**EUROBODALLA SHIRE COUNCIL***Good Government, better living*

In Reply Please

Quote Reference: E10.4422 - 55644

28 October 2010

PO Box 99 Moruya NSW 2537

email: council@eurocoast.nsw.gov.auwebsite: www.esc.nsw.gov.au

DX 4873

Major Development Assessment
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Dear Sir

Dargues Reef Gold Project (10_0054)
Submission to the Exhibition of Environmental Assessment

Attention: Mr. Howard Reed

I refer to the Department of Planning correspondence dated 27 September 2010 seeking Eurobodalla Shire Council's comments and recommended conditions of approval in relation to the exhibition of the Environmental Assessment (EA) for the Dargues Reef Gold Project. The following comments and proposed conditions of approval raise a number of issues of concern that require resolution prior to the issuing of a determination under Part 3A of the Environmental Planning and Assessment Act 1979.

The failure to consult with Eurobodalla Shire Council (ESC) and failure to consider the Eurobodalla water supply during preparation of the EA has resulted in significant costs to Council. This includes ongoing costs associated with the review of environmental management plans, water quality data management and annual environmental performance auditing.

The proposed gold mine site is located within the Araluen catchment, at the head waters of the Deua River which in turn supplies 75% of the Eurobodalla Shire potable water supply. The EA, prepared by RW Corkery Pty Limited on behalf of Big Island Mining Pty Ltd in support of the Dargues Reef Gold Project, failed to identify ESC as a stakeholder nor any potential impacts on its water supply. This is seen as a significant shortcoming of the EA and brings into question the adequacy of the Risk Assessment contained in the EA as well as the classification of the consequence category of dam failure which should have been considered in relation to the Tailings Dam (DSC 2010).

The EA did identify and consider risks related to local drinking water users, particularly groundwater users and the Araluen village, however, in neglecting to consider Eurobodalla's water supply it has failed to assess potential risks to a peak population of over 100,000 people. Furthermore, the EA did identify water as an environmental issue, ranking groundwater 3rd and surface water 4th on the basis of unmitigated risks (although the Eurobodalla drinking water supply was not considered as part of this

Page 1 of 9

risk assessment). The methodology used for this ranking appears to be flawed as the rankings were determined by the number of potential low risk impacts. Based on the number of high and extreme events, surface water should rank 2nd. This rank is prior to any additional assessment of risk relating to impact upon drinking water supply.

As the EA failed to consider the potential impacts from its operations on the downstream Eurobodalla water supply, a water quality risk assessment has been undertaken as part of the EA review. ESC engaged Water Futures Pty Ltd and Atom Consulting to conduct a review of the EA. The Briefing Paper *Review of Dargues Reef Gold Mine EA*, Water Futures & Atom Consulting (October 2010) is included at attachment 3 and forms part of Council's submission.

Risks were assessed in line with the Australian Drinking Water Guidelines (2004). The risks posed to Eurobodalla's water supply by the Dargues Reef Gold Mining Project were considered in relation to the construction phase, the operation phase and the end of life phase of the project. Thirty risks to Eurobodalla's water supply were identified and assessed (see Briefing Paper Appendix – Risk Assessment).

The potential contaminants of concern were:

- Pathogens
- Metals
- Hydrocarbons
- Turbidity
- Potassium amyl xanthate, IF6500, MF351

Hazardous events could be categorized into three areas:

- reduced flows affecting water availability;
- increased pollutants during base flow conditions, such as through leaching, and
- increased pollutants during event flow conditions, such as through dam failure events or following storms.

No very high risk events were identified. Risk associated with the use of IF6500 and MF351 warrant further assessment as ready access to these compounds chemical characteristics has not been determined.

The high risk events identified during construction were:

- Human waste released from site to Majors Creek posing a threat to human health in the ESC water supply; and
- Failure of sewage treatment process on site leading to a spill in Majors Creek posing a threat to human health in the ESC water supply.

The high risk events identified during operation were:

- Potassium amyl xanthate spill entering creek in dry weather and posing a threat to human health;

- Exposed soils being washed into rivers during rainfall event in concentrations that would overwhelm chlorination effectiveness in the ESC water supply;
- Human waste released from site to Majors Creek posing a threat to human health in the ESC water supply;
- Failure of sewage treatment process on site leading to a spill in Majors Creek posing a threat to human health in the ESC water supply; and
- Collapse of tailings dam leading to contaminated water and sediments affecting the ESC water supply;
- Spill from the tailings dam in dry weather entering the creek and posing a threat to human health;
- Spill from the tailings dam spill in wet weather entering the creek and posing a threat to human health.

The EA claims that the quality of water discharged from the site will be improved relative to the current situation. This is based on:

- waste materials that are not acid generating;
- prevention of any leachate being discharged from the tailings dam;
- no cyanide use on-site; and
- a reduction in erosion and agricultural discharges.

The achievement of this claim shall be dependent on the competent preparation, implementation, maintenance and review of the numerous plans, strategies and programs that the EA undertakes to prepare. The adequacy of the proposed plans in controlling the significant risks cannot be assessed until the plans have been developed. The risks to the Eurobodalla water supply relate predominantly to failures of the proposed water management systems. It is considered that it is important that NSW Planning acknowledge and ensure that ESC shall be involved in consultation and review of management plans as system failure has the potential to impact Council's water supply source.

Further, there are a number of water quality issues associated with both the operations and the rehabilitation of the tailing dam. Insufficient information has been provided in the EA with regard to the consequence categories for a dam failure. It is possible that the consequences have been underestimated as the proponent failed to identify ESC water supply as a downstream user. In the unlikely event of a tailings dam collapse, it is possible for sludge to be released downstream, be retained in downstream pools and release heavy metals into Eurobodalla's water supply for a number of years.

ESC request that NSW Planning provide Council with copies of the following documents and allow Council a minimum of 14 days to update the risk assessment and lodge further submission, prior to the issuing of a determination under Part 3A of the Environmental Planning and Assessment Act 1979:

- 1) Material Safety Data Sheet for reagents IF6500 and MF351
- 2) Geotechnical Investigation Final Report - ref PE801-00139/2" and "tailings storage facility Design - ref PE801-00139/3" by Knight Piesold Pty Ltd.

ESC requests NSW Planning impose conditions on the development consent (if issued) to require that:

- 1) Eurobodalla Shire Council is provided with an opportunity to review and comment on plans (and subsequent revision of plans) to manage risks which have the potential to impact on the water supply including but not limited to those identified below:
 - a. Eurobodalla Shire Council is consulted during the preparation of management plans associated with surface waters, and that these take into account drinking waters downstream of the site.
 - b. Eurobodalla Shire Council is consulted in the preparation of the *Rehabilitation and Environmental Management Plan*.
 - c. Eurobodalla Shire Council is consulted in the development of the *Tailings Management Plan*.
 - d. Eurobodalla Shire Council is consulted in the development of the *Surface Water, Sediment and Erosion Control Plan*.
 - e. Eurobodalla Shire Council is consulted in the development of the *Dam Safety Emergency Plan*.
 - f. Eurobodalla Shire Council is consulted in the development of the *Mine Safety Management Plan*.
 - g. Eurobodalla Shire Council is consulted in the development of the *Hydrocarbon, Chemical and Reagent Management Plan*.
 - h. Eurobodalla Shire Council is consulted in the development of the *Mining Operations Plan (MOP)*.
2. An on-site Environmental Management position shall be employed for the duration of the project.
3. Eurobodalla Shire Council shall be given the opportunity to participate in each annual environmental performance review of the mining activities.
4. Eurobodalla Shire Council Water Supply contacts shall be included as primary contacts in any pollution incident and emergency response plan.
5. Eurobodalla Shire Council shall be provided with prompt notification of and access to
 - a. any discharge or overflow from the tailings dam,
 - b. results of any chemical analysis of seepage water (groundwater and surface water) from the tailings dam.
6. Surface water monitoring shall include:
 - a. ICP-MS scan for metals, plus specific testing for mercury and lead, on a quarterly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger).
 - b. *E. coli* and *Clostridium perfringens* monitoring downstream of the site to assess impacts from on-site sewage management facilities on a monthly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger).

7. Groundwater monitoring in tailings dam monitoring bores shall include real time monitoring of pH and EC.
8. Eurobodalla Shire Council shall be provided with all water quality monitoring information collected on a quarterly basis within 60 days of the end of each quarter.
9. The rehabilitation securities required by NSW Department of Industry and Investment associated with the project take into account the ongoing use of the Moruya (Deua) River as a major source of drinking water for the Eurobodalla Regional Water Supply Scheme.
10. The proponent shall meet reasonable costs associated with Eurobodalla Shire Council's review of environmental management plans, water quality data and involvement in the annual environmental performance review of the mining activity.

Council considers that the imposition of the abovementioned conditions of approval will assist to give effect to the undertaking given in the Environmental Assessment that states "A comprehensive monitoring program would be established to demonstrate compliance with environmental criteria and liaison with both official and unofficial community representation would continue to address community concerns as they arise."

If you require further information please contact Greg Cooney on (02) 4474-7431.

Yours faithfully



AMANDA JONES
ACTING DIRECTOR – WATER & WASTE
WATER AND WASTE DIVISION

Attachments

1. Eurobodalla Shire Council - EA Comment Summary
2. Eurobodalla Shire Council - Recommended Conditions of Approval
3. Briefing Paper - *Review of Dargues Reef Gold Mine EA*, Water Futures Pty Ltd & Atom Consulting, October 2010.

Attachment 1
Dargues Reef Gold Mine Project Environmental Assessment
Eurobodalla Shire Council – EA Comment Summary

1. The proposed gold mine site is located within the Araluen catchment, at the head waters of the Deua River which in turn supplies 75% of the Eurobodalla Shire potable water supply.
2. The failure to consult with Eurobodalla Shire Council (ESC) and failure to consider the Eurobodalla water supply during preparation of the Environmental Assessment (EA) has resulted in significant costs to Council. This includes ongoing costs associated with the review of environmental management plans, water quality data management and annual environmental performance auditing.
3. The achievement of the EA claim that the quality of water discharged from the site will be improved shall be dependent on the competent preparation, implementation, maintenance and review of the numerous plans, strategies and programs that the EA undertakes to prepare. It is considered that it is important that the Department of Planning acknowledge and ensure that ESC shall be involved in consultation and review of management plans as system failure has the potential to impact Council's water supply source.
4. There are a number of water quality issues associated with both the operations and the rehabilitation of the tailing dam. Insufficient information has been provided in the EA with regard to the consequence categories for a dam failure. ESC request that the Department Planning provide ESC with copies of the Geotechnical Investigation Final Report - ref PE801-00139/2" and "tailings storage facility Design - ref PE801-00139/3" by Knight Piesold Pty Ltd for review and allow Council a minimum of 14 days to update the risk assessment and lodge further submission, prior to the issuing of a determination under Part 3A of the Environmental Planning and Assessment Act 1979.
5. The EA failed to identify ESC as a stakeholder nor any potential impacts on its water supply. This is seen as a significant shortcoming of the Environmental Assessment and brings into question the adequacy of the Risk Assessment contained in the Environmental Assessment as well as the classification of the consequence category of dam failure which should have been considered in relation to the Tailings Dam (DSC 2010). In neglecting to consider Eurobodalla's water supply it has failed to assess potential risks to a peak population of over 100,000 people.
6. The EA methodology used for ranking environmental issues appears to be flawed as the rankings were determined by the number of potential low risk impacts. This ranking is prior to any additional assessment of risk relating to impact upon the Eurobodalla drinking water supply.

7. A Risk Assessment in accordance with the Australian Drinking Water Guideline (2004) identified and assessed thirty risks to Eurobodalla's water supply. Risk associated with the use of IF6500 and MF351 warrant further assessment as ready access to these compounds chemical characteristics has not been determined. ESC requests that the Department of Planning provide ESC with copies of MSDS's for reagents IF6500 and MF351 and allow Council a minimum of 14 days to update the risk assessment and lodge further submission, prior to the issuing of a determination under Part 3A of the Environmental Planning and Assessment Act 1979.
8. The risk assessment identified potential contaminants of concern included pathogens, metals, hydrocarbons, turbidity, potassium, amyl, xanthate, IF6500 & MF351.
9. The risk assessment identified hazardous events that could be categorized into three areas including a) reduced flows affecting water availability; b) increased pollutants during base flow conditions, such as through leaching; c) and increased pollutants during event flow conditions, such as through dam failure events or following storms.

Attachment 2
Dargues Reef Gold Mine Project
Recommended Conditions Of Approval – Eurobodalla Shire Council

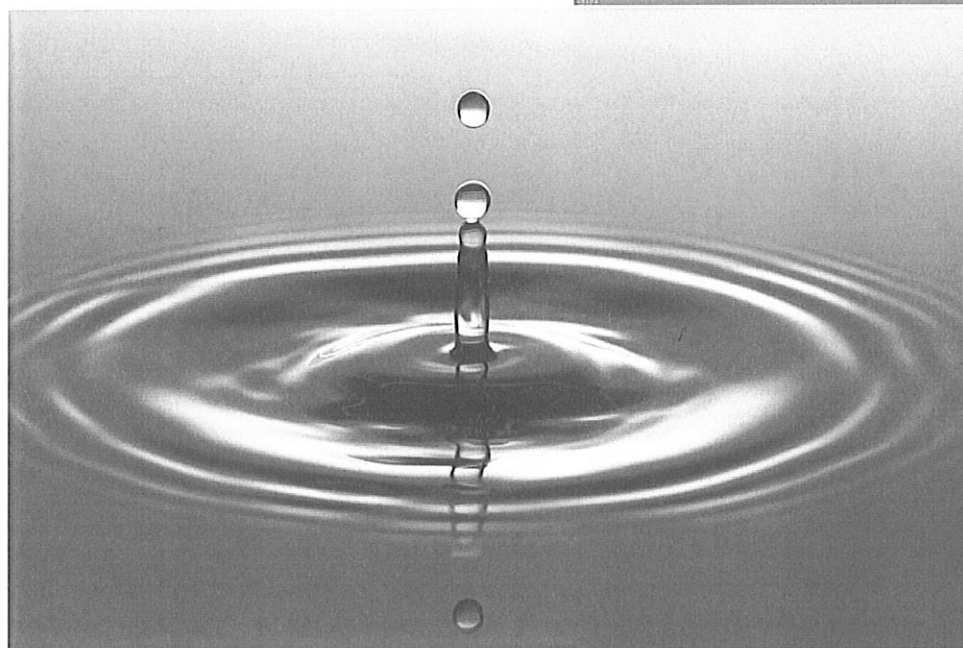
- 1) Eurobodalla Shire Council is provided with an opportunity to review and comment on plans (and subsequent revision of plans) to manage risks which have the potential to impact on the Eurobodalla water supply including but not limited to those identified below:
 - a. Eurobodalla Shire Council is consulted during the preparation of management plans associated with surface waters, and that these take into account drinking waters downstream of the site.
 - b. Eurobodalla Shire Council is consulted in the preparation of the *Rehabilitation and Environmental Management Plan*.
 - c. Eurobodalla Shire Council is consulted in the development of the *Tailings Management Plan*.
 - d. Eurobodalla Shire Council is consulted in the development of the *Surface Water, Sediment and Erosion Control Plan*.
 - e. Eurobodalla Shire Council is consulted in the development of the *Dam Safety Emergency Plan*.
 - f. Eurobodalla Shire Council is consulted in the development of the *Mine Safety Management Plan*.
 - g. Eurobodalla Shire Council is consulted in the development of the *Hydrocarbon, Chemical and Reagent Management Plan*.
 - h. Eurobodalla Shire Council is consulted in the development of the *Mining Operations Plan (MOP)*.
- 2) An on-site Environmental Management position shall be employed for the duration of the project.
- 3) Eurobodalla Shire Council shall be given the opportunity to participate in each annual environmental performance review of the mining activities.
- 4) Eurobodalla Shire Council Water Supply contacts shall be included as primary contacts in any pollution incident and emergency response plan.
- 5) Eurobodalla Shire Council shall be provided with prompt notification of and access to:
 - a) any discharge or overflow from the tailings dam,
 - b) results of any chemical analysis of seepage water (groundwater and surface water) from the tailings dam.
- 6) Surface water monitoring shall include:

- a) ICP-MS scan for metals, plus specific testing for mercury and lead, on a quarterly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger).
 - b) *E. coli* and *Clostridium perfringens* monitoring downstream of the site to assess impacts from on-site sewage management facilities on a monthly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger).
- 7) Groundwater monitoring in tailings dam monitoring bores shall include real time monitoring of pH and EC.
 - 8) Eurobodalla Shire Council shall be provided with all water quality monitoring information collected on a quarterly basis within 60 days of the end of each quarter.
 - 9) The rehabilitation securities required by NSW Department of Industry and Investment associated with the project take into account the ongoing use of the Moruya (Deua) River as a major source of drinking water for the Eurobodalla Regional Water Supply Scheme.
 - 10) The proponent shall meet reasonable costs associated with Eurobodalla Shire Council's review of environmental management plans, water quality data and involvement in the annual environmental performance review of the mining activity.

Briefing Paper

Review of Dargues Reef Gold Mine EA

Final



For Eurobodalla Shire Council

By Water Futures & Atom Consulting

October 2010



This document is designed for printing double-sided.

EXECUTIVE SUMMARY

BACKGROUND

Big Island Mining Pty Ltd propose to develop an underground gold mine on the Dargues Reef orebody which is located approximately 2.5 km north of the village of Majors Creek in south-eastern New South Wales. The mine is situated in the headwaters of the Moruya Catchment, one of three drinking water catchments which supply Eurobodalla Shire. An Environmental Assessment (EA) for the project was undertaken and is currently on display for comments. The EA failed to identify ESC as a stakeholder nor any potential impacts on its drinking water supply.

PURPOSE OF REVIEW

The purpose of this review of the EA is to:

- Identify possible issues affecting Eurobodalla's water supply from the proposed Dargues Reef Gold Mine;
- Undertake a risk assessment of any identified key water quality risks; and
- Make recommendations to Eurobodalla Shire Council (ESC) for management of any potential risk to the water supply.

RISK IDENTIFICATION AND ASSESSMENT

A risk assessment was undertaken in line with the Australian Drinking Water Guidelines (2004). The assessment identified thirty risks. The risk profile is shown in the table below.

TABLE ES-1 RISK ASSESSMENT PROFILE.

	High	Moderate	Low	Uncertain	N/A	Total
Construction	2	2	3	0	0	7
Operation	7	4	6	2	1	20
Post Operation	0	1	2	0	0	3
Total	9	7	11	2	1	30

RECOMMENDATIONS

Nineteen recommendations are made to ensure the ESC water supply is not put at risk from proposed mining activities in the catchment:

1. ESC provides a response to NSW Planning highlighting the failure of the proponent to identify the ESC water source as a potential downstream impact and ESC as a stakeholder.
2. ESC is provided with an opportunity to review and comment on plans to manage risks which have the potential to impact their water supply including but not limited to those identified below.

3. ESC is consulted during the preparation of management plans associated with surface waters, and that these take into account drinking waters downstream of the site.
4. ESC requests a copy of the *Mining Operations Plan (MOP)* and reviews the plan to identify any areas of concern.
5. ESC requests involvement in the annual environmental review of the mining activities.
6. ESC Water Supply contacts need to be included in any incident and emergency response plan.
7. The rehabilitation securities required by NSW Department of Industry and Investment associated with the project take into account the ongoing use of the Moruya (Deua) River as a major source of drinking water for the Eurobodalla Regional Water Supply Scheme.
8. ESC considers the level of water quality monitoring information they would like to review regarding the project:
 - Quarterly results as monitored; or
 - annually in the *Annual Environmental Management Plan*.
9. ESC is consulted in the preparation of the *Rehabilitation and Environmental Management Plan*.
10. ESC receives the results of any chemical analysis of seepage water from the tailings dam.
11. ESC is consulted in the development of the *Tailings Management Plan*.
12. ESC is consulted in the development of the *Surface Water, Sediment and Erosion Control Plan*.
13. Surface water monitoring to include:
 - ICP-MS scan for metals, plus specific testing for mercury and lead on a quarterly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger).
 - *E. coli* and *Clostridium perfringens* monitoring downstream of the site to assess impacts from on-site sewage management facilities on a monthly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger).
14. ESC should seek real time groundwater monitoring in tailings dam monitoring bores to ensure dam does not leach metals into the environment (eg pH, EC)
15. ESC is consulted in the development of the *Dam Safety Emergency Plan*.
16. ESC is consulted in the development of the *Mine Safety Management Plan*.
17. ESC is consulted in the development of the *Hydrocarbon, Chemical and Reagent Management Plan*.
18. ESC seeks an on-site Environmental Management position as a condition of consent .
19. ESC seeks a copy of the MSDS for the reagents IF6500 and MF351 to verify that these chemicals do not pose a risk to the drinking water supply.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	3
BACKGROUND	3
PURPOSE OF REVIEW.....	3
RISK IDENTIFICATION AND ASSESSMENT	3
RECOMMENDATIONS	3
1 PURPOSE OF REVIEW	6
2 PROJECT BACKGROUND	6
2.1 EA RISK ASSESSMENT	7
3 WATER SUPPLY RISK ASSESSMENT	8
3.1 METHODOLOGY	8
3.2 RISK IDENTIFICATION.....	9
3.3 RISK ASSESSMENT OUTCOMES	10
4 RISK MITIGATION MEASURES	11
4.1 PROPOSED ON-SITE CONTROL MEASURES	11
4.2 ADEQUACY OF PROPOSED CONTROLS	12
5 RECOMMENDATIONS	14
6 REFERENCES	16
7 ABBREVIATIONS	16
APPENDIX - RISK ASSESSMENT	17

1 PURPOSE OF REVIEW

The purpose of this review of the EA is to:

- Identify possible issues affecting Eurobodalla's water supply from the proposed Dargues Reef Gold Mine;
- Undertake a risk assessment of any identified key water quality risks; and
- Make recommendations to Eurobodalla Shire Council (ESC) for management of any potential risk to the water supply.

2 PROJECT BACKGROUND

Big Island Mining Pty Ltd ("the Proponent") propose to develop an underground gold mine on the Dargues Reef orebody which is located approximately 2.5 km north of the village of Majors Creek in south-eastern New South Wales. The mine is situated in the headwaters of the Moruya Catchment, one of three drinking water catchments which supply Eurobodalla Shire.

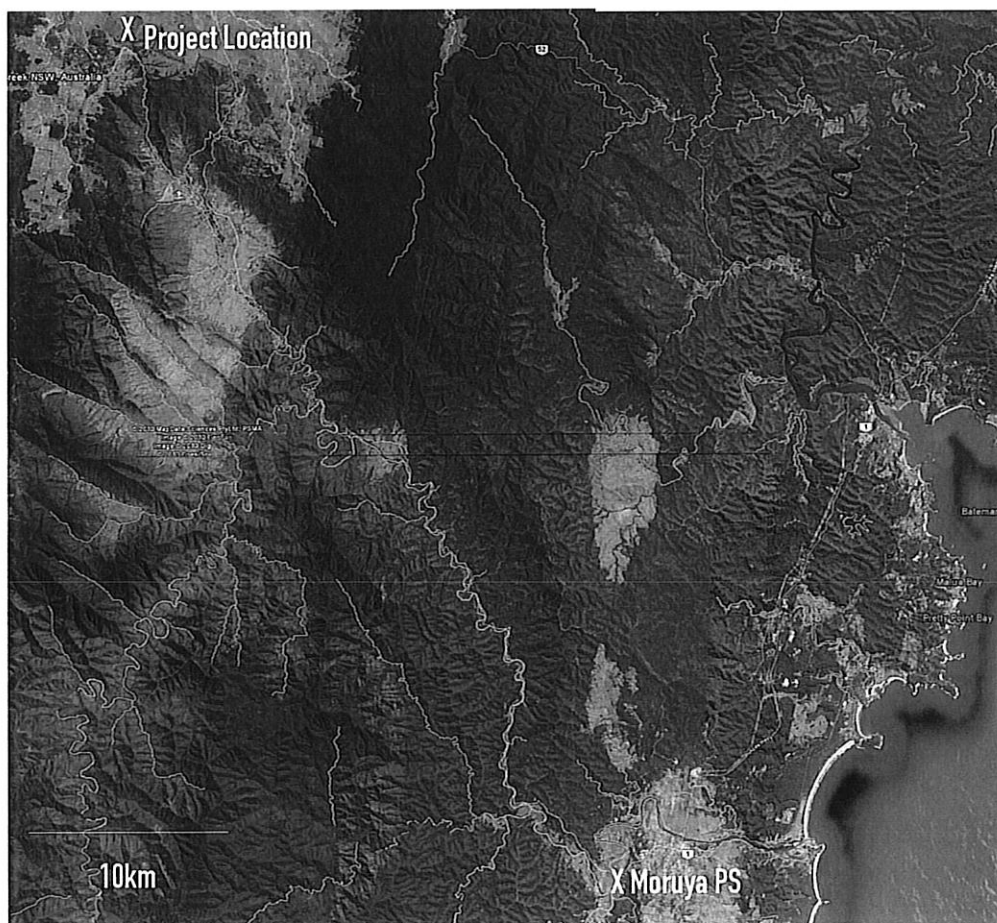


FIGURE 1. AERIAL PHOTOGRAPH SHOWING THE LOCATION OF THE MINE AND THE HEADWATERS OF THE MORUYA DRINKING WATER CATCHMENT (ADAPTED FROM GOOGLE MAPS15/10/2010)

The proponent has an obligation to identify issues and their potential impacts through a program of community and government consultation, preliminary environmental studies and literature review.

The EA failed to identify ESC as a stakeholder nor any potential impacts on its water supply. This is seen as a significant shortcoming of the EA and brings into question the adequacy of the Risk Assessment contained in the EA as well as the classification of the consequence category of dam failure which should have been considered in relation to the Tailings Dam (DSC, 2010).

The EA failed to identify ESC as a stakeholder nor any potential impacts on its water supply.

The EA did identify and consider risks related to local drinking water users, particularly groundwater users and the Araluen village however in neglecting to consider Eurobodalla's water supply it has failed to assess potential risks to a peak population of over 100,000 people.

2.1 EA RISK ASSESSMENT

The EA did identify water as an environmental issue, ranking groundwater 3rd and surface water 4th on the basis of unmitigated risks (although the Eurobodalla drinking water supply was not considered as part of this risk assessment).

The methodology used for this ranking appears flawed as the rankings were determined by the number of potential low risk impacts. Based on the number of high and extreme events, surface water should rank 2nd as shown in Table 1.

TABLE 1. REVIEWED ENVIRONMENTAL RISK RANKING.

Impact	Impacts	Extreme	High	Rank
Noise	8	1	6	1
Surface water	22		9	2
Ecology	7		6	3
Groundwater	11		6	4
Bushfire	6		2	5

This rank is prior to any additional assessment of risk relating to impact upon drinking water supply.

3 WATER SUPPLY RISK ASSESSMENT

As the EA failed to consider the potential impacts from its operations on the downstream Eurobodalla water supply, a water quality risk assessment has been undertaken as part of the EA review.

3.1 METHODOLOGY

These risks were assessed in line with the Australian Drinking Water Guidelines (2004). The likelihood was assessed according to Table 2, the consequence was assessed according to Table 3 and the risk matrix used is shown in Table 4.

TABLE 2. LIKELIHOOD TABLE (ADWG, 2004).

Level	Descriptor	Example description
A	Almost certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur or should occur at some time
D	Unlikely	Could occur at some time
E	Rare	May occur only in exceptional circumstances

TABLE 3. CONSEQUENCE TABLE (ADWG, 2004).

Level	Descriptor	Example description
1	Insignificant	Insignificant impact, little disruption to normal operation, low increase in normal operation costs
2	Minor	Minor impact for small population, some manageable operation disruption, some increase in operating costs
3	Moderate	Minor impact for large population, significant modification to normal operation but manageable, operation costs increased, increased monitoring
4	Major	Major impact for small population, systems significantly compromised and abnormal operation if at all, high level of monitoring required
5	Catastrophic	Major impact for large population, complete failure of systems

TABLE 4. RISK MATRIX (ADWG, 2004).

	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
A (almost certain)	Moderate	High	Very high	Very high	Very high
B (likely)	Moderate	High	High	Very high	Very high
C (possible)	Low	Moderate	High	Very high	Very high
D (unlikely)	Low	Low	Moderate	High	Very high
E (rare)	Low	Low	Moderate	High	High

3.2 RISK IDENTIFICATION

The risks posed to Eurobodalla's water supply by the Dargues Reef Gold Mining project were broken down into the three project phases:

- Construction
- Operation
- End of life

The potential contaminants of concern were:

- Pathogens
- Metals
- Hydrocarbons
- Turbidity
- Potassium amyl xanthate, IF6500, MF351

Hazardous events could be categorized into three areas:

- reduced flows affecting water availability;
- increased pollutants during base flow conditions, such as through leaching, and
- increased pollutants during event flow conditions, such as through dam failure events or following storms.

3.3 RISK ASSESSMENT OUTCOMES

Thirty risks to Eurobodalla's water supply were identified and assessed. The full risk assessment is found in the Appendix. The risk assessment profile is shown in Table 5.

TABLE 5. RISK ASSESSMENT PROFILE

	High	Moderate	Low	Uncertain	N/A	Total
Construction	2	2	3	0	0	7
Operation	7	4	6	2	1	20
Post Operation	0	1	2	0	0	3
Total	9	7	11	2	1	30

No very high risk events were identified.

The high risk events identified during construction were:

- Human waste released from site to Majors Creek posing a threat to human health in the ESC water supply; and
- Failure of sewage treatment process on site leading to a spill in Majors Creek posing a threat to human health in the ESC water supply.

The high risk events identified during operation were:

- Potassium amyl xanthate spill entering creek in dry weather and posing a threat to human health;
- Exposed soils being washed into rivers during rainfall event in concentrations that would overwhelm chlorination effectiveness in the ESC water supply;
- Human waste released from site to Majors Creek posing a threat to human health in the ESC water supply;
- Failure of sewage treatment process on site leading to a spill in Majors Creek posing a threat to human health in the ESC water supply;
- Collapse of tailings dam leading to contaminated water and sediments affecting the ESC water supply;
- Spill from the tailings dam in dry weather entering the creek and posing a threat to human health; and
- Spill from the tailings dam in wet weather entering the creek and posing a threat to human health.

4 RISK MITIGATION MEASURES

The EA claims that the quality of water discharged from the site will be improved relative to the current situation. This is based on:

- waste materials that are not acid generating;
- prevention of any leachate being discharged from the tailings dam;
- no cyanide use on-site; and
- a reduction in erosion and agricultural discharges.

4.1 PROPOSED ON-SITE CONTROL MEASURES

The proponent has identified in the EA that the following plans and programs will be prepared as part of its operations:

- Air Quality Monitoring Program
- Annual Weed And Pest Inspection And Eradication Programs
- Biodiversity Management Plan
- Biodiversity Offset Plan
- Biodiversity Strategy Plan
- Compensatory Flow Program
- Explosives Safety and Security Plan
- Formal Assessment of the groundwater model within 2 years of the mining operations
- Groundwater Management Plan
- Groundwater Monitoring Program
- Hydrocarbon, Chemical and Reagent Management Plan
- Management plan to ensure that Common Wombat are not harmed during establishment of the tailings storage facility
- Mine Safety Management Plan
- Mining Operations Plan
- Noise and Vibration Monitoring Program
- Noise Management Plan
- Property Vegetation Plan
- Purchasing and Waste Management Plans
- Recruitment, Induction And Training Program
- Rehabilitation and Environmental Management Plan
- Rehabilitation Monitoring And Maintenance Program
- Revegetation and Amelioration Program
- Surface water monitoring program
- Surface Water, Sediment and Erosion Control Plan
- Tailings Management Plan
- Transportation Management Plan

- Tree Planting Program
- Water Level Monitoring Plan (groundwater)
- Water Quality Monitoring Plan (groundwater)

In addition the following are required for the Tailings Dam:

- Dam Safety Emergency Plan
- Dam Operation and Maintenance Manual

Further the EA states that “A comprehensive monitoring program would be established to demonstrate compliance with environmental criteria and liaison with both official and unofficial community representation would continue to address community concerns as they arise.”

4.2 ADEQUACY OF PROPOSED CONTROLS

Assuming:

- the construction and proper maintenance of the water control structures proposed;
- the absence of cyanide processing on site; and
- waste materials that do not generate acids;

the EA indicates it is unlikely that significant water quality impacts will occur at the ESC water supply off-take point on the Moruya River.

The risks to the water supply relate to failures with the proposed water management systems. It is important that ESC is involved in consultation and review of the management plans as system failures have the potential to impact Council’s water supply source.

The adequacy of the proposed plans in controlling the significant risks cannot be assessed until the plans have been developed. ESC is strongly advised to seek consultation and review to ensure that downstream drinking water considerations are not omitted again. It also noted that the plans require successful implementation to achieve their objectives. In reviewing the plans ESC should ensure that appropriate monitoring and reviews are in place.

Further there are a number of water quality issues associated with both the operations and the rehabilitation of the tailing dam. Insufficient information has been provided in the EA with regard to the consequence categories for a dam failure. Council is advised to seek copies of the “Geotechnical Investigation Final Report - ref PE801-00139/2” and “Tailings Storage Facility Design - ref PE801-00139/3” by Knight Piesold Pty Ltd for review. It is possible that the consequences have been under estimated as the proponent failed to identify ESC water supply as a downstream user. In the unlikely event of a tailings dam collapse, it is possible for sludge to be released downstream, be retained in downstream pools and release heavy metals into ESC’s water supply for a number of years.

It is inappropriate to suggest that ESC's nearly completed WTP will be capable of managing any contamination incident the mining may pose.

The ADWG states "Prevention of contamination provides greater surety than removal of contaminants by treatment, so the most effective barrier is protection of source waters to the maximum degree practical."

Indeed a guiding principal of the ADWG is "The drinking water system must have, and continuously maintain, robust multiple barriers appropriate to the level of potential contamination facing the raw water supply".

Prevention of contamination provides greater surety than removal of contaminants by treatment, so the most effective barrier is protection of source waters to the maximum degree practical (ADWG, 2004)

5 RECOMMENDATIONS

Table 6 outlines recommendations for ESC to seek as a condition of consent and the issues which will be managed by the implementation of these recommendations.

TABLE 6. RECOMMENDATIONS FOR MANAGING POTENTIAL IMPACTS TO ESC'S WATER SUPPLY

Recommendation	Issue Managed
ESC provides a response to NSW Planning highlighting the failure of the proponent to identify the ESC water source as a potential downstream impact and ESC as a stakeholder.	ESC, a stakeholder downstream of the proposed development by virtue of its management of the Eurobodalla Regional Water Supply Scheme, was not consulted during the EA process.
ESC is provided with an opportunity to review and comment on plans to manage risks which have the potential to impact their water supply including but not limited to those identified below.	ESC, a stakeholder downstream of the proposed development by virtue of its management of the Eurobodalla Regional Water Supply Scheme, was not consulted during the EA process.
ESC is consulted during the preparation of management plans associated with surface waters, and that these take into account drinking waters downstream of the site.	Issues relating to the ESC water supply that were not identified in the EA due to lack of consultation.
ESC requests a copy of the <i>Mining Operations Plan (MOP)</i> and reviews the plan to identify any areas of concern.	Issues relating to the ESC water supply that were not identified in the EA due to lack of consultation.
ESC requests involvement in the annual environmental review of the mining activities.	Potential impacts of mining activities upon ESC's water source.
ESC Water Supply contacts need to be included in any incident and emergency response plan.	Implications of catastrophic failure of tailings dam on downstream water supplies was not addressed. Council needs to know about any catastrophic failure occurring on site in order to manage water off-take appropriately.
The rehabilitation securities required by NSW Department of Industry and Investment associated with the project take into account the ongoing use of the Moruya (Deua) River as a major source of drinking water for the Eurobodalla Regional Water Supply Scheme.	Potential impact of tailings leachate upon ESC's water source.
ESC considers the level of water quality monitoring information they would like to review regarding the project: <ul style="list-style-type: none"> Quarterly results as monitored; or annually in the <i>Annual Environmental Management Plan</i>. 	Monitoring of water quality.
ESC is consulted in the preparation of the <i>Rehabilitation and Environmental Management Plan</i> .	Ongoing potential leachate impact upon water supply.
ESC receives the results of any chemical analysis of seepage water from the tailings dam.	Potential impact on the water supply from any leachate leaking from the tailings dam.

Recommendation	Issue Managed
ESC is consulted in the development of the <i>Tailings Management Plan</i> .	Potential water supply impact of the failure of the tailings dam.
ESC is consulted in the development of the <i>Surface Water, Sediment and Erosion Control Plan</i> .	Ensure specific issues relating to potential water supply impacts arising from on-site activities are considered.
<p>Surface water monitoring to include:</p> <ul style="list-style-type: none"> • ICP-MS scan for metals, plus specific testing for mercury and lead on a quarterly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger). • <i>E. coli</i> and <i>Clostridium perfringens</i> monitoring downstream of the site to assess impacts from on-site sewage management facilities on a monthly basis during normal flow conditions downstream of the site plus events to be taken during high flow storm events (based on a flow rate trigger). 	Ensure potential water supply impacts arising from on-site activities are monitored in a manner timely enough to allow action to be taken.
ESC should seek real time groundwater monitoring in tailing monitoring bores to ensure dam does not leach metals into the environment (eg pH, EC)	Timely detection of potential tailings dam seepage.
ESC is consulted in the development of the <i>Dam Safety Emergency Plan</i> .	Potential water supply impacts of the failure of the tailings dam.
ESC is consulted in the development of the <i>Mine Safety Management Plan</i> .	Reduce / mitigate any potential water supply impacts arising from on-site incidents.
ESC is consulted in the development of the <i>Hydrocarbon, Chemical and Reagent Management Plan</i> .	Potential impact of a chemical spill in a water supply catchment eg potassium amyl xanthate.
ESC seeks an on-site Environmental Management position as a condition of consent .	Insufficient on-site resources to manage environmental commitments.
ESC seeks a copy of the MSDS for the reagents IF6500 and MF351 to verify that these chemicals do not pose a risk to the drinking water supply.	Insufficient details were provided in the EA for MSDS to be obtained.

6 REFERENCES

ADWG (2004) Australian Drinking Water Guidelines, NHMRC/NRMMC

ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand

DSC (2010) Dam Guidance Sheets - Tailings Dams DSC3F, Dam Safety Committee (acd 21/10/2010)

Corkery (2010) Environmental Assessment for the Dargues Reef Gold Project, September 2010 Major Project Application No. PA 10_0054, Prepared by R.W. Corkery & Co. PTY. Limited

7 ABBREVIATIONS

ADWG	Australian Drinking Water Guidelines
EA	Environmental Assessment
ESC	Eurobodalla Shire Council
ICP-MS	Inductively coupled plasma - mass spectrometry
MSDS	Material Safety Data Sheet
N/A	Not applicable
PS	Pump station
WTP	Water Treatment Plant

APPENDIX - RISK ASSESSMENT

Risk No.	Process Step	How can the hazard be introduced?	Contaminants (hazards)	Current control measures	Proposed control measures	Responsibility	Likelihood (A-E)	Consequence (1 to 5)	Risk	Basis	Follow-up Actions
R1	Construction of proposed gold mine in catchment	Exposed soils being washed into rivers during rainfall event	Turbidity	ESC Pumping Rules	Construction Management Plan Surface Water, Sediment and Erosion Control Plan	Mine Council does not pump during first flush events	E	3	Moderate	It is considered unlikely that the construction would generate sufficient turbidity to prolong pumping during a first flush event. Moderate risk is valid as any chlorination failure has the potential to cause illness	
R2	Construction of proposed gold mine in catchment	Human waste released from site to Majors Creek posing a threat to human health in the ESC water supply	Pathogens	Palerang Council planning requirements	Palerang Council inspection regimes	Mine	E	5	High	ESC water supply has no barriers against protozoa during dry weather flows	
R3	Construction of proposed gold mine in catchment	Failure of sewage treatment process on site leading to a spill in Majors Creek posing a threat to human health in the ESC water supply	Pathogens	River length	Palerang Council inspection regimes	Mine	E	5	High	ESC water supply has no barriers against protozoa during dry weather flows	Liaise with Palerang Shire Council regarding the proposed sewage treatment system Ensure Eurobodalla Shire Council is included in Incident and Emergency Response Plan
R4	Construction of proposed gold mine in catchment	Spill entering creek in dry weather	Hydrocarbons		Bunding Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine	C	1	Low		
R5	Construction of proposed gold mine in catchment	Traffic accident resulting in a spill to waterway	Chemicals, Waste	River length	Transportation Management Plan Mine Safety Management Plan	Mine	E	2	Low		
R6	Operation of proposed gold mine in catchment	Spill entering creek in dry weather and posing a threat to human health	Potassium amyl xanthate	River length	Bunding Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine	E	4	High	0.5 µg/L guideline value for freshwater and marine ecosystem protection, Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)	ESC should seek to be consulted in the development of the <i>Hydrocarbon, Chemical and Reagent Management Plan</i>
R7	Operation of proposed gold mine in catchment	Spill entering creek in wet weather and posing a threat to human health	Potassium amyl xanthate	River length, Water volumes	Bunding Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine	E	2	Low	0.5 µg/L guideline value for freshwater and marine ecosystem protection, Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)	
R8	Operation of proposed gold mine in catchment	Spill entering creek in dry weather and posing a threat to human health	Nitric Acid	River length, Water volumes	Bunding Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine	E	1	Low	Acid would be diluted and or neutralised before it reaches ESC water supply	

Risk No.	Process Step	How can the hazard be introduced?	Contaminants (hazards)	Current control measures	Proposed control measures	Responsibility	Likelihood (A-E)	Consequence (1 to 5)	Risk	Basis	Follow-up Actions
R9	Operation of proposed gold mine in catchment	Spill entering creek in dry weather and posing a threat to human health	Hydrocarbons	River length, Water volumes	Bunding site Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine	C	1	Low		
R10	Operation of proposed gold mine in catchment	Spill entering creek in dry weather and posing a threat to human health	Copper Sulphate Pentahydrate	Unlikely to be present in quantities that will pose significant risk to human health if split	Bunding site Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine	E	1	Low		
R11	Operation of proposed gold mine in catchment	Spill entering creek in dry weather and posing a threat to human health	IF6500	River length, Water volumes	Bunding site Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine			Uncertain	More details on chemical required (MSDS could not be found based on the information available)	Obtain MSDS, CAS number or chemical name
R12	Operation of proposed gold mine in catchment	Spill entering creek in dry weather and posing a threat to human health	MF351	River length, Water volumes	Bunding site Small quantities held on site Hydrocarbon, Chemical and Reagent Management Plan	Mine			Uncertain	More details on chemical required (MSDS could not be found based on the information available)	Obtain MSDS, CAS number or chemical name
R13	Operation of proposed gold mine in catchment	Spill entering creek in dry weather and posing a threat to human health	Cyanide	Not proposed for use on site		Mine			N/A	Gold will not be fully processed. Cyanide will not be used on site.	
R14	Operation of proposed gold mine in catchment	Tailings dam spill entering creek in dry weather and posing a threat to human health	Heavy metals	Dam Safety Act	Tailings dam design Tailings Management Plan Groundwater Monitoring Program Surface water monitoring program	Mine	E	4	High	This is considered an extremely rare event, however tailings dam failures do occur (approx 1/yr worldwide). Should the tailings enter the environment they potentially could affect Eurobodalla's water quality for a number of years	ESC is advised to review copies of the Geotechnical Investigation Final Report - ref PE801-00139/2" and "Tailings Storage Facility Design - ref PE801-00139/3" by Knight Piesold Pty Ltd
R15	Operation of proposed gold mine in catchment	Tailings dam spill entering creek in wet weather and posing a threat to human health	Heavy metals	Dam Safety Act	Tailings dam design Tailings Management Plan Groundwater Monitoring Program Surface water monitoring program	Mine	E	4	High	This is considered an extremely rare event, however tailings dam failures do occur (approx 1/yr worldwide). Should the tailings enter the environment they potentially could affect Eurobodalla's water quality for a number of years	ESC is advised to review copies of the Geotechnical Investigation Final Report - ref PE801-00139/2" and "Tailings Storage Facility Design - ref PE801-00139/3" by Knight Piesold Pty Ltd
R16	Operation of proposed gold mine in catchment	Tailings dam leachate entering groundwater and posing a threat to human health	Heavy metals		Tailings dam design Tailings Management Plan Groundwater Monitoring Program Surface water monitoring program	Mine	D	3	Moderate		ESC should seek real time groundwater monitoring to ensure dam does not leach metals into the environment (eg pH/EC)

Risk No.	Process Step	How can the hazard be introduced?	Contaminants (hazards)	Current control measures	Proposed control measures	Responsibility	Likelihood (A-E)	Consequence (1 to 5)	Risk	Basis	Follow-up Actions
R17	Operation of proposed gold mine in catchment	Traffic accident resulting in a spill to waterway	Concentrate		Transportation Management Plan Mine Safety Management Plan	Mine	E	3	Moderate		
R18	Construction of proposed gold mine in catchment	Diversion of groundwater flows beyond those modelled for EA	Loss of water	NOW embargo on water exaction		Mine	E	3	Moderate	A small proportion of water would not be available to ESC water supply	
R19	Construction of proposed gold mine in catchment	Old workings disturbed releasing cyanide/arsenic/mercury downstream	Cyanide/arsenic	River length	Surface Water Monitoring Program	Mine	E	2	Low	Proponent is not aware of cyanide or mercury being used during previous mining operations	
R20	Operation of proposed gold mine in catchment	Exposed soils being washed into rivers during rainfall event in concentrations that would overwhelm chlorination effectiveness in the ESC water supply	Turbidity	Pumping Rules	Surface Water, Sediment and Erosion Control Plan	Mine	E	5	High	It is considered unlikely that the construction would generate sufficient turbidity to prolong pumping during a first flush event. Still ranks high as any chlorination failure can cause illness	Ensure Eurobodalla Shire Council is consulted in regard to the development of the Surface Water, Sediment and Erosion Control Plan
R21	Operation of proposed gold mine in catchment	Human waste released from site to Majors Creek posing a threat to human health in the ESC water supply	Pathogens	Palerang Council Planning requirements	Palerang Council Inspection regimes Mining Operations Plan	Mine	E	5	High	ESC water supply has no barriers against protozoa during dry weather flows	Liaise with Palerang Shire Council regarding the proposed sewage treatment system Ensure Eurobodalla Shire Council is included in Incident and Emergency Response Plan
R22	Operation of proposed gold mine in catchment	Failure of sewage treatment process on site leading to a spill in Majors Creek posing a threat to human health in the ESC water supply	Pathogens	River length	Palerang Council Inspection regimes Mining Operations Plan Tailings dam design Tailings Management Plan Groundwater Monitoring Program Surface water monitoring program	Mine	E	5	High	ESC water supply has no barriers against protozoa during dry weather flows	Ensure Eurobodalla Shire Council is notified of any failure of the on-site treatment process
R23	Operation of proposed gold mine in catchment	Collapse of tailings dam	Heavy metals	Dam Safety Act River length	Tailings dam design Tailings Management Plan Groundwater Monitoring Program Surface water monitoring program	Mine	E	5	High	Receives a high ranking as is a high impact event	Ensure Eurobodalla Shire Council is included in the mine's Incident and Emergency Response Plan
R24	Operation of proposed gold mine in catchment	Acid sulphides released from minerals impacting Eurobodalla's water supply	Acid/ heavy metals	River length	Tailings dam design Tailings Management Plan Groundwater Monitoring Program Surface water monitoring program	Mine	E	1	Low		
R25	Operation of proposed gold mine in catchment	Surface water harvesting reduced flows to Majors Creek		Harvestable rights	Mine, NSW Office of Water	Mine, NSW Office of Water	A	1	Moderate	Within landowners rights to harvest the water	

Risk No.	Process Step	How can the hazard be introduced?	Contaminants (hazards)	Current control measures	Proposed control measures	Responsibility	Likelihood (A-E)	Consequence (1 to 5)	Risk	Basis	Follow-up Actions
R26	Operation of proposed gold mine in catchment	Groundwater extraction from previous goldmining activities	Chemical (arsenic, cyanide)		Surface Water Monitoring Program	Mine	E	2	Low	Proponent is not aware of cyanide or mercury being used during previous mining operations	
R27	Operation of proposed gold mine in catchment	Diversion of groundwater flows beyond those modelled for EA	Loss of water		Water level monitoring program (groundwater) Tailings Dam design	Mine	E	3	Moderate	A small proportion of water would not be available to ESC water supply	
R28	Decommissioned proposed gold mine in catchment	Heavy metals leaching from tailing dam	Heavy metals	River length	Tailings Management Plan Rehabilitation and Environmental Management Plan	Mine	D	2	Low	Will be diluted before reaching water supply offtake.	
R29	Decommissioned proposed gold mine in catchment	Acid sulphides released from minerals	Acid/ heavy metals	River length	Tailings dam design Tailings Management Plan Rehabilitation and Environmental Management Plan	Mine	E	1	Low		
R30	Decommissioned proposed gold mine in catchment	Tailings dam leachate entering groundwater and posing a threat to human health	Heavy metals		Tailings dam design Tailings Management Plan	Mine	D	3	Moderate	Once the mine has been decommissioned and the bond returned ESC will have no recourse if their supply is contaminated	ESC should seek real time groundwater monitoring to ensure dam does not leach metals into the environment (eg pH, EC)