarthur Bushwalkers and Bicycle Users Group), Office of Environment and Heritage, Sydney Catchment Authority and Sydney Metro Catchment Management Authority were advised of the information session, but were unable to attend.
- The EPA received 14 submissions on Endeavour Coal's application.
- The EPA held a second public information session on 10 December 2012. Macarthur Bushwalkers and Bicycle Users Group, Rivers SOS, National Parks Association, Campbelltown City Council, Wollondilly Shire Council and Georges River Combined Councils' Committee were in attendance.

Public submissions summary

The EPA received 14 submissions on Endeavour Coal's application, seven were from community members, four were from community groups or non-government organisations and three were from councils or regional organisation of councils. Of these submissions, three objected to the application, 10 raised concerns on the application and one had no formal position. A summary of the key issues raised in the submissions is provided in [Attachment 1](#).

4. Variations made to the EPL

L2.4 Concentration limits – discharge point 10

Existing EPL

At discharge point 10, the existing EPL limits pH to the range 6.5 to 9.0, TSS to 50 mg/L and Oil and Grease to 10 mg/L.

Endeavour Coal's application

Endeavour Coal sought a continuation of existing limits for pH, TSS and Oil and Grease as 100 percentile limits. 100 percentile limits mean that the concentration limits must be met at all times (i.e. that the concentration limits must not to be exceeded).

Endeavour Coal also sought to add 90 percentile limits for Aluminium, Nickel, Zinc, Copper, Arsenic, Lead, Salinity, COD and Total Dissolved Solids. 90 percentile limits mean that the concentration limits must be met for 90 percent of the time, not all the time. For weekly monitoring this means that at most five samples of the 52 samples taken over the year may be above the specified concentration limit. The 47 remaining samples must have results below the concentration limit.

Endeavour Coal also applied to have a Pollution Reduction Program added to the EPL, in order to determine the need or otherwise of setting concentration limits for Cadmium, COD, Cobalt, Manganese and Ammonia.

Variations made to the EPL

The following table outlines the existing EPL requirements, Endeavour Coal's application and variations made to licence condition L2.4 in the EPL:

Pollutant	Units of Measure	Existing EPL		Endeavour Coal's application		Variations made to the EPL in 2013	
		90 percentile concentration limit	100 percentile concentration limit	90 percentile concentration limit	100 percentile concentration limit	90 percentile concentration limit	100 percentile concentration limit
Oil and Grease	mg/L		10		10		10
pH	pH		6.5 – 9.0		6.5 – 9.0		6.5 – 9.3
Total suspended solids	mg/L		50		50		50
Aluminium (dissolved)	µg/L			1000		1000	
Nickel (dissolved)	µg/L			200		200	

Zinc (dissolved)	µg/L		100		84	
Copper (dissolved)	µg/L		10		8	
Arsenic (dissolved)	µg/L		20		19	
Lead (dissolved)	µg/L		16		6	
Manganese (dissolved)	µg/L				102	
Salinity, as expressed as Conductivity	µS/cm		<2500 (>1.5ML/day) ≥2500 (≤1.5ML/day)		2500 (>2ML/day) 3570 (≤2ML/day)	
Chemical Oxygen Demand (COD)	mg/L		50		50	
Total Dissolved Solids (TDS)	mg/L		<1425 (>1.5ML/day) ≥1425 (≤1.5ML/day)		2500	

The EPA details the variations made to licence condition L2.4 in the EPL as outlined below:

- *Oil and Grease* - The EPA has not varied the limit for Oil and Grease.
- *pH* - The EPA has varied the upper pH limit to 9.3 to allow for *PRP 18 Modification to Brennans Creek Dam Off Take*. This upper pH limit will be in place until completion of *PRP 19 Water Discharge Quality Improvement to Upper Georges River via discharge point 10* by 30 December 2016. The change to the upper pH limit will not in effect represent any increase in environmental impact, due to carbon dioxide out gassing in the discharge waters that causes the pH to increase downstream of discharge point 10, compared to the pH measured at discharge point 10.
- *Total Suspended Solids* - The EPA has not varied the limit for TSS.
- *Aluminium* - Endeavour Coal sought to add a 90 percentile limit for Aluminium of 1000µg/L. The EPA has reviewed Endeavour Coal's monitoring data for the period 2008 to 2012. The EPA has agreed to add a 90 percentile limit for Aluminium of 1000µg/L.
- *Nickel* - Endeavour Coal sought to add a 90 percentile limit for Nickel of 200µg/L. The EPA has reviewed Endeavour Coal's monitoring data for the period 2008 to 2012. The EPA has agreed to add a 90 percentile limit for Nickel of 200µg/L.
- *Zinc* - Endeavour Coal sought to add a 90 percentile limit for Zinc of 100µg/L. The EPA has reviewed Endeavour Coal's monitoring data for the period 2008 to 2012. The discharge has not exceeded 100µg/L between 2008 and 2012. A 90 percentile limit for Zinc of 100µg/L would have allowed an increase in Zinc concentration from existing conditions. The EPA has applied the maximum recorded Zinc concentration of 84µg/L as a 90 percentile limit.

- *Copper* - Endeavour Coal sought to add a 90 percentile limit for Copper of 10µg/L. The EPA has reviewed Endeavour Coal's monitoring data for the period 2008 to 2012. The discharge has not exceeded 10µg/L between 2008 and 2012. A 90 percentile limit for Copper of 10µg/L would have allowed an increase in Copper concentration from existing conditions. The EPA has applied the maximum recorded Copper concentration of 8µg/L as a 90 percentile limit.
- *Arsenic* - Endeavour Coal sought to add a 90 percentile limit for Arsenic of 20µg/L. The EPA has reviewed Endeavour Coal's monitoring data for the period 2008 to 2012. The discharge has not exceeded 20µg/L between 2008 and 2012. A 90 percentile limit for Arsenic of 20µg/L would have allowed an increase in Arsenic concentration from existing conditions. The EPA has applied the maximum recorded Arsenic concentration of 19µg/L as 90 percentile limit.
- *Lead* - Endeavour Coal sought to add a 90 percentile limit for Lead of 16µg/L. The EPA has reviewed Endeavour Coal's monitoring data for the period 2008 to 2012. The discharge has not exceeded 16µg/L between 2008 and 2012. A 90 percentile limit for Lead of 16µg/L would have allowed an increase in Lead concentration from existing conditions. The EPA has applied the maximum recorded Lead concentration of 6µg/L as 90 percentile limit.
- *Manganese* - Endeavour Coal also applied to have a Pollution Reduction Program added to the EPL, in order to determine the need or otherwise of setting a concentration limit for Manganese. The EPA has reviewed Endeavour Coal's monitoring data for the period 2008 to 2012. The EPA has applied the maximum recorded Manganese concentration of 102µg/L as a 90 percentile limit.
- *Salinity, as expressed as Conductivity* - Endeavour Coal initially sought to add a 90 percentile limit for Salinity, as expressed as Conductivity, of <2500µS/cm (>1.5ML/day) and >2500µS/cm and <5000µS/cm (<1.5ML/day). Endeavour Coal then advised the EPA that the low flow (<1.5ML/day) does not account for the seepage from Brennans Creek Dam wall and requested that the low flow value be increased to 2ML/day. The EPA has reviewed Endeavour Coal's recent annual returns, in which the mean seepage in 2011-12 was 214kL/day and the mean seepage in 2010-11 was 249kL/day. The EPA has agreed to increase the low flow discharge volume to 2ML/day. The EPA has reviewed Endeavour Coal's monitoring data for the period 2004 to 2012. The average Conductivity concentration between 2004 and 2012 was 2498µS/cm, with a maximum of 3570µS/cm. The EPA has agreed to add a 90 percentile limit for Conductivity of 2500µS/cm for high flow. A 90 percentile upper limit for Conductivity of <5000µS/cm for low flow would have allowed an increase in Conductivity concentration from existing conditions. The EPA has applied the maximum recorded Conductivity concentration of 3570µS/cm as a 90 percentile limit for low flows.
- *Chemical Oxygen Demand* - Endeavour Coal sought to add a 90 percentile limit for COD of 50mg/L. Endeavour Coal sought to add a limit for COD 'to encompass all organic matter by indirect measurement.' The EPA holds no historic monitoring data with respect to COD. The EPA has agreed to add a 90 percentile limit for COD of 50mg/L.
- *Total Dissolved Solids* - Endeavour Coal sought to add a 90 percentile limit for TDS of <1425mg/L (>1.5ML/day) and >1425 (<1.5ML/day). Endeavour Coal sought to add a limit for TDS 'to encompass cations and anions together with some minor dissolved species such as silicate, nitrate/nitrite and fluoride.' The EPA holds no historic monitoring data with respect to TDS. TDS can be estimated from Conductivity using a conversion factor stipulated in [Australian and New Zealand Guidelines for Fresh and Marine Water Quality](#) (ANZECC 2000 Guidelines), being Conductivity (µS/cm) x 0.67 = TDS (mg/L). Given that the EPA has applied the maximum recorded Conductivity concentration of 3570µS/cm as 90 percentile limit for low flows, the EPA has applied a TDS concentration of 2500mg/L as a 90 percentile limit.

M2.3 Requirement to monitor – discharge point 10

Existing EPL

At discharge point 10, the existing EPL requires monthly monitoring for pH, TSS, Oil and Grease, Nickel, Zinc, Copper, Arsenic and Conductivity.

Endeavour Coal's application

Endeavour Coal sought to continue monthly monitoring for pH, TSS, Oil and Grease, Nickel, Zinc, Copper, Arsenic and Conductivity. Endeavour Coal also applied to add new monthly monitoring conditions for Aluminium, Lead, COD and TDS.

Variations made to the EPL

The EPA has agreed to continued monitoring for pH, TSS, Oil and Grease, Nickel, Zinc, Copper, Arsenic and Conductivity. The EPA has agreed to add new monitoring conditions for Aluminium, Lead, COD and TDS to monitor compliance with the concentration limits in L2.4. The EPA has also added a requirement to monitor Manganese, as Manganese has been added to the concentration limits in L2.4. In addition, the EPA has also added a requirement to monitor Turbidity, Total Alkalinity, Bicarbonate, Cobalt, Cadmium, Total Nitrogen, Nitrogen (ammonia) and Oxides of Nitrogen, to monitor progress towards meeting the concentration limits in *PRP 19 Water Quality Discharge Improvement to Upper Georges River via discharge point 10*.

Given the highly complex and variable chemical nature of the discharge, as well as to address concerns raised in submissions, the EPA has changed the frequency of monitoring from monthly to weekly for all analytes, with the exception of pH, Conductivity and Turbidity. The EPA has changed the frequency of monitoring for pH, Conductivity and Turbidity from monthly to continuous in stream monitoring during discharge. The frequency of monitoring at discharge point 10 will be reviewed after one year, following a review of monitoring data.

As many of the concentration limits in L2.4 are 90 percentile limits, meaning that 90 percentile concentration limits in L2.4 must be met for 90 percent of the time, a higher frequency of monitoring will enable a more comprehensive data set from which to determine compliance. A weekly monitoring regime means that at most, five samples of the 52 samples taken over the year, may be above the specified concentration limit. The 47 remaining samples must have results below the concentration limit.

Following recent changes to the POEO Act, monitoring data collected under requirements in M2.3 must be made publicly available in a timely manner.

M2.3 Requirement to monitor – discharge points 11 and 12

Existing EPL

At discharge points 11 and 12, the existing EPL requires monthly monitoring for pH and Conductivity.

Endeavour Coal's application

Endeavour Coal sought to continue monthly monitoring for pH and Conductivity.

Variations made to the EPL

The EPA has agreed to continued monitoring for pH and Conductivity.

Given the highly complex and variable chemical nature of the discharge, as well as to address concerns raised in submissions, the EPA has also added a requirement to monitor TSS and has changed the frequency of monitoring from monthly to weekly for all analytes. The frequency of monitoring at discharge points 11 and 12 will be reviewed after one year, following a review of monitoring data.

Following recent changes to the POEO Act, monitoring data collected under requirements in M2.3 must be made publicly available in a timely manner.

M2.5 Requirement to carry out acute and chronic toxicity testing – discharge point 10

Existing EPL

The existing EPL does not require any toxicity testing.

Endeavour Coal's application

Endeavour Coal did not seek to undertake any toxicity testing.

Variations made to the EPL

Given the highly complex and variable chemical nature of the discharge, as well as to address concerns raised in submissions, the EPA has added a requirement to undertake acute and chronic (sub-lethal) toxicity testing of the discharge from discharge point 10. To determine toxicity under a variety of seasonal conditions, the EPA has required toxicity testing to be undertaken quarterly. To measure the effect of the discharge on a range of species, the EPA has required the use of freshwater crustacean, shrimp, larval fish, an aquatic herb and microalgae in toxicity testing. The frequency of toxicity testing at discharge point 10 will be reviewed after two years, following a review of monitoring data.

Following recent changes to the POEO Act, monitoring data collected under requirements in M2.5 must be made publicly available in a timely manner.

Pollution Reduction Programs

Endeavour Coal's application

Endeavour Coal applied to have a Pollution Reduction Program added to the EPL, in order to determine the need or otherwise of setting concentration limits for Cadmium, COD, Cobalt, Manganese and Ammonia.

Variations made to the EPL

The EPA considers that there is a demonstrated need to set concentration limits for Cadmium, COD, Cobalt, Manganese and Ammonia and that information is currently available to set these concentration limits.

The ANZECC 2000 Guidelines establish a framework for developing water quality trigger values based on the condition of aquatic ecosystems and the levels of protection provided to those ecosystems. The EPA has determined that the condition of Brennans Creek and the upper Georges River aquatic ecosystem is a 'slightly to moderately disturbed ecosystem.' For 'slightly to moderately disturbed ecosystems,' the ANZECC 2000 Guidelines provides corresponding guidance on the level of protection to apply, which is generally a 95 percent protection level. Species protection levels refer to the percentage of species present in the receiving environment considered to be protected from adverse effects when exposed to a specific water quality trigger value for a physical or chemical stressor. The ANZECC 2000 Guidelines set out water quality trigger values for a range of pollutants at a 95 percent protection level. The EPA considers that the water quality trigger values in the ANZECC 2000 Guidelines can be used to set concentration limits for Cadmium, Cobalt and Manganese at discharge point 10.

The ANZECC 2000 Guidelines do not include a water quality trigger value for COD. The EPA will retain the concentration limit for COD of 50mg/L at discharge point 10. The EPA will change the concentration limit for COD to a 100 percentile limit following completion of *PRP 19 Water Discharge Quality Improvement to Upper Georges River via discharge point 10*, meaning that the concentration limit of 50mg/L must then be met at all times.

With regard to Ammonia, the *Assessment of West Cliff Mine Brennans Creek Discharge - Recommendations Regarding Discharge Trigger Values Required to Protect Receiving Waters* (OEH, 2012b) report prepared for the EPA has been used to set a concentration limit for Ammonia of 13µg/L at discharge point 10, to be put in place following the completion of *PRP 19 Water Discharge Quality Improvement to Upper Georges River via discharge point 10*.

In summary, the EPA has not added a Pollution Reduction Program to the EPL in order to determine the need or otherwise of setting concentration limits for Cadmium, COD, Cobalt, Manganese and Ammonia. However the EPA has added three Pollution Reduction Programs to the EPL, which are outlined below:

PRP 18 Modification to Brennans Creek Dam off take

Under existing conditions, the discharge from discharge point 10 is sourced from a pipe at the bottom of Brennans Creek Dam. There is clear evidence that changing the discharge configuration to a surface water off-take will result in an overall reduction in ecological risks associated with the discharge, including a decrease in Ammonia and Conductivity concentrations (Endeavour Coal, 2012b; OEH, 2012b).

The EPA has added *PRP 18 Modification to Brennans Creek Dam off take* to the EPL, which requires Endeavour Coal to change the configuration of discharge point 10 from a pipe at the bottom of Brennans Creek Dam to surface water off-take by 30 June 2013.

Coupled with this change, the EPA has varied the upper pH limit to 9.3 to allow for *PRP 18 Modification to Brennans Creek Dam off take*. This upper pH limit will be in place until completion of *PRP 19 Water Discharge Quality Improvement to Upper Georges River via discharge point 10* by 30 December 2016. The change to the upper pH limit will not in effect represent any increase in environmental impact, due to carbon dioxide out gassing in the discharge waters that causes the pH to increase downstream of discharge point 10, compared to the pH measured at discharge point 10.

PRP 19 Water Quality Discharge Improvement to Upper Georges River via discharge point 10

A variety of industry and independent studies have found that the discharge from discharge point 10 can be toxic to aquatic life, including adverse impacts on downstream animal and plant assemblages in Brennans Creek and the upper Georges River (EcoEngineers, 2005; Ecology Lab, 2006; GRCCC, 2009; OEH, 2012b). Effects consistently exceed the 95 percent protection level provided for slightly to moderately disturbed ecosystems.

The EPA has added *PRP 19 Water Discharge Quality Improvement to Upper Georges River via discharge point 10* to the EPL, which requires Endeavour Coal to reduce the concentration of pollutants in the discharge from discharge point 10 to meet the concentration limits specified in the table below. The concentration limits are based on achieving a 95 percent protection level, as outlined in ANZECC 2000 Guidelines and the *Assessment of West Cliff Mine Brennans Creek Discharge - Recommendations Regarding Discharge Trigger Values Required to Protect Receiving Waters*. These concentration limits are 100 percentile limits, meaning that the limits must be met at all times following the completion of *PRP 19*.

Pollutant	Units of Measure	Variations made to the EPL in 2013		PRP 19 requirements by 2016
		90 percentile concentration limit	100 percentile concentration limit	100 percentile concentration limit
Oil and Grease	mg/L		10	10
pH	pH		6.5 – 9.3	6.5 - 8.0
Total suspended solids	mg/L		50	50
Conductivity	µS/cm	2500 (>2ML/day) 3570 (≤2ML/day)		495
Bicarbonate	mg/L			225
Aluminium (dissolved)	µg/L	1000		55
Nickel (dissolved)	µg/L	200		11
Zinc (dissolved)	µg/L	84		8
Copper (dissolved)	µg/L	8		1.4
Arsenic (dissolved)	µg/L	19		24
Lead (dissolved)	µg/L	6		3.4
Manganese (dissolved)	µg/L	102		1900

Cobalt (dissolved)	µg/L			30
Cadmium (dissolved)	µg/L			0.2
Chemical oxygen demand	mg/L	50		50
Total dissolved solids	mg/L	2500		340
Total nitrogen	µg/L			250
Nitrogen (Ammonia)	µg/L			13
Oxides of nitrogen	µg/L			15

In addition to the concentration limits, *PRP 19* also requires Endeavour Coal to reduce the concentration of pollutants in the discharge from discharge point 10 to meet the toxicity limits specified in the table below. The toxicity limits provide that the toxic effect on species of freshwater crustacean and shrimp must not exceed the corresponding 90 percentile limit for that species.

Species	Frequency	Sampling Method	90 percentile concentration limit
<i>Ceriodaphnia dubia</i>	Monthly	7-day reproductive impairment test (USEPA 2002 - EPA/821/R/02/013)	No reduction in reproduction (EC10 reproduction)>100% effluent)
<i>Paratya australiensis</i>	Monthly	10-day acute test (USEPA 2002 - EPA/821/R/02/012) Adaptation of Test Method 2007.0 in that mature <i>Paratya australiensis</i> are used, with feeding 3 hours prior to 48-hour renewal of test solutions	No lethal acute effects (L10>100% effluent)

PRP 19 requires Endeavour Coal to carry out a program of works to reduce the concentration of pollutants in the discharge. The program may include any practical measures such as minimisation or avoidance of a discharge, the installation of a water treatment plant, or a combination of a water treatment plant and other discharge improvement options.

PRP 19 requires Endeavour Coal to carry out a program of works by 30 December 2016. The EPA considers that the completion date of *PRP 19* will enable Endeavour Coal to scope out the program of works, seek any necessary consents or approvals and then commission the program of works.

In December 2011, the NSW Planning and Assessment Commission granted approval to the Bulli Seam Operations Project, subject to conditions. The Bulli Seam Operations Project relates to the continuation of mining operations at the Appin and West Cliff mines. Approval conditions included the requirement for Endeavour Coal to prepare and implement a Surface Water Management Plan. The Surface Water Management Plan must include the identification of 5, 7 and 10 year commitments to substantially reduce the impacts on biota of salinity and other pollutants in such discharges. The completion date of *PRP 19* coincides with the 5 year commitment period for the Bulli Seam Operations Project.

PRP 19 also requires Endeavour Coal to provide progress reports to the EPA by 30 June and 30 December each year, commencing 30 June 2013 until the completion of *PRP 19*.

PRP 20 Aquatic Health Monitoring Program

A variety of independent studies have found that the discharge signature from discharge point 10 is observable in Brennans Creek and the upper Georges River, extending to the confluence of Georges River and O'Hares Creek (GRCCC, 2009; Wright 2012). The discharge signature was the subject of concerns raised in a number of submissions.

The EPA has added *PRP 20 Aquatic Health Monitoring Program* to the EPL, which requires Endeavour Coal to assess the aquatic health of Brennans Creek and the upper Georges River prior to, during and after completion of *PRP 18* and *PRP 19*. *PRP 20* requires Endeavour Coal to undertake the aquatic health monitoring program between 1 September and 30 November (monitoring period) in the years 2013, 2015, 2017 and 2019. Following *PRP 18* and *PRP 19*, it is anticipated that the discharge signature will move closer to discharge point 10, as works to reduce the concentration of pollutants in the discharge are carried out. The 2013 monitoring period will capture the anticipated improvements to the discharge after completion of *PRP 18*. The 2015, 2017 and 2019 monitoring periods will capture anticipated improvements prior to, during and after completion of *PRP 19*.

PRP 20 requires Endeavour Coal to undertake chemical analysis and an in-stream biota assessment, such as macroinvertebrate, algal and vertebrate species. Chemical analysis and an in-stream biota assessment will be required to be carried out at five or more locations including discharge point 10, discharge point 11, discharge point 12 and at the confluence of Georges River and O'Hares Creek.

PRP 20 also requires Endeavour Coal to provide reports to the EPA following each monitoring period, commencing in 2013. Following recent changes to the POEO Act, monitoring data collected under the requirements of *PRP 20* must be made publicly available in a timely manner.

Endeavour Coal may choose to partner with the Georges River Combined Councils' Committee who undertake a River Health Monitoring Program along the Georges River.

Negotiation with Endeavour Coal on variations made to the EPL

Consistent with all major licence variations, opportunity was provided for Endeavour Coal to raise any relevant matters to the attention of the EPA prior to variations being made to the EPL. Key steps in the negotiation process were as follows:

- On 3 December 2012, the EPA met with Endeavour Coal to discuss the draft notice to vary the EPL. The EPA provided Endeavour Coal with a draft notice to vary the EPL at that meeting, seeking comments by 24 December 2012.
- On 24 December 2012, Endeavour Coal provided a written response to the EPA on the draft notice to vary the EPL.
- On 22 January 2013, the EPA met with Endeavour Coal to discuss their written response dated 24 December 2012.
- On 2 February 2013, the EPA met with Endeavour Coal to discuss the revised draft notice to vary the EPL. The EPA provided Endeavour Coal with a revised draft notice to vary the EPL at that meeting.
- On 5 March 2013, Endeavour Coal provided a written response to the EPA on the revised draft notice to vary the EPL. On 6 March 2013, the EPA met with Endeavour Coal to discuss their written response dated 5 March 2013.
- On 4 April 2013, the EPA provided Endeavour Coal with a final draft notice to vary the EPL.

5. Matters to be taken into consideration in licensing functions

In determining EPL requirements the EPA has taken into consideration the matters prescribed in Section 45 of the POEO Act. They are set out below:

(a) any protection of the environment policies

There are no protection of the environment policies under the POEO Act that apply to the Georges River.

(b) the objectives of the EPA as referred to in section 6 of the *Protection of the Environment Administration Act 1991*

The objectives of the EPA are:

- (a) to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development, and
- (b) to reduce the risks to human health and prevent the degradation of the environment, by means such as the following:
 - Promoting pollution prevention,
 - Adopting the principle of reducing to harmless levels the discharge into the air, water or land of substances likely to cause harm to the environment,
 - Minimising the creation of waste by the use of appropriate technology,
 - Regulating the transportation, collection, treatment, storage and disposal of waste,
 - Encouraging the reduction of the use of materials, encouraging the re-use and recycling of materials and encouraging material recovery,
 - Adopting minimum environmental standards prescribed by complementary Commonwealth and State legislation and advising the Government to prescribe more stringent standards where appropriate,
 - Setting mandatory targets for environmental improvement,
 - Promoting community involvement in decisions about environmental matters,
 - Ensuring the community has access to relevant information about hazardous substances arising from, or stored, used or sold by, any industry or public authority,
 - Conducting public education and awareness programs about environmental matters.

The EPA has made variations to the EPL to protect and enhance the quality of Brennans Creek and the upper Georges River. This will be achieved by:

- Adding new concentration limits for Aluminium, Nickel, Zinc, Copper, Arsenic, Lead, Manganese, Conductivity, COD and TSS in licence condition L2.4 to protect the quality of the discharge from discharge point 10 from further degradation. These concentration limits will be in place until the completion of *PRP 19* by 30 December 2016.
- The EPA has set mandatory targets for environmental improvement, through the addition of two Pollution Reduction Programs to enhance the quality of the discharge from discharge point 10. *PRP 18* requires the discharge configuration to be changed to a surface water off-take will result in an overall reduction in ecological risks associated with the discharge, including a decrease in Ammonia and Conductivity concentrations by 30 June 2013. *PRP 19*

requires Endeavour Coal to reduce the concentration of pollutants in the discharge from discharge point 10 to meet specified concentration limits by 30 December 2016. These concentration limits are based on achieving a 95 percent protection level, as outlined in ANZECC 2000 Guidelines and the *Assessment of West Cliff Mine Brennans Creek Discharge - Recommendations Regarding Discharge Trigger Values Required to Protect Receiving Waters*.

- Outcomes of the above measures to protect and enhance the quality of Brennans Creek and the upper Georges River will be monitored through a suite of new requirements. Compliance with concentration limits in licence condition L2.4 will be monitored through additional monitoring requirements for all pollutants at discharge point 10. These monitoring requirements are supported by the requirement to carry out toxicity testing which will measure the effect of the discharge from discharge point 10 on a range of species, including freshwater crustacean, shrimp, larval fish, an aquatic herb and microalgae. *PRP 20* requires Endeavour Coal to assess the aquatic health of Brennans Creek and the upper Georges River prior to, during and after completion of *PRP 18* and *PRP 19*.

In order to promote community involvement in the decision to vary the EPL, the EPA invited public submissions on Endeavour Coal's application and held a number of public information sessions. In determining EPL requirements the EPA has taken into consideration all matters raised in public submissions.

Following recent changes to the POEO Act, all monitoring data collected under the requirements of EPL must be made publicly available in a timely manner, ensuring that the community has access to relevant information relating to the discharge from discharge point 10.

(c) The pollution caused or likely to be caused by the carrying out of the activity or work concerned and the likely impact of that pollution on the environment

A variety of industry and independent studies have found that the discharge from discharge point 10 can be toxic to aquatic life, including adverse impacts on downstream animal and plant assemblages in Brennans Creek and the upper Georges River (EcoEngineers, 2005; Ecology Lab, 2006; GRCCC, 2009; OEH, 2012b). Effects consistently exceed the 95 percent protection level provided for slightly to moderately disturbed ecosystems.

A variety of independent studies have also found that the discharge signature from discharge point 10 is observable in Brennans Creek and the upper Georges River, extending to the confluence of Georges River and O'Hares Creek (GRCCC, 2009; Wright 2012).

(d) The practical measures that could be taken: (i) to prevent, control, abate or mitigate that pollution, and (ii) to protect the environment from harm as a result of that pollution

The EPA considers that Endeavour Coal can undertake a number of practical measures to prevent, control, abate or mitigate pollution of Brennans Creek and the upper Georges River, including changing the discharge configuration of discharge point 10 to a surface water off-take, minimising or avoiding the discharge, installing a water treatment plant, or a combination of installing a water treatment plant and other discharge improvement options. The EPA has not required Endeavour Coal to meet background water quality levels as this would require significantly higher costs without any statistical benefit to ecosystem health.

(e) Any relevant green offset scheme, green offset works or tradeable emissions scheme or other scheme involving economic measures, as referred to in Part 9.3

Not applicable.

(f) Whether the person concerned is a fit and proper person (as referred to in section 83)

The EPA has considered section 83 of the POEO Act, especially as it relates to past compliance with environmental legislation. The EPA has, in the past, issued Endeavour Coal with a clean-up notice under the POEO Act, relating to water pollution at Tower Colliery in 2004. The EPA has not issued a penalty, prevention or prohibition notice, nor convicted Endeavour Coal of any offence under the POEO Act.

(f1) In relation to an activity or work that causes, is likely to cause or has caused water pollution: (i) the environmental values of water affected by the activity or work, and (ii) the practical measures that could be taken to restore or maintain those environmental values

The community has identified Georges River as being of high value, environmentally, culturally and recreationally.

The ANZECC 2000 Guidelines establish a framework for developing water quality trigger values based on the condition of aquatic ecosystems and the levels of protection provided to those ecosystems. The EPA has determined that the condition of Brennans Creek and the upper Georges River aquatic ecosystem is a 'slightly to moderately disturbed ecosystem.' For 'slightly to moderately disturbed ecosystems,' the ANZECC 2000 Guidelines provides corresponding guidance on the level of protection to apply, which is a 95 percent protection level. The ANZECC 2000 Guidelines set out water quality trigger values for a range of pollutants at a 95 percent protection level. The concentration limits specified in *PRP 19* are based on achieving a 95 percent protection level, as outlined in ANZECC 2000 Guidelines and the *Assessment of West Cliff Mine Brennans Creek Discharge - Recommendations Regarding Discharge Trigger Values Required to Protect Receiving Waters*. The EPA considers that Endeavour Coal can undertake a number of practical measures to meet the concentration limits specified in *PRP 19* by 30 December 2016.

(g) In connection with a licence application relating to the control of the carrying out of non-scheduled activities for the purpose of regulating water pollution – whether the applicant is the appropriate person to hold the licence having regard to the role of the applicant in connection with the carrying out of those activities

Not applicable.

(h) in connection with a licence application – any documents accompanying the application

The supporting documents are:

- Endeavour Coal, 2012, [Application to Vary EPL 2504 Supporting Material](#), received 18 September 2012.
- EcoEngineers, 2012, [West Cliff Mine Assessment of Potential Ecotoxicants Brennans Creek Dam Discharge](#), received 18 September 2012.

During the public exhibition process additional information was requested as follows:

- Endeavour Coal, 2012, *Raw Data For All Analytes* (monitoring data), received 4 October 2012.
- EcoEngineers, 2012, *Modelling Input and Output Files and Supplement to Appendix B*, received 17 October 2012.

(i) in connection with a licence application-any relevant environmental impact statement, or other statement of environmental effects, prepared or obtained by the applicant under the *Environmental Planning and Assessment Act 1979*

If approval is granted by the Minister for Planning and Infrastructure an environment protection licence is subsequently applied for, the EPA cannot refuse to issue the licence. Licence conditions must be substantially consistent with the conditions of the approval.

In December 2011, the NSW Planning and Assessment Commission (PAC) granted approval to the Bulli Seam Operations Project, subject to conditions. The Bulli Seam Operations Project relates to the continuation of mining operations at the Appin and West Cliff mines.

The issue of mine water discharge was the subject of close scrutiny by the independent experts on the PAC, stating 'ongoing environmental impacts and consequences of the West Cliff facility that would invoke the greatest regional concern relate largely to water quality issues in Brennans Creek and the Georges River. Water quality issues are governed in turn by EPA licence constraints which can be adjusted periodically to enforce improved water quality outcomes.' During the [Review of the Bulli Seam Operations Project](#) (PAC, 2010), the PAC recommended 'that future Pollution Reduction Programs address the improvement in discharge water quality with a goal of less than 1000µS/cm within 10 years' with respect to Conductivity. *PRP 19* requires Endeavour Coal to carry out a program of works to reduce the concentration of Conductivity to meet a limit of 495µS/cm by 30 December 2016.

Approval conditions included the requirement for Endeavour Coal to prepare and implement a Surface Water Management Plan. The Surface Water Management Plan must include the identification of 5, 7 and 10 year commitments to substantially reduce the impacts on biota of salinity and other pollutants in such discharges. The completion date of *PRP 19* coincides with the 5 year commitment period for the Bulli Seam Operations Project.

(j) in connection with a licence application-any relevant species impact statement prepared or obtained by the applicant under the *Threatened Species Conservation Act 1995* or Part 7A of the *Fisheries Management Act 1994*

Not applicable.

(k) in connection with a licence application, any waste strategy in force under the *Waste Avoidance and Resource Recovery Act 2001*

Not applicable.

(l) in connection with a licence application: (i) any public submission in relation to the licence application received by the appropriate regulatory authority under this Act, and (ii) any public submission that has been made under the *Environmental Planning and Assessment Act 1979*, in connection with the activity to which the licence application relates, and that has been received by the appropriate regulatory authority

The EPA considered its obligations under section 58(6) of the POEO Act and invited public submissions on Endeavour Coal's application.

The EPA received 14 submissions on Endeavour Coal's application, seven were from community members, four were from community groups or non-government organisations and three were from councils or regional organisation of councils. Of these submissions, three objected to the application, 10 raised concerns on the application and one had no formal position. In determining EPL requirements, the EPA has taken into consideration all matters raised in public submissions. A summary of the key issues raised in the submissions is provided in [Attachment 1](#).

(m) if the appropriate regulatory authority is not the EPA-any guidelines issued by the EPA to the authority relating to the exercise of functions under this Chapter.

Not applicable.

6. Decision to vary the EPL

In determining EPL requirements, the EPA has taken into consideration Endeavour Coal's application, supporting documentation, matters raised in public submissions, a scientific review undertaken by the Office of Environment and Heritage, as well as written responses from Endeavour Coal on the draft notices to vary the EPL.

The EPA has also taken into consideration the matters prescribed in Section 45 of the POEO Act, including but not limited to:

- The objectives of the EPA as referred to in section 6 of the *Protection of the Environment Administration Act 1991* (section 45(b) of the POEO Act).
- The pollution caused or likely to be caused by the carrying out of the activity or work concerned and the likely impact of that pollution on the environment (section 45 (c) of the POEO Act).
- The practical measures that could be taken to prevent, control, abate or mitigate that pollution, and to protect the environment from harm as a result of that pollution (section 45 (d) of the POEO Act).
- The environmental values of water affected by the activity or work and the practical measures that could be taken to restore or maintain those environmental values (section 45 (f1) of the POEO Act).

The EPA considers that Endeavour Coal can undertake a number of practical measures to prevent, control, abate or mitigate pollution of Brennans Creek and the upper Georges River, including changing the discharge configuration of discharge point 10 to a surface water off-take, minimising or avoiding the discharge, installing a water treatment plant, or a combination of installing a water treatment plant and other discharge improvement options.

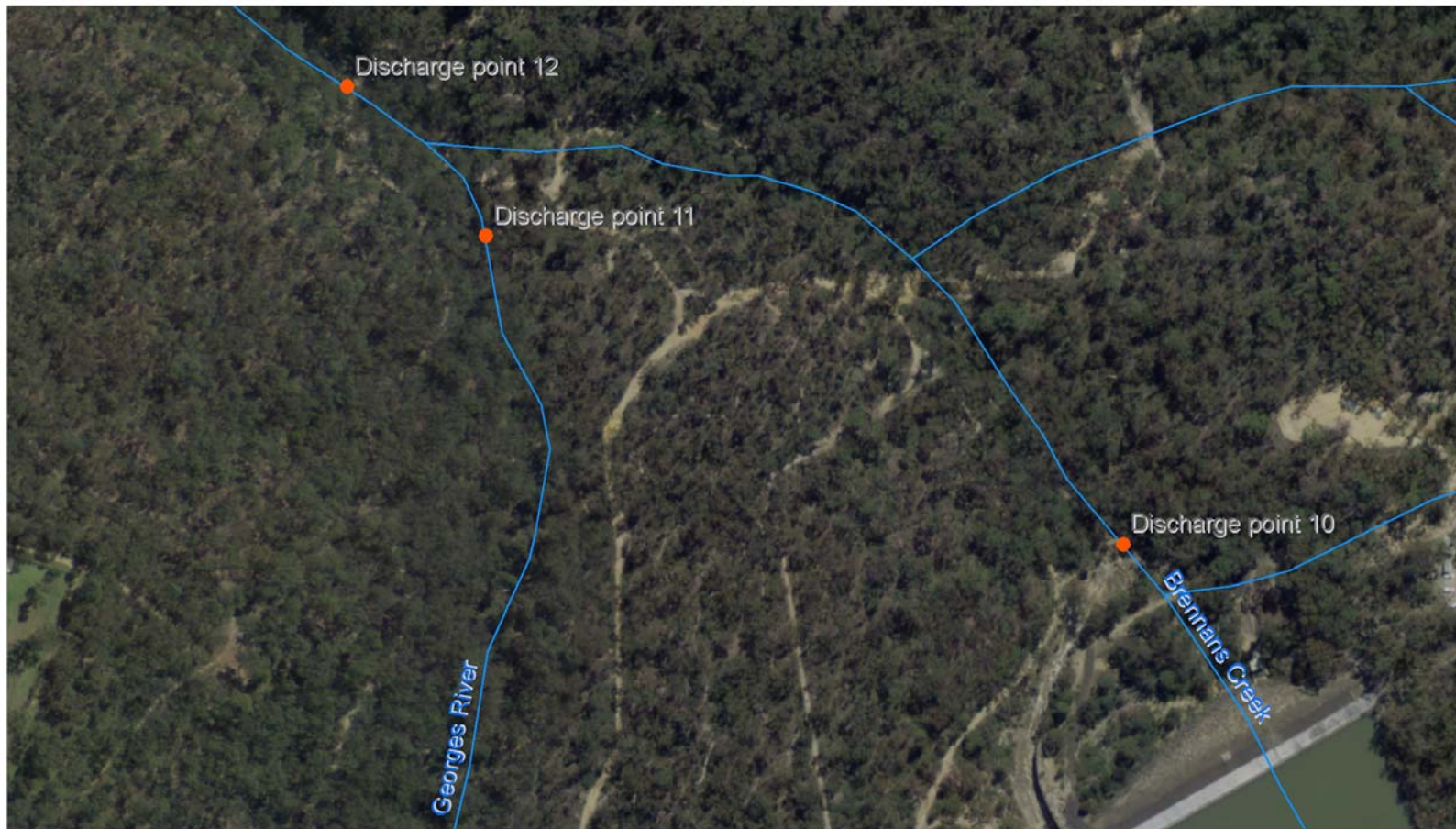
Taking the above considerations into account, the EPA has determined to vary the licence in the manner set out in notice 1508855.



Regional Operations Officer: <i>Jen Byrne</i>	<i>[Signature]</i>	Date: <i>24 / 4 / 13</i>
Director Metropolitan:	<i>[Signature]</i>	Date: <i>23/4/13.</i>
<i>a/</i> Chief Environmental Regulator:	<i>[Signature]</i>	Date: <i>23/4/13.</i>

7. References

- ANZECC and ARMCANZ, 2000, [Australian and New Zealand Guidelines for Fresh and Marine Water Quality](#). Australian and New Zealand Environment and Conservation Council / Agricultural and Resource Management Council of Australian and New Zealand.
- Cardno Ecology Lab and EcoEngineers, 2010, *Pollution Reduction Program 10 West Cliff Colliery Discharge of Water from Brennans Creek Dam*. Report to Endeavour Coal.
- EcoEngineers, 2005, *Pollution Reduction Program 6 Brennans Creek Dam Discharge Trial*. Report to Endeavour Coal.
- EcoEngineers, 2012a, [West Cliff Mine Assessment of Potential Ecotoxicants Brennans Creek Dam Discharge](#). Report to Endeavour Coal.
- EcoEngineers, 2012b, *Modelling Input And Output Files And Supplement To Appendix B*. Report to Endeavour Coal.
- EcoEngineers, 2012c, [Pollution Reduction Program 11 West Cliff Mine Water Discharge Ecotoxicity Study Summary Report](#). Report to Endeavour Coal.
- Ecology Lab, 2006, *Pollution Reduction Program 9 Ecological effects of Mine Water Discharge from West Cliff Colliery into Brennans Creek*. Report to Endeavour Coal.
- Endeavour Coal, 2012a, [Application to Vary EPL 2504 Supporting Material](#).
- Endeavour Coal, 2012b, *Raw Data for all Analytes*.
- GRCCC, 2009, [Community River Health Monitoring Program: Report Card Spring 2009](#), Georges River Combined Councils' Committee, Sydney.
- NSW Planning and Assessment Commission, 2010, [Review of the Bulli Seam Operations Project](#).
- OEH, 2012a, [Chemical and Ecotoxicology Assessment of the Discharge Waters from West Cliff Mine](#). Office of Environment and Heritage. Report to NSW EPA.
- OEH, 2012b, *Assessment of West Cliff Mine Brennans Creek Discharge - Recommendations Regarding Discharge Trigger Values Required to Protect Receiving Waters*. Office of Environment and Heritage. Report to EPA.
- Wright, 2012, *Submission to EPA regarding review of EPL 2504*.

Figure 1: Licensed discharge points



<p>Legend</p> <ul style="list-style-type: none">● Discharge Points— Watercourse	<p>Figure 1: Licensed Discharge Points Environment Protection Licence No. 2504 for West Cliff mine</p> <p><small>Copyright Environment Protection Authority (NSW) April, 2013 This map is not guaranteed to be free from error or omission. The Environment Protection Authority (NSW) and its employees disclaim liability for any actions on the information in the map and any consequences of such acts or omissions.</small></p>	<p>N</p>  <p>Meters 0 10 20 40 60 80</p>  <p>Datum/Projection: GDA 1994 MGA Zone 56 Printed By: Jen Byrne, Illawarra EPA</p>
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Attachment 1: Endeavour Coal's licence variation application - submissions summary

Summary

The EPA received 14 submissions on Endeavour Coal's application, seven were from community members, four were from community groups or non-government organisations and three were from councils or regional organisation of councils. Of these submissions, three objected to the application, 10 raised concerns on the application and one had no formal position.

Position	Held by
No formal position on Endeavour Coal's application (no indication of support/opposition)	ANON
Objection to Endeavour Coal's application	BD, JC, NCC
Concerns raised on Endeavour Coal's application	CG, CCC, AY, GREA, PD, RSOS, WSC, IW, GRCCC, NPA
Support of Endeavour Coal's application	-

A summary of the key issues raised in submissions

The objective of this submission summary is to provide a breakdown of the key issues raised in submissions relating to the discharge from West Cliff mine to Brennans Creek and the upper Georges River. Whilst not all issues are cited in this summary, the EPA has taken into consideration all matters raised in public submissions.

Key issue	Raised by	EPA response
<i>Values of the Georges River</i>		
Georges River is a significant river system. Georges River is a near-pristine waterway. Much of the upper Georges River catchment is protected and valued for conservation and Aboriginal cultural heritage. Catchment reported to house approximately 1.2 million people. Contains defence land and drinking water catchment areas	GREA, RSOS, CCC, GRCCC, IW	The EPA acknowledges that the upper Georges River is a significant river system, and is of high environmental, cultural and recreational value to the community
Georges River is of high recreational value to the community. Activities include water skiing and swimming	ANON, CCC, IW	Limits established in L2.4 and <i>PRP 19</i> will protect and enhance water quality for recreation
<i>General</i>		

Key issue	Raised by	EPA response
Cited evidence that the discharge is causing pollution of the Georges River. Discharge has adversely changed the physical, chemical and biological condition of the Georges River. Of greatest concern are the consistently elevated levels of Salinity, Nickel, Zinc, Copper, Aluminium, Turbidity, Cobalt, Nitrogen and pH which were found to be above ANZECC guidelines and all indicate a high risk of damage to the aquatic ecosystem	JC, AY, NPA, NCC, PD, BD, WSC, GREA, RSOS, CG, CCC, GRCCC, IW	Recent independent testing found Salinity, Nickel, Zinc, Copper, Aluminium, Turbidity, Cobalt, Nitrogen and pH to be above ANZECC 2000 Guidelines. Limits set in <i>PRP 19</i> will achieve a 95 percent protection level
Concern about the impact of pollution on terrestrial and aquatic biodiversity, recreational opportunities and National Park estate. Salt, Copper, Nickel, Zinc, Aluminium and pH all exceeded guideline levels for ecosystem protection and contribute to toxic conditions for downstream aquatic ecosystems, macroinvertebrate data from GRCCC indicates that the Brennans Creek and Georges River ecosystems are impaired	ANON, JC, NPA, NCC, WSC, GREA, GRCCC, IW	Recent independent testing found some low level toxic effects to sensitive aquatic life. M2.5 and <i>PRP 20</i> require Endeavour Coal to monitor the aquatic health of Brennans Creek and the upper Georges River
Opposed to any increase in, or continuation, of pollution of the Georges River. Action is required urgently	JC, CG, NCC, BD, PD, NPA, GREA	L2.4 and <i>PRP 19</i> set concentration limits to protect and enhance water quality. <i>PRP 19</i> requires Endeavour Coal to carry out a program of works by 30 December 2016, providing adequate time to scope out the program of works, seek any necessary consents or approvals and then commission the works
Concern about historical pollution of the Georges River. Concern about length of time pollution has occurred	JC, NPA, NCC, BD, WSC, GREA, IW	Comment noted. <i>PRP 19</i> requires Endeavour Coal to carry out a program of works by 30 December 2016

Key issue	Raised by	EPA response
Concern about historical reduction in water volume in the Georges River	PD	Comment noted. The existing EPL requires volumetric monitoring in licence condition M7. Brennans Creek Dam is both a pollution control device and a water storage dam, as such the EPA will not set a volumetric limit on the discharge
Concern about the downstream impacts of pollution. Cited evidence of impacts downstream to the Georges River confluence with O'Hares Creek	AY, NPA, NCC, WSC, CCC, GRCCC	PRP 20 requires Endeavour Coal to monitor the aquatic health of Brennans Creek and the upper Georges River, to the confluence of Georges River and O'Hares Creek
Concern about the potential of increased pollution following expansion of West Cliff mine and coal wash emplacement	PD, BD, GRE, CCC	L2.4 and PRP 19 set concentration limits regardless of any change to the catchment
Concern about the water quality of Brennans Creek compared to background waterways, for example upstream Georges River and O'Hares Creek. Concern about the water quality of Brennans Creek compared to ANZECC guidelines	AY, NCC, BD	Limits set in PRP 19 will achieve a 95 percent protection level. To meet background water quality levels would require significantly higher cost without any statistical benefit to ecosystem health

Key issue	Raised by	EPA response
That the proposed limits in the application will increase pollution of the Georges River	VA, JC, BD, NCC	L2.4 and <i>PRP 19</i> set concentration limits to protect and enhance water quality. The EPA has varied the upper pH limit to 9.3 to allow for <i>PRP 18</i> until completion of <i>PRP 19</i> by 30 December 2016. The change will not in effect represent any increase in environmental impact due to CO ₂ out gassing
It is inconsistent that Dendrobium mine discharges to Port Kembla rather than a local waterway, whilst West Cliff mine discharges to the Georges River. Dendrobium mine's licence includes 100 percentile limits for pH, TSS, Oil and Grease, Arsenic, Copper, Nickel And Zinc	AY, NPA	Inconsistency noted. The discharge and receiving environment for each mine are different. <i>PRP 19</i> sets 100 percentile concentration limits for pH, TSS, Oil and Grease, Arsenic, Copper, Nickel and Zinc
Approval of the application will void the <i>Macarthur Bushwalkers v Endeavour Coal and Illawarra Coal</i> case	NCC	The EPA is not a party in the <i>Macarthur Bushwalkers v Endeavour Coal and Illawarra Coal</i> court case
Mine water is discharged from the base of Brennans Creek Dam. Concern that the lower discharge point may alter Dissolved Oxygen, metals and temperature levels	AY	<i>PRP 18</i> will change the configuration of discharge point 10 to a surface water off-take by 30 June 2013. This change will decrease Ammonia and Conductivity concentrations
Call for stronger and faster regulatory approach from the EPA. Strengthening the licence will improve environmental performance. Endeavour Coal considers that its meeting its licence. Failure of EPA to prosecute Endeavour Coal for pollution	CG, NCC, RSOS, CCC	Comments noted. Variation to the EPL set mandatory targets for environmental improvement
Endeavour Coal has had reasonable time to prevent pollution. Endeavour Coal has financial means to prevent pollution	NPA, RSOS	Comments noted

Key issue	Raised by	EPA response
<i>Comments on Endeavour Coal's application</i>		
The application is highly biased, heavy on opinion and short on science. Concern about the independence of EcoEngineers. Concern about a perceived or real conflict of interest	NPA, CG	Comments noted. The EPA assessment of Endeavour Coal's application included a detailed scientific review by OEH and an independent review of metals speciation modelling by CSIRO
The application did not analyse all analytes. Conclusions drawn without comprehensive testing of all relevant cations and anions. Conclusions drawn without analysis under different flow and discharge regimes	WSC	L2.4 and PRP 19 set concentration limits regardless of any variation to flow or discharge regimes. L2.4 and PRP 19 set concentration limits for TDS, which encompasses cations and anions
Concern that Endeavour Coal has not carried out monitoring to assess downstream impacts of pollution	CCC	PRP 20 requires Endeavour Coal to monitor the aquatic health of Brennans Creek and the upper Georges River, to the confluence of Georges River and O'Hares Creek
The application lacks consideration of relevant studies and reports, such as Wright and Burgin (2009), NSW Planning and Assessment Commission (2010) and Tipler <i>et al</i> (2012). Contradiction between the application and external studies and reports	CCC	In determining EPL requirements, the EPA has taken into consideration all matters raised in public submissions, including relevant studies and reports
Missing data or lack of raw data to enable interpretation. Conclusions are based on 52 samples over 8 years at an assumed frequency of 1 per month, 44 samples appear unaccounted for	WSC	Comment noted. Monthly monitoring of metals commenced in 2008. Following recent changes to the POEO Act, monitoring data must be made publicly available in a timely manner
<i>pH</i>		

Key issue	Raised by	EPA response
Current pH limits are 6.5 - 9.0. pH is unlikely to be naturally alkaline given the upper Georges River is in Hawkesbury Sandstone, with Wianamatta Shale outcrops on the western edge. Discharge of highly alkaline water into a naturally acidic environment is unacceptable. pH levels reported by Dr Wright are 0.5 and 2.28 times greater in Brennans Creek than background levels. pH limits should be lowered to reflect background levels. It is recommended that a pH range of 5.1-7.1 be set	AY, GREa, RSOS, NPA, IW	The default upper pH ANZECC water quality trigger value for upland streams is 8.0. To meet a pH range of 5.1-7.1 would require significantly higher cost without any statistical benefit to ecosystem health
Reducing the discharge of high pH water would reduce ecotoxicity	AY, IW	<i>PRP 19</i> will reduce the upper pH limit to 8.0
Alkaline water can leach minerals that would not normally be soluble	NPA	<i>PRP 19</i> will reduce the upper pH limit to 8.0. Reducing the pH will reduce the solubility of minerals
Variations or spikes in pH can kill macroinvertebrates instantly	WSC	Comment noted. The EPA has added a requirement for continuous in-stream monitoring of pH at discharge point 10
Current pH limits permit hydrogen ion concentrations below background levels	RSOS	Comment noted
Many metals exist in a more stable form whilst the pH is alkaline, which potentially could become soluble and toxic if and when the pH reduces. Poses a potential downstream impact and in low flow conditions. Implications for increased bioavailability of major anions and cations	WSC, RSOS	<i>PRP 19</i> set concentration limits for a broad range of analytes, including pH, metals and TDS, which encompasses cations and anions
The application seems to rely on the maintenance of high pH levels to render other analytes unavailable. Not a scientifically justifiable position. High pH itself introduces altered chemical conditions	RSOS	<i>PRP 19</i> will reduce the upper pH limit to 8.0, while concurrently reducing the concentration limits of other analytes
<i>Salinity</i>		

Key issue	Raised by	EPA response
Concern about ecotoxicological impacts of elevated salinity, including impacts of variations or spikes. Concern over impacts of elevated salinity in downstream pools	RSOS, GREA, CCC, NPA, IW	The EPA has added a requirement for continuous in-stream monitoring of Conductivity at discharge point 10. <i>PRP 19</i> will reduce the concentration limit for Conductivity to 495µS/cm
Concern over the potential impacts of elevated salinity on any Aboriginal cultural heritage sites downstream	WSC	Salinity can impact Aboriginal cultural heritage sites. <i>PRP 19</i> will reduce the concentration limit for Conductivity to 495µS/cm, which will assist in preventing impacts to Aboriginal cultural heritage
Concern over salt like crust observed on sandstone downstream	PD, WSC	It is likely that the salt like crust is attributable to concentrations of Bicarbonate. <i>PRP 19</i> will reduce the concentration limit for Bicarbonate to 225mg/L
Average electrical conductivity levels reported by EcoEngineers were 2496µS/cm. Individual levels between 3.6 and 18.3 times greater in Brennans Creek than background levels and well above NWQG trigger values. Background levels are characteristically <200µS/cm. NWQG trigger values for protection of slightly to moderately impaired systems in south-eastern Australia are 30 to 350µS/cm in upland rivers and 125 to 2200µS/cm in lowland rivers. Tippler <i>at al.</i> (2012) recommends <212µS/cm. It is recommended that a salinity limit of <212µS/cm be considered	GREA, RSOS, CCC, IW	<i>PRP 19</i> will reduce the concentration limit for Conductivity to 495µS/cm, to achieve a 95 percent protection level as recommended by in <i>PRP 10</i> . To meet a Conductivity limit of 212µS/cm would require significantly higher cost without any statistical benefit to ecosystem health
The expansion of West Cliff mine and coal wash emplacement will result in increased Salinity and flow	CCC	L2.4 and <i>PRP 19</i> set concentration limits regardless of any variation to flow or discharge regimes

Key issue	Raised by	EPA response
The application states that the 'higher salinities can be ascribed to the presence of a number of naturally saline springs.' Scientific data does not support this. The application does not provide specific locations and methods used to inform this conclusion	AY, GRCCC	Comment noted
The application classifies the whole of the Georges River as a lowland river. This approach is flawed. It is inconsistent to apply this approach to salinity only	GRCCC	The EPA considers Brennans Creek and the upper Georges River to be classified as an upland river using the ANZECC 2000 Guidelines
<i>Metals</i>		
Aluminium concentrations reported by Dr Wright are 2 and 7 times greater in Brennans Creek than background levels and well above NWQG trigger values. The application acknowledges that the average aluminium concentration is well above the trigger value. Aluminium concentrations in Brennans Creek were at levels likely to be stressful to aquatic ecosystems	RSOS, AY, CG, GREA, CCC	L2.4 and <i>PRP 19</i> set concentration limits to protect and enhance water quality. <i>PRP 19</i> will reduce the concentration limit for Aluminium to 55µg/L, to meet ANZECC water quality trigger values.
Concern that the bioavailability of the Aluminium would increase with decreased pH	RSOS	Aluminium bioavailability and toxicity has recently been shown in higher pH environments. <i>PRP 19</i> will reduce the upper pH limit to 8.0, while concurrently reducing the concentration limit for Aluminium to 55µg/L, to meet ANZECC water quality trigger values.
Highly elevated concentrations of major anions and cations cause unnatural and potentially ecologically stressful changes to the ionic composition of the Georges River	IW	Limits established in L2.4 and <i>PRP 19</i> include TDS, which encompasses cations and anions. <i>PRP 19</i> will reduce the concentration limit for TDS to achieve a 95 percent protection level

Key issue	Raised by	EPA response
Copper, Nickel And Zinc concentrations reported by Dr Wright and EcoEngineers are many factors greater in Brennans Creek than background levels and well above NWQG trigger values. Copper, Nickel And Zinc concentrations in Brennans Creek were at levels likely to be stressful to aquatic ecosystems	RSOS, AY, CG, GREA, IW	L2.4 and <i>PRP 19</i> set concentration limits to protect and enhance water quality. <i>PRP 19</i> will reduce the concentration limits for Copper, Nickel and Zinc to meet ANZECC water quality trigger values.
<i>Other analytes and ecotoxicity</i>		
Arsenic levels are often elevated in Brennans Creek as a result of the discharge	IW	L2.4 and <i>PRP 19</i> set concentration limits to protect and enhance water quality. <i>PRP 19</i> will reduce the concentration limits for Arsenic ANZECC water quality trigger values.
Turbidity levels reported by Dr Wright were greater in Brennans Creek than background levels. Turbidity increased by 687% between upstream Georges River and downstream of the Georges River confluence with Brennans Creek. Turbidity is likely to be at an ecologically stressful level	GREA, IW	The requirement to monitor TSS has been added to discharge point 11 and discharge point 12. <i>PRP 20</i> requires Endeavour Coal to monitor the aquatic health of Brennans Creek and the upper Georges River
The application states that 'there is absolutely no field evidence to suggest that Bicarbonate is a recognisable stressor on the aquatic ecosystem of the Georges River.' This does not mean that Bicarbonate is not a stressor on the aquatic ecosystem. Evidence is required to support such a statement	GRCCC, RSOS	Comments noted. <i>PRP 19</i> will reduce the concentration limit for Bicarbonate to 225mg/L to achieve a 95 percent protection level
High Bicarbonate may be responsible for the very high pH. Bicarbonate has been recorded at 1450mg/L (at 2750µS/cm) while the trigger value derived by OEHL is 225 mg/L. Bicarbonate alkalinity increased by 4586% between upstream Georges River and downstream of the Georges River confluence with Brennans Creek	RSOS, IW	<i>PRP 19</i> will reduce the concentration limit for Bicarbonate to 225mg/L to achieve a 95 percent protection level

Key issue	Raised by	EPA response
Ammonia has the potential to be highly ecotoxic	GRCCC	<i>PRP 19</i> will reduce the concentration limit for Total nitrogen, Nitrogen (Ammonia) and Oxides of nitrogen to achieve a 95 percent protection level
The concentrations of anions and cations in Brennans Creek were highly elevated, particularly Sodium, Carbonate, Sulphate, Bicarbonate And Chloride. The ionic composition is likely to have adverse implications for aquatic ecosystems	IW	Limits established in L2.4 and <i>PRP 19</i> include TDS, which encompasses cations and anions. <i>PRP 19</i> will the concentration limit for TDS to achieve a 95 percent protection level
Ecotoxicity is likely to be caused by synergistic effects of multiple stressors rather than a single analyte. The chemistry is complex. It is the ecotoxicity of metals and Bicarbonate in relation to background levels that should be under consideration	AY, RSOS, IW	Limits established in L2.4 and <i>PRP 19</i> include metals and Bicarbonate
The application proposes a 90% species protection level, and therefore a 10% species loss. This is not acceptable	NPA	Limits established in <i>PRP 19</i> will achieve a 95 percent protection level 100 percent of the time. This is consistent with slightly to moderately disturbed ecosystems in the ANZECC 2000 Guidelines
Studies by GRCCC have consistently shown reduced macroinvertebrate species richness in Brennans Creek. Demonstrate ecological impairment of aquatic ecosystems. Particularly a lower abundance of sensitive taxonomic groups such as decapod crustaceans, mayflies, stoneflies and caddisflies. Studies by Endeavour Coal are 6 years old and outdated	GRCCC, WSC, IW	The requirement to undertake quarterly toxicity testing has been added to the EPL. <i>PRP 20</i> requires Endeavour Coal to monitor the aquatic health of Brennans Creek and the upper Georges River

Key issue	Raised by	EPA response
Studies have not been undertaken to assess impacts on all water dependent organisms, focus on macroinvertebrates	NPA	The requirement to measure the effect of the discharge on freshwater crustacean, shrimp, larval fish, an aquatic herb and microalgae in toxicity testing has been added to the EPL. <i>PRP 20</i> requires Endeavour Coal to undertake chemical analysis and an in-stream biota assessment, such as macroinvertebrate, algal and vertebrate species
<i>Monitoring</i>		
Recommend that Ammonia, Magnesium, Total Kjeldahl Nitrogen Phosphates, Hydrogen Cyanide, Sulphates, Sulphide, Ethoxylates and TDS be added to the monitoring suite	WSC, GRCCC	New analytes have been added to licence condition M2.3, including Nitrogen (Ammonia), Cobalt, Cadmium, COD, Magnesium, Total Nitrogen and TDS. TDS encompasses cations and anions. COD encompasses organic matter
Recommend continuous flow monitoring of pH and Salinity, with monitoring to be undertaken if pH or Salinity exceeds a specified threshold	WSC	The EPA has changed the frequency of monitoring for pH, Conductivity and Turbidity from monthly to continuous in stream monitoring during discharge
Concern regarding the current frequency of monitoring. Recommend a weekly sampling regime. Consider the appropriateness of a rolling average given seasonal variations and spikes in analytes	AY, GRCCC, WSC, IW	The EPA has changed the frequency of monitoring for all analytes except pH, Conductivity and Turbidity from monthly to weekly during discharge

Key issue	Raised by	EPA response
Conduct a rigorous monitoring program over 12 months. Tests for all analytes on the licence. Make results publically available. Review monitoring data. Have the monitoring data peer reviewed. Review the licence following monitoring data	GRCCC, WSC, CCC,	New analytes have been added to licence condition M2.3 and the frequency of monitoring has been changed. Monitoring data collected under requirements in M2.3 must be made publicly available The frequency of monitoring will be reviewed after one year, following a review of monitoring data
Conduct regular (spring and autumn) assessment of macroinvertebrate and algal diatom communities. Compare macroinvertebrate and algal diatom data with background levels	IW	The requirement to undertake quarterly toxicity testing has been added to the EPL.
Conduct comprehensive water sampling to assess downstream impacts of pollution	WSC, CCC	<i>PRP 20</i> requires Endeavour Coal to monitor the aquatic health of Brennans Creek and the upper Georges River, to the confluence of Georges River and O'Hares Creek
Monitoring data be made available on the EPA's website	WSC, GRCCC, CCC	Monitoring data collected under requirements of the EPL must be made publicly available. Monitoring data is currently available on Endeavour Coal's website The EPA does not propose to host monitoring data at this time
Investigate and monitor the impact of Salinity on any Aboriginal cultural heritage sites downstream	WSC	Suggestion noted

Key issue	Raised by	EPA response
Monitor and analyse the bioavailability of Aluminium	CCC	<i>PRP 19</i> will reduce the concentration limit for Aluminium to 55µg/L, to meet ANZECC water quality trigger values. The requirement to undertake quarterly toxicity testing has been added to the EPL. <i>PRP 20</i> requires Endeavour Coal to monitor the aquatic health of Brennans Creek and the upper Georges River
Conduct further research into the effects of Bicarbonate on the physical, chemical and biological condition of the Georges River	CCC	Suggestion noted
<i>Volume</i>		
Recommends that the flow regime return to the natural flow regime. Brennans Creek would have been an intermittent stream prior to the construction of Brennans Creek Dam	GRE, AY	Brennans Creek Dam is both a pollution control device and a water storage dam. The program of works to achieve a 95 percent protection level may include any practical measures such as minimisation or avoidance of a discharge
Concern about the potential for increased pollution under decreased flow regimes	PD	Comment noted. The flow of water in the upper Georges River does dilute the discharge from discharge point 10. L2.4 and <i>PRP 19</i> set concentration limits regardless of any variation to flow or discharge regimes.
<i>Pollution reduction programs</i>		
Despite the problem existing for so long and despite the many Pollution Reduction Programs, the pollution continues. This is not acceptable. Pollution Reduction Programs are not substitute for, nor a precursor to, licence conditions	NPA, AY	Comments noted.

Key issue	Raised by	EPA response
Recommend that Ammonia, Cobalt, Cadmium, COD, Magnesium, Total Kjeldahl Nitrogen Phosphates, Hydrogen Cyanide, Sulphates, Sulphide, Ethoxylates and a detailed suite of cations and anions be added to any Pollution Reduction Program	WSC, GRCCC	<i>PRP 19</i> includes concentration limits for new analytes including Nitrogen (Ammonia), Cobalt, Cadmium, COD, Magnesium, Total Nitrogen and TDS. TDS encompasses cations and anions. COD encompasses organic matter
Recommendations		
Given the lack of complete scientific certainty about what exact factor, or combination of factors, contributes to the ecological impairment of the aquatic ecosystem it seems that the precautionary principal must be central to decisions about the licence	NCC, NPA, RSOS, IW	The EPA has considered the precautionary principal in determining EPL requirements
Recommends that the discharge mimic background levels of nearby near-pristine waterways. The Georges River catchment includes a number of near-pristine waterways such as O'Hares Creek, Madden's Creek, Stokes Creek, Iluka Creek and the upper Georges River. Support of Tippler <i>et al</i> (2012) in setting limits. ANZECC guidelines could also be used to inform limits, but concerns that ANZECC guidelines are too general. Dr Wright recommends Tippler <i>et al</i> (2012) for pH, Total Nitrogen and Salinity, ANZECC guidelines for Copper, Aluminium, Nickel and Zinc, background levels for Oil and Grease, TSS, Turbidity, Cobalt, Arsenic, no measurable adverse impact for 99% of macroinvertebrate and diatom species assemblages and no modification of reference creeks for ionic composition and concentration	CG, BD, WSC, GREA, NPA, GREA, RSOS, CCC, GRCCC, NCC, IW	L2.4 and <i>PRP 19</i> set concentration limits to protect and enhance water quality to meet ANZECC water quality trigger values. To require Endeavour Coal to meet background levels would require significantly higher cost without any statistical benefit to ecosystem health
Only treated mine water be discharged from Brennans Creek Dam	RSOS	Brennans Creek Dam is both a pollution control device and a water storage dam, it captures underground mine water, washery process water, emplacement area waste water, rainfall and runoff

Key issue	Raised by	EPA response
No mine water be discharged from Brennans Creek Dam	AY, CG	The program of works to achieve a 95 percent protection level may include avoiding the discharge, a water treatment plant, or a combination of a water treatment plant and other discharge improvement options. Endeavour Coal will need to determine what works will be undertaken to achieve a 95 percent protection level
Mine water be recycled or reinjected underground. Surface water be collected and treated and used for dust suppression and other non-potable uses, or mixed with mine water to be recycled underground. Change Brennans Creek Dam from a dual purpose water supply / pollution control device operation to a single purpose water supply dam	AY, CG, NPA, RSOS	As above
Consider connecting to the sewage treatment plant at Appin or Liverpool	NPA	As above
Recommends desalination or reverse osmosis, such as at Appin West mine. BHP uses desalination technology elsewhere in Australia, so an equal value should be placed on the Georges River.	CG, NPA, PD, BD, GREA	As above
Notes that the only available technology with the capacity to treat all of the identified inorganic anions, cations and heavy metals and the overall Salinity is reverse osmosis. May need appropriate pre-treatment, which may include filtration and pH adjustment. Final pH adjustment and/or remineralisation subsequent to reverse osmosis treatment may also be necessary. Need to consider the management and disposal of the concentrated waste streams. Recommends comprehensive laboratory analysis and validation of any pilot plant	NPA	As above
The onus is on Endeavour Coal to determine the most efficient process by which pollution of the Georges River is avoided	RSOS, NPA	As above
Review licence at 5, 7 and 10 year timeframes as per Bulli Seam Operation Project approval	GRCCC	The EPA will regularly review the EPL to ensure it is fit for purpose. Under the POEO Act, the EPA is required to review the EPL at intervals not exceeding 5 years

Key issue	Raised by	EPA response
Establish an advisory committee of independent scientists, including Dr Wright, to advise on limits and monitoring and investigation conditions, community members should participate in the advisory committee	CG	Comments noted

- ANON** Anonymous
- AY** Dr A Young
- BD** B Durman
- CCC** Campbelltown City Council
- CG** C Graham
- GRCCC** Georges River Combined Councils' Committee
- GREA** Georges River Environment Alliance
- IW** Dr I Wright
- JC** J Cooney
- NCC** Nature Conservation Council
- NPA** National Parks Association
- PD** P Durman
- RSOS** Rivers SOS
- WSC** Wollondilly Shire Council