Government of Western Australia
Department of Water and Environmental Regulation

Amendment Notice 1

Licence Number	L6869/1992/12
Licensee	Pilbara Iron Company (Services) Pty Ltd
ACN	107 210 248
File Number:	DER2013/001174
Premises	Marandoo Iron Ore Mine Part of AM70/272, G47/1237, L47/334, easement N276548 and Crown Lease 3114/1277 MT SHEILA WA 6751
Date of Amendment	28 June 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.

Date signed: 28 June 2018

Danielle Eyre

SENIOR MANAGER RESOURCES

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
ACN	Australian Company Number
AEP	Annual Exceedance Probability
AER	Annual Environment Report
Amendment Notice	refers to this document
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
CS Act	*Contaminated Sites Act 2003* (WA)
DBCA	Department of Biodiversity, Conservation and Attractions
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
DoW	The former Department of Water
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*

	(Cth)
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 Review
HDPE	High density polyethylene
Licensee	Pilbara Iron Company (Services) Pty Ltd.
m^3	cubic metres
mbgl	metres below ground level
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
mtpa	million tonnes per annum
Occupier	has the same meaning given to that term under the EP Act.
OD	overall diameter
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*
RTIO	Rio Tinto Iron Ore
SSTV	site specific trigger value
SWFSF	Southern Waste Fines Storage Facility
t/m^3	tonnes per cubic metre

1. Amendment Notice

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

This notice is limited only to the construction, commissioning and operation of the Southern Waste Fines Storage Facility (SWFSF) under Category 5, changes to monitoring requirements under Category 6 and an increase to the throughput under Category 12. No changes to the aspects of the original Licence relating to Categories 54, 60 and 64 have been requested by the Licensee. The Licensee has stated that no commissioning is required.

2. Amendment description

On 22 May 2017, Pilbara Iron Company (Services) Pty Ltd. (Licensee) applied for an amendment to Licence L6869/1992/12. The application pertains to the construction of the SWFSF, and a request to review the Operational Water Quality Guidelines for Dewatering Discharges, with a view to reducing the monitoring parameters as required by condition 29 of the Licence. An increase in the design capacity for category 12 has also been requested.

Table 2 outlines the proposed changes to the design or throughput capacity for Category 12. No changes have been requested for the other prescribed premises categories.

Table 2: Proposed design or throughput capacity changes

Category	Current design or throughput capacity	Proposed design or throughput capacity	Description of proposed amendment
12	4,380,000 tonnes per annual period	10,000,000 tonnes per annual period	Increase to 10,000,000

3. SWFSF

3.1 Background

The existing Marandoo waste fines storage facility (WFSF) is reaching operational capacity, therefore, the Licensee has requested approval to construct and operate a new above ground waste fines storage facility.

The proposed SWFSF is to have a footprint of approximately 146 hectares and is located wholly within State Agreement tenure (AML70/272), granted pursuant to the *Iron Ore (Hamersley Range) Agreement Act 1963*. The location of the SWFSF in relation to other site infrastructure is depicted in Figure 1. The approximate boundary coordinates are provided in Table 3 and depicted in Figure 2.

Table 3: Boundary coordinates (MGA 50) of the SWFSF (RTIO-HSE-0305356)

ID	Easting (m)	Northing
1	618,400	7,493,520
2	620,340	7,493,400
3	619,690	7,492,620
4	618,610	7,492,760

Additional infrastructure that is also required includes a "*haul road, pipeline access roads, creek modifications, plant pump upgrade and new slurry delivery line*" (RTIO-HSE-0305356).

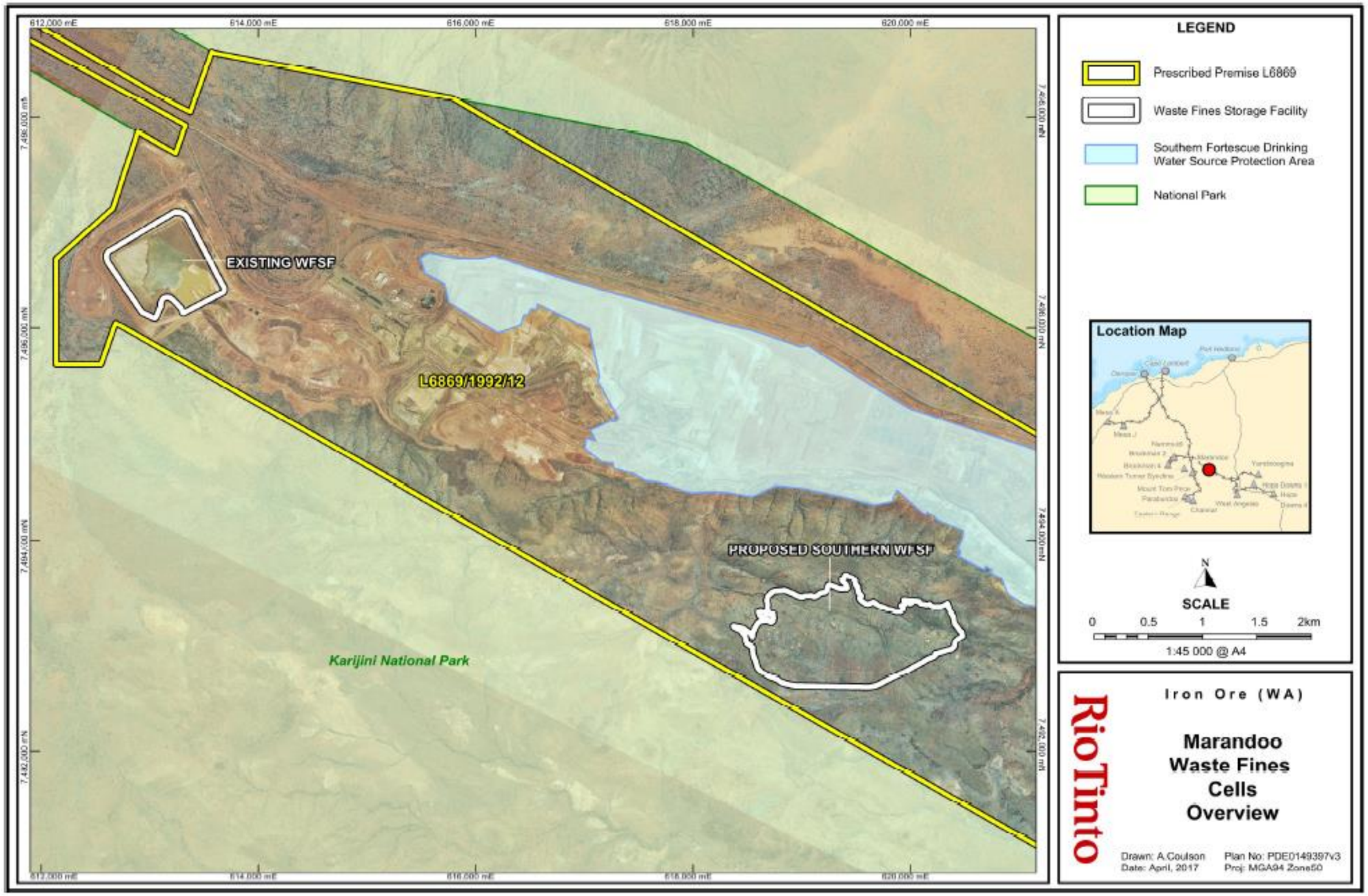


Figure 1: SWFSF location at Marandoo Mine (RTIO-HSE-0305356)

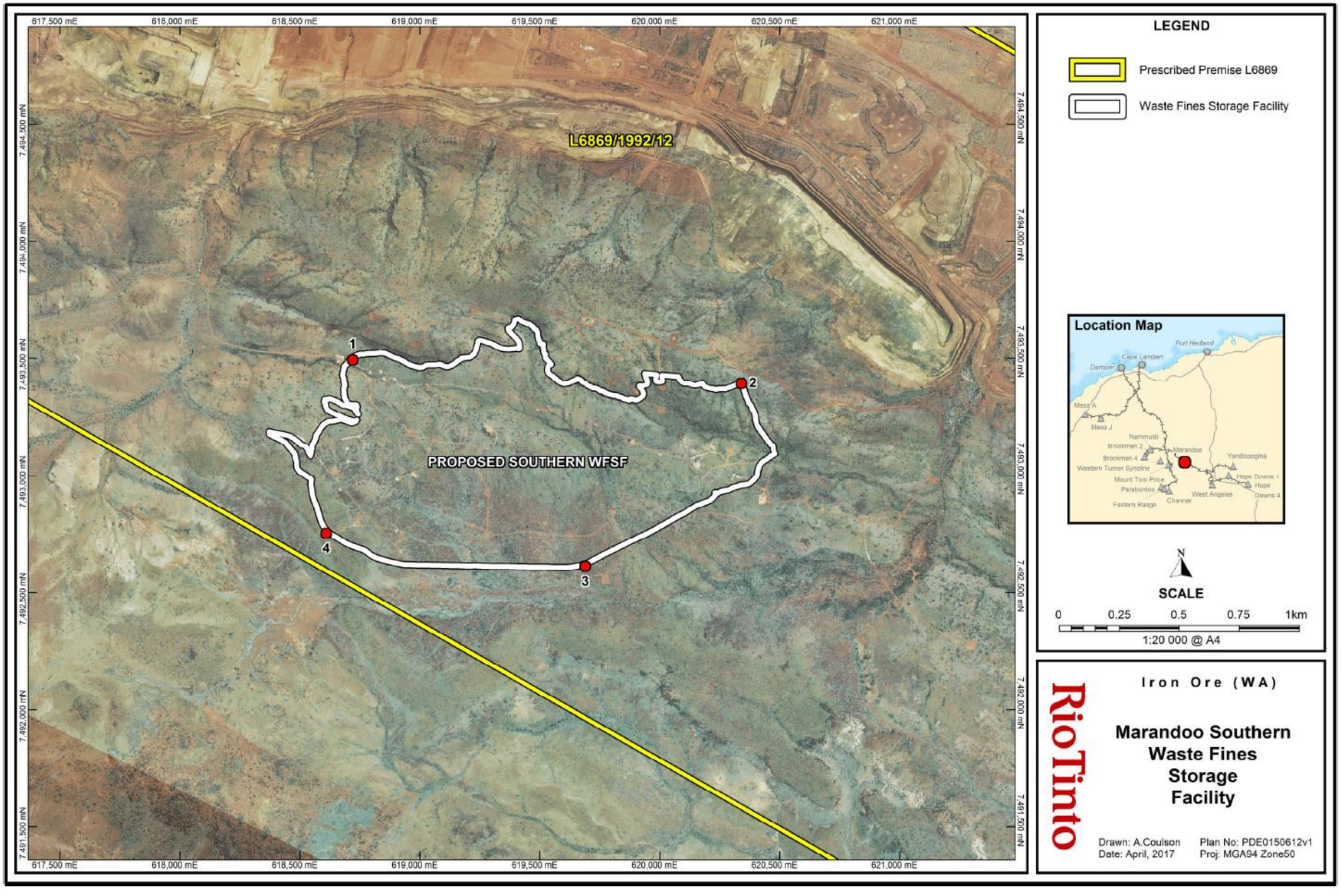


Figure 2: Proposed extent of the SWFSF (RTIO-HSE-0305356)

3.2 SWFSF design and operation

3.2.1 Capacity

The SWFSF is to contain the remainder (from 2018) of waste fines from the existing Marandoo below water table processing plant. Ore is processed at a rate of up to 18 million dry tonnes per annum. The ore is crushed, scrubbed and wet screened to produce oversized, lump and fine product. The ultrafine material is de-slimed and thickened prior to pumping through to the SWFSF. Approximately 12% of the ore is to be disposed as waste fines (KP 2017).

Over the life of mine (12 years), a total of approximately 25.22 Mt of waste fines is to be deposited (KP, 2017). The tailings have a particle size of approximately 80% passing 10 µm and will be transferred via a slurry pipeline at a range of 35-40% solids (KP 2017).

3.2.2 Embankment design

The facility is to consist of a single cell with a waste fines inundation area of approximately 100 ha. The location and embankment alignment is to make use of the natural topography to form a "*side hill facility with one complete side being a natural ridge to the north"* (RTIO-HSE-0305356).

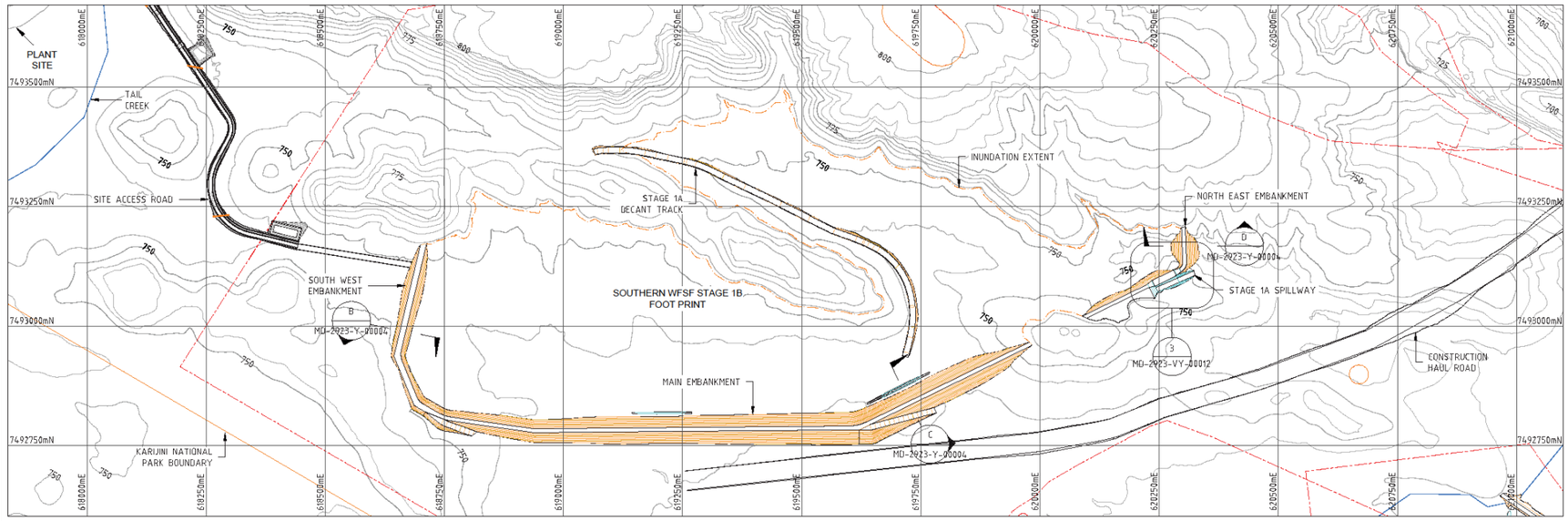
The facility comprises a main embankment with three nominal saddle embankments. The west side is split into the northwest and south-west saddle embankments and the north-east side consists of a single saddle embankment. The west side is split into the northwest and southwest saddle embankments while the east side consists of one saddle embankment. At final crest level, two of the saddle embankments are continuous with the main embankment.

All stages of construction (stage 1 embankment and subsequent raises) will be constructed using the downstream construction method.

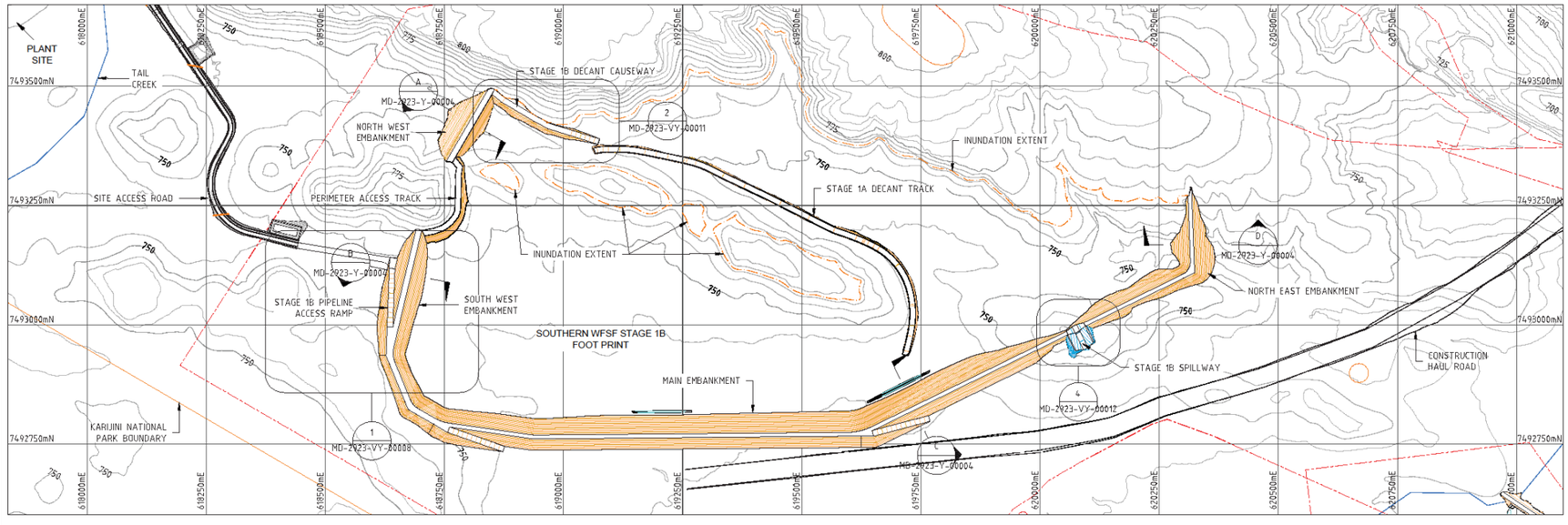
Table 4: SWFSF indicative embankment staging and crest levels (KP 2017)

Stage	Construction Year	Embankment construction method	Years Capacity	Embankment Level (RL m)
1A	-1	Downstream	1	754.0
1B	1	Downstream	3	762.0
2	3	Downstream	3	768.0
Final	6	Downstream	4	775.0
Expansion	11	-	-	780.0

Figure 3 depicts the general arrangement of the SWFSF at Stages 1A and 1B. Figure 4 depicts the general arrangement of the SWFSF at the final stage.



STAGE 1A WASTE FINES STORAGE FACILITY
SCALE 1:4000



STAGE 1B WASTE FINES STORAGE FACILITY
SCALE 1:4000

LEGEND:

- AR BOUNDARY (EXISTING)
- AVOIDANCE SITE (UNLESS NOTED)
- HERITAGE AVOIDANCE SITE
- WATER COURSE

NOTES:

1. 5m LIDAR CONTOUR INTERVAL SHOWN.
2. GRID DATUM MGA94.

NOT FOR CONSTRUCTION
PRELIMINARY

100 50 0 100 200 Metres
SCALE 1 : 4000 (B1)

Knight Piésold CONSULTING
Knight Piésold Pty. Ltd.

REFERENCES
MD-2923-Y-00004 EMBANKMENT - SECTIONS AND DETAILS - SHEET 1 OF 4
MD-2923-Y-00004 EMBANKMENT PIPELINE ACCESS RAMP
MD-2923-Y-00011 DECANT SYTEM - SECTIONS AND DETAILS
MD-2923-Y-00012 SPILLWAY - SECTIONS AND DETAILS

REV	BY	DATE	DESCRIPTION	CKD	APP
A	AZ	16-12-16	DRAWING ADOPTED FOR PN 11234	DSS	
B	AZ		EMBANKMENT ALIGNMENT AMENDED		

DRAWN	A.ZDUNIC	18-07-16
TRACED		
CHECKED		
SUPT DRAFT		
PROJ. ENG.	D.SAWYER	16-12-16
APPROVED		
APP. FOR CONST.		

MGA94

RioTinto

PILBARA IRON, ASSET MANAGER FOR HAMERSLEY IRON PTY LTD, HAMERSLEY HMS PTY LTD AND ROBE RIVER MINING COMPANY PTY LTD

MARANDOO MINE
SOUTHERN WASTE FINES STORAGE FACILITY
EMBANKMENT - STAGE 1A AND 1B
GENERAL ARRANGEMENT

SCALE	1:4000
DRAWING NUMBER	MD-2923-Y-00002
REV	B
PROJECT NUMBER	11234

CAUTION

Figure 3: SWFSF embankment stages 1A and 1B.

Licence: L6869/1992/12

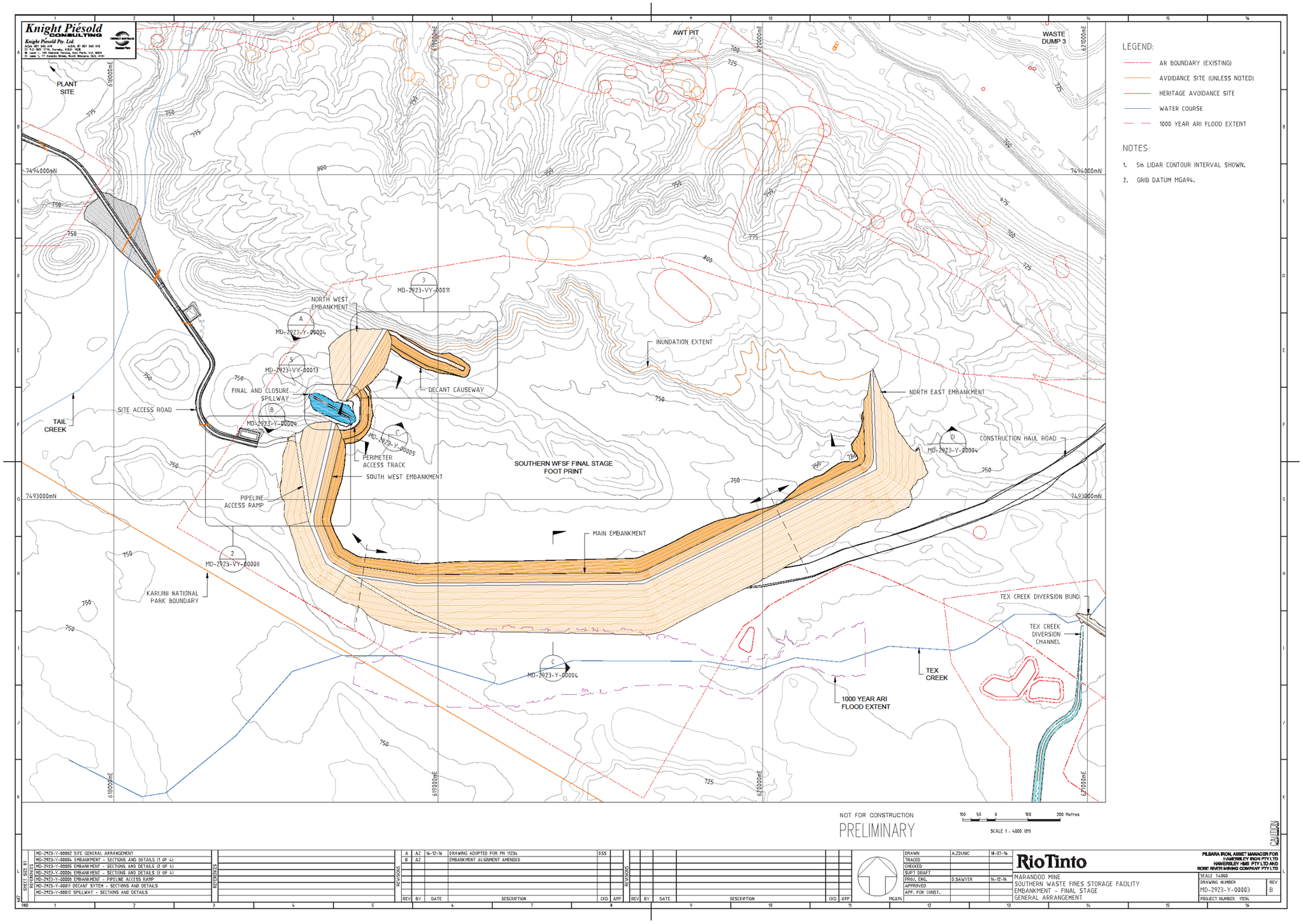


Figure 4: Overview of facility design depicting the side hill facility and embankments.

3.2.3 SWFSF design criteria and specifications

Table 5: Design Criteria and Specifications (RTIO-HSE-0305356)

Design Aspect	Design Basis
Facility Design Parameter	
Design life	12 years (2018 to 2029)
Waste fines production	Up to 2.424 Mtpa
Total waste fines	25.22 Mt
SWFSF Geometry	
Lowest basin elevation	739.5 m
Final embankment elevation	775 m
Inundation area	100 ha
Maximum embankment height	35 m
Embankment length	2760 m
Waste fines parameters	
Particle density (SG)	3.8
Average stored dry density	1.0-1.3 t/m^3
Hydraulic conductivity	5 x 10^{-8} m/s – 5 x 10^{-9} m/s
Waste fines slurry feed solids concentration	35-40% solids w/w
Waste fines beaching angle	1V:200H
Water Management (RTIO-HSE-0305356)	
Decant return	Diesel powered portable pump
Freeboard	Operational freeboard: 300 mm solids to crest Total Freeboard: 500 mm above maximum required stormwater capacity elevation to spillway invert
SWFSF catchment area	146 Ha
Design storm event	1% AEP, 72 hour duration (Containment)
Extreme storm event	PMF due to a PMP (Spillway)
Stability	
Minimum FoS: Long-term drained	1.5
Minimum FoS: Short-term undrained	1.3

Design Aspect	Design Basis
(incl during construction)	
Minimum FoS: Post-seismic	1.0-1.2
Maximum design earthquake return period during operations	1 in 10 000 year
Design earthquake PGA	0.28 g
Minimum design earthquake post closure	Equivalent to 1 in 20 000 year
MDE PGA	0.40 g
Maximum acceptable vertical displacement following MCE	Freeboard of 300 mm
Waste fines deposition infrastructure (RTIO-HSE-0305356)	
Waste fines pumping parameters (e.g. pressures, flow rates)	372 tph average 450 tph maximum Maximum Operating Pressure ~2400 kPa over 4 stage pumping (Weir 8/6 AH)
Deposition infrastructure configuration	Perimeter embankment multi spigot discharge combined with 2 full single point discharge
Monitoring (RTIO-HSE-0305356)	
Phreatic surface	Vibrating Wire Piezometers (embankment and foundation Pond level staffs
Settlement	Embankment Survey Prisms Settlement cells/profilers Planned laser or fly over surface survey
Flows	Waste fines flow and percent solids Decant return flow Underdrainage flow
Groundwater	4 surrounding groundwater monitoring bores

3.2.4 Deposition of tailings

The deposition of tailings will occur in 4 phases and corresponds to the embankment staging outlined in Table 4.

- Phase 1 – during embankment Stage 1A level. Deposition along the southwest is to be greater (by approximately 4.5 m) than the deposition along the main embankment to direct the pond into the main valley (KP, 2017)
- Phase 2 – during embankment Stage 1B level. Deposition along the southwest and northeast will be greater than the main embankment to push the pond towards the main valley (KP, 2017)
- Phase 3 – during embankment Stage 2 level. Deposition along the northeast will be

slightly greater than the other embankments to direct the pond near the decant causeway in the northeast (KP, 2017)

- Phase 4 – during final embankment level. Even deposition will occur from all embankments to direct the pond towards the decant causeway at the northeast.

3.2.5 Seepage

Seepage can potentially occur through embankments and base materials and a number of features have been implemented in the design to manage seepage issues. The supernatant pond is to be managed so that it is located remotely from the embankments.

A series of barriers and drainage zones are to be used within the SWFSF to reduce the phreatic surface (wetting from the tailings) and to manage seepage issues within the embankment walls. The seepage controls consist of:

Embankment cut-off trenches (KP, 2017)

Embankment cut-off trenches excavated into the foundation soils, backfilled with low permeability fill or cement grout to reduce the phreatic surface will be the primary seepage control. Three types of cut-off trench are proposed:

- Type 1 cut-off trench located beneath the upstream toe of the main and southwest embankments. The cut-off trench will be continuous along the entire embankment to the maximum deposition elevation. The cut-off trench will be excavated to a depth of around 3 m through the colluvium into weathered shale.
- Type 2 cut-off trench will be located beneath the upstream toe of the northeast and northwest embankments. The trench will be excavated to a depth of around 1 m.
- Type 3 cut-off trench located where exposed Banded Iron Formation or near surface bedrock refusal on the valley side slopes is encountered.

The cut off trenches are depicted in Figure 5 (SWFSF long section).

Embankment blanket drain

The northeast and northwest embankment will incorporate an internal blanket drain which will be placed within the natural low spot off the original creek line at the centre of the valley. This drain will be extended each stage to the final downstream toe and will be monitored for any visible seepage. If seepage is detected a collector trench and collector pond will be installed for the seepage recovery (KP, 2017).

Embankment upstream toe drain and underdrainage

A toe drain will be constructed along the upstream toe of the main embankment where a Type 1 cut off trench is present. This toe drain is to provide drainage of waste fines at the embankment. The main collector drains will form the underdrainage system which will be located within the Stage 1 basin extent. The layout of main collector drain will follow the existing creek depressions.

The toe and main collectors will drain by gravity into the underdrainage sump and will be pumped out via a submersible pump (equipped with a flowmeter) for recycling back into the facility (KP, 2017).

Underdrainage sump and riser pipe

An underdrainage collection sump and riser pipe will be constructed at the lowest topographic point in the basin. The sump will collect liquor from the toe drain and underdrainage systems and return it to the supernatant pond (KP, 2017). This system will not be operated during Stage 1A until a suitable beach and pond has formed to cover the underdrainage network (KP, 2017).

Decant system

The facility will operate with a diesel powered decant trailer pump. Once the pond reaches the north side of the facility (at the end of Stage 1), a decant causeway will be constructed where the trailer pump will be located and it will be relocated vertically for each stage (KP, 2017).

The trailer pump will consist of a floating intake located in the pond which can reduce the pond to approximately 1 m deep without sedimentation issues. When the pond is between 1m and 0.5 m deep there is a potential for turbid water to affect the pump, therefore it will be fitted with a turbidity meter to automatically turn off. The pump can be turned off remotely in the event of emergency (KP, 2017).

Seepage modelling

Seepage modelling has been undertaken for the facility for each stage of construction with a supernatant pond level based on the water balance "normal" and "large" pond sizes. The modelling has assumed the groundwater table is about 60 metres below ground level (noting that this can be variable). The seepage model parameters are provided in Table 6.

Table 6: Seepage modelling parameters for the SWFSF (KP, 2017)

Material Type	Estimated Saturated Hydraulic Conductivity (m/s)
Embankment	
Embankment Zone A – Upstream Face	1×10^{-7}
Embankment Zone C – Structural Fill	1×10^{-6}
Embankment Zone D1/D2 – Mine Placed	1×10^{-6}
Embankment Zone F – Blanket Drain	1×10^{-3}
Waste Fines	
Vertical direction	5×10^{-9}
Horizontal direction	5×10^{-8}
Foundation	
Colluvium	1×10^{-7}
Shale – Vertical	1×10^{-8}
Shale – Horizontal	1×10^{-7}
Chert/BIF*	1×10^{-5}

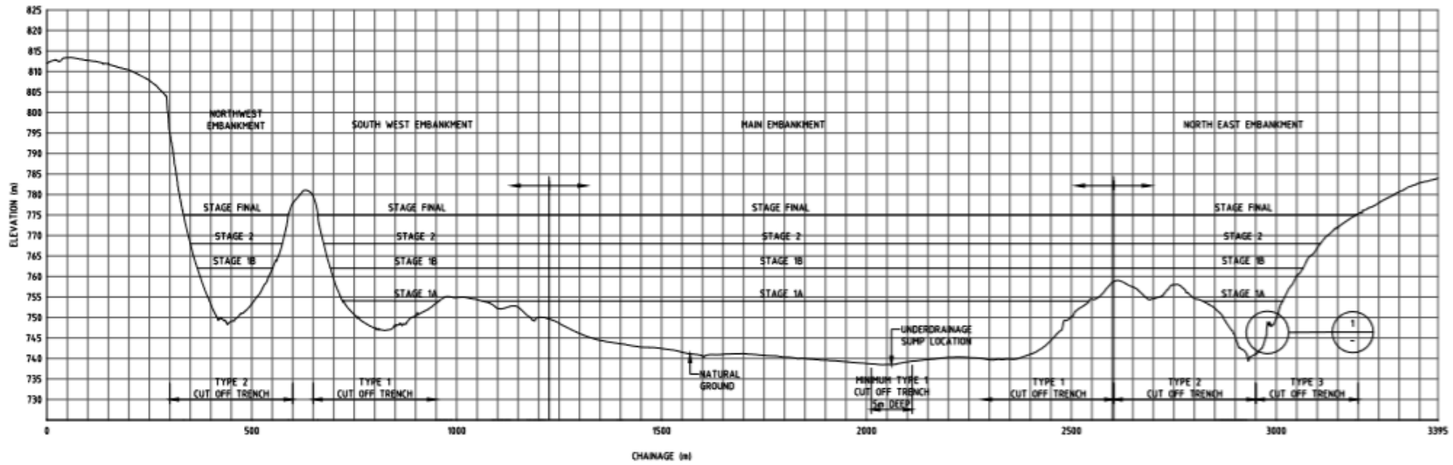
* Sensitivity conducted for minus one order of magnitude.

Figure 6 depicts the seepage model cross section.

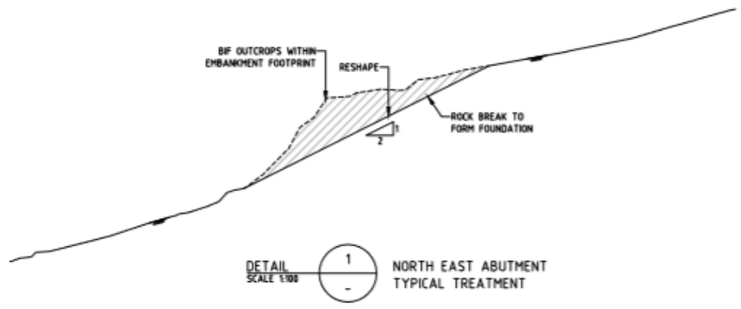
Knight Piésold CONSULTING

NOTES:

1. LONG. SECTION BASED ON FINAL CREST ALIGNMENT.
2. TYPE 3 CUT OFF TRENCH LOCATIONS AS REQUIRED.



EMBANKMENT LONG. SECTION
H. SCALE: 1:5000
V. SCALE: 1:500



NOT FOR CONSTRUCTION
PRELIMINARY

SCALE 1 : 500
SCALE 1 : 5000

CAUTION

MD-2923-Y-80003 EMBANKMENT - FINAL STAGE - GENERAL ARRANGEMENT	A	AZ	21-12-16	DRAWING ADOPTED FOR PH 1234	DDS
	B	AZ		EMBANKMENT LONG. SECTION AMENDED, DETAIL 1 ADDED	

Rio Tinto

MARANDOO MINE
SOUTHERN WASTE FINES STORAGE FACILITY
EMBANKMENT
SECTIONS AND DETAILS - SHEET 3 OF 4

DRAWING NUMBER: MD-2923-Y-00006 REV B

Figure 5: Embankment long section

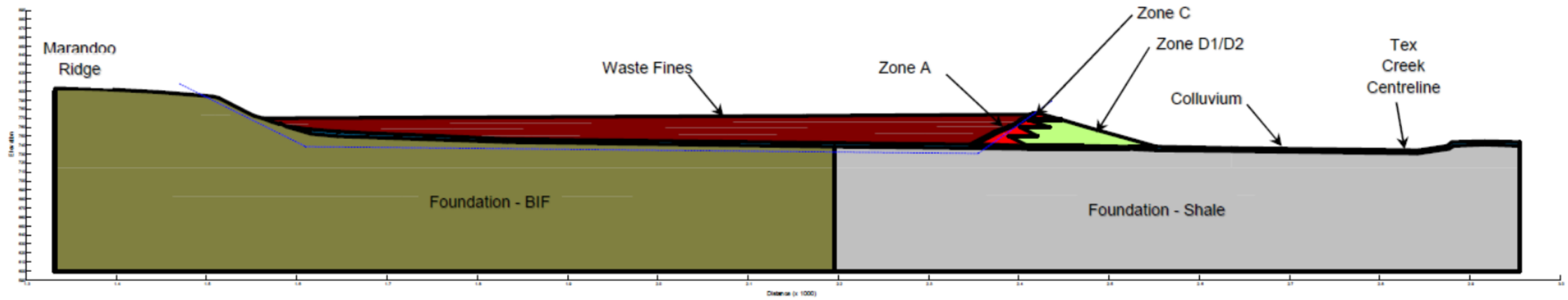


Figure 6: Seepage model cross section of the SWFSF

Colluvium is loose, unconsolidated material that is generally deposited at the base of hillslopes. This material ranges in thickness (4 m at the Tex Creek centerline and consisting of 2- 3 m in thickness in the remainder of the valley). The thickness of the colluvium reduces to zero as the terrain steepens at the Marandoo Ridge (KP, 2017).

The foundation material beneath the colluvium consists of shale and banded iron formation. The permeability of the materials used as modelling parameters are provided in Table 6.

The model has indicated that groundwater mounding could occur under the facility during Stage 1B, Stage 2 and Stage Final Main Embankment under normal and large pond conditions.

Groundwater mounding is expected to occur under the northwest embankment over all three stages with no Tail Creek ponding. With the Tail Creek permanently flooded the groundwater could increase to just below ground level in the area between the SWFSF and the existing waste fines storage facility (KP, 2017).

Groundwater movement is likely to be towards the south-east. The Tex Creek is situated to the south/southeast of the SWFSF and is to be diverted south towards the boundary of Karijini National Park.

3.2.6 Tex Creek diversion

The Tex Creek currently flows from the southwest to the northwest reporting through a gap in the Marandoo Ridge. As the creek currently flows through the footprint of the future pit, the Licensee will divert the Tex Creek south away from the Marandoo pit by constructing an earth fill bund and excavated diversion channel.

The diversion of Tex Creek is not within the scope of Part V of the EP Act and will not be assessed here. Condition 6 of Ministerial Statement 1020 related to springs, pools and creek lines of Karijini National Park. This condition requires (amongst other requirements) that any interception of surface water flows does not adversely affect the springs, pools or creek lines in Karijini National Park, or their surrounding vegetation or surrounding Aboriginal heritage sites.

3.2.7 Summary of water quality from waste fines generated at the below water table plant

Table 7 provides the water quality of the waste fines supernatant from the below water table plant.

A comparison against the freshwater guidelines and livestock drinking water guidelines in ANZECC/ARMCANZ 2000 indicates that chromium and copper are elevated in the tailings supernatant, with nickel being slightly elevated in two samples when compared against the 95% trigger values for freshwater ecosystems. The phosphorus levels are elevated when compared against the default trigger values for tropical Australia. No samples exceeded the livestock drinking water guidelines for the parameters provided.

Table 7: Summary of water quality from waste fines generated at the BWT plant (RTIO-HSE-0305356)

Analyte	Units	16/3/2016 sample	27/3/2016 sample	5/5/2016 sample	2010 sample
TDS	mg/L	650	591	558	333
pH (lab)	pH	7.7	7.9	7.8	7.6
Aluminium	mg/L	0.02	0.025	0.06	0.01
Arsenic	mg/L	0.00	0.00	0.00	0.00
Barium	mg/L	0.074	0.028	0.01	0.106
Boron	mg/L	0.03	0.01	0.01	0.08
Cadmium	mg/L	0.0005	0.0005	0.0005	0.00002
Calcium	mg/L	67	63	68	21.07
Chloride	mg/L	118	123	117	94
Chromium	mg/L	0.01	0.025	0.01	0.01
Cobalt	mg/L	0.0004	0.0001	0.0002	0.0001
Copper	mg/L	0.01	0.01	0.01	0.01
Fluoride	mg/L	0.7	0.85	0.7	0.7
Iron	mg/L	0.04	0.04	0.24	0.01
Lead	mg/L	0.002	0.002	0.002	0.001
Magnesium	mg/L	48.51	41.45	47.03	8.65
Manganese	mg/L	0.01	0.01	0.01	0.01
Mercury	mg/L	0.0001	0.0001	0.0001	0.0001
Molybdenum	mg/L	0.00	0.00	0.001	0.001
Nickel	mg/L	0.01	0.015	0.03	0.01
Phosphorus	mg/L	0.1	0.1	0.1	0.02
Selenium	mg/L	0.001	0.001	0.001	0.001
Silver	mg/L	0.00001	0.000035	0.00001	0.00002
Sodium	mg/L	52.1	50	50.3	67.2
Sulfate	mg/L	85	87	83	29.4
Tin	mg/L	0.0001	0.0001	0.0001	0.0001
Uranium	mg/L	0.0002	0.0004	0.0000	0.0000
Vanadium	mg/L	0.01	0.01	0.01	0.01
Zinc	mg/L	0.01	0.01	0.01	0.01

3.2.8 Geochemical characterisation of Marandoo tailings

A single sample has been used to undertake the geochemical characterisation of Marandoo tailings.

The sample was subjected to:

- Elemental analysis;
- Mineralogy analysis;

- Acid base accounting;
- Bottle leachate analysis; and
- Sequential extraction leach testing.

Elemental analysis

The elemental analysis has indicated that the tailings have significant geochemical enrichment of iron and silver.

Mineralogy

The x-ray diffraction mineralogy analysis has indicated that the "material is a sub-grade ferruginous material containing kaolinite and amorphous materials as gangue minerals" (ChemCentre, February 2018).

Acid base accounting

Concentrations of total sulfur, sulfate sulfur and chromium reducible sulfur were all below the reporting limits of 0.01%. The sample was classified as nonacid forming as a consequence of a negative NAPP value and a NAGpH value greater than 4.5 (ChemCentre, February 2018).

Bottle leachate analysis (ChemCentre, February 2018)

Results from the bottle leachate analysis have been compared against the 95% trigger values for freshwater ecosystems in ANZECC/ARMCANZ 2000. The bottle leachate analysis indicates that silver, aluminium, arsenic, cadmium, cobalt, manganese, molybdenum, nickel, lead and selenium are unlikely to leach out at levels of environmental concern. DWER notes that the results for mercury were not provided at a sufficient detection level to allow a comparison against the ANZECC 95% trigger levels.

The results for major ions and for nitrate indicate that there will be washed-out as the concentration of these substances decreased in the sequential water leachate tests.

Boron (0.56-0.78 mg/L) and chromium (0.001-0.0072 mg/L) were slightly elevated when compared against the ANZECC 95% trigger values (0.37 and 0.001 mg/L respectively) for most leachates tested. No results exceeded the livestock drinking water guidelines.

Sequential extraction leach testing

The sequential leach testing procedure has been developed through the Minerals Research Institute of WA M432 project to validate and standardised a sequential leaching test to better predict the impact of iron ore mines on ground and surface water quality.

Elements that are present in the water extractable fraction may be mobilized by infiltrating rainwater. The only element elevated when compared to the ANZECC 95% trigger values in the water extractable fraction is aluminium (0.67 mg/L). The 95% trigger level for protection of species in freshwater ecosystems is 0.055 mg/L. Elevated levels of aluminium, chromium and copper and zinc occur in the carbonate fraction, however, these elements may not be mobilized by infiltrating rainwater, but may be mobilized by acidic seepage (ChemCentre, 2017). Acidic conditions are not expected in the SWFSF as the waste fines are non-acid forming. No results exceed the livestock drinking water guidelines.

3.2.8 Spillway

The facility has been designed to contain the "*1% Average Exceedance Probability 72 Hour rainfall event with the decant not operational and still maintain adequate freeboard to the spillway invert*" (KP, 2017).

3.2.9 Tailings and decant return pipelines

A 3 m wide permanent pipeline corridor will be established for the facility. A tailings pipeline

from the existing below water table wet processing plant will enter the facility from the west side.

The tailings pipeline is to tee off from the existing tailings pipeline near the below water table processing plant, with the installation of a valve station. The proposed pipeline is 8.7 km in length and consists of a 300-350 mm OD HDPE lined steel pipe for ~1.4 km, followed by a 400 mm OD PN20 HDPE pipeline for a total length of ~ 8.7 km to the far east side of the SWFSF.

The decant return line will follow the waste fines pipeline back to the plant and is to consist of a 225 mm OD PN10 and 315 mm OD PN16 HDPE pipeline. The pipeline and instrument diagrams for the project are shown in Figures 7 and 8. Figure 9 depicts the general arrangement of the pipeline corridor.

Pipeline failure controls

The Licensee proposes to monitor all pipelines for leaks and wall stability during operation. A differential flow reading between the plant flowmeter and SWFSF flowmeter will be monitored. Any significant difference in flow detection will trigger an alarm associated within a real time monitoring system. Any differential flow reading between the decant flow meter and the process plant flow meter will also be monitored. Any significant difference in flow will be set to alarm or a no flow at the process plant (RTIO-HSE-0317137).

The tailings pipelines will contain air vents/vacuum breakers at pipeline high spots (five locations) and dump valves at all low spots (five locations). At each low spot, the dump valves will report to containment ponds (5 locations). The pipe volume has been calculated to 600 m^3 with a design flow rate of up to 700 m^3/hr. The containment ponds are to be 25 m x 25 m base dimension and 2 m in depth providing a containment size of 2000 m^3. This is adequate to contain the full pipe volume plus two hours of continuous pumping (RTIO-HSE-0317137). Figure 10 depicts the pipeline location in relation to other site infrastructure.

The Licensee has undertaken an assessment of the topography in the event of pipeline failure with the pipeline bund and containment ponds at capacity. This analysis has identified the general flow direction if the secondary containment bunding overflows and this is depicted in Figure 11.

The majority of the discharge in this event will be directed into the mine area and remain on lease. The assessment has determined that Road Section 1(behind Waste Dump 1) may result in tailings potentially being discharged off lease. The Licensee has stated that the "backfill area behind Waste Dump 1 is extremely wide and flat, with the waste fines expected to pond locally" (RTIO-HSE-0317137).

The assessment also shows that there will be an uncontained discharge at Road Section 3 in the vicinity of Tail Creek (in the unlikely scenario of secondary containment measures failing) with the majority of this discharge being directed to Tail Creek. This section will be constructed with a pipe sleeve (a double skinned pipeline) across Tail Creek to ensure the bridged pipeline still reports to Containment Pond 4 in the event of a failure. Tail Creek flows into the current pit.

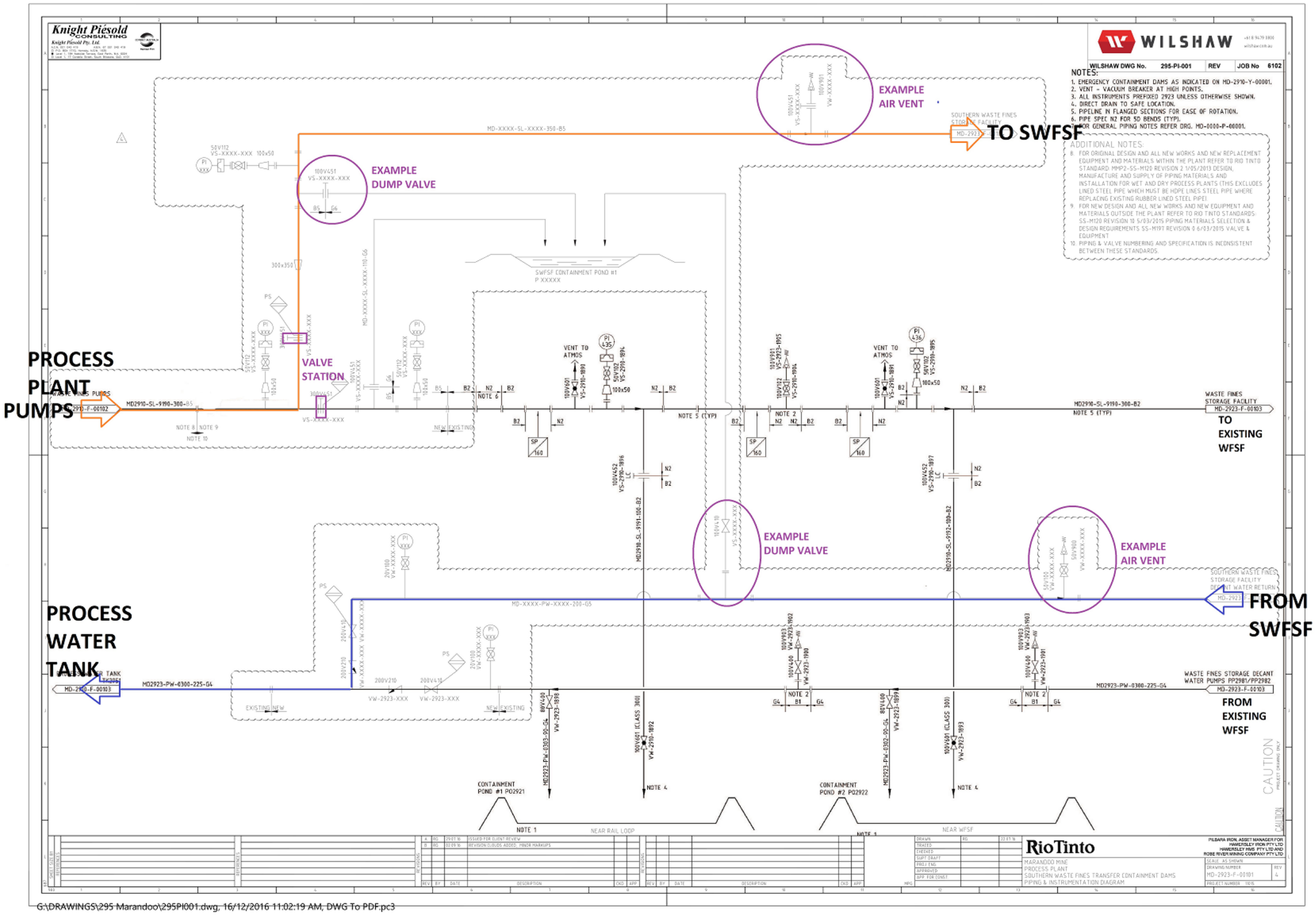


Figure 7: Pipeline schematics for the section near the plant.

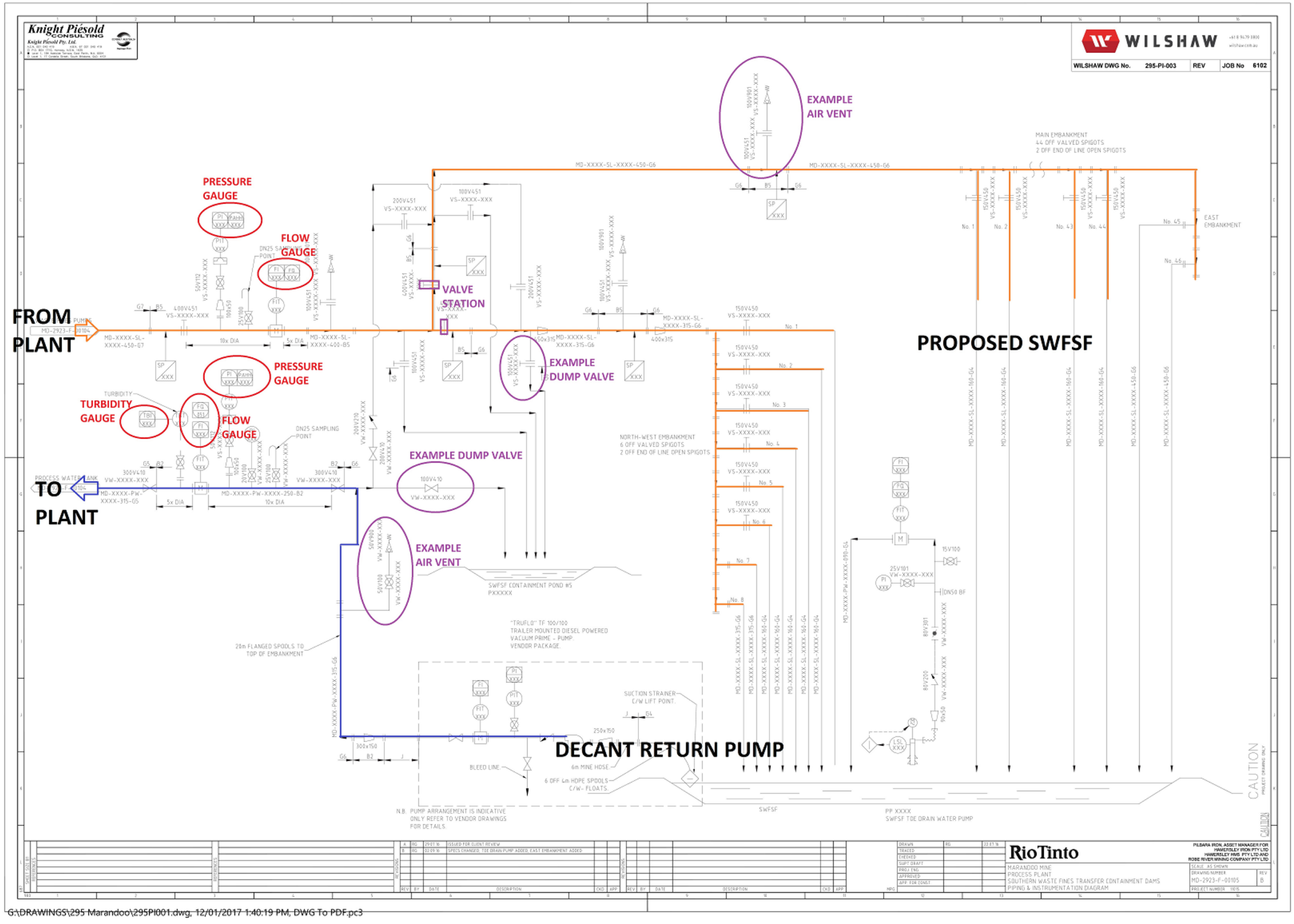


Figure 8: Pipeline schematics for the pipeline near the SWFSF

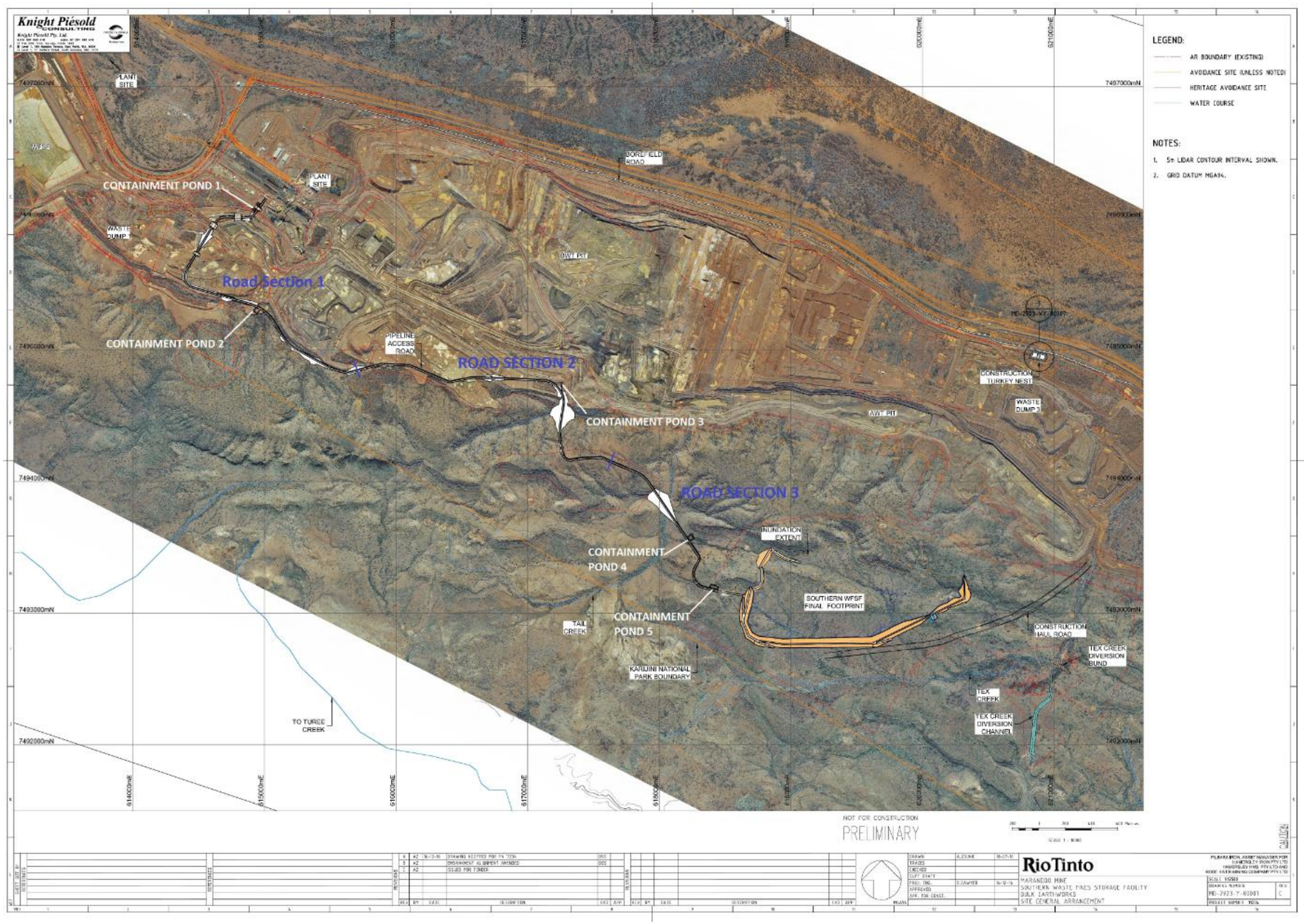


Figure 9: General arrangement of the pipeline corridor (RTIO-HSE-0317137)

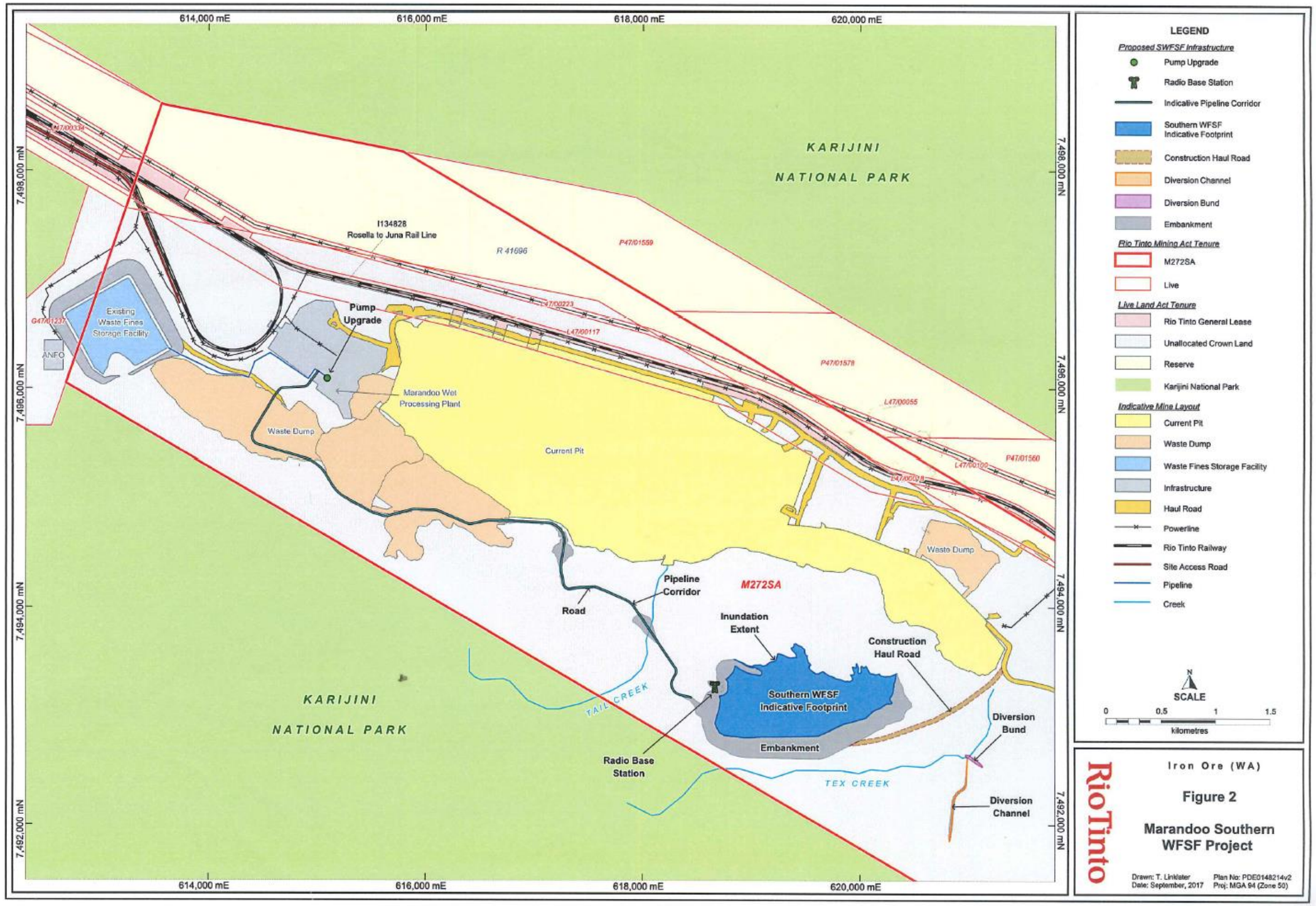


Figure 10: Pipeline route in relation to other site infrastructure.

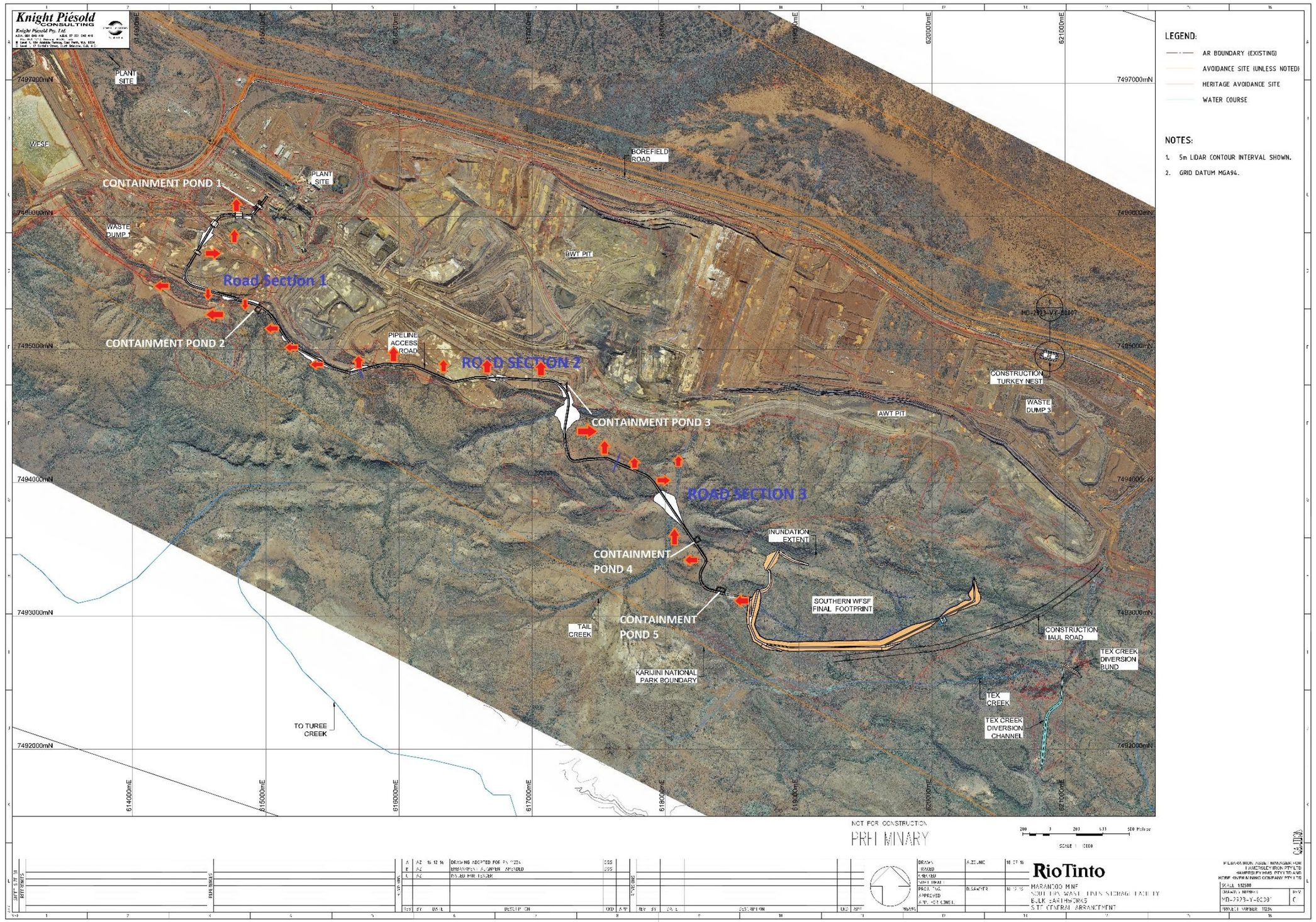


Figure 11: Assessment of pipeline failure (likely discharge flow paths if secondary containment failed indicated by red arrows)

3.3 Other approvals

The Licensee has provided the following information relating to other approvals as outlined in Table 8.

Table 8: **Relevant approvals**

Legislation	Number	Approval
Environmental Protection Act 1986	MS (Ministerial Statement) 1020	Marandoo Iron Ore Mine operates under MS1020. MS1020 was granted on 28 October 2015 and supersedes MS286, MS598 and MS833
Iron Ore (Hamersley Range) Agreement Act 1963	Act no: 024 of 1963 (12 Eliz.II No.24)	The development of Marandoo iron Ore Mine is subject to the *Iron Ore (Hamersley Range) Agreement Act 1963*

3.4 Location and receptors

Table 9 lists the relevant sensitive land uses in the vicinity of the SWFSF which may be receptors relevant to the proposed amendment.

Table 9: **Receptors and distance from activity boundary**

Residential and sensitive premises	Distance from SWFSF
Karijini camping grounds	Camping grounds more than 30 km
Tom Price Town Site	More than 30 km
Aboriginal communities	More than 30 km

Table 10 lists the relevant environmental receptors in the vicinity of the SWFSF which may be receptors relevant to the proposed amendment.

Table 10: **Environmental receptors and distance from activity boundary**

Environmental receptors	Distance from SWFSF
Coolibah Priority Ecological Site	Located within the 5 km buffer
Priority 2 flora	More than 4 km
Priority 4 Fauna (mammals)	Approximately 750 m

Table 11 lists the relevant specified ecosystems in the vicinity of the SWFSF which may be receptors relevant to the proposed amendment.

Table 11: Environmental values

Specified ecosystems	Distance from the SWFSF
Karijini National Park	Within 150 m at its closest point

The distances to groundwater and water sources are shown in Table 12.

Table 12: Groundwater and water sources

Groundwater and water sources	Distance from SWFSF
Minor non-perennial watercourses	Several creek lines throughout the SWFSF footprint. Tex Creek to be diverted as part of the works[1]. The Tex Creek is located approximately 100 m to the south of the SWFSF. The creek is approximately 2 m below the natural ground level of the SWFSF.
Public drinking water source areas	Southern Fortescue and Marandoo P1 Water Reserve located more than 400 metres to the north of the facility. A field programme and development of a hydrogeological conceptualisation (RTIO-PDE-0145728) has determined that it is unlikely that there is hydraulic connectivity between the SWFSF and this P1 Water Reserve.
Groundwater	All bores located within 10 km are owned by mining companies or have no current owner. The bores are for observation, exploration or production (where use is available). Located within the Pilbara Surface Water Area and Pilbara Groundwater Area proclaimed under the *Rights in Water and Irrigation Act 1914* (RiWI Act). Groundwater in this region is typically fresh. Depth to groundwater ranges from 25 to 125 mbgl and is commonly between 50- 60 mbgl within the basin of the SWFSF (RTIO-HSE-0305356). Groundwater movement within the Fortescue group is most likely to be towards the south-east (RTIO-PDE-0145728). A search of the Bureau of Meteorology's Groundwater Dependent Ecosystems Atlas identified a terrestrial groundwater dependent ecosystem within the SWFSF footprint (spinifex grassland).

Note 1: Tex Creek diversion is authorised under MS1020 and is not assessed in this amendment.

3.5 Consultation

Letters of referral were sent to the Department of Biodiversity, Conservation and Attractions (DBCA), the Department of Mines Industry Regulation and Safety (DMIRS), the former Department of Water (now Regulatory Services (Water) in DWER) and the Environmental Protection Authority (now EPA Services in DWER).

3.5.1 DBCA

The comments on the SWFSF received from DBCA are summarised below:

- The location of the proposed facility is approximately 150 m from the boundary of Karijini National Park and the application documents indicate that there is some risk (if a dam break incident occurred) that waste fines could enter the park. The risk of unplanned impacts (and ongoing liability) from the facility should be addressed as a part of approval considerations.
- The existing mine closure plan for Marandoo does not specifically address rehabilitation and closure of the facility at this location. Additional certainty in relation to definition of proposed mine closure outcomes for the site and adjacent national park would be beneficial.
- The location of the facility is likely to compromise several of the proposed weed monitoring sites required under MS1020. DBCA have contacted the EPA regarding this matter.

3.5.2 Department of Mines Industry Regulation and Safety geotechnical assessment

DMIRS has undertaken a geotechnical assessment of the SWFSF detailed design (KP, 2017) and requested further information. The detailed design is contained within Appendix 1 to this amendment. Further information to support the geotechnical assessment and provided by the Licensee is at Appendix 2 of this amendment.

After receipt of the further information at Appendix 2, DMIRS determined that the detailed designs are satisfactory. The geotechnical stability of the SWFSF will not be assessed here.

3.5.3 Regulatory Services (Water)

The comments on the SWFSF received from the former DoW on 19 October 2017 are summarised below:

- The facility requires assessment by DMIRS geotechnical specialists.
- The construction/final specifications are unclear, including height above ground level and compaction/preparation of ground prior to deposition.
- Decommissioning and closure of the facility has been inadequately addressed and requires consideration as part of the approved closure plan.
- The waste fines composition data is limited and therefore is it difficult to draw conclusion that the material is benign. An updated geochemical assessment is recommended.
- It is expected that the Tex creek modifications are to occur consistent with MS1020.

Additional comments were provided on 26 October 2017 after review of the SWFSF design report prepared by Knight Piésold. The former DoW advised that the facility is unlikely to impact on water resources in the area and that additional characterization work has identified several elements that exceed ecological criteria, and that these must be added to the monitoring parameters.

DoW requested that the groundwater monitoring undertaken as part of the proposed annual monitoring with contingency responses to form a part of the licence conditions.

DoW initially expressed concerns Banjima pool would be impacted, but following further advice DoW were assured that impacts to this pool from Tex Creek were unlikely.

3.5.4 Environmental Protection Authority

EPA Services provided the following comments on 14 February 2018:

- Condition 6 of Ministerial Statement 1020 relates to Springs, Pools and Creeklines of Karijini National Park. This condition requires that groundwater abstraction, dewatering and the interception of surface water flows does not adversely affect any of the springs, pools or creeklines in Karijini National Park, or their surrounding vegetation or surrounding Aboriginal heritage sites.
- The proponent is required to comply with this condition, which is administered through the Part IV Compliance Branch, which currently sits within the DWER Compliance and Enforcement Division.
- As the proposal does not require any change to the Ministerial Statement through Sections 45C or 46 of the *Environmental Protection Act 1986*, EPA Services has no comment to make other than that it is incumbent on the proponent to ensure that they meet the requirements of Ministerial Statement 1020.

4.0 Risk assessment

4.1 Determination of emission, pathway and receptor

Tables 13 and 14 describe 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.

Table 13: Risk assessment for proposed amendments during construction

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	Construction of SWFSF, decant infrastructure, decant and tailings pipeline and pipeline corridor	Dust: Associated with clearing, bulk and detailed earthworks	No sensitive receptors in close proximity No threatened or priority flora in close proximity	Air: Transport through air then deposition	Health and amenity impacts	Slight	Rare	Low	No camping grounds or residential premises are located within 30 km of the SWFSF. There are “no notable public roads, camps, tracks located within the immediate Turee catchment area to the south-east” (KP 2017). The closest priority flora is located more than 4 km away. Noting the lack of receptors, the risk of dust impacts during construction has been determined as ***low***.
		Noise: Associated with construction works and heavy machinery	No sensitive receptors in close proximity	Air: Noise within the frequency range of the human ear	Health and amenity impacts	Slight	Rare	Low	No camping grounds or residential premises are located within 30 km of the SWFSF. The risk of noise impact during construction has therefore been determined as ***low***.
		Stormwater: Sediment laden stormwater generated through bulk and detailed earthworks	Surface water systems and aquatic ecosystems	Overland sheet flow prior to draining to surface water systems	Increased turbidity in surface water systems causing an impact to aquatic ecosystems	Slight	Rare	Low	Bulk earthworks will be undertaken but are likely to involve the movement of coarse material which will settle quickly, creating less opportunity for runoff. The risk of stormwater impacts during construction has therefore been determined as ***low***. The closest watercourse is the Tex Creek, which currently flows into mine areas. The Tex Creek will be diverted south as part of the works on the SWFSF. This is authorized under MS 1020.
		Spills and breach of containment systems causing a release of hydrocarbons/ lubricants	Localised soils Groundwater and surface water systems No threatened or priority flora in close proximity	Direct discharge	Soil contamination inhibiting vegetation growth and survival	Slight	Unlikely	Low	Only small quantities of hydrocarbons are to be stored for refueling purposes and will be stored in purpose built dangerous goods cabinets and/or on bunded pallets. No threatened or priority flora are located within 4 km of the SWFSF. Noting the small quantities of hydrocarbons, the risk has been determined as ***low***.

Table 14: Risk assessment for proposed amendments during operation

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	Operation of SWFSF	Dust: From exposed surfaces of the SWFSF Dust from unsealed roads and access roads	No sensitive receptors in close proximity No threatened of priority flora in close proximity	Air: Transport through air then deposition	Health and amenity impacts Impacts on the ability for plants to photosynthesize/ oxidative stress	Slight	Rare	Low	No camping ground or residential premises is located within 30 km of the SWFSF. There are "no notable public roads, camps, tracks located within the immediate Turee catchment area to the south-east" (KP 2017). Noting the lack of receptors, the risk of dust impacts during operation has been determined as ***low***.
		Waste: Waste fines slurry/liquor	Native vegetation No threatened or priority flora in close proximity Underlying groundwater Karijini National Park surface water systems	Overtopping of the SWFSF causing a direct discharge to ground	Poor vegetation health or death from tailings inundation Soil contamination through release of liquors with elevated metals/metalloids	Minor	Rare	Low	The SWFSF is to be constructed with adequate storage to contain a 1% AEP rainfall event over 72 hours (376 mm) with the decant not operational and to maintain adequate freeboard to the spillway invert (KP, 2017). The risk of overtopping is considered to be low due to the Licensee's proposed controls. This requirement will be conditioned in the works approval.
		Waste: Seepage from tailings	Underlying groundwater capable of beneficial use Surrounding vegetation Tex Creek to the south of the SWFSF	Seepage of leachate through the base of the SWFSF and infiltration to groundwater Seepage forming a surficial aquifer resulting in a pathway to the Tex Creek	Contamination of groundwater with beneficial uses Surficial aquifer inundating root zones of vegetation, resulting in poor vegetation health or death Contamination of the Tex Creek	Moderate	Unlikely	Medium	See detailed risk assessment at section 4.4 below.
		Waste: Tailings/ tailings supernatant	Vegetation adjacent to tailings pipeline alignment Karijini National Park surface water systems	Rupture of pipeline causing tailings discharge to land and runoff during a rainfall event	Soil contamination through release of liquors with elevated levels of metals/metalloids Impacts to vegetation health if inundated by tailings slurry/supernatant Run-off into ephemeral surface water systems causing degradation of water quality and impacts to aquatic fauna Discharge to Karijiini National Park during a storm event	Moderate	Possible	Medium	See detailed risk assessment at section 4.5 below.

4.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 15 below.

Table 15: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 16 below.

Table 16: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity

Likelihood	
The following criteria has been used to determine the likelihood of the Risk Event occurring.	
Almost Certain	The risk event is expected to occur in most circumstances
Unlikely	The risk event will probably not occur in most circumstances
Rare	The risk event may only occur in exceptional circumstances

Consequence		
The following criteria has been used to determine the consequences of a Risk Event occurring:		
	Environment	**Public health* and amenity (such as air and water quality, noise, and odour)**
Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*
* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*
"onsite**"** means within the Prescribed Premises boundary.

4.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 17 below:

Table 17: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

4.4 Risk Assessment – tailings seepage from the SWFSF impacting on groundwater quality and causing groundwater mounding

Description of tailings seepage

Seepage from the SWFSF impacting groundwater quality within the unconfined fractured rock aquifer. Groundwater is fresh and is therefore capable of beneficial use. A seepage model indicates that monthly seepage will be between 6,680 and 11,100 m^3 per month for the initial 12 months followed by annual seepage rates as depicted in Table 18.

Table 18: Water Balance Results – Annual Average Conditions (KP, 2017)

Year	Water in Slurry (Mm^3)	Rainfall Runoff (Mm^3)	Pond Evaporation (Mm^3)	Total Retained (Mm^3)	Waste Fines Seepage (Mm^3)	SWFSF Water Returned (Mm^3)
2018	4.82	0.13	1.11	1.49	1.18	1.13
2019	4.84	0.19	2.10	1.05	0.70	1.18
2020	4.99	0.21	2.24	0.99	0.72	1.25
2021	5.02	0.23	2.32	0.96	0.69	1.28
2022	3.95	0.25	2.05	0.47	0.57	1.12
2023	4.52	0.27	2.30	0.86	0.43	1.19
2024	4.79	0.29	2.46	0.99	0.47	1.17
2025	4.74	0.30	2.49	0.94	0.48	1.14
2026	4.74	0.31	2.53	0.92	0.46	1.14
2027	4.40	0.32	2.47	0.76	0.42	1.07
2028	4.32	0.33	2.48	0.75	0.36	1.07
2029	1.07	0.20	0.71	0.16	0.07	0.33

Seepage through the foundation varies depending on the foundation materials:

- Colluvium – 1 x 10^{-7} m/s.
- Shale – vertical – 1 x 10^{-8} m/s.
- Shale – horizontal – 1 x 10^{-7} m/s.
- Chert/Banded Iron Formation – 1 x 10^{-5} m/s.

Figure 6 shows a cross-section of the facility depicting the variation in foundation materials. Any degradation in groundwater quality could impact on surface water if there is connectivity through a surficial aquifer to the Tex Creek system. The Tex Creek is located immediately south of the facility with groundwater flow likely to be towards the south-east.

Identification and general characterisation of emission

The physical and chemical properties of the waste fines have been characterised by ChemCentre. Refer to section 3.2.8 for more details. This testing has comprised of bottle leachate analysis and sequential extraction leach testing.

The bottle leachate analysis indicates that silver, aluminium, arsenic, cadmium, cobalt, manganese, molybdenum, nickel, lead and selenium are unlikely to leach out at levels of environmental concern. DWER notes that the results for mercury were not provided at a sufficient detection level to allow a comparison against the ANZECC 95% trigger levels.

Results for major ions and nitrate indicate that these will be “washed-out” as the concentration of these substances decreased in the sequential water leachate tests.

Boron and chromium exceeded the ANZECC 95% trigger values for most leachates tested. No results exceeded the livestock drinking water guidelines.

Elements that are present in the water extractable fraction of the sequential leach testing may be mobilised by infiltrating rainwater. The only element slightly elevated when compared to the ANZECC 95% trigger values in the water extractable fraction is aluminium. Elevated levels of aluminium, chromium, copper and zinc occur in the carbonate fraction, however, these elements may not be mobilized by infiltrating rainwater, but may be mobilized by acidic seepage (ChemCentre, 2017). Acidic conditions are not expected as the tailings are classified as non-acid forming.

Groundwater movement within the Fortescue group is most likely to be towards the south-east (RTIO-PDE-0145728). Depth to groundwater ranges between 25 to 125 mbgl, and is commonly between 50-60 mbgl within the basin of the SWFSF (RTIO-HSE-0305356).

Description of potential adverse impact from the emission

Seepage is likely to radiate out from beneath the facility in all directions with regional groundwater flow to the south-east. Seepage is likely to contain elevated levels of aluminium, boron and chromium. Seepage modelling indicates that groundwater mounding may occur beneath the facility during Stage 1B, Stage 2 and the Final Stage embankment. This may result in positive pressure in the vibrating wire piezometers when a large pond exists. A creek system is located 100 m from the facility and is located 2 m below the facility in the landscape.

Criteria for assessment

ANZECC/ARMCANZ 2000 provides default trigger values for fresh and marine water quality. ANZECC/ARMCANZ 2000 also provides trigger values for livestock drinking water. The ASC (Assessment of Site Contamination) NEPM provides health investigation levels and ecological investigation levels for soils and groundwater.

Applicant/Licensee controls

This assessment has reviewed the controls set out in Table 19 below.

Table 19: Applicant's/Licensee's proposed controls for seepage

Site infrastructure	Description
Tailings deposition	
Supernatant pond	The active beach will be rotated around the facility to ensure the pond migrates up the spine of the valley.
	Pond to be located remote from the embankment.
Seepage controls	
Base materials	No engineered liner will be utilised – natural base materials have the following permeability: • Colluvium – 1 x 10^{-7} m/s • Shale – vertical – 1 x 10^{-8} m/s • Shale – horizontal – 1 x 10^{-7} m/s • Chert/Banded Iron Formation – 1 x 10^{-5} m/s
Embankment seepage controls	Type 1 cut-off trench, located beneath the upstream toe of the main and southwest embankments. The trench will be excavated to a depth of around 3 m through the colluvium into weathered shale.

Site infrastructure	Description
	Type 2 cut off trench will be located beneath the upstream toe of the northeast and northwest embankments and will be excavated to a depth of around 1 m. Type 3 cut off trench, located where exposed BIF or near surface bedrock refusal on the valley site slopes is encountered. The northeast and northwest embankments will incorporate a blanket drain. This blanket drain will be located within the natural low spot of the original creek line at the centre of each valley. The blanket drains will be monitored for seepage. If seepage is detected a collector trench and collector pond will be installed for the recovery of seepage.
	A toe drain will be constructed along the upstream toe of the main embankment where a type 1 cut off trench is present. Main collector drains will form the underdrainage system The layout will generally follow the existing creek depressions The toe drain and main collectors will drain by gravity into the underdrainage sump and will be pumped out via a submersible pump for recycling back into the facility.
Underdrainage	
Underdrainage sump and riser	600 mm diameter steel riser pipe from the base of the sump to the embankment crest. Coarse clean rock filled collection sump covered with a fine sand filter media. A layer of geotextile will cover the sump which will be overlain by a second layer of fine sand filter media. A submersible pump with flow control switches and flowmeter. Constructed at the lowest topographic point in the basin. To collect seepage and return to the facility supernatant pond. Power and control infrastructure located on the embankment crest.
Decant return	
Diesel powered decant trailer pump	A diesel powered decant trailer pump will initially retreat up the main spine of the valley for stage 1. The diesel pump will consist of a floating intake located in the supernatant pond which can reduce the pond to around 1 m deep. This pump will be fitted with a turbidity meter to automatically turn off. The pump will have internal controls to auto off for low flow, high pressure, low fuel etc. Remote off will be incorporated in the event of emergency or the process water tank at the plant reached a high level. A decant causeway will be constructed at the end of stage 1 and will be relocated vertically for each stage.
Monitoring	
Vibrating wire piezometers	Vibrating wire piezometers (VWPs) to be installed to monitor phreatic surface. Location of VWPs:

Site infrastructure	Description
	BOREHOLE LOCATION

VWP No.	EASTING	NORTHING	R.L. (m)
BH-RIDGE-01	620017.0	7493285.0	-
BH-RIDGE-02	618988.0	7493553.0	-
BH-TC-01	618091.3	7493836.2	735.6
BH-TEX-01	621040.4	7492620.3	728.1
BH-WFSF-01	618777.8	7493416.9	749.2
BH-WFSF-02	618641.8	7493025.7	748.7
BH-WFSF-03	618620.1	7492752.0	756.5
BH-WFSF-04	618934.2	7492738.9	743.6
BH-WFSF-05	618970.1	7492626.1	742.0
BH-WFSF-06	619202.8	7492673.7	740.3
BH-WFSF-07	619279.5	7492740.7	740.9
BH-WFSF-08	619613.1	7492744.3	738.9
BH-WFSF-09	619804.9	7492843.8	739.8
BH-WFSF-10	620159.4	7493040.9	748.8
BH-WFSF-11	620294.1	7493108.3	752.6
BH-WFSF-12	618952.7	7493185.3	751.5
BH-WFSF-13	619274.5	7492926.5	743.9
BH-WFSF-14	619289.1	7493199.5	762.2
BH-WFSF-15	619878.4	7493138.2	744.4
BH-WFSF-16	618979.3	7492998.8	744.8
BH-WFSF-17	618670.6	7493484.8	747.2

Pond level staffs	Pond level staffs to be installed parallel to the decant channel and causeway.
Groundwater monitoring bores	Groundwater monitoring bores:

Monitoring Bore Locations		
Name	Easting	Northing
MB16MN0002	620055.7	7493582.8
MB16MN0003	621146.0	7492981.7
MB16MN0004	620426.3	7492895.2
MB16MN0006	619774.4	7492553.8
MB16MN0007	619004.5	7492528.3
MB16MN0008	618494.1	7493146.8
MB16MN0009	618668.5	7493706.6

Site infrastructure	Description		
	MB16MN0010	619004.5	7492528.3
	MB16MN0011	619774.4	7492553.8
	MB16MN0012	621146.0	7492981.7
	MB16MN0013	619217.0	7493706.6

Key findings

The Delegated Officer has reviewed the information regarding seepage and has found:

1. Only one sample of tailings material has been characterised by geochemical testing.
2. Seepage will potentially contain elevated levels of aluminium, boron, chromium and nitrate above the 95% trigger values in ANZECC/ARMCANZ 2000.
3. The active beach will be rotated around the facility to ensure the pond migrates up the spine of the valley away from the embankment.
4. Levels of contaminants do not exceed the livestock drinking water guidelines.
5. A surficial aquifer is expected to be created beneath the facility.
6. A toe drain will be constructed along the upstream toe of the main embankment where a type 1 cut off trench is present. The type 1 cut off trench will be constructed at a depth of 3 metres.
7. Main collector drains will form the underdrainage system.
8. The toe drain and main collectors will drain by gravity into the underdrainage sump and will be pumped out via a submersible pump for recycling back into the facility.
9. The adjacent Tex Creek is to be diverted south towards Karijini National Park.
10. The Tex Creek diversion channel will intersect creek systems within Karijini National Park approximately 1.2 km downstream.
11. There are no downstream pools.

Consequence

If seepage alters groundwater quality and the surficial aquifer is connected to the Tex Creek system, then the Delegated Officer has determined that the 95% trigger values for freshwater ecosystems are at risk of not being met. This could cause mid-level on site impacts and low level off site impacts (Karijini Park boundary is 1.2km downstream) on a local scale. Therefore, the Delegated Officer considers the consequence of seepage to be ***moderate***.

Likelihood of Risk Event

The Delegated Officer notes that a cut off trench is to be constructed 3 m through the

colluvium into the underlying weathered shale continuously along the entire main embankment to reduce seepage under the embankment. The supernatant pond is also to be directed away from the embankment towards the ridge. Furthermore, the groundwater is at a minimum depth of 25 mbgl. As such, the likelihood of seepage impacting groundwater quality and surface water quality will probably not occur in most circumstances. Therefore, the likelihood of seepage impacts is ***unlikely***.

Overall rating of seepage

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 15) and determined that the overall rating for the risk of seepage is ***medium***.

4.5 Detailed Risk Assessment – tailings or decant return pipeline rupture

Description of Risk Event

Release of tailings slurry and/or supernatant to land/vegetation and subsequent infiltration to groundwater and/or run-off to ephemeral creek system as a result of pipeline failure. Run off could enter Karijini National Park during a rainfall event.

Identification and general characterisation of emission

The physical and chemical properties have been characterised by ChemCentre. Refer to section 3.2.8 for more details. The tailings are significantly enriched in iron and silver.

Table 7 contains the water quality of the tailings supernatant. A comparison against the freshwater guidelines and livestock drinking water guidelines in ANZECC/ARMCANZ 2000 shows that chromium, copper are elevated in the tailings supernatant with nickel being slightly elevated in two samples when compared against the 95% trigger values for freshwater ecosystems. The phosphorus levels are elevated when compared against the default trigger values for tropical Australia. No samples exceeded the livestock drinking water guidelines for the parameters provided.

Description of potential adverse impact from the emission

Figures 9 depicts the pipeline location with the pipeline being approximately 6.8 km in length. The majority of the discharge in the event of pipeline failure is to be directed into the mine areas as depicted in Figure 10. The assessment of spills undertaken by the Licensee has determined that Road Section 1(behind Waste Dump 1) may result in tailings potentially being discharged off lease. The Licensee has stated that the "backfill area behind Waste Dump 1 is extremely wide and flat, with the waste fines expected to pond locally" (RTIO-HSE-0317137). The Licensee has stated that "rainfall may carry waste fines off site if not cleaned up prior to rainfall events" (RTIO-HSE-0317137).

The assessment also shows that there will be an uncontained discharge at Road Section 3 in the vicinity of Tail Creek. The majority of this discharge is directed to Tail Creek, which discharges into the current pit. Any offsite discharge could result in tailings/supernatant being discharged to Karijini National Park.

Criteria for assessment

ANZECC/ARMCANZ 2000 provides default trigger values for fresh and marine water quality. ANZECC/ARMCANZ 2000 also provides trigger values for livestock drinking water. The ASC NEPM provides health investigation levels and ecological investigation levels for soils and groundwater.

Applicant/Licensee controls

This assessment has reviewed the controls set out in Table 20 below.

Table 20: Applicant's/Licensee's proposed controls for tailings/return pipeline failure

Site infrastructure	Description
Waste fines pipeline (2) and decant return pipeline (1)	A 3m wide permanent pipeline corridor is to be established.
	The waste fines pipelines are to consist of a 300-350 mm OD HDPE lined steel pipe for ~1.4 km, followed by a 400 mm OD PN20 HDPE pipeline for a total length of ~ 8.7 km to the far east side of the SWFSF.
	The decant pipeline is to consist of a 225 mm OD PN10 and 315 mm OD PN16 HDPE pipeline.
	Provision for decant water flushing for each waste fines distribution lines
	All pipelines will contain air vents/vacuum breakers at pipeline high spots (five locations) and dump valves at all low spots (five locations). At each low spot, the dump valves will report to containment ponds (5 locations).
	The decant pipeline is to follow the waste fines deliver line back to the plant utilising the same containment ponds at low spots (5 locations) with vents at high spots.
	Waste fines pipelines to be installed with a valve station, pressure gauges, flow gauges, dump valves and air vents.
	Decant pipelines to be installed with valve station, turbidity gauge, pressure gauges, flow gauges, dump valves and air vents.
Pipeline containment ponds	The 5 containment ponds are to be sized (2000 m^3) to contain the full pipe volume plus two hours of continuous pumping.
Monitoring	The Licensee proposes to monitor all pipelines for leaks and wall stability during operation to ensure there is no failure of embankments.
	A differential flow reading between the plant flowmeter and SWFSF flowmeter will be monitored for the tailings pipelines. Any significant difference in flow detection will trigger an alarm associated within a real time monitoring system
	Any differential flow reading between the decant flow meter and the process plant flow meter will also be monitoring. Any significant difference in flow will be set to alarm or a no flow at the process plant

Key finding

The Delegated Officer has reviewed the information regarding pipeline rupture and has found:

1. The tailings are enriched in iron and silver.
2. The tailings supernatant contains elevated levels of chromium, copper with nickel being slightly elevated in 2 samples when compared against the 95% trigger values for freshwater ecosystems. The phosphorus levels are elevated when compared against the default trigger values for tropical Australia. No samples exceed the livestock drinking water guidelines for the parameters provided.
3. Monitoring of the pipeline will be undertaken with alarm systems to enable pipeline shut down.
4. 5 pipeline containment ponds at low spots designed to contain the full pipe volume plus two hours of continuous pumping
5. The majority of the discharge in the event of pipeline failure is to be directed into the mine areas
6. The Licensee has determined that spills within Road Section 1(behind Waste Dump 1) may result in tailings potentially being discharged off lease but has determine this unlikely due to this area “being extremely wide and flat”.
7. Based on Figure 10 and the topography, a spill within Road Section 3 could potential flow towards Tail Creek.
8. Rainfall may carry waste fines off site if not cleaned up prior to rainfall events
9. Tailings/supernatant could be discharged to the Tail Creek at Road Section 3. Tail Creek reports to the pit.

Consequence

If a rupture of the tailings/decant pipeline occurs, there could be mid-level on site impacts and low level off site impacts to surface water systems on a local scale as the 95% trigger values for freshwater ecosystems are at risk of not being met. Therefore, the Delegated considers the consequence of pipeline rupture to be ***moderate***.

Likelihood of Risk Event

Based on the Licensee’s proposed controls and that spills within Road Section 1 could result in tailings being discharged off lease and that spills within Road Section 3 could result in tailings being discharged to Tail Creek, the Delegated Officer has determined that the likelihood of tailings rupture causing an impact to freshwater ecosystems occurring will be possible. Therefore, the Delegated Officer considers the likelihood of tailings/supernatant being discharged to vegetation and surface water systems as ***possible***.

Overall rating of pipeline rupture

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 15) and determined that the overall rating for the risk of pipeline rupture is ***medium***.

5.0 Decision

The Amendment to Licence L6869/1992/12 is granted.

Definitions and reporting conditions have been updated to reflect the changes in the department administering the *Environmental Protection Act 1986*. Changes have been made to the Annual Audit Compliance Reporting condition in line with DWER's *Guideline: Annual Audit Compliance Reports* August 2016.

Increase in category 12 production

Changes have been made to the Licence authorising an increased premises production capacity for Category 12: Screening etc. of materials from 4,380,000 tonnes per annual period to 10,000,000 tonnes per annual period.

Request to amend monitoring parameters

The Licensee's request to reduce the monitoring parameters listed in Column 1 of Table 21 below for the reasons specified in Column 2 of Table 21 below has been assessed. The outcome of the assessment is listed in Column 3 of Table 21. Condition 26 has been amended accordingly.

Table 21: Assessment of dewatering monitoring parameters in condition 29.

Column 1	**Column 2**	**Column 3**
Parameter	**RTIO reason for removal**	**DWER's Decision**
Arsenic	Currently not elevated in discharge	Accepted and is removed from condition 29 for both discharges. 12 samples of results provided in the 2015, 2016 and 2017 AERs shows all values consistently below the 95% protection level in ANZECC/ARMCANZ.
Boron	Currently not elevated in discharge	Not accepted; boron within the contingency discharge has been close or elevated when compared against the 95% protection level in ANZECC/ARMCANZ on 2 out of the last 12 samples.
Cadmium	Currently not elevated in discharge	Accepted and is removed from condition 29 for both discharges. 12 samples of results provided in the 2015, 2016 and 2017 AERs shows all values consistently below the 95% protection level in ANZECC/ARMCANZ.
Chloride	Currently not elevated in discharge	Not accepted; major ions act as a precursor to elevation in other contaminants. All major ions to remain on the licence.
Lead	Currently not elevated in discharge	Accepted and is removed from condition 29 for both discharges. 12 samples of results provided in the 2015, 2016 and

Column 1	Column 2	Column 3
Parameter	**RTIO reason for removal**	**DWER's Decision**
		2017 AERs shows all values consistently below the site specific trigger value and the 95% protection level in ANZECC/ARMCANZ.
Magnesium	Currently not elevated in discharge	Not accepted; major ions act as a precursor to elevation in other contaminants. All major ions to remain on the licence.
Manganese	Currently not elevated in discharge or production bore.	Accepted and is removed from condition 29 for both discharges. 12 samples of results provided in the 2015, 2016 and 2017 AERs shows all values significantly below the site specific trigger value and the 95% protection level in ANZECC/ARMCANZ.
Mercury	Currently not elevated in discharge	Not accepted; a sample in 2017 for the contingency discharge exceeded the SSTV (site specific trigger value) and ANZECC/ARMCANZ trigger value.
Molybdenum	Currently not elevated in discharge	Not accepted; one sample exceeded SSTV in Q4 2015 for the HAP discharge.
Nickel	Currently not elevated in discharge or production bore.	Accepted and is removed from condition 29 for both discharges. 12 samples of results provided in the 2015, 2016 and 2017 AERs shows all values significantly below the site specific trigger value and the 95% protection level in ANZECC/ARMCANZ.
Nitrate	Not recommended as discharge water does not exceed the new SSTV of 11 mg/L.	Not accepted; the 95% trigger value in ANZECC/ARMCANZ is currently 0.7 mg/L. All samples currently exceed this value for both discharges.
Potassium	Not recommended for continued monitoring as concentration from major ions (i.e. Ca, K, Mg, HCO_3, Na, Cl, SO_4) captured by monitoring of EC.	Not currently on the licence, to be added as major ions are a precursor to elevation in other contaminants.
Selenium	Currently not elevated in discharge or production bore.	Accepted and is removed from condition 29 for both discharges. 12 samples of results provided in the 2015, 2016 and 2017 AERs shows all values significantly below the site specific trigger value and

Column 1	Column 2	Column 3
Parameter	**RTIO reason for removal**	**DWER's Decision**
		the 95% protection level in ANZECC/ARMCANZ.
Sodium	Not recommended for continued monitoring as concentration from major ions (i.e. Ca, K, Mg, HCO_3, NA, Cl, SO_4) captured by monitoring of EC.	Not currently on the licence, to be added as major ions are a precursor to elevation in other contaminants.
Sulphate	Not recommended for continued monitoring. Should EC increase sulphate should be re-instated into the monitoring program	Note accepted; major ions act as a precursor to elevation in other contaminants. All major ions to remain on the licence.
Turbidity	Currently not elevated in discharge, but elevated in creek.	Not accepted; several values for the contingency discharge exceed the SSTV.
Zinc	Not recommended for continued monitoring as currently not elevated in discharge water. Zn should be reinstated in the monitoring program should significant enrichment be identified in ongoing sampling of production bores.	Not accepted; zinc levels are elevated in the HAP (Hammersley Agricultural Project) discharge and exceed the SSTV and the 95% protection level in ANZECC/ARMCANZ.

Mobile crushing and screening

Condition 38 has been added to the Licence for the mobile crushing and screening plants that are to be utilised on site. The Licensee's controls within the Iron Ore (WA) Mobile Crushing and Screening Management Plan (RTIO-HSE-0235877) have been conditioned.

Tex Creek Diversion

The Tex Creek diversion works are not authorised by the Licence. This work is not within the scope of Part V of the EP Act. Condition 6 of Ministerial Statement 1020 relates to Springs, Pools and Creeklines of Karijini National Park. This condition requires that groundwater abstraction, dewatering or any interception of surface water flows does not adversely affect any of the springs, pools or creeklines in Karijini National Park, or their surrounding vegetation or surrounding Aboriginal heritage sites.

Southern Waste Fines Storage Facility and associated infrastructure

New conditions 39 to 51 pertain to the construction and operation of the Southern Waste Fines Storage Facility. The Licensee is required to construct the Southern Waste Fines Storage Facility in accordance with the detailed design prepared by Knight Piésold consulting (PE801-00080/36). DMIRS has undertaken a geotechnical review of the detailed design and determined it as satisfactory. The groundwater monitoring locations proposed in the report

have been conditioned through condition 49 of the Licence. The Licensee's pipeline controls have been conditioned.

Further regulatory controls have been applied to the pipeline. The Licensee is required to construct bunding in Road Section 1 and Road Section 3 in areas of the pipeline where leaks will not be contained by containment ponds or the mine area. The majority of the discharge in this event will be directed into the mine area and remain on lease. The assessment has determined that Road Section 1(behind Waste Dump 1) may result in tailings potentially being discharged off lease. The Licensee has stated that the "backfill area behind Waste Dump 1 is extremely wide and flat, with the waste fines expected to pond locally" (RTIO-HSE-0317137). The assessment also shows that there will be an uncontained discharge at Road Section 3 in the vicinity of Tail Creek with the majority of this discharge being directed to Tail Creek which flows into the current pit.

Whilst a surficial aquifer is likely to form beneath the facility, it is expected that the seepage controls within the main embankment will capture the component of the seepage that could migrate to the Tex Creek. However, regulatory controls have been applied in the form of a groundwater limit in the bores between the SWFSF and the Tex Creek through condition 50. This will ensure that there is no significant impact to the Tex Creek system which will flow off site to Karijini National Park once diverted. In the event that there the groundwater limit is breached, the Licensee will be required to undertake an investigation into the environmental impacts of seepage from the SWFSF in accordance with condition 51 of the Licence.

Licensee's comments

The Licensee was provided with the draft Amendment Notice on 25 May 2018. Comments received from the Licensee on 11 June 2018 have been considered by the Delegated Officer as shown in Appendix 3. An additional draft was forwarded to the Licensee on 18 June 2018, with comments received on 20 June 2018. A summary of the key remaining comments on the second draft is also included in Appendix 3.

Amendment

1. The Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline.

PRESCRIBED PREMISES CATEGORY
Schedule 1 of the Environmental Protection Regulations 1987

CATEGORY NUMBER	***CATEGORY DESCRIPTION***	***CATEGORY PRODUCTION OR DESIGN CAPACITY***	***PREMISES PRODUCTION OR DESIGN CAPACITY***
5	*Processing or beneficiation of metallic or non-metallic ore*	*50,000 tonnes or more per year*	*20,000,000 tonnes per annual period*
6	*Mine dewatering*	*50,000 tonnes or more per year*	*36,500,000 tonnes per annual period*
12	*Screening, etc. of material*	*50,000 tonnes or more per year*	~~*4,380,000*~~ ***10,000,000*** *tonnes per annual period*
54	*Sewage facility*	*100 cubic metres or more per day*	*342 cubic metres per day*
60	*Incineration*	*100 kilograms or more per hour*	*190 kilograms per hour*

64	*Class II putrescible landfill site*	*20 tonnes or more per year*	*5,000 tonnes per annual period*

2. 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:

'Act' means the Environmental Protection Act 1986;

'Annual Audit Compliance Report' means a report in a format approved by the CEO as presented by the Licensee or as specified by the CEO from time to time and published on the Department's website;

'CEO' *means Chief Executive Officer of the Department* ***of Water and*** *Environment****al*** *Regulation;*

CEO *for the purposes of notification means:*

> ~~*Chief Executive Officer*~~
> ***Director General***
> *Department Administering the Environmental Protection Act 1986*
> *Locked Bag 33*
> *Cloisters Square WA 6850*
> *info@d**w**er.wa.gov.au*

'Department' means the department established under section 35 of the Public Sector Management Act and designated as responsible for the administration of Division 3 Part V of the EP Act.

'Engineer/geotechnical specialist' means a 3rd party (with relevant experience and competence in tailings management to verify the tailings storage facility construction) holding professional registration through the Institute of Engineers Australia or the Australasian Institute of Mining and Metallurgy.

3. Condition 37 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:

ANNUAL AUDIT COMPLIANCE REPORT

37 ~~The Licensee shall by 30 April in each year, provide to the CEO an Annual Audit Compliance Report in the form in Attachment 5 to this Licence, signed and certified in the manner required by Section C of the form, indicating the extent to which the Licensee has complied with the conditions of this Licence, and any previous licence issued under Part V of the Act for the premises, during the period beginning 1 January the previous year and ending on 31 December in that year.~~

The Licensee must submit to the CEO a Compliance Report by 30 April in each year indicating the extent to which the Licensee has complied with the conditions in this Licence for the Annual Period.

4. Condition 29 of the Licence is amended by the deletion of the text shown in strikethrough and insertion of the text shown in bold underline below.

DEWATERING DISCHARGE MONITORING

29 The Licensee shall collect and have analysed representative water samples from the discharge locations listed in column 1 of Table 4, for the parameters listed in column 2 of Table 4, at the frequencies in column 3 of Table 4.

Table 4: Dewatering discharge monitoring

Column 1	***Column 2***	***Column 3***
Discharge locations *(Attachment 2)*	***Parameter***	***Frequency***
Water supply to Agricultural Project	*Electrical Conductivity (µS/cm)* [1] *pH (pH units)*[1] *Total Dissolved Solids (mg/L)* *Dissolved Oxygen (% sat)* [1] *Turbidity (NTU)*	*Quarterly*
Contingency discharge outlet	*Hardness ($CaCO_3$ mg/L)* *Ions and Metals (mg/L) – Al, ~~Total As~~, B, ~~Cd~~, Cl, Total Cr, Cu, Inorganic Hg, **K**, Mg, ~~Mn~~, Mo, **Na,** NH_3, NO_3, ~~Ni~~, Total Phosphorus, ~~Pb~~, SO_4, ~~Total Se~~, Zn*	*Quarterly – when discharging*

Note 1: In field non-NATA accredited analysis permitted

5. The Licence is amended by the insertion of the conditions 38 to 51 below:

MOBILE CRUSHING AND SCREENING PLANTS

38. *The Licensee shall ensure that the mobile crushing and screening plants are situated in a suitable location such that:*

(a) They are located at least 50 metres from any permanent water body;

(b) The mobile plant area is contained so no contaminated runoff (any waste listed in Environmental Protection (Unauthorised Discharges) Regulations 2004) leaves the Premises. In the event that stormwater becomes contaminated with hydrocarbons, contaminated water is to be collected in sumps and removed via truck to a suitable licensed disposal/remediation facility; and

(c) Uncontaminated stormwater from the surrounding areas shall be diverted around the mobile plant area.

SOUTHERN WASTE FINES STORAGE FACILITY

39. *The Licensee must install and undertake the Works for the infrastructure and equipment:*

specified in Column 1; and

to the requirements specified in Column 2;

of Table 6 below.

40. *The Licensee must not depart from the requirements specified in Column 2 of 6 except:*

where such departure does not increase risks to public health, public amenity or the environment; and

all other Conditions in this Licence are still satisfied.

41. *The construction details of any tailings storage embankment must be documented by*

an engineering or geotechnical specialist and confirm that the construction satisfied the design intent. The construction document shall include the records of all construction quality control testing, the basis of any method specification adopted, The construction document shall also present as-built drawings for the embankment earthworks and tailings pipework. A copy of the construction document shall be submitted to the CEO.

42. *Where a departure from the requirements specified in Column 2 of Table 6 occurs and is of a type allowed by Condition 40, the Licensee must provide to the CEO a description of, and explanation for, the departure along with the certification required by Condition 40.*

Table 6: Infrastructure and equipment requirements table

<table>
<tr><th>Column 1</th><th>Column 2</th></tr>
<tr><td>Infrastructure/ Equipment</td><td>Requirements (design and construction)</td></tr>
<tr><td>Southern Waste Fines Storage Facility</td><td>Constructed within the approximate boundaries below:
<table>
<tr><td colspan="3">MGA 94 (Zone 50)</td></tr>
<tr><td>ID</td><td>Easting</td><td>Northing</td></tr>
<tr><td>1</td><td>618,400</td><td>7,493,520</td></tr>
<tr><td>2</td><td>620,340</td><td>7,493,400</td></tr>
<tr><td>3</td><td>619,690</td><td>7,492,620</td></tr>
<tr><td>4</td><td>618,610</td><td>7,492,760</td></tr>
</table></td></tr>
<tr><td>Southern Waste Fines Storage Facility</td><td>The Licensee shall construct the Southern Waste Fines Storage Facility in accordance with the Southern Waste Fines Storage Facility Detailed Design prepared by Knight Piésold Pty Limited September 2017(PE801-00080/36 Rev 0) in Appendix 2.

The construction of any tailings storage embankment must be supervised by an engineering or geotechnical specialist.</td></tr>
<tr><td>Southern Waste Fines Storage Facility embankment stages</td><td>The Licensee shall construct the Southern Waste Fines Storage Facility embankment to a final embankment height of 780 mRL, generally in accordance with the indicative stages shown below:
<table>
<tr><td>Stage</td><td>Construction year</td><td>Embankment configuration</td><td>Years of storage</td><td>Embankment Level (RL m)</td></tr>
<tr><td>1A</td><td>-1</td><td rowspan="5">Downstream</td><td>1</td><td>754.0</td></tr>
<tr><td>1B</td><td>1</td><td>3</td><td>762.0</td></tr>
<tr><td>2</td><td>3</td><td>3</td><td>768.0</td></tr>
<tr><td>Final</td><td>6</td><td>4</td><td>775.0</td></tr>
<tr><td>Expansion</td><td>11</td><td>-</td><td>780.0</td></tr>
</table></td></tr>
<tr><td>Decant system</td><td>The Licensee shall construct the decant infrastructure in accordance with the Southern Waste Fines Storage Facility Detailed Design prepared by Knight Piésold Pty Limited September 2017(PE801-00080/36 Rev 0) in Appendix 2.</td></tr>
<tr><td>Deposition infrastructure configuration</td><td>Perimeter embankment multi spigot discharge combined with 2 full single point discharge</td></tr>
<tr><td>Pipeline corridor</td><td>A 3 metre wide permanent pipeline corridor is to be established.</td></tr>
</table>

Column 1	***Column 2***
Infrastructure/ Equipment	***Requirements (design and construction)***
Tailings pipelines (2)	*The waste fines pipelines are to consist of a 300-350 mm OD HDPE lined steel pipe for ~1.4 km, followed by a 400 mm OD PN20 HDPE pipeline for a total length of ~ 8.7 km to the far east side of the SWFSF.* *All pipelines will contain air vents/vacuum breakers at pipeline high spots (five locations) and dump valves at all low spots (five locations) as depicted in the pipeline schematics in Attachments 5 and 6.* *At each low spot in the pipelines, the dump valves will report to containment ponds (5 locations).* *Tailings pipeline to be installed with a flow meter at the southern waste fines storage facility and a flow meter at the below water table processing plant.*
Decant return pipeline (1)	*The decant pipeline is to consist of a 225 mm OD PN10 and 315 mm OD PN16 HDPE pipeline.* *All pipelines will contain air vents/vacuum breakers at pipeline high spots (five locations) and dump valves at all low spots (five locations) as depicted in Attachments 5 and 6.* *At each low spot, the dump valves will report to containment ponds (5 locations).* *Decant pipelines to be installed with valve station, turbidity gauge, pressure gauges, flow gauges, dump valves and air vents as depicted in Attachments 5 and 6.* *Decant pipeline to be installed with a flow meter at the decant and a flow meter at the below water table processing plant.*
Pipeline containment ponds	*The 5 containment ponds are to be sized (2000 m^3) to contain the full pipe volume plus two hours of continuous pumping.* *Constructed in the locations depicted in Attachment 7.*
Pipeline bunding	*Pipeline bunding (or pipe with sleeve) must be constructed for all areas of the pipeline.*
Additional shallow groundwater monitoring bore	*A groundwater bore shall be installed at location MB16MN004, as shown in Attachment 8. The bore shall be slotted to intercept the groundwater mounding from the SWFSF (approximately at a depth of 6 – 12 mbgl).* *The bore shall be installed prior to tailings deposition to the SWFSF commencing.*

43. *Groundwater bores construction logs for monitoring bores in Table 7 shall be supplied to the CEO within one month of the signing of this Amendment Notice. The groundwater bore construction log for the monitoring bore to be constructed as per Table 6 shall be supplied to the CEO within one month of installation.*

44. *The SWFSF shall be inspected daily by the Licensee during periods of deposition to ensure that the facility is functioning as per the design intent. The available freeboard in the SWFSF at the main embankment shall be checked and recorded. The integrity of tailings pipelines shall be inspected daily and recorded. At least 90% of inspections in a month shall be completed, to allow for operational or weather constraints. Reasons for missed inspections shall be documented in the Annual Environmental Report.*

45. *An engineering or geotechnical specialist shall audit and review the active tailings storage facility on an annual basis. The specialist shall review past performance, validate the design, examine tailings management, and review the results of monitoring. Any deficiencies noted in the audit and review report shall be addressed and improved. The audit and review report shall be submitted to the CEO and should be accompanied by a recent survey pick-up of the facility and an updated tailings storage data sheet.*

46. *At the time of decommissioning of the SWFSF and prior to rehabilitation, a further review report by a geotechnical or engineering specialist shall be submitted to the CEO. This report shall review the status of the structure and its contained waste fines, examine and address the implications of the physical and chemical characteristics of the materials, and present and review the results of all monitoring. The rehabilitation stabilisation works proposed and any on-going remedial requirements shall also be addressed.*

47. *The Licensee shall submit a detailed operating manual for the Southern Waste Fines Storage Facility in accordance with the Department of Mines, Industry Regulation and Safety's Guide to Departmental requirements for the management and closure of tailings storage facilities (TSFs).*

48. *Following submission of the construction documents required by Condition 41 to the CEO, the Licensee shall be authorised to deposit tailings to the SWFSF for a commissioning period of no longer than 3 months.*

49. *The Licensee shall not operate the facility and deposit tailings in the approved staged manner to the SWFSF until the construction documents required by Condition 41 have been submitted to the CEO.*

SOUTHERN WASTE FINES STORAGE FACILITY GROUNDWATER MONITORING

50. *The Licensee shall collect and have analysed representative water samples from the monitoring sites shown in column 1 of Table 7 for the parameters listed in column 2 of Table 7 at the frequencies in column 4 of Table 7. The Licensee is required to meet the limits in Column 3 of Table 7.*

Table 7: SWFSF groundwater monitoring schedule (ATTACHMENT 8)

Column 1	***Column 2***	***Column 3***	***Column 4***
Monitoring site(s) *(Attachment 3)*	***Parameter***	***Limit***	***Frequency***
Southern Waste Fines Storage Facility bores *MB16MN002* *MB16MN003* *MB16MN004* *MB16MN006* *MB16MN007* *MB16MN008* *MB16MN009*	*Depth to water*[1]	*4 mbgl* *Non specified*	*Monthly*

MB16MN0010[4] *MB16MN0011[4]* *MB16MN0012[4]* *MB16MN0013*			
MB16MN003 *MB16MN004* *MB16MN006* *MB16MN007* *MB16MN008* *MB16MN009* *MB16MN0010[4]* *MB16MN0011[4]* *MB16MN0012[4]*	*Electrical Conductivity (µS/cm)[1]* *pH (pH units)[1]* *Total Hardness ($CaCO_3$) (mg/L)* *TDS (mg/L)* *NO_3* *Major Ions (mg/L): Na, K, Ca, Cl, F, Br Mg, and SO_4,* *Metals/metalloids (mg/L) – Ag, Al, Ba, Cu^2, Fe^2, Mn^2, As^2, Cd^2, Cr^2, Pb^2, Hg^2, Ni^2, Co^2, Se^2, B^2, Mo^2, Sb^2, Si^2, Sn^2, Sr^2, Th^2, U, V^2, Zn^2 and Tl^3*	*Non specified*	*Quarterly*

Note 1: In-field non NATA analysis permitted
Note 2: Comparison against the 95% protection level in ANZECC 2000, taking background water quality into consideration is required
Note 3: Comparison against the USEPA National Primary Drinking Water Table of Contaminants 2009 is required
Note 4: Indicates shallow bores

51. *In the event that the limit listed in Table 7 is exceeded, the Licensee must:*

a) undertake an investigation into the environmental impact of seepage from the Southern Waste Fines Storage Facility;
b) provide the CEO a report within 3 months of completing the assessment; and
c) clearly outline mitigation methods to reduce the environmental impact of seepage from the Southern Waste Fines Storage Facility.

6. The Licence is amended by the deletion of Attachment 5 shown in strikethrough below.

~~**ATTACHMENT 5 – ANNUAL AUDIT COMPLIANCE REPORT**~~

~~SECTION A~~

~~**LICENCE DETAILS**~~

~~Licence Number:~~	~~Licence File Number:~~
~~Company Name:~~ ~~Trading as:~~	~~ABN:~~

Reporting period:

_____ to _____

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of licence complied with within the reporting period? (please tick the appropriate box)

Yes ☐ Please proceed to Section C

No ☐ Please proceed to Section B

Each page must be initialed by the person(s) who signs Section C of this Annual Audit Compliance Report

INITIAL:_____

SECTION B - DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each licence condition that was not complied with.

a) Licence condition not complied with?	
b) Date(s) when the non compliance occurred, if applicable?	
c) Was this non compliance reported to DER?	
☐ Yes ☐ Reported to DER verbally Date_____ ☐ Reported to DER in writing Date _____	☐ No
d) Has DER taken, or finalised any action in relation to the non compliance?	
e) Summary of particulars of compliance non compliance, and what was the environmental impact?	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram)	
g) Cause of non compliance	
h) Action taken or that will be taken to mitigate any adverse effects of the non compliance	
i) Action taken or that will be taken to prevent recurrence of the non compliance	

Each page must be initialed by the person(s) who signs Section C of this Annual Audit Compliance Report

INITIAL:_____

SECTION C - SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report must only be signed by a person(s) with legal authority to sign it. The ways in which the Annual Audit Compliance Report must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this Annual Audit Compliance Report is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		**The Annual Audit Compliance Report must be signed and certified:**
an individual	☐	by the individual licence holder, or
	☐	by a person approved in writing by the Chief Executive Officer of the Department of Environment Regulation to sign on the licensee's behalf.
A firm or other unincorporated company	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A corporation	☐	by affixing the common seal of the Licensee in accordance with the Corporations Act 2001; or
	☐	by two directors of the licensee; or
	☐	by a director and a company secretary of the licensee, or
	☐	if the Licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or
	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A public authority (other than a local government)	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
a local government	☐	by the chief executive officer of the licensee; or
	☐	by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of $50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____ SIGNATURE: _____

NAME:(printed)_____ NAME:(printed)_____

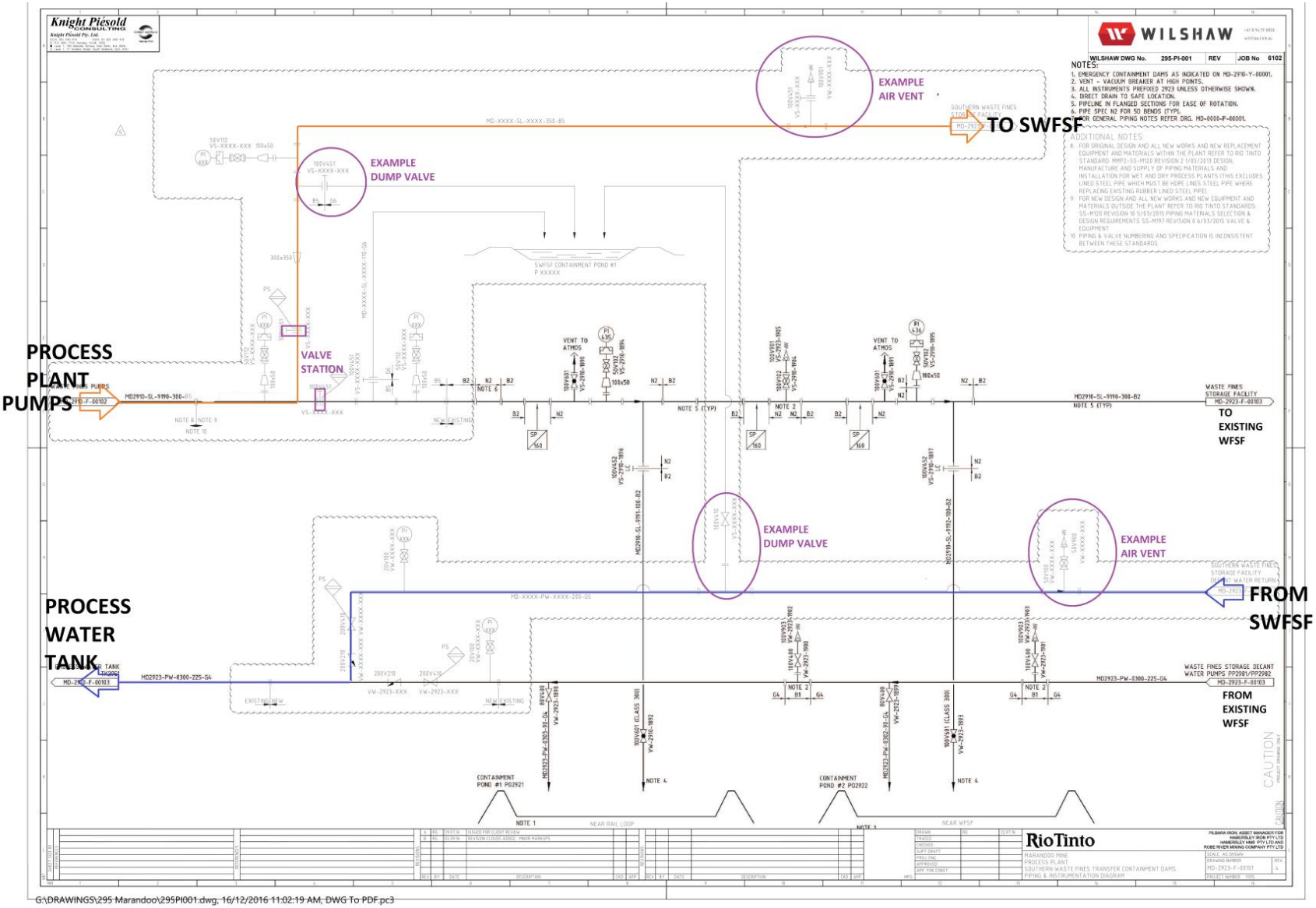
POSITION: _____ POSITION: _____

DATE: _____/_____/_____ DATE: _____/_____/_____

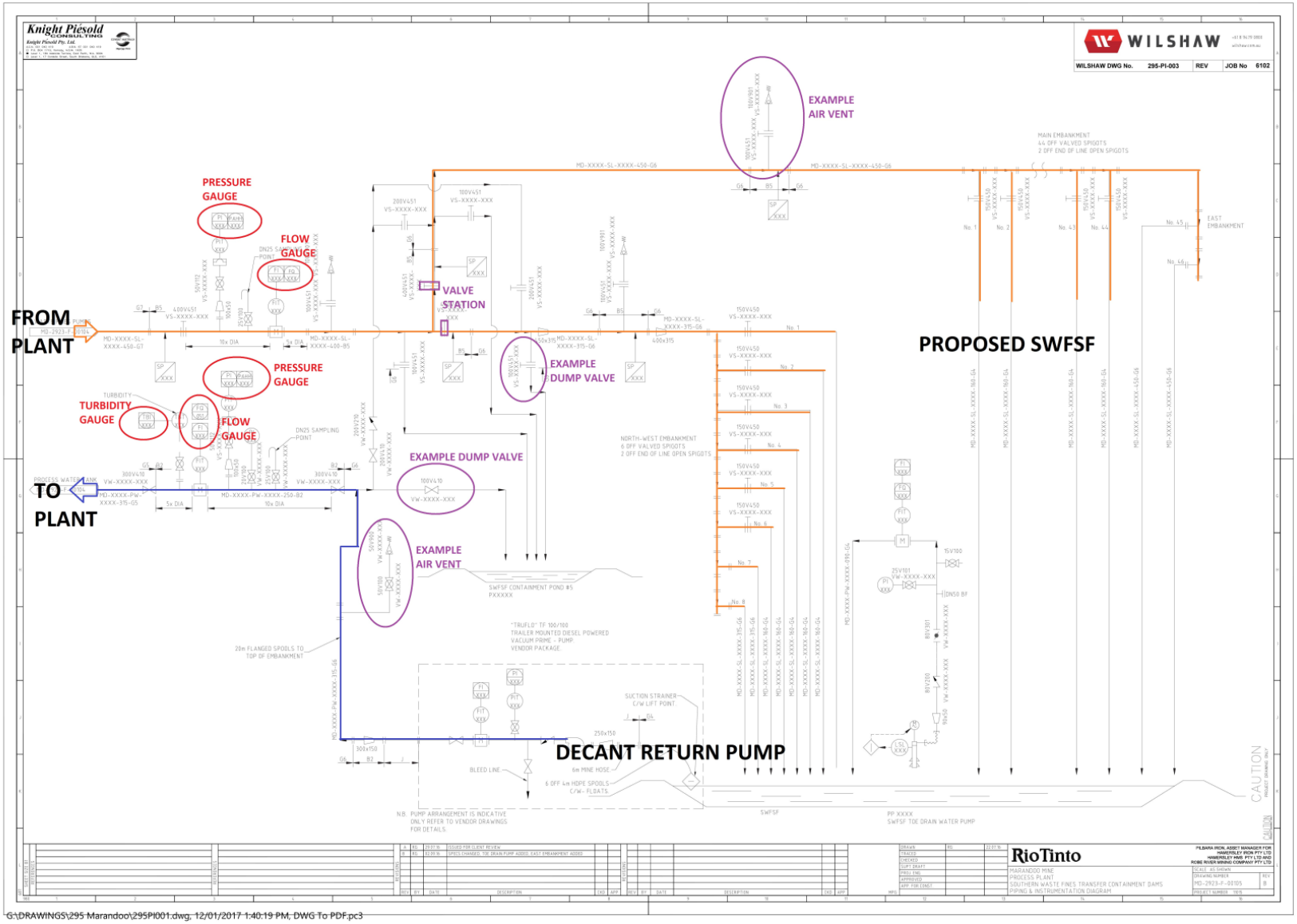
SEAL (if signing under seal)

7. The Licence is amended by the insertion of Attachments 5, 6, 7 and 8 below

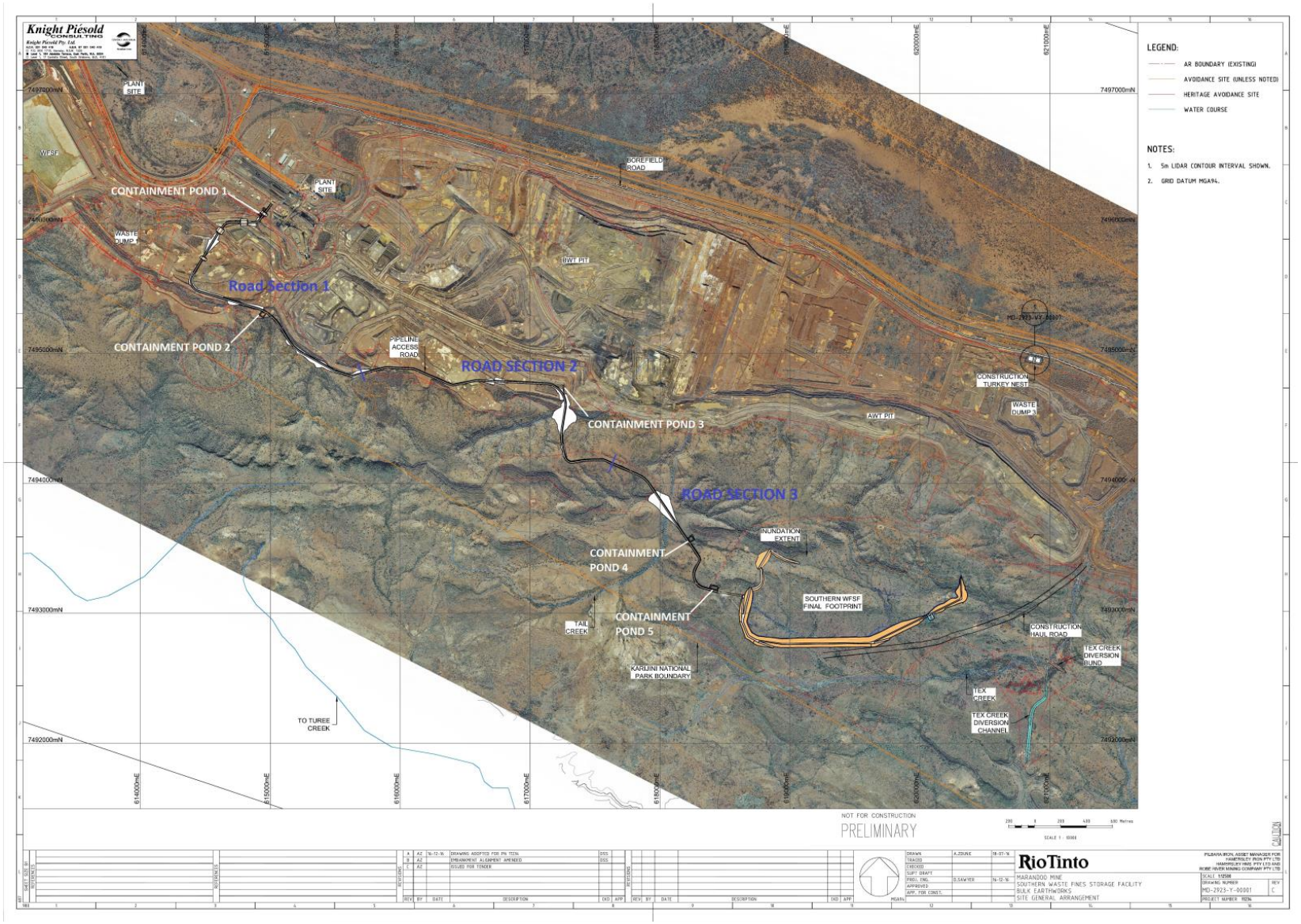
ATTACHMENT 5 – TAILINGS AND DECANT RETURN PIPELINE SCHEMATICS AT PLANT



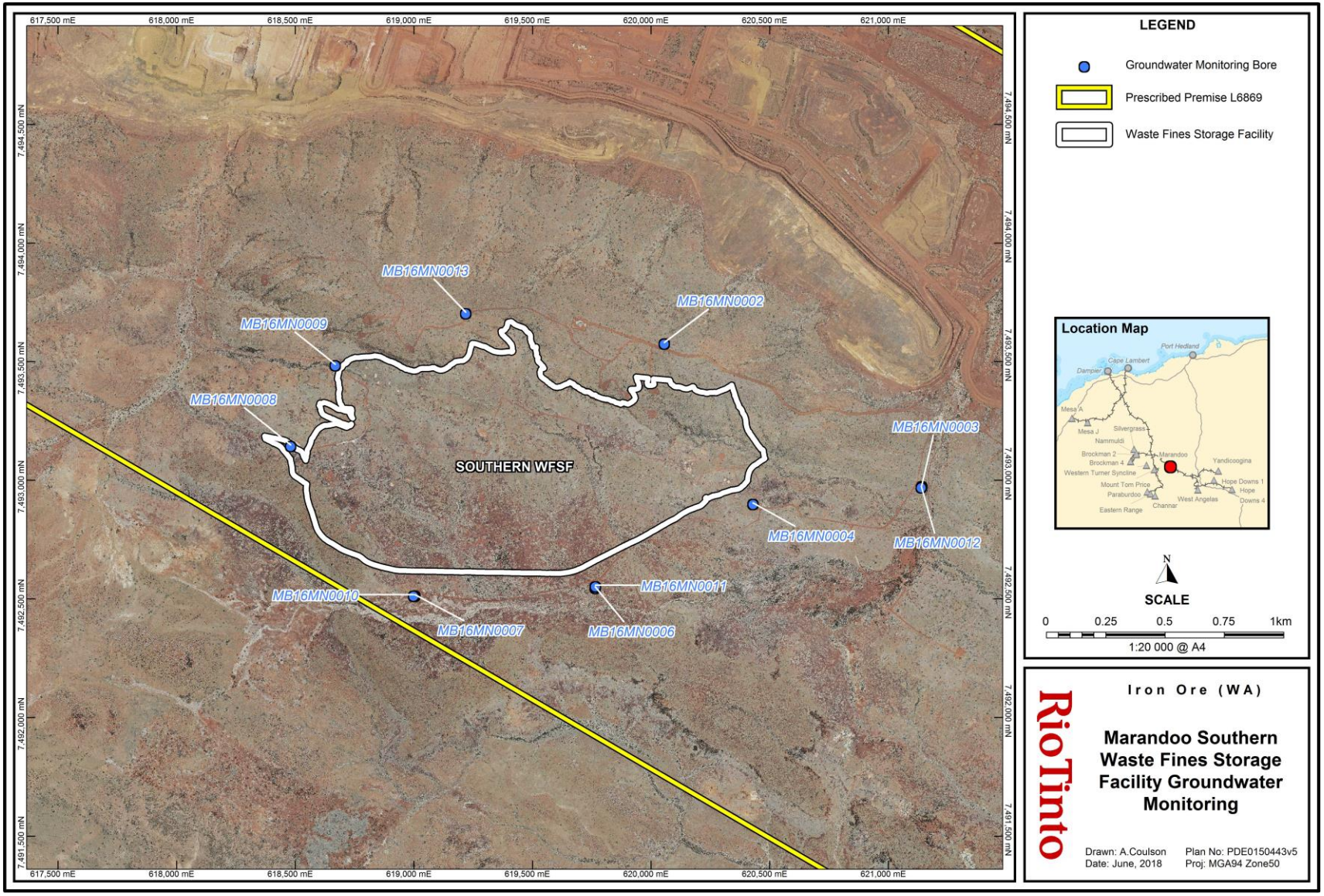
ATTACHMENT 6 – TAILINGS AND DECANT RETURN PIPELINE SCHEMATICS AT SWFSF



ATTACHMENT 7 – PIPELINE CONTAINMENT PONDS



ATTACHMENT 8 – SWFSF GROUNDWATER MONITORING LOCATIONS



Appendix 1: Southern Waste Fines Storage Facility Detailed Design

Appendix 2: Further information provided by RTIO to support Geotechnical Assessment

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Key documents

	Document title	In text ref	Availability
1	Licence L6869/1992/12 Marandoo Iron Ore Mine	L6869/1992/12	accessed at www.dwer.wa.gov.au
2	Application form and covering letter	RTIO-HSE-039630	DWER record A1436097
3	Southern Waste Fines Storage Facility application supporting documentation	RTIO-HSE-0305356	
4	Operational Water Quality Guidelines for Dewatering Discharge	RTIO-HSE-0295472	
5	Further information on water balance, pipeline, and	RTIO Jun 2017	DWER record A1456591
6	Marandoo Southern SWFSF Hydrogeological conceptualisation	RTIO-PDE-0145728	
8	Knight Piesold Consulting TSF design report prepared for Rio Tinto	KP 2017	DWER record A1530984
8	Further information on groundwater mounding risks	RTIO October 2017	DWER record A1555282
9	Further information on the designs of pipeline and contingency ponds	RTIO-HSE-0317137	DWER record A1593211
10	Further information for geotechnical assessment	RTIO-HSE-0316857	DWER record A1593188
11	DMIRS comments on geotechnical assessment	DMIRS November 2017	DWER record A1571755
12	Geochemical Characterisation of Marandoo Iron Ore Tailings ChemCentre Reference 17S2308 26 February 2018	ChemCentre February 2018	DWER record A1627583
13	Ministerial Statement 1020	MS1020	accessed at www.epa.wa.gov.au/
14	National Environment Protection (Assessment of Site Contamination) Measure 1999	ASC NEPM	Accessed at www.nepc.gov.au
15	Department of Mines, Industry Regulation and Safety (August 2015). Guide to Departmental requirements for the management and closure of tailings storage facilities (TSFs)	Department of Mines, Industry Regulation and Safety's Guide to Departmental requirements for the	Accessed at www.dmirs.wa.gov.au

		management and closure of tailings storage facilities (TSFs).	
16	DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	-	accessed at www.dwer.wa.gov.au
17	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.	-	
18	DER, November 2016. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	-	
19	DER, November 2016. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.	-	

Appendix 3: Summary of Licensee comments

The Licensee was provided with the draft Amendment Notice on 25 May 2018 for review and comment. The Licensee responded on 11 June 2018. The following comments were received on the draft Amendment Notice:

Condition	Summary of Licensee comment	DWER response
Condition 42, Table 6	The licensee requires some flexibility in terms of years provided for construction of different stages and minor potential changes to RL height of the different stages. This does not alter potential impact to the environment and reduces the administrative effort required in seeking approval for individual stages.	DWER accepts the change.
Condition 42, Table 6	All pipelines are either bunded or will have double walls to ensure any spills report to containment ponds. Road Section 3 will be constructed with a double sleeve across Tail Creek to ensure the bridged pipeline still reports to Containment Pond 4 in the event of a failure. Figure 11 in the decision document was provided to demonstrate the topography of the area and indicate potential flow paths if secondary containment measures failed (which is very unlikely).	DWER accepts the change
Condition 42, Table 6	All monitoring bores are existing bores and have been drilled and screened appropriately in order to detect any potential changes in groundwater chemistry or level as a result of seepage from the facility	DWER notes this; requirement to construct bores will be removed as the bores are existing. Instead there will be a requirement to supply the bore logs for these to DWER (see new condition 43.)
Old Conditions 43 - 46	Considering that the overall risk rating for the facility was medium following DWERs risk assessment, the licensee believes that draft conditions 43 – 46 should be replaced with more outcome-based conditions as per DWERs risk assessment guidance (which outlines a preference for outcome based conditions for medium risk events). The draft conditions do not limit a risk event from occurring nor mitigate the extent of impact following an event. They also replicate requirements of the Mine Safety Inspections Act 1994 and Code of Practice for Tailings Storage Facilities in WA. Suggestions for outcome based conditions which focus on the	As discussed these conditions must remain as it is advice from DMIRS in lieu of the Mining act not having jurisdiction as the Premises is subject to an Agreement Act.

Condition	Summary of Licensee comment	DWER response
	design controls implemented to prevent and/or mitigate the extent of a risk event occurring are provided below: 'The licensee shall ensure an operational freeboard (solids to crest) of 300 mm is maintained during deposition' 'The licensee shall ensure tailings and seepage are not discharged from the premises'. 'The licensee shall maintain drains, pipe bunding and containment ponds which shall be used to collect and recover liquid matter resulting from seepage along deposition pipelines and embankment walls'	
Condition 47	It is requested that the requirement 'to an operating height to be determined by the CEO' be removed, as the operational risk of operating the facility at different embankment heights has been assessed through this amendment notice. This requirement which would likely require the licensee to seek additional approval for each stage adds administrative workload to a scenario where risk to environment is being managed appropriately by other controls (and conditions).	This is a standard approach where a series of incremental raises to a TSF are approved in advance (and assessed) but the operational heights are dependent on the successful submission of progressive compliance reports following the completion of construction activities for each individual raise, and the ongoing groundwater monitoring results etc support that the facility is operating as originally modelled (ie seepage impacts are being managed). It does not impose unnecessary regulation and allows for progressive operation within the Licence. The change requested is not accepted. A maximum operating height for each stage should be nominated as part of the compliance documents and then the CEO is able to document this operating height The text is included in new condition 49.
New Conditions 48, 49	The licensee requests the wording of this condition be changed to reflect that deposition of tailings is potentially required during commissioning and it is unreasonable to construct the facility and then have contractors stand down and wait to commence commissioning until the CEO approves the construction documentation. No commissioning period was requested in the original application given DWER advice/policy at the time that operational conditions would be incorporated in the amendment notice.	Accepted. Text as noted above included in condition 49.

Condition	Summary of Licensee comment	DWER response
	Alternative conditions are proposed which allows for a period of commissioning while authorisation to operate the facility is obtained.	
New Condition 50 (previously 48) Table 7, Note 2	This additional text is requested to align with ANZECC guidelines given parameters in groundwater may naturally be higher than default 95% protection levels.	Accepted
New Condition 50 (previously 48) Table 7, Note 3	Its unsure why the USEPA guidelines would be used instead of the Australian Drinking Water Guidelines?	For Thallium only; there are no applicable ADWG or other trigger values
New Condition 50 (previously 48) Table 7	As outlined above, this table is requested to be updated for the following reasons: MB16MN0001 doesn't exist as the bore was abandoned when the casing failed. MB16MN0010, 11, 12 are shallow bores which are currently dry. The immediately adjacent deeper bores can be used to monitor groundwater level rises and quality in these locations. MB16MN0002 and MB16MN0013 depth to water is >120mbgl. There will be some practical limitations with water chemistry sampling, so its requested only water depth measurements be taken from these bores	Updated as noted. As the surface water monitoring requirement has been removed (see below) need to also have a shallow bore at MB16MN004 location. If not present, requirement to install one shallow slotted bore will be added to Table 6.
Old Condition 49	The licensee believes that the monitoring of surface water, as required by this condition, does not assist in detecting potential detrimental changes in downstream water quality in the Tex Creek system or KNP as a result of seepage, for the following reasons: • Surface expression of seepage in Tex Creek is extremely unlikely. • If surface expression of seepage were to occur in Tex Creek, it would be best detected via visual inspection and groundwater level monitoring rather than via surface water quality monitoring. • Tex Creek is an ephemeral creek which only flows once or twice a year following significant rainfall events. Surface water samples will not be able to be collected when the creek is dry. • The ability to detect potential seepage will be limited to	DWER notes the difficultly in attributing surface water quality data to the influence of the SWFSF so accepts that groundwater monitoring of the surficial perched aquifer that will develop as a result of the tailings deposition is a better method of determining the risk of seepage migrating to Tex Creek. To that end, the frequency of monitoring of bores to the south/ south east of the fines cell (between the cell and the Tex Creek) will be increased to monthly and the requirement to investigate and report on seepage impacts (condition 50) will remain in the event of the water level limit being breached. Additionally it appears that there is no shallow bore at location MB16MN004, so if that is the case one must be installed there alongside the deep bore to allow potential seepage

Condition	Summary of Licensee comment	DWER response
	the extent of the surface expression in Tex Creek. • Flows in Tex Creek following rainfall events will have high flow rates, very high (naturally occurring) sediment loads and a large dilution factor owing to the large volume of rainwater contribution compared to the much lower volume of water associated with any potential seepage. As such, these samples will not be representative of seepage water quality and determining a statistical increase at the downstream sample point is unachievable. It is also unclear in the condition how significance would be determined with regards to a statistical increase. The groundwater monitoring required by condition 48 is more appropriate to monitor seepage water quality to detect any detrimental changes in downstream water quality. If seepage surface expression were identified (via visual inspection) then condition 50 would be relevant. The licensee believes that targeted monitoring would provide a better allocation of effort and environmental protection to KNP.	impacts to be monitored. **RT please advise; if necessary Table 6 will be updated accordingly**.
	The licensee requests that water chemistry analysis be undertaken 6-monthly rather than quarterly given the risk assigned to this potential impact of medium.	Not accepted.
Comments on draft version 2, dated 18 June 2018		
Conditions 45 - 47	The licensee understands and accepts the inclusion of conditions 45 – 47 following a request from DMIRS, however, the licensee maintains its view that they: • do not limit a risk event from occurring nor mitigate the extent of impact following an event; and • duplicate requirements of the Mine Safety Inspections Act 1994 and Code of Practice for Tailings Storage Facilities in WA. Outcome based conditions would be preferred as per DWER policy guidance for moderate risk facilities.	Noted.

Condition	Summary of Licensee comment	DWER response
Old condition 49	No shallow bore was installed at the MB16MN004 location given that at the time of installation the focus was on the initial response from Stage 1 of the facility, given the shallow bores drilled are topographically lower than the MB16MN004 location. The licensee proposes that it would be more appropriate to install a shallow bore at this location as a response to whether we see seepage in the topographically lower shallow MBs (MB16MN0010, MB16MN0011 and MB16MN0012). This could be incorporated into any response required by condition 50	Shallow bore is to be installed at location MB16MN0004 prior to tails deposition. Table 6 is amended accordingly.
Attachment 8	Amendment made to indicate location of bores MB16MN0010 – MB16MN0012 in Attachment 8	Noted and updated.