Works Approval – Mining Area C South Flank

Supporting Documentation (Including Information relating to Attachments 1 to 8)

March 2018

Contents

1. Introduction 3
2. Proposed Infrastructure 9
3. Approvals Framework 28
4. Stakeholder Consultation 32
5. Existing Environment and Location 34
6. Environmental Management Framework 50
7. Environmental Impact Assessment 51
8. Abbreviations 59
9. References 60

List of Tables

Table 1.1: Infrastructure Characteristics and Commitments 3
Table 2.1: Project Description Processing Infrastructure 9
Table 2.2: Project Description Fuel Storage 21
Table 2.3: Key Features of Diesel Storage Facility at PC1 and PC2 22
Table 2.4: L7851/2002/6 Table 1.2.2.: Waste Processing 24
Table 2.5: Support Waste Water Treatment Plants 25
Table 3.1: Approval Summary 28
Table 3.2: Mining Area C and South Flank Part V Submissions 30
Table 4.1: Stakeholder Engagement 32
Table 5.1: Sensitive Receptors 34
Table 5.2: Landsystems Present within the Prescribed Premises 37
Table 5.3: Vegetation Associations Within the Mining Area C Prescribed Premise 40
Table 5.4: Fauna Habitats 47
Table 6.1: MS 1072 Management Plans 50
Table 7.1: Dust Sources 52
Table 7.2: Visibility Risk Rating (PEL 2015b) 54

List of Figures

Figure 1.1: Mining Area C Regional Location 6
Figure 1.2: Mining Area C Prescribed Premises Boundary 7
Figure 2.1: Mining Area C – South Flank Infrastructure 10
Figure 2.2: Processing Diagram 11
Figure 2.3: Primary Crushing Station 1 General Layout 13
Figure 2.4: Primary Crushing Station 2 General Layout 14
Figure 2.5: Overland Conveyors 15
Figure 2.6: Ore Handling Plant General Layout 16
Figure 2.7: Coarse Ore Stockpile and Ore Handling Plant 17
Figure 2.8: Stacking and Stockyard Infrastructure 19
Figure 2.9: Outflow and Train Load Out 20
Figure 2.10: Locations of Supporting Facilities 27
Figure 5.1: Land Uses and Sensitive Receptor 35

Attachments

Attachment 0: Compliance Report Project Characteristics and Commitments Confirmation
Attachment 1: Applicants Details
Attachment 1a Proof of occupier status
Attachment 1B: ASIC company extracts
Attachment 2A: Premises, Facilities and Location Map
Attachment 2B: Prescribed Premises Map Coordinates
Attachment 3A: Proposed Activities
Attachment 4A: Other Approvals MS1072
Attachment 4B: Other Approvals: Environmental Licence L7851/2002/6
Attachment 5: Emissions and discharges and Waste acceptance
Attachment 6: Siting and location
Attachment 7A: Supporting Document – Dust Modelling
Attachment 7B: Supporting Document – Risk Summary

1. Introduction

1.1. Background

BHP Billiton Iron Ore Pty Ltd (BHP) currently operates a number of Iron Ore mines and associated rail and port infrastructure within the Pilbara region of Western Australia (WA). Current mining operations include the:

- Newman Joint Venture (NJV) hub located approximately two kilometres (km) west of Newman Township and consists of Mount Whaleback, and Orebodies 29, 30 and 35;
- Mining Area C located approximately 90 km north west of Newman Township;
- Wheelarra Hill (Jimblebar) Mine, Orebody 18 and Orebody 31 (Jimblebar Hub) are located approximately 35 km east of Newman Township;
- Eastern Ridge hub located approximately 5 km east of Newman Township and consists of Orebodies 23, 24, 25 and 32; and
- Yandi Mine located approximately 100 km north-west of Newman Township.

Ore from the NJV hub, Mining Area C, Eastern Ridge, Wheelarra Hill (Jimblebar) and Yandi mining operations is transported to Port Hedland via the BHP Billiton Newman to Port Hedland Mainline (and associated spur lines). Ore is then shipped out through Port Hedland at the BHP facilities at Nelson Point and Finucane Island.

1.2. Purpose of this Document

BHP currently operates an iron ore mine at Mining Area C, under environmental licence L7851/2002/6. BHP is seeking to develop and operate a satellite ore body at South Flank by submission of works approval to:

- Construct Category 5, 80 million tonnes per annum (Mtpa) processing facility, two 40Mtpa primary crushing stations and conveyors;
- Construct Category 73, two 2ML diesel storage facilities: and
- Request staged commissioning of the above facilities.

This supporting document has been prepared to provide supplementary information to the “Application Form: Works Approval / Licence / Renewal / Amendment / Registration” for the South Flank works approval, as required under Section 54 of the *Environmental Protection Act 1986* (EP Act).

BHP commits to undertake the proposed works in accordance with the details set out in Table 1.1. BHP will confirm compliance as detailed in Table 1.1 in the compliance document using the template provided (Attachment 0). Compliance reporting will be required to be submitted in stages to meet the construction and commissioning requirements, at the completion of construction and prior to commencement of load commissioning of the infrastructure. BHP will communicate the change to the Department of Water and Environmental Regulation and detail the change in the Compliance Report.

Table 1.1: Infrastructure Characteristics and Commitments

Infrastructure Characteristics	
Infrastructure:	**Category 5 Processing or beneficiation of metallic or non-metallic ore** Two primary crushing stations Overland conveyors Transfer stations Ore Handling Plant **Category 73 Bulk Fuel Storage** Two diesel storage facilites

Works Approval – Mining Area C South Flank

Maximum production / design capacity	Primary crushing stations - 40Mtpa each Ore handling Plant 80Mtpa Diesel Storage 2ML (2,000kL) each facility
Location of all infrastructure associated with the Works Approval:	Mining Area C prescribed premise (see Figure 1.2 and Attachment 0)
Tenure	Mineral Leases ML281SA and ML249SA
Commissioning and Compliance Report:	A two year load commissioning period is required. BHP commits to undertake the proposed works in accordance with the details set out in Table 1.1. BHP will confirm compliance as detailed in Table 1.1 in the compliance document using the template provided (Attachment 0). Compliance reporting will be required to be submitted in stages to meet the construction and commissioning requirements.
Licence:	The infrastructure will be operated under the existing Environmental Operating Licence L7851/2002/6.
Relevant Environmental Factors:	The following environmental factors associated with the proposed infrastructure are considered to require management measures as detailed below: • Air Quality – Dust • Treated Waste Water • Surface Water

Application Commitments	Phase to which the Commitment Applies[1]	Section
BHP will confirm compliance with phase commitments.	Commissioning	2.4 and 2.5
Compliance reporting will be required to be submitted in stages to meet the construction and commissioning requirements. (as detailed in Table 1 using the template provided Attachment 0) will be submitted and a Licence amendment obtained from, the DWER.	Commissioning	2.4 and 2.5
BHP will communicate the change to the Department of Water and Environmental Regulation and detail the change in the Compliance Report.	Construction and Commissioning	2.4
Dust emissions will be managed through the • Automated dust suppression water cannons, • fogging systems will be located on the ROM Bin, product screening, scalping and crushing buildings at discharge from screens and crushers; • Covers and/or hoods installed in PC1, PC2 and OHP3; • Bulk Ore Conditioning (BOC) sprays and moisture analysers along the conveyors	Commissioning and Operations	2.1 and 7.1.1

Storm water from key infrastructure areas will be diverted through a sedimentation pond prior to discharge sedimentation ponds	All	7.1.1
Water potentially contaminated with hydrocarbons will be treated by an oily water separator until monitoring confirms the Total recoverable hydrocarbons (TRH) concentration is less than 15mg/L;	All	7.1.3
Fuel facilities will be managed through the • The prevention of spills through the implementation of engineering and administrative controls (Table 2.3); • Facilities will be constructed in accordance with Australian Standard 1940-2004 The storage and handling of flammable and combustible liquids; • Stored and handled in accordance with the requirements of the *Dangerous Goods Safety Act 2004; Dangerous Goods Safety (Storage and Handling of non-explosives) Regulations 2007*; and Australian Standard 1940-2004; • Spill kits will be provided and maintain at refueling points and fuel storage facilities	Construction and commissioning	2.2 7.2

1 Please note that these commitments only apply to the Pre-construction, Construction and Commissioning phases of the project. Further commitments related to the Operation and Decommissioning of the infrastructure will be detailed in subsequent license application(s) to the Department of Environment Regulation (DWER)

1.3. Premises

1.3.1. Location

The Mining Area C is located approximately 90 km northwest of the Newman Township in the Pilbara region of Western Australia (Figure 1.1). The South Flank ore body is positioned approximately 8 km south of BHP Mining Area C (Figure 1.1).

1.3.2. Tenement Details

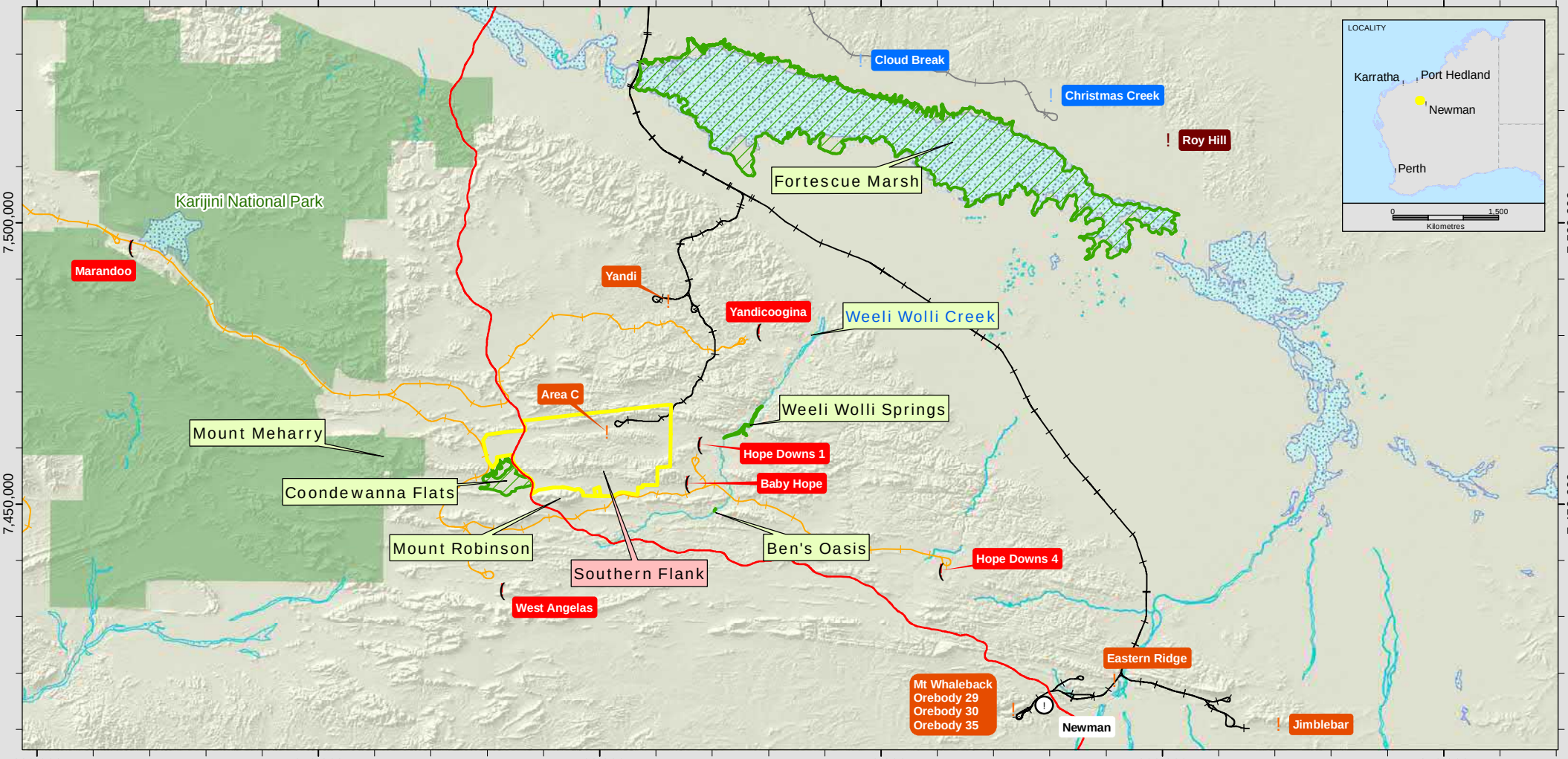
The proposed infrastructure is located primarily on Mineral Leases ML281SA and ML249SA and are subject to the *Iron Ore (Mount Goldsworthy) Agreement Act 1964* State Agreement legislation (Attachment 1.

1.3.3. Local Government

Mining Area C is located within the Shire of East Pilbara.

1.3.4.Prescribed Premise Boundary

An application has been submitted (31 Jan 2018) to expand the prescribed premise boundary to include the South Flank Satellite deposit and associated infrastructure (Figure 1.2). The proposed boundary will align with the proposed Ministerial Statement boundary with the exception of the rail corridor and the south-eastern corner that overlies Rio Tinto's rail corridor. The spatial coordinates of the prescribed premise are included in (Attachment 2). Figure 1.2shows the approximate locations of the proposed discharge points within the prescribed premises.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Central Pilbara Overview

Scale @ A4:	1:1,000,000	Prepared:	M. LYTTLE	Project No:	A780/100 REV A
Date:	21/03/2018	Checked:	G. MANNING	Figure :	1.1
Revision:	REV A	Reviewed:	K. FLOWERDEW		

Town

Major Active Iron Ore Mines

- BHP Billiton
- Fortescue Metals Group
- Rio Tinto
- Roy Hill Holdings

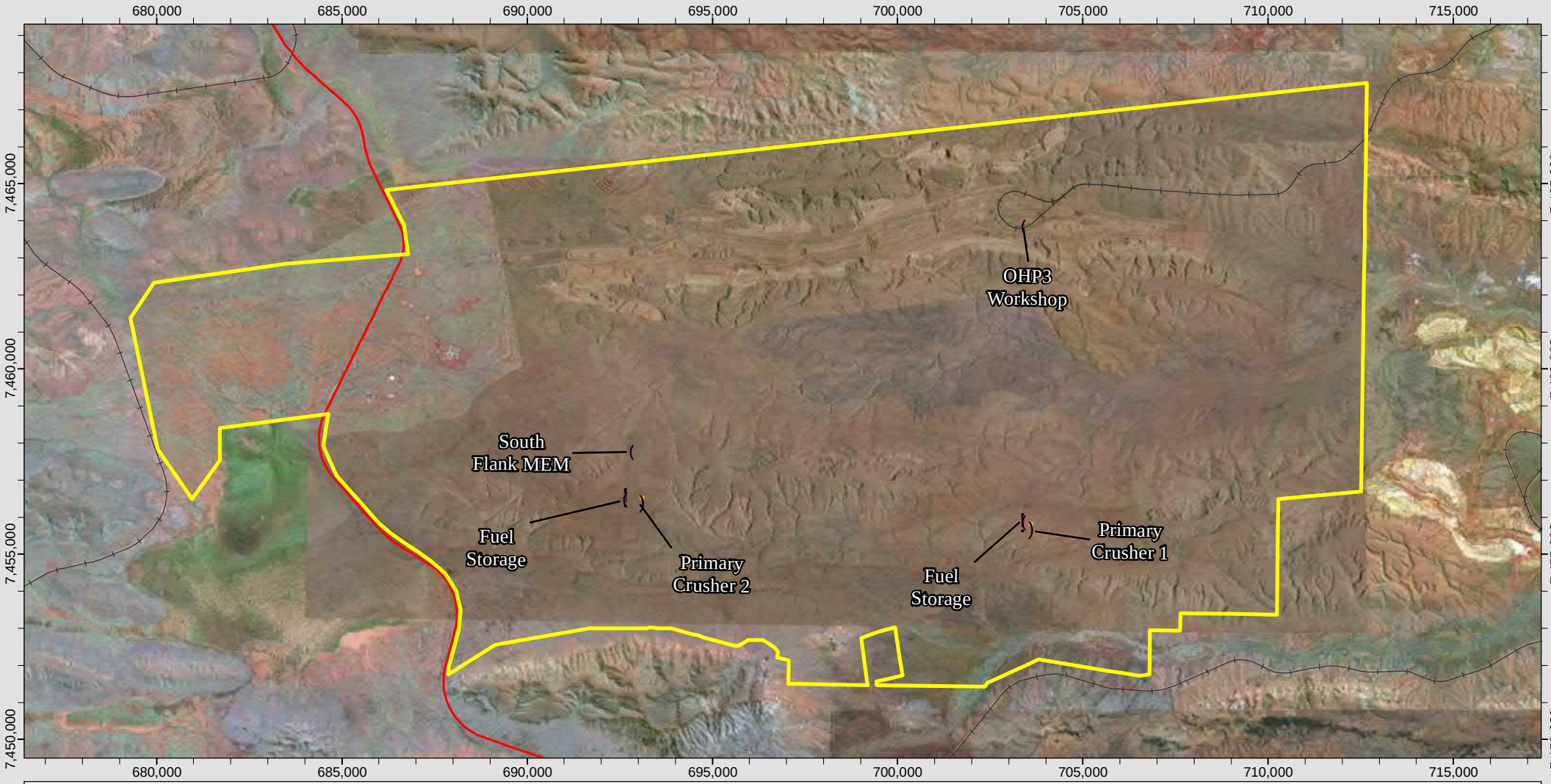
Environmental Receptors Relevant to Proposal

- Priority Ecological Community
- Prescribed Premise Boundary (L7851)
- Great Northern Highway
- BHP Billiton Rail
- FMG Rail
- Rio Tinto Rail
- Watercourse Areas - Non-perennial
- Land Subject To Inundation
- Karijini National Park

0 20 40 60
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_100_E_MAC_SouthernFlank_WorksApproval_CentralPilbaraOverview_Fig1.1_RevA.mxd



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK
Works Approval Discharge Locations

Scale @ A4:	1:150,000	Prepared:	M. LYTTLE	Project No:	A780/101 REV A
Date:	22/03/2018	Checked:	G. MANNING	Figure :	1.2
Revision:	REV A	Reviewed:	K. FLOWERDEW		

Discharge Locations

- ! Bulk Chemical Storage
-) Crusher
- (Oily Water Separator

MAC / Southern Flank Proposed Prescribed Premises Boundary (L7851)

Highways

Rail

0 2 4 6
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_101_E_MAC_SouthernFlank_WorksApproval_DischargeLocations_Fig1.2_RevA.mxd

1.4. Proponent

BHP as the manager for the Mount Goldsworthy Mining Associates Joint Venture, which owns Mining Area C including South Flank, has submitted this Works Approval application. The allocation between the partners of the Joint Venture is as follows:

- BHP Billiton Minerals Pty Ltd 85%
- Itochu Minerals and Energy Australia Pty Ltd 8%
- Mitsui Iron Ore Corporation Pty Ltd 7%

BHP has the authority to act for the Mount Goldsworthy Joint Venture and is authorised as the manager and agent of the proponent to submit this application and execute the works as approved.

The key contact for this proposal is:

Kimberley Flowerdew
Specialist – Environment A&I
BHP Billiton
Phone: (08) 6321 2078
Email: Kimberley.Flowerdew@bhpbilliton.com
Level 36, 125 St Georges Terrace
Perth WA 6000 Australia

2. Proposed Infrastructure

2.1. Category 5 Process Infrastructure

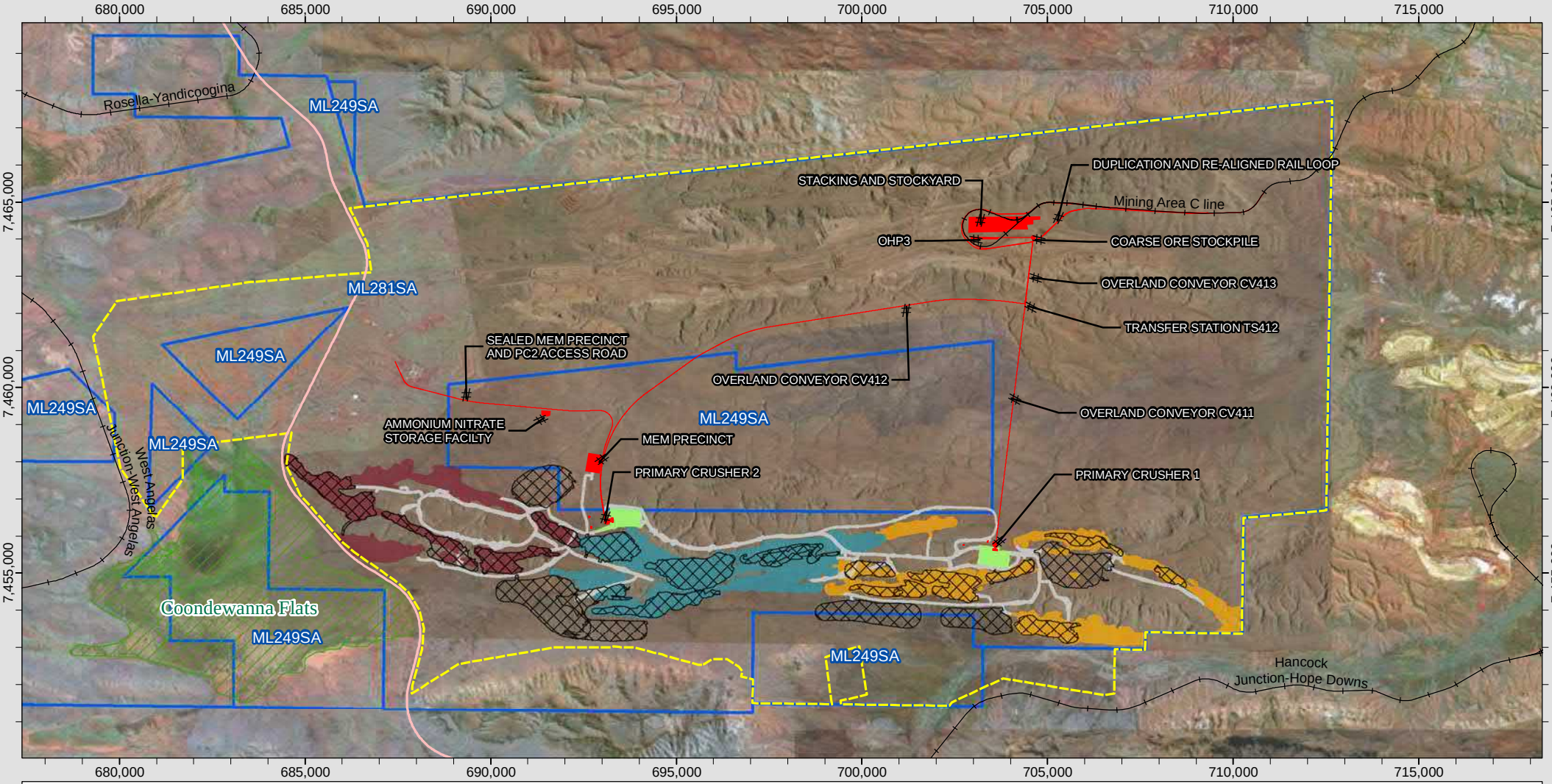
2.1.1. Overview

Mining at South Flank will be undertaken utilising conventional open-cut mining for iron ore. Campaign mining involves drilling, blasting, and categorisation of blasted material into iron ore or waste rock. Iron ore will be extracted from the three South Flank deposits - Highway, Vista Oriental and Grand Central (Figure 2.1).

BHP is seeking a works approval to construct processing and support infrastructure at Mining Area C -South Flank (Table 2.1). Primary crushing will occur at South Flank, and overland conveyors will transport crushed ore to the Mining Area C hub (Figure 2.1). The existing Mining Area C hub infrastructure and facilities will be expanded with a a new ore handling plant (OHP) to achieve a nominal combined processing rate of 150 Mtpa of blended ore. Figure 2.2 illustrates the ore movement from the South Flank Deposits through the stages of processing to the train load out facility.

Table 2.1: Project Description Processing Infrastructure

Category	Project Components	Design Capacity	System Description	Expected discharges
5	**South Flank** Two primary crushing stations Discharge and overland conveyors Transfer stations	The two primary crushing stations will each have a name plate capacity of 40Mtpa increasing the Mining Area C processing capacity to 150Mtpa	Metso gyratory 70-89s MKIII 70-89 primary crushers	• Dust and greenhouse gases discharged to air; • Potential hydrocarbon spillage ground; and • Noise during construction and operation.
	Mining Area C Coarse ore stockpile Ore Handling Plant 3 comprising: o Scalping screening building containing five scalping screening bays (Scheck SLD4385s); o Secondary crushing building containing four secondary crusher bays (Metso MP1250s); o Product screening building containing six product screening bays (Scheck SLD4385s); and o Conveyors Ore sampling stations Stockyard expansion to receive South Flank ore: o 2 stackers; and o 1 new reclaimer.			



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK
Infrastructure

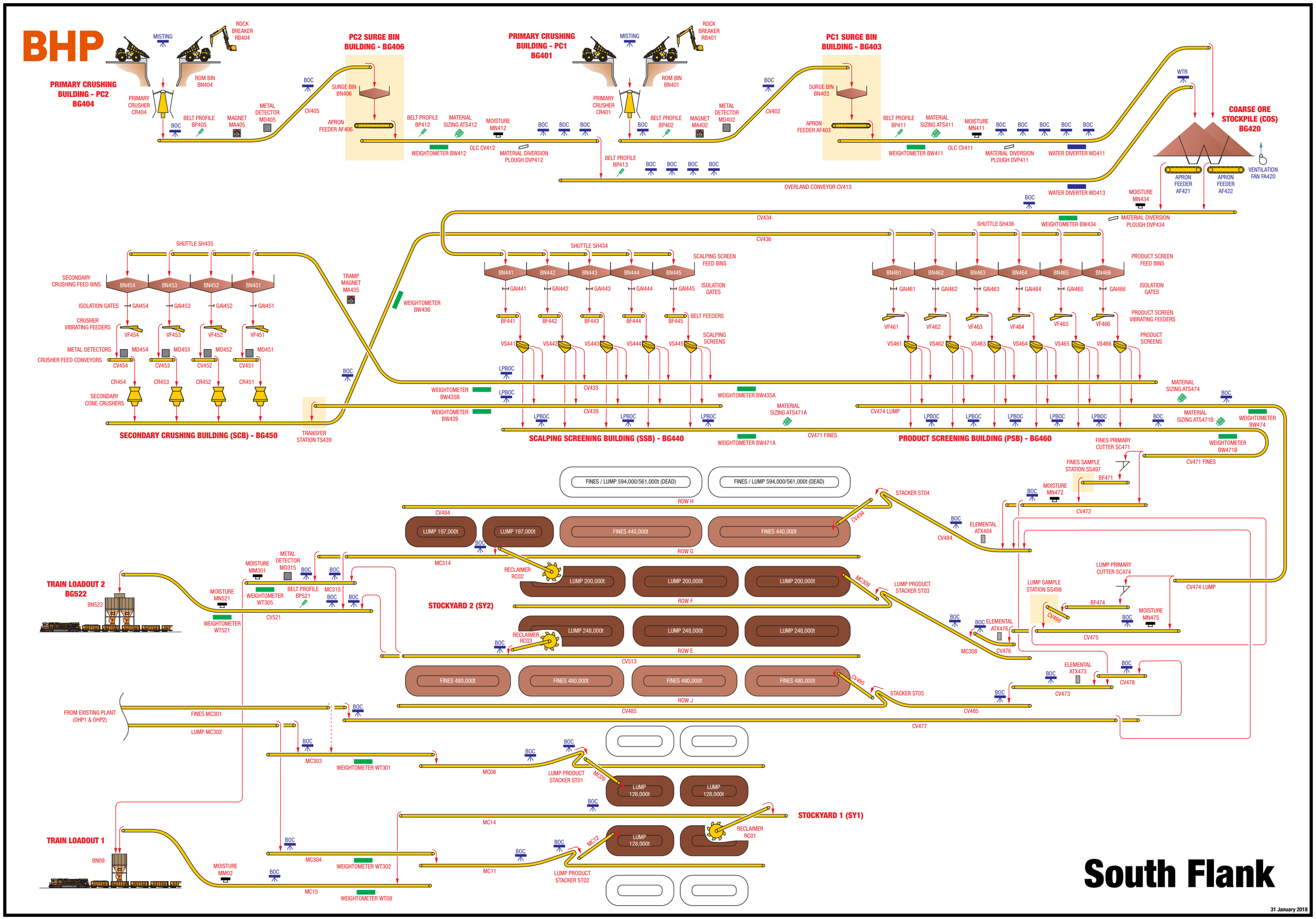
Scale @ A4:	1:150,000	Prepared:	M. LYTTLE	Project No:	A780/102 REV A
Date:	22/03/2018	Checked:	G. MANNING	Figure :	2.1
Revision:	REV A	Reviewed:	K. FLOWERDEW		

- MAC / Southern Flank Proposed Prescribed Premises Boundary (L7851)
- Priority Ecological Community
- Grand Central Pit Outlines
- Highway Pit Outlines
- Vista Oriental Pit Outlines
- Haul Road
- Overburden Storage Area
- ROM Pad
- Infrastructure
- Great Northern Highway
- Existing Rail
- BHP State Agreement Tenure (ML249SA & ML281SA)

0 2 4 6
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_102_E_MAC_SouthernFlank_WorksApproval_Infrastructure_Fig2.1_RevA.mxd


BHP
PRIMARY CRUSHING BUILDING - PC2 BG404
MISTING
ROCK BREAKER RB404
ROM BIN BN404
PRIMARY CRUSHER CR404
BOC
BELT PROFILE BP405
MAGNET MA405
METAL DETECTOR MD405
CV405
PC2 SURGE BIN BUILDING - BG406
SURGE BIN BN406
APRON FEEDER AF406
BELT PROFILE BP412
MATERIAL SIZING ATS412
MOISTURE MN412
WEIGHTOMETER BW412
OLC CV412
MATERIAL DIVERSION PLOUGH DVP412
PRIMARY CRUSHING BUILDING - PC1 BG401
MISTING
ROCK BREAKER RB401
ROM BIN BN401
PRIMARY CRUSHER CR401
BELT PROFILE BP402
MAGNET MA402
METAL DETECTOR MD402
CV402
PC1 SURGE BIN BUILDING - BG403
SURGE BIN BN403
APRON FEEDER AF403
BELT PROFILE BP411
MATERIAL SIZING ATS411
MOISTURE MN411
WEIGHTOMETER BW411
OLC CV411
MATERIAL DIVERSION PLOUGH DVP411
WATER DIVERTER WD411
BELT PROFILE BP413
OVERLAND CONVEYOR CV413
WATER DIVERTER WD413
WTR
COARSE ORE STOCKPILE (COS) BG420
APRON FEEDER AF421
APRON FEEDER AF422
VENTILATION FAN FA420
MOISTURE MN434
CV434
CV436
SHUTTLE SH436
WEIGHTOMETER BW434
MATERIAL DIVERSION PLOUGH DVP434
SHUTTLE SH435
SECONDARY CRUSHING FEED BINS
BN454 BN453 BN452 BN451
ISOLATION GATES
GAI454 GAI453 GAI452 GAI451
CRUSHER VIBRATING FEEDERS
VF454 VF453 VF452 VF451
METAL DETECTORS
MD454 MD453 MD452 MD451
CRUSHER FEED CONVEYORS
CV454 CV453 CV452 CV451
CR454 CR453 CR452 CR451
SECONDARY CONE CRUSHERS
SECONDARY CRUSHING BUILDING (SCB) - BG450
TRAMP MAGNET MA435
TRANSFER STATION TS439
WEIGHTOMETER BW436
SHUTTLE SH434
SCALPING SCREEN FEED BINS
BN441 BN442 BN443 BN444 BN445
GAI441 GAI442 GAI443 GAI444 GAI445
ISOLATION GATES
BF441 BF442 BF443 BF444 BF445
BELT FEEDERS
VS441 VS442 VS443 VS444 VS445
SCALPING SCREENS
LPBOC
CV435
WEIGHTOMETER BW435B
WEIGHTOMETER BW435A
WEIGHTOMETER BW439
CV439
MATERIAL SIZING ATS471A
WEIGHTOMETER BW471A
CV471 FINES
SCALPING SCREENING BUILDING (SSB) - BG440
PRODUCT SCREEN FEED BINS
BN461 BN462 BN463 BN464 BN465 BN466
GAI461 GAI462 GAI463 GAI464 GAI465 GAI466
ISOLATION GATES
PRODUCT SCREEN VIBRATING FEEDERS
VF461 VF462 VF463 VF464 VF465 VF466
PRODUCT SCREENS
VS461 VS462 VS463 VS464 VS465 VS466
MATERIAL SIZING ATS474
CV474 LUMP
MATERIAL SIZING ATS471B
WEIGHTOMETER BW474
WEIGHTOMETER BW471B
CV471 FINES
PRODUCT SCREENING BUILDING (PSB) - BG460
FINES PRIMARY CUTTER SC471
FINES SAMPLE STATION SS497
BF471
MOISTURE MN472
CV472
FINES / LUMP 594,000/561,000t (DEAD)
FINES / LUMP 594,000/561,000t (DEAD)
ROW H
STACKER ST04
CV484
CV494
ELEMENTAL ATX484
LUMP 197,000t
LUMP 197,000t
FINES 440,000t
FINES 440,000t
ROW G
MC314
RECLAIMER RC02
LUMP 200,000t
LUMP 200,000t
LUMP 200,000t
MC309
LUMP PRODUCT STACKER ST03
ROW F
STOCKYARD 2 (SY2)
LUMP PRIMARY CUTTER SC474
LUMP SAMPLE STATION SS498
BF474
CV498
MOISTURE MN475
CV475
CV474 LUMP
ELEMENTAL ATX476
MC308
CV476
TRAIN LOADOUT 2 BG522
BN522
MOISTURE MN521
WEIGHTOMETER WT521
CV521
MOISTURE MM301
METAL DETECTOR MD315
WEIGHTOMETER WT305
BELT PROFILE BP521
MC315
LUMP 248,000t
LUMP 248,000t
LUMP 248,000t
RECLAIMER RC03
ROW E
CV513
ELEMENTAL ATX473
CV473
CV478
FINES 480,000t
FINES 480,000t
FINES 480,000t
FINES 480,000t
CV485
STACKER ST05
ROW J
FROM EXISTING PLANT (OHP1 & OHP2)
FINES MC301
LUMP MC302
CV477
MC303
WEIGHTOMETER WT301
MC08
LUMP PRODUCT STACKER ST01
LUMP 128,000t
LUMP 128,000t
MC14
STOCKYARD 1 (SY1)
RECLAIMER RC01
LUMP 128,000t
MC12
TRAIN LOADOUT 1
BN09
MOISTURE MM02
MC304
WEIGHTOMETER WT302
MC11
LUMP PRODUCT STACKER ST02
MC15
WEIGHTOMETER WT08
South Flank
31 January 2018

2.1.2. Primary Crushing Stations

Ore from the South Flank via Vista Oriental (PC1) and Grand Central North (PC2) will be processed through two primary crushing (PC) facilities, each with a nameplate capacity of 40Mtpa (Figure 2.1, Figure 2.3 and Figure 2.4). The two primary crushing stations (PC1 and PC2) will have a dual truck dump apron located at the top of a mechanically stabilised earth wall designed to accept ultra-class mining trucks of up to 363t capacity. Each primary crusher will have a nameplate capacity of 40Mtpa. The mining trucks will feed into the Run of Mine (ROM) bin located over a gyratory crusher that will crush the iron ore to a -250mm top size. The crusher will discharge to a surge vault directly beneath. An apron feeder draws ore from the surge vault and loads the discharge conveyor, which feeds onto the overland conveyor (OLC) system (Figure 2.2).

Each the primary crushing facility includes (Attachment 3):

- Rock catchers, truck dump slabs and anchor blocks;
- Primary crushing building including rock breakers;
- Dust suppression (foggers and cannons);
- Primary crushing discharge conveyor; and
- Transfer stations, onto the overland conveyor circuit.

2.1.3. Discharge and Overland Conveyors

Three new overland conveyors will transport primary crushed ore from the primary crushing facilities at South Flank to the new coarse ore stockpile (COS) at Mining Area C (Figure 2.5). The discharge conveyors CV402 and CV404 will transfer ore from PC1 and PC2 onto the overland conveyors CV411and CV412 via Transfer Stations TS402 and TS404 (Figure 2.2). The discharge conveyors will each include a magnet, metal detector, Bulk ore conditioning sprays (BOC) sprays, moisture analyser and belt weigher. The overland conveyors CV411 and CV412 have a design capacity of 7,500 tonnes per hour (tph). The third conveyor CV413 will be loaded with ore by overland conveyor CV412 at Transfer Station TS411. Conveyor CV411 and CV413 will discharge onto the COS and has a capacity of 15,000tph. All three overland conveyors will be fitted with BOC sprays to ensure the ore is above the DEM moisture content prior to being fed onto the COS.

2.1.4. Ore Handling Plant (OHP)

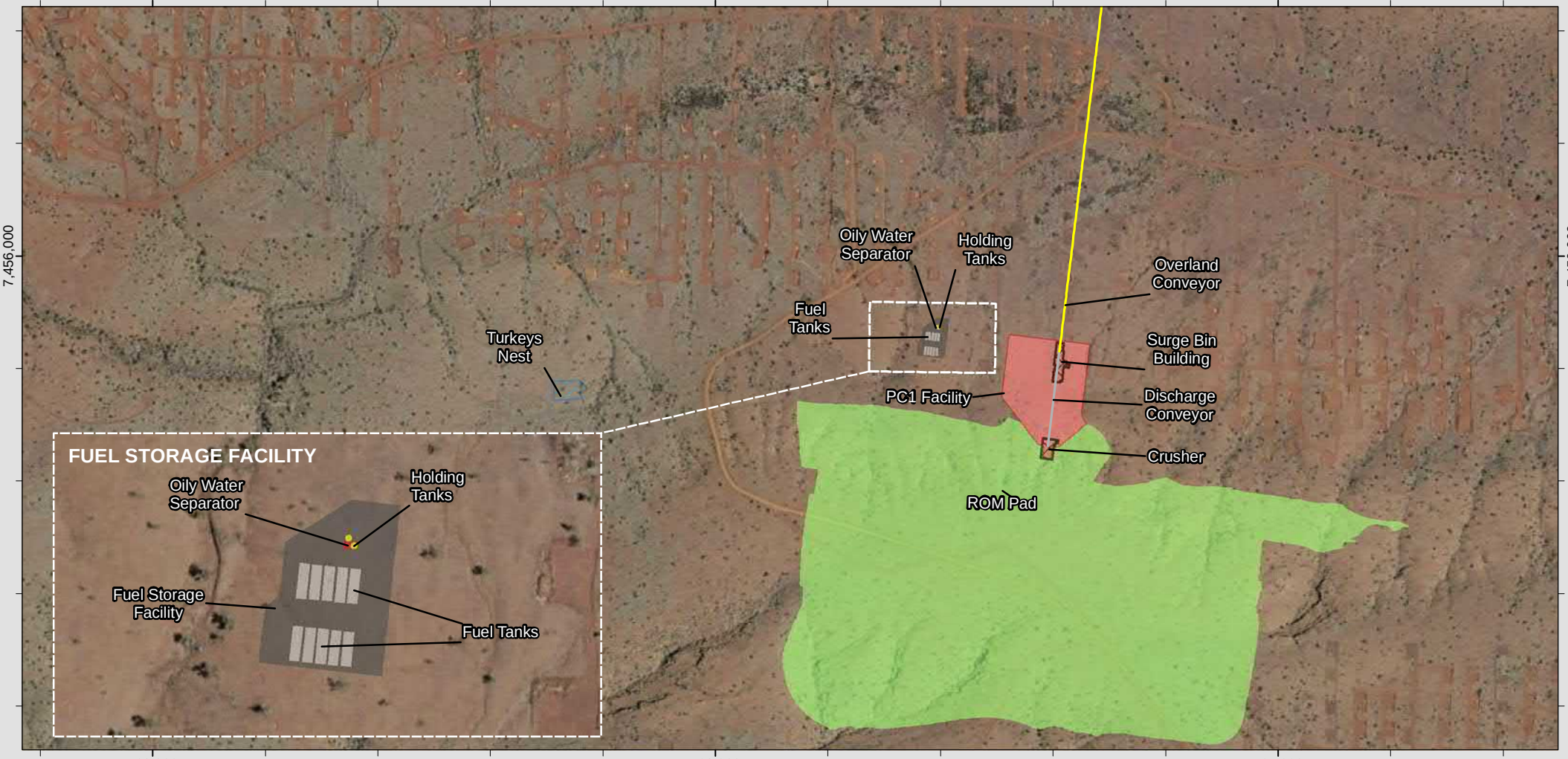
The coarse ore stockpile (COS) will be located inside the rail loop and will receive and store primary crushed ore from South Flank (Figure 2.6 and Figure 2.7). It will consist of a conical stockpile above a concrete vault and tunnel containing two apron feeders for reclaim of the primary crushed ore for loading onto the scalping screen feed conveyor for transfer to Ore Handling Plant (OHP) 3. The nameplate production rate for OHP3 is 80Mtpa. The key components of the OHP3 comprising of:

- Scalping screening building containing five scalping screening bays (Scheck SLD4385s);
- Secondary crushing building containing four secondary crusher bays (Metso MP1250s)'
- Product screening building containing six product screening bays (Scheck SLD4385s);
- Interconnection conveyors; and
- Lump and fines product conveyors.

The material from the COS feeds the scalping screening building. The scalping screening building arrangement includes with five screening bays and large screens (Schenck SLD4385DX.). The belt feeders transfer material from the bins onto the double deck screens. Material separates into three streams (Figure 2.2):

- The oversize is conveyed to the Secondary Crushing Building;
- The middlings is directed to the Product Screening Building; and
- The undersize Fines Product is conveyed to the stockyard.

The Secondary Crushing Building includes four Metso MP1250 cone crushers. Ore will be delivered into the secondary crusher feed bins and transferred to the crusher feed conveyor via a vibrating feeder. The feed conveyor incorporates a metal detector to protect the cone crusher from tramp metal damage. Once crushed, the undersized ore will be discharged onto the product screening feed conveyor. Oversize material will be recirculated through the crushing and screening circuit.



BHP BILLITON IRON ORE

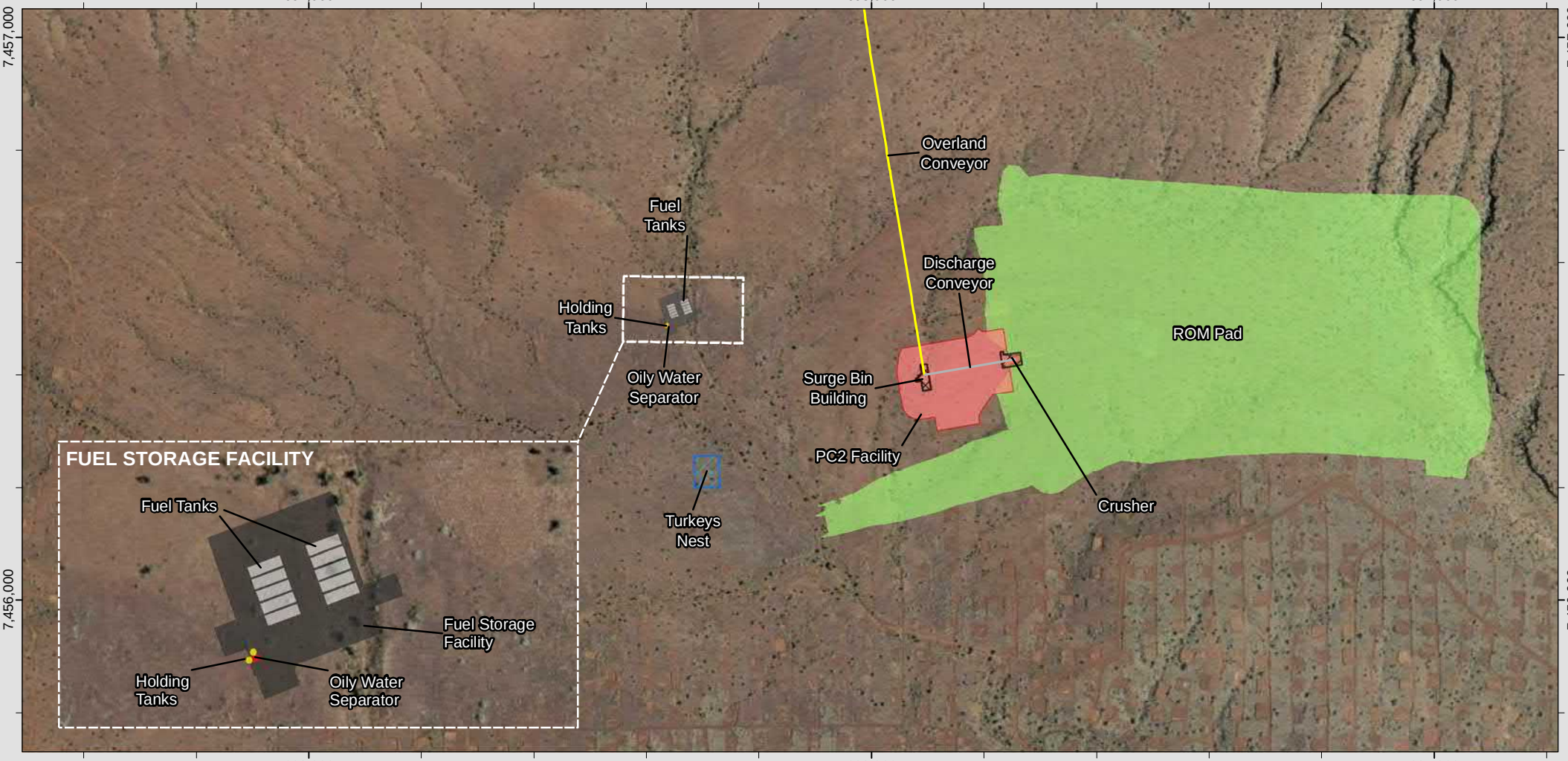
MINING AREA C - SOUTHERN FLANK
Primary Crushing Station 1 - General Layout

Scale @ A4:	1:10,000	Prepared:	M. LYTTLE	Project No:	A780/103 REV B
Date:	22/03/2018	Checked:	G. MANNING	Figure :	2.3
Revision:	REV B	Reviewed:	K. FLOWERDEW		

- Overland Conveyor
- Discharge Conveyor
- Fuel Storage Facility
- Crusher Facility
- Storage Tanks
- Oily Water Separator
- Turkeys Nest
- Building
- Fuel Tanks
- ROM Pad

0 100 200 300
Meters
Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_103_E_MAC_SouthernFlank_WorksApproval_PC1_Fig2.3_RevB.mxd



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Primary Crushing Station 2 - General Layout

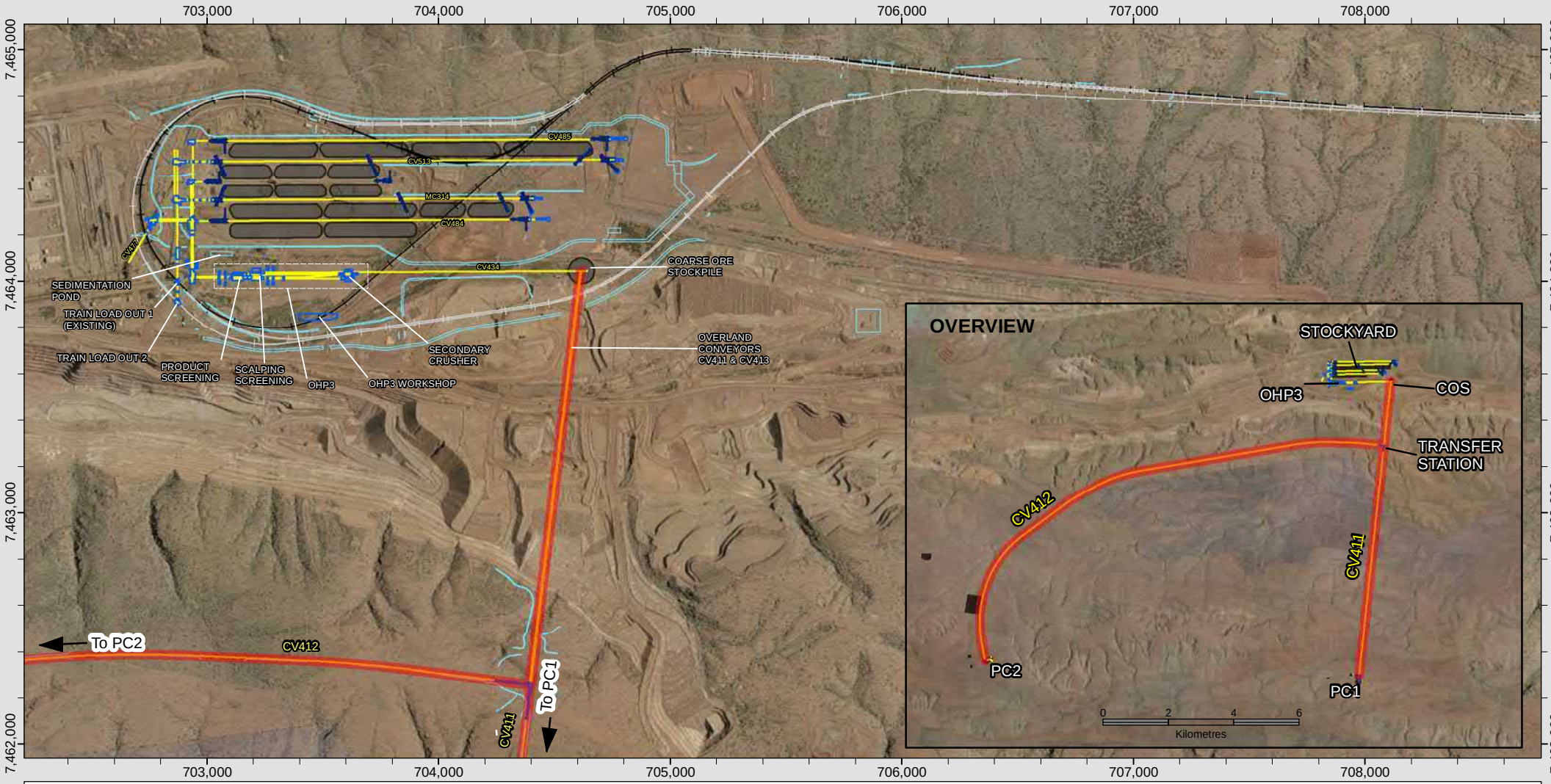
Scale @ A4:	1:10,000	Prepared:	M. LYTTLE	Project No:	A780/104 REV B
Date:	22/03/2018	Checked:	G. MANNING	Figure :	2.4
Revision:	REV B	Reviewed:	K. FLOWERDEW		

- Overland Conveyor
- Discharge Conveyor
- Fuel Storage Facility
- Crusher Facility
- Storage Tanks
- Oily Water Separator
- Turkeys Nest
- Building
- Fuel Tanks
- ROM Pad

0 100 200 300
Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_104_E_MAC_SouthernFlank_WorksApproval_PC2_Fig2.4_RevB.mxd



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Process Flow - Overland Conveying and Coarse Ore Stockpile

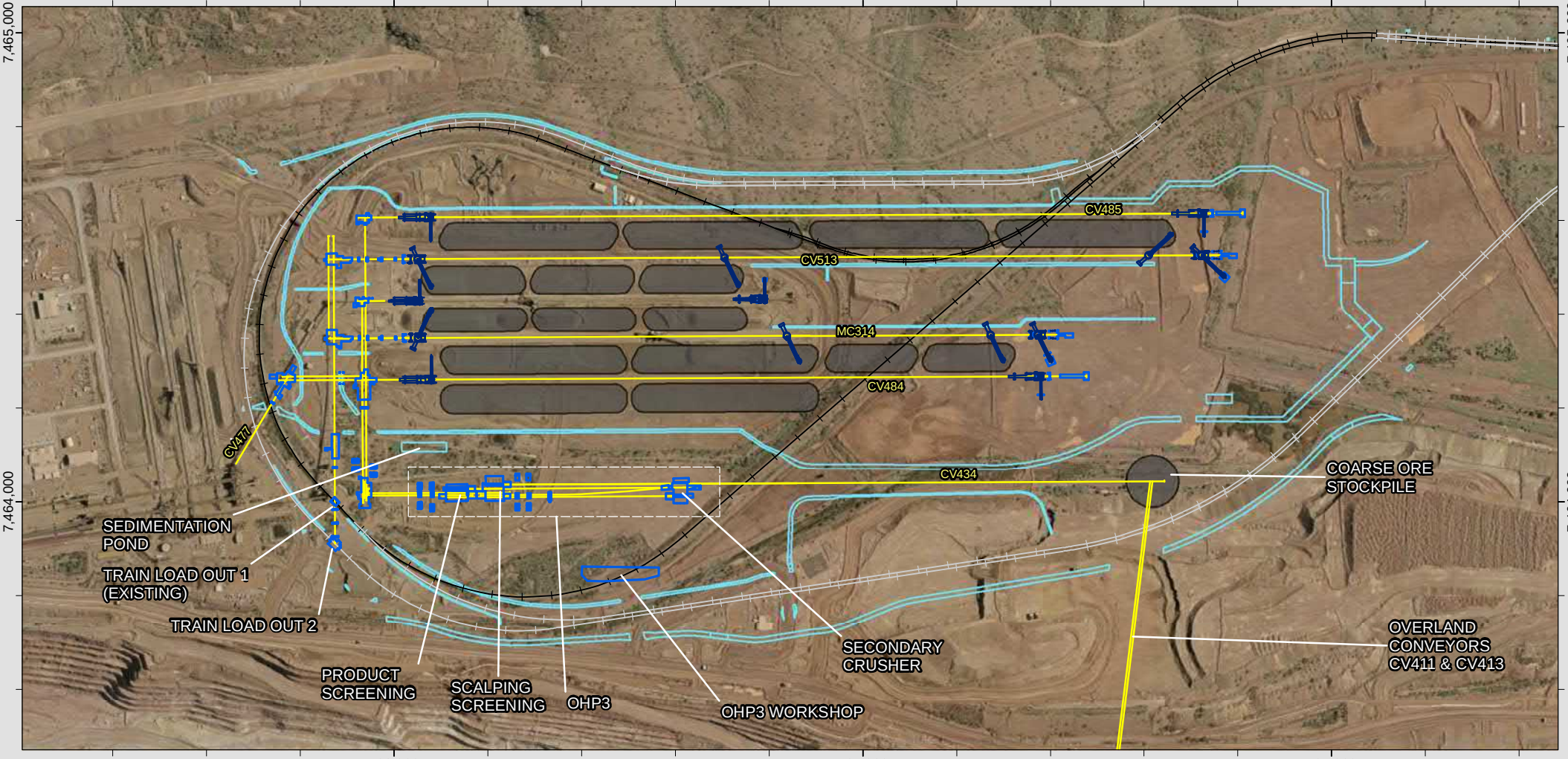
Scale @ A4:	1:24,000	Prepared:	M. LYTTLE	Project No:	A780/108 REV A
Date:	22/03/2018	Checked:	G. MANNING	Figure :	2.5
Revision:	REV A	Reviewed:	K. FLOWERDEW		

- Overland Conveying to Coarse Ore Stockpile
- Infrastructure
- Stacker/Reclaimer
- Conveyor
- Existing Rail
- New Rail
- Open Drains
- Stockpiles

0 200 400 600
Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_108_E_MAC_SouthernFlank_WorksApproval_ProcessFlow_Fig2.5_RevA.mxd



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK
Ore Handling Plant and Stockyards

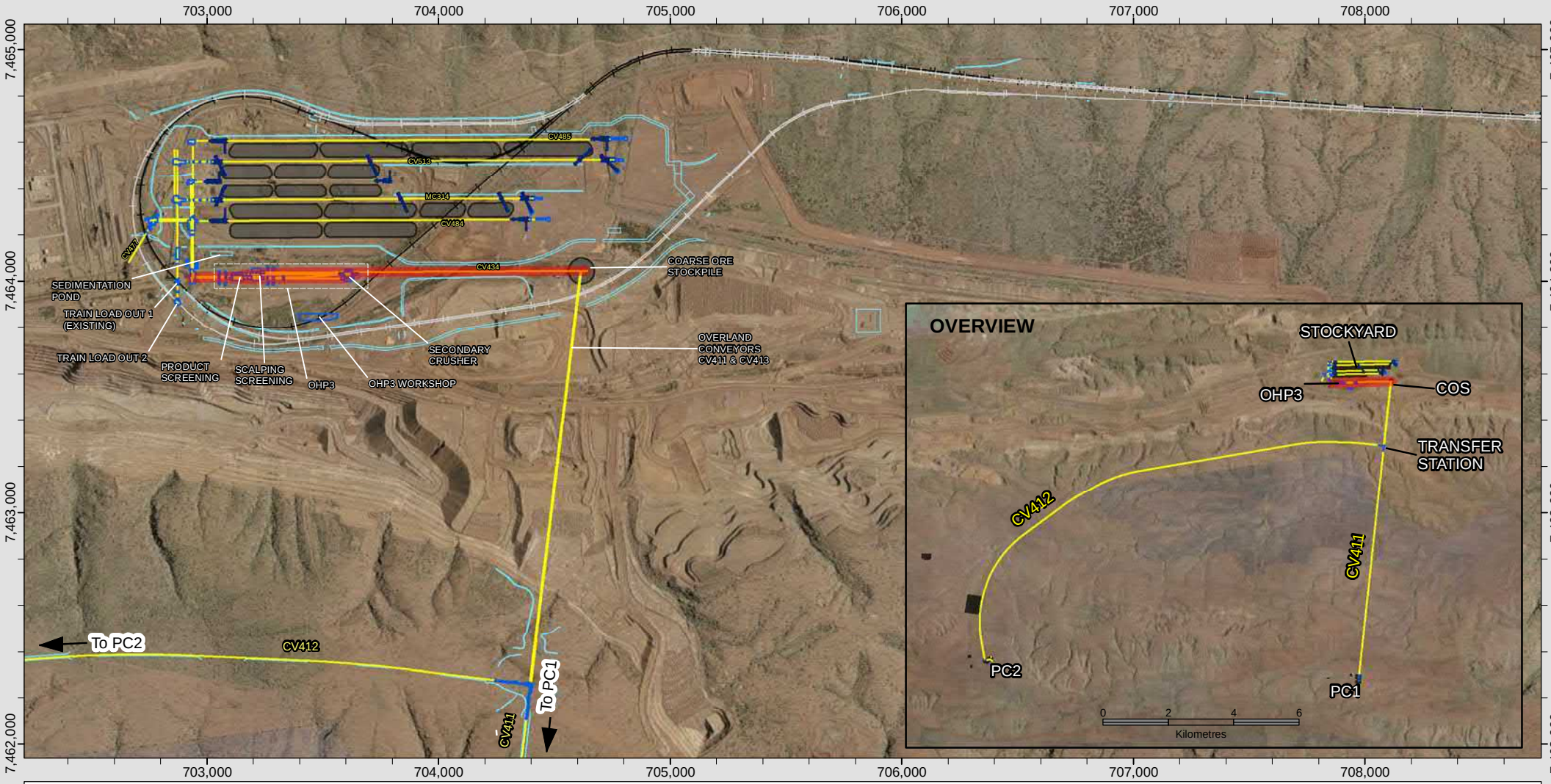
Scale @ A4:	1:12,000	Prepared:	M. LYTTLE	Project No:	A780/105 REV A
Date:	22/03/2018	Checked:	G. MANNING	Figure :	2.6
Revision:	REV A	Reviewed:	K. FLOWERDEW		

- Infrastructure
- Stacker/Reclaimer
- Conveyor
- Existing Rail
- New Rail
- Open Drains
- Stockpiles

0 100 200 300
Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_105_E_MAC_SouthernFlank_WorksApproval_OHP3_Stockyards_Fig2.6_RevA.mxd



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Process Flow - Coarse Ore Stockpile and Ore Handling Plant 3

Scale @ A4:	1:24,000	Prepared:	M. LYTTLE	Project No:	A780/109 REV A
Date:	22/03/2018	Checked:	G. MANNING	Figure :	2.7
Revision:	REV A	Reviewed:	K. FLOWERDEW		

- Coarse Ore Stockpile to OHP3
- Infrastructure
- Stacker/Reclaimer
- Conveyor
- Existing Rail
- New Rail
- Open Drains
- Stockpiles

0 200 400 600
Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_109_E_MAC_SouthernFlank_WorksApproval_ProcessFlow_Fig2.7_RevA.mxd

The secondary crushed ore and the mid-size ore from the scalping screening building will be conveyed into the product screening building surge bins. Vibrating feeders will transfer material onto the double deck screens which will again separate the ore into three streams. The oversize is recirculated to the Secondary Crushing Building for processing. The mid-size reports to the Lump Product Conveyor and undersize to the Fines Product Conveyor. The lump and fines ore streams are sampled en-route to the stockyard.

2.1.5.Stacking and Stockyard

Expansion of Stockyard 2 at Mining Area C is required to accommodate the increased production of fines and lump from Mining Area C and South Flank (Figure 2.8). The proposed stockyard facility will have approximately 2 million tonnes of live storage capacity in eight stockpiles, with capacity for the same amount of ore to be stacked dead. Two new travelling slewing and luffing stackers with 20,000 tph capacity will be installed. Upgrades to the conveyors and transfers station associated with the existing stacker will be undertaken. A new travelling, slewing and luffing bucket-wheel reclaimer will be installed to increase reclaiming capacity. The new reclaimer has a capacity of with 20,000tph.

Fines product produced by OHP3 will be blended on belt with existing Mining Area C OHP1 and OHP2 fines products prior to stacking in Stockyard 2. Lump product produced by OHP3 will be stacked in Stockyard 2 whilst OHP1 and OHP2 lump product will be stacked in Stockyard 1. Lump products will be blended during train loading after staging at Train load out (TLO) 1 via shuttle (Figure 2.9). Products will be reclaimed to either the existing train load-out facility TLO1 or the new TLO2.

2.1.6.Surface Water and Drainage

The drainage for each primary crushing facility consists of table drains along the perimeters of the process and Non processing infrastructure pads to divert water away from the infrastructure. PC2 also includes a series of diversion drains to divert water to natural watercourses. A sediment settlement pond will be provided at each primary crushing station to remove sediment laiden discharge from the process areas. Run-off from the primary crushing process area will pass through a sedimentation pond, to reduce sediment concentration, before being released back to natural water courses.

The drainage for the COS comprises table drains along the conveyor embankment and culverted crossings in the drains to discharge water into the existing Mining Area C plant diversion drain.

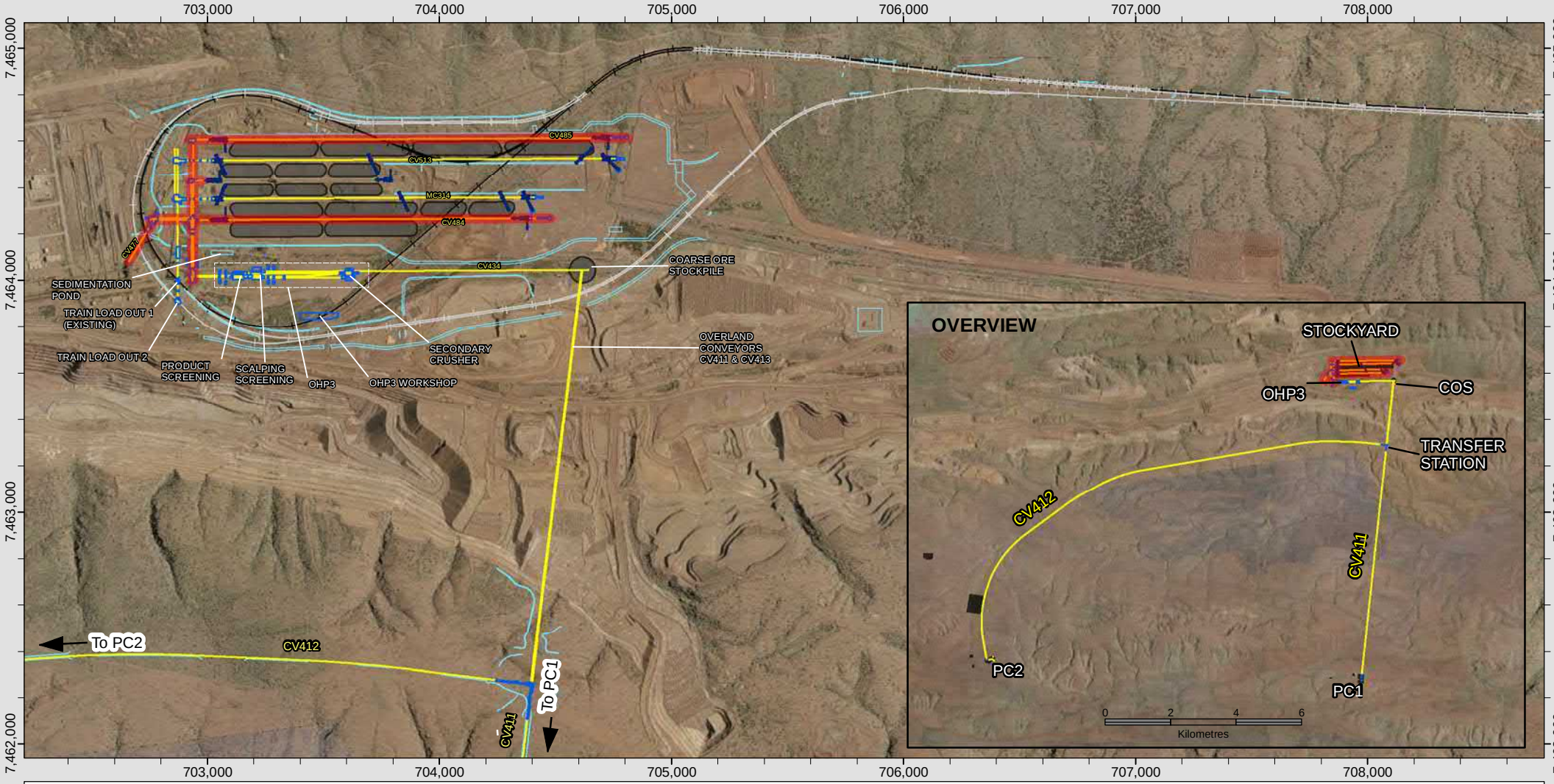
Drainage for the OHP3 consists of table drains on the north and south sides of the facility, which fall into the plant diversion drain at the northeast end of the OHP3 pad. A settlement pond is proposed on the northwest corner of the OHP3 pad to remove sediment discharge from process buildings' wash-down collection sumps.

The drainage works for the Stockyard include new drains and culverts under the existing conveyors at the western end to divert water away from the new work areas. Perimeter drains will be constructed around the stockyard to divert water away from the infrastructure. The eastern side of the Stockyard includes a series of breaks in the windrows to allow runoff from the stockyard floor to flow into the Mining Area C plant diversion drain. A settlement pond will be provided at the southeast end of the Stockyard to remove sediment discharge collected from process areas.

2.1.7.Supporting Works

Additional works are required to support the construction and operation of the processing infrastructure. These include the:

- A new bin type dual gate TLO2 will be constructed which will tie into a new rail loop outside of the existing rail loop at Mining Area C.
- The rail loop at Mining Area C will be duplicated and realigned to deliver up to 150 Mtpa of product from Mining Area C. Ore will be railed to Port Hedland on BHP's existing network; and
- Electricity is currently supplied to Mining Area C via a single 33kV overhead transmission line, from the 132/33kV Junction Substation, located at the eastern end of ML281SA. Electricity is drawn from the Yarnima power station at Newman. Power will be supplied to the South Flank mining area and the new OHP at Mining Area C via two new 132kV transmission lines from the Junction Substation.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK
Process Flow - Stacking and Stockyard

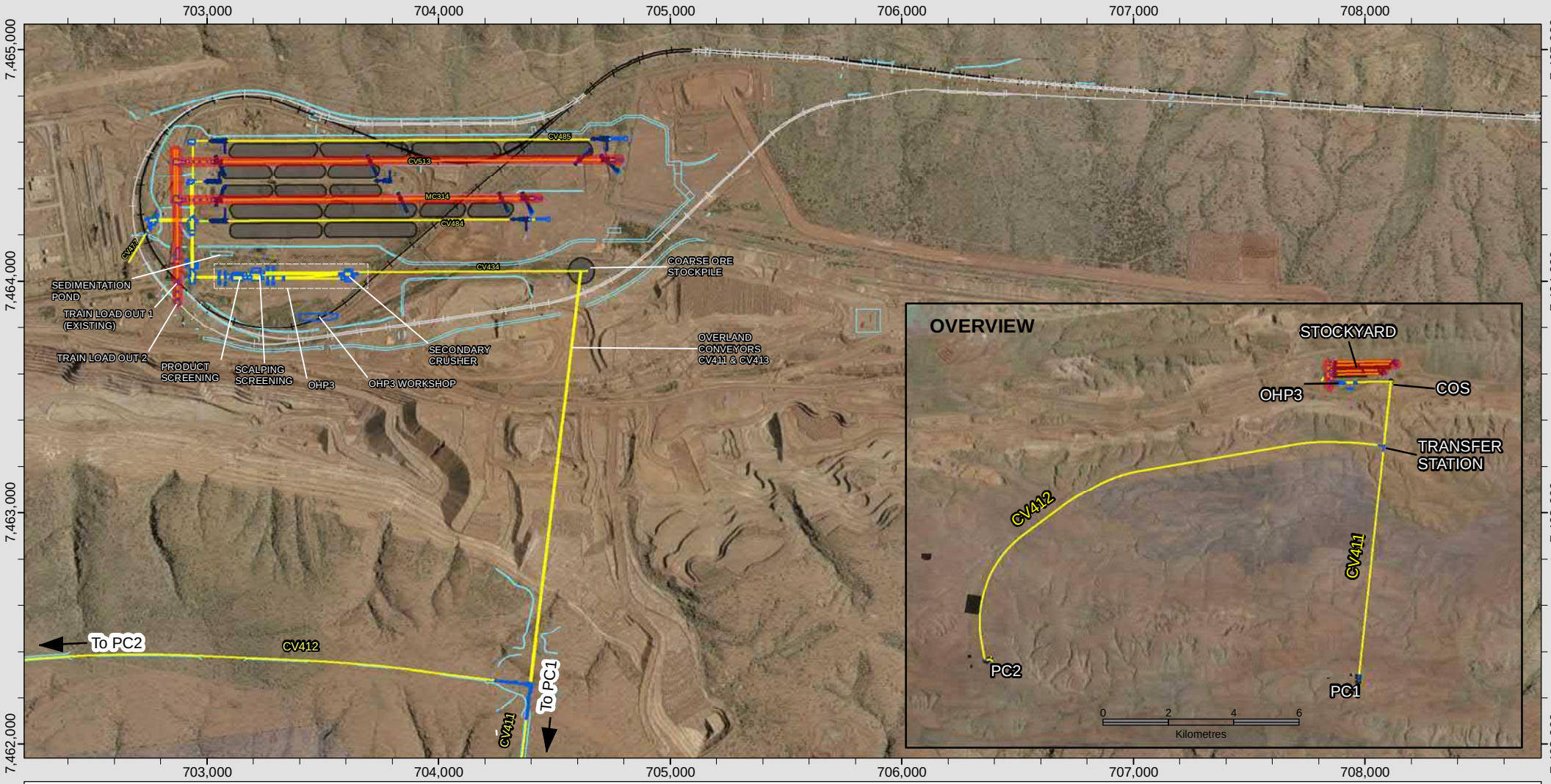
Scale @ A4:	1:24,000	Prepared:	M. LYTTLE	Project No:	A780/110 REV A
Date:	22/03/2018	Checked:	G. MANNING	Figure :	2.8
Revision:	REV A	Reviewed:	K. FLOWERDEW		

- OHP3 to Stockyard
- Infrastructure
- Stacker/Reclaimer
- Conveyor
- Existing Rail
- New Rail
- Open Drains
- Stockpiles

0 200 400 600
Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_110_E_MAC_SouthernFlank_WorksApproval_ProcessFlow_Fig2.8_RevA.mxd



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK

Process Flow - Outflow and Train Load Out

Scale @ A4: 1:24,000	Prepared: M. LYTTLE	Project No: A780/111 REV A
Date: 22/03/2018	Checked: G. MANNING	Figure : 2.9
Revision: REV A	Reviewed: K. FLOWERDEW	

- Stockyard to Train Load Out
- Infrastructure
- Stacker/Reclaimer
- Conveyor
- Existing Rail
- New Rail
- Open Drains
- Stockpiles

0 200 400 600
Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_111_E_MAC_SouthernFlank_WorksApproval_ProcessFlow_Fig2.9_RevA.mxd

2.2. Category 73 – Bulk Fuel Storage

2.2.1. Diesel Facilities

Two diesel facilities will be installed at PC1 and PC2 to store and dispense fuel to heavy vehicles, in pit refuelling tankers and light vehicles (Figure 2.3 and **Error! Reference source not found.**). Each facility will consist of ten (10), 200 kL horizontal transportable self bunded diesel storage tanks complying with Australian Standards (AS) 1940 with a total storage capacity of 2ML (Table 2.2). Re-stocking of these tanks will be undertaken using triple road train tankers. The management of the tank restocking will be automated with individual tank inlet valves being opened and closed according to the standing time of the fuel in the tank on a first in, first out basis. Overfill protection will be managed through a series of checks utilising level controls in each tank. The restocking and the re-fuelling areas will located within bunded slab that drain to a spill containment sump. Ultraspin oily water separators with a processing a throughput of 4.6L/s will be installed at each facility.

Table 2.2: Project Description Fuel Storage

Category	Project Components	Design Capacity	System Description	Expected discharges
73	**Primary Crushing Station 1 – Vista Oriental**			• Hydrocarbon spillage • Potentially contaminated surface water
	Diesel Storage Facility	Diesel Storage 2ML (2,000kL)	Ten (10) 200 kL horizontal transportable self bunded diesel storage tanks compliant with AS1692	
	Oily Water Separator	Process throughput 4.6 L/s	Ultraspin oily water separator	
	Primary Crushing Station 2 Grand Central North			
	Diesel Storage Facility	2ML (2,000kL)	Ten (10) 200 kL horizontal transportable self bunded diesel storage tanks compliant with AS1692	
	Oily Water Separator	Process throughput 4.6 L/s	Ultraspin oily water separator	

The key features of the PC1 and PC2 diesel facilities include:

- Ten (10) 200 kL horizontal transportable self bunded diesel storage tanks;
- An unloading manifold consisting of five (5) unloading points on a bunded slab designed to receive fuel from road tankers;
- Separate refuelling dispensing system for light vehicles and heavy vehicles;
- Fast filling dispensing system for Haulmax service vehicles;
- Modular diesel fuel pumps:
  - Duty and Standby arrangement for unloading fuel, and
  - Series of pumps with a standby pump for refuelling.
- Filter/coalescer for fuel dispensing system with a bypass (primary and secondary) filtration unit;
- Interconnecting tank piping and valve systems;
- Tank level monitoring and measuring systems;
- Fuel management system AdaptFMS;
- Safety systems – overfill protection;
- Aprons and slabs to contain accidental spillage;
- Grated drainage trenches;
- Drive-in collection sump;
- Hose reel for vehicle washdown;
- Fire protection system; and

- Oily water separator.

Attachment 3 and Table 2.3 outline the design and controls of the facility.

Table 2.3: Key Features of Diesel Storage Facility at PC1 and PC2

Aspect	Description
Storage Facility	
Number of Tanks	10
	Double Walled, Category 4, horizontal storage tank to comply with the requirements of AS1692.
Tank Safe Fill Level	200kL
Nominal Total Storage Capacity	<2,000kL
Material of Construction	Carbon steel, AS3678 Grade 250 with tensile strength 410MPa Internal surfaces will be coated against corrosion
Tank Nozzels	Inlets fitted with mechanical overfill protection and the outlets with anti-siphon valve
Valves	Double block and bleed isolation valves at each tank inlet and outlet. The valve furthest from the tank is to be fail-closed pneumatically actuated with open/closed position feedback to the PLC.
Instrumentation	Each tank has: • Level transmitter with low and high alarm set points; and • Independent high-high level switch.
Overfill Protection	The high level alarm and independent high-high level switch are to be set in accordance with API RP 2350. The tank inlet shall be fitted with mechanical overfill protection The double walled tanks shall include an interstitial leakage monitoring probe system
Unloading System	
Capacity of delivery fuel	Maximum tanker size 135kL
Unloading Points	One point with five unloading connections. Each connection will have a dedicated isolation valve. A separate docking rack to hook the couplings up to when not in use. The unloading pad will be a single concrete slab requiring triple road tanker trains to be moved progressively onto the slab for the unloading of diesel fuel and the pad shall be sized to the tankers unloading manifold
Unloading Pumps	Two pumps in a duty and stand-by arrangement. The pump skids are to be fully bunded with the capacity to contain a 20 year rain event for 72 hours. Each skid is to be provided with a manual isolation valve to allow drainage of the skid to either the local sump or to a collection truck.
Valves	Isolation valves at each pump and non-return valves fitted on the downstream line. Isolation valves at each off-loading connection.
Flow Metering	A positive displacement meter suitable for 750 – 2200 L/min complete with strainer and air eliminator.
Flow Control	To be set for slow start and slow completion of delivery to minimise system hydraulic shock and allow for slow filter filling.
Drainage	A bunded spill pad will surround the unloading area. The pad tied into the LV refuelling pad and fall to a collection sump. The flow from the sump shall fall to the main area collection sump
Spillage	Spill kit compliant to AS1940 requirements will be available at all unloading points. Concrete spillage slabs or bunded steel skids capture leaks and spills from operations and maintenance activities around pumps, drains and tank headers. The slabs graded to a drainage channel with a minimum fall of 1:100 before to a collection sump. The spillage channels are constructed from concrete and are covered with open grating to permit an inspection and wash down of these trenches as required
Refuelling System	

Aspect	Description	
	HV Refuelling	**LV Refuelling**
Refuelling Points	Will have designated areas for the refuelling of Light Vehicles, heavy vehicles and Haul max The heavy vehicle refuelling slab shall be sized to suit a 290 tonne haul truck and a Haulmax service truck Lockout system to prevent truck driving away without decoupling the refuelling nozzle.	The light vehicle-refuelling slab shall accommodate a standard site specification utility vehicle and light vehicle trucks.
Fuel connections	The haul truck and HaulMax refuelling nozzles to a spring balanced loading arm and fitted with breakaway couplings. Each refuelling nozzle with a docking stand with return position switch and to be linked to the PLC.	
Refuelling Pumps	Series of pumps with a standby pump. The pump skids are to be fully bunded with the capacity to contain a 20 year rain event for 72 hours. Each skid is to be provided with a manual isolation valve to allow drainage of the skid to either the local sump or to a collection truck.	A single stand-alone duty pump to supply diesel to the bowser.
Pipework	NA	Carbon Steel/dual contained pipe. The LV system requires a section of pipe to be run underground beneath the tanker offloading bay. The design contractor is to propose a dual contained system with leak detection connected
Bowser	NA	Single bowser to come with a filter, positive displacement flow meter, and under sump.
Valves	Isolation valves at each pump and filter with non-return valves fitted on the downstream line of each filter. Isolation valves at each refuelling connection.	A manual isolation valve prior to the pump. An actuated valve shall be provided downstream of the pump. The bowser shall incorporate a shear valve
Flow Metering	A positive displacement meter suitable for 750 – 2200 L/min complete with strainer and air eliminator. The meter is to have a local display indicating flow rate and batch volume and supply a pulse output to the fuel management system.	
Drainage	A bunded spill pad at the HV refuelling slab. The slab shall drain to a containment sump capable of containing a 9,000L spill	The refuelling bunded slab shall be integrated with the tanker unloading slab. The slab shall drain to a sump capable of containing a 300L spill.
Spillage	Spill kit compliant to AS1940 requirements provided at all refuelling points. Concrete spillage slabs or bunded steel skids capture leaks and spills from operations and maintenance activities around pumps, drains and tank headers. The slabs graded to a drainage channel with a minimum fall of 1:100 before to a collection sump. The spillage channels are constructed from concrete and are covered with open grating to permit an inspection and wash down of these trenches as required	

2.2.2. Oily Water Separator

An Ultraspin oily water separator unit will be located at PC1, PC2 and the MEM Precinct to treat surface water runoff potentially contaminated by hydrocarbons. Each Ultraspin will have a processing throughput capacity 4.6L/s.

Potentially contaminated surface water from each bunded area will be channelled into a collection sump before passing through an oily water separator. The oily water collection sumps at PC1 and PC2 are designed to contain the first flush volume (initial 20 minutes of rainfall) from the bunded fuel loading and unloading tanks and tank nozzle bunds plus the largest potential diesel release from one of vehicles (9,000 litres). After the first 20 minutes of rainfall any further surface water runs off the bunded slabs to the local stormwater drainage system. The sump is fitted with low and high level switches.

The oily water separator will treat the water to a total recoverable hydrocarbon (TRH) concentration of 15mg/L or less. The system will be fitted with a local high oil alarm and a signal back to the site PLC of the diesel storage facility. Treated water from the oily water separator will be transferred to a local 5 kL holding tank for monitoring. Holding tanks will retain the treated water until there is a manual intervention to confirm that the TRH concentration has been met and the water may be released to the turkey's nests. The oily water separator will shut down once the holding tank is full. The holding tank shall be fitted with a sample point for manual sampling and fitted with a hydrocarbon sensor. Water from the turkey's nest will be utilised for dust suppression. The turkey's nest will be lined with 1.5mm HDPE liner. A spillway will direct water overflow water to the adjacent diversion drain (Attachment 3). Waste oil will be captured in a 5 kL tank for removal and disposal off site at an appropriate disposal facility.

2.3. Supporting Facilities

To support the mining operations and workforce the following infrastructure is required:

- Mining Area C area new buildings and facilities:
    - Sample preparation building expansion;
    - OHP3 and Conveyor Maintenance Workshops with office, crib and ablution facilities;
    - Shutdown Execution Centre; and
    - Train Driver crib and ablutions facilities.
- South Flank area buildings and facilities:
    - Unmanned mine access gate;
    - Mobile equipment maintenance (MEM) Precinct. The Precinct will include; a warehouse delivery and laydown area, tyre storage and exchange facility, waste water tanks, maintenance workshop, wash-down facility and parking.
    - South Flank ammonium nitrate (AN) products facility;
    - Office, crib and ablution facilities at PC1 and PC2.
- Seal and unsealed access roads;
- Expansion of Mulla Mulla village to final capacity of 3,000 rooms. Expansion of Mulla Mulla waste water treatment plant (approved by works approval W6092/2017/1);
- Expansion of water infrastructure for provision of services to new plant and NPI;
- New powerlines and substations to provide power.

The capacities of the above facilities do not trigger the design capacities of the *Environmental Protection Regulations 1987* or contribute to the emissions of an existing licenced facility (Figure 2.10).

2.3.1. Category 57 – Used Tyre Storage

Used tyres generated from the maintenance of heavy and light vehicles will be stored at the MEM precinct. Up to 70 used tyres will be stored at any one time with a minimum separation distance of 6m between the stacks in accordance with conditions of Licence L7851/2002/6 (Table 2.4). The used tyres will be trucked to the Mining Area C inert landfill or an overburden storage area (OSA) for disposal. Landfilling of the used tyres will be undertaken in accordance with the *Environmental Protection Regulations 1987* and *Environmental Protection (Controlled Wastes) Regulations 2004* and the conditions of Licence L7851/2002/6 (Attachment 4).

Table 2.4: L7851/2002/6 Table 1.2.2.: Waste Processing

Waste Types	Process	Process Limit
Inert Waste Type 2 - Tyres	Receipt, Handling, storage prior to disposal by landfilling	To be stored in piles up to 100 units with a 6m separation distance between piles Tyres/rubber shall only be landfilled in

Waste Types	Process	Process Limit
		overburden storage areas located within the prescribed premises boundary shown in Schedule 1

2.3.1. Category 77 - Concrete Batching

Concrete batching plants will supply approximately 16,000m^3 of concrete and 15,000m^3 of cement stabilised products for construction. All concrete manufactured will be utilised within the prescribed premise boundary. All activities will be undertaken in accordance with the *Environmental Protection (Concrete Batching and Cement Product Manufacturing) Regulations 1998.*

2.3.2. Category 85 - Sewage Treatment Plants

Six (6) wastewater treatment plants (WWTP) will be constructed at the offices, workshops and plant facilities (Table 2.5). The facilities will each have a capacity less than 20m^{3}per day and will dispose of treated effluent via separate designated spray fields.

The package WWTPs are designed to reduce Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorous (TP) and E.coli to acceptable levels, as required by *Water Quality Protection Note 22 – Irrigation with Nutrient-Rich Wastewater* (Department of Water, 2008). The design effluent quality values of the WWTP will meet or exceed the standards in the *Guidelines for Australian Guidelines for Sewage Systems – Effluent Management* (ANZECC, 1997). Each WWTP will dispose of the treated effluent via irrigation spray field of native vegetation, in accordance with the *Guidelines for Sewerage Systems – Use of Reclaimed Water* (ARMCANZ, ANZECC and NHMRC, 2000).

Table 2.5: Support Waste Water Treatment Plants

Region	Location	Model	Capacity	Spray Field Area
South Flank	Primary Crusher 1	BIOMAX C60	10.8m^3/day	1,080m^2
	Primary Crusher 2	BIOMAX C60	10.8m^3/day	1,080m^2
	MEM Precinct	BIOMAX C60	10.8m^3/day	1,080m^2
	MEM HV Tyre Storage Area	BIOMAX C10	1.8m^3/day	180m^2
Mining Area C	Train Driver Crib Room	BIOMAX C10	1.8m^3/day	65 m^2
	OHP	BIOMAX C50	9m^3/day	5,000m^2*

*Area to be revised once package awarded

2.4. Compliance Reporting

BHP proposes to submit compliance reporting for PC1, PC2, OLC, OHP3, stockyards and PC1, PC2 diesel facilities following the completion of construction and prior to commencement of load commissioning. This compliance reporting will be required to be submitted in stages to meet the construction and commissioning requirements. Compliance reporting will be provided as per Table 1.1, prior to Load Commissioning.

2.5. Commissioning

A two year load commissioning period will be required. Commissioning will be staged as various components of the infrastructure are completed. Potential stages for commissioning include:

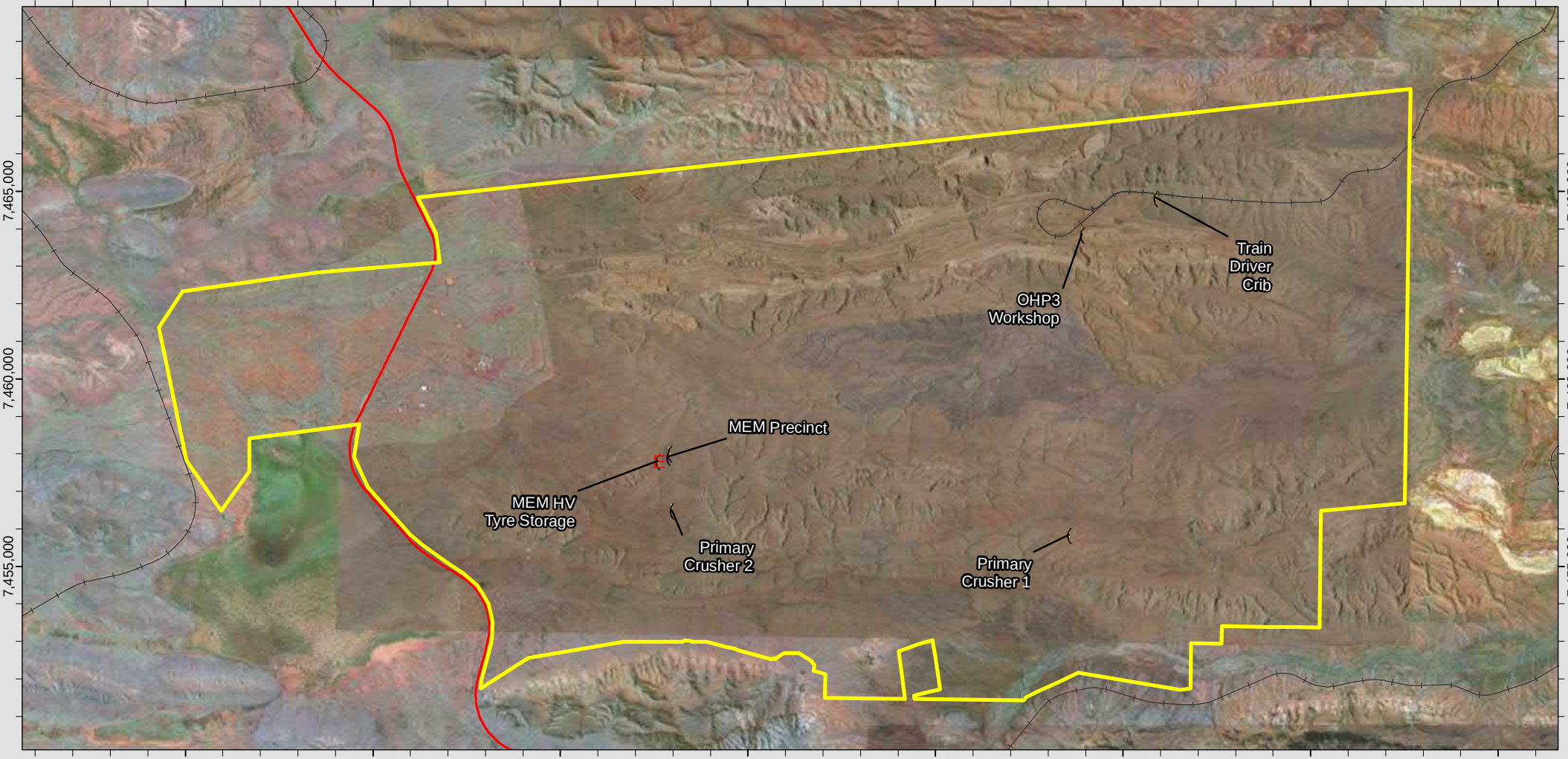
- Mining Area C OHP1/2 to Stockyards (via CV484);
- Stock yards to the TLO;
- PC2 to COS (via CV412 and CV413);

Works Approval – Mining Area C South Flank

- COS to Stockyards (via CV476)
- PC1 to COS (via CV411;
- North Stock yard to TLO;
- COS to OHP3 to stockyards (via CV473); and
- OHP1/2 to stockyards (via CV478).

Performance testing and reliability testing will be undertaken during the commissioning phase. Commissioning shall verify that the facilities are capable of continuously operating to design criteria and specifications. This verification will include performance testing of the dust emission controls. Dust emission will be monitored via the existing air quality monitoring network. Maintenance strategies to ensure performance longevity for these key design elements are developed pre-commissioning and are implemented at the completion of the commissioning process.

All commissioning activities for Mining Area C - South Flank Project shall comply with the South Flank HSEC Management Plan and the conditions of the works approval. A commissioning management plan is in preparation and will be submitted to the DWER.



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK
Works Approval Supporting Infrastructure Discharge Locations

Scale @ A4: 1:150,000	Prepared: M. LYTTLE	Project No: A780/106 REV A
Date: 22/03/2018	Checked: G. MANNING	Figure : 2.10
Revision: REV A	Reviewed: K. FLOWERDEW	

MAC / Southern Flank Proposed Prescribed Premises Boundary (L7851)

Highways

Rail

Supporting Infrastructure Discharge Locations

(Fuel Storage

(Sewage Treatment Facility

E Tyre Storage

0 2 4 6
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_106_E_MAC_SouthernFlank_WorksApproval_SupInfraDischargeLocations_Fig2.10_RevA.mxd

3. Approvals Framework

Table 3.1 summarises the approvals that govern Mining Area C. Additional approvals and amendments will be sought as determined by the requirements of the mine schedule and associated activities.

Table 3.1: Approval Summary

Legislation	Approval	Reference	Aspects	Expiry
Iron Ore (Mount Goldsworthy) Agreement Act 1964	Mineral Lease	ML281SA and ML249SA	Tenure	
	State Agreement Project Proposals	In preparation	Detailed proposals describing the proposed infrastructure and mining operations.	
Environmental Protection and Biodiversity Act 1999	Strategic Environmental Assessment (SEA) Approval Notice	Authorised by The Hon Josh Frydenberg MP Minister for the Environment and Energy Dated 19 June 2017	Matters of National Environmental Significance: • Northern Quoll (*Dasyurus hallucatus*), • Greater Bilby (*Macrotis lagotis*), • Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*), • Pilbara Olive Python (*Liasis olivaceus barroni*); and • Ghost Bat (*Macroderma gigas*).	19 June 2117
	SEA Condition 3 Assurance Plan	Under assessment		
	SEA Condition 3 Offsets Plan	Under assessment		
	Validation Notice	In preparation		
Environmental Protection Act 1986	Ministerial Statement	MS1072	Key Environmental Factors: • Terrestrial Fauna; • Flora and Vegetation; • Hydrological Processes; • Subterranean Fauna; • Inland Waters Environmental Quality; • Heritage; • Rehabilitation and Closure;	Life of Asset
	Licence	L7851/2002/6	• Category 5: Processing – 65,000,000tonnes per annual period • Category 6: Mine dewatering - 34,931,000tonnes per annual period • Category 54: Sewage Facility – 480m^3 per day • Category 63: Class 1 inert landfill – 9,000tonnes per annual period • Category 73: Bulk Storage of Chemicals – 3,500m^3 in aggregate • Category 85B: Desalinisation Plant – 0.9125GL per annual period • Category 89: Putrescible Landfill – 3,000tonnes per annual period	16 Nov 2027
	Works Approval	W6092/2017/1	New WWTP at Mulla Mulla with capacity of 630m^3 per day	25 Feb 2021
Rights in Water and Irrigation Act 1914	5C Licence to Take Groundwater	GWL110044(10)	Mining Area C Annual water entitlement of up to 15,330,000 kilolitres per annum (kL/a) from Pilbara, Hamersley Fractured Rock aquifer.	13 April 2026
		GWL178477(2)	Juna Downs Borefield 750,000kL/a from Wittenoom aquifer	13 April 2026
		GWL174613(1)	Mulla Mulla Camp Borefield 50,000kL/a from the Pilbara, Hamersley Fractured Rock aquifer	23 Nov 2021

Works Approval – Mining Area C South Flank

Legislation	Approval	Reference	Aspects	Expiry
Aboriginal Heritage Act 1972	Section 18 Notices	Approved 16 March 2018	Salvage and disturbance of heritage sites	
		Under assessment	Salvage and disturbance of heritage sites	
Dangerous Goods and Safety Act 2004	Dangerous Goods and Storage Licence	DGS017237	Facilities added to the manifest as required.	
Health Act 1914	Permit to install apparatus for the treatment of sewage	In preparation. Will be submitted as determined by schedule and site requirements	To Construct a waste water treatment plant	
	Permit to install apparatus for the treatment of sewage – Mulla Mulla Village WWTP	Under assessment submitted 12 Feb 2018		
	Permit to operate apparatus for the treatment of sewage	Submission following construction of the sewage treatment facility, as required.	To operate a waste water treatment plant	

3.1. State Agreement

Mining Area C is located on land that is held pursuant to the *Iron Ore (Mount Goldsworthy) Agreement Act 1964*. The Mine has been the subject of multiple approved proposals under this Agreement since 2002. Two detailed proposals will be submitted for South Flank. The first application will outline early works to enable access to the site and the second will describe the full mine development.

3.2. Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)

On 19 June 2017 the Minister for the Environment and Energy (Cwth) approved actions associated with developing future iron ore mines and associated infrastructure in the Pilbara region of Western Australia as described in a strategic assessment program issued in accordance with Section 146(1) of the *Environment Protection and Biodiversity Conservation Act 1999.* The implementation framework of the Program comprises two plans: an Assurance Plan and an Offsets Plan. The Assurance Plan and the Offsets Plan under assessment by the Department of Environment and Energy (DoEE).

South Flank will be subject to a Validation process under the Program following endorsement of the Assurance and Offsets Plan. The Validation Notice will describe how the potential impact to the Matters of National Significant (NES) species will be managed to ensure the Program Matter Outcomes are achieved. BHP will publish a draft Validation Notice for public comment for at least 28 days, with any comments received to be taken into account when finalising the Validation Notice.

3.3. Part IV of the EP Act

In 1998, BHP received approval under Part IV of the *Environmental Protection Act 1986* (EP Act) for the multiple Iron Ore Mine Development Area Mining Area C Northern Flank via Ministerial Statement 491 (MS491).

On 30 May 2016, BHPBIO referred the proposal to develop and operate a satellite orebody at South Flank as part of its Mining Area C operations, under Part IV of the EP Act. The referral also sought to expand the scope of disturbance currently approved at the Mining Area C hub and create a single Ministerial Statement to govern the Northern and South Flanks. The EPA assessed the proposal at the Public Environmental Review (PER) level.

A Ministerial Statement of Approval No.1072 (MS1072) was issued by the Minister for Environment on 20 February 2018 under Part IV of the EP Act. All works will be undertaken in accordance with the conditions of the MS1072, which supersedes MS491. MS1072 permits the clearing of native vegetation up to 21,824ha (inclusive of 5,564ha cleared in accordance with MS491).

3.4. Part V of the EP Act

BHP Billiton currently holds a Licence to Operate (L7851/2002/6) for the approved Mining Area C operations. The prescribe premises categories permitted under the licence include 5, 6, 54, 63, 73, 85B and 89 (Table 3.1). Table 3.2 outlines the Part V approvals framework to allow construction of Mining Area C and South Flank infrastructure.

Table 3.2: Mining Area C and South Flank Part V Submissions

Mining Area C L7851		Licence Amendment submitted Jan 2018	Works Approval Application (this application)	
Category	**Existing Licence Capacity**	**Proposed capacity**	**Project Components**	**Proposed Capacity**
5 - Process Infrastructure	65,000,000 tonnes per annual period	Increase capacity to 71,000,000* tonnes per annual period	South Flank - Two 40Mtpa primary crushing stations, discharge and overland conveyors transfer stations Mining Area C - Coarse ore stockpile, OHP 3 (150Mtpa), ore sampling stations, stockyard expansion	Increase capacity to 150,000,000* tonnes per annual period
6 – Dewatering	34,931,000 tonnes per annual period	Addition of injection bores and new discharge points	No change	No change
12 – Screening	-	Add the category up to 1,000,000 tonnes per annual period	No change	No change
54 – Sewage Facility	480 m^3 per day	No change	No change	No change
63 – Class I Inert Landfill	9,000 tonnes per annual period	Increase to 14,000 tonnes per annual period to account for an increase in inert waste resulting from the construction of the South Flank mining hub.	No change	No change
73 – Bulk Storage of Chemicals	3,500m^3 in aggregate	Increase to 6,000 m^3 to allow for the installation of additional 15 fuel bullets at MAC and South Flank (inclusive of the fuel storage at MEM precinct), and to allow flexibility in future hydrocarbon storage within the revised boundary of L7851/2002/6.	Installation of the two 2,000kL fuel storage facilities at PC1 and PC2,	Increase to 10,000m^3
85B - Water Desalination Plant	0.9125 gigalitres per annual period	No change	No change	No change
89 - Putrescible Landfill Site	3,000 tonnes per annual period	Increase to 5,000 tonnes per annual period to account for an increase in putrescible waste	No change	No change

Mining Area C L7851		Licence Amendment submitted Jan 2018	Works Approval Application (this application)	
Category	**Existing Licence Capacity**	**Proposed capacity**	**Project Components**	**Proposed Capacity**
		resulting from the expansion of Mulla Mulla Village.		

* While the Mining Area C – South Flank have the capacity to process 151mtpa, the existing Mining Area C stackers limit the throughput to 70Mtpa (total 150Mtpa). Upgrades to the Mining Area C stackers will be subject to another Part V application

3.5. Rights in Water and Irrigation Act 1914 (RiWI Act)

Groundwater abstraction is required to provide water supply for the mining activities. Mining of the conventional open-pits will extend below the water table and will require mine dewatering ahead of mining to facilitate dry mining conditions. BHP Billiton holds several 5C licences that support the current approved MAC operations (Table 3.1). The licensed activities include dewatering, dust suppression, mine processes, construction and potable water supply. The approved Groundwater Operating Strategy for Mining Area C will be amended to incorporate South Flank water requirements.

3.6. Aboriginal Heritage Act 1972

The prescribed premises is situated within the Banjima Native Title Determination (WCD2014/001). BHP manages and protects Aboriginal heritage in compliance with the WA *Aboriginal Heritage Act 1972* (AHA) and the Banjima and BHP Billiton Comprehensive Land Access Agreement (WI2015/021).

The prescribed premises has been archaeologically and ethnographically surveyed to identify heritage sites in order to avoid, where practicable through design, planning and engineering solutions. One known ethnographic site has been identified and will be impacted, along with approximately 77 archaeological sites. A Section 18 application was submitted to the Department of Planning, Lands and Heritage (DPLH) in October 2016. Consetn was granted 16 March 2018. A second Section 18 application for 22 additional archaeological sites that will be impacted was submitted to DPLH in December 2017.

Personnel employed on the project will undergo a compulsory induction, which includes advice of their obligations under the AHA not to disturb, alter or damage any Aboriginal heritage site and of the management and protection measures required for each of the Aboriginal sites located within and adjacent to BHPBIO affected tenure. Personnel will also be instructed to report any previously unrecorded Aboriginal heritage site, if one is discovered or if damage to an Aboriginal heritage site, is identified.

3.7. Dangerous Goods and Safety Act 2004

BHP holds dangerous goods and storage licence DGS017237 under the *Dangerous Goods and Safety Act 2004* for Mining Area C. The manifest associated with the licence will be updated to include the fuel storage facilities at PC1 and PC2.

3.1. Health Act 1911

BHP will obtain a permit to install apparatus for the treatment of sewage under the Health Act 1911, for each of the waste water treatment facilities prior to construction. Following construction a permit to operate the apparatus will be obtained.

4. Stakeholder Consultation

BHP Billiton's commitment to community engagement are articulated in the Company's *Code of Business Conduct* (BHP Billiton, 2016a), which states:

> *Our ability to build relationships and work collaboratively and transparently with our host communities is critical to our long term success. BHP Billiton aims to be valued and respected by the communities in which we operate.*

To support this commitment, BHP Billiton has comprehensive Company standards and dedicated resources to ensure its activities are underpinned by continuous community engagement and feedback.

BHP Billiton undertakes regular and ongoing stakeholder engagement as part of its core business activities. BHP Billiton's Our Requirements[1] Community sets out the Company's approved mandatory and minimum performance requirements for community engagement (BHP Billiton, 2016b). BHP Billiton aims to facilitate regular, open and honest dialogue to understand expectations, concerns and interests of stakeholders and to incorporate them into business planning to help build strong, mutually beneficial relationships.

Table 4.1 summarises the relevant consultation undertaken by BHP Billiton regarding the aspects of this application.

Table 4.1: Stakeholder Engagement

Stakeholder	Date	Description	Topics Discussed	Outcomes
DWER (formerly Department of Environmental Regulation)	19 September 2016	Meeting Overview of the MAC – South Flank project work undertaken and findings to date were presented	Scope and spatial characteristics of the Proposal. Overview provided on hydrological, air quality and amenity aspects of the Proposal	DWER requested that BHP Billiton Iron Ore provide an approvals strategy, including timing for the Part V process related to this project. DWER requested clarification of the water surplus from the Proposal.
DWER	16 January 2018	Meeting	To highlight upcoming projects requiring Part V approval (Works Approvals and Licence Amendments) Briefing regarding the preferred approval framework to progress Mining Area C operational requirements and South Flank construction requirements	Works approval to be submitted for the major infrastructure required for South Flank
Main Roads Western Australia (MRWA)	2 February 2018	Phone Conference Overview of South Flank project and dust management	MRWA comments provided on the Mining Area C – South Flank PER Visibility risks on the Great Northern Highway from dust BHP Monitoring and Dust Management practises	BHP to continue to engage with MRWA regarding dust management and any key changes. BHP to engage with MRWA regarding dust incidents and inform MRWA when there is a potential for low visibility to occur on the highway from the mining activities.
DWER	7 February 2018	Meeting Mining Area C – South Flank Scoping Meeting –	Project overview for Mining Area C – South Flank Overview of the proposed infrastructure to be included in the works approval Identification and familiarisation of sensitive receptors	Works approval to include detail on • meteorological events that result in high dust emissions

[1] BHP Billiton Our Requirements documents set out minimum company standards, processes and procedures that must be met across the globe.

Works Approval – Mining Area C South Flank

Stakeholder	Date	Description	Topics Discussed	Outcomes
			Dust modelling scenarios, analysis and results Outline of dust management and proposed controls	• potential dust impacts to Coondewanna Flats • dust monitoring • surface water management
Department of Biodiversity, Conservation and Attractions (DBCA)	6 March 2018	Meeting Monthy Meeting	Potential dust impacts from Mining Area C – South Flank activities on Coondewanna Flats PEC	Dust unlikely to impact the vegetation of Coondewanna Flats. WABSI has commenced a project to investigate dust impacts on vegetation
Shire of East Pilbara	4 April 2018	Meeting	Introduce Mining Area C – South Flank Propose meeting for dedicated discussion for potential dust impacts and management	

5. Existing Environment and Location

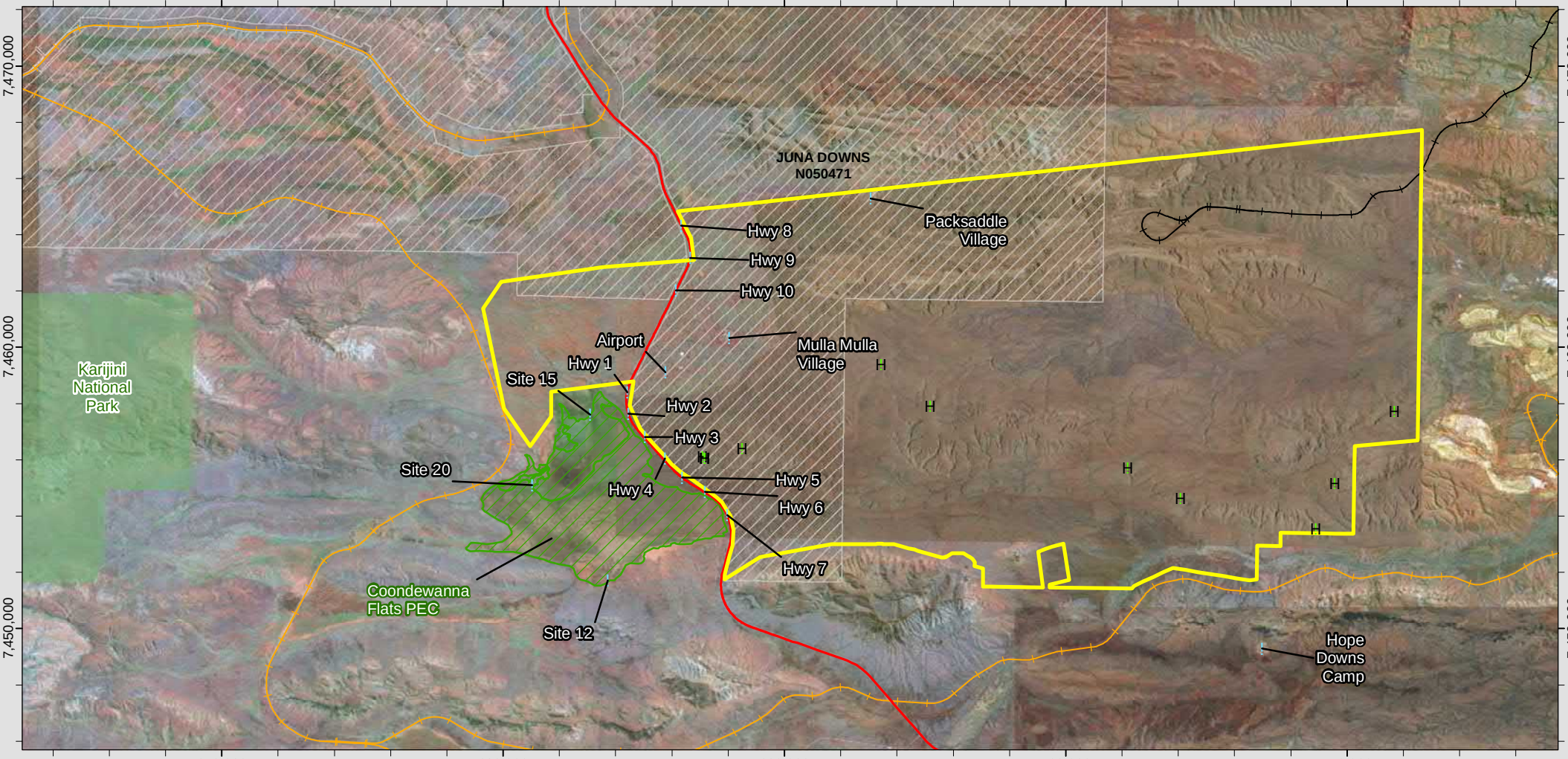
5.1. Nearby Land Uses and Sensitive Receptors

The land uses in the regional surrounding the area include low intensity pastoral grazing and mining activities (Figure 5.1). Pastoral leases in the vicinity of the prescribed premise include Juna Downs (N050471) and Marillana (N050368) pastoral stations (Table 5.1). The Karijini National Park is located approximately 20 km to the west.

The closest sensitive receptor to the prescribed premises are BHP's Mulla Mulla Village, Packsaddle Village and the Coondewanna Airport which are located within the prescribed premises (Figure 5.1). The closest non-BHP owned sensitive receptor in the vicinity of the prescribed premise are the Hope Downs Village and Pastoral station homesteads (Table 5.1).

Table 5.1: Sensitive Receptors

Receptors	Approximate Distance (km) from nearest to prescribed premise boundary	Approximate distance from nearest category 5 Facility or catehory 73 Facility
BHP Packsaddle Village	Within the premise	8km
BHP Mulla Mulla Village	Within the premise	6km
BHP Coondewanna Airport	Within the premise	6.5km
Great Northern Highway	100m	5.5km
Rio Tinto Hope Downs Camp	1.5km	6.5km
Juna Downs Pastoral Station Homestead	28km	42km
Marilana Pastoral Station Homestead	44km	53km
Newman	80km	85km
Coondewanna Flats	200m	5.5km
Karijini National Park	10km	24km
Weeli Woolie Spring PEC	9km	19km
Bens' Oasis	11km	17.5km



BHP BILLITON IRON ORE

MINING AREA C - SOUTHERN FLANK
Works Approval Sensitive Receptors

Scale @ A4:	1:200,000	Prepared:	M. LYTTLE	Project No:	A780/107 REV A
Date:	22/03/2018	Checked:	G. MANNING	Figure :	5.1
Revision:	REV A	Reviewed:	K. FLOWERDEW		

- MAC / Southern Flank Proposed Prescribed Premises Boundary (L7851)
- Sensitive Receptors
- High Value Ghost bat Caves
- Juna Downs Pastoral Lease
- Priority Ecological Community
- Karijini National Park
- Highways
- BHP Rail
- RioTinto Rail

0 2 4 6
Kilometres

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A780\3Project\A780_107_E_MAC_SouthernFlank_WorksApproval_SensitiveReceptors_Fig5.1_RevA.mxd

5.2. Climate

Mining Area C is located in the Pilbara region of Western Australia, which experiences a semi-arid climate with two distinct seasons: a hot summer from October to April and a mild winter from May to September.

Climatic data from the Bureau of Meteorology's (BoM) Newman weather station (Station Number 007176) indicates that peak rainfall occurs in the summer months between December and March with a smaller peak in May and June. The mean monthly rainfall for Newman ranges from 4.9 millimetres (mm) in October to 77 mm in February with a mean annual rainfall of 310.7 mm (BoM, 2017).

Rainfall during summer months is strongly dominated by tropical cyclones and thunderstorm activity between November and March. Rainfall during May and June is the result of cold fronts moving across the south of the State that occasionally extends to the Pilbara.

Mean maximum temperatures range between 22°C to 29°C in winter and 32°C to 39°C during summer. Evaporation greatly exceeds rainfall in the region throughout the year and on a month-by-month basis since the mean annual pan evaporation rate at Mining Area C is estimated at 3,400 mm, which exceeds annual rainfall by around 3,100 mm, and average monthly pan evaporation rates vary between a minimum 160 mm in June and a maximum 430 mm in December (Aquaterra, 2009).

The seasonal wind roses for Newman weather station show that the dominant annual wind directions are distinctively north-westerly during the summer months and south-easterly during the winter months (PEL, 2015). Spring also shows high north-westerly dominance, driven by land-sea temperature differences in the lead up to the summer months.

5.3. Geology

The Pilbara bioregion, where the Proposal is located, is situated in the south-eastern comer of the Pilbara Craton. The cratonic basement comprises Archaean granite-greenstone and is unconformably overlain by the late Archaean to Early Proterozoic deposits of the Hamersley Basin. The Hamersley Basin can be divided into three stratigraphic groups: the Fortescue, Hamersley and Turee Creek groups. Of these groups, the Fortescue and Hamersley groups outcrop in the immediate area Mining Area C.

The Hamersley Group is seen throughout the Hamersley Basin and forms the outcrop of Mining Area C. It is a sedimentary sequence comprising banded iron formations (BIFs), shales and dolomites with minor felsic volcanics and intrusive dolerite dykes and sills. The group contains both the Brockman and Marra Mamba Iron formations, which together host most of the known major iron ore deposits in the Pilbara region. The six lower-most formations of the Hamersley Group that exist within the area are listed below in order of increasing age:

1. Weeli Wolli Formation.
2. Brockman Iron Formation. Ore mineralisation from the Packsaddle Range deposits is contained within the Brockman Iron Formation, composed of a sequence of interbedded Banded Iron Formation, shales, siltstones and cherts. The four members comprising of the formation are:
    - Yandicoogina Shale Member (shale and BIF);
    - Joffre Member (BIF with minor shale bands);
    - Whaleback Shale Member (interbedded shale, chert and BIF); and
    - Dales Gorge Member (interbedded BIF and shale).
3. Mount McRae Shale (graphitic and chloritic shales interbedded with BIF). The Mount McRae Shale (~30 m thick) consists of alternating bands of black carbonaceous shale and chert and is commonly capped with pyritic chert bands. The Mount McRae Shale forms the basal unit to the ore horizons in the Brockman Iron Formation and contains a limited enriched ore zone. BHP Billiton Iron Ore informally subdivides this lithology into five units based on lithology and pyrite content. Several zones within the unit contain abundant pyrite nodules, thus, the formation is commonly regarded as a significant AMD risk throughout the Pilbara region.
4. Mount Sylvia Formation (shale, dolomite and BIF bands).The Mount Sylvia Formation (~2.5 Ma) has a thickness of ~50 m in the vicinity of the town of Newman, WA, and consists of three BIFs separated by interlayered shale and dolomite as well as small amounts of chert.
5. Wittenoom Formation. The Wittenoom formation is located stratigraphically above and is younger than (2.6 – 2.5 Ma) the Marra Mamba Formation. The Wittenoom Formation has been deeply eroded in the development area and is mostly covered by Tertiary Detritals. The formation is predominantly

comprised of calcareous and manganiferous shales, cherts and dolomite and includes the following members comprising:

- Bee Gorge Member (calcareous shale and dolomite);
- Paraburdoo Member (dolomite – karstic in part); and
- West Angela Member (manganese-rich shale with minor BIF and chert bands).

6. Marra Mamba Iron Formation. The Marra Mamba Iron Formation is approximately 205 m thick and is the oldest formation (2.6 Ma) identified in the prescribed premise. It is comprised of a sequence of BIF, shales, siltstones and minor cherts. The Mount Newman Member hosts the bulk of the mineralisation associated with the Marra Mamba Iron Formation Deposits. The formation is divided into the following members:
   - Mount Newman Member (BIF with thin shale bands);
   - MacLeod Member (BIF with extensive interbedded shales and 'podded' BIF horizons); and
   - Nammuldi Member (cherty BIF with occasional shale bands).

5.4. Soils and Landform

Five land systems occur within the Mining Area C prescribed premises (Table 5.2). The dominant land systems present are the Newman and Boolgeeda land systems, comprising the plateaux, ridges, mountains and hills and their associated drainage zones of this section of the Hamersley Range.

Table 5.2: Landsystems Present within the Prescribed Premises

Landsytem	Description
Boolgeeda	Stony plains with hard Spinifex grasslands or Mulga shrublands. The geology is quaternary colluvium
Newman	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.
Pindering	Gravelly hardpan plains supporting groved mulga shrublands with hard and soft spinifex.
Platform	Narrow, raised plains and highly dissected slopes on partly consolidated colluvium below the footslopes of hill systems such as Newman, relief mostly up to about 30 m but occasionally considerably greater
Wannamunna	Level alluvial plains with prominent grove patterns of vegetation and shallow loamy soils over hardpan and broad internal drainage plains with deeper more clayey soils, relief up to 5 m. The system is found in south central parts of the survey area as broad flats within the Hamersley Ranges (Newman land system).

The prescribed premises occur within the Hamersley Plateaux Zone of the Fortescue Province of the Western Region of the soil-landscape zones of Western Australia (Tille, 2006). The dominant landform features within this zone are rocky ranges and hills and stony plains. Rugged hills, ridges, dissected plateaux and mountains occur on the basalt, BIF and sandstone of the Hamersley Basin, the most notable examples being the Chichester and Hamersley ranges.

Soils of the Pilbara region have been defined and mapped at a scale of 1:2,000,000 by Bettenay et al. (1967). Three soil units occur within the Prescribed Premises: Fa13, Fb3 and Ja2.

- Soil Unit Fa13 is described as: "Ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations; some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments. This unit is largely associated with the Hamersley and Ophthalmia Ranges. The soils are frequently stony and shallow and there are extensive areas without soil cover: chief soils are shallow stony earthy loams (Um5.51) along with some (Uc5.11) soils on the steeper slopes. Associated are (Dr2.33, Dr2.32) soils on the limited areas of dissected pediments, while (Um5.52) and (Uf6.71) soils occur on the valley plains."
- Soil Unit Fb3 is described as: "High-level valley plains set in extensive areas of unit Fa13. There are extensive areas of pisolitic limonite deposits: principal soils are deep earthy loams (Um5.52) along with small areas of (Gn2.12) soils."
- Soil Unit Ja2 is described as: "This unit occupies the central position within the high-level valley plains represented by unit Fb3: chief soils are earthy clays (Uf6.71) along with extensive areas of (Ug5.38) soils."

5.5. Air Quality

The semi-arid landscape of the Pilbara is a naturally dusty environment with wind-blown dust a significant contributor to ambient dust levels in the region. BHP Billiton has an ambient air quality monitoring network in place in the vicinity of the inland Pilbara operations. In 2015 an assessment of the total suspended particles and PM_{10} data from the network was undertaken to estimate the local background air quality. From the six monitoring sites, one (BG2) was considered representative of ambient conditions and was not expected to be influenced by existing mining activities. The BG2 site is located approximately 5 km south-east of the Newman Township. From the 2009 to 2012 catalogue of data, the year 2010 was recommended as reflective of background conditions. The background PM10 concentration of 18 µg/m3 and a background TSP concentration of 33 µg/m3 was considered to be reflective of the region. These were based on the 70th percentile of PM10 and TSP concentrations in 2010 (PEL 2015a). Ongoing monitoring of background particulate matter levels from the BHP ambient air quality network surrounding Newman have shown that background level are higher than the 70 µg/m^3 typically around 3-6 times per annum.

5.6. Groundwater

The prescribed premises lies within the following two regional aquifers:

1. Hamersley – Fractured Rock Aquifer: The Precambrian rocks of the Hamersley Basin are principally volcanics, shales and iron formations. Groundwater is contained within fractures within these rocks. The groundwater level may be deep below the surface, and is generally fresh. The main use of this aquifer is for mining and mine dewatering from iron ore mines. Bores have also been drilled for road and railway construction. There will be increasing dewatering from the fractured rocks around iron ore mines as the pits become deeper (DoW, 2015a).
2. Hamersley – Wittenoom Aquifer: The Wittenoom aquifer is distinguished as a separate aquifer system because the Wittenoom Dolomite is distinct from the other fractured rock aquifers in the Hamersley Basin, having karst development (solution cavities) and being overlain by a thick sequence of valley filled sediments consisting of pisolite, calcrete and alluvium. The Wittenoom Dolomite is the most important aquifer in the province and underlies the main valleys in the Hamersley Range; it is highly transmissive and high yielding where there is karst development. Water levels may be fairly deep. The groundwater is generally fresh. The aquifer has been developed for Tom Price and Marandoo water supply and has been investigated at other localities. There is likely to be significant development pressure on this aquifer for supply to iron ore operations (DoW, 2015b).

The main regional aquifer at Mining Area C is the karstic Paraburdoo Dolomite of the Wittenoom Formation. This forms a high permeability zone at the base of the Northern Flank valley, and is the source of the majority of the mine water supply. Above the dolomite, the valley has been filled with Tertiary age materials, including calcrete and possibly scree (or Channel Iron Deposits) originating from mineralised Brockman Iron Formation on the valley sides. Over much of the valley, the tertiary material comprises significant clay and silt of low permeability (Aquaterra, 2008).

Mining Area C is predominantly located in the upper reaches of the Weeli Wolli Creek system, which is a tributary of the Fortescue River. The regional groundwater flow direction within the North and South Flank Valleys is from west to east towards Weeli Wolli Spring, with outflow from the system occurring as both surface water flow and groundwater through-flow at the spring. Weeli Wolli Spring is formed by the convergence of groundwater flow on the narrow gap through the Packsaddle Range and shallow sub cropping/outcropping basement rock, causing groundwater levels to rise to the topographic surface (Aquaterra, 2008).

The depth to water across the area varies between 0 mbgl and over 100 mbgl, but typically the range across the catchment is 15 – 60 mbgl. Generally, depth to water is lowest in the areas of Coondewanna Flats and Weeli Wolli Spring where surface water and groundwater flow concentrates. Depth to water is greatest in the upland areas

The majority of the groundwater recharge occurs via seepage from the Lake Robinson – which forms in Coondewanna Flats after inundation events. Enhanced recharge also occurs in the area of Weeli Wolli Spring via surface exposures of calcretes. Recharge occurs seasonally or periodically in response to high magnitude low frequency rainfall events. On average, significant recharge to the groundwater system occurs annually at Weeli Wolli Spring and every four years at Coondewanna Flats. A limited amount of recharge also occurs from diffuse recharge over the entire catchment in response to seasonal rainfall events.

There are no public drinking water source areas within or adjacent to the prescribed premises.

5.7. Surface water

The prescribed premises occurs in the sub-catchment of Weeli Wolli Creek, which is a tributary of the Fortescue River. The Weeli Wolli Creek sub-catchment is further divided into three sub-catchments:

- Upper Weeli Wolli Creek sub-catchment (1,877 km^2);
- Marillana Creek sub-catchment (2,050 km^2); and
- Lower Weeli Wolli Creek sub-catchment (210 km^2) - which receives flow from the above sub-catchments.

The Weeli Wolli Creek sub-catchment is flanked by the Coondewanna sub-catchment (862 km^2), which is part of the Ashburton River catchment. Groundwater sometimes flows across the catchment divide between the Upper Weeli Wolli Creek sub-catchment and the Coondewanna sub-catchment (URS, 2014).

A number of unnamed perennial watercourses flow across the prescribed premises. The prescribed premises also intersects the northern-most section of Coondewanna Flats but is not within the boundary of the Coondewanna Flats Priority Ecological Community (PEC).

5.8. Flora and Vegetation

5.8.1. Vegetation

There are two vegetation associations (as mapped by Shepherd *et al*. (2002)) in the Mining Area C Prescribed Premise:

- Hamersley 18: Low woodland; mulga (*Acacia aneura*); and
- Hamersley 82: Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*.

Botanical surveys identified 34 vegetation associations in the Mining Area C Prescribe Premises Boundary (Table 5.3, Onshore Environmental, 2017). At the complex level, vegetation within the Mining Area C Prescribed Premises is well represented and well reserved within the Pilbara bioregion.

No Threatened Ecological Communities (TECs) listed under the *Environmental Protection Biodiversity Conservation Act, 1999* (EPBC Act) or the *Wildlife Conservation Act, 1950* (WC Act) have been identified within the Prescribed Premises. Two Priority Ecological Communities (PECs) occur within 20 km of the Mining Area C –South Flank (Figure 1.1). DBCA (2017) priority listings described the PEC's as:

- **Coolibah-lignum flats**: *Eucalyptus victrix* over Muehlenbeckia community Woodland or forest of *Eucalyptus victrix* (coolibah) over thicket of Duma florulenta (lignum) on red clays in run-on zones. Associated species include *Eriachne benthamii, Themeda triandra, Aristida latifolia, Eulalia aurea* and *Acacia aneura*. A series of subtypes have been identified: ·
    - Priority 3 - Coolibah and mulga (*Acacia aneura*) woodland over lignum and tussock grasses on clay plains (Coondewanna Flats).
    - Priority 1 - Coolibah woodlands over lignum (*Duma florulenta*) over swamp wandiree (Lake Robinson is the only known occurrence).

- **Weeli Wolli Spring** – Priority 1. Weeli Wolli Spring's riparian woodland and forest associations are unusual as a consequence of the composition of the understorey. The sedge and herbfield communities that fringe many of the pools and associated water bodies along the main channels of Weeli Wolli Creek have not been recorded from any other wetland site in the Pilbara.

Neither PEC occurs within the prescribed premise boundary.

A majority of the vegetation in the Mining Area C prescribed premises, was considered to be in Good or better condition. Vegetation in areas of higher relief, with restricted access by stock and supporting less palatable plant species, retained higher condition in the range of Excellent to Pristine. Vegetation condition declines to Very Good or Good on drainage lines and flood plains, as well as on areas where exploration activities have occurred or the impact of stock is greater. The major impact on lowland vegetation is the result of grazing by cattle, which has contributed to changes in native vegetation structure and composition, the introduction of weed species, and surface instability.

Table 5.3: Vegetation Associations Within the Mining Area C Prescribed Premise

Landform	Map Code	Broad Floristic Formation	Vegetation Association	Locally Significant	No of Priority Flora	Mapped Area (ha)
Calcrete Plains	CP TwTa Ese AbPlApyp	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia wiseana* and *Triodia angusta* with Open Mallee of *Eucalyptus socialis* subsp. *eucentrica* and Open Shrubland of *Acacia bivenosa, Petalostylis labicheoides* and *Acacia pyrifolia* var. *pyrifolia* on light brown clay loam on calcrete plains and rises	no	-	10,246
Flood Plains	FP Ev Aa EuaErbTt	*Eucalyptus* Woodland	Woodland of *Eucalyptus victrix* over Low Woodland of *Acacia aptaneura* over Open Tussock Grassland of *Eulalia aurea, Eriachne benthamii* and *Themeda triandra* on orange clay loam on floodplains	no	-	122
	FP AaApApt TtChfErb	*Acacia* Low Open Forest	Low Open Forest of *Acacia aptaneura, Acacia paraneura* and *Acacia pteraneura* over Open Tussock Grassland of *Themeda triandra, Chrysopogon fallax* and *Eriachne benthamii* on red brown clay loam on floodplains	no	-	10,214
	FP AaAcaoAp ErlnSolPto ArcErdiArj	*Acacia* Low Open Woodland	Low Open Woodland of *Acacia aptaneura, Acacia catenulata* subsp. *occidentalis* and *Acacia paraneura* over Low Open Shrubland of *Eremophila lanceolata, Solanum lasiophyllum* and *Ptilotus obovatus* over Very Open Tussock Grassland of *Aristida contorta, Eragrostis dielsii* and *Aristida jerichoensis* var. *subspinulifera* on red brown clay loam on hardpan intergrove plains.	no	-	5,761
	FP TtEua ExAa AprAtpErlo	*Themeda* Tussock Grassland	Tussock Grassland of *Themeda triandra* and *Eulalia aurea* with Low Woodland of *Eucalyptus xerothermica* and *Acacia aptaneura* over Open Shrubland of *Acacia pruinocarpa, Acacia tumida* var. *pilbarensis* and *Eremophila longifolia* on red brown clay loam on unincised drainage lines and floodplains	Yes Ecosystem at risk Kendrick (2001) and significant flora present	2	2,009
Footslopes	FS Ts CdHc AancAiGrwh	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Open Woodland of *Corymbia deserticola* subsp. *deserticola* and *Hakea chordophylla* over Open Shrubland of *Acacia ancistrocarpa, Acacia inaequilatera* and *Grevillea wickhamii* subsp. *hispidula* on red brown sandy loam on footslopes and stony plains	Yes significant flora present	4	45,322
	FS TsTpTw Ell AbApaAanc	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia pungens* and *Triodia wiseana* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and Open Shrubland of *Acacia bivenosa, Acacia pachyachra* and *Acacia ancistrocarpa* on red brown loam on footslopes and low undulating hills	no	-	6,687
Georges and Gullies	GG CcolCfEll	*Callitris* Low Open Forest	Low Open Forest of *Callitris columellaris, Corymbia ferriticola* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Tussock Grassland of *Eriachne mucronata,*	Yes significant flora present	1	584

Landform	Map Code	Broad Floristic Formation	Vegetation Association	Locally Significant	No of Priority Flora	Mapped Area (ha)
	ErmuThmbCya		*Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Cymbopogon ambiguus* and Very Open Hummock Grassland of *Triodia pungens* on orange brown loam on upper gorges			
	GG CfEllFib AhDovmAsh a CyaErmuTh mb	*Corymbia* Low Woodland	Low Woodland of *Corymbia ferriticola, Eucalyptus leucophloia* subsp. *leucophloia* and *Ficus brachypoda* over Open Shrubland of *Acacia hamersleyensis, Dodonaea viscosa* subsp. *mucronata* and *Astrotricha hamptonii* over Open Tussock Grassland of *Cymbopogon ambiguus, Eriachne mucronata* and *Themeda* sp. Mt Barricade on red brown loam along clifflines and gorges	Yes significant flora present	5	3,685
	GG TtErmuThm b EllChCf AtpGoroPl	*Themeda* Tussock Grassland	Tussock Grassland of *Themeda triandra, Eriachne mucronata* and *Themeda* sp. Mt Barricade with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* and *Corymbia ferriticola* over High Shrubland of *Acacia tumida* var. *pilbarensis, Gossypium robinsonii* and *Petalostylis labicheoides* on red brown sandy loam in narrowly incised rocky drainage lines	Yes significant flora present	2	1,030
Hill Crests and Upper Hill Slopes	HC TpTwTs EllCh AarGooKev e	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia pungens, Triodia wiseana* and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over Low Shrubland of *Acacia arida, Gompholobium oreophilum* and *Keraudrinia velutina* subsp. *elliptica* on red brown loam on hills	no	-	5,277
	HC Tw Ah EkkEgCh	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia wiseana* with Shrubland of *Acacia hamersleyensis* and Open Mallee of *Eucalyptus kingsmillii* subsp. *kingsmillii, Eucalyptus gamophylla* and *Corymbia hamersleyana* (mallee form) on red brown loam and silty loam on hill crests	no	-	4,901
	HC TwTsTp EllCh Ah	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia wiseana, Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over Open Shrubland of *Acacia hamersleyensis* on red brown clay loam on hill crests and upper hill slopes	no	-	8,049
Hill Slopes and Undulating Low Hills	HS AaApr ErjpAmarCo cf TwTp	*Acacia* Low Woodland	Low Woodland of *Acacia aptaneura* and *Acacia pruinocarpa* over Shrubland of *Eremophila jucunda* subsp. *pulcherrima, Acacia marramamba* and *Codonocarpus cotinifolius* over Open Hummock Grassland of *Triodia wiseana* and *Triodia pungens* on red brown loam on hill slopes	Yes significant flora present	2	715
	HS TbrTw Ell	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia brizoides* and/or *Triodia wiseana* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* on brown sandy loam on steep hill slopes	no	-	12,977
	HS Tp AaApr	*Triodia* Open Hummock Grassland	Open Hummock Grassland of *Triodia pungens* with Low Open Woodland of *Acacia aptaneura* and *Acacia pruinocarpa* over Open Shrubland of *Eremophila fraseri, Acacia*	no	-	391

Landform	Map Code	Broad Floristic Formation	Vegetation Association	Locally Significant	No of Priority Flora	Mapped Area (ha)
	ErfrAmarSe gl		*marramamba* and *Senna glutinosa* subsp. *x luerssenii* on red brown loam on undulating hills			
	HS Tp Ell SeggGrwhE rll	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia pungens* with Scattered Low Trees of *Eucalyptus leucophloia* subsp. *leucophloia* and Scattered Shrubs of *Senna glutinosa* subsp. *glutinosa, Grevillea wickhamii* subsp. *hispidula* and *Eremophila latrobei* subsp. *latrobei* on skeletal orange brown loam on stony hill slopes	no	-	378
	HS TsTw Eg GrwhSeggA b	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia wiseana* with Very Open Mallee of *Eucalyptus gamophylla* over Open Shrubland of *Grevillea wickhamii* subsp. *hispidula, Senna glutinosa* subsp. *glutinosa* and *Acacia bivenosa* on red brown sandy clay loam on hill slopes	no	-	1,032
	HS TsTwTp EllCh AhiAaa	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over Low Open Shrubland of *Acacia hilliana* and *Acacia adoxa* var. *adoxa* on red brown sandy loam on hill slopes	Yes significant flora present	4	44,324
	HS TwTpTbr Ell Ep	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia wiseana, Triodia pungens* and *Triodia brizoides* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over Open Mallee of *Eucalyptus pilbarensis* on red brown loam on steep hill slopes	no	-	2,339
	HS TwTpTs Ell AprAaAanc	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia wiseana, Triodia pungens* and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over Open Shrubland of *Acacia pruinocarpa, Acacia aptaneura* and *Acacia ancistrocarpa* on red brown loam on plains and low hills	no	-	1,304
Major Drainage Lines	MA EcrEvEx ApypAtpGor o TtEuaCyp	*Eucalyptus* Low Open Forest	Low Open Forest of *Eucalyptus camaldulensis* subsp. *refulgens, Eucalyptus victrix* and *Eucalyptus xerothemica* over High Shrubland of *Acacia pyrifolia* var. *pyrifolia, Acacia tumida* var. *pilbarensis* and *Gossypium robinsonii* over Open Tussock Grassland of *Themeda triandra, Eulalia aurea* and *Cymbopogon procerus* on red brown clay loam on major drainage lines	Yes – ecosystem at risk Kendrick (2001) and significant flora present	2	3,970
	MA AtpApypAse Ecr ThmbTtCyp	*Acacia* High Shrubland	High Shrubland of *Acacia tumida* var. *pilbarensis, Acacia pyrifolia* var. *pyrifolia* and *Acacia sericophylla* with Scattered Trees of *Eucalyptus camaldulensis* subsp. *refulgens* over Open Tussock Grassland of *Themeda* sp. Mt Barricade (M.E. Trudgen 2471), *Themeda triandra* and *Cymbopogon procerus* on brown loam and gravels on major drainage channels	Yes - ecosystem at risk Kendrick (2001)	-	255

Landform	Map Code	Broad Floristic Formation	Vegetation Association	Locally Significant	No of Priority Flora	Mapped Area (ha)
Medium Drainage Lines	ME TpTlo ExAciCh PlApypGoro	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia pungens* and *Triodia longiceps* with Low Woodland of *Eucalyptus xerothermica, Acacia citrinoviridis* and *Corymbia hamersleyana* over High Shrubland of *Petalostylis labicheoides, Acacia pyrifolia* var. *pyrifolia* and *Gossypium robinsonii* on red brown clay loam on medium drainage lines and surrounding floodplains	Yes significant flora present	3	10,915
	ME TtAriCya ChEll AmPlAnl	*Themeda* Open Tussock Grassland	Open Tussock Grassland of *Themeda triandra, Aristida inaequiglumis* and *Cymbopogon ambiguus* with Low Open Woodland of *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Shrubland of *Acacia monticola, Petalostylis labicheoides* and *Androcalva luteiflora* on red brown alluvium on minor and medium drainage lines	Yes significant flora present	2	1,584
	ME TtChfEua ExEvCh PlApaApyp	*Themeda* Tussock Grassland	Tussock Grassland of *Themeda triandra, Chrysopogon fallax* and *Eulalia aurea* with Low Open Woodland of *Eucalyptus xerothermica, Eucalyptus victrix* and *Corymbia hamersleyana* and Shrubland of *Petalostylis labicheoides, Acacia pachyacra* and *Acacia pyrifolia* var. *pyrifolia* on red sandy loam on medium drainage lines	no	-	1,775
	ME TtEuaEte ApypAtpPl EvCh	*Themeda* Tussock Grassland	Tussock Grassland of *Themeda triandra, Eulalia aurea* and *Eriachne tenuiculmis* with High Shrubland of *Acacia pyrifolia* var. *pyrifolia, Acacia tumida* var. *pilbarensis* and *Petalostylis labicheoides* and Open Woodland of *Eucalyptus victrix* and *Corymbia hamersleyana* on red brown silty loam on medium drainage lines and flood plains	no	-	851
Minor Drainage Lines	MI AtpPlAm TpTs ChEll	*Acacia* Open Scrub	Open Scrub of *Acacia tumida* var. *pilbarensis, Petalostylis labicheoides* and *Acacia monticola* over Open Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Open Woodland of *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* on red brown sandy loam on minor drainage lines	Yes significant flora present	3	5,671
	MI PlAtpAm ChEll TwTp	*Petalostylis* Shrubland	Shrubland of *Petalostylis labicheoides, Acacia tumida* var. *pilbarensis* and *Acacia monticola* with Low Open Woodland of *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Hummock Grassland of *Triodia wiseana* and *Triodia pungens* on red brown loam on minor drainage lines	no	-	1,108
Stony Plains	SP AaApr TmTwTp TtChfAri	*Acacia* Low Open Forest	Low Open Forest of *Acacia aptaneura* and *Acacia pruinocarpa* over Open Hummock Grassland of *Triodia melvilei, Triodia wiseana* and *Triodia pungens* over Tussock Grassland of *Themeda triandra, Chrysopogon fallax* and *Aristida inaequiglumis* on red brown loam on plains	Yes – ecosystem at risk Kendrick (2001) and significant flora present	2	7,717
	SP AcaoAa ArobDiaChf	*Acacia* Low Open Forest	Low Open Forest of *Acacia catenulata* subsp. *occidentalis* and *Acacia aptaneura* over Very Open Tussock Grassland of *Aristida obscura, Digitaria ammophila* and *Chrysopogon fallax* on red brown clay loam on lower stony plains	Yes – ecosystem at risk Kendrick	1	89

Works Approval – Mining Area C South Flank

Landform	Map Code	Broad Floristic Formation	Vegetation Association	Locally Significant	No of Priority Flora	Mapped Area (ha)
				(2001) and significant flora present		
	SP TpTb Eg PlAbAanc	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia pungens* and *Triodia basedowii* with Open Mallee of *Eucalyptus gamophylla* and Shrubland of *Petalostylis labicheoides, Acacia bivenosa* and *Acacia ancistrocarpa* on red brown loamy sand on stony plains and footslopes	no	-	2,363
	SP TpTm AaExAcao ApaErffAads	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia pungens* and *Triodia melvillei* with Low Open Woodland of *Acacia aptaneura, Eucalyptus xerothermica* and *Acacia catenulata* subsp. *occidentalis* and Open Shrubland of *Acacia pachyacra, Eremophila forrestii* subsp. *forrestii* and *Acacia adsurgens* on red brown clay loam or silty loam on stony plains and floodplains	Yes significant flora present	4	37,659
	SP TsTwTp EgEt AbApaApr	*Triodia* Hummock Grassland	Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), Tri*odia wiseana* and *Triodia pungens* with Very Open Mallee of *Eucalyptus gamophylla* and *Eucalyptus trivalva* over Open Shrubland of *Acacia bivenosa, Acacia pachyacra* and *Acacia pruinocarpa* on red brown sandy loam and clay loam on stony plains	Yes significant flora present	3	5,257

5.8.2. Flora

No flora species listed under the EPBC Act or the *Wildlife Conservation Act 1950* (WC Act) have been identified within the prescribed premises. Twelve flora species listed as priority flora by the Department of Biodiversity, Conservation and Attractions (DBCA) occur within the Mining Area C prescribed premise boundary :

- Acacia bromilowiana (Priority 4);
- Aristida jerichoensis supsp. spinulifera (Priority 3);
- Aristida lazaridis (Priority 2);
- Eremophila magnifica subsp. magnifica (Priority 4);
- Goodenia nuda: Priority 4;
- Grevillea saxicola (Priority 3);
- Nicotiana umbratica (Priority 3);
- Rhagodia sp. Hamersley (M. Trudgen 17794) (Priority 3);
- Rostellularia adscendens var. latifolia (Priority 3);
- Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3);
- Themeda sp. Hamersley Station (M.E. Trudgen 11431): Priority 3; and
- Triodia sp. Mt Ella (M.E. Trudgen 12739) (Priority 3) ;

Twenty three introduced flora species have been recorded within the prescribed premises boundary (Onshore, 2016). None of these taxa are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (BAM Act).

5.9. Ecological Communities

5.9.1. Coondewanna Flats PEC

Coondewanna Flats is located directly south west of Mining Area C and is the terminus of an internally draining catchment which extends to the west and has an overall catchment area of approximately 86,000 ha (AQ2, 2016). Coondewanna Flats occupies an area of about 3,600 hectares (ha) (defined by the 690 m Australian Height Datum [AHD] land surface contour) and is bounded by hills and ranges including Mt Robinson (south east), The Governor (south), Packsaddle Range (north) and Mt Meharry (west). Elevations range from 690 m AHD near the margins, to 686 m AHD at its lowest points, while the surrounding hills rise to over 1,200 m AHD.

The hydrostratigraphy of Coondewanna Flats includes low to moderate permeability Tertiary detritals overlying an unconfined aquifer comprising calcrete and dolomite. The calcrete layer is extensive at a depth of about 16 to 20 mbgl. This is underlain by low to high permeability basement of the Wittenoom Formation. The water table occurs at a depth of approximately 18-24 mbgl; with the shallowest depth to water corresponding with the lowest elevation portion of the Flats near the south-west margin. Groundwater level gradients across the Flats are low, however aquifer connectivity across the surface water catchment divide enables groundwater outflow into the Northern Flank (MAC) and South Flank valleys to the east. A southwest-northeast trending dyke acts as a partial (low flow) groundwater flow barrier near the eastern edge of the Flats (AQ2, 2016).

An ecohydrological conceptualisation of the Coondewanna Flats (AQ2 and Equinox 2016) identified the following three discrete ecohydrological system elements:

- Woodland vegetation communities dominated by *Acacia aptaneura* and *Eucalyptus victrix*;
- Soil Water Reservoir comprising of the water resources contained in the unsaturated zone (vadose zone), consisting of deep, fine textured sediments; and
- Groundwater Reservoir comprising of the groundwater resources contained in the saturated alluvial aquifer and underlying dolomite aquifer beneath the vadose zone.

These elements are linked to each other and the broader environment by the following processes:

- Periodic inundation of Coondewanna Flats by flood waters from the surrounding catchment;

- Local scale redistribution of surface water within Coondewanna Flats as mediated by microtopography and areas of focussed surface water accumulation which occur at the Lake Robinson depression and near the southwest margin of Coondewanna Flats;
- Infiltration of water into the soil profile during flood events which replenishes soil water approximately three out of four years and the groundwater system approximately one in four years;
- Transpiration by:
    - Major tree species *Eucalyptus victrix* (which has a deep rooted species which may extract soil water at depths of up to approximately 15 mbgl) and *A. aptaneura* (which has a shallow root system with roots confined to 5 mbgl); and
    - Under-storey vegetation (i.e. shallow rooted tussock grasses and *Duma florulenta*),
- Evaporation from bare soil and from ephemerally ponded water; and
- Outflow of groundwater from Coondewanna Flats to the east, into the Northern and South Flank Valleys respectively (Note: there is minimal lateral inflow of groundwater to Coondewanna Flats from the surrounding landscape due to low hydraulic gradients).

Approximately 2,990 ha of Coondewanna Flats contains the DBCA listed PEC 'Coolibah-lignum flats vegetation (Section 5.8.1). The deep sediments of Coondewanna Flats are of key importance to the Coondewanna Flats PEC as they provide significant inter-annual plant available water storage for the major tree species *Eucalyptus victrix* which adopts a drought avoidance strategy, by maintaining access to relatively moist soil throughout the year. In contrast *Acaiac aptaneura* adopts a drought tolerance strategy, by becoming quasi-dormant during prolonged dry conditions (AQ2, 2016).

A number of studies addressing aspects of the ecohydrology of Coondewanna Flats have been completed in the past decade, and more recently a considerable volume of monitoring data has been collected. These studies have included a hydro-environmental assessment, monitoring of regional bores, analysis of tree water chemistry and leaf water potential, and development of an ecohydrological conceptual model. A summary of key components of the conceptual ecohydrological model is as follows:

- It is an internally draining system relying on surface water runoff from the surrounding catchments.
- Surface water flows typically reach the Coondewanna Flats three out of every four years to replenish the soil moisture in the unsaturated zone, even when groundwater recharge does not occur. Groundwater is generally 20 m below ground level (mbgl).
- The vegetation communities are considered unlikely to rely on groundwater as:
    - There is abundant water in the soil profile to support the community for extended periods of time.
    - The depth to groundwater is beyond the range commonly associated with groundwater dependence.
    - Soil matric-potential and soil water chemistry indicate plant water abstraction from 0 to 5 mbgl and 6 to 15 mbgl.
    - Measured predawn leaf water potentials for all species are negative. Changes in leaf water potential have reflected changes in soil moisture and matric pressure.
- The estimated soil-water reservoir could sustain the vegetation community for a drought period of approximately nine years.

5.9.2. Weeli Wolli Spring PEC

The Weeli Wolli Spring area is recognised as having multiple ecological values that collectively contribute to its DBCA listing as a Priority 1 Ecological Community. The community is described by DBCA (2017) as follows:

"riparian woodland and forest associations are unusual as a consequence of the composition of the understorey. The sedge and herbfield communities that fringe many of the pools and associated water bodies along the main channels of Weeli Wolli Creek have not been recorded from any other wetland site in the Pilbara. The spring and creekline are also noted for their relatively high diversity of stygofauna and this is probably attributed to the large-scale calcrete and alluvial aquifer system associated with the creek. The valley of Weeli Wolli Spring also supports a very rich microbat assemblage including a threatened species".

5.10. Vertebrate Fauna

Nine major fauna habitats occur in the Mining Area C – South Flank Prescribed Premises (Table 5.4). There are no habitat types restricted to the Prescribed Premises. In addition to the major fauna habitats, significant habitat features, such as caves (63) and waterholes (one semi-permanent waterhole), have been recorded across the Mining Area C Prescribed Premise (Biologic 2011, 2016c).

Table 5.4: Fauna Habitats

Habitat Type	Distinguishing Characteristics
Gorge/Gully	Gorges and gullies are rugged, steep-sided valleys incised into the surrounding landscape. Gorges tend to be deeply incised, with vertical cliff faces, while gullies are more open (but not as open as Drainage Area or Valleys). Caves and rock pools are most often encountered in this habitat type. Vegetation can be dense and complex in areas of soil deposition or sparse and simple where erosion has occurred.
Crest/Slope	These fauna habitats tend to be more open and structurally simple than other fauna habitats and are dominated by varying species of spinifex. Common features of these habitats are rocky substrates, often with exposed bedrock, and skeletal red soils. Some Crest/Slope habitats are dissected by rocky gullies. This habitat is usually dominated by *Eucalyptus* woodlands, *Acacia* and *Grevillea* scrublands and *Triodia* low hummock grasslands. Dolerite Hills are also a part of this habitat type in some sections.
Minor Drainage Line	These are characterised by sloping sides vegetated with hummock-forming grasses and valley bases dominated by thick *Acacia* species. Rocky outcropping is common throughout these valleys, and crumbling breakaways form boulder piles in some locations.
Major Drainage Lines	This habitat is created by episodic rainfall that scours the landscape when draining. Mature river red gums and coolibahs over river pools and open, sandy or gravelly riverbeds characterise this habitat type. The eucalypt species (*E. victrix* and *E. camaldulensis*) typically contain a number of significant tree hollows used by parrots and owls for roosting and nesting. In ungrazed areas, the vegetation adjacent to the main channel or channels is denser, taller and more diverse than adjacent terrain and can include reed beds around pools.
Stony Plain	These are erosional surfaces of gently undulating plains, ridges and associated foot slopes. They are characterised by open shrubland of mixed acacias and other shrubs (particularly *Petalostylis labicheoides*) and open spinifex (*Triodia pungens*) grasslands with abundant coarse fragments up to the size of stones. Trees are mixed, consisting of *Eucalyptus xerothermica* in association with *Acacia aneura* and *Corymbia hamersleyana*.
Mulga	This habitat includes woodlands and other ecosystems in which mulga (*Acacia aneura*) is dominant, either as the principal acacia or mixed with others. It consists of groves on stony soils with tussock grasses and occasionally spinifex.
Sand Plain	Sand Plain habitat is characterised by relatively deep sandy soils supporting dense spinifex grasslands and sparse shrubs. This habitat transitions into patches of mulga in places.
Drainage Area/ Floodplain	Characterised by low and sparse vegetation compared to Major Drainage Lines. Consisted of *Acacia* low woodland sometimes with scattered *Eucalyptus xerothermica* and *Corymbia hamersleyana*. The understorey generally lacks density and often consists solely of sparse tussock grassland, often of **Cenchrus ciliaris* where it has been introduced. The substrate can be sandy in places but generally consists of a loam gravel or stone.
Hardpan Plain	Gently inclined alluvial plains with shallow loams. Typically covered by low scattered woodlands of mulga in groves arranged at right angles to the direction of sheet water flow. In areas where the hardpan is close to the surface and soil depth is insufficient to support trees, an open scrub may persist.

Eleven significant fauna species have been identified within the Prescribed Premises:

- *Anilios ganei*, (Pilbara Flat-headed Blind-snake): DBCA Priority 1;
- *Apus pacificus* (Fork-tailed Swift):EPBC Act Migratory, WC Act Migratory
- *Dasyurus hallucatus* (Northern Quoll):EPBC Act Endangered, WC Act Vulnerable;
- *Falco hypoleucos* (Grey Falcon):WC Act - Vulnerable;
- *Falco peregrinus* (Peregrine Falcon): WC Act Schedule 7;
- *Liasis olivaceus* subsp *barroni* (Pilbara Olive Python): EPBC Act Vulnerable, WC Act Vulnerable;
- *Macroderma gigas* (Ghost Bat): EPBC Act Vulnerable, WC Act Vulnerable;
- *Merops ornatus* (Rainbow Bee-eater): EPBC Act Migratory, WC Act Schedule 5;
- *Pseudomys chapmani* (Western Pebble-mound Mouse): DBCA Priority 4;
- *Rhinonicteris aurantia* (Pilbara Leaf-nosed Bat): EPBC Act Vulnerable; WC Act Vulnerable; and
- *Underwoodisaurus seorsus* (Pilbara Barking Gecko): DBCA Priority 2.

5.11. Subterranean Fauna

5.11.1. Stygofauna

Suitable habitat for stygofauna is hosted below water table within the enriched units of the Marra Mamba Iron Formation, West Angelas units of the Wittenoom Formation, calcrete aquifers around Weeli Wolli Spring and the Tertiary Detritals. Large areas of habitat remain outside the impact footprint including tertiary detritals in valleys to the south and west of South Flank, calcrete aquifers downstream of Weeli Wolli spring and aquifers associated with Ben's Oasis. Tertiary detritals can range from coarse sand and gravels with abundant pore space through to clay rich layers with microscopic voids and low habitat availability. Similarly calcretes can range from vuggy material with significant pore space to crystalline deposits with very little pore space. Connection between voids in calcretes is variable and can be created during formation or by chemical dissolution post-deposition. Mapping of widespread surrogate stygofauna within the Upper Weeli Wolli and Coondewanna catchments suggests that there are few barriers to movement for stygofauna.

Of the 27 species recorded in the prescribed premise and adjacent area, ten species are known only from the area. For three species (Nr Epactophenes sp B01, Dussartcyclops sp B01 and Bathynella sp 2) the impacts from Mining Area C are uncertain. The five potentially restricted species at South Flank: Prethopalpus sp. B15, Prethopalpus julianneae, Philosciidae sp. B03, nr Andricophiloscia sp. B16 and Parajapygidae DPL024 were recorded within the pit area. Given that habitat connectivity along Weeli Wolli Creek is likely to be high for all stygofaunal species, the potential conservation threat to all four species is considered to be low.

5.11.2. Troglofauna

The geology of the prescribed premises comprises four habitat types relevant to troglofauna. These are 'hardcap zone', detritals, mineralised rock and BIF host rock.

The hardcap zone, formed from continued weathering of the surface of the deposits and surrounding landscape, constitutes a semi-continuous carapace across the ranges. The formation of hardcap is not limited to a particular rock type and has been observed on unconsolidated sediments, BIF and ore (Crowe, 2012). This zone can be extremely variable in texture and is known to contain frequent voids and cavities. Cavities on a scale of metres are occasionally observed during drilling and mining. Hardcap formation is usually strongest near the surface and often grades into semi-hardcap and then unaltered rock with depth. This stratum is considered to provide important habitat for troglofauna.

The detritals can be divided into Recent Quaternary detritals and three classes of Tertiary detritals. Quaternary detritals usually comprise a mix of ore and shale in a silty matrix. The deepest Tertiary detrital class consists of haematite conglomerate or silt and clay, with limited capacity to support troglofauna. The middle Tertiary detrital class consists of vuggy breccia, sand and calcrete that are suitable for troglofauna, together with lenses of clay that are not. The upper Tertiary detrital class consists of gravelly siltstone and siltstone that are likely to provide troglofauna habitat.

The mineralised rock that is BIF contains voids and cavities as a result of weathering; it usually provides important troglofauna habitat. This mineralised BIF is a target for mining when iron ore levels within it are high,

although it may also provide suitable habitat for troglofauna when ore concentrations are below commercial grade.

The BIF host rock, precursor to iron ore, consists of finely bedded chert, iron oxides and silicates. The texture of this rock type is fine-grained and dense, with few to no voids and essentially no intergranular pore spaces. Interbedded within the iron formation are shales and cherts that can form bands up to 40 m thick. The shales and cherts are similarly non-porous. Thus, it is unusual for BIF host rock to contain significant troglofauna habitat.

A total of 3,585 specimens of troglofauna have been collected in the Mining Area C prescribed premise. These specimens represent at least 126 species from 19 orders (Bennelogia 2016). Insects were numerically dominant, and schizomids were also relatively common. Most species, however, occurred at very low abundance, and 49 species were represented by only one specimen (singleton). Detailed three dimensional habitat assessments have been undertaken for all species potentially restricted to areas of impact. These habitat assessments suggest that most species (33 of the 41 potentially restricted species) are not restricted to potential areas of impact. There is uncertainty around the remaining eight species due to lack of knowledge about the habitats in which these species occur or if they are actually even true troglofauna species. Given that species records and habitat assessments suggest that the troglofauna species have, or likely have, distributions that extend beyond the proposed impact assessment areas and there are no major geological features likely to restrict distributions of troglofauna

6. Environmental Management Framework

6.1. Corporate Level Plans and Procedures

The management of the environmental aspects of BHP's operations for the Project are managed under the company's AS/NZS ISO 14001:2016 certified Environmental Management System (EMS). The EMS describes the organisational structure, responsibilities, practices, processes and resources for implementing and maintaining environmental objectives at all BHP sites.

Additionally, operational controls for environmental management for the mine are guided by BHP's Charter values. The Charter Values outline a commitment to develop, implement and maintain management systems for sustainable development that drive continual improvement and set and achieve targets that promote efficient use of resources. In order to give effect to the Charter Values, a series of "Our Requirements" (formerly Group Level Documents) have been developed.

BHP has also developed a Sustainable Development Policy for its Iron Ore operations. The Sustainable Development Policy outlines a commitment to setting objective and targets to achieve sustainable outcomes and to continually improve our performance.

To support these documents BHP has an internal Project Environmental and Aboriginal Heritage Review (PEAHR) system. The purpose of the system is to manage implementation of environmental, Aboriginal heritage, land tenure and legal commitments prior to and during land disturbance. All ground disturbance activities will meet the requirements of the PEAHR system.

6.2. Premises Level Plans and Procedures

At Mining Area C and South Flank, MS 1072 and Licence L7851/2002/6 govern environmental management. Table 6.1 outlines the five management plans required by MS1 072.

All personnel carrying out works associated with clearing activities are required to comply with the Sustainable Development Policy, the MS 1072 (and associated management plans), Environmental Licence L7851/2002/6, the PEAHR system and any other relevant legislative and licensing requirements.

Table 6.1: MS 1072 Management Plans

Condition Reference	Management Plan required	Environmental Aspects
3	Compliance Assessment Plan	Compliance
5	Cultural Heritage Management Plan	*Social Surroundings* Heritage
6	Water Management Environmental Plan	*Hydrological Processes and Vegetation* Coondewanna Flats PEC Weeli Wolli Spring PEC Bens Oasis
7	Ghost Bat Environmental Management Plan	*Terrestrial Fauna* Ghost Bat
9	Mine Closure Plan	Rehabilitation

7. Environmental Impact Assessment

BHP has conducted multiple environmental risk assessments for the proposed mining activities for the Mine. This includes identifying all environmental sources of risk, the risk pathways, and any impacts likely to directly or indirectly arise from the proposed mining activities. The aim of the risk assessment is to generate a comprehensive list of the activities and or infrastructure and their potential risks to impact on the environment and the public.

For every risk identified, an assessment of the likelihood and consequence was undertaken to determine the pre-treated level of risk using the following risk assessment criteria provided in DWER (2017) Guidance Statement Risk Assessments. Following the evaluation and assessment of the pre-treated level of risk, measures used to treat the risk, using a risk reduction hierarchy, have been used to demonstrate that residual risks are reduced (Attachment 8).

7.1. Category 5 Processing Infrastructure

The following environmental factors associated with the proposed processing infrastructure that require specific management strategies include:

- Air Quality;
- Treated Waste Water; and
- Surface water.

Other environmental factors assessed include atmospheric gases, amenity and surface water.

7.1.1. Air Quality

Dispersion Modelling

BHP commissioned air quality modelling to predict the potential impacts of the Mining Area C – South Flank on the local and regional air quality (Attachment 7). The study included the assessment of dust particles as PM_{10} and total suspended particles (TSP). Dispersion modelling was conducted using the CALPUFF dispersion model combined with the Weather Research and Forecasting (WRF) Model for generation of meteorological inputs. Background particulate emissions were determined from monitoring data collected at a suitable background location near Newman. The background air quality applied to each scenario was PM_{10} concentration of 18µg/m^3 and TSP of concentration of 33 µg/m^3 (Section 5.5).

The modelling was conducted for a number of scenarios to assess the ground-level impact of the emissions from Mining Area C and South Flank. These included prediction of ground level impact from the South Flank development in isolation including background (PEL, 2016), the predictions of ground level impact of mining the 14 deposits at Mining Area C (PEL, 2015b) and a cumulative assessment of impacts of operations at Mining Area C, South flank and background (PEL, 2016). The modelled scenarios utilised the year of mining with the highest movement of tonnes of ore and waste in the closest proximity to the sensitive receptors (Section 5.1). Table 7.1 outlies the inventory of dust sources and emission estimates for Mining Area C – South Flank.

The Mt Whaleback operations in Newman have a Part V licence that stipulates a value of 70 µg/m^3, averaged over 24 hours for PM_{10}. This value has been utilised for assessment of significance of potential impacts to air quality. The particulate matter composition and background regional particulate matter concentrations for Mt Whaleback are similar in nature to those expected for Mining Area C.

Table 7.1: Dust Sources

Processing Infrastructure			Mining		
Activity	**PM_{10} (tonnes per year)**	**TSP (tonnes per year)**	**Activity**	**PM_{10} (tonnes per year)**	**TSP (tonnes per year)**
Primary crushing of ore	160	400	Bull dozing	8	37
ROM stacker	30	86	Loading ore and waste	2,204	4,591
Screening plant	268	698	Unloading waste	378	1,056
Transfer station	44	100	Unloading ore	207	523
Stackers	37	88	Drilling	4	8
Train load out	10	23	Blasting	6	12
Wind erosion in open areas	67	-	Wind erosion of OSA and ROM pad	1,025	-
			Haulage	1,698	5,580
Total	**616**	**1,395**	**Total**	**5,530**	**11,807**

Background and South Flank Scenario

Modelling of the mine plan and infrastructure design, predicted the maximum concentrations of the PM_{10} fraction of particulate matter for the South Flank scenario are predicted to be 102 µg/m^3 at the Mulla Mulla accommodation village and 46 µg/m^3 at the Packsaddle accommodation village . The modelling outputs shows that the ground level concentrations rapidly decrease from the maximum to the fifth highest prediction. This suggest the maximums are isolated high events. The modelling undertaken is representative of the worst case year where mining occurs nearest the receptors and assumes highest activity of mining equipment. Maximum predictions usually occur during unfavourable but infrequent meteorological conditions. These events can include high wind speeds that result in dust erosion and low wind speed scenarios that prevent dust dispersion and create dust suspension. Therefore the 95th percentile prediction has been utilised to evaluate significance.

The 95th percentile prediction for the South Flank ore body with background was 60 µg/m^3 and 32 µg/m^3 for Mulla Mulla and Packsaddle accommodation villages respectively, which are below the 70 µg/m^3 guidance for significance.

The model predicted the maximum concentrations of the PM_{10} of 74 µg/m^3 at Rio Tinto Hope Downs camp, with 1 exceedance of the 70 µg/m^3 guidance value.

The maximum predicted total suspended particle (TSP) concentrations expected on the Great Northern Highway range from 186 to 285 µg/m^3. Again, the modelling shows that the maximums are isolated high events, with the 95th percentile predictions lower with a range of 110 to 175 µg/m^3.

Background South Flank and Mining Area C Scenario

For the 14 deposits at Mining Area C the 95th percentile prediction is 48 µg/m^3 at the Packsaddle accommodation village and 34 µg/m^{3}at the Mulla Mulla accommodation village with standard controls included when modelled in isolation (PEL, 2015a).

The cumulative impact of South Flank with the existing operation at Mining Area C was modelled. As a result, there will also be a proportional increase in dust from mining activities. The maximum PM_{10} concentration predicted at the Packsaddle and Mulla Mulla camps is 214 and 115 µg/m^3 respectively. The 95th percentile predictions for cumulative modelling are predicted to be 73 and 68 µg/m^3 at Packsaddle and Mulla Mulla camps respectively. Background monitoring in the region shows that natural high background events account for between 3 and 6 instances of above the guidance level of 70 µg/m^3 per annum. The cumulative predictions are not considered significantly different to natural particulate emissions in the region.

The model predicted the maximum concentrations of the PM_{10} of 77 µg/m^3 at Rio Tinto Hope Downs camp, with 1 exceedance of the 70 µg/m^3 guidance value per annum.

The highest TSP (24-hour) concentration expected on the Highway range from 114 to 192 µg/m^3. The 95th percentile and annual average concentrations predicted at this receptor are 68 µg/m^3 and 104 µg/m3 respectively.

Vegetation and Dust

Dust associated with iron ore mining in the Pilbara is generally chemically inert (Butler, 2009; Turner, 2013). Any potential impacts on plants are likely to be:

- physical, including leaf abrasion,
- blocking of stomata and
- increased absorption of incident radiation, which in turn can elevate leaf temperature and negatively impact on photosynthetic processes and transpiration loss.

The susceptibility of vegetation to dust deposition is dependent on individual plant traits such as leaf hairiness, petiole length and plant height. (Butler, 2009). These physical effects tend to be proportional to the amount of dust that vegetation is exposed to, the plant structures and the size of the dust particles (i.e. the higher the dust loading and the smaller the particle size, then the higher the risk) (Grierson, 2015).

Long-term observations of vegetation in close proximity to other mine sites across the Hamersley Range have demonstrated repeatedly the overall resilience of vegetation to extremely high levels of dust exposure. Plants coloured orange with dust accumulation for several years can survive and not display detectable negative impacts to the plants function (Butler 2009). This in part because plants in arid environments mainly grow in response to high rainfall and have very low metabolic rates outside of these periods. Growth periods also coincide with when (i) foliage is washed clean by rainfall and (ii) the lowest level of dust emissions due to damping down of the environment.

There is low risk of increased dusting to the vegetation forming the two subtypes of the Coondewanna Flats PEC. Studies in the Pilbara on a range of species suggest that dust should it accumulate it is unlikely to impact vegetation function (Grierson, 2015).

Terrestrial Fauna and Dust

Vegetation clearing, mining, hauling and vehicle movements will result in an increase in airborne particulate matter. Dust can indirectly affect fauna by altering the structure and composition of native vegetation. A result of this could be a decline in vegetation quality, although no prior studies have been able to detect a significant adverse impact of airborne dust on plant function in the Pilbara (Grierson, 2015). If vegetation was to be affected this could impact faunal assemblages by reducing both food and habitat resources.

Ghost Bats detect prey via sound, they also have excellent vision and it is possible that high dust levels could irritate their eyes or reduce vision and affect their ability to capture prey. The dust modelling indicates that high dust events are likely at certain locations and times; however, a low risk rating is predicted for the majority of the year.

Continued implementation of existing dust suppression strategies will result in additional impacts to vertebrate fauna from dust being minor.

Air Quality Management Strategies

The following processing infrastructure dust controls will be adopted:

- Conveyor transfer chutes will be enclosed;
- Automated dust suppression water cannons will be installed at the stockyard to wet the stockpiles and surrounding areas;
- Dust suppression fogging systems will be located on the ROM Bin, product screening, scalping and crushing buildings at discharge from screens and crushers;
- Covers and/or hoods installed in PC1, PC2 andOHP3;
- The OLC and OHP3 will have Bulk Ore Conditioning (BOC) systems to control the moisture in the ore by targeting the optimum moisture level to prevent dust and blockage issues;
- Measurement of real time ore moisture using Low Frequency Microwave Moisture Analysis throughout the process. The analysis will be located on the OLC (411 and CV412), scalping screen feed conveyor (CV434), fines and lump transfer conveyors (CV472 andCV475) and the TLO feed conveyors (MC315 and CV521). Results inform the application of water via the BOC system;
- All Process Infrastructure buildings (PC1, PC2 and OHP3) and transfer stations have floor slabs designed for washdown and clean-up including slurry disposal systems;

- Use of water sprays at stockpile reclamation and train load-out operations, as required; and
- Dust suppression equipment will be maintained in efficient operating condition.

The Biodiversity Environmental Management Plan will manage terrestrial fauna impacts. Management of Ghost bats will be undertaken in accordance with the conditions of MS 1072. Condition 7 states:

> The proponent shall prepare and submit an Environmental Management Plan (the Plan), on the advice of the Department of Biodiversity, Conservation and Attractions, that demonstrates how the proponent will achieve the following environmental outcome:
>
> > (1) maintain the long term viability of the Ghost Bat population in the Mining Area C Development Envelope as defined in Figure 1 of Schedule 1.
> >
> > (2) No disturbance of the eleven (11) retained high value ghost bat caves as shown in Figure 2 of Schedule 1.

7.1.2. Visibility Assessment

A visibility assessment was undertaken due to the proximity of the proposed mine to the Great Northern Highway. A study undertaken by Baddock et al (2014) defined a relationship between total suspended dust and visibility. The formula described visibility in kilometres. Based on the calculated visibility a risk rating was developed (Table 7.2). The risk rating is reflective of the levels of total suspended dust in the air and the resulting visibility range.

Table 7.2: Visibility Risk Rating (PEL 2015b)

Risk	Visibility
High risk	Visibility is up to 1km
Medium risk	Visibility is from 1km to 2km
Low risk	Visibility is from 2km to 3km

Key findings include:

- Approximately 15km of the Great Northern Highway adjacent to the development envelop is at high risk of experiencing a reduction in visibility from the Mining Area C and South Flank Scenario (as described for the dispersion modelling), and
- For the majority of the year (approximately 60%) visibility along the Great Northern Highway has a low risk rating.

Visibility and Air Quality Management Strategies

The following dust management strategies will be adopted:

- Removal and relocation of OSA's from areas adjacent to Great Northern Highway and Coondewanna Flats PEC;
- Water tankers will be used to apply water to areas of operation which have the potential to generate dust, including unsealed roads, haul roads, construction areas, OSA's and ROM pads;
- Traffic management of vehicle speed to reduce dust lift off from unsealed roads;
- Minimisation of bare soil (land disturbance) will be minimised;
- Dust monitoring units added to the existing real time monitoring Mining Area C network. Additional boundary monitors will be established near the Great Northern Highway and to the east of South Flank deposits.;
- The existing Mining Area C Envirosuite meteorological forecast algorithms will be updated to consider temperature, wind direction, wind speed and South Flank sources to predict high risk dust weather events. Forecasts will be generated for 48 hours to inform site activities and the potential level of dust control required;
- Routine maintenance and housekeeping practices will be employed to avoid waste materials in or around the premises from accumulating and lead to the generation of unacceptable airborne dust.

- Employees and contractors will be inducted regarding the importance of minimising ambient dust levels and, where possible, measurable dust minimisation targets will be set.

7.1.3. Treated Waste Water

The following management measures will be considered proposed oily water separators are considered to require specific management measures:

- Site hydrocarbon management will continue to be in accordance with the relevant Dangerous Goods Licence(s) and the proposed change will not alter the site risk profile;
- Treated water will be released manually to the turkeys nest for dust suppression once monitoring confirms the TRH concentration is less than 15mg/L;
- Routine maintenance and housekeeping practices will be employed to maintain capacities of the sumps and waste oil tanks; and
- An approved contractor will be used for the removal of waste oil in accordance with the *Environmental Protection (Controlled Waste) Regulations 2004.*

7.1.1. Surface Water

Mining Area C – South Flank does not directly affect any major watercourses or waterbodies. Potential impacts on hydrology include localised impacts on surface water resources by changing local surface water patterns through construction of open pits and infrastructure or by affecting surface water quality as a result of erosion from disturbed areas. Stormwater runoff may collect sediment from cleared areas and result in smothering of nearby vegetation, impacting growth and survival. Rainfall events at the Premises are likely to be of short duration and high intensity, and large volume events can be experienced.

The drainage design will ensure that uncontaminated surface water runoff from the surrounding landforms will be diverted away from infrastructure PC1, PC2, OHP3 and material stockpiles areas. Sedimentation ponds will be constructed to capture any contaminants collected in surface water run-off from the PC1, PC2, OHP3, and stockyard areas. The sedimentation ponds are designed to prevent stormwater with high sediment loading discharging directly to the natural drainage lines.

Surface water managements strategies include:

- Routine maintenance and housekeeping practices will be employed to maintain capacities of the sedimentation ponds.

7.1.2. Atmospheric Gases

Greenhouse gas emissions resulting from Mining Area C and South Flank will be generated through the combustion of hydrocarbons, clearing of native vegetation, the use of explosives during blasting operations and the use of electricity. The maximum annual emission of greenhouse gases for the South Flank life of the mine is predicted to be equivalent to 909 kilotonnes of carbon dioxide (CO_2-e). This corresponds to 0.22% of Australia's and 1.09% of Western Australia's financial year 2014 greenhouse inventory (Department of the Environment and Energy, 2016). The average CO_2-e emissions over the life of the mine is predicted to be 385 kilotonnes of CO_2-e per annum (or 0.46% of Western Australia's emissions on average).

Management Strategies

Management strategies to minimise greenhouse gas emissions will be focused on:

- Using efficient plant equipment and conducting regular maintenance.
- Tracking of greenhouse gas emissions through site based monitoring programmes.

Greenhouse gas emissions will be monitored and reported on an annual basis as required by *National Greenhouse and Energy Reporting Act 2007.*and MS1072. Condition 8 of MS1072 states:

> 8-1 The proponent shall publically report the greenhouse gas emissions from the proposal on an annual basis, in a manner approved by the CEO.

7.1.3. Amenity

Noise

Increases in noise and vibration has the potential to impact environmental and social values in the Mining Area C prescribed premise and surrounds (e.g. residential areas, other land users, fauna and caves).
The main sources of noise are expected to be associated with:

- mobile plant, such as excavators, graders, haul trucks and drill rigs;
- fixed plant, such as conveyors, ore processing facilities and the rail loader; and
- blasting noise.

The noise impact assessment undertaken for the Mining Area C (SVT, 2014) predicted that the noise levels without mitigation at the Mulla Mulla camp met the assigned levels and predicted that noise levels without mitigation at the Packsaddle camp were slightly above (~0.8 dB) assigned levels. The noise modelling was undertaken with worst-case assumptions, that is with all equipment functioning, equipment located at surface level and located nearest the receptors and during worst case meteorological conditions.

Further noise modelling on a number of scenarios for Mining Area C and South Flank was commissioned. The scenarios included prediction of noise impacts from the South Flank development in isolation with maximum fleet configuration, South Flank with maximum activities closest to the sensitive receptors and the cumulative scenario of South Flank and Mining Area C.

In line with meteorological guidance, modelling assumed worst-case meteorological conditions. Worst-case mining assumptions were also made, including:

- All mining fleet and fixed plant is operating at once;
- All mining fleet is located at the surface (i.e. noise from equipment is not shielded by pits); and
- Mining fleet is located either nearest to the receptor or represents maximum fleet numbers.

For the South flank ore body development the assigned noise levels were met at the Packsaddle Accommodation Village. The noise model predicted that the noise levels may be above the assigned levels at the Mulla Mulla Accommodation Village by as much as 4.3 dB(A) when the mining fleet is located closest to the camp. However, given that the modelling undertaken applying a conservative approach (e.g. assumed worst-case mining conditions). There is a low probability that the assigned level will be exceeded during normal operations.

The predicted impact for the Proposed Mining Area C Development Envelope shows that the existing Mining Area C equipment operating in the western deposits dominates impacts to the Packsaddle Accommodation Village.

The indoor noise levels were found to be well below the criterion outlined in AS2107.

Terrestrial Fauna – Noise and Vibration

Responses to noise and vibration vary among vertebrate fauna species and individuals according to a number of factors (Busnel and Fletcher, 1978).. These include

- the characteristics of the noise and its duration;
- life history characteristics of the species;
- habitat type;
- season;
- activity at the time of exposure;
- sex and age of the individual;
- level of previous exposure; and
- whether other stresses are present at the time of exposure.

Potential impacts to Ghost Bats from increased noise are considered to be minor. Noise modelling was undertaken to determine potential noise levels at the entrances to known caves inhabited by Ghost Bats (SVT 2016). All levels were predicted to be below 70 dB, with the highest levels ranging between 65 dB and 69.1 dB at three caves. A study undertaken by Bullen and Creese (2014) suggested that sound levels up to 70 dB are

unlikely to result in ghost bats leaving their roost; therefore, the impacts of mining-related sound emissions are unlikely to be significant.

A vibration assessment undertaken to predicted likely vibration levels experienced at Ghost Bat caves at various distances from a single hole and simultaneous blasting of 10 holes in soft and hard ground types (SVT 2016). It is suggested that Ghost Bats will be able to tolerate vibrations of up to 15 mm/s (R. Bullen, pers. comm.), although there has been no specific research undertaken to support this. Further, it would be very difficult to undertake an assessment of vibration tolerance at South Flank given the low likelihood of locating a continual population of bats within a cave for study. The vibration assessment indicated for 10 blast holes in soft ground, the received vibration levels are predicted to be 3.4 mm/s at 1 km and 0.4 mm/s at 2 km, whilst for hard ground, the received vibration levels are predicted to be 19.6 mm/s at 1 km and 6.9 mm/s at 2 km. It is predicted that at 1.1 km a vibration of 15 mm/s will be experienced. One cave (AC13) is located approximately 1.1 km from mining operations at Hope Downs 1. This cave continues to be used by ghost bats, and hormone analysis shows that pregnant females were using this cave in 2014 (Biologic, in prep). It is considered highly likely that the soft ground type would be applicable to caves at South Flank, based on current geological knowledge. The impacts of vibrations on retained caves are considered to be low.

Noise Management Strategies

Management strategies to reduce noise levels include:

- use of low noise equipment as per WAIO standard specifications ;
- use of acoustic treatment where necessary;
- installation of fixed barriers (acoustic walls);
- installation of retractable and removable noise curtains;
- consideration for alternative dust seal materials; and
- generators to be located in enclosed areas and at a sufficient distance from personnel areas to minimise ground disturbance.

Light

Artificial light could disrupt navigation, cause barriers to movement, impact foraging activity, cause abandoning of roosts and nests and expose nocturnal animals to nocturnal predators (Rich and Longcore, 2006). Additional impacts associated with artificial light are considered to be minor and will be managed according to existing management strategies.

7.2. Category 73 Bulk Fuel Storage

7.2.1. Diesel facilities

Potential leaks and spills of diesel from the storage facilities have the potential to contaminate soil and land. The proposed management strategies include:

- The prevention of spills through the implementation of engineering and administrative controls (Table 2.3);.
- Facilities will be constructed in accordance with Australian Standard 1940-2004 The storage and handling of flammable and combustible liquids;
- Stored and handled in accordance with the requirements of the *Dangerous Goods Safety Act 2004; Dangerous Goods Safety (Storage and Handling of non-explosives) Regulations 2007*; and Australian Standard 1940-2004;
- Preventive maintenance will aim to limit the potential for equipment failure leading to environmental contamination;
- Spill kits will be provided and maintain at refuelling points and fuel storage facilities;
- Hydrocarbon contaminated soil will be managed and disposed of in accordance with the Conditions of L7851/2002/6.

7.2.2. Treated Waste Water

Treated waste water management is outlined in section 7.1.3.

8. Abbreviations

Term	Meaning
AH Act	*Aboriginal Heritage Act 1972* (WA)
Air NEPM	Ambient Air Quality National Environment Protection Measure
AMD	acid and metalliferous drainage
ARI	average recurrence interval
BHP Billiton Iron Ore	One of the BHP Billiton businesses
BOC	Bulk Ore Conditioning
BIF	banded iron formation
CPWRMP	Central Pilbara Water Resource Management Plan
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
kL	Kilolitres
kL/d	Kilolitres per day
km	kilometre
km^2	square kilometre
LA_{10}	is the noise level just exceeded for 10% of the measurement period, A-weighted and calculated by Statistical Analysis
m	metre
mbgl	metre below ground level
MEM	Mobile equipment maintenance
mm	millimetres
mm/s	millimetres per second
µm	micrometre
mg/L	milligram per litre
MS	Ministerial Statement
OHP	Ore Handling Plant
OLC	Overland conveyor
OSA	overburden storage area
PC	Primary Crushing station
PEAHR	Project Environment and Aboriginal Heritage Review
PEC	Priority Ecological Community
PM_{10}	PM10 refers to the total of suspended particulate matter less than 10 µm in aerodynamic diameter. Particles in this size range can enter bronchial and pulmonary regions of the respiratory tract and can impact human health. Particles in this size range can remain suspended for many days in the atmosphere.
RIWI Act	*Rights in Water and Irrigation Act 1914* (WA)
SMU's	soil management units
SRE	Short-range endemic
TLO	Train Load Out
TSP	Total suspended particulates. TSP refers to the total amount of the particulate matter suspended in air, regardless of size.
TRH	Total recoverable hydrocarbons
Visibility	relates to the reduction in visual distance due to suspended particle light scattering
WAIO	Western Australia Iron Ore – represents the same entitiy as BHP Billiton Iron Ore
WC Act	*Wildlife Conservation Act 1950* (WA)

9. References

ANZECC (1997) *Australian and New Zealand Environment and Conservation Council Australian Guidelines for Australian Guidelines for Sewage Systems – Effluent Management*.

ARMCANZ, ANZECC and NHMRC (2000) *Guidelines for Sewage Treatment Systems - Use of Reclaimed Water*.

Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) (2000), *Australian Water Guidelines for Fresh and Marine Waters* and its updates

Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia (ANZMEC/MCA) (2000) *Strategic Framework for Mine Closure*, Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia, National Library of Australian Catalogue Data

AQ2 (2016) Coondewanna Flats Eco-hydrology Review and Conceptual Model. Unpublished report for BHP Billiton Iron Ore.

Baddock, M., Strong, C., Leys, J., & Heidenreich, S. (2014). A Visibility and total suspended dust relationship. Atmoshpheric Environment, 329 - 336.

Beard J. (1975). *Vegetation survey of Western Australia: Pilbara, map and explanatory memoir 1:1,000,000 series*, University of Western Australia Press, Perth, Western Australia.

Bennelongia (2016) *Mining Area C – South Flank: Troglofauna Assessment.* Prepared for BHP Billiton Iron Ore Pty Ltd.

Bettenay, E., Churchward, H.M. and McArthur, W.M. (1967) *Atlas of Australian Soils, Sheet 6, Meekatharra-Hamersley Range area*, CSIRO

BHP Billiton (2016a). Code of Business Conduct. Available at: http://www.bhpbilliton.com/aboutus/ourcompany/codeofbusconduct.

BHP Billiton (2016b). Our Requirements Community. Available at: http://www.bhpbilliton.com/~/media/bhp/documents/aboutus/ourcompany/governance/160404_gld_community.pdf?la=en.

BHP Billiton (2016c). Our Requirements Environment and Climate Change. Available at: http://www.bhpbilliton.com/~/media/bhp/documents/aboutus/ourcompany/governance/160411_gld_environmentclimatechange.pdf?la=en.

BHP Billiton Iron Ore (2016). Hydrological Impact Assessment and Water Management Summary. BHP Billiton Iron Ore Pty Ltd. Perth, Western Australia.

BHP Billiton Iron Ore (2016b). South Flank Preliminary AMD Risk Assessment. BHP Billiton Iron Ore Pty Ltd. Perth, Western Australia.

Biologic Environmental Survey (Biologic) (2011). *Southern Flank Vertebrate Fauna Survey*. Report for BHP Billiton Pty Ltd.

Biologic Environmental Survey (Biologic) (2016). *South Flank Baseline and Targeted SRE Fauna Survey*. Report for BHP Billiton Iron Ore, Perth, Western Australia.

Biologic Environmental Survey (Biologic) (2016). *South Flank Targeted Fauna Survey*. Report for BHP Billiton Iron Ore, Perth, Western Australia.

Biologic Environmental Survey (Biologic) (2017). *Mining Area C and Southern Flank Desktop Review of Vertebrate Fauna.* Report for BHP Billiton Iron Ore, Perth, Western Australia.

BoM (Bureau of Meteorology) (2017a) Climate statistics for Australian locations – Newman Aero.

Website: http://www.bom.gov.au/climate/averages/tables/cw_007176_All.shtml Accessed: 20 March 2017.

BoM (Bureau of Meteorology) (2017b) Climate statistics for Australian locations – Wittenoom. Website: http://www.bom.gov.au/climate/averages/tables/cw_005026_All.shtml Accessed: 20 March 2017.

Bullen, R. and Creese, S. (2014). A note on the impact on Pilbara leaf-nosed and ghost bat activity from cave sound and vibration levels during drilling operations. *The Western Australian Naturalist* 29: 145-154.

Busnel, R.G. and Fletcher, J.L. (Eds.) (1978). *Effects of Noise on Wildlife*. Academic Press, New York.

Bulter R. (2009). *Vulnerability of plant functional types to dust deposition in the Pilbara, NW* Australia. Unpublished report for the University of Western Australia.

Crowe, M. (2012). *Guidelines for Geological Interpretation in the Hamersley Province*. Unpublished internal document for BHP Billiton Iron Ore

Department of Biodiversity, Conservation and Attractions (DBCA) (2017) *PRIORITY ECOLOGICAL COMMUNITIES FOR WESTERN AUSTRALIA VERSION* 27 Species and Communities Branch, Department of Biodiversity, Conservation and Attractions 30 June 2017

Department of Environment Regulation (2017) *Guidance Statement: Risk Assessments*. Government of Western Australia

Department of Water (2008) *Water Quality Protection Note 22 Irrigation with nutrient-rich wastewater*. Government of Western Australia

Grierson, P. (2015). *Dust suppression and likelihood of adverse impact on Acacia sp. East Fortescue at Orebody 31*. Report for BHP Billiton Iron Ore.

Onshore Environmental (2014) *Consolidation of Regional Vegetation Mapping BHP Billiton Iron Ore Pilbara Tenure*. Unpublished Report for BHP Billiton Iron Ore.

Onshore Environmental (2015). *Mining Area C Flora and Vegetation Environmental Impact Assessment.* Report for BHP Billiton Iron Ore.

Onshore Environmental (2017). *Mining Area C Southern Flank. Flora and Vegetation Impact Assessment*. Report prepared for BHP Billiton Iron Ore.

Pacific Environment Limited (PEL) (2015a). *Air Quality Assessment for Mining Area C.* Prepared for BHP Billiton Iron Ore Pty Ltd.

PEL (2015b). *Pilbara Strategic Environmental Assessment – Cumulative Air Quality Assessment*. Report Number 8299. Prepared for BHP Billiton Iron Ore Pty Ltd.

PEL (2016). *Updated Air Quality Modelling for South Flank Proposal.* Prepared for BHP Billiton Iron Ore Pty Ltd.

Shepherd D.P., Beeston G.R. and Hopkins A.J.M. (2002). *Native vegetation in Western Australia – extent, type and status, Resource Management Technical Report 249*. Western Australian Department of Agriculture, Perth, Western Australia.

Rich, C. and Longcore, T (eds) (2006). *Ecological Consequences of Artificial Night Lighting.* Island Press, Washington.

SVT (2014). *Environmental Noise Assessment: Mining Area C.* Unpublished report prepared for BHP Billiton Iron Ore Pty Ltd. Perth, Western Australia.

SVT (2016). *South Flank Environmental Noise Assessment*. Report prepared for BHP Billiton Iron Ore. Perth, Western Australia.

Tille P. (2006). *Soil-landscapes of Western Australia's rangelands and arid interior, resource management technical report 313*. Report prepared by the Western Australian Department of Agriculture and Food, Perth, Western Australia.

Turner G.F (2013). *Vulnerability of Vegetation to Mining Dust at the Jack Hills, Western Australia*. Unpublished report for the University of Western Australia.

URS (2014). *Coondewanna Flats Phase III Water Assessment*. Report prepared for BHP Billiton Iron Ore.

van Vreeswyk, A.M.E., Payne, A.L., Leighton, K.A. and Hennig, P. (2004) *An Inventory and Condition Survey of the Pilbara Region, Western Australia*. Technical Bulletin No. 92, Department of Agriculture, Perth.

Attachment 0: Compliance Report Project Characteristics and Commitments Confirmation

Infrastructure Characteristics		Constructed as Designed
Infrastructure:	**Category 5 Processing or beneficiation of metallic or non-metallic ore** Two primary crushing stations Overland conveyors Transfer stations Ore Handling Plant **Category 73 Bulk Fuel Storage** Two diesel storage facilites	
Maximum production / design capacity	Primary crushing stations - 40Mtpa each Ore handling Plant 80Mtpa Diesel Storage 2ML (2,000kL) each facility	
Location of all infrastructure associated with the Works Approval:	Mining Area C prescribed premise (see Figure 1.2 and Attachment 0)	
Tenure	Mineral Leases ML281SA and ML249SA	
Commissioning and Compliance Report:	A two year load commissioning period is required. BHP commits to undertake the proposed works in accordance with the details set out in Table 1.1. BHP will confirm compliance as detailed in Table 1.1 in the compliance document using the template provided (Attachment 0). Compliance reporting will be required to be submitted in stages to meet the construction and commissioning requirements.	
Licence:	The infrastructure will be operated under the existing Environmental Operating Licence L7851/2002/6.	
Relevant Environmental Factors:	The following environmental factors associated with the proposed infrastructure are considered to require management measures as detailed below: • Air Quality – Dust • Treated Waste Water • Surface Water	

Works Approval – Mining Area C South Flank

Application Commitments	Phase to which the Commitment Applies[1]	Section	Commitment Met
BHP will confirm compliance with phase commitments.	Commissioning	2.4 and 2.5	
Compliance reporting will be required to be submitted in stages to meet the construction and commissioning requirements. (as detailed in Table 1 using the template provided Attachment 0) will be submitted and a Licence amendment obtained from, the DWER.	Commissioning	2.4 and 2.5	
BHP will communicate the change to the Department of Water and Environmental Regulation and detail the change in the Compliance Report.	Construction and Commissioning	2.4	
Dust emissions will be managed through the • Automated dust suppression water cannons, • fogging systems will be located on the ROM Bin, product screening, scalping and crushing buildings at discharge from screens and crushers; • Covers and/or hoods installed in PC1, PC2 and OHP3; • Bulk Ore Conditioning (BOC) sprays and moisture analysers along the conveyors	Commissioning and Operations	2.1 and 7.1.1	
Storm water from key infrastructure areas will be diverted through a sedimentation pond prior to discharge sedimentation ponds	All	7.1.1	
Water potentially contaminated with hydrocarbons will be treated by an oily water separator until monitoring confirms the Total recoverable hydrocarbons (TRH) concentration is less than 15mg/L;	All	7.1.3	
Fuel facilities will be managed through the • The prevention of spills through the implementation of engineering and administrative controls (Table 2.3); • Facilities will be constructed in accordance with Australian Standard 1940-2004 The storage	Construction and commissioning	2.2 7.2	

and handling of flammable and combustible liquids; • Stored and handled in accordance with the requirements of the *Dangerous Goods Safety Act 2004; Dangerous Goods Safety (Storage and Handling of non-explosives) Regulations 2007*; and Australian Standard 1940-2004; Spill kits will be provided and maintain at refueling points and fuel storage facilities			

1 Please note that these commitments only apply to the Pre-construction, Construction and Commissioning phases of the project. Commitments related to the Operation and Decommissioning of the infrastructure will be detailed in subsequent license application(s) to the Department of Environment Regulation (DWER)