



Decision Document

Environmental Protection Act 1986, Part V

Proponent: Sandfire Resources NL

Licence: L8558/2011/1

Registered office: Level 2, 31 Ventnor Ave
WEST PERTH WA 6005

ACN: 105 154 185

Premises address: DeGrussa Copper-Gold Project
Mining Tenement: M52/1046
MEEKATHARRA WA 6642

Issue date: Thursday, 20 December 2012

Commencement date: Monday, 24 December 2012

Expiry date: Saturday, 23 December 2017

Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER) has decided to issue an amended Licence. DER considers that in reaching this decision, it has taken into account all relevant considerations and legal requirements, and that the amended Licence and its conditions will ensure that an appropriate level of environmental protection is provided.

Decision Document prepared by: Paul Anderson
Licensing Officer

Decision Document authorised by: Alana Kidd
Manager Licensing



Contents

Decision Document	1
Contents	2
1 Purpose of this Document	2
2 Administrative summary	3
3 Executive summary of proposal and assessment	4
4 Decision table	6
5 Advertisement and consultation table	11
6 Risk Assessment	12
Appendix A	13

1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986*. Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.



2 Administrative summary

Administrative details													
Application type	Works Approval <input type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input checked="" type="checkbox"/> Works Approval amendment <input type="checkbox"/>												
Activities that cause the premises to become prescribed premises	<table border="1"> <thead> <tr> <th>Category number(s)</th> <th>Assessed design capacity</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>2,050,000 tonnes per annual period</td> </tr> <tr> <td>6</td> <td>2,000,000 tonnes per annual period</td> </tr> <tr> <td>52</td> <td>19 megawatts in aggregate</td> </tr> <tr> <td>54</td> <td>240 cubic metres per day</td> </tr> <tr> <td>64</td> <td>1,300 tonnes per annual period</td> </tr> </tbody> </table>	Category number(s)	Assessed design capacity	5	2,050,000 tonnes per annual period	6	2,000,000 tonnes per annual period	52	19 megawatts in aggregate	54	240 cubic metres per day	64	1,300 tonnes per annual period
	Category number(s)	Assessed design capacity											
	5	2,050,000 tonnes per annual period											
	6	2,000,000 tonnes per annual period											
	52	19 megawatts in aggregate											
	54	240 cubic metres per day											
64	1,300 tonnes per annual period												
Application verified	Date: 1/9/2015												
Application fee paid	Date: N/A												
Works Approval has been complied with	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>												
Compliance Certificate received	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>												
Commercial-in-confidence claim	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>												
Commercial-in-confidence claim outcome													
Is the proposal a Major Resource Project?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>												
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Referral decision No: Managed under Part V <input type="checkbox"/> Assessed under Part IV <input type="checkbox"/>												
Is the proposal subject to Ministerial Conditions?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Ministerial statement No: EPA Report No:												
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i>)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Department of Water consulted Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>												
Is the Premises within an Environmental Protection Policy (EPP) Area	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>												
If Yes include details of which EPP(s) here.													
Is the Premises subject to any EPP requirements?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>												
If Yes, include details here, eg Site is subject to SO ₂ requirements of Kwinana EPP.													



3 Executive summary of proposal and assessment

The Sandfire Resources NL (Sandfire) DeGrussa Copper-Gold Project (Project) is located approximately 900 km north of Perth and 150 km north of Meekatharra in the Gascoyne Region of Western Australia. The Project is located on Mining Tenement M52/1046. *Environmental Protection Act 1986* Licence L8558/2011/1 for the Project was issued on 23 June 2011.

Sandfire mines ore by open cut and underground methods and processes the ore onsite by using crushing and screening and flotation techniques to produce copper concentrate. Sandfire is licensed for the following Schedule 1 *Environmental Protection Regulations 1987* categories:

- 5 - Processing or beneficiation of metallic or non-metallic ore;
- 6 - Mine Dewatering;
- 52 - Electric power generation;
- 54 - Sewage facility; and
- 64 - Class II landfill.

The Department of Environment Regulation (DER) received a Licence amendment application from Sandfire on the 6 August 2015. The application related to an increase in their processing plant throughput and an increase in the amount of dewatering effluent discharged. An addendum to this Licence amendment application was received from Sandfire on the 17 September 2015 to include the proposed Stage 3 DeGrussa Tailings Storage Facility (TSF) extension.

Sandfire has now requested on the 23 September 2015 that they only wish to proceed with an amendment to the Licence to include an increase in throughput of the processing facility and the installation of Stage 3 at the TSF. Any increase in the dewatering throughput could not be assessed at this Licence amendment stage. Works Approval W5866/2015/1 was issued to Sandfire on the 19 October 2015 which included the installation of additional dewatering discharge pipelines and discharge areas, and an increase in the dewatering discharge throughput. These works are yet to be completed and a compliance document as required by the Works Approval has not been submitted to DER.

This Licence amendment for category 5 is to increase the throughput from 1,700,000 tonnes per annual period to 2,050,000 tonnes per annual period. The increase is achievable by improved ore handling and processing improvements to maximise capacity and efficiency. No additional infrastructure or power generation is required to support the increased processing plant throughput. Ore will continue to be sourced from the existing underground mine, but no additional surface storage for mine waste or ore is required. Tailings will continue to be disposed in the TSF via existing discharge pipelines. DER considers the proposed increase in throughput for category 5 has not significantly changed the risk profile of emissions and discharges from the Premises since the last Licence amendment. Therefore DER has not amended conditions relating to emissions and discharges.

Sandfire are also extending the double liner system along existing embankments of the TSF. Embankments of the TSF were constructed to a height of 575.5 metres (m) Reduced Level (RL) during 2011/2012 in accordance with Works Approval 4960/2011/1 (now inactive). A double liner system consisting of compacted clay and High Density Polyethylene (HDPE) has been installed along these embankments to a height of 570 m RL where process tailings are currently being deposited (Stage 2). The liner system will now be extended along existing embankments, between 570.0 to 575.5 m RL so tailings can be deposited into the Stage 3 level. DER considers the proposed extension of the double liner system at the TSF has not significantly changed the risk profile of emissions and discharges from the Premises since the last Licence amendment. Therefore DER has not amended conditions relating to the discharge or storage of tailings material in the TSF and the monitoring of the TSF.



As part of this Licence amendment process, DER has converted the Licence into the latest version 2.9. Justification is provided for each change or alteration to a condition which has occurred as part of this conversion process.

DER considers this Licence amendment has not significantly changed the risk profile of the Premises and therefore no change has been made to the Licence expiry date which is currently the 23 December 2017.



4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
General conditions	L1.2.1 to L1.2.3	Operation Condition 1.2.2 which refers to the code of practice for the storage and handling of dangerous goods is no longer applied to licences and has therefore been removed. All references made in the Interpretation section have been removed.	Application supporting documentation. General provisions of the <i>Environmental Protection Act 1986</i> . <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> .
Premises operation	L1.3.1 to L1.3.10	Construction & Operation Table 1.3.1 of condition 1.3.1 has been amended to include the quantity limit for wastes accepted onto the Premises landfill. The combined total of 1,300 tonnes per annual period includes Inert Waste Type 1, Inert Waste Type 2, Putrescible waste and Special Waste Type 2. This has been included in the Licence to ensure the Licensee does not exceed the approved throughput for category 64 at the Premises. Stockpiles of clean fill are stored at the landfill and are used for covering of waste and is therefore not considered a material that is accepted for burial.	Application supporting documentation. General provisions of the <i>Environmental Protection Act 1986</i> .



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>Quantity limit of '100 used tyres are stored' has been removed from Table 1.3.1 of condition 1.3.1 because the Premises has not been assessed as a prescribed premises category 57 which allows the storage of used tyres in numbers greater than 100. Additionally, the provisions of the <i>Environmental Protection Regulations 1987</i> apply whereby storage of used tyres in excess of 100 is a prescribed alteration of the environment unless it is done so in accordance with conditions of the Licence.</p> <p>Details of DER's assessment and decision making for the inclusion of condition 1.3.9 is included in Appendix A.</p> <p>The recording and the establishment of limits for process throughputs will be included in the Licence through condition 1.3.10 – Production or design capacity limits. This has been included in the Licence to ensure the Licensee does not exceed the approved throughputs for each category of the Licence.</p> <p>Production or design capacity for category 5 has been increased from the current licenced amount of 1,700,000 tonnes per annual period to 2,050,000 tonnes per annual period. The increase has been achieved by improving ore handling and processing improvements to maximise capacity and efficiency. These improvements have come through:</p> <ul style="list-style-type: none"> • internal upgrades to processing design ('tweaking' the plant with no new infrastructure); • improved crushing and screening; • reduction in recirculation of scats; and • improved technology to deal with the process flow. <p>No additional infrastructure has been required and no alteration to any of the pollution control equipment has been needed. No significant change has occurred to the risk profile of emissions and discharges from the Premises as a result of the throughput increase.</p>	<p><i>Environmental Protection Regulations 1987</i>, Part 6 Regulation 12.</p>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Point source emissions to surface water including monitoring	L2.3.1 to L2.3.3, L3.3.1	<p>Operation Condition 2.3.2 has been amended by removing point source emission targets to surface water and replacing with a point source emission limit to surface water for total dissolved solids (TDS). Details of DER's assessment and decision making are included in Appendix A.</p>	<p>Application supporting documentation.</p> <p>General provisions of the <i>Environmental Protection Act 1986</i>.</p> <p><i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>.</p>
Emissions to land including monitoring	L2.4.1 to L2.4.2, 3.4.1	<p>Operation Existing condition 3.4.1 requires monitoring the Wastewater Treatment Plant (WWTP) discharge to land. Targets for the discharge were applied through condition 2.4.2 however have been removed from the Licence. Limits have not been applied as the irrigation of treated wastewater to land is considered a low risk. DER's assessment and decision making is provided below.</p> <p><u>Emission Description</u> <i>Emission:</i> Treated wastewater discharged to the irrigation area during operation. <i>Impact:</i> Contamination of surrounding land, groundwater and eutrophication of nearby surface waters. <i>Controls:</i> The Project is situated in a semi-arid region with average annual rainfalls of between 200 and 250 mm and pan evaporation rates of about 3 000 mm per year. Depth to groundwater is 40 -50 metres below ground level. The Project area is characterised by low permeability saprolite clays and bedrock with only minor</p>	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>fracturing. The nearest potential surface water (John's Creek) is greater than one kilometre away however rarely contains water (only during cyclonic events). The nearest permanent surface water is 40 km away. Sandfire has in place a management plan for the operation of the batch plant and irrigation of the treated wastewater. Premises inspections undertaken by DER show the plant is operating in accordance with the requirements of the Licence. Previous sampling results indicated the WWTP discharge was exceeding Licence targets for Nitrogen on a number of occasions during the first few years of operations. However, Sandfire has made a number of improvements to the WWTP batch plant since that time and the results have now consistently remained at a level DER considers acceptable.</p> <p><u>Risk Assessment</u> <i>Consequence:</i> Insignificant. <i>Likelihood:</i> Rare. <i>Risk Rating:</i> Low</p> <p><u>Regulatory Controls</u> Licence conditions:</p> <ul style="list-style-type: none"> • Condition 2.4.1 identifies the discharge areas for the treated wastewater. • Condition 3.4.1 requires monitoring of the discharged treated wastewater. Parameters monitored include volume, faecal coliforms, total phosphorus and total nitrogen, residual chlorine, suspended solids and biochemical oxygen demand. Monitoring for Ph has been included in the parameters requiring analysis. As a consequence of limited retention times, in-field non-NATA accredited analysis is permitted for pH measurements. • analysis for pH can be conducted in the field using • Reporting conditions. Sandfire are required to report on the WWTP data and compare this to previous results as part of the AER. <p><u>Residual Risk</u></p>	



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L= Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<i>Consequence:</i> Insignificant. <i>Likelihood:</i> Rare <i>Risk Rating:</i> Low	
Information	L5.1.1 to 5.1.4 L5.2.1 to 5.2.2 L5.3.1 to 5.3.3	Operation Table 5.2.1 and 5.3.1 have been amended to reflect updates to table numbers and new notification requirements for completed works under condition 1.3.9 and limit exceedance of table 2.3.2. Conditions 5.3.2 and 5.3.3 have been removed from the Licence as they are no longer applicable because targets have been removed from the Licence.	Application supporting documentation. General provisions of the <i>Environmental Protection Act 1986</i> .



5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
19/11/2015	Proponent sent a copy of draft instrument	No comments received	N/A



6 Risk Assessment

Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management

Table 1: Emissions Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High



Appendix A

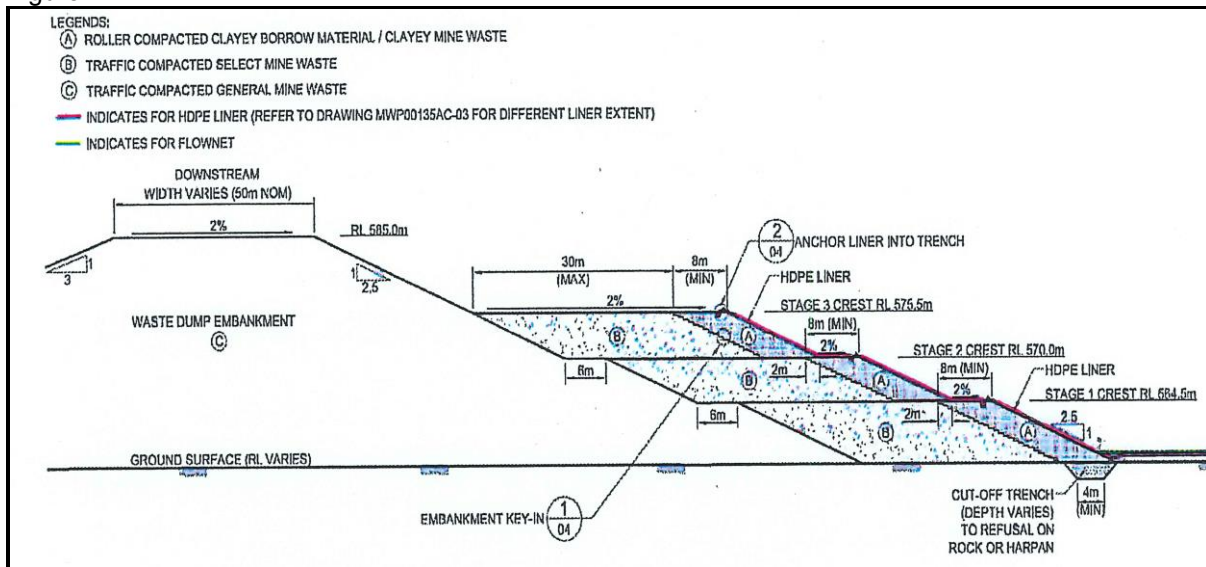
Emission Risk Assessment – Construction of an additional inner Tailings Storage Facility lined embankment

Condition 1.3.9 has been included in the Licence to ensure the Licensee constructs Stage 3 at the TSF in accordance with the submitted documentation.

The existing TSF is located 500 metres northwest of the processing plant within the Waste Rock Dump. DER conducted an emission risk assessment of the TSF via Works Approval W4960/2011/1, issued 7 July 2011 for its construction. The operation of the TSF is subject to the conditions of this environmental Licence L8558/2011/1. Sandfire are extending the double liner system along existing embankments of the TSF. Embankments of the TSF were constructed to a height of 575.5 metres (m) Reduced Level (RL) during 2011/2012 in accordance with Works Approval 4960/2011/1 (now inactive). A double liner system consisting of compacted clay and High Density Polyethylene (HDPE) has been installed along these embankments to a height of 570 m RL where process tailings are currently being deposited (Stage 2). The liner system will now be extended along existing embankments, between 570.0 to 575.5 m RL so tailings can be deposited into the Stage 3 level.

The TSF was constructed by placing mine waste around the outer edge of the alignment selected for the inner containment embankment for the TSF such that a void was formed inside the Waste Rock Dump. The engineered containment embankment was formed by placing controlled, compacted earthworks around the inner annulus of the Waste Rock Dump. This embankment was formed to retain the tailings. As the Waste Rock Dump has been formed, the void has been maintained and this allows for further controlled, compacted earthworks to be placed around the inner circumference of the void to form a perimeter containment boundary between waste rock and the deposited tailings. A compacted layer of low permeability (10^{-7} metres per second (m/s)) clay material has been placed against the mine waste for Stage 1 and Stage 2. The placement and compaction of the natural clay layer provides a surface free of sharp objects and protrusions to lay a HDPE liner on. The inner batter of the compacted embankment (against which tailings is deposited) is covered by a one millimetre HDPE liner. This forms a double liner system for the walls comprising compacted clay and artificial liner. Figure 1 below shows a cross section of the construction method used for the TSF.

Figure 1:





Other key environmental controls incorporated into the original design and construction of the TSF are:

- A compacted layer of low permeability clay material (1×10^{-10} m/s) was placed over the base of the TSF area to an average thickness of one metre;
- A two millimetre thick HDPE liner was placed over the compacted clay layer at the base of the TSF;
- An underdrainage water collection system, placed across the base of the TSF, comprising of a Flownet and a protective layer of Geotextile material and associated slotted collection pipes placed over the HDPE liner to capture water that percolates through the tailings during operation of the facility; and
- The underdrainage system discharges by gravity to an external sealed tank.

Process tailings are currently being discharged into the Stage 2 level which is nearing capacity. Sandfire propose to increase the capacity of the TSF inner embankment by constructing Stage 3. Stage 3 construction involves the following:

- Reshaping existing inner batters of the Stage 3 TSF level.
- Reshaping existing decant access way.
- Formation of a compacted clay embankment on existing inner batters of the Stage 3 level and decant area.
- Installation of A34 Geotextile and HDPE liners on existing inner batters of the Stage 3 level and decant area (extending the liner system from the Stage 2 area).
- relocation of the tailings discharge, decant return and seepage water return pipework to the embankment of the Stage 3 level (RL 575.0 metre).

Stage 3 will utilise approximately 80,000 cubic metres of clay material which was stockpiled for this purpose. This clay material originated from the DeGrussa Open Pit and has been assessed as suitable for consideration as construction material with a very low permeability of 10^{-6} to 10^{-7} m/s (Coffey Mining, 2011).

The current height of the TSF will not change. Tailings will continue to be transferred from the processing plant to the TSF circumference via existing discharge pipelines.

Emission Description

Emission: Discharge of tailings into a tailings storage facility.

Impact: Contamination of groundwater and elevated groundwater levels due to seepage. Contamination of surrounding land and impacts to vegetation due to overtopping.

Controls: Only minor amounts of floatation chemicals used in the process. Process water is good quality (less than 1,500 total dissolved solids). A compacted layer of low permeability clay material (1×10^{-10} m/s) was placed over the base of the TSF area to an average thickness of one metre. A two millimetre thick HDPE liner was placed over the compacted clay layer at the base of the TSF. Underdrainage collection system that drains to sealed collected tank. Walls of TSF lined with compacted layer of low permeability clay material (1×10^{-6} to 1×10^{-7} m/s) and one millimetre HDPE liner. Series of ambient groundwater monitoring bores with results to date showing there has been no discernible seepage from the TSF or any groundwater impacts. TSF management plan.

Risk Assessment

Consequence: Minor.

Likelihood: Rare.

Risk Rating: Low

Regulatory Controls

Licence conditions:

- Condition 1.2.2 requires the Licensee to recover or remove any spills from containment systems.
- Condition 1.3.4 requires tailings are only discharged into containment infrastructure that complies with the requirements of the Licence.



- Condition 1.3.5 requires the Licensee to ensure a minimum freeboard of 500 mm is maintained at the TSF, and methods of operation are to minimise embankment erosion.
- Condition 1.3.6 requires the Licensee to undertake routine inspections of the TSF and the discharge and return pipelines.
- Condition 3.5.1 requires the Licensee to undertake quarterly ambient groundwater sampling from the TSF groundwater monitoring bores. Sampling results are to be presented in the Annual Environmental Report as required by condition 5.2.1.
- Reporting conditions.

Residual Risk

Consequence: Insignificant

Likelihood: Rare

Risk Rating: Low

Point source emissions to surface water including monitoring

Emission Risk Assessment - Operations

Condition 2.3.2 has been amended by removing targets for pH, TDS and Total Petroleum Hydrocarbons (TPH) emissions to surface water, and setting a limit for TDS. DER's justification for this amendment is presented below. Impacts to creek beds by erosion and localised groundwater mounding have not been considered in this assessment for the removal of targets and the setting of a limit.

Sandfire is currently licenced to discharge up to 2,000,000 tonnes per annual period of dewatering effluent to the North Creek. The dewatering discharge effluent is made up of collected underground mine water, open pit water and water from the dewatering groundwater bore (DWB12).

The hydrogeology of the Project area is characterised by low permeability saprolite clays and bedrock with only minor fracturing. There are no clear continuous aquifers in the region, with only one highly constrained and localised higher permeability zone (referred to as the Caprock aquifer). All localised aquifers that have been identified are categorised as the fractured rock type. However, the term aquifer is probably not appropriate given the permeability and constrained nature. All units in the area are more correctly referred to as aquitards. Fractured rock aquifers at the Project occur within caprock at depths of 40 to 50 m.

There are no permanent water bodies, wetlands or groundwater dependent ecosystems near the Project. The nearest water body is the Gascoyne River located 40 km away. The Project's surface water catchment consists of three weekly incised drainage systems that drain west northwest into an ephemeral tributary of the Gascoyne River. North Creek where dewatering effluent is discharged, is the most significant of the ephemeral watercourses and is 200 to 300 m wide overall with numerous braided shallow channels, most of which are relatively densely vegetated. Main channel length is 16.2 km.

North Creek, which is generally referred to as a drainage channel, is dry for the majority of the time and carries runoff following significant storm events during the summer months when the potential exposure to high intensity cyclonic rainfall is greatest. On average these types of events occur only a couple of times a decade.

Groundwater quality at the Project is generally fresh to slightly brackish, neutral to slightly alkaline with a naturally high nitrate/nitrite concentration. Water from the open pit (up to 12 L/s) has a slightly higher salinity level due to pit wall washing and evaporation concentration, however, this is not expected to have an impact because it is combined with the fresher underground mine water at the discharge location. With exception of selenium, heavy metal and metalloid concentrations are well below guideline values (ANZECC 2000 for Livestock and Fresh Water) with most below detectable



limits. The pit water selenium concentrations are twice as high as both guideline values, however the ferruginous soil type at the Project is expected to remove most of the selenium by surface adsorption. Water quality parameter results for North Creek Discharge during 2014 are provided in Table 2. Sampling of the discharge waters commenced during 2014 when the Licence was amended to include routine sampling.

Table 2: Water Quality results for North Creek Discharge

Analyte	Apr-14	Jun-14	Aug-14	Dec-14
TSS (mg/L)	BLD	127	BLD	17
Acidity (mg/L)	BLD	3	5	BLD
NO ₃ (mg/L)	44	52	53	52
Sulfate (mg/L)	160	250	240	320
Arsenic (mg/L)	BLD	BLD	BLD	BLD
Cadmium (mg/L)	BLD	BLD	0.0002	BLD
Chromium (mg/L)	BLD	0.003	0.002	0.003
Copper (mg/L)	BLD	0.0025	BLD	0.061
Lead (mg/L)	BLD	BLD	BLD	BLD
Selenium (mg/L)	BLD	0.0045	0.004	0.0045
Zinc (mg/L)	BLD	-	0.01	0.07
TRH	BLD	BLD	BLD	BLD

BLD means below level of detection

TRH presented in Table 2 above is described as the Total Recoverable Hydrocarbons analysed in the sample. Total Petroleum Hydrocarbons (TPH) is presented in the current Licence and is the equivalent of the more recently used TRH.

Water quality results for pH and TDS analysis for samples taken from dewatering bore (DWB12), the underground settlement ponds (underground and open pit water combined) and the discharge to North Creek is provided in Table 3. The TDS of water from the underground mine increased slightly when a fractured dolomite unit was intercepted however this has now reduced.

Table 3: pH and TDS results for North Creek discharge point, underground settlement ponds and dewatering bore 12.

Date	pH			TDS (mg/L)		
	Discharge Point	Settlement Ponds	DWB12	Discharge Point	Settlement Ponds	DWB12
Apr - 2014	7.99	-	7.99	970	-	970
Jun - 2014	7.95	8.1	7.9	1,420	3,400	860
Aug - 2014	7.6	8	8.3	900	2,600	820
Dec - 2014	8.4	-	7.7	1,600	1,500	770

Emission Description

Emission: Discharge of mine dewatering effluent into a creek.

Impact: Reduction in surface water quality. Reduction in quality of local groundwater. Contamination of soils with heavy metals.

Controls: Quarterly monitoring of dewatering discharge effluent. Underground and Pit water combined with fresher groundwater from DWB12 before discharge to lower overall TDS. Low permeability saprolite clays and bedrock with only minor fracturing which reduces ground seepage. Discharge water is sourced from local groundwater and therefore of similar quality. High evaporation rates for this region (3,000 mm per year) assisting in reducing the amount of seepage. Settlement ponds prior to discharge. The nearest water body is the Gascoyne River located 40 km away.



Risk Assessment

Consequence: Insignificant

Likelihood: Unlikely

Risk Rating: Low

Regulatory Controls

Condition 2.3.2 of the Licence requires the Licensee to target point source emissions to surface water at or below those stated in the Licence. Targets are currently imposed in the Licence for pH, TDS and TPH for dewatering discharge waters.

Works Approval W5866/2015/1 was issued to Sandfire on the 19 October 2015 for the installation of additional dewatering pipelines, new dewatering discharge locations and increasing the dewatering discharge volumes. The works are yet to be completed. Also included in the assessment was the raising of the target for TDS in dewatering effluent discharge from 1,500 to 3,000 mg/L to reflect the quality of the groundwater experienced in the underground operations. Monitoring data shows that while the water in the dewatering bore has a TDS of up to 970 mg/L, water from the open pit and underground mine have a recorded combined TDS of up to 3,400 mg/L which is higher than the Licence target. As most dewatering water is from the open pit and underground mine, and the dewatering bore may not always produce better quality water to dilute the TDS of the discharge, there has been times when compliance with the target has not been achieved. Sandfire exceeded the 1,500 mg/L TDS Licence target in December 2014 by 100 mg/L. Therefore, the setting of targets and limits for TDS in dewatering discharge effluents and has been assessed as part of this Licence amendment.

DER does apply emission limits to a licence as a primary environmental regulatory control where necessary and appropriate.

Potential downstream use for the dewatering discharge effluent is for stock watering. TDS of groundwater at the premises is below 3,400 mg/L. Therefore in order to prevent impacts to the environment in the discharge area, DER has imposed limits for TDS. There are no adopted standards or guidelines for TDS values for discharge waters to creek lines. The ANZECC (2000) guidelines for livestock drinking water recommend a maximum TDS of 4,000 mg/L (page 9.3-11) so no adverse effects occur to livestock. Groundwater at the Project is naturally up to 3,400 mg/L TDS in some areas. Therefore taking all these factors into account, DER considers it appropriate to set a Licence limit of 3,500 mg/L for TDS in dewatering discharge waters.

There are no adopted standards for TRH values for discharge waters to creek lines. Previous sampling of the dewatering effluent waters since 2012 indicates there have been no hydrocarbons present. There are no sensitive receptors and depth to groundwater is greater than 17 m below ground level. Quarterly monitoring for TRH (requires amending from TPH) still applies in the Licence. Therefore taking all these factors into account, DER has determined that the setting of a limit for TPH in dewatering discharge waters is not necessary.

A limit has not been considered for pH because sampling results for groundwater and dewatering discharge effluent indicate pH has remained steady as neutral to slightly alkaline and is not considered a risk to the environment. Quarterly monitoring for pH still applies in the Licence.

Condition 3.3.1 of the Licence requires routine monitoring of point source emissions to surface water.

Residual Risk

Consequence: Insignificant

Likelihood: Unlikely

Risk Rating: Low