AGNEW GOLD MINE
WORKS APPROVAL APPLICATION

ATTACHMENT 3B
PROJECT ACTIVITIES

PREPARED FOR:

AGNEW GOLD MINING COMPANY PTY LTD

AUGUST 2024

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REDEEMER WWTP WORKS APPROVAL APPLICATION
WORKS APPROVAL ATTACHMENT 3B

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1. INTRODUCTION

1.1 BACKGROUND

Agnew Gold Mining Company (AGMC) owns and operates Agnew Gold Mine (AGM), a gold mine and processing operation located 630 km northeast of Perth and 26 km southwest of Leinster in the Northern Goldfields of WA (Figure 1, Attachment 2).

The Project is owned by Agnew Gold Mining Company (AGMC), a wholly owned subsidiary of Gold Fields Australia Pty Ltd. All tenements associated with the Project are held by AGMC.

1.2 APPROVAL HISTORY

The following Part V *Environmental Protection Act 1986* (EP Act) approvals have been granted for the Project:

- Environmental Licence (L4611/1987/11) granted October 2013.

The approvals related to the following prescribed activities in accordance with Schedule 1 of the *Environmental Protection Regulations 1987* (EP Act Regulations).

- Category 5: Processing or beneficiation of metallic or non-metallic ore
- Category 6: Mine dewatering
- Category 85: Sewage facility
- Category 89: Putrescible landfill site

The Prescribed Premises comprise the Mining tenements M36/27, M36/32, M36/53, M36/55, M36/65, M36/150, M36/174, M36/248, M36/314 and M36/450 granted under the *Mining Act 1978* (Figure 2, Attachment 2).

No amendments to the existing Prescribed Premises Boundary are proposed.

1.3 PURPOSE

This Works Approval application is submitted to the Department of Environment and Regulation (DWER) for approval of specific infrastructure and activities proposed for the Project as classified as Prescribed Premises Categories under Schedule 1 of the EP Act Regulations.

This application specifically seeks approval for the construction and commissioning of the following scheduled activities at the Redeemer/Barren Lands Project:

- Wastewater Treatment Plant and associated Irrigation Field

A Reverse Osmosis (RO) plant designed to process 20 kL per day and discharge up to 6 kL of waste brine daily will be situated alongside the Wastewater Treatment Plant (WWTP). The brine will be discharged into the WWTP for redirection into the irrigation field. This additional discharge will be free of Nitrogen (N) or Phosphorous (Ph), which are the key factors limiting the nutrient load on the irrigation spray field area.

The discharge of the RO Brine falls well below the Schedule 1 Cat 54A threshold of 50 GL per annum; however the effluent discharge metering volumes will be affected (increased) by blending of the RO brine with WWTP effluent stream.

As the injection volumes of brine rise, the overall effluent volume will correspondingly increase, leading to a dilution of nutrient concentration, while the total nutrient load discharged to the land remains constant. A site water balance calculation, conducted in line with the Guidance on Site-and-soil Evaluation for On-site Wastewater Management (Department of Health (DOH) 2021), was performed for the combined output (WWTP Effluent and RO brine) of 18.72 kL. The land area required for water balance is approximately half that required for nutrient loading (Ph, N), thus having no impact on the size of the irrigation field.

This application solely focuses on the construction of the WWTP, although references will be made to RO inputs and outputs within relevant sections. Consequently, all calculations will be presented solely for the WWTP effluent.

Effluent volumes discharged to the land reported during operations will be adjusted to exclude the daily brine injection into the system.

Information presented in this document aims to assist DWER in assessing the adequacy of proposed pollution prevention and control measures to ensure adverse environmental impacts are prevented or minimised to levels where appropriate environmental standards can be complied with.

1.4 PROJECT SUMMARY

The Barren Lands project is a component of the broader Agnew Gold Mine operations. The Barren Lands project is a greenfield site, located between the existing Waroonga Pit and Redeemer mine. The Barren Lands project currently comprises of:

- Barren Lands Open Pit,
- Barren Lands Waste Rock Dump
- Workshop/office
- Topsoil Stockpiles
- Laydown area
- Turkey's Nest

Mining activities include drilling, blasting, digging and loading using excavators and front-end loaders. Ore is transferred by haul trucks on the existing haul road and to be processed at the Agnew EMU processing plant. Waste rock material will be transferred to a waste rock dump adjacent the pit.

1.5 TENURE

The Barren Lands Precinct comprises of two Mining Leases (M 36/55 and M36/150) as listed in Table 1 . The prescribed premises boundary for the Agnew Gold Mining Project which includes M 36/55 and the proposed WWTP and irrigation field locations are shown in Figure 3 of Attachment 2.

Table 1: Redeemer/Crusader (incl Barren Lands) Precinct Tenements

Tenement	Area (ha)	Tenement Holder	Grant Date	Expiry Date
M 36/55	927.1	Agnew Gold Mining Company Pty Ltd	19 October 1987	28 October 2029
M 36/150	398.25		27 October 1987	28 October 2029

1.6 LICENSEE AND OCCUPIER OF PREMISES

The Project is owned by Agnew Gold Mining Company (AGMC), a wholly owned subsidiary of Gold Fields Australia Pty Ltd. All tenements associated with the Project are held by AGMC. The proponent and key contact details are provided in Table 2.

Table 2: Proponent and Key Contact Details

Proponent	
Name	Agnew Gold Mining Company Pty Ltd
Address	PMB 10, Leinster WA 6437
ACN/ABN	098 385 883
Key Contact	
Name	Campbell Reeves
Position	Senior Advisor: Environment
Address	Level 4, 235 St Georges Terrace, PERTH WA 6000
Postal Address	PMB 10 Leinster WA 6437
Phone	08 9088 3842
Email	AGM_Environmental@goldfields.com

1.7 PRESCRIBED PREMISE CATEGORIES

This Works Approval Application (WAA) is submitted to the Department of Environment and Regulation (DWER) for approval of specific infrastructure and activities proposed for the Project as classified as Prescribed Premises Categories under Schedule 1 of the EP Act Regulations.

The Prescribed Premise Categories applicable to the Project are identified in Table 3.

Table 3: Relevant Prescribed Premise Category

Category No.	Category Description	Prescribed Premise Threshold	Infrastructure
85	Sewage facility: premises – (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters.	20 m^3 per day	WWTP

2. EXISTING ENVIRONMENT

A description of the existing environment at the Barren Lands Project is provided in Attachment 7 (Siting and Location) of the WAA and is not repeated here.

3. KEY CHARACTERISTICS OF THE PROJECT

Infrastructure subject to the Prescribed Premise Categories of this Works Approval application is discussed in the following sections.

3.1 WASTEWATER TREATMENT PLANT (CATEGORY 85)

A 100-person Wastewater Treatment Plant (WWTP) is proposed to support the expansion of underground mining at Barren Lands and Redeemer.

The proposed WWTP and wastewater irrigation area (1 ha sprayfield) will be located on previously disturbed areas within tenement M36/55, as shown in Figure 2, Attachment 2.

The Redeemer WWTP will comprise:

- A Sequencing Batch Reactor (SBR) modular system housed in a series of 12m containers constructed of 6 mm steel.
- External tanks for balance and sludge storage.
- Fenced irrigation field

.

The key characteristics of the WWTP are presented in Table 4 and each operation is described in the following sections.

Table 4: Key characteristics of the WWTP

Characteristic	Description
Plant Capacity	20 kL per day
Planned Plant Throughput	14.72 kL per day
System Type	Sequencing Batch Reactor
Peak Influent Flow	4.68 kL/h peak hourly for max 2 hours
Footprint of WWTP	0.3 ha
Footprint of Irrigation Field	Minimum of 0.9ha require. 1.0 ha assigned by AGM.

3.1.1 Influent and Effluent Quality

The WWTP influent and effluent specifications are provided in Table 5. It is noted that these values are designed to be achievable during stable WWTP operation and that hydraulically shock loading the plant and/or a change in influent quality may influence the effluent quality.

Table 5: WWTP Influent and Effluent Specifications

Parameter	Unit	Influent	Effluent
Biological Oxygen Demand (BOD)	(mg/L)	650	<30
Total Suspended Solids (TSS)		650	<30
Total Nitrogen		60	<30
Total Phosphorus		14	<8
Residual Chlorine		-	0.2 - 2.0
pH	pH units	6.5 - 8.5	6.5 - 8.5
E. Coli	(cfu/100 mL)	-	<1000 cfu/100 ml

3.1.2 SBR Wastewater Treatment System

The proposed SBR WWTP is a 12 m containerised system constructed of 6 mm steel and will have external tanks for balance and sludge storage. The SBR WWTP will require an inlet connection to the bar screen and electrical power connection to the control panel.

The proposed system operates in a five-step mode including:

- Filling of the reactor basin
- A reaction phase
- A settling phase
- A decant phase
- An idle phase.

The general arrangement of the WWTP has been presented in Appendix 1. The WWTP is designed and built to meet applicable Australian Standards (see Section 4) and the design details are as follows;

- 2.5mm inlet bar screen.
- External 1 x 50m3 poly balance tank (external).
- Balance pump.
- SBR Tank with heavy duty submersible aerators and floating decant weir.
- Cyclic operation of the SBR tank includes:
  - 4 x 6 hr cycles per day:
  - 0.5hr feed/1.25hr anoxic period with mixing,
  - 3.25hr aeration, 0.75hr settle and 0.75hr decant.
- Decant pump.
- pH control with caustic dosing
- Sludge pump.
- Recirculation pump with inline sodium hypochlorite dosing. Setpoint for residual chlorine in tank will be 0.2-2.0 mg/L.
- Sodium hypochlorite dosing system.
- Polyaluminiumchloride dosing system.

- 1 x 50kl sludge storage tank (external)
- Irrigation pump
- Discharge flow meter
- Control panel (Australian Standard) with PLC and remote monitoring capabilities
- Audible and visual alarms

The SBR WWTP will be operated in accordance with the Tristar Operation and Maintenance Manual, including regular inspections and monthly services completed by Tristar

3.1.3 Reverse Osmosis Water Treatment Plant

A 20kL Brine Water Reverse Osmosis Water Treatment Plant (BWROP) is proposed for the project which will supply potable water to administration, crib and ablution facilities for the underground crew at the Redeemer precinct.

The proposed BWROP will be located adjacent to the WWTP, within previously disturbed areas of tenement M36/55. Raw water supply will be sourced from licensed borefields and directed to the BWROP for processing. The proposed BWRO will have permeate recovery of 70 - 75%, dependant on feed water, and will produce 20 kL total permeate water. A reject stream of up to 6 kL per day which is to be directed to the proposed Irrigation Field via the WWTP.

The general arrangement of the BWROP has been presented in Appendix 2.. The design details are as follows;

- IP54 control panel.
- Centrifugal Low-Pressure pump.
- Multimedia pre-filter with fully automated and integrated time-clock based backwash function.
- Integrated antiscalant dosing facility with antiscalant low level plant shut down protection.
- 5 and 1micron cartridge filtration with differential pressure indication.
- Low feed pressure plant shut down protection.
- Vertical Multistage High-Pressure Pump
- FRP RO pressure vessels.
- Composite polyamide BWRO membranes.
- System operating and differential pressure gauge.
- Permeate (fresh water) flow rotameter and product quality (conductivity) meter.
- Concentrate reject pressure let-down valve and flow rotameter.
- Concentrate recirculation throttling valve and flow rotameter.
- Blend Filtrate throttling valve and flow rotameter.
- Automated, feed and freshwater storage tank based system start and stop.
- Audible and visual alarms.
- Potable Water Recirculation and Chlorination Disinfection System.
- Distribution pump set duty/duty assist.

3.1.3.1 Water Quality

Raw water, permeate water and reject brine data is provided in Table 6.

Table 6: Water Quality Data

Parameter	Unit	Value
Design inflow (Raw water)	m^3/day	25
Design product flow (RO Permeate)	m^3/day	20
Design Reject Flow	m^3/day	6
Raw Water TDS	mg/l	<1,100
RO Permeate Water TDS	mg/l	<600
Reject Water TDS	mg/l	<4,000
Raw Water pH	pH Unit	7.9
RO Permeate Water pH	pH Unit	6.5-8.5

3.1.3.2 Water Treatment Process

Bore water is pumped to raw water storage tanks, feed/backwash pumps then draw from the raw water storage tanks passing water firstly through media filters then 5 micron and 1 micron cartridge filters then into the suction of the RO high pressure pump.

The multimedia filter is installed to filter out any suspended solids larger than 5 micron. A pressure switch across the media filter measures the differential pressure and activates a backwash as required. During media filter backwash, the desalination system is shut down and all feed/backwash pumps continue to run to provide sufficient flow rate to ensure that the media filters are effectively backwashed.

The 5 micron rated cartridge filters capture solids which would otherwise block the 1 micron rated cartridge filters. A pressure gauge across the 5micron rated cartridge filter housing measures the differential pressure and indicates when the cartridge filters require replacement.

An antiscalant chemical is then dosed into the feed between the 5 and 1 micron rated cartridge filters. Antiscalant is dosed to inhibit fouling and scale on the RO membranes.

The RO high pressure pump boosts the feed water pressure to that required for the reverse osmosis membrane. The reverse osmosis membranes then separate the filtered feed water into two streams, the RO permeate stream and the concentrate reject stream.

The RO permeate will be stored in treated water storage tanks. A chlorination probe and injection point will be incorporated within the recirculation system that will analyse the levels of chlorine within the water and then automatically dose accordingly to maintain the correct level for adequate disinfection (as per the ADWG 2011.) The dosing rate is automatically controlled by a chlorine analyser. This system maintains a chlorine residual of 0.2 - 2.0mg/l.

The RO reject stream is directed to the WWTP Irrigation Field.

3.1.4 Irrigation Field

The irrigation field has been designed to meet DOH and DWER requirements, specifically:

- DWER considerations for Part V emissions in relation to WWTP discharge to land primarily focus on the factors affecting vegetation (such as Phosphorous/Nitrogen/FAC), proximity to and potential for run-off water to carry emissions into environmentally sensitive areas.

- DOH considerations for e-coli and other pathogens are driven by the necessity to ensure the land earmarked for discharge is capable of absorbing the grey water so as to avoid standing water that attracts mosquitos and/or flies and the subsequent human health issues.

Irrigation area has been calculated in accordance with the requirements for Nitrogen and Phosphorus application rates as outlined in Table 2 of Government of Western Australia's Department of Water (DoW) 'Water Quality Protection Note WQPN 22 Irrigation with nutrient-rich wastewater' (DoW, 2008).

Soils at the proposed project are part of the Sunrise System (279Su), comprising dark red shallow sand (DAFWA Soil Group 423). These soils and are classified as WQPN 22 risk category C "Fine grained soil (e.g. clay, loam or peat) close (500 m) to surface waters PBI > 100". A review of the soils at the project and vulnerability to eutrophication for soils of this risk category indicates that the maximum allowable nitrogen (N) and phosphorus (P) loads are 300kg/ha/year and 50 kg/ha/year, respectively.

The irrigation field has been sized using the effluent quality specified in Table 5 to achieve the prescribed nutrient loadings as provided in Table 7 . Calculations for the sprayfield size are provided in Appendix 4.

The required irrigation area is 0.9 ha based on specified throughput and nutrient loadings as shown in Table 7. However, a maximum irrigation area of 1.0 ha has been included in the proposal to allow for rotation of active spray areas and contingency.

Table 7: Irrigation Field Nutrient Loading

Item	Units	Value
Treated Effluent Discharge Volume = 14.72 kL		
Nitrogen Load		
Effluent load criteria	mg/L	30
Disposal area load limit	kg/ha/year	300
Area required	ha	0.9 ha
Phosphorus Load		
Effluent load criteria	mg/L	8
Disposal area load limit	kg/ha/year	50
Area required	ha	

The WWTP will be operated by AGM with remote assistance by Tristar.

The irrigation field will comprise:

- Above ground cast iron hammer-type sprinklers—these sprinklers will deliver large droplets over a radius of 30 m each with 5 mm nozzle reducing any element of clogging.
- Up to 100 m of rising main from WWTP irrigation pump to the irrigation field (laid above ground).
- 1200 mm high, two strand steel wire fencing, with vehicle access gates and safety signage every 50 m to prevent inadvertent access by personnel and fauna. AGM undertakes vermin control across site, with control measures varying and dependant on the target species. AGM engages an external contractor specialising in pest animal control to conduct an organised control program (as required).
- Individual branch line flush valves.
- Automated control from the WWTP irrigation pump.

The WWTP locations and irrigation areas were selected in accordance with Water Quality Protection Note 22 - Irrigation with Nutrient Rich Wastewater' (DoW, 2008). The land is not permanently inundated or waterlogged, however the natural landform is subject to seasonal surface water flows which have been disturbed or diverted during historical operations and the irrigation field is protected by these diversions. Consequently, the area does not contain defined watercourses, ephemeral streams, or discernible drainage channels. Sheet flow runoff that occurs following significant rainfall events terminates in disconnected low-lying areas such as playas and sand plains.

There are no Sensitive Water Resources within 500 m of the WWTP facility. The location of the facility is not within a Public Drinking Water Source Area, a wetland with defined conservation value, Environmental Protection Policy Lakes, Waterways Management Areas or other wetlands.

The irrigation field has also been located with consideration to potential amenity issues associated with proximity to workplace areas and is located at least 200 m from the nearest occupied structure.

The general arrangement of the Irrigation Field has been presented in Appendix 3.

3.1.5 Sludge Dewatering and Disposal

Wastewater treatment plants generate sludge that requires regular disposal from the system. Rather than transporting liquid sludge, which typically contains around 80% water, off-site, the WWTP will employ a dewatering unit. This unit can efficiently treat liquid sludge on-site, converting it into a solid cake that can then be disposed of at the on-site landfill facility (refer to Figure XX).

Sludge is generated from the aeration tank at regular intervals and stored in a poly sludge storage tank. The sludge dewatering system is housed in an insulated 6m modular pump room, equipped with a sludge transfer pump, poly dosing system, mixing tank, and control panel.

The dewatering process begins by drawing sludge from the storage tank(s) into the pump room, where polymer is added to aid coagulation. The treated sludge is then transferred to geobags, which effectively trap the sludge while allowing excess water (supernatant) to drain and be captured. A return pump collects the captured supernatant from the bunded area and circulates it back to the beginning of the wastewater treatment plant for further processing, ensuring a closed-loop circuit.

The resulting dried biosolids, or sludge cake, can then be disposed of at the on-site landfill or bio-remediation pads in accordance with the conditions of Environmental Licence L4611/1987/11. The biosolid sludge is classed as putrescible waste according to the DWER Landfill Waste Classification and Waste Definitions, December 2019.

3.1.6 WWTP Pipelines

Pipelines carrying raw effluent to the WWTP will be constructed from HDPE and located within a bunded corridor or buried, and appropriately signposted.

Construction of the WWTP pipeline shall be in accordance with the following Acts, Regulations and Standards;

- Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations, 1974.
- Plumbers Licensing and Plumbing Standards Regulations, 2000 (Plumbing Regulations)
- AS/NZS 3000. Electrical installations (known as the Australian/New Zealand Wiring Rules)
- Water Services Act, 2012 (WA) (Section 91)

Treated effluent from the WWTP will be transferred via HDPE pipeline to the nearby irrigation field. Time Limited Operations. Due to the modular nature of the installation, environmental commissioning is not required.

Following installation of the WWTP, a Construction Compliance Report will be furnished to DWER confirming that the facility has been constructed in accordance with the conditions of the Works Approval. Simultaneously, an Environmental License Amendment Application (LAA) will be lodged to add the WWTP to the existing Environmental Licence (L4611/1987/11).

During the LAA assessment period, the facility will operate under emissions and discharge conditions stipulated in the Works Approval under Time Limited Operations (TLO). AGM proposes a TLO period of 180 days be granted the prescribed premises categories nominated in Section 1.7 as described in Table 8

Attachment 6A outlines the emissions and discharges from the Prescribed Premises categories expected during operations and the relevant controls. These are also applicable during the TLO phase.

Operations under Licence conditions would begin when the Licence is granted.

Table 8: Proposed Time Limited Operations for Prescribed Premises

Prescribed Premises Category	Infrastructure	Time Limited Operations Period (days)
85	WWTP	180

4. REFERENCES

Australian and New Zealand Standard AS/NZS1170/2011: Wind actions up to cyclonic region D terrain Category 2

Australian and New Zealand Standard AS/NZS1477/2017: PVC Pipes and fittings for pressure applications Importance Level 2

Australian Standard AS1657/2018: Fixed platforms, walkways, stairways and ladders – Design, construction and installation.

Australian and New Zealand Standard AS/NZS 3500.2021 Plumbing and Drainage

Australian and New Zealand Standard AS/NZS 3000:2018. Electrical installations

Australian and New Zealand Standard AS/NZS4766/2006: Polyethylene Storage Tanks

Australian Standard AS1940/2017: The storage and handling of flammable and combustible liquids

Australian Standard AS2129/2000: Flanges for pipes, valves and fittings

Australian Standard AS3776/2015: Lifting components for chain slings

Australian Standard AS3990/1993: Mechanical equipment – Steelwork

Australian Standard AS4991/2004: Lifting devices

Department of Health, Western Australia (1974) Supplement to Regulation 29 and Schedule 9 of the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 (Regulations)

Department of Health, Western Australia (2021) Guidance on Site-and-soil evaluation for on-site wastewater management

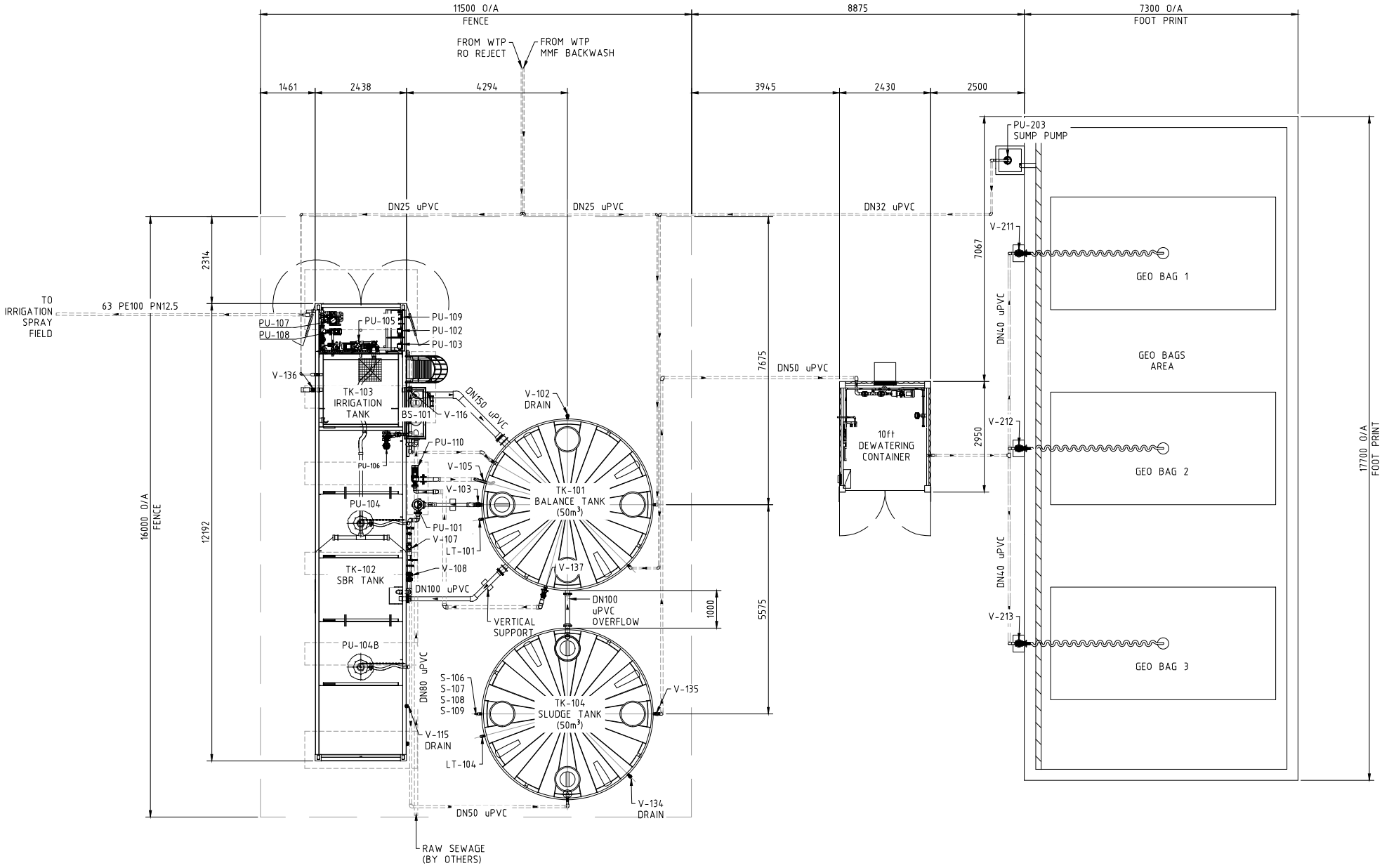
DoW. 2016. Water Quality Protection Note. WQPN 8. Sensitive water resources. January 2016. Government of Western Australia's Department of Water, Perth.

DoW. 2008. Water Quality Protection Note. WQPN 22. Irrigation with nutrient-rich wastewater. July 2008. Government of Western Australia's Department of Water, Perth.

Government of Western Australia, Water Services Act, 2012 (WA). September 2012

APPENDICES

APPENDIX 1: WWTP GENERAL ARRANGEMENT



PLAN

ISSUE	DATE	REVISION	DRN	CHK	APPD
A	22.01.24	FIRST ISSUE	YR	JS	DD

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GOLDFIELDS
REDEEMER SITE
92EP (18.72kL/day) SBR WWTP
SITE GENERAL ARRANGEMENT

PROJECT	P1389	PLAN	P1389-M-100	ISSUE	A
SCALE	1:50				

ORIGINAL SHEET SIZE A1

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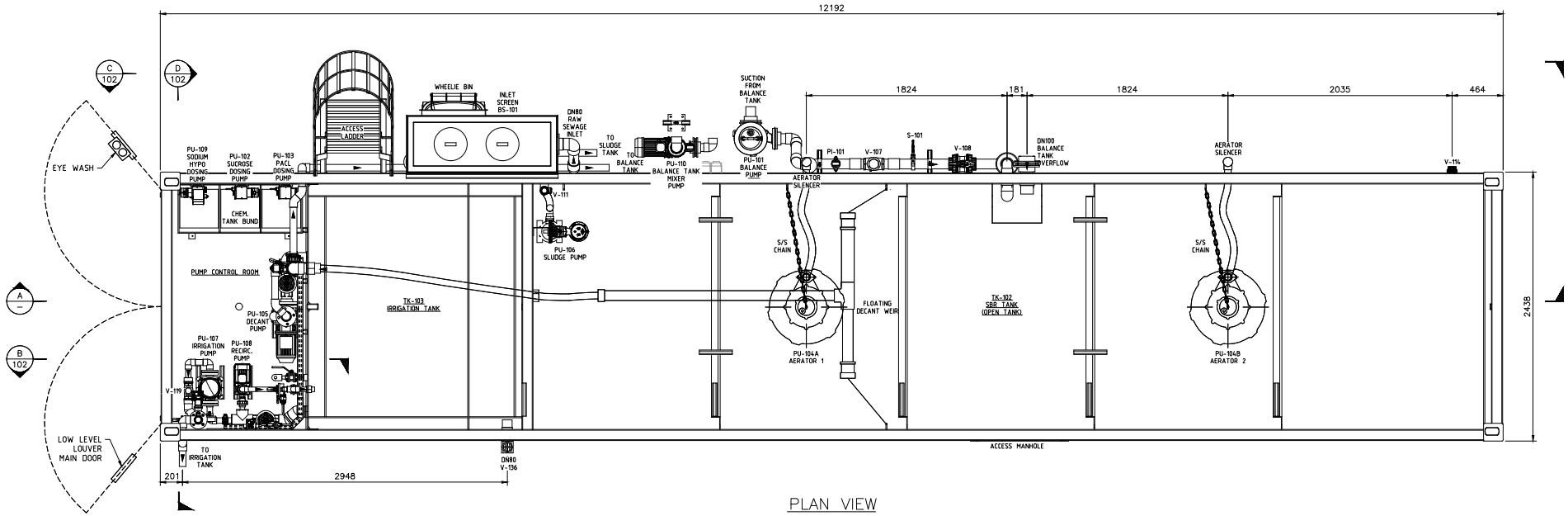
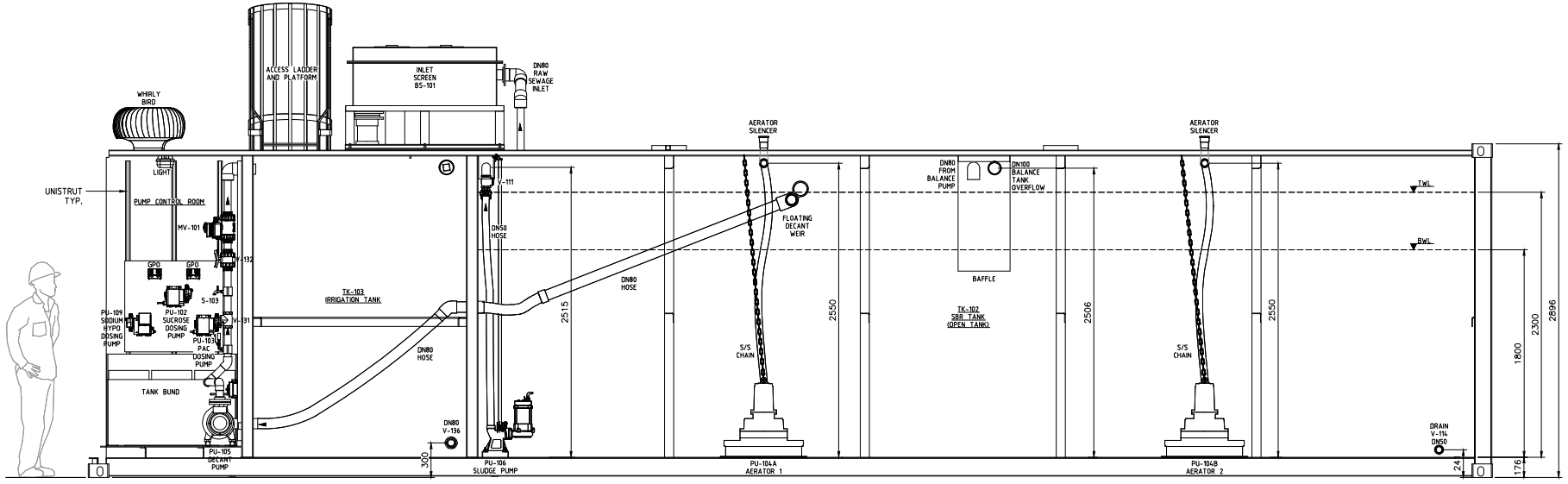


PLAN VIEW



SECTION A –

ISSUE	DATE	REVISION	DRN	CHK	APPD
A	16.01.24	FIRST ISSUE	YR	JS	AM

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TRISTAR WATER SOLUTIONS
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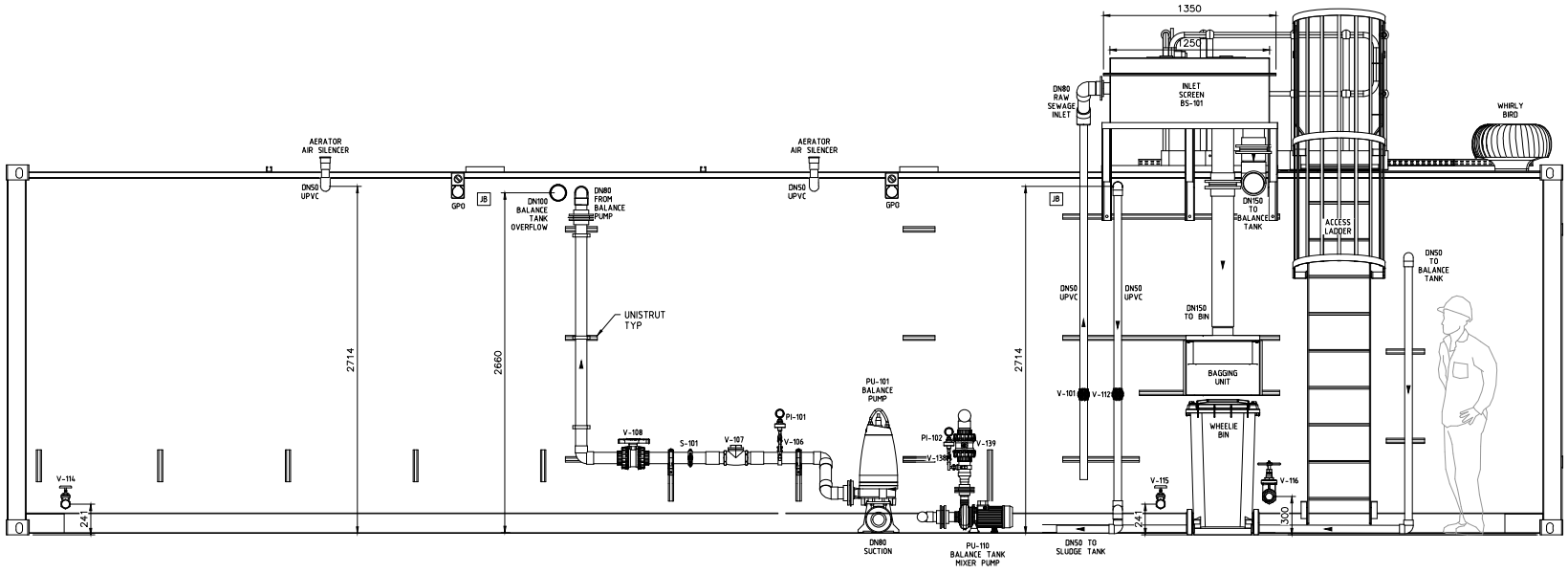
GOLDFIELDS
REDEEMER SITE
92EP (18.72kL/day) SBR WWTP
CONTAINER GENERAL ARRANGEMENT SHEET 1 OF 2

PROJECT	P1389	PLAN	P1389-M-101	ISSUE	A
SCALE	1:20				

ORIGINAL SHEET SIZE A1



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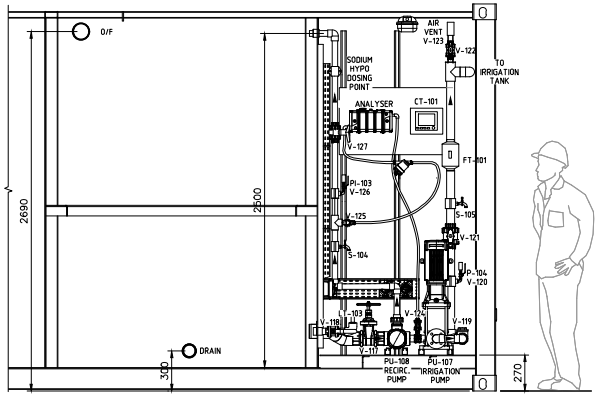

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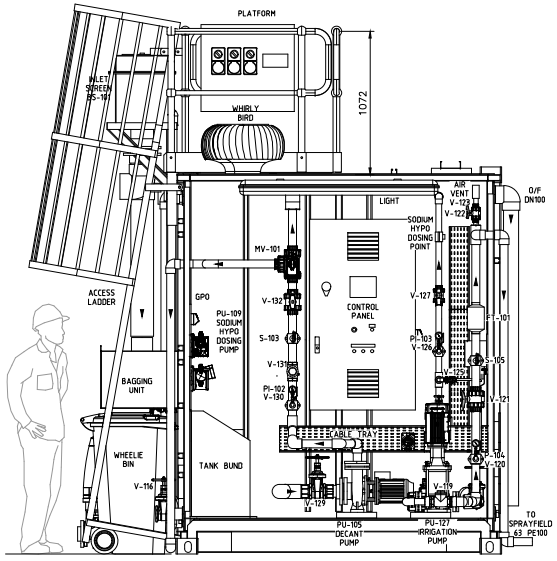

SECTION D 101

ISSUE	DATE	REVISION	DRN	CHK	APPD
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GOLDFIELDS
REDEEMER SITE
92EP (18.72kL/day) SBR WWTP
CONTAINER GENERAL ARRANGEMENT SHEET 2 OF 2

PROJECT	P1389	PLAN	P1389-M-102	ISSUE	A
SCALE	1:20				

ORIGINAL SHEET SIZE A1

566
810

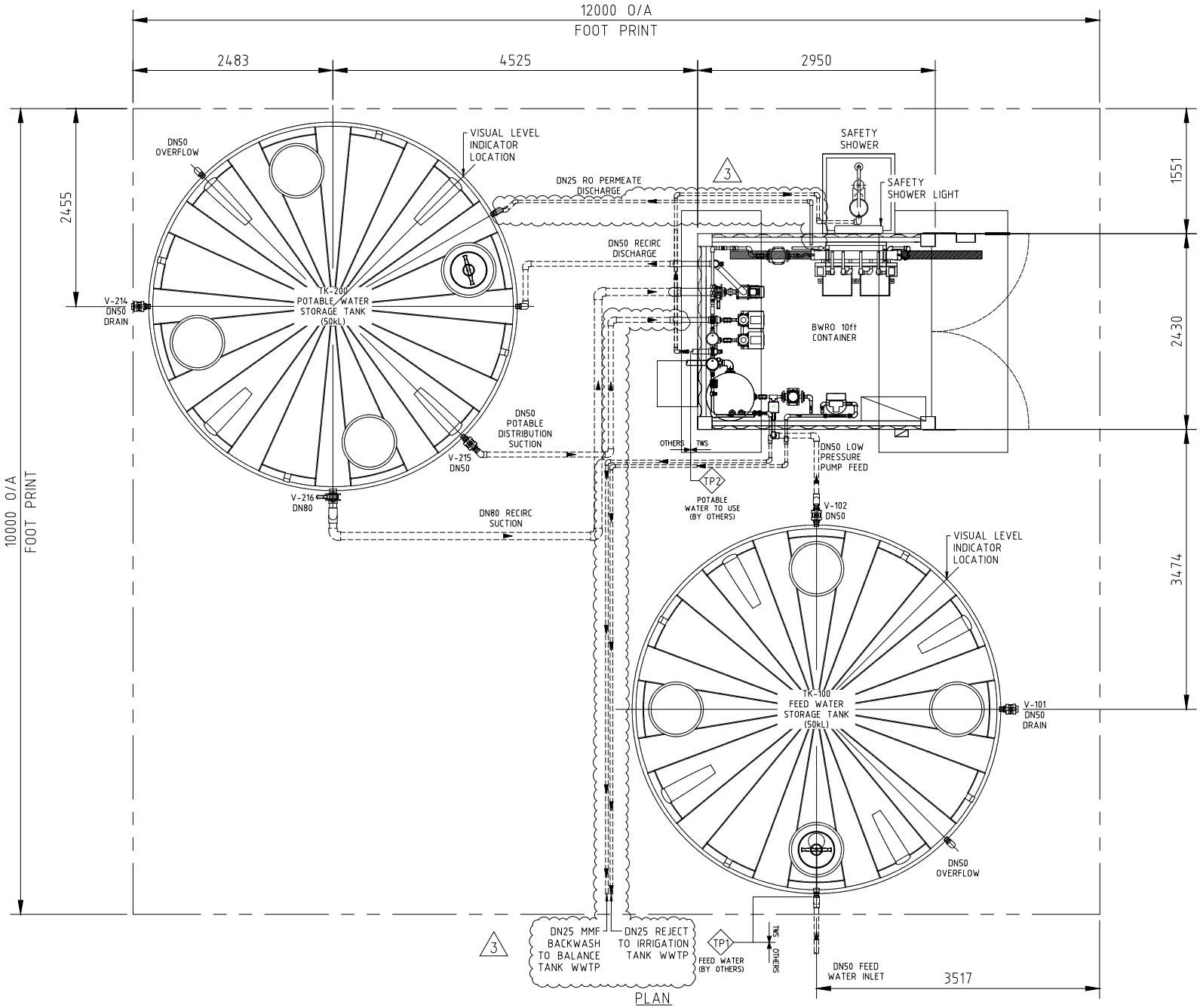
APPENDIX 2: BWRO GENERAL ARRANGEMENT

TERMINATION POINT	
TP1	DN80 T/E FLANGE
TP2	DN50 T/E FLANGE

LEGEND

ABOVE GROUND ——————

BELOW GROUND - - - - - - - - - -



ISSUE	DATE	REVISION	DRN	CHK	APPD
A	22.01.24	FIRST ISSSUE	YR	JS	AM
0	29.02.24	ISSUE FOR CONSTRUCTION	YR	JBS	JS
1	05.04.24	NOZZLE SIZE CHANGED & LEVEL INDICATOR LOCATION ADDED	YR	JS	GS
2	13.08.24	PIPE LOCATION CHANGED AS NOTED	YR	JBS	TA
3	03.09.24	PIPE LOCATION CHANGED AS NOTED	KP	JBS	TA

CENTURION WATER & WASTEWATER SOLUTIONS PTY LTD
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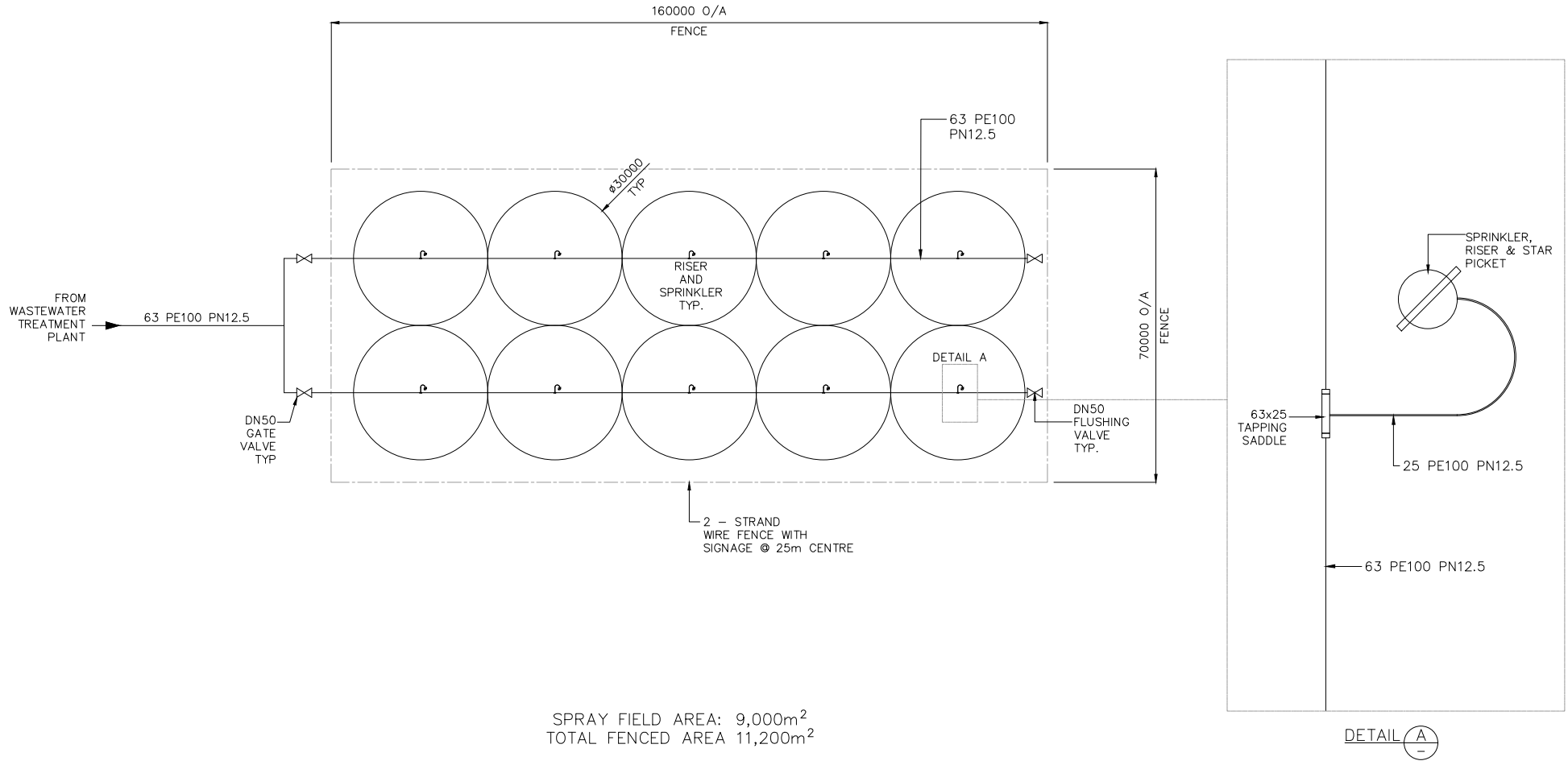
CENTURION WATER & WASTEWATER SOLUTIONS

GOLDFIELDS
REDEEMER MINE CAMP
20kL/day BWRO WTP
BWRO WTP SITE LAYOUT

PROJECT P1388
SCALE 1:25
DRAWING NUMBER P1388-M-100
ISSUE 3
ORIGINAL SHEET SIZE A1

APPENDIX 3: IRRIGATION FIELD GENERAL ARRANGEMENT



SPRAY FIELD AREA: 9,000m^2
TOTAL FENCED AREA 11,200m^2

DETAIL A

ISSUE	DATE	REVISION	DRN	CHK	APPD
A	22.01.24	FIRST ISSUE	YR	JS	DD

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TRISTAR WATER SOLUTIONS
A CENTURION COMPANY

GOLDFIELDS
REDEEMER SITE
92EP (18.72kL/day) SBR WWTP
SPRAYFIELD LAYOUT AND DETAILS

PROJECT P1389
SCALE NTS
PLAN P1389–M–103
ISSUE A

ORIGINAL SHEET SIZE A1

566
B10

APPENDIX 4: IRRIGATION FIELD CALCULATIONS

Data Input

Job Details	
Client:	Goldfields
Site Address:	Agnew Redeemer Trister WWTP & RO
Date:	2-Jun-24
Assessor:	MBS Environmental

Waste Water Treatment Plant Details	
Number of occupants:	92
Daily Discharge Per Person (L):	160
RO Brine (L):	
Daily Discharge Rate (L):	14720
EPA Part V Emissions:	No Licencing Required (<20 m3 / day)
	**Except where overall site discharge is above combined threshold
Discharge days per annum:	365
Average or maximum licence concentrations	
Nitrogen (mg/L):	30
Phosphorous (mg/L):	8

Irrigation Area Details	
Area of land available for irrigation (ha):	1
Risk Category from Table A:	C
Soil description:	Fine grained soil (e.g. clay, loam or peat) close (500 m) to surface waters PBI >
Nitrogen Application Rate (kg/ha/year):	300
Phosphorous Application Rate (kg/ha/year):	50
Soil Category from Table B:	1
Irrigation Type from Table B:	Spray Irrigation
Soil Texture:	Gravels and sands
Rainfall runoff factor:	0.5

Climate Data Details

Month	Rainfall (mm/month)	Evaporation (mm/month)
January	36.9	238.7
February	41.3	207.2
March	35.1	167.4
April	23.9	111
May	14.1	74.4
June	13.5	48
July	15	55.8
August	8.4	74.4
September	4.2	102
October	11.7	145.7
November	16	174

Rainfall data can be found here: http://www.bom.gov.au/climate/data/index.shtml

Pan Evaporation data can be found here: http://data.un.org/Data.aspx?d=CLINO&f=ElementCode%3A21

Waste Water Treatment Plant Irrigation Investigation

Client: Goldfields
Site Address: Agnew Redeemer Trister WWTP & RO

Date: 2/06/2024 **Assessor:** MBS Environmental

Number of Occupants:	92		**Daily Discharge Rate:**	14,720	L
Daily Discharge Per Person:	160	L	**EPA Part V Emissions Category:**	No Licencing Required (<20 m	
Discharge Days per annum:	365	days			
Licences Nutrient Discharge Concentrations			**Run off Factor:**	0.5	
Nitrogen:	30	mg/L			
Phosphorous:	8	mg/L			
Irrigation Type:	Spray Irrigation		**Recommended Irrigation Rate:**	5	mm/day
Soil Texture:	Gravels and sands		**Area available for irrigation:**	1	ha
Soil Description:	Fine grained soil (e.g. clay, loam or peat) close (500 m) to surface waters PBI > 100				

Environmental Assessment - Nutrient Application

Government of Western Australia, Department of Water and Environmental Regulation

Allowable Nutrient Application Rate					
Nitrogen:	300	kg/ha/year	**Phosphorous:**	50	kg/ha/year
Nitrogen Area:	0.5	ha	**Phosphorous Area:**	0.9	ha
Minimum Irrigation Area:	0.9	ha			

Based on nutrient application to soils, is the irrigation area available sufficient?	YES

Health Assessment - Water Loading / Soil Infiltration

Government of Western Australia, Department of Health

Minimum irrigation area: 0.3 ha

Based on water loading and soil infiltration, is the irrigation area available sufficient?	YES

Minimum Irrigation Area Required: 0.9 ha

Based on nutrient application and water loading / soil infiltration of soils, is the irrigation area available sufficient?	YES