Government of Western Australia
Department of Water and Environmental Regulation

Amendment Notice #2

Licence Number	L7967/2003/6
Licence Holder	Savannah Nickel Mines Pty Ltd
ACN	103 729 282
File Number:	DER2013/001406-1
Premises	Savannah Project M80/179, M80/180 and M80/181 WARMUN WA 6740
Date of Amendment	**21/12/2018**

Amendment

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above Licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act) 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.

Alana Kidd
Digitally signed by Alana Kidd
Date: 2018.12.20 09:20:52 +08'00'

Alana Kidd

Manager, Resource Industries

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

Definitions and interpretation

Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Amendment Notice	refers to this document
ANZECC	Australian and New Zealand Environment Conservation Council
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department Administering the *Environmental Protection Act 1986* Locked Bag 33 Cloisters Square PERTH WA 6850 info@dwer.wa.gov.au
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DMIRS	Department of Mines, Industry Regulation and Safety
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Amendment
Licence Holder Licensee	Savannah Nickel Mines Pty Ltd

m^3	cubic metres
mtpa	million tonnes per annum
NWQMS	National Water Quality Management Strategy
Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report.
Risk Event	as described in *Guidance Statement: Risk Assessment*
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
WSF	Water Storage Facility

Amendment Notice

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the licence L7967/2003/6 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 is for an amendment to reinstate the previously approved premises production and design capacities onto the licence and to incorporate TSF management conditions recommended as part of the TSF lift approved via Works Approval W5208/2012/1, as the Licence Holder is anticipating the recommencement of production in November 2018 following a period of care and maintenance. It also includes the incorporation of the TSF upgrades authorized via works approval W5208/2012/1. Category 6 is also removed from the licence as Category 6 was originally for dewatering of the open pit. Since mining of the open pit has ceased (mining has continued underground as a long hole open stoping operation) the two open pit dewatering bores have been decommissioned. The water that is abstracted to allow mining of ore using the long hole open stoping method, is not discharged to the environment. Mine water (comprised of minor groundwater inflows and surface water entering through the portal) is recovered and sent to a lined water storage and utilised for dust suppression and processing.

The following guidance statements have informed the decision made on this amendment*:*

- *Guidance Statement: Decision Making* (February 2017); and
- *Guidance Statement: Risk Assessment* (February 2017).

Amendment description

The Licence Holder notified DWER on 7 August 2018, as per Condition 4.3.1 of Licence L7967/2003/6, of their intent to recommence production, at least 90 days prior to start-up.

The Licence Holder submitted a licence amendment application on 12 August 2018 to increase the approved premises production and design capacities, in anticipation of recommencement of production, scheduled to begin in November 2018. These were reduced on 18 July 2016 via a licence amendment as the mine transitioned into care and maintenance and suspended production. The Licence Holder is seeking to amend the licence to increase its approved premises production and design capacities to effectively reinstate those previously in place when operational, as shown in Table 2.

Table 2: Proposed throughput capacity changes

Category	Current throughput capacity	Proposed throughput capacity	Description of proposed amendment
5 Processing or beneficiation of metallic or non-metallic ore	Not more than 50,000 tonnes per annual period	950,000 tonnes per annual period	Recommencement of production, following a period of care and maintenance
6 Mine dewatering	100,000 tonnes per annual period	No change	Recommencement of production, following a period of care and maintenance
54 Sewage facility	Not more than 200 cubic metres or more per day	200 cubic metres or more per day	Recommencement of production, following a period of care and maintenance
64 Class II putrescible landfill site	Not more than 5,000 tonnes per annual period	10,000 tonnes per annual period	Recommencement of production, following a period of care and maintenance

Processing Plant

There will be refurbishment of the existing processing plant, broadly consisting of:

- Repairing structural steel;
- Repairing, servicing and updating mechanical equipment;
- Painting or relining tanks;
- Installing new wear plates;
- Installing new conveyor belts;
- Re-certifying of classified plant (e.g. pressure vessels, cranes);
- Installing analysis technology; and
- Testing electrical circuits.

The plant process and throughput will remain the same as previous operations and there will be no change to the materials used in processing and the product being produced (bulk Nickel, Copper and Cobalt concentrate).

TSF

The TSF has previously been operational. The constructed TSF is proposed to be again used as part of the mine site recommencing operations. The Licence Holder was also granted Works Approval W5208/2012/1 on 3 December 2012. The Works Approval gives approval for the construction of:

(a) two sequential three metre raises to the main embankment of the existing TSF;
(b) three additional saddle embankments around the existing TSF;
(c) an internal wall to form two primary cells within the existing TSF;
(d) an extension to the existing internal decant structure; and
(e) an engineered cover for the completed TSF

There were a number of recommendations made during the assessment for licence conditions, to be implemented when the outstanding TSF modifications became operational. These recommendations have been taken into consideration during this amendment notice and relevant licence conditions implemented. The Licence Holder has submitted compliance documentation as per conditions 2.1.1 and 2.1.2 of Works Approval W5208/2012/1 following construction and prior to commissioning of the completed TSF lifts.

Mine dewatering

Category 6 is removed from the licence as mine dewatering water abstracted to allow mining of ore is not discharged to the environment. It is sent to a lined water storage and utilised for dust suppression and processing. Conditions referring to only disposing of mine dewatering water to containment cells and/or water storage facilities and inspecting of dewatering pipelines have been left on the licence.

WWTP

During this amendment the Total Nitrogen and Total Phosphorus loading rates were recalculated due to the requested increased throughput of 1,880 m^3/day with the 1.33 ha irrigation area. These loading rates were not acceptable and it was confirmed with the Licence Holder that the WWTP would not be operated at the full design capacity. It has therefore been determined that the capacity will not be amended from 200 m^3/day. The loading rates using this reduced capacity are still slightly elevated and, therefore, a condition has been recommended to be included on the licence in the notifications section, requiring the Licence Holder to address this via improvements to the WWTP and/or increasing the irrigation area.

Landfill

During care and maintenance the landfill capacity was reduced to 5,000 tonnes per annum. It is now being increased up to 10,000 tonnes per annum. Depth to groundwater in the vicinity of the landfill is approximately 30 mbgl as it is operated on the north waste rock dump.

Compliance

The most recent inspection for this premises was conducted on 16 June 2015, with some minor non-compliances reported:

- Four drums containing xanthate were stored outside of a bunded area;
- Housekeeping around the lime milling and dosing areas was sub-standard;
- Landfill waste at the North dump was not being covered on a weekly basis; and
- An exceedance of total recoverable hydrocarbons was recorded by the Licence Holder.

These non-compliances were addressed by the Licence Holder and a closure letter sent on 21 August 2015.

The most recent AER states that the mine site was in Care and Maintenance during the entire reporting period.

The Licence Holder declared non-compliances with the following conditions:

Condition 1.2.8 – During the reporting period, the mine site experienced unusually high rainfall, which resulted in higher levels of seepage and dewatering (227,542 tonnes per annum) above the Approved Premises production or design capacity of category 6 (100,000 tonnes per annum). It should be noted that this water is not discharged to the environment and has been incorrectly declared as a non-compliance. Mine water (comprised of minor groundwater inflows and surface water entering through the portal) is recovered and sent to a lined water storage and utilised for dust suppression and processing. As this water is not discharged to the environment, this category 6 can be removed from the licence.

Condition 3.1.1(a) - The Licence Holder has stated that, due to the remote location of the mine site, it is not possible to meet the specified holding times as per this condition. They are referring to Total Dissolved Solids, as the licence already has a clause in it for pH. However, the Licence Holder was under the impression that the recommended holding time for TDS was 24 hours, however, it is 7 days. This has been incorrectly declared as a non-compliance.

Amendment history

Table 3 provides the amendment history for L7967/2003/6.

Table 3: Licence amendments

Instrument	Issued	Amendment
L7967/2003/4	21/11/2011	Licence amendment to allow concrete batching onsite.
L7967/2003/4	02/02/2012	Licence amendment to allow emergency response training onsite.
L7967/2003/5	02/08/2012	Licence reissued
L7967/2003/5	17/10/2013	Licence amendment to allow new putrescible landfill
L7967/2003/6	01/08/2014	Licence reissue and conversion to new licence format
L7967/2003/6	09/10/2014	Licence amendment to increase category 5 production and design capacity.
L7967/2003/6	18/07/2016	Licence amendment to allow for tyre burial within waste rock dump and to reduce design capacities of premises while during Care and Maintenance.
L7967/2003/6	24/04/2018	Licence Amendment Notice (#1) to change annual period to 1 July – 30 June.

L7967/2003/6	21/12/2018	Licence Amendment Notice (#2) to reinstate the approved premises production and design capacities and include amended conditions for the TSF as recommended during the TSF lift assessment (Works Approval W5208/2012/1), in anticipation of recommencement of production. Removal of category 6 for mine dewatering. Inclusion of an improvement condition to address the elevated Total Nitrogen and Total Phosphorus loading rates at the WWTP irrigation area. A typographical error has also been corrected from Amendment Notice #1, finalised 24 April 2018, where the annual period date has been written as 1 July – 31 June, instead of 1 July - 30 June in the Definitions section.

Location and receptors

Table 4 below lists the relevant sensitive land uses in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 4: Receptors and distance from activity boundary

Residential and sensitive premises	Distance from Prescribed Premises
Frog Hollow	10 km north of the Savannah Project
Warmun Aboriginal Community	40 km north of the Savannah Project
Port of Wyndham	250 km north of the Savannah Project

Table 5 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment. These are shown in Figure 1.

Table 5: Environmental receptors and distance from activity boundary

Environmental receptors	Distance from Prescribed Premises
Groundwater quality is indicated below: • pH levels are neutral, ranging from 6.7 to 7.1: • Total Dissolved Solids (TDS) between 950 mg/L and 2260 mg/L; • Sulphate concentrations from 460 mg/L to 2200 mg/L; • Copper levels ranged from less than 0.001 mg/L to 0.001 mg/L; • Nickel levels ranged from less than 0.001 mg/L to 0.022 mg/L; • Cobalt levels ranged from less than 0.001 mg/L to 0.004 mg/L; • Manganese levels ranged from 0.02 mg/L to 0.67 mg/L; and • Selenium levels ranged from less than 0.001 mg/L to 0.008 mg/L.	Depth to groundwater in the vicinity of the TSF varies from 1 – 17 mbgl. Depth to groundwater in the vicinity of the waste rock dumps is approximately 30 mbgl. Depth to groundwater is closely related to topographic elevation and seasonal recharge. Seasonal variations of 3 – 15 m occur as a result of direct infiltration and local recharge.
Stoney Creek, including Rademy Spring and Rademy Creek Moderate ephemeral tributary. Flows in a south easterly direction into Fletcher Creek.	2 km north of the Savannah Project
Mine Creek Ungazetted creek. Drains approximately 1.8 km east into Fletcher	South of TSF1 and WSF1

Creek. Construction of TSF1 and WSF1 has altered the local hydrology creating artificial flow that may last for up to six months of the year during operations.	
Fletcher Creek Large ephemeral drainage line. Flows in a southerly direction. Late wet season gives rise to seasonal ponds and springs that may: • Drain to base flow; • Be consumed by evapotranspiration processes; and/or • Persist into the dry season in scour points that are themselves transient, depending on the intensity of seasonal flows.	2 km east of the Savannah Project
Ord River Major ephemeral river, drains to Lake Argyle (Ramsar wetland, approximately 250 km downstream) and then to Cambridge Gulf. Total length is 650 km with a catchment area of 30,000 km2, containing 35 tributaries. Has an estimate annual flow of 3,870 GL/year	12 km south of the Savannah Project

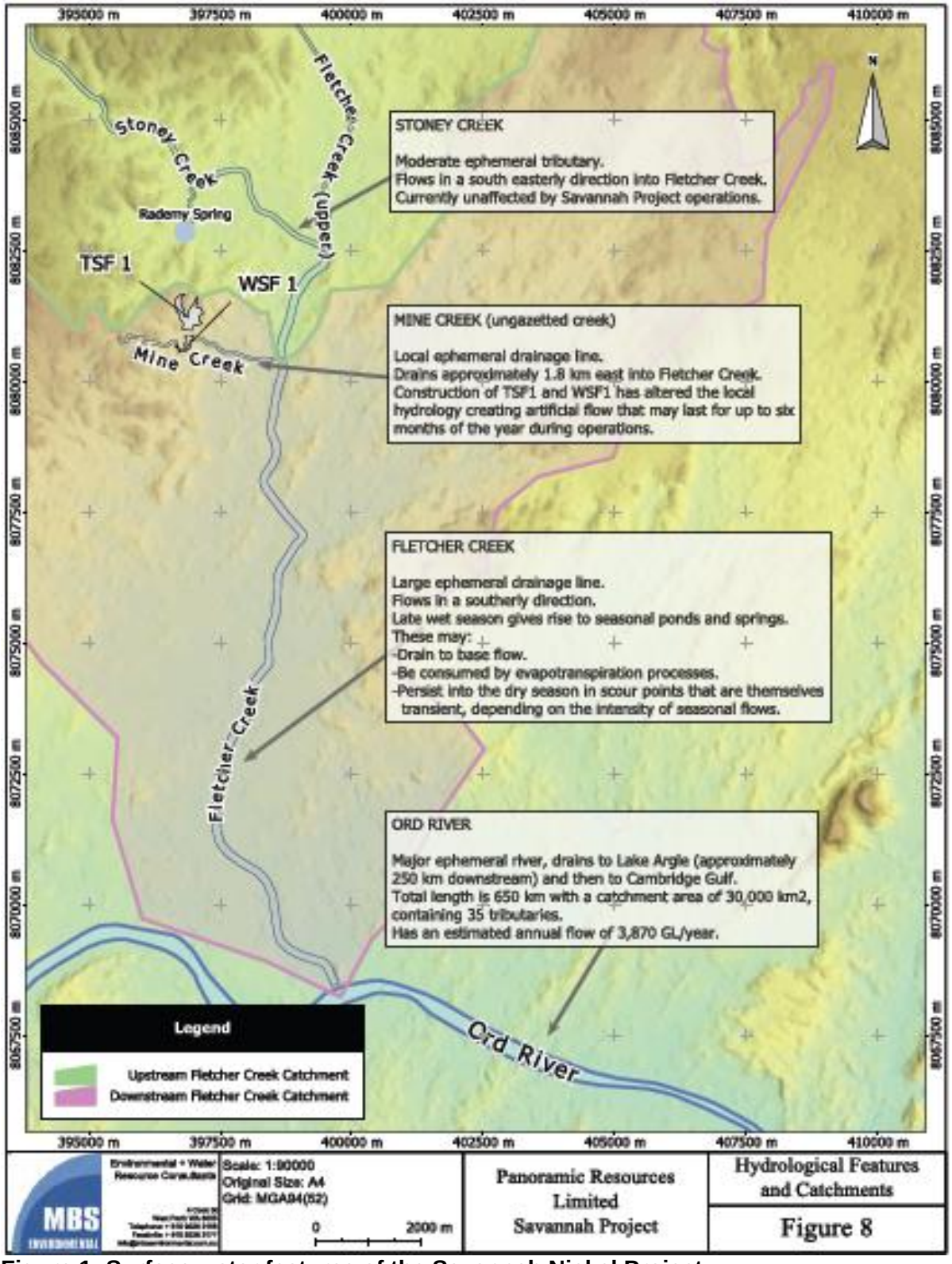


Figure 1: Surface water features of the Savannah Nickel Project

Risk assessment

Table 6 below describes the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. Both tables identify whether the emissions present a material risk to public health or the environment, requiring regulatory controls. Please note that only the TSF and the WWTP have been risk assessed, as the other infrastructure is recommencing operation in the same, or reduced capacity conditions. The 2017 – 2018 AER has also been reviewed.

Table 6: Risk assessment for proposed amendments during operation of the TSF and WWTP

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
Cat 5 *Processing or beneficiation of metallic or non-metallic ore*	*TSF*	***Waste:*** *Seepage through the base of the TSF*	*Groundwater with beneficial use (Groundwater Dependent Ecosystem) and surface water*	*Seepage through the base and embankments of the TSF and soil to groundwater and surface water*	*Health and survival of vegetation dependent upon groundwater or cattle using the groundwater for drinking water*	*Minor*	*Likely*	*Medium*	*See detailed risk assessment in Section 1.1.*
		Waste: *Tailings releases due to overtopping of the TSF*	*Nearby soils and vegetation*	*Direct discharge*	*Health and survival of vegetation, with potential to gain access to nearby drainage lines*	*Minor*	*Unlikely*	*Medium*	*The quality of the tailings / decant water that would be discharged is likely to be contaminated with elevated TDS, sulfate, nickel, copper and cobalt.* *The tailings within the TSF have been well characterised through extensive geochemical assessment. Tailings typically contain 8-9% total sulfur, present in the mono-sulfide (pyrrhotite) form in a gangue of mafic-silicates. Tailings consolidate well and form a trafficable hardpan surface below which exhibits a low oxygen (reducing) environment where tailings remain relatively fresh, and do not generate acid conditions. Geochemical testing has indicated that the main product of the oxidation of tailings material is elemental sulfur, via a reaction that does not result in acid or metalliferous drainage (acid mine drainage – AMD). The presence of magnesium silicate minerals results in pH neutral drainage with excess alkalinity and low levels of dissolved metals or metalloids and*

									elevated levels of salinity derived from sulfate, calcium and magnesium. Salinity of tailings return water is between 1,600 and 5,000 mg/L and pH ranges between 5 and 9. *In addition contaminates will concentrate as the water is recirculated.* *Management controls in place by the Licence Holder include diversion of stormwater runoff from adjacent areas and adequate freeboard incorporated to accommodate the temporary storage of water on the facility during a 1 in 100 year average recurrence interval (ARI) 72 hour storm event with excess water removed from the facility via a weir during operation.* *There is adequate capacity in the TSF design to ensure that in extreme rainfall events, water accumulating on the TSF surface can be stored and/or safely removed from the facility, ensuring ongoing embankment integrity. Additional lined water storage facilities have been constructed to reduce water inputs to the TSF and ensure water ponding on the surface of the TSF is minimised. Water storage facilities are maintained and operated so that there is additional capacity for water storage in a rainfall event that exceeds the 1:100 year ARI.* *Current Licence conditions also require:* • *Maintaining a minimum top of embankment freeboard of 300 mm*

									*The Delegated Officer therefore considers that impacts from overtopping will be **minor** as the discharge would occur onsite (so offsite impacts would be minimal), and the likelihood of occurrence is **unlikely**. The risk rating for overtopping is therefore **medium**.*
		Waste: *Tailings releases due to pipeline leaks and spills*	*Nearby soils and vegetation*	*Direct discharge*	*Adverse impacts to the health and survival of nearby vegetation, with potential to gain access to nearby drainage lines*	*Minor*	*Unlikely*	*Medium*	*The tailings / decant water that would be discharged is likely to be contaminated with elevated TDS, sulfate, nickel, copper and cobalt.* *Management controls in place by the Licence Holder include containing the pipelines in an earthen bund that is cleared of vegetation with cameras located at the booster station for surveillance at the mill control room. The pipelines are inspected daily and fittled with an automatic shutdown system.* *Current Licence conditions also require:* • *pipelines containing tailings, decant water, dewater effluent and process water are either:* *(a) equipped with automatic cut-outs in the event of a pipe failure; or* *(b) provided with a secondary containment sufficient to contain any spill for a period equal to the time between routine inspections.* • *Tailings delivery pipelines and Tailings return water lines should be checked for visual integrity; and* • *Internal embankment freeboard of the TSF should be visually*

									checked to confirm required freeboard capacity is available. *The Delegated Officer considers that impacts from pipeline leaks/spills will be **minor** as the discharge would occur onsite (so offsite impacts would be minimal), and the likelihood of occurrence is **unlikely**. The risk rating for pipeline leaks/spills is therefore **medium**.*
	WSFs	***Waste:** Seepage water through the base of the WSFs*	*Groundwater with beneficial use (Groundwater Dependent Ecosystem) and surface water*	*Seepage through the base and embankments of the WSFs and soil to groundwater and surface water*	*Health and survival of vegetation dependent upon groundwater or cattle using the groundwater for drinking water*	*Minor*	*Possible*	*Medium*	*The WSF1 lining is engineered waste rock and clay and the embankment comprises a zoned earth and rockfill dam incorporating a low permeability 'clay' core and cut-off trench with competent rockfill on the upstream and downstream sides.* *Current Licence conditions also require:* • *WSF2 and WSF3 have a 1.5 mm HDPE liner to achieve a permeability of <10^{-9}m/s or equivalent.* *The Delegated Officer considers that impacts from pipeline leaks/spills will be **minor** as the discharge would occur onsite (so offsite impacts would be minimal), and the likelihood of occurrence is **possible**. The risk rating for seepage from WSFs is therefore **medium**.*
		***Waste:** Wastewater releases via overtopping of the WSFs*	*Nearby soils and vegetation*	*Direct discharge*	*Health and survival of vegetation, with potential to gain access to nearby drainage lines*	*Minor*	*Unlikely*	*Medium*	*The quality of the water that would be discharged is likely to be contaminated with elevated TDS, sulfate, nickel, copper and cobalt. In addition contaminates will concentrate as the water is recirculated.* *Management controls in place by the Licence Holder include diversion of stormwater runoff from adjacent areas*

									and adequate freeboard incorporated to accommodate the temporary storage of water in the facility during a 1 in 100 year average recurrence interval (ARI) 72 hour storm event with excess water removed from the facility via a weir during operation. *Current Licence conditions also require:* • *Maintaining a minimum top of embankment freeboard of 500 mm for WSF1, 300 mm for WSF2 and 300 mm for WSF3;* • *Overflow point E1 from WSF1 via spillway to mine creek, is listed on the Licence as an emission point;* • *Monitoring results for the discharge of overflow water from WSF1 during discharge events* *The conditions have been modified to include:* • *requirement to minimise the volume of water stored in the TSF and WSF1 by preferentially pumping water to and storing water within WSF2 and WSF3;* • *include volumes of water transferred to the TSF, WSF1, WSF2 and WSF3 and also TSF seepage recovered from the seepage recovery bores SMPB03 and SMPB12.* • *require the volumes of water transferred to the TSF; and WSF1, WSF2 and WSF3 and also TSF seepage recovered from the seepage recovery bores SMPB03 and SMPB12 to be reported in the Annual Environmental Report.*

									*The Delegated Officer therefore considers that impacts from overtopping will be **minor** as the discharge would occur onsite (so offsite impacts would be minimal), and the likelihood of occurrence is **unlikely**. The risk rating for overtopping is therefore **medium**.*
		Waste: *wastewater releases due to pipeline leaks and spills*	*Nearby soils and vegetation*	*Direct discharge*	*Adverse impacts to the health and survival of nearby vegetation, with potential to gain access to nearby drainage lines*	*Minor*	*Unlikely*	*Medium*	*The water that would be discharged is likely to be contaminated with elevated TDS, sulfate, nickel, copper and cobalt.* *Management controls in place by the Licence Holder include containing the pipelines in an earthen bund that is cleared of vegetation with cameras located at the booster station for surveillance at the mill control room. The pipelines are inspected daily.* *Current Licence conditions also require:* • *pipelines containing tailings, decant water, dewater effluent and process water are either:* *(a) equipped with automatic cut-outs in the event of a pipe failure; or* *(b) provided with a secondary containment sufficient to contain any spill for a period equal to the time between routine inspections.* • *Mine dewatering pipelines should be checked for visual integrity.* *The Delegated Officer considers that impacts from pipeline leaks/spills will be **minor** as the discharge would occur onsite (so offsite impacts would be minimal), and the likelihood of*

									*occurrence is **unlikely**. The risk rating for pipeline leaks/spills is therefore **medium**.*
Cat 54 *Sewage Facility*	*WWTP*	***Odour:*** *associated with effluent treatment and disposal*	*None*	*Air*	*Amenity*	*N/A*	*N/A*	*N/A*	*No receptor present – distance to residential receptors is too great (10km)*
		Waste: *Disposal of treated sewage effluent to spray field*	*Gum trees (*Corymbia dichromophloia *and* Eucalyptus brevifolia*).* Acacia smeringa *with scattered* Cajanus pubescens *and* Grevillea pyramidalis *(Caustic Bush).* *Spinifex (*Triodia basedowii*).*	*Direct discharge*	*Adverse impacts to the health and survival of vegetation in the irrigation area*	*Slight*	*Possible*	*Low*	*The loading rates for Total Nitrogen and Total Phosphorus are elevated when the WWTP is operating at 200 m^3/day with disposal to a 1.33 ha irrigation area.* *Hence, an improvement condition has been included during this assessment, to reduce the loading rates of Total Nitrogen and Phosphorus to soil and groundwater, through actions such as improving the treatment of the WWTP to reduce Total Nitrogen and Phosphorus concentrations and/or increase the size of the irrigation area.* *The following requirements are already on the Licence –* *The Licence Holder shall manage the irrigation of treated wastewater such that:* *(a) no irrigation generated run-off, spray drift or discharge occurs beyond the boundary of the defined irrigation area(s);* *(b) treated wastewater is evenly distributed over the irrigation area;* *(c) no soil erosion occurs;* *(d) irrigation does not occur on land that is waterlogged; and* *(e) vegetation cover is maintained over the irrigation areas* *The Delegated Officer therefore considers that impacts from the*

									*irrigation of treated effluent will be **slight** as the discharge occurs onsite (so offsite impacts are not expected), and the likelihood of occurrence is **possible**. The risk rating for irrigation of treated effluent is therefore **low**.*

1.1 Risk Assessment – Seepage from the TSF

1.1.1 General hazard characterisation and impact

The release of tailings water via seepage through the base and embankments of the TSF, which may cause contamination of the surrounding soils, groundwater and surface water. Tailings seepage may contain elevated levels of TDS, sulfate, nickel, copper and cobalt which have been identified as key environmental hazards.

1.1.2 Criteria for assessment

The relevant water quality guidelines include the ANZECC water quality guidelines for livestock watering, the 95% species protection level trigger values for freshwater (ANZECC, 2000), the NWQMS Australian Drinking Water Guidelines (NWQMS, 2011) and also site specific values based on observed data ranges.

1.1.3 Licence Holder controls

The Licence Holder controls for seepage from the TSF are outlined in Table 7 below.

Table 7: Licence Holder's controls for seepage from the TSF

Site infrastructure	Design Details	Operation
TSF	• Valley fill style impoundment located approximately 1 km north of the processing plant and immediately upstream of WSF1. It has a footprint of approximately 16 hectares; • Hazard rating of 'High' (Category 1) based on the classification criteria published in the DMIRS (1999) *Guidelines on the Safe Design and Operating Standards for Tailings Storage;* • The base of the TSF consists of fresh to weathered bedrock overlain by a clayey colluvium and alluvium sediment layer. The natural ground surface was prepared but not lined. The estimated hydraulic conductivity for the weathered fractured rock	• The Licence Holder has conducted baseline groundwater monitoring, which shows: ➢ pH near-neutral; ➢ TDS 500 – 600 mg/L; ➢ Sulfate 10 – 50 mg/L (except for the upper catchment of Mine Creek where the concentration of sulfate in groundwater upstream and up-gradient of mining activity is up to 310 mg/L); ➢ Nickel <0.01mg/L – 0.03 mg/L; and ➢ Concentrations of other metals and metalloids including arsenic, cadmium, chromium, copper, lead and selenium are all low when compared to ANZECC guidelines. • Operated in the conventional manner, with tailings deposition cycled around the facility to maximise tailings consolidation and density, and resulting storage volume and geotechnical stability. Tailings are thickened prior to deposition, and deposited sub-aerially at an average density of 65%. Liberated water is collected and continually removed from the tailings via central pumped decant; • The presence of magnesium silicate minerals in the tailings results in pH neutral drainage with excess alkalinity and low levels of dissolved metals or metalloids and elevated levels of salinity derived from sulfate, calcium and magnesium. Salinity of tailings return water is between 1,600 and 5,000 mg/L and pH ranges between 5 and 9; • Water inputs to the TSF have been significantly reduced through operational measures on site thereby reducing the hydraulic head of the facility and the subsequent volume of seepage reporting to groundwater. Seepage is recovered into WSF1 and then pumped into WSF2 and WSF3 to be used within the processing water circuit;

<table>
<tr><th>Site infrastructure</th><th>Design Details</th><th>Operation</th></tr>
<tr><td></td><td>beneath the TSF is 0.4 to 2.5 metres per day (m/day) (10^{-6} – 10^{-5} m/sec) and the estimated conductivity for the clayey alluvium (colluvium) layer at the surface of pre-mining valley of TSF is 0.01 m/day (10^{-7} m/sec). Water pressure testing conducted in 2002 resulted in an overall estimate of permeability of 10^{-5} m/sec in the foundations of the TSF;
• WSF1, WSF2 and WSF3;
• A diversion embankment has also been constructed upstream of WSF1 to reduce inflows of uncontaminated stormwater and reduce the volume of water stored within the impoundment;
• Decant pond is located centrally within Cell 2 to reduce saturation of the facility and minimise the build-up of free-standing water adjacent to embankments, consistent with DMIRS (1999) Guidelines for TSFs and will enhance the structural integrity of the facility;
• The discharge of seepage water to groundwater and surface water has been modelled. Groundwater with elevated solute concentrations will continue to discharge</td><td>• A series of seepage collection sumps and seepage recovery bores have been constructed within Mine Creek and are operated continuously during operations to capture seepage along this primary flow path;
• Two seepage recovery bores are operational:
➢ SMPB03; and
➢ SMPB12
• Engaged a specialist hydrogeological consultant to conduct periodic reviews of monitoring data and update the groundwater model;
• Groundwater Operating Strategy (GWOS));
• Water Balance Review and Assessment;
• Groundwater seepage and solute transport hydrogeological modelling has also been undertaken for the project, which has demonstrated that the seepage of sulfate and other contaminants can be minimised through ongoing management measures;
• The Licence Holder has a monitoring program in the Savannah Nickel Project Operating Strategy including trigger levels to detect any impacts to water quality. These include:
➢ Groundwater quality triggers for monitoring bores within the mining area. These are derived from the water quality guidelines for livestock watering, the 95% species protection level trigger values for freshwater (ANZECC, 2000) and site specific values.
<table><tr><th>Parameter</th><th>Units</th><th>Trigger Level</th></tr><tr><td>pH</td><td>pH units</td><td>6.5–8.5*</td></tr><tr><td>Electrical Conductivity, EC</td><td>mS/cm</td><td>5.0**</td></tr><tr><td>Total Dissolved Solids, TDS</td><td>mg/L</td><td>4,000*</td></tr><tr><td>Cobalt, Co</td><td>mg/L</td><td>1.0*</td></tr><tr><td>Copper, Cu</td><td>mg/L</td><td>2.0</td></tr><tr><td>Arsenic, As</td><td>mg/L</td><td>0.5*</td></tr><tr><td>Manganese, Mn</td><td>mg/L</td><td>20**</td></tr><tr><td>Nickel, Ni</td><td>mg/L</td><td>3**</td></tr><tr><td>Sulphate, SO4</td><td>mg/L</td><td>4,000**</td></tr><tr><td>Cadmium, Cd</td><td>µg/L</td><td>N/A</td></tr><tr><td>Selenium, Se</td><td>mg/L</td><td>0.02*</td></tr><tr><td>Mercury, Hg</td><td>µg/L</td><td>N/A</td></tr><tr><td>Silver, Ag</td><td>µg/L</td><td>N/A</td></tr></table>
Note:
NA: background data not available
* Trigger levels are based on ANZECC 2000 Livestock Water Guidelines
** Trigger levels are based on observed data ranges
➢ Groundwater quality triggers for Production Bores located in the Fletcher Creek and Stoney Creek borefields. These are located further from the mining operations. These are derived from the water quality guidelines for livestock watering, the 95% species protection level trigger values for freshwater (ANZECC, 2000), with the exception of copper.</td></tr>
</table>

Site infrastructure	Design Details	Operation
	to Mine Creek and Fletcher Creek during and shortly after the wet seasons due to seasonal rise in the water table. Elevated solute concentrations in groundwater will occur as a plume that extends primarily between the TSF and Fletcher Creek; and • There are no identified sensitive groundwater receptors that will be impacted by elevated solute concentrations from tailings seepage. The only beneficial groundwater use in vicinity of the Savannah Project is livestock drinking water. With the exception of sulfate, all solute concentrations are below the corresponding ANZECC (2000) guideline values for livestock. The nearest groundwater feed stock watering point is located approximately 6 km from the Project and will not be impacted by seepage.	<table><tr><th>Parameter</th><th>Units</th><th>Trigger Level</th></tr><tr><td>pH</td><td>pH units</td><td>6.5–8.5*</td></tr><tr><td>Electrical Conductivity, EC</td><td>mS/cm</td><td>1.5</td></tr><tr><td>Total Dissolved Solids, TDS</td><td>mg/L</td><td>4,000*</td></tr><tr><td>Aluminium, Al</td><td>mg/L</td><td>5.0*</td></tr><tr><td>Ammonia, NH_3</td><td>mg/L</td><td>2.5</td></tr><tr><td>Cobalt, Co</td><td>mg/L</td><td>1.0*</td></tr><tr><td>Copper, Cu</td><td>mg/L</td><td>1.0*</td></tr><tr><td>Iron, Fe</td><td>mg/L</td><td>0.3**</td></tr><tr><td>Arsenic, As</td><td>mg/L</td><td>0.01**</td></tr><tr><td>Manganese, Mn</td><td>mg/L</td><td>0.1**</td></tr><tr><td>Nickel, Ni</td><td>mg/L</td><td>0.05</td></tr><tr><td>Sulphate, SO_4</td><td>mg/L</td><td>500**</td></tr><tr><td>Lead, Pb</td><td>mg/L</td><td>0.1*</td></tr><tr><td>Hexavalent Chromium, Cr (VI)</td><td>mg/L</td><td>0.05**</td></tr><tr><td>Cadmium, Cd</td><td>µg/L</td><td>N/A</td></tr><tr><td>Selenium, Se</td><td>mg/L</td><td>0.01**</td></tr><tr><td>Mercury, Hg</td><td>µg/L</td><td>N/A</td></tr><tr><td>Silver, Ag</td><td>mg/L</td><td>0.02</td></tr></table> Note: NA: background data not available * Trigger levels are based on ANZECC 2000 Livestock Water Guidelines ** Trigger levels are based on NHMRC 2011 Drinking Water Guidelines <table><tr><th>Monitoring Location</th><th>Limit Sulphate Concentration (mg/L)</th><th>Target Sulphate Concentration (mg/L)</th><th>Target Nickel Concentration (mg/L)</th><th>Target Copper Concentration (mg/L)</th><th>Target Colbat Concentration (mg/L)</th></tr><tr><td>Mine Creek Surface Water</td><td>5000[a]</td><td>1800[b]</td><td>1.0[c]</td><td>1.0[c]</td><td>1.0[c]</td></tr><tr><td>Fletcher Creel Surface Water</td><td>700[d]</td><td>350[e]</td><td>0.067[f]</td><td>0.0014[g]</td><td>0.003[h]</td></tr></table> Note: [a] Mine Creek sulphate limit is nominally double the modelled maximum concentration (URS 2012) [b] Mine Creek sulphate target is site-specific trigger value (WRM, 2012) [c] Mine Creek nickel, copper and cobalt targets are the livestock value (ANZECC, 2000) [d] Fletcher Creek sulphate limit is nominally double the site-specific trigger value (ERISS, 2009) [e] Fletcher Creek sulphate target is the site-specific trigger value (ERISS, 2009) [f] Fletcher Creek nickel target is the aquatic ecosystems 95% species protection level- hardness corrected (ANZECC, 2000) [g] Fletcher Creek copper target is the aquatic ecosystems 95% species protection level – not hardness corrected (ANZECC, 2000) as per ERISS 2009 [h] Fletcher Creek cobalt target is the site-specific trigger value (ERISS, 2009) • The target value for copper in the table above, is replaced by the value of 0.0062 mg/L (the 90th percentile for background data received), as a site specific value based on data received onsite. The Savannah Nickel Project Operating Strategy is the process of being reviewed to modify this. • Contingency actions to prevent further impacts, are implemented when a trigger value is exceeded. Trigger are concentrations that, if exceeded, would indicate a potential environmental problem and so trigger a management response, such as further investigations, duplicate sampling and/or subsequent refinement of the guidelines according to local conditions". These include: ➢ Taking a duplicate analysis; ➢ Investigation to determine probable cause of the change in water quality; and ➢ Appropriate management and reporting actions conducted.

Key findings

The Delegated Officer has reviewed the information regarding the risk of seepage from the TSF and has found:

1. Water inputs to the TSF have been significantly reduced through operational measures and seepage is recovered into WSF1, then pumped to WSF2 and WSF3 to be used in the processing water circuit. Therefore, the hydraulic head of the facility is reduced and the subsequent volume of seepage reporting to groundwater is reduced.
2. A series of seepage collection sumps and seepage recovery bores have been constructed within Mine Creek and are operated continuously during operations to capture seepage along this primary flow path.
3. The Licence Holder has a monitoring program including trigger levels to detect any impacts to water quality and contingency actions to prevent further impacts.
4. There are no nearby receptors but groundwater has been determined to be good quality.

1.1.4 Consequence

Based on the information detailed above and distance to the nearest sensitive receptors and seepage recovery methods in place, the Delegated Officer has determined that the impact of seepage from the TSF will result in low level on-site impacts. Therefore, the Delegated Officer considers the consequence to be **minor**.

1.1.5 Likelihood of consequence

Based upon the seepage recovery methods in place and the distance to the nearest groundwater feed stock watering point is located approximately 6 km, the Delegated Officer has determined that the likelihood of an environmental impact from TSF seepage will not occur in most circumstances. However, as the groundwater is relatively shallow (1 – 17 mbgl in the vicinity of the TSF) and seepage is occurring, the Delegated Officer considers the consequence to be **likely**.

1.1.6 Overall rating

The Delegated Officer has compared the consequence and likelihood ratings described above for the Risk Criteria (Table 7) and determined that the overall rating for the risk of TSF seepage on sensitive receptors during operation is **medium**.

1.1.7 Licence conditions recommended to manage seepage from the TSF

Site Infrastructure	Management controls

TSF	Current Licence conditions require:
	• Quarterly monitoring of ambient groundwater monitoring bores:
	  ➢ SMMB1;
	  ➢ SMMB2;
	  ➢ SMMB3; and
	  ➢ PARPMB01.
	• Monitoring of any overflows from WSF1 via E1.
	
	New licence conditions require:
	• Addition of the requirement to minimise the volume of water stored in the TSF and WSF1 by preferentially pumping water to and storing water within WSF2 and WSF3;
	• Addition of the following parameters to groundwater and surface water monitoring:
	  ➢ Electrical Conductivity;
	  ➢ Total Recoverable Hydrocarbons;
	  ➢ Ammonia;
	  ➢ Arsenic;
	  ➢ Cadmium;
	  ➢ Calcium;
	  ➢ Chloride;
	  ➢ Chromium;
	  ➢ Iron;
	  ➢ Silicon;
	  ➢ Magnesium;
	  ➢ Mercury;
	  ➢ Nitrate;
	  ➢ Potassium;
	  ➢ Silver; and
	  ➢ Sodium.
	• Addition of groundwater monitoring of production bores SMPB01, SMPB02, SMPB10 and SMPB11 in the Fletcher Creek and Stoney Creek borefields.
	• Addition of triggers and limits to the mine area and Fletcher Creek, Stoney Creek and Mine Creek groundwater and surface water monitoring sites from the Savannah Nickel Project Operating Strategy that are in line with the water quality guidelines for livestock watering and the 95% species protection level trigger values for freshwater (ANZECC, 2000) and also the NWQMS Australian Drinking Water Guidelines (NWQMS, 2011);
	• Addition of recording volumes of water pumped to the TSF, WSF1, WSF2, and WSF3 each calendar month and calculate a monthly site water balance to be reported in the AER; and
	• Addition of recording volumes of tailings seepage extracted from the seepage recovery bores SMPB03 and SMPB12.

Decision

The Delegated Officer has determined that this amendment is partially for an administrative matter as the previous production and design capacities have already been assessed and are to be reinstated following a period of care and maintenance.

However, an improvement condition has been included for the WWTP, the TSF reoperation has required a detailed risk assessment, and the licence has been updated with licence conditions reflective of risk:

The definition of Annual period has been updated.

The capacities of each relevant category have been increased in the Prescribed premises category on page 1. Category 6 has been removed.

Condition 1.2.2, Table 1.2.1 has been amended to include the increased capacities.

Condition 1.2.4, Table 1.2.3 has been amended to include the requirement to minimise the volume of water stored in the TSF and WSF1 by preferentially pumping water to and storing water within WSF2 and WSF3.

Condition 1.2.8, Table 1.2.5 has been amended to include the increased capacities.

Condition 3.4.1, Table 3.4.1 has been amended to include volumes of water transferred to the TSF, WSF1, WSF2 and WSF3 and also TSF seepage recovered from the seepage recovery bores SMPB03 and SMPB12.

Condition 3.5.1, Table 3.5.1 has been amended to include production bores in the Fletcher and Stoney Creek borefields SMPB02 and SMPB10. Additional parameters added include; Electrical Conductivity, Total Recoverable Hydrocarbons, Ammonia, Arsenic, Cadmium, Calcium, Chloride, Chromium, Iron, Silicon, Magnesium, Mercury, Nitrate, Potassium, Silver and Sodium. Triggers and limits have been added to the production groundwater monitoring bores and mine area groundwater monitoring bores and surface water monitoring at Mine Creek and Fletcher Creek.

Condition 4.2.1, Table 4.2.1 has been amended to require the volumes of water transferred to the TSF, WSF1, WSF2 and WSF3 and also TSF seepage recovered from the seepage recovery bores SMPB03 and SMPB12 to be reported in the Annual Environmental Report.

Condition 4.3.1, Table 4.3.1 has been amended to include an improvement plan for the WWTP irrigation area and triggers along with limits.

The Reporting form AGWQ1 (annual groundwater quality) has been changed to AWQ1 (annual water quality) and has been updated to include surface water quality monitoring, all parameters and trigger levels and limits.

It should be noted that this licence has previously been highlighted as in need of review. Once this project has commenced operations and groundwater monitoring data required via the licence is available during operations, this should be referred to Contaminated Sites Branch for reassessment.

Licence Holder's comments

The Licence Holder was provided with the draft Amendment Notice on 26 November 2018. Correspondence was received from the Licence Holder on 10 December 2018. Comments were provided and are documented in Appendix 2.

Amendment

1. Definitions 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:

‘Annual period’ means the inclusive period from 1 July – ~~31~~ **30** June in the same year

2. The Prescribed premises category table on page 1 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

Category number	Category description	Category production or design capacity	Approved Premises production or design capacity
5	Processing or beneficiation of metallic or non-metallic ore	50,000 tonnes or more per year	~~50,000~~ **950,000** tonnes per annual period
~~6~~	~~Mine dewatering~~	~~50,000 tonnes or more per year~~	~~100,000 tonnes per annual period~~
54	Sewage facility	100 cubic metres or more per day	200 cubic metres or more per day
64	Class II putrescible landfill site	20 tonnes or more per year	~~5,000~~ **10,000** tonnes per annual period

3. Condition 1.2.2, Table 1.2.1 of the Licence is amended by the by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

1.2.2 The Licensee shall ensure that where waste produced on the Premises are not taken off-site for lawful use or disposal, they are managed according to the requirements in Table 1.2.1.

Table 1.2.1: Management of Waste			
Facility as depicted in Schedule 1	**Waste type**	**Management Strategy**	**Requirements[1]**
Waste Water Treatment Plant	Sewage	Biological and physical treatment	Treatment of sewage waste shall be at or below the treatment capacity of 200 m^3/day.
Landfill	Clean fill Inert Waste Type 1 Inert Waste Type 2 Putrescible waste Contaminated Solid Waste Special Waste Type 1 (Asbestos) Special Waste Type 2 (Biomedical and Clinical Waste)	Handling, storage prior to or disposal of waste by landfilling	All waste types No more than ~~5,000~~ **10,000** tonnes per annual period of all waste types cumulatively shall be disposed of by landfilling. Disposal of waste (except tyres) by landfilling shall only take place within the Landfill area shown on the Premises map in Schedule 1. Place waste within a defined trench or within an area enclosed by earthen or other bunds. Restrict the tipping area to a maximum linear length of 30 m. The separation distance between the base of the landfill and the highest groundwater level shall not be less than 3 m. Must meet the acceptance criteria for a Class II landfill.

			<u>Special Waste Type 1 (Asbestos)</u> Only to be disposed of into a designated asbestos disposal area within the landfill. Not to be deposited within 2 m of the final tipping surface of the landfill. No works shall be carried out on the landfill that could lead to a release of asbestos fibres. <u>Special Waste Type 2 (Biomedical and Clinical Waste)</u> Only to be disposed of into a designated biomedical waste disposal area within the landfill. Not to be deposited within 2 m of the final tipping surface of the landfill. No works shall be carried out on the landfill that could lead to biomedical wastes being excavated or uncovered.
North and South Waste rock dumps	Inert Waste Type 2 (Tyres only)	Handling and disposal by landfilling	<u>Inert Waste Type 2 (Tyres)</u>[2] No more than 70 tonnes of tyres per annual period shall be disposed of by landfilling. Tyres shall only be landfilled within the North waste rock dump and South waste rock dump as shown on the Premises map in Schedule 1. The location of where tyres are buried will be surveyed and latitude and longitude recorded.
TSF1	Tailings	Containment in TSF or directed to paste plant	Disposal of tailings shall only take place within TSF1 as shown on the Premises map in Schedule 1.

Note 1: Additional requirements for the acceptance and landfilling of controlled waste (including asbestos and tyres) are set out in the *Environmental Protection (Controlled Waste) Regulations 2004.*
Note 2: Requirements for landfilling tyres are set out in Part 6 of the *Environmental Protection Regulations 1987*.

4. Condition 1.2.4, Table 1.2.3 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

1.2.4 The Licensee shall ensure that tailings, decant water, dewater effluent and process water are only discharged into containment cells and/or a water storage facility with the relevant infrastructure requirements and at the locations specified in Table 1.2.3 and identified in Schedule 1.

Table 1.2.3: Containment infrastructure			
Containment point reference	**Vessel or compound**	**Material**	**Requirements**
TSF1	TSF1	Tailings	Maintain a minimum top of embankment freeboard of 300 mm **Minimise the volume of water stored by preferentially pumping decant water to the Process Water Dam (PWD) for reuse in processing**
	Paste Plant	Tailings	Tailings from Paste Plant to report to Underground operations.
WSF1	WSF1	Seepage water from TSF1	Maintain a minimum top of embankment freeboard of 500 mm **Minimise the volume of water stored by preferentially pumping water to and storing water within WSF2 and WSF3**
WSF2	WSF2	Bore field water	1.5 mm HDPE liner to achieve a permeability of $<10^{-9}$m/s or equivalent. Maintain a minimum top of embankment freeboard of 300 mm in the process area run-off pond.
WSF3	WSF3	Bore field water	1.5 mm HDPE liner to achieve a permeability of $<10^{-9}$m/s or equivalent. Maintain a minimum top of embankment freeboard of 300 mm.
P1	Process area run-off water pond	Process water and stormwater from process plant	1.5 mm HDPE liner to achieve a permeability of $<10^{-9}$m/s or equivalent. Maintain a minimum top of embankment freeboard of 300 mm.

5. Condition 1.2.8, Table 1.2.5 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

1.2.8 The Licensee shall ensure the limits specified in Table 1.2.5 are not exceeded.

Table 1.2.5: Production or design capacity limits		
Category[1]	**Category description[1]**	**Premises production or design capacity limit**
5	Processing or beneficiation of metallic or non-metallic ore	~~50,000~~ **950,000** tonnes per annual period
~~6~~	~~Mine dewatering~~	~~100,000 tonnes per annual period~~

Note 1: *Environmental Protection Regulations 1987,* Schedule 1.

6. Condition 3.4.1, Table 3.4.1 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

3.4.1 The Licensee shall undertake the monitoring in Table 3.4.1 according to the specifications in that table.

Table 3.4.1: Monitoring of inputs and outputs					
Input/output	**Monitoring point reference**	**Parameter**	**Units**	**Averaging period**	**Frequency**
Treated wastewater discharge to irrigation areas	L2 – Flow meter devices on outgoing pipelines	Volumetric flow rate (cumulative)	m^3/day	Daily	Continuous
Waste Inputs	Landfill	Clean fill, Inert Waste Type 1, Inert Waste Type 2, Putrescible waste, Contaminated Solid Waste, Special Waste Type 1, Special Waste Type 2	m^3	N/A	Monthly
	North and South Waste Rock Dumps	Inert Waste Type 2 (tyres)			
Water	**TSF WSF1 WSF2 WSF3**	**Volumetric flow rate (cumulative)**	**m^3/day**	**Monthly**	**Continuous**
TSF seepage	**Seepage recovery bores: SMPB03 SMPB12**	**Volume**	**m^3/day**	**Daily**	**Continuous**

7. Condition 3.5.1, Table 3.5.1 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

3.5.1 The Licensee shall undertake the monitoring in Table 3.5.1 according to the specifications in that table.

Table 3.5.1: Monitoring of ambient groundwater and surface water quality						
Monitoring point reference and location as specified on Map in schedule 1.	**Parameter**	**Trigger**	**Limit**	**Units**	**Averaging period**	**Frequency**
Groundwater monitoring bores: SMMB1 SMMB2 SMMB3 PARPMB01	Standing Water Level	**-**	**-**	m(AHD)	Spot sample	Quarterly
	pH[1]	**6.5-8.5**	**-**	**pH units**		
	Electrical Conductivity	**5,000**	**-**	**µS/cm**		
	Total Dissolved Solids	4,000	**-**	mg/L		

	Total Recoverable Hydrocarbons	-	-			
	Aluminium	5	-			
	Ammonia	2.5	-			
	Arsenic	0.5	-			
	Cadmium	0.01	-			
	Calcium	-	-			
	Chloride	-	-			
	Chromium	0.05	-			
	Cobalt	1	-			
	Copper	2	-			
	Iron	0.3	-			
	Lead	0.1	-			
	Magnesium	-	-			
	Manganese	20	-			
	Mercury	0.002	-			
	Nickel	3	-			
	Nitrate	-	-			
	Potassium	-	-			
	Selenium	0.02	-			
	Silicon	-	-			
	Silver	0.02	-			
	Sodium	-	-			
	Sulfate	4,000	-			
	Zinc	20	-			
Production bores: SMPB02 SMPB10	**Standing Water Level**	-	-	m(AHD)	**Spot sample**	**Quarterly**
	pH[1]	6.5-8.5	-	pH units		
	Electrical Conductivity	1,500	-	µS/cm		
	Total Dissolved Solids	4,000	-	mg/L		
	Total Recoverable Hydrocarbons	-	-			
	Aluminium	5	-			
	Ammonia	2.5	-			
	Arsenic	0.01	-			
	Cadmium	0.01	-			
	Calcium	-	-			
	Chloride	-	-			
	Chromium	0.05	-			
	Cobalt	1	-			
	Copper	1	-			
	Iron	0.3	-			
	Lead	0.1	-			
	Magnesium	-	-			
	Manganese	0.1	-			
	Mercury	0.002	-			
	Nickel	0.05	-			
	Nitrate	-	-			
	Potassium	-	-			
	Selenium	0.01	-			
	Silicon	-	-			
	Silver	0.02	-			
	Sodium	-	-			

	Sulfate	**500**	**-**			
	Zinc	**20**	**-**			
Surface water monitoring points: WSF1 Seepage Spillway 1 Spillway 2	pH[1]	**-**	**-**	**pH units**	Spot sample	Quarterly
	Electrical Conductivity	**-**	**-**	**µS/cm**		
	Total Dissolved Solids	**-**	**-**	mg/L		
	Total Recoverable Hydrocarbons	**-**	**15**			
	Aluminium	**-**	**-**			
	Ammonia					
	Arsenic	**-**	**-**			
	Cadmium	**-**	**-**			
	Calcium	**-**	**-**			
	Chloride					
	Chromium	**-**	**-**			
	Cobalt	**-**	**-**			
	Copper	**-**	**-**			
	Iron	**-**	**-**			
	Lead	**-**	**-**			
	Magnesium	**-**	**-**			
	Manganese	**-**	**-**			
	Mercury	**-**	**-**			
	Nickel	**-**	**-**			
	Nitrate	**-**	**-**			
	Potassium	**-**	**-**			
	Selenium	**-**	**-**			
	Silicon	**-**	**-**			
	Silver	**-**	**-**			
	Sodium	**-**	**-**			
	Sulfate	**-**	**-**			
	Zinc	**-**	**-**			
Surface water monitoring point: Mine Creek @ HWY	pH[1]	**-**	**-**	**pH units**	Spot sample	Quarterly
	Electrical Conductivity	**-**	**-**	**µS/cm**		
	Total Dissolved Solids	**-**	**-**	mg/L		
	Total Recoverable Hydrocarbons	**-**	**15**			
	Aluminium	**-**	**-**			
	Ammonia					
	Arsenic	**-**	**-**			
	Cadmium	**-**	**-**			
	Calcium	**-**	**-**			
	Chloride	**-**	**-**			
	Chromium	**-**	**-**			
	Cobalt	**1**	**-**			
	Copper	**1**	**-**			
	Iron	**-**	**-**			
	Lead	**-**	**-**			
	Magnesium	**-**	**-**			
	Manganese	**-**	**-**			
	Mercury	**-**	**-**			
	Nickel	**1**	**-**			
	Nitrate	**-**	**-**			
	Potassium	**-**	**-**			

	Selenium	-	-			
	Silicon	-	-			
	Silver	-	-			
	Sodium	-	-			
	Sulfate	**1,800**	**5,000**			
	Zinc	-	-			
Surface water monitoring points: FCNCP (Fletchers Creek Northern Control Point) FCSCP2 (Fletchers Creek Southern Control Point 2)	pH[1]			pH units	Spot sample	Quarterly
	Electrical Conductivity	-	-	**µS/cm**		
	Total Dissolved Solids	-	-	mg/L		
	Total Recoverable Hydrocarbons	-	**15**			
	Aluminium	-	-			
	Ammonia					
	Arsenic	-	-			
	Cadmium	-	-			
	Calcium	-	-			
	Chloride	-	-			
	Chromium	-	-			
	Cobalt	**0.003**	-			
	Copper	**0.0062**	-			
	Iron	-	-			
	Lead	-	-			
	Magnesium	-	-			
	Manganese	-	-			
	Mercury	-	-			
	Nickel	**0.067**	-			
	Nitrate	-	-			
	Potassium	-	-			
	Selenium	-	-			
	Silicon	-	-			
	Silver	-	-			
	Sodium	-	-			
	Sulfate	**350**	**700**			
	Zinc	-	-			

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

8. Condition 4.2.1, Table 4.2.1 of the Licence is amended by the by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

4.2.1 The Licensee shall submit to the CEO an Annual Environmental Report within 120 calendar days after the end of the annual period. The report shall contain the information listed in Table 4.2.1 in the format or form specified in that table.

Table 4.2.1: Annual Environmental Report		
Condition or table (if relevant)	**Parameter**	**Format or form[1]**
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
-	Summary of surface water monitoring data as required by *Savannah Nickel Project Operating Strategy*, prepared by RPS Aquaterra Pty Ltd for Savannah Nickel Mines Pty Ltd, 20 November 2013	None specified

Table 3.2.1	Monitoring results for the discharge of overflow water from WSF1 during discharge events	None specified
Table 3.3.1	Total Recoverable Hydrocarbons	LR1
	Monitoring results for the wastewater treatment plant with a comparison against the NWQMS Australian Guidelines for Sewerage Systems, Effluent Management, 1997	None specified
Table 3.4.1	Cumulative volumes to irrigation area**,** ~~and~~ waste inputs**, water and TSF seepage**	None specified
Table 3.5.1	Groundwater bore monitoring results – pH, **Electrical Conductivity**, Total Dissolved Solids, Total Recoverable Hydrocarbons, Aluminium, **Ammonia**, **Arsenic**, **Cadmium**, **Calcium**, Chloride, **Chromium**, Cobalt, Copper, **Iron**, **Lead**, **Magnesium**, Manganese, **Mercury**, Nickel, **Nitrate, Potassium**, Selenium, **Silicon**, **Silver**, **Sodium**, Sulfate and Zinc	A~~G~~WQ1
Table 3.5.1	Surface water monitoring results - **pH, Electrical Conductivity, Total Dissolved Solids, Total Recoverable Hydrocarbons, Aluminium, Ammonia, Arsenic, Cadmium, Calcium, Chloride, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Nitrate, Potassium, Selenium, Silicon, Silver, Sodium, Sulfate and Zinc**	AWQ1
Table 3.5.1	Breach of any trigger and/or limit specified in the Licence	None specified
4.1.2	Compliance	Annual Audit Compliance Report (AACR)
4.1.3	Complaints summary	None specified

Note 1: Forms are in Schedule 2

9. Condition 4.3.1, Table 4.3.1 of the Licence is amended by the by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

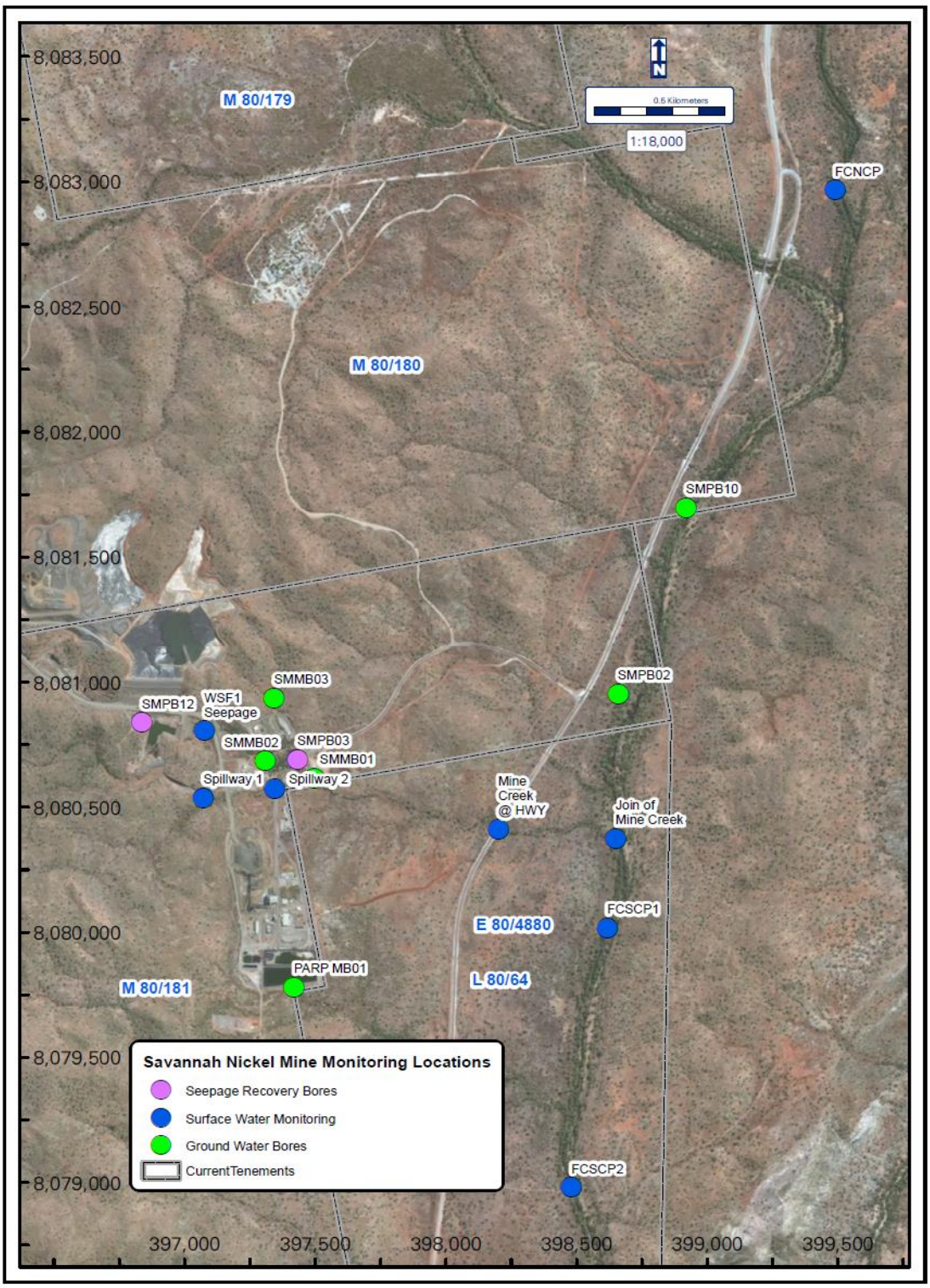
4.3.1 The Licensee shall ensure that the parameters listed in Table 4.3.1 are notified to the CEO in accordance with the notification requirements of the table.

Table 4.3.1: Notification requirements			
Condition or table (if relevant)	**Parameter**	**Notification requirement[1]**	**Format or form[2]**
-	***Total Nitrogen and Phosphorus***	***"Within 6 months of the issue of the amended Licence, the Licence Holder must provide to the CEO an improvement plan for the WWTP. The improvement plan must include measures to reduce the loading rates of Total Nitrogen and Phosphorus to soil and groundwater, through actions such as improving the treatment of the WWTP to reduce Total Nitrogen and Phosphorus concentrations and/or increasing the size of the irrigation area."***	***None specified***
-	Recommencing start-up of operations (after a period of care and maintenance)	At least 90 days prior to recommencing production	None specified
1.3.1 ~~and~~ 2.1.1 **3.5.1**	Breach of any limit specified in the Licence	Part A: As soon as practicable but no later than 5pm of the next usual working day. Part B: As soon as practicable	N1
3.1.4	Calibration report	As soon as practicable	None specified

Note 1: Notification requirements in the Licence shall not negate the requirement to comply with s72 of the Act
Note 2: Forms are in Schedule 2

10. Map of seepage recovery bores as per Table 3.4.1 is included on the Licence:

The locations of the monitoring points defined in Table 3.4.1 and Table 3.5.1 are shown below. These replace the maps on page 20 and 21 of the Issued Licence.



11. Reporting form AGWQ1 is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

Licence: L7967/2003/6 Licensee: Savannah Nickel Mines Pty Ltd
Form: AGWQ1 Period:
Name: Monitoring of ambient groundwater quality

Form AGWQ1: Monitoring of ambient groundwater quality							
Emission point	**Parameter**	**Trigger**	**Limit**	**Result**	**Averaging period**	**Method**	**Sample date & times**
Groundwater monitoring bores: SMMB1 SMMB2 SMMB3 PARPMB01	Standing Water Level	**-**	**-**	m(AHD)	Spot sample		
	pH[1]	**6.5-8.5**	**-**	**pH units**	Spot sample		
	Electrical Conductivity	**5,000**	**-**	**µS/cm**	Spot sample		
	Total Dissolved Solids	4,000	**-**	mg/L	Spot sample		
	Total Recoverable Hydrocarbons	**-**	**-**	mg/L	Spot sample		
	Aluminium	**5**	**-**	mg/L	Spot sample		
	Ammonia	**2.5**	**-**	**mg/L**	**Spot sample**		
	Arsenic	**0.5**	**-**	**mg/L**	**Spot sample**		
	Cadmium	**0.01**	**-**	**mg/L**	**Spot sample**		
	Calcium	**-**	**-**	**mg/L**	**Spot sample**		
	Chloride	**-**	**-**	mg/L	Spot sample		
	Chromium	**0.05**	**-**	**mg/L**	**Spot sample**		
	Cobalt	**1**	**-**	mg/L	Spot sample		
	Copper	**2**	**-**	mg/L	Spot sample		
	Iron	**0.3**	**-**	**mg/L**	**Spot sample**		
	Lead	**0.1**	**-**	**mg/L**	**Spot sample**		
	Magnesium	**-**	**-**	**mg/L**	**Spot sample**		

	Manganese	**20**	**-**	mg/L	Spot sample		
	Mercury	**0.002**	**-**	**mg/L**	**Spot sample**		
	Nickel	**3**	**-**	mg/L	Spot sample		
	Nitrate	**-**	**-**	**mg/L**	**Spot sample**		
	Potassium	**-**	**-**	mg/L	Spot sample		
	Selenium	**0.02**	**-**	mg/L	Spot sample		
	Silicon	**-**	**-**	**mg/L**	**Spot sample**		
	Silver	**0.02**	**-**	**mg/L**	**Spot sample**		
	Sodium	**-**	**-**	**mg/L**	**Spot sample**		
	Sulfate	**4,000**	**-**	mg/L	Spot sample		
	Zinc	**20**	**-**	mg/L	Spot sample		
Production bores: SMPB02 SMPB10	**Standing Water Level**	**-**	**-**	**m(AHD)**	**Spot sample**		
	pH[1]	**6.5-8.5**	**-**	**pH units**	**Spot sample**		
	Electrical Conductivity	**1,500**	**-**	**µS/cm**	**Spot sample**		
	Total Dissolved Solids	**4,000**	**-**	**mg/L**	**Spot sample**		
	Total Recoverable Hydrocarbons	**-**	**-**	**mg/L**	**Spot sample**		
	Aluminium	**5**	**-**	**mg/L**	**Spot sample**		
	Ammonia	**2.5**	**-**	**mg/L**	**Spot sample**		
	Arsenic	**0.01**	**-**	**mg/L**	**Spot sample**		
	Cadmium	**0.01**	**-**	**mg/L**	**Spot sample**		
	Calcium	**-**	**-**	**mg/L**	**Spot sample**		
	Chloride	**-**	**-**	**mg/L**	**Spot sample**		
	Chromium	**0.05**	**-**	**mg/L**	**Spot sample**		
	Cobalt	**1**	**-**	**mg/L**	**Spot sample**		

	Copper	**1**	**-**	**mg/L**	**Spot sample**		
	Iron	**0.3**	**-**	**mg/L**	**Spot sample**		
	Lead	**0.1**	**-**	**mg/L**	**Spot sample**		
	Magnesium	**-**	**-**	**mg/L**	**Spot sample**		
	Manganese	**0.1**	**-**	**mg/L**	**Spot sample**		
	Mercury	**0.002**	**-**	**mg/L**	**Spot sample**		
	Nickel	**0.05**	**-**	**mg/L**	**Spot sample**		
	Nitrate	**-**	**-**	**mg/L**	**Spot sample**		
	Potassium	**-**	**-**	**mg/L**	**Spot sample**		
	Selenium	**0.01**	**-**	**mg/L**	**Spot sample**		
	Silicon	**-**	**-**	**mg/L**	**Spot sample**		
	Silver	**0.02**	**-**	**mg/L**	**Spot sample**		
	Sodium	**-**	**-**	**mg/L**	**Spot sample**		
	Sulfate	**500**	**-**	**mg/L**	**Spot sample**		
	Zinc	**20**	**-**	**mg/L**	**Spot sample**		
Surface water monitoring points: **WSF1 Seepage** **Spillway 1** **Spillway 2**	pH[1]	**-**	**-**	**pH units**	**Spot sample**		
	Electrical Conductivity	**-**	**-**	**µS/cm**	**Spot sample**		
	Total Dissolved Solids	**-**	**-**	**mg/L**	**Spot sample**		
	Total Recoverable Hydrocarbons	**-**	**15**	**mg/L**	**Spot sample**		
	Aluminium	**-**	**-**	**mg/L**	**Spot sample**		
	Ammonia			**mg/L**	**Spot sample**		
	Arsenic	**-**	**-**	**mg/L**	**Spot sample**		
	Cadmium	**-**	**-**	**mg/L**	**Spot sample**		
	Calcium	**-**	**-**	**mg/L**	**Spot sample**		

	Chloride			**mg/L**	**Spot sample**		
	Chromium	**-**	**-**	**mg/L**	**Spot sample**		
	Cobalt	**-**	**-**	**mg/L**	**Spot sample**		
	Copper	**-**	**-**	**mg/L**	**Spot sample**		
	Iron	**-**	**-**	**mg/L**	**Spot sample**		
	Lead	**-**	**-**	**mg/L**	**Spot sample**		
	Magnesium	**-**	**-**	**mg/L**	**Spot sample**		
	Manganese	**-**	**-**	**mg/L**	**Spot sample**		
	Mercury	**-**	**-**	**mg/L**	**Spot sample**		
	Nickel	**-**	**-**	**mg/L**	**Spot sample**		
	Nitrate	**-**	**-**	**mg/L**	**Spot sample**		
	Potassium	**-**	**-**	**mg/L**	**Spot sample**		
	Selenium	**-**	**-**	**mg/L**	**Spot sample**		
	Silicon	**-**	**-**	**mg/L**	**Spot sample**		
	Silver	**-**	**-**	**mg/L**	**Spot sample**		
	Sodium	**-**	**-**	**mg/L**	**Spot sample**		
	Sulfate	**-**	**-**	**mg/L**	**Spot sample**		
	Zinc	**-**	**-**	**mg/L**	**Spot sample**		
Surface water monitoring point: **Mine Creek @ HWY**	pH[1]	**-**	**-**	**pH units**	**Spot sample**		
	Electrical Conductivity	**-**	**-**	**µS/cm**	**Spot sample**		
	Total Dissolved Solids	**-**	**-**	**mg/L**	**Spot sample**		
	Total Recoverable Hydrocarbons	**-**	**15**	**mg/L**	**Spot sample**		
	Aluminium	**-**	**-**	**mg/L**	**Spot sample**		
	Ammonia			**mg/L**	**Spot sample**		

	Arsenic	**-**	**-**	**mg/L**	**Spot sample**		
	Cadmium	**-**	**-**	**mg/L**	**Spot sample**		
	Calcium	**-**	**-**	**mg/L**	**Spot sample**		
	Chloride	**-**	**-**	**mg/L**	**Spot sample**		
	Chromium	**-**	**-**	**mg/L**	**Spot sample**		
	Cobalt	**1**	**-**	**mg/L**	**Spot sample**		
	Copper	**1**	**-**	**mg/L**	**Spot sample**		
	Iron	**-**	**-**	**mg/L**	**Spot sample**		
	Lead	**-**	**-**	**mg/L**	**Spot sample**		
	Magnesium	**-**	**-**	**mg/L**	**Spot sample**		
	Manganese	**-**	**-**	**mg/L**	**Spot sample**		
	Mercury	**-**	**-**	**mg/L**	**Spot sample**		
	Nickel	**1**	**-**	**mg/L**	**Spot sample**		
	Nitrate	**-**	**-**	**mg/L**	**Spot sample**		
	Potassium	**-**	**-**	**mg/L**	**Spot sample**		
	Selenium	**-**	**-**	**mg/L**	**Spot sample**		
	Silicon	**-**	**-**	**mg/L**	**Spot sample**		
	Silver	**-**	**-**	**mg/L**	**Spot sample**		
	Sodium	**-**	**-**	**mg/L**	**Spot sample**		
	Sulfate	**1,800**	**5,000**	**mg/L**	**Spot sample**		
	Zinc	**-**	**-**	**mg/L**	**Spot sample**		
Surface water monitoring points:	pH[1]			**pH units**	**Spot sample**		
	Electrical Conductivity	**-**	**-**	**µS/cm**	**Spot sample**		
	Total Dissolved Solids	**-**	**-**	**mg/L**	**Spot sample**		

FCNCP (Fletchers Creek Northern Control Point) **FCSCP2 (Fletchers Creek Southern Control Point 2)**	**Total Recoverable Hydrocarbons**	**-**	**15**	**mg/L**	**Spot sample**		
	Aluminium	**-**	**-**	**mg/L**	**Spot sample**		
	Ammonia			**mg/L**	**Spot sample**		
	Arsenic	**-**	**-**	**mg/L**	**Spot sample**		
	Cadmium	**-**	**-**	**mg/L**	**Spot sample**		
	Calcium	**-**	**-**	**mg/L**	**Spot sample**		
	Chloride	**-**	**-**	**mg/L**	**Spot sample**		
	Chromium	**-**	**-**	**mg/L**	**Spot sample**		
	Cobalt	**0.003**	**-**	**mg/L**	**Spot sample**		
	Copper	**0.0062**	**-**	**mg/L**	**Spot sample**		
	Iron	**-**	**-**	**mg/L**	**Spot sample**		
	Lead	**-**	**-**	**mg/L**	**Spot sample**		
	Magnesium	**-**	**-**	**mg/L**	**Spot sample**		
	Manganese	**-**	**-**	**mg/L**	**Spot sample**		
	Mercury	**-**	**-**	**mg/L**	**Spot sample**		
	Nickel	**0.067**	**-**	**mg/L**	**Spot sample**		
	Nitrate	**-**	**-**	**mg/L**	**Spot sample**		
	Potassium	**-**	**-**	**mg/L**	**Spot sample**		
	Selenium	**-**	**-**	**mg/L**	**Spot sample**		
	Silicon	**-**	**-**	**mg/L**	**Spot sample**		
	Silver	**-**	**-**	**mg/L**	**Spot sample**		
	Sodium	**-**	**-**	**mg/L**	**Spot sample**		
	Sulfate	**350**	**700**	**mg/L**	**Spot sample**		
	Zinc	**-**	**-**	**mg/L**	**Spot sample**		

Signed on behalf of Savannah Nickel Mines Pty Ltd: …….. Date: …….

12. Notification form N1 is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

Licence: L7967/2003/6 Licensee: Savannah Nickel Mines Pty Ltd
Form: N1 Date of breach:

Notification of detection of the breach of a limit.

These pages outline the information that the operator must provide.
Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission **triggers/**limits.

Part A

Licence Number	
Name of operator	
Location of Premises	
Time and date of the detection	

Notification requirements for the breach of a limit	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Part B

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident.	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission.	
The dates of any previous N1 notifications for the Premises in the preceding 24 months.	

Name	
Post	
Signature on behalf of Savannah Nickel Mines Pty Ltd	
Date	

Appendix 1: Key documents

	Document title	In text ref	Availability
1	Licence L7967/2003/6 – Savannah Project	L7967/2003/6	accessed at www.dwer.wa.gov.au
2	Works Approval W5208/2012/1	W5208/2012/1	full version accessible by contacting DWER amended version accessed at www.dwer.wa.gov.au
3	DER, November 2016. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	N/A	accessed at www.dwer.wa.gov.au
4	DER, November 2016. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	N/A	

Appendix 2: Summary of Licence Holder comments

The Licence Holder was provided with the draft Amendment Notice on 26 November 2018 for review and comment. The Licence Holder responded on 10 December 2018. The following comments were received on the draft Amendment Notice.

Condition	Summary of Licence Holder comment	DWER response
Amendment 4 - Condition 1.2.4, Table 1.2.3	TSF Requirements - Minimise the volume of water stored by preferentially ~~pumping excess water to and storing within WSF2 and WSF3~~ **pumping decant water to the Process Water Dam (PWD) for reuse in processing**. • Infrastructure is already in place to pump decant water to the PWD and allows for segregation of process water from relatively "clean" raw water stored in WSF2 and WSF3.	The condition has been modified as requested.
Amendment 6 - Condition 3.4.1, Table 3.4.1	Water – Volumetric ~~follow~~ **flow**	The condition has been modified as requested.
Amendment 7 - Condition 3.5.1, Table 3.5.1	Groundwater Monitoring Bores • Electrical Conductivity **5,000** (not 5) to reflect units being µS/cm	The condition has been modified as requested.
	Production Bores • **Remove SMPB01 & SMPB11 from condition – bores not in operation** ○ If bores are commissioned they will be sampled and reported in the SNM Groundwater Monitoring Summary as required by the SNM Operating Strategy. • Electrical Conductivity **1,500** (not 1.5) to reflect units being µS/cm	
	Surface water monitoring points • ~~WSF1 Wall base~~ **WSF1 Seepage** • ~~Box Cut Base 1~~ **Spillway 1**	

Condition	Summary of Licence Holder comment	DWER response

	• ~~Box Cut Base 2~~ **Spillway 2**
	• ~~Mine Creek~~ **Mine Creek @ HWY**
	• ~~Fletchers creek above~~ **FCNCP** (Fletchers Creek Northern Control Point)
	• ~~Fletchers creek below~~ **FCSCP2** (Fletchers Creep Southern Control Point 2)
	  ○ **Change names to align with monitoring points in SNM Operating Strategy**
	• Copper trigger ~~0.0014~~ **0.062**
	  ○ Baseline copper concentrations at fletchers creek northern control point regularly exceed the proposed ANZEC trigger value. AECOM have proposed a trigger value of 0.062 mg/L derived from the calculated 90th percentile value for observed background concentrations (see Table 4 – page 15 of attached AECOM Care and maintenance water Balance Review)	

Amendment 10 - Map of Seepage recovery Bores	DWER Licence Monitoring Locations provided which incorporates Groundwater bores, Production Bores, Surface Monitoring Sites listed in Table 3.5.1 and referred to in Condition 3.2.1 (E1).	The map has been modified as requested.
Amendment 11 – Form AGWQ1	Form AGWQ1 will require amendment to reflect requested changes to Amendment 7.	The form has been modified as requested.