



Amendment Notice 3

Licensee	Northern Star Resources Ltd
ACN	092 832 892
Licence Number	L7969/2004/3
File Number:	DER2013/0000991
Premises	Paulsens Gold Project Mining Leases M08/99 and M08/196 Nanutarra-Munjina Road PARABURDOO WA 6754
Date of amendment	21 April 2017

Amendment

The Chief Executive Officer (CEO) of the Department of Environment Regulation (DER) has amended the above licence in accordance with section 59 of the *Environmental Protection Act 1986* as set out in this Amendment Notice. This Amendment Notice constitutes written notice of the amendment in accordance with section 59B(9) of the EP Act and follows.

Date signed: 20 April 2017

Alana Kidd

Manager Licensing – Resource Industries

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Amendment Notice

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

This notice of amendment implements changes to the tailings storage facility (TSF) groundwater monitoring requirements specified under condition 5(b) of Licence L7969/2004/3 and removes condition 18 which required the development and implementation of a Groundwater Management Plan.

The following DER Guidance Statements have informed the decision made on this amendment:

- *Guidance Statement: Regulatory Principles* (July 2015)
- *Guidance Statement: Setting Conditions* (October 2015)
- *Guidance Statement: Decision Making* (February 2017)
- *Guidance Statement: Risk Assessment* (February 2017)
- *Guidance Statement: Environmental Siting* (November 2016)

Amendment Description

On 14 February 2017 the CEO of DER initiated this amendment to make changes to the TSF groundwater monitoring requirements specified in Table 2 of conditions 5(a) and 5(b) of Licence L7969/2004/3.

Northern Star Resources Ltd (the Licensee) submitted the Paulsens Gold Project TSF *Groundwater Management Plan* (ATC Williams, 2017) to DER on 17 October 2016 to satisfy the requirements of condition 18 of Licence L7969/2004/3, which states:

“The licensee shall develop and implement a Groundwater Management Plan including but not limited to:

- Extend the groundwater monitoring bore network at the TSF;*
- Undertake a hydrogeological review and develop a conceptual aquifer model (Phase 1);*
- Develop an action plan detailing key activities and timelines of any further actions that are required to be conducted (Phase 2);*
- estimate the magnitude of seepage that is taking place from the TSF by developing a solute mixing model using the chemical composition of pore water in the TSF and background groundwater quality; and*
- Implement Phase 1 and Phase 2 proposals to develop a Groundwater Management Plan.”*

Following DER’s review of the *Groundwater Management Plan*, the Licensee resubmitted a revised plan to address issues identified by DER with respect to increasing sulfate concentrations in groundwater and establishment of an appropriate management trigger value for sulfate in groundwater. DER also requested that a review of monitoring results for fluoride, cadmium, mercury, selenium and thallium be undertaken to identify exceedances of livestock drinking water criteria in groundwater near the TSF. The revised plan was submitted to DER on 19 January 2017.

DER has reviewed the revised plan and is satisfied that it meets the requirements of Condition 18. The plan adequately addresses the issues raised by DER, as described above. The revised plan includes a number of management measures to ensure that the surface expression of seepage which could be detrimental to flora and fauna is prevented and a sustainable groundwater source for the purpose of livestock watering is maintained. The

Delegated Officer considers these management measures appropriate to provide a sufficient level of protection for the environment and the key environmental receptor, being livestock drinking water quality.

This notice of amendment amends Licence L7969/2004/3 as described below.

Conditions 5(a) and 5(b) – TSF monitoring requirements

Sulfate monitoring

The Delegated Officer notes that sulfate concentrations in many of the monitoring bores near the TSF now have concentrations that exceed 2,000 mg/L, a level that the national water quality guidelines (ANZECC, 2000) indicate may cause chronic or acute health problems for susceptible animals if present in livestock drinking water. The Delegated Officer considers that management trigger values for groundwater quality should be set on the basis of an appropriate sulfate concentration rather than salinity to better target livestock drinking water quality as the key environmental receptor.

Noting the above and consistent with the management measures proposed by the Licensee in the *Groundwater Management Plan*, the TSF monitoring requirements specified in Table 2 of Conditions 5(a) and 5(b) will be updated to include sulfate as a parameter sampled at each monitoring bore. A trigger value for sulfate of 5,000 mg/L will be implemented for the TSF monitoring bores (PMB1-PMB10) and a trigger value of 2,000 mg/L at production bore PB45. The Delegated Officer notes that production bore PB45 is located between the TSF and the nearest downstream pastoral bore, being PB70. PB 70 is currently used for a supply of livestock drinking water.

In the event that the trigger value of 5,000 mg/L is exceeded at any of the TSF monitoring bores a seepage recovery bore will be installed at PMB9. In the event that the trigger is exceeded at production bore PB45, a pump will be installed immediately at production bore PB81 and abstraction commenced to facilitate a reduction, or cessation of abstraction at PB45. These trigger event management actions are specified in Table 2(a) which has been included in Licence L7969/2004/3 at the time of this amendment.

Monitoring suite and frequency

The Delegated Officer notes condition 5(b) currently requires bores PMB1-PMB10 and production bore PB45 to be monitored on a quarterly basis for pH, TDS, standing water level, copper, arsenic, chromium, aluminium, cadmium, iron, manganese, nickel, selenium, zinc, lead, antimony, cobalt, thallium, weak acid dissociable cyanide, total nitrogen and total phosphorus.

This notice of amendment implements the following changes to Table 2 of Conditions 5(a) and 5(b), consistent with the proposed operator controls in the *Groundwater Management Plan*:

- Include production bore PB70 as a monitoring location. The Delegated Officer notes that PB70 provides a livestock water supply and is located approximately 1.5 km downstream of the TSF. Production bore PB70 will be subject to quarterly monitoring for the same suite of parameters as PB45 and the TSF monitoring bores;
- Include fluoride and mercury in the suite of analytes for quarterly assessment for all bores. The Delegated Officer notes that concentrations of these elements could potentially increase as a result of redox reactions associated with groundwater lowering and have the potential to cause health impacts in susceptible animals when present in high concentrations in livestock drinking water; and
- Expand the suite of water quality analysis for the tailings dam pond water to include the same parameters as the TSF groundwater monitoring and production bores.

Other Amendments

Condition 18 is being removed via this notice of amendment. Condition 18 required the development and implementation of a *Groundwater Management Plan* to address the management of groundwater quality at the TSF. The Delegated Officer considers that the requirements of this condition have been adequately addressed through the submission of the revised *Groundwater Management Plan* submitted to DER on 19 January 2017.

Decision

The Delegated Officer has considered the management measures outlined in the *Groundwater Management Plan* for the Paulsens Gold Project TSF and has determined to amend Licence L7969/2004/3 to implement these controls via this notice of amendment.

The Delegated Officer has determined to amend conditions 5(a) and 5(b) to require the quarterly monitoring of production bore PB70, include fluoride, mercury and sulfate in the monitoring suite for all bores and to specify triggers (reportable events) for sulfate in the TSF monitoring and production bores. Reportable event management actions have been implemented via the inclusion of Table 2(a) into the Licence. Reporting requirements in the event of a reportable event have also been included in Table 2(a).

The Delegated Officer considers these controls necessary to address the issue of increasing sulfate levels in groundwater near the TSF. As previously noted, concentrations in many of the monitoring bores near the TSF now have concentrations that exceed 2,000 mg/L, a level that the national water quality guidelines (ANZECC, 2000) indicate may cause chronic or acute health problems for susceptible animals if present in livestock drinking water.

The Delegated Officer considers the sulfate trigger of 2,000 mg/L for production bore PB45 to be appropriate as PB45 is located between the TSF and the nearest downstream pastoral bore (PB70), considered the key sensitive receptor for groundwater in the area. This will allow appropriate remedial action to be implemented prior to groundwater with elevated sulfate concentrations reaching production bore PB70, which could potentially affect the health of livestock.

Fluoride and mercury could potentially increase in groundwater as a result of redox reactions associated with groundwater lowering and have the potential to impact animal health. The Delegated Officer has included these parameters to ensure changes to groundwater quality are identified prior to livestock drinking water being detrimentally affected.

Figures depicting the location of production bores PB45 and PB70 has been included in the Licence as Attachment 5 to Licence L7969/2004/3.

The Delegated Officer has determined to delete condition 18 from the Licence as the requirements for this condition have been satisfied through the submission of the revised *Groundwater Management Plan*.

Amendment History

Table 1 provides the amendment history for L7969/2004/3.

Table 1: Licence amendments

Instrument	Issued	Amendment
L7969/2004/3	21/11/2013	Amendment issued to correct the company registered business address.
L7969/2004/3	15/09/2016	Amendment issued for the following: <ul style="list-style-type: none">• Removal of mine dewatering conditions and category 6;• Reduction in the frequency of tailings monitoring;;

		<ul style="list-style-type: none"> • Increase in the TDS limit of ambient groundwater monitoring from 3500mg/L up to 10,000mg/L; • Addition of groundwater monitoring bores and Production bore; • Addition of category 63 and 64 to the licence; • Addition of category 52 to the licence as upgrades involved the installation of three additional skid mounted container style diesel generators; • Addition of improvement conditions to address groundwater concerns; and <p>Update to definitions and removal of targets as per CEO instructions.</p>
L7969/2004/3	20/10/2016	<p>Amendment Notice 1</p> <p>Licence amendment to change Licensee's registered business address</p>
L7969/2004/3	15/12/2016	<p>Amendment Notice 2</p> <p>Licence amendment to update the landfill location map in Attachment 5 of licence</p>
L7969/2004/3	21/04/2017	<p>Amendment Notice 3</p> <p>Licence amendment to review and update the ambient groundwater monitoring requirements for the TSF</p>

Licence Holder's Comments

The Licensee was provided with the draft Amendment Notice on 23 March 2017. Comments received from the Licensee have been considered by the Delegated Officer as shown in Appendix 2.

Amendment

1. Conditions 5 (a) and 5(b) of the licence are amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:
 - 5(a) *The Licensee shall take representative samples from the locations identified in column 1 of Table 2, at the frequency stated in column 2 of Table 2 and have them analysed for the parameters listed in column 3 of Table 2.*
 - 5(b) *The Licensee shall ensure that the parameter limits listed in Column 4 of Table 2 are not exceeded at the monitoring sites listed in column 1 of Table 2.*
The Licensee shall take the specified management actions outlined in Table 2(a) in the case of a reportable event listed in column 5 of Table 2.

Table 2: TSF monitoring requirements.

Column 1	Column 2	Column 3	Column 4	Column 5
Monitoring site	Sampling Frequency	Parameters to be measured ³	Limits	Reportable event
Tailings Dam Ground Water Monitoring (Attachment 3)				
PMB1, PMB2, PMB3, PMB4, PMB5, PMB6, PMB07, PMB08, PMB09, PMB10	Quarterly; (October, January, April, July)	pH ¹ , Total Dissolved Solids (TDS), Standing Water Level (SWL) ² , Major Anions and Cations; Copper(Cu), Arsenic(As), Chromium (Cr), Aluminium (Al), Cadmium (Cd), Iron (Fe), Manganese (Mn), Nickel (Ni), Selenium (Se), Zinc (Zn), Lead (Pb), Antimony (Sb), Cobalt (Co), Thallium (Tl), Weak Acid Dissociable Cyanide (WADCN), Total Nitrogen, Total Phosphorus, <u>Sulfate (SO₄)</u> , <u>Fluoride (F)</u> , <u>Mercury (Hg)</u>	TDS ≤ 10,000mg/l pH 6.5-8.5 WADCN ≤ 0.5mg/l	<u>Sulfate > 5,000mg/l</u>
Production Bore 45 (<u>PB45</u>) (<u>Attachment 5</u>)			TDS ≤ 5000mg/l pH 6.5-8.5 WADCN ≤ 0.5mg/l	<u>Sulfate >2,000mg/l</u>
<u>Production Bore 70 (PB70)</u> (<u>Attachment 5</u>)		<u>Total Cyanide (CN)⁴</u>	<u>N/A</u>	<u>N/A</u>
<u>Tailings dam pond water - Tailings hopper monitoring point</u> (<u>Attachment 3</u>)			<u>N/A</u>	<u>N/A</u>
Tailings Dam Pond Water Monitoring (Attachment 3)				
Tailings hopper – monitoring point	Quarterly	Total Cyanide (CN) (mg/L)	N/A	
		Weak Acid Dissociable Cyanide (WADCN) (mg/L)		

Note 1: In-field non-NATA accredited analysis permitted.

Note 2: SWL shall be determined prior to collection of other water samples.

Note 3: With the exception of pH and SWL all measurements are to be reported in mg/L.

Note 4: Only applicable for tailings hopper monitoring

Table 2(a): Trigger event management actions

Column 1	Column 2	Column 3	Column 4
<u>Monitoring site</u>	<u>Event</u>	<u>Management action</u>	<u>Reporting requirements</u>
<u>PMB1, PMB2, PMB3, PMB4, PMB5, PMB6, PMB07, PMB08, PMB09, PMB10</u>	<u>Reportable event listed in column 5 of Table 2</u>	<u>Install seepage recovery bore at PMB09 within one month of a reportable event</u>	<u>Notify the CEO of DER within one month of a reportable event, providing a report containing:</u> <ul style="list-style-type: none"> <u>the reportable event date;</u> <u>the raw monitoring data for the reportable event in tabulated form; and</u> <u>evidence of management action implementation.</u>
<u>Production Bore 45 (PB45)</u>		<u>Cease abstraction at production bore PB45 within 24 hours of a reportable event</u>	<u>Notify the CEO of DER within seven days of a reportable event, providing a report containing:</u> <ul style="list-style-type: none"> <u>the reportable event date;</u> <u>the raw monitoring data for the reportable event in tabulated form; and</u> <u>evidence of management action implementation.</u>

2. The licence is amended by the deletion of the following Condition 18:

~~18. The Licensee shall complete the improvements in Table 7 by the date of completion in Table 7.~~

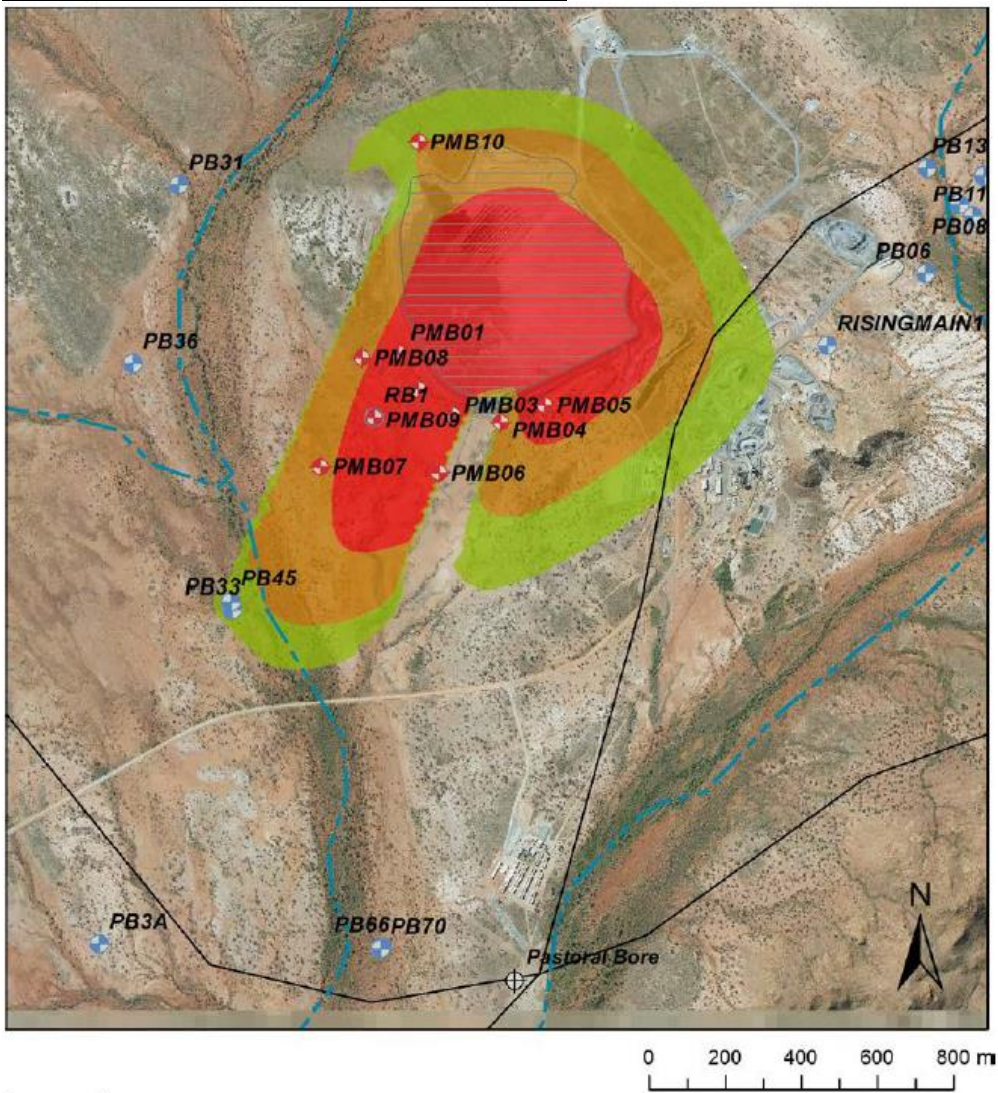
Table 7: Improvement program

Improvement reference	Improvement	Date of completion
IR1	The licensee shall develop and implement a Groundwater Management Plan including but not limited to: <ul style="list-style-type: none"> (i) Extend the groundwater monitoring bore network at the TSF; (ii) Undertake a hydrogeological review and develop a conceptual aquifer model (Phase 1); (iii) Develop an action plan detailing key activities and timelines of any further actions that are required to be conducted (Phase 2); (iv) estimate the magnitude of seepage that is taking place from the TSF by developing a solute mixing model using 	31 October 2016

	<p><i>the chemical composition of pore water in the TSF and background groundwater quality; and</i></p> <p><i>(v) Implement Phase 1 and Phase 2 proposals to develop a Groundwater Management Plan.</i></p>	
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- The licence is amended by the inclusion of the following figures as Attachment 5 and Attachment 6 to Licence L7969/2004/3:

ATTACHMENT 5: LOCATIONS OF TAILINGS GROUNDWATER MONITORING POINTS PB45 AND PB70 (PRODUCTION BORES)



Appendix 1: Key Documents

	Document Title	In text ref	Availability
1	Licence L7969/2004/3 – Paulsens Gold Project	L7969/2004/3	Accessed at http://www.der.wa.gov.au
2	ATC Williams, January 2017. <i>Groundwater Management Plan</i> , West Perth	ATC Williams 2017	DER on request
3	Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Management Strategy Paper No. 4 published by the Australian and New Zealand Environment and Conservation Council	ANZECC, 2000	Accessed at https://www.environment.gov.au
5	DER, July 2015. <i>Guidance Statement: Regulatory principles</i> . Department of Environment Regulation, Perth.	DER 2015a	accessed at http://www.der.wa.gov.au
6	DER, October 2015. <i>Guidance Statement: Setting conditions</i> . Department of Environment Regulation, Perth.	DER 2015b	
8	DER, November 2016. <i>Guidance Statement: Risk Assessments</i> . Department of Environment Regulation, Perth.	DER 2017a	
9	DER, November 2016. <i>Guidance Statement: Decision Making</i> . Department of Environment Regulation, Perth.	DER 2017b	

Appendix 2: Summary of Licensee’s comments

The Licensee was provided with the draft Amendment Notice on 23 March 2017 for review and comment. The Licensee responded on 4 April 2017. The following comments were received on the draft Amendment Notice.

Comments received	DER consideration of risk
<p>The Licensee stated:</p> <p><i>“In Condition 5(b), Table 2(a) the management action for Production Bore 45 reaching the trigger level for sulphate is “Cease abstraction at production bore PB45 within 24 hours of a reportable event and commence abstraction at alternative production bore PB81 within 48 hours”. Given that the commencement of abstraction from PB81 is not a critical response to the sulphate levels at PB45, as in it will not help reduce the sulphate levels or manage them in any way, we would like to request this part of the action be removed. Abstraction from PB81 will be required to maintain production, and is therefore a production risk, rather than an environmental one...”</i></p>	<p>The Delegated Officer has considered the Licensee’s comments and agrees that abstraction from an alternative production bore is an operational issue and not related to the management of sulfate levels in groundwater at the TSF. The requirement to commence abstraction at production bore PB81 in the event of a reportable event at production bore 45 has been removed from the Amendment Notice.</p>