

Tuesday, July 18, 2023

Shire of Mingenew
21 Victoria Street,
Mingenew, Western Australia 6522

Attention: Matt Fanning

Dear Matt,

RE: PLANNING APPLICATION FOR THE RIG SITE CAMP ASSOCIATED WITH THE MINERAL RESOURCES LIMITED LOCKYER-4 EXPLORATION DRILLING PROGRAM

Please find attached a planning application for the installation and operation of a rig camp site that will be utilized to support the upcoming Lockyer-4 exploration drilling program for Mineral Resources Limited within Petroleum Licence EP368 managed under the *Petroleum and Geothermal Energy Resources Act 1967*. The drilling activities are expected to commence in October 2024 although may be delayed until January 2025 based on potential variations to the current rig schedule.

Once drilling activities have commenced, they will be conducted continuously on a 24-hour basis with two crews working back-to-back on 12-hour shifts. The rig site camp is planned to accommodate up to six (6) persons that are required on-site at the drilling rig for the duration of the drilling activity. There will be up to 22 additional non-accommodated personnel on site during each 12-hour shift.

The drilling program is temporary in nature and planned to be completed within 60 days for this well, however there may be a requirement (over a period of up to 2 years) for various short-term maintenance or well testing activities to be completed. These activities may require accommodation on site but would also be temporary in nature.

The rig site location map is provided as Attachment 1 and will be accessed via Strawberry North East and Watson Road. The rig site camp will be installed within the first five days of the drilling activity and will be conducted in conjunction with the installation of the drilling rig. The rig site equipment layout is provided as Attachment 2. The modular camp units will be transported to the site utilizing semi-trailers or winch trucks. There will be a total of eighty trailer loads (two of which will be the modular sleeper units) required to transport the drilling rig, rig camp units and associated equipment to the site. The rig site camps are plug-and-play oilfield camp units that have depreciated in value. The \$10,000 installation cost covers the transportation, loading/unloading of the units utilizing side-loaders or winch trucks. Minimal plumbing and cabling are required to commission the camp units as they are designed to be highly mobile, to be readily moved from site to site with the drilling rig.

The cost breakdown of the two sleeper units are as follows:

Rig up:

- 3 hours x Unloading/spotting/rig up of sleeper units with side loader: \$750 (based on a \$250/hour side loader cost)
- 1 x Electrician and 2 x assisting personnel: \$3,062.

Rig down:

- 3 hours x Rig down/spotting/rig up of sleeper units with side loader: \$750 (based on a \$250/hour side loader cost)
- 1 x Electrician and 2 x assisting personnel: \$3,062.

The rig camp location is not within close proximity to any residential dwellings with the distance to the nearest residential dwelling being greater ~1.6 kms. At the rig site camp, there will be no food preparation facilities (this will be conducted off site at the main camp).

The following information has been provided as attachments to the completed Development Application Form:

- ▶ Attachment 1: Site location showing the exploration well location with regards to the lot boundaries and lot area.
- ▶ Attachment 2: A site layout schematic that provides an indication of where the accommodation units will be situated with regards to additional key drilling rig infrastructure and wellsite boundaries.
- ▶ Attachment 3: A compilation of information regarding the rig site camp with plan views, dimensions and images associated with the temporary building structures.
- ▶ Attachment 4: The information and manual associated with the ATU system. The ATU application form has been submitted to the Shire of Mingenew EHO together with its supporting documentation.

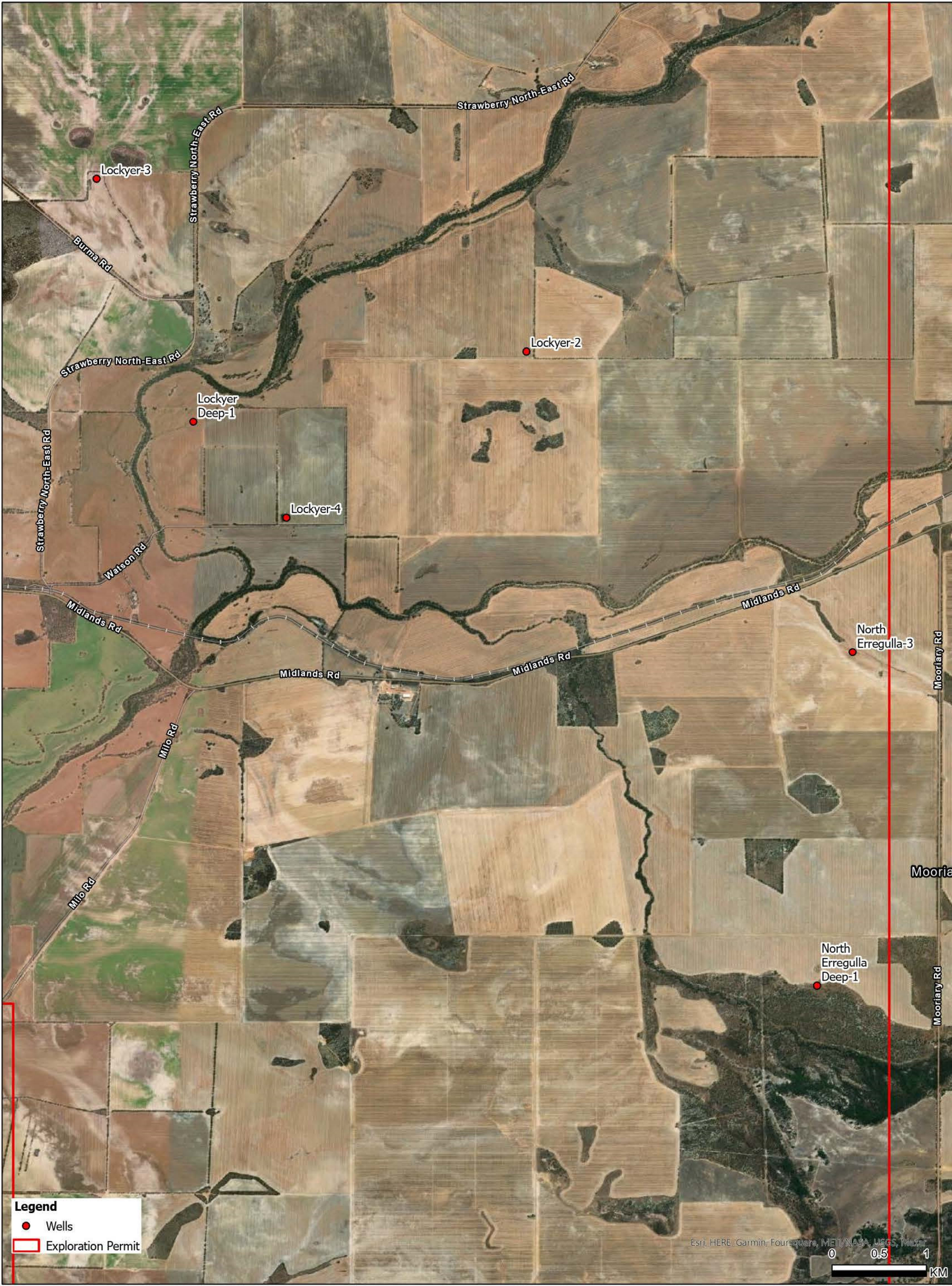
This information has been collated and submitted for and on behalf of Mineral Resources Limited.

Yours sincerely,



Darrell Girgenti
Project Manager

Mineral Resources Limited





Lot 100

East Road

Watson Road

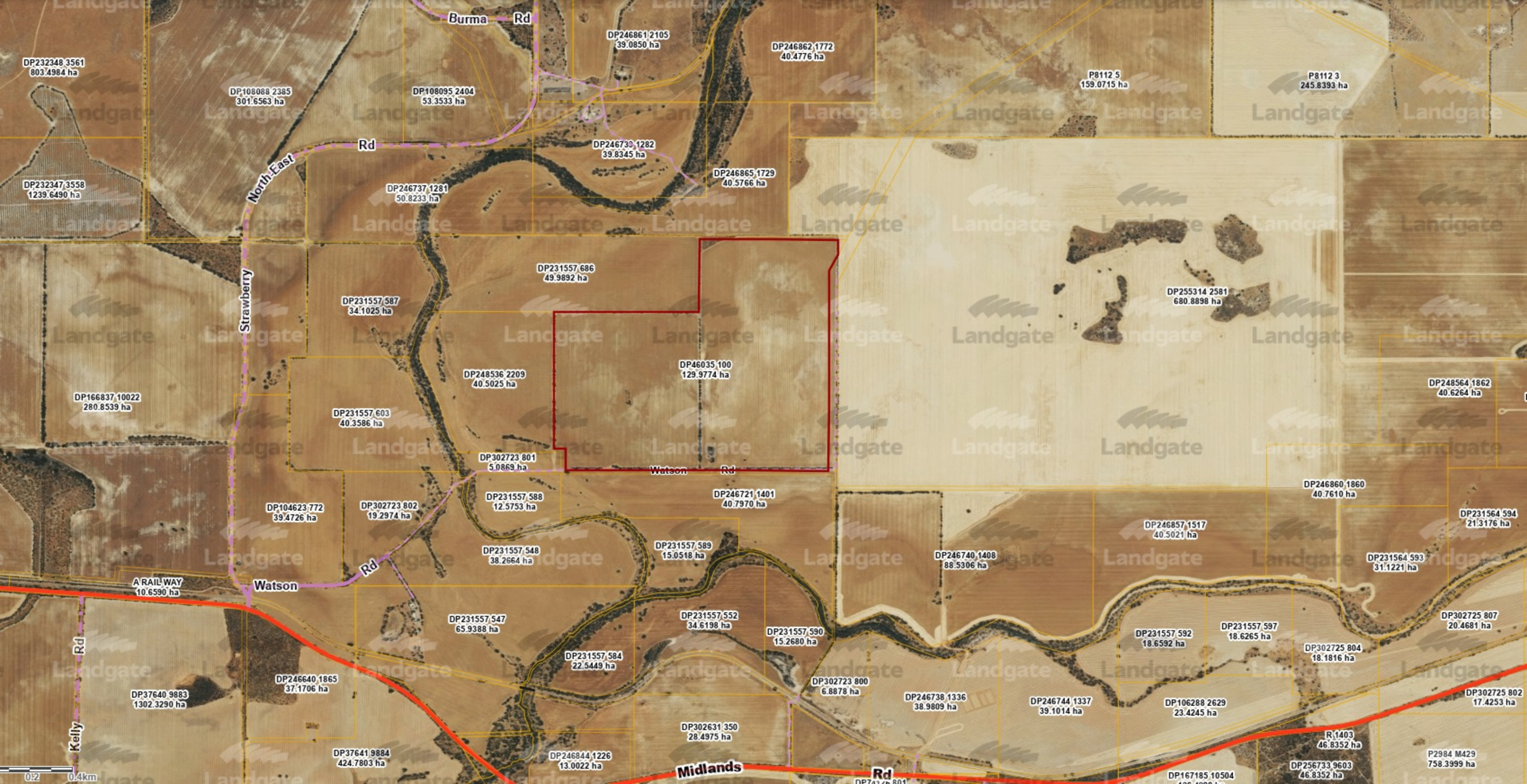
Strawberry North

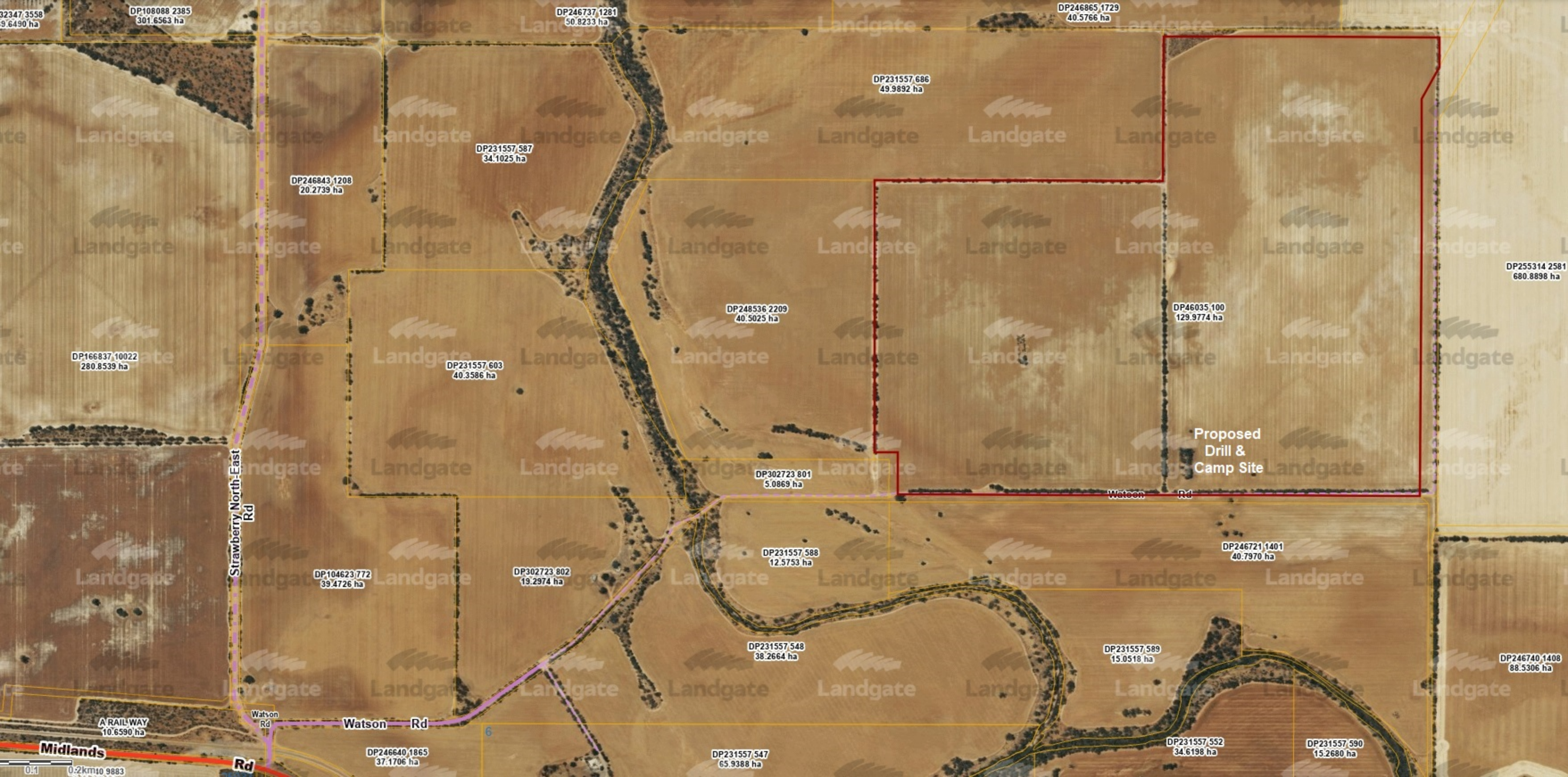
Midlands Rd

Mingenew townsite

Mingenew-Mullewa Rd

Mingenew-Morawa Rd





LOCKYER-4 SITE LAYOUT

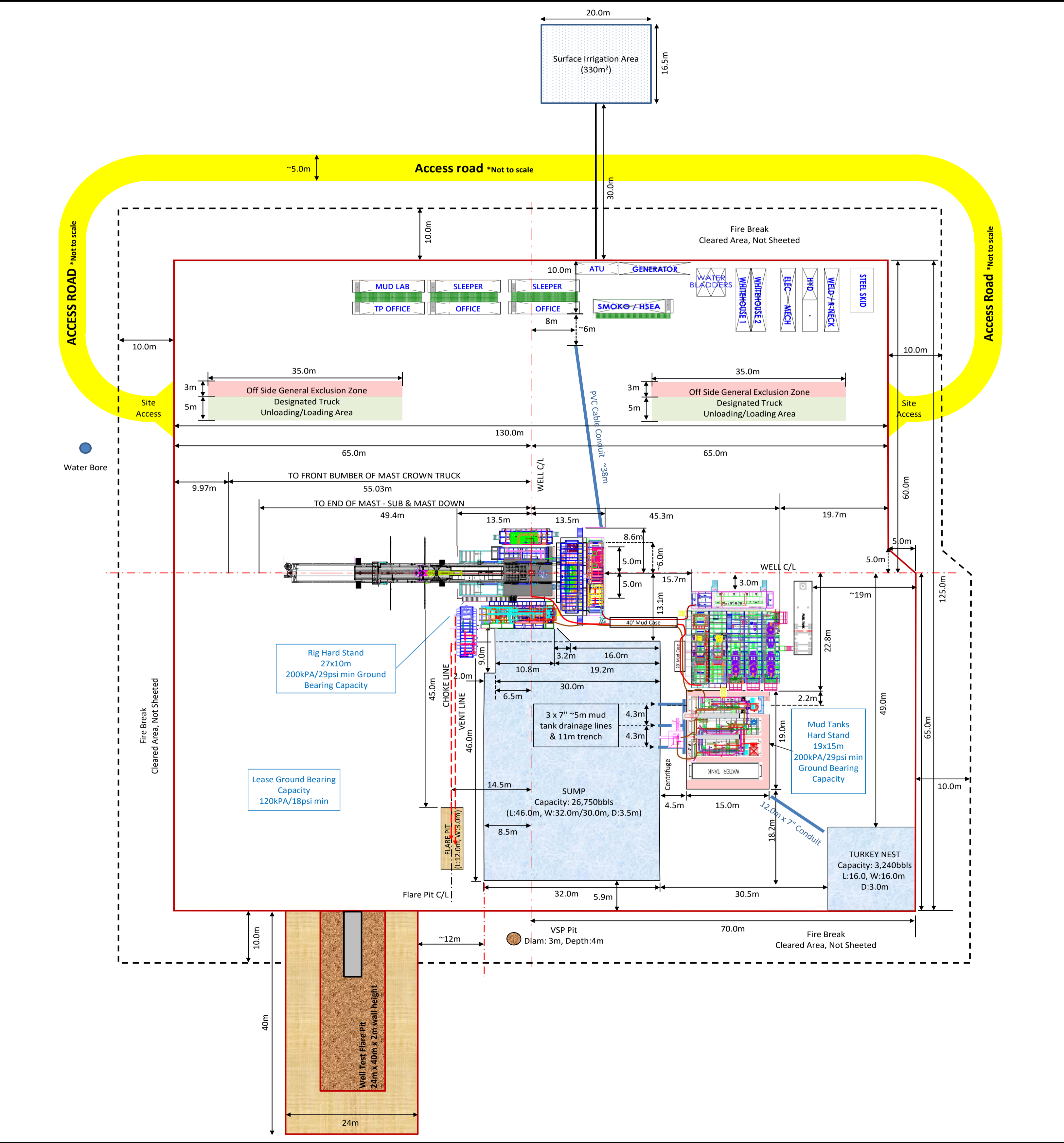
Operator	Energy Resources Ltd		Permit	EP368	Location	Onshore Perth Basin, WA		
Surface Location					Water Bore			
Latitude	29° 12' 08.95" S	Longitude	115° 16' 39.32" E		Latitude		Longitude	
<div><div></div><div>N</div><div>W</div><div>E</div><div>S</div></div>		Revision	Rev A			Date	25/06/2023	
		Drafted	Darrell Girgenti			Position	Project Manager	
		Signed						
		Reviewed				Position		
		Signed						

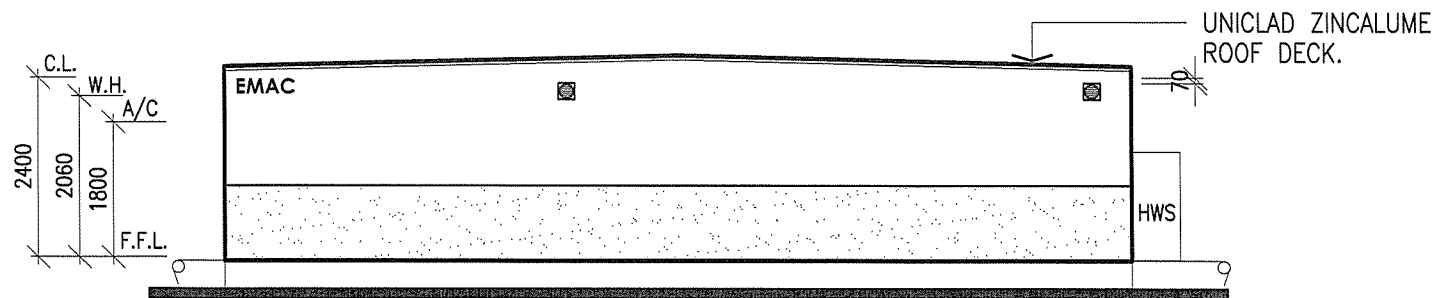


Required Soil Bearing Minimum Capacity (Graded and Compacted Area)

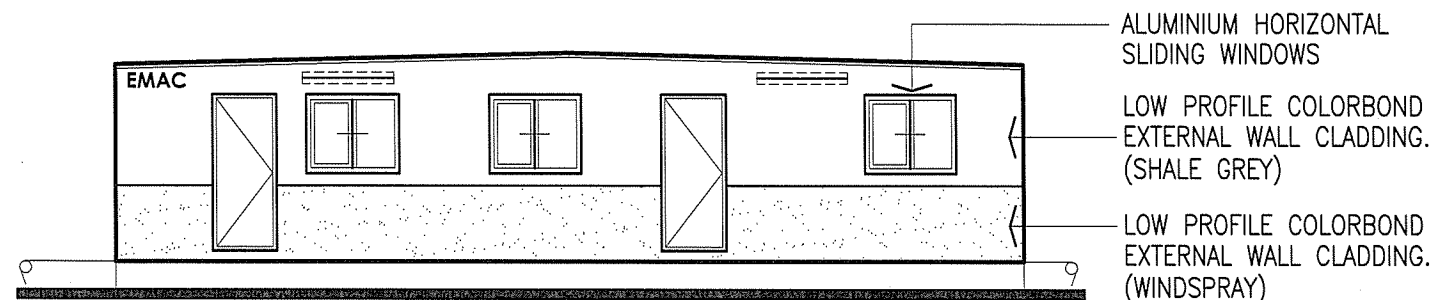
HIGH LOAD BEARING GRADED AND COMPACTED AREA (MIN 200kPA/29psi)

SHEETED, GRADED AND COMPACTED AREA W/ 2% FALL (MIN 120kPA/18psi)

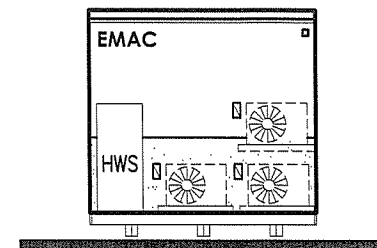




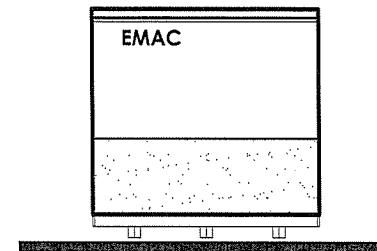
ELEVATION 1



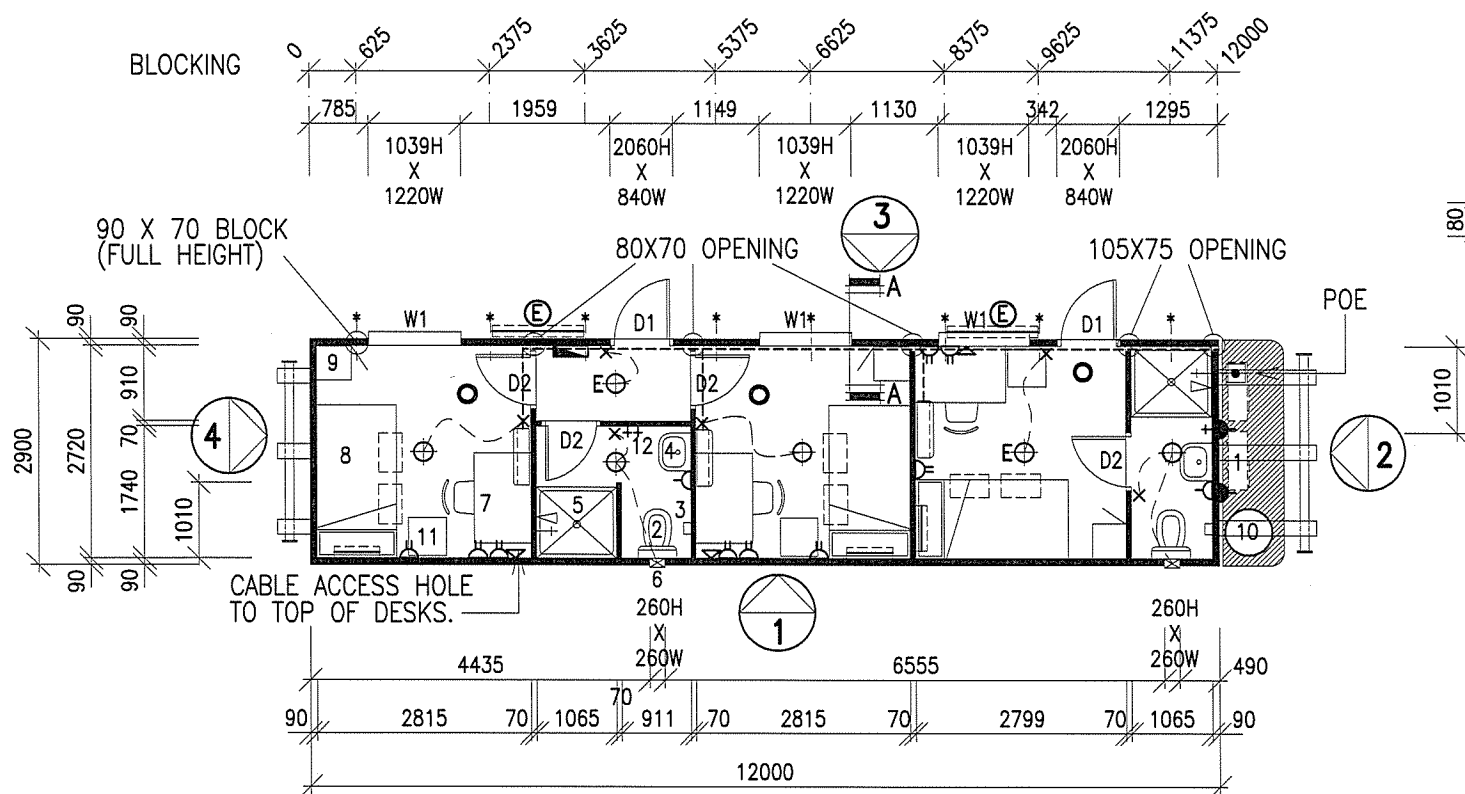
ELEVATION 3



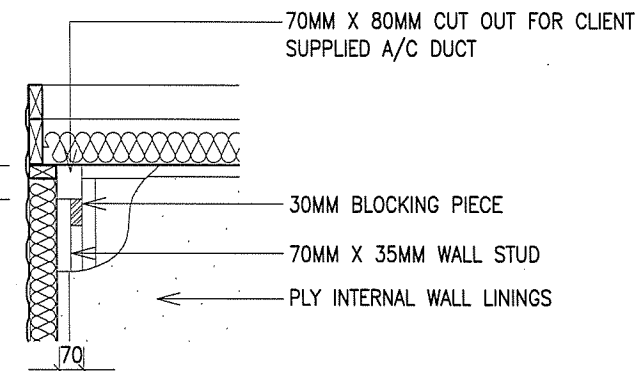
ELEVATION 2



ELEVATION 4

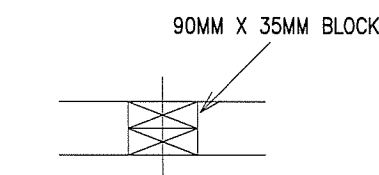


FLOOR PLAN



SECTION A-A

SCALE 1:20



90 X 70 BLOCK

SCALE 1:10

ITEM:	DESCRIPTION:	QTY:
W1.	1029H. X 1210W. HORIZONTAL SLIDING WINDOW (6.38 LAMINATED - GREY)	3.
D1.	2040H. X 820W. METAL CLAD REBATE EDGE EXTERNAL DOOR C/W SPRING RESTRAINER & EXIT SIGN.	2.
D2.	2040H. X 720W. S.P.M. HOLLOW CORE INTERNAL DOOR C/W EXIT SIGN AND DOOR CATCHES TOP AND BOTTOM.	4.
1.	SPLIT R/CYCLE A/C.	3.
2.	TOILET SUITE.	2.
3.	TOILET ROLL HOLDER.	2.
4.	500MM X 400MM HAND BASIN C/W MIRROR OVER.	2.
5.	1055MM X 945MM F/GLASS SHOWER CUBICLE C/W SHOWER CURTAIN.	2.
6.	WALL MOUNTED EXHAUST FAN.	2.
7.	1200MM X 750MM DESK C/W PLASTIC STACK CHAIR.	3.
8.	KING SINGLE BED C/W STORAGE DRAWERS.	3.
9.	LOCKER.	3.
10.	250L ELECTRIC HOT WATER SERVICE.	1.
11.	BAR FRIDGE	3.
12.	COAT HOOKS.	3.
13.	15 AMP ISOLATOR.	3.
14.	SINGLE GPO.	2.
15.	DOUBLE GPO (100 A.F.F.L.)	9.
16.	LIGHT SWITCH.	6.
17.	FLUORESCENT BED LIGHT.	3.
18.	DATA POINT.	3.
19.	BATTEN CEILING LIGHT	4.
20.	BATTEN CEILING LIGHT C/W BATTERY BACKUP.	2.
21.	1 X 36W FLOURO. VANDALITE @ 2400 HEIGHT C/W BATTERY BACKUP & PE CELL.	2.
22.	SMOKE DETECTOR.	3.
23.	WILCO 5 PIN MALE PLUG FOR GENERATOR CONNECTION.	1.
24.	CIRCUIT BREAKER BOARD (3 PHASE).	1.

NOTE:

- ALL DOORS TO HAVE STICK ON REFLECTIVE EXIT SIGNS ON INSIDE FACE OF DOOR.
- ALL EXTERNAL LIGHTS TO BE ON SAME P.E. CELL.

CLIENT: ENSIGN INTERNATIONAL

SALES ORDER NO: -

PROJECT: 12.0M X 2.9M
3 PERSON LIVING QUARTERS

SERIAL NO: -

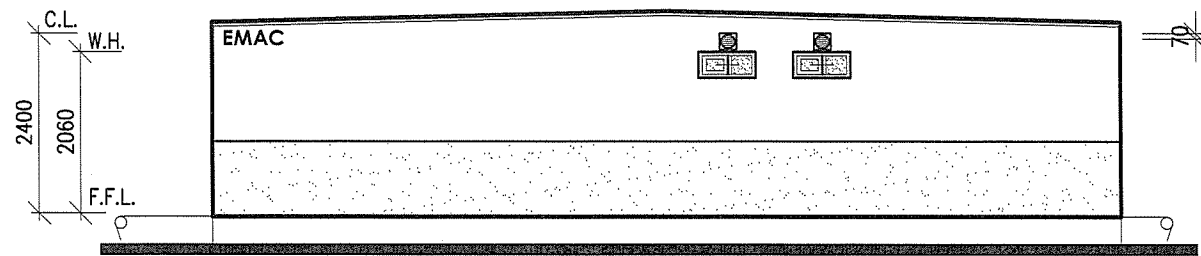
SITE: EX PLANT

EMAC
S Y S T E M S

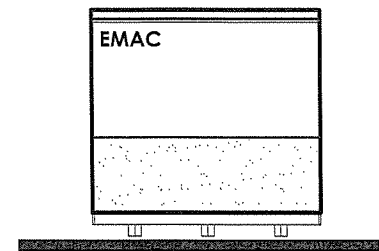
KARYDAV PTY. LTD. A.C.N. 061 115 133
1253 MAIN NORTH ROAD, PARA HILLS WEST,
SOUTH AUSTRALIA 5096
P.O. BOX 46, PARA HILLS
PH: (08) 8260 4866 FAX: (08) 8349 6273
BUILDERS LICENCE NO. GL 102757

SUBMITTAL STATUS	INITIAL	DATE
A CONTRACT DRAWINGS		
B BILL OF MATERIALS		
C ISSUE FOR PURCHASING		
D ISSUE FOR PRODUCTION		
E RELEASE FOR DELIVERY		
F APPROVED BY MANAGER		

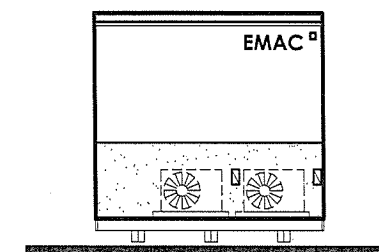
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SCALE: 1:100	DATE: 5/03/10
DRAWN: JR	CHECK: TS
REV	6



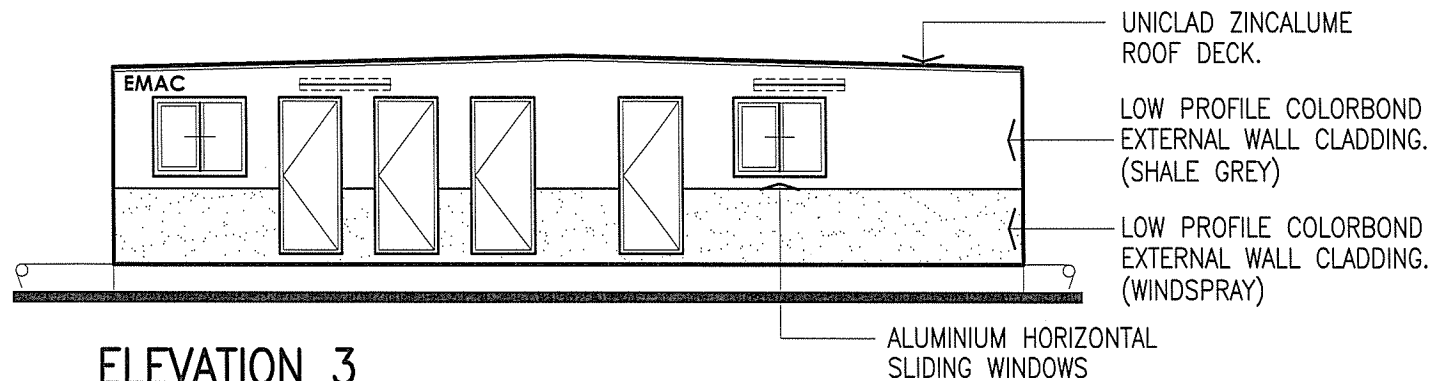
ELEVATION 1



ELEVATION 2



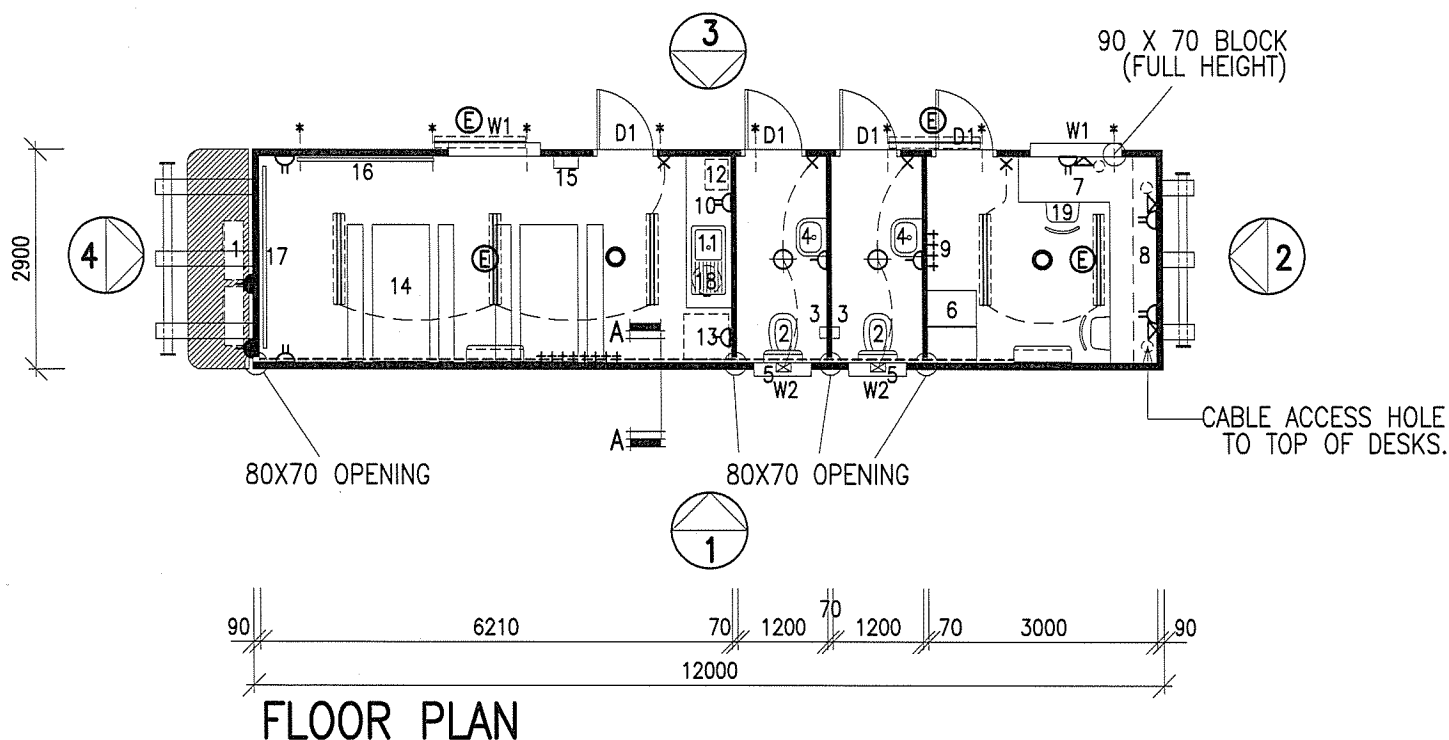
ELEVATION 4



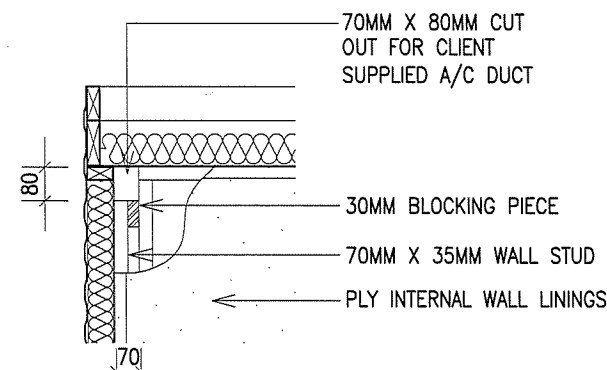
ELEVATION 3

NOTE:

1. ALL EXTERNAL DOORS TO HAVE STICK ON REFLECTIVE EXIT SIGNS ON INSIDE FACE OF DOOR.
2. ALL EXTERNAL LIGHTS TO BE ON SAME P.E. CELL.

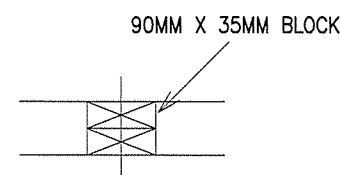


FLOOR PLAN



SECTION A-A

SCALE 1:20



90 X 70 BLOCK

SCALE 1:10

ITEM:	DESCRIPTION:	QTY:
W1.	1029H. X 1210W. HORIZONTAL SLIDING WINDOW (6.38 LAMINATED - GREY)	2.
W2.	350H. X 750W. ALUMINIUM SLIDING WINDOW. (OBSCURE GLAZING)	2.
D1.	2040H. X 820W. METAL CLAD REBATE EDGE EXTERNAL DOOR C/W SPRING RESTRAINER & EXIT SIGN.	4.
1.	SPLIT R/CYCLE A/C.	2.
2.	TOILET SUITE.	2.
3.	TOILET ROLL HOLDER.	2.
4.	500MM X 400MM HAND BASIN C/W MIRROR OVER.	2.
5.	WALL MOUNTED EXHAUST FAN.	2.
6.	4 DRAW FILING CABINET.	2.
7.	750MM DEEP DESK UNIT C/W CABLE ACCESS HOLES.	1.
8.	SHELVING OVER DESK (AS PER DETAIL).	1.
9.	COAT HOOKS.	12.
10.	LAMINATED CUPBOARD UNIT.	1.
11.	900MM S/STEEL INSET SINGLE BOWL SINK.	1.
12.	CHILLER/BOILER UNIT.	1.
13.	380L FRIDGE.	1.
14.	TABLE AND BENCHES (SCREWED TO FLOOR).	2.
15.	FIRST AID BOX.	1.
16.	1000 X 1800 WHITE BOARD.	1.
17.	1000 X 2400 WHITE BOARD.	1.
18.	50L UNDERBENCH HOT WATER UNIT.	1.
19.	CLERICAL CHAIR.	2.
▲	15 AMP ISOLATOR.	2
△	SINGLE GPO.	3.
△	DOUBLE GPO (100 A.F.F.L.)	6.
×	LIGHT SWITCH.	4.
⊕	BATTEN CEILING LIGHT	2.
=====	2 X 36W. DIFFUSED FLUORO.	3.
ⓔ	2 X 36W. DIFFUSED FLUORO C/W BATTERY BACKUP.	2.
ⓔ	1 X 36W FLOURO. VANDALITE @ 2400 HEIGHT C/W BATTERY BACKUP & PE CELL.	2.
○	SMOKE DETECTOR.	2.
⊞	ELECTRICAL POINT OF ENTRY (TBA).	1.
■	CIRCUIT BREAKER BOARD (3 PHASE).	1.

SUBMITTAL STATUS	INITIAL	DATE
A CONTRACT DRAWINGS		
B BILL OF MATERIALS		
C ISSUE FOR PURCHASING		
D ISSUE FOR PRODUCTION		
E RELEASE FOR DELIVERY		
F APPROVED BY MANAGER		

CLIENT: ENSIGN INTERNATIONAL

SALES ORDER NO: -

PROJECT: 12.0M X 2.9M OFFICE/TOILET/LUNCHROOM

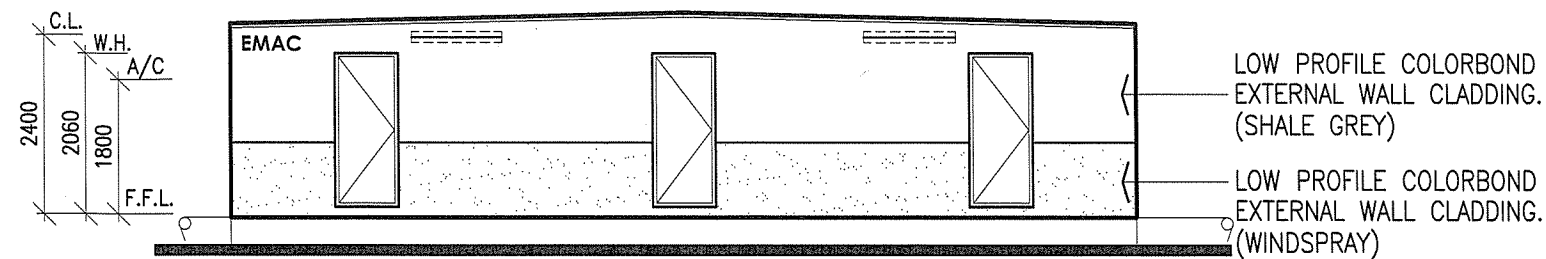
SERIAL NO: -

SITE: -

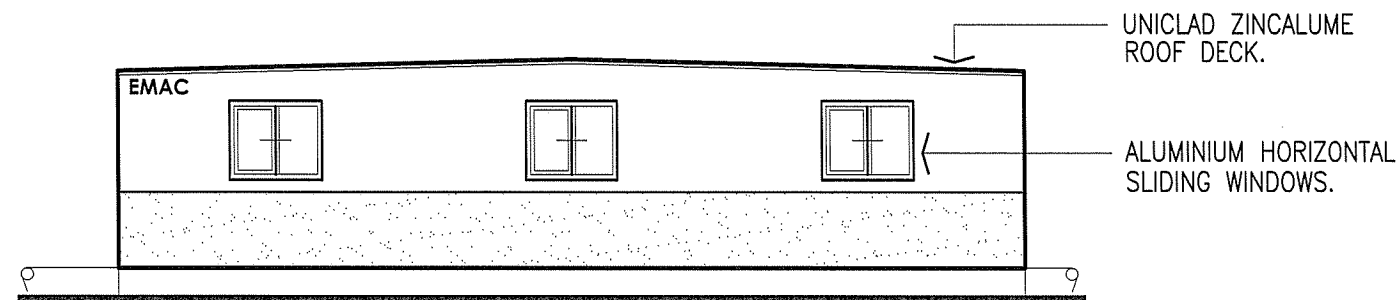
EMAC SYSTEMS

KARYDAV PTY. LTD. A.C.N. 061 115 133
1253 MAIN NORTH ROAD, PARA HILLS WEST,
SOUTH AUSTRALIA 5096
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BUILDERS LICENCE NO. GL 102757

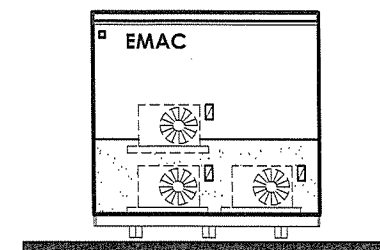
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REV	0



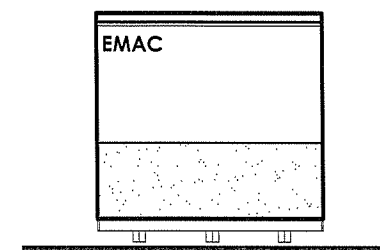
ELEVATION 1



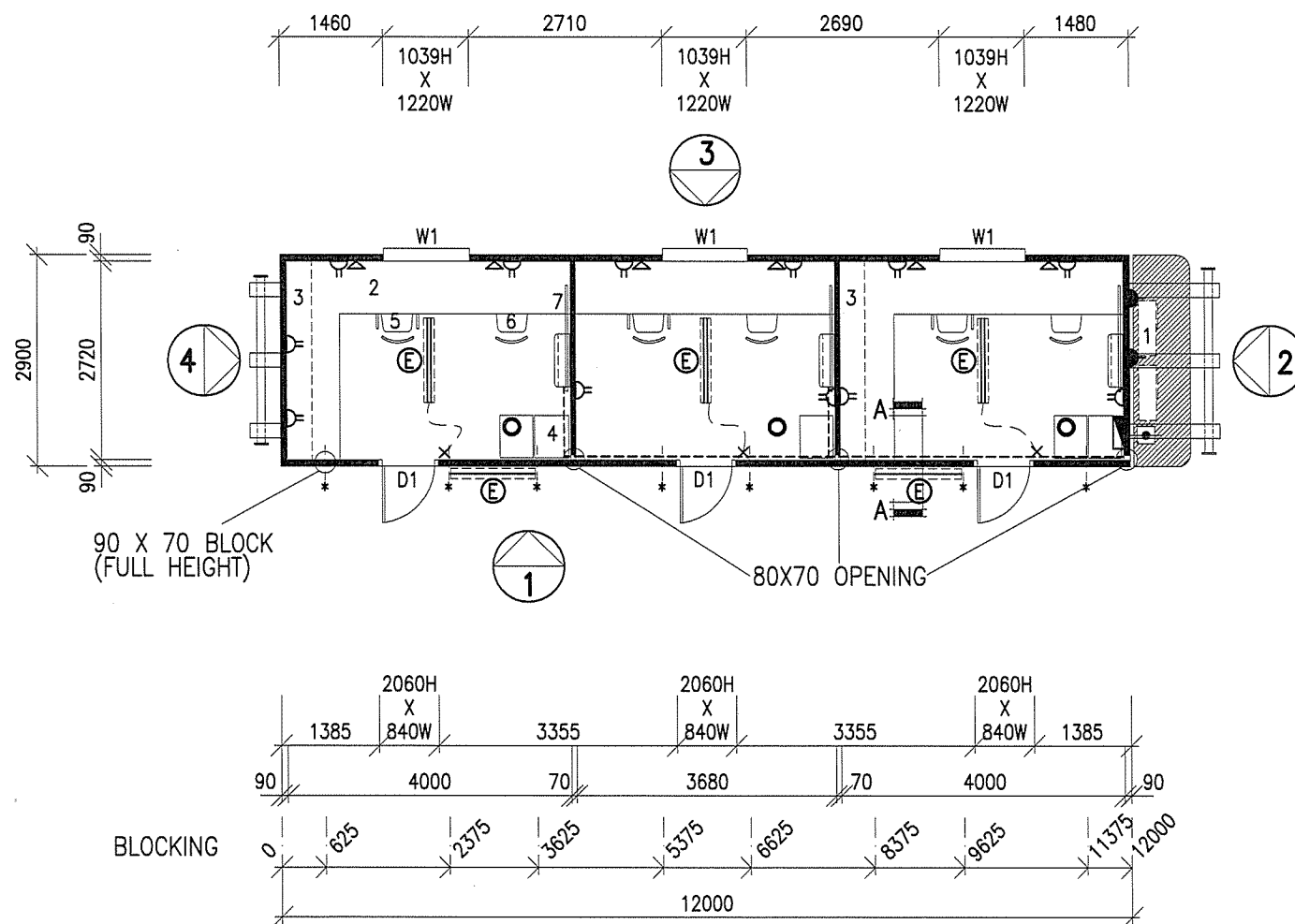
ELEVATION 3



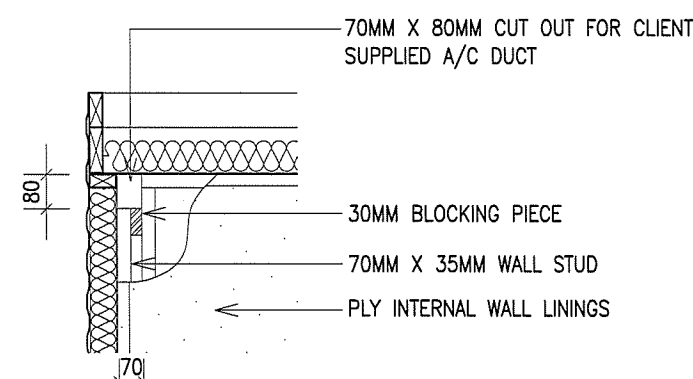
ELEVATION 2



ELEVATION 4



FLOOR PLAN

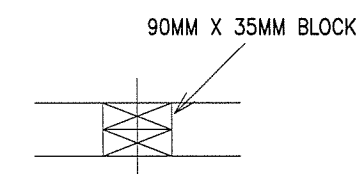


SECTION A-A
SCALE 1:20

ITEM:	DESCRIPTION:	QTY:
W1.	1029H. X 1210W. HORIZONTAL SLIDING WINDOW (6.38MM LAMINATE - GREY)	3.
D1.	2040H. X 820W. METAL CLAD REBATE EDGE EXTERNAL DOOR C/W SPRING RESTRAINER & EXIT SIGN.	3.
1.	SPLIT R/CYCLE A/C.	3.
2.	FULL WALL 750MM DEEP DESK.	5.
3.	BOOK SHELF OVER DESK C/W BRACKETS UNDER.	2.
4.	4 DRAW FILING CABINET.	5.
5.	TYPIST CHAIR WITH ARMS.	3.
6.	TYPIST CHAIR NO ARMS.	3.
7.	1000H X 1500W WHITEBOARD	3.
▲	15 AMP ISOLATOR.	3.
△	DOUBLE GPO.	12.
×	LIGHT SWITCH.	3.
▽	DATA POINT.	6.
⊕	2 X 36W. DIFFUSED FLUORO C/W BATTERY BACKUP.	3.
⊕	1 X 36W FLOURO. VANDALITE @ 2400 HEIGHT C/W BATTERY BACKUP & PE CELL.	2.
○	SMOKE DETECTOR.	3.
⊕	WILCO 5 PIN MALE PLUG FOR GENERATOR CONNECTION.	1.
⊕	CIRCUIT BREAKER BOARD (3 PHASE).	1.

NOTE:

- ALL DOORS TO HAVE STICK ON REFLECTIVE EXIT SIGNS ON INSIDE FACE OF DOOR.
- ALL EXTERNAL LIGHTS TO BE ON SAME P.E. CELL.



90 X 70 BLOCK
SCALE 1:10

SUBMITTAL STATUS	INITIAL	DATE
A CONTRACT DRAWINGS		
B BILL OF MATERIALS		
C ISSUE FOR PURCHASING		
D ISSUE FOR PRODUCTION		
E RELEASE FOR DELIVERY		
F APPROVED BY MANAGER		

CLIENT: ENSIGN
INTERNATIONAL
SALES ORDER NO: -

PROJECT: 12.0M X 2.9M
3 ROOM OFFICE
SERIAL NO: -

SITE: EX PLANT

EMAC
S Y S T E M S

KARYDAV PTY. LTD. A.C.N. 061 115 133
1253 MAIN NORTH ROAD, PARA HILLS WEST,
SOUTH AUSTRALIA 5096
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BUILDERS LICENCE NO. GL 102757

DWG NO: 3 RM OFF	SHEET: 1 OF 1
SCALE: 1:100	DATE: 5/03/10
DRAWN: JR	CHECK: TS
REV	0

CERTIFIED
A. PRESCOTT
RP-16002

A. Prescott
REF: 1235



Proudly owned, designed and manufactured
by Suncoast Waste Water Management

Technical Specifications

OZZI KLEEN Sewage Treatment Systems

SK20A-G



Efficiency, Reliability, Simplicity
www.ozzikleen.com

1. DESIGN CAPACITY

The design capacity of the SK20A-G treatment plant is 4,000L per day, producing advanced secondary effluent quality as specified below.

2. DESIGN PARAMETERS

The performance of the OZZI KLEEN SK20A-G Sewage Treatment Plant will achieve advanced effluent quality provided the incoming wastewater parameters meet the following characteristics:

Sewage Inlet

Parameter	Unit	Influent	Advanced
Biological Oxygen Demand (BOD ₅)	mg/L	≤ 350	≤ 10
Total Suspended Solids (TSS)	mg/L	≤ 350	≤ 10
Total Nitrogen	mg/L	≤ 75	≤ 10
Total Phosphorus	mg/L	≤ 15	≤ 5
Faecal Coliforms, FC	cfu/100 mL	-	≤ 10
Chlorine Residual	mg/L	-	0.5 ≤ 2.0
pH		6.0 ≤ 8.5	6.0 ≤ 8.5

3. SERVICE LIFE

The Ozzi Kleen SK20A-G was designed for a minimum service life of 15 years

4. ENGINEERING CALCULATION AND POE

Description	Document No.	Revision
SK20A-G Design Calculation Sheet	OK-SK20A-G-CS	12/11/2020
SK20A-G Power & Operating Cost Estimate	OK-SK20A-G-POE	12/11/2020
SK20A-G Elevation View Drawing	GD-SK20A-G-H06	17/11/2020
SK20A-G Plan View Drawing	GD-SK20A-G-H05	17/11/2020

CERTIFIED
A. PRESCOTT
RP-16002

AP
REF: 1235

Suncoast Waste Water Management

Plant Engineering Calculation

Project: Ozzi Kleen SK20A-G

Model	Unit	SK20A-G	Notes
1. Process Design Parameters			
Plant Capacity	EP	20	
Hydraulic flow	l/day	4000	
BOD ₅ loading	mg/l	350	
BOD ₅ loading	kg/day	1.4	
Suspended solids loading	mg/l	350	
Suspended solids loading	kg/day	1.4	
Mixed Liquor Suspended Solids (MLSS)	mg/l	5000	Typical extended aeration: 2500 to 6000 mg/l
Sludge Age	days	40	Typical extended aeration: > 30 days
Flow hours per day - Hydraulic sizing	hr/day	24	
Blower on time per cycle	min	60	
Settling time per cycle	min	30	
Decant time per cycle	min	30	
Total cycle time	min	120	
Number of cycles per day	cycles	12	
Total decanting time per day	min	360	
Total decanting time per day	hr	6	
Total aeration time per day	min	720	
Total aeration time per day	hr	12	
2. Aeration Tank			
Number of Aeration Tanks		2	Two RP Tanks, SBR operation
Aeration Tank outside diameter	mm	1900	
Shell Thickness	mm	18	
Aeration Tank inside diameter	mm	1864	
Aeration Tank top water level	mm	1745	
Aeration Tank volume - actual, calculated	litre	8,414	Excluding 4 x ø450 OD tubes volume
Aeration Tank volume per EP actual		421	
Maximum decant depth	mm	150	
Aeration Tank max. decant volume	litre	723	
Max. decant volume to daily flow	%	18%	Two cells on same cycling
Aeration Tank minimum working volume	litre	7690	
Max. decant ratio	%	8.6%	
Hydraulic Residence Time based on TWL	hr	50	24 hours minimum: Ref: SA Dept. of Health
Hydraulic Residence Time based on BWL	hr	46	
Food to Microbial Mass ratio (F:M Ratio)	g/g day	0.033	Typical for extended aeration, F:M 0.04 to 0.15
3. Air Flow			
Oxygen demand (kg O ₂ / kg BOD ₅)	kg/kg	2.4	Ref: SA Dept. of Health
BOD ₅ loading	kg/day	1.40	
Actual Oxygen demand required	kg O ₂ /day	3.4	Ref: SA Dept. of Health
1 kmol of air at STP occupies:	m ³ /kmol	22.41	
1 kmol of dry air has mass of:	kg/kmol	28.96	
Gravimetric fraction of Oxygen in dry air	kg/kg	0.2314	
Mass of Oxygen per kmol of air	kg/kmol	6.701	
Mass of Oxygen per m ³ of air at STP (dry basis)	kg/m ³	0.299	
Inlet air temperature	°C	25	25°C default
Inlet air relative humidity	%	70	
Inlet air temperature	K	298.15	
Standard air temperature	°C	0	
Standard air temperature	K	273.15	
Inlet air pressure	bara	1.013	
Saturated vapour pressure at inlet conditions	bara	0.032	0.03166 for 25°C. 0.04242 for 30°C

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ARP
REF: 1235

Blower discharge pressure at TWL	mbar	207	2 Blowers
Blower air flow (FAD) - actual	m ³ /hr	18	
Blower model	LP150HN		
Number of Elastox-T type B diffusers		4	Recommended for Elastox-T: 2 to 6 Nm ³ /h
Air flow per diffuser (FAD at suction temperature)	m ³ /hr	4.50	
Ratio : Actual m ³ (wet basis) per Nm ³ (dry basis)		1.116	
Air flow per diffuser (at STP)	Nm ³ /hr	4.03	
Elastox-T diffuser Oxygen transfer (from	g O ₂ /m Nm ³	22	
Diffuser immersion depth at TWL	m	1.545	
Diffuser Oxygen transfer at immersion depth	g O ₂ /Nm ³	33.99	
Oxygen transfer per diffuser	g O ₂ /hr	137.06	
Oxygen transfer, all diffusers	kg O ₂ /hr	0.55	
Oxygen transfer, all diffusers - daily basis at TWL	kg O ₂ /day	6.6	
Standard Oxygen transfer efficiency (wet basis)	%	12.7	
4. Chlorine Contact Tank			
Decanting flow rate	l/min	16	Based on average flow plus 40% margin
Decanting flow rate	m ³ /hr	0.9	
Minimum Cl contact time	min	30	
Minimum Cl contact tank volume required	litre	467	
Number of Contact Tanks		2	
Contact Tank outside diameter	mm	450	
Shell Thickness	mm	10	
Contact Tank inside diameter	mm	430	
Contact Tank top water level	mm	1745	
Contact Tank volume - calculated	litre	507	
Cl contact time - actual	min	33	
Chlorine tablet consumption			
dosage rate	mg/L	10	
daily tablet consumption	kg/d	0.04	
min. storage - 3 months	kg	3.64	
number of tablets (200 g/ea) - 3 months	no.	18	
5. Waste Sludge Tank			
Sludge oxidation ratio	40 l	40	
Sludge D.S. wastage based on SS loading	kg/day	0.035	
Wet sludge solids content in sludge tank	% D S	1	
Wet sludge mass to be wasted	kg/day	3.5	
Wet sludge volume wasted where SG = 1	l/day	3.5	
Period between tank de-sludging	day	90	
Minimum sludge tank volume required	litre	315	
Number of Sludge Tanks		2	
Sludge Tank outside diameter	mm	450	
Shell Thickness	mm	10	
Sludge Tank inside diameter	mm	430	
Sludge Tank top water level	mm	1900	
Sludge Tank volume - calculated	litre	552	
Period between de-sludging - actual	day	158	
6. Alum Dosing System (SK20A / A-G ONLY)			
Dosage rate	mg/L	30	
Daily alum consumption	kg/d	0.12	
Percentage of alum solution	%	20	
Daily alum consumption at 20% solution:	kg/d	0.6	
Daily alum consumption at 20% solution:	L/d	0.53	
Dosing rate per inflow at 20% solution	ml/m ³	133	
Chemical tank volume	litre	80	
Minimum refill period of Alum	days	150	

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ARP
REF: 1235

Suncoast Waste Water Management

AWTS Process Design Parameters for Power Utilisation

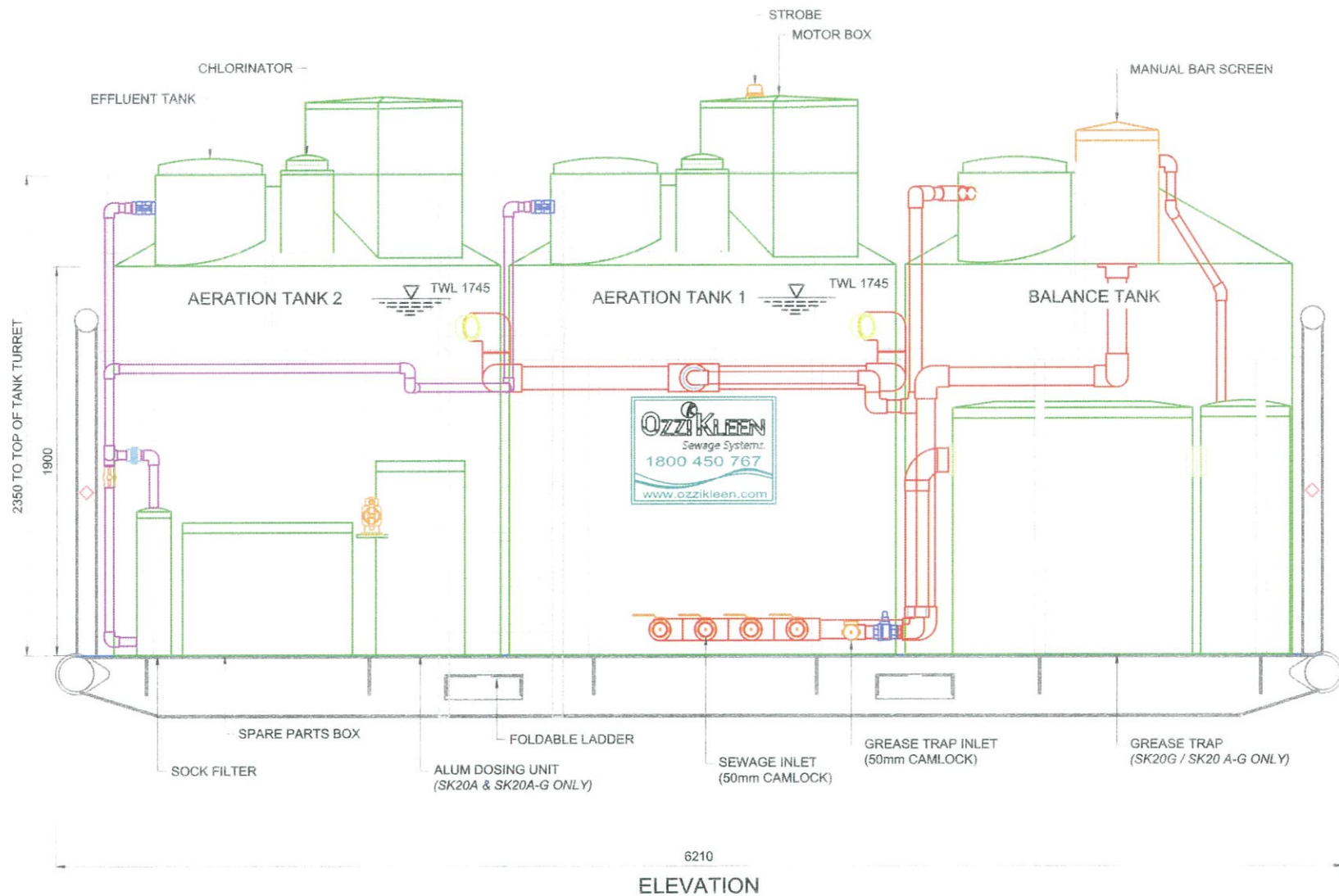
Project: Ozzi Kleen SK20A-G

Design Parameter	EP	20				
Hydraulic Flow	l/day	4000				
Flow Hours per Day - Hydraulic Sizing	hr/day	24				
Blower ON Time per Cycle	min	60				
Settling Time per Cycle	min	30				
Decant Time per Cycle	min	30				
Total Cycle Time	min	120				
Number of Cycles per Day	cycles	12	Model			
Transfer Pump Flow Rate	l/min	200	Showfou STA-112			
Effluent Pump Flow Rate	l/min	100	Reefe RVS300			
Grease Trap Pump Flow Rate (SK20G / A-G ONLY)	l/min	200	Reefe RVS300			
Dosing Pump Flow Rate (SK20A / A-G ONLY)	l/hr	3	Iwaki EJ B16			
Air Blower	m³/hr	18	Thomas LP150HN			
Power Utilisation Based on Rated Power	Installed Power		Unit	Hrs/day	Energy Used	
	3 phase	1 phase		hr	kWh	
Transfer Pump		0.75	kW	0.33	0.25	
Effluent Pump 1		0.40	kW	0.33	0.13	
Effluent Pump 2		0.40	kW	0.33	0.13	
Grease Trap Pump (SK20G / A-G ONLY)		0.18	kW	0.11	0.02	
Dosing Pump (SK20A / A-G ONLY)		0.10	kW	0.37	0.04	
Blower 1		0.13	kW	12.00	1.56	
Blower 2		0.13	kW	12.00	1.56	
Control System		0.10	kW	24.00	2.40	
Total Installed Power	0.00	2.19	kW		6.1	
Average Power			kW		0.25	
Current Draw Based on Full Load Current	Full Load Current		Unit	Hrs/day	Amp-hr Used	
	3 phase	1 phase			3 phase	1 phase
Transfer Pump		6.00	A	0.33		2.00
Effluent Pump 1		4.00	A	0.33		1.33
Effluent Pump 2		4.00	A	0.33		1.33
Grease Trap Pump (SK20G / A-G ONLY)		4.00	A	0.11		0.44
Dosing Pump (SK20A / A-G ONLY)		0.50	A	0.37		0.19
Blower 1		0.85	A	12.00		10.20
Blower 2		0.85	A	12.00		10.20
Control System		1.00	A	24.00		24.00
Total Installed Current	0.00	21.20	A		0.00	49.69
Average Current			A		0.00	2.07

Operating Cost Estimating	unit	unit price	qty/d	qty/yr	\$/yr
Power	kW	0.20	6.1	2224	445
Chlorine	kg	12.50	0.04	15	183
Alum	kg	1.50	0.12	44	66
Waste Sludge Disposal	L	0.20	3.50	1278	256
total:	\$/year				949
Note: All costs are estimated based on the SK20A-G operating for 365 days at full design capacity (4 kL/day), an adjustment should be made when less sewage is treated per year.					

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REF: 1235



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REF: 1235
AP

DATE	DESCRIPTION	REV.	BY
17/11/20	TANK WATER LEVEL INDICATED	2	YH
26/10/16	GENERAL REVISION	1	YH



Suncoast Waste Water Management

59 INDUSTRIAL AVE
KUNDA PARK
QLD 4556
PH +61 7 5459 4900
FAX +61 7 5456 4877
www.ozzikleen.com

CLIENT	GENERAL DRAWING	DESIGN	AP
PROJECT	OZZI KLEEN SK20A-G AWTS	DRAWN	YH
TITLE	ELEVATION VIEW	CHKD	SB
DWG NO.	GD-SK20A-G-H06	DATE	17/11/20
		SCALE	NTS



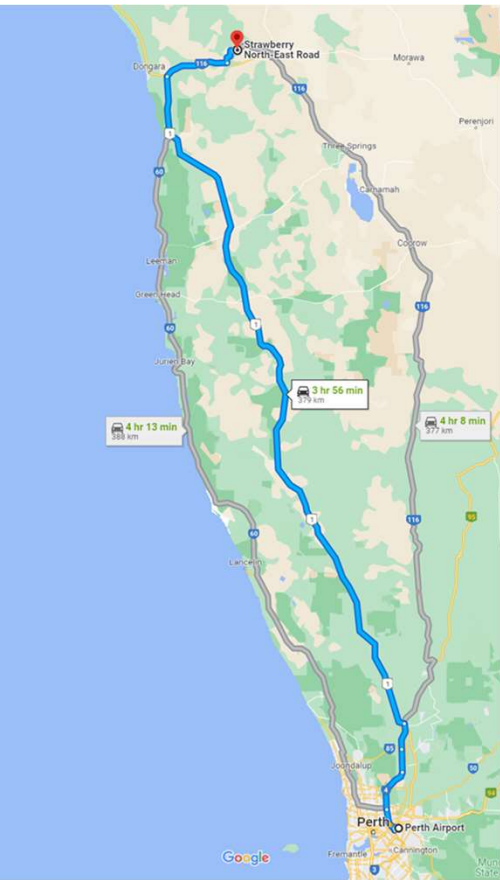
NORTH PERTH BASIN WELLS DRILLING PROJECT PRE-TRAVEL INFORMATION

TO BE A LEADING PROVIDER OF SECURE,
AFFORDABLE ENERGY FOR WESTERN AUSTRALIA

JOURNEY MANAGEMENT

- Road travel with a continuous duration >2 hours will require a journey management plan
 - 15 minutes rest stops must be taken for every 2 hours of driving
- Personnel will use their own organisation's journey management procedure
 - Where there is no journey management procedure covering 3rd party personnel, the MRE Project journey management procedure will be used,
- Night travel is only permitted with approval of the Operations Superintendent or Lead Contractor's PIC
- ALL personnel must seek approval of the MRE Operations Superintendent before travelling to Site.
 - Prior to departure the Operations Superintendent must be notified of the travel route and expected time of arrival at the Site.
 - On arrival at Site the Operations Superintendent must be notified accordingly
 - Excludes Lead Contractor personnel and freight companies
- Diesel AWD/4WD is preferred mode of transport.

TRAVELLING TO LOCKYER AREA WELL LOCATIONS FROM AIRPORT



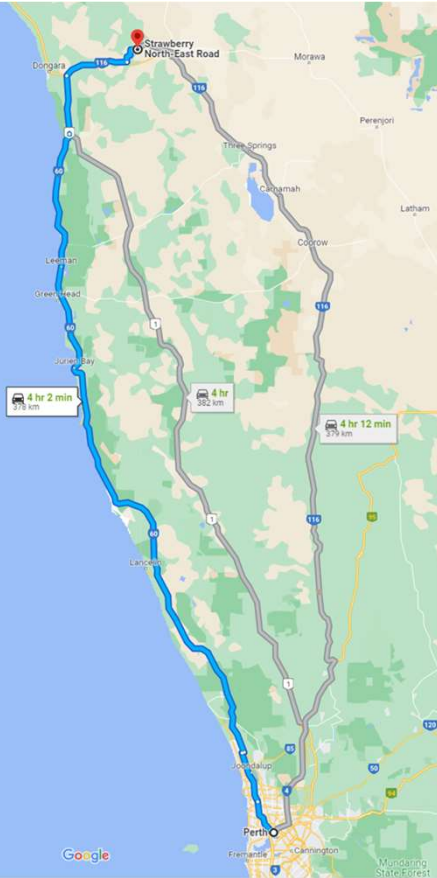
Option 1: Via Brand Highway. For heavy vehicles and light vehicles from the Perth airport

- Depart the Airport terminal and get onto the Tonkin Hwy north
 - Terminals 3 & 4: Travel along Snook Road to the 2nd round about, turn left onto Dunreath Road, travel 0.76 kms and turn right at the roundabout, cross over the Tonkin Hwy and turn right at the round about onto the Tonkin Hwy north
 - Terminals 1 & 2: Travel along Airport drive for ~4.3 kms, cross over the Tonkin Hwy onto the Tonkin Hwy north
- Travel north along the Tonkin Hwy to intersect the Brand Hwy near to Muchea (~47.3 kms)
- Travel along the Brand Hwy to the Midlands Rd intersection (296 kms)
- Turn right onto Midlands Rd and travel 26.3 kms to Strawberry North-East Rd turn off

Refer to the relevant site access map within this document for access to specific Lockyer area well locations.

Remember to report to the Site Supervisor on arrival at Site and log-off with your journey manager

TRAVELLING TO LOCKYER AREA WELL LOCATIONS FROM PERTH CITY



Option 2: Indian Ocean Drive – for light vehicles from Perth city

- Get onto Mitchell Fwy travelling north
- Travel to the end of the Mitchell Fwy and turn right on Hester Ave (36 kms)
- Travel east on Hester Ave and turn left onto Wanneroo Rd (1 km)
- Travel north along Wanneroo Rd / Indian Ocean Drive (State route 60), through Leeman to where the road intersects with the Brand Hwy (283 kms)
- Turn left onto the Brand Hwy and travel north to Midlands Rd intersection (24 kms)
- Turn right onto Midlands Rd and travel 26.3 kms to Strawberry North-East Rd turn off

Refer to the relevant site access map within this document for access to specific Lockyer area well locations.

Option 3: Brand Hwy – from the Perth city

- Alternatively, travel along Lord St / Guildford Rd (State Route 51) to intersect with Tonkin Hwy and revert to Option 1 directions

Remember to report to the Site Supervisor on arrival at Site and log-off with your journey manager

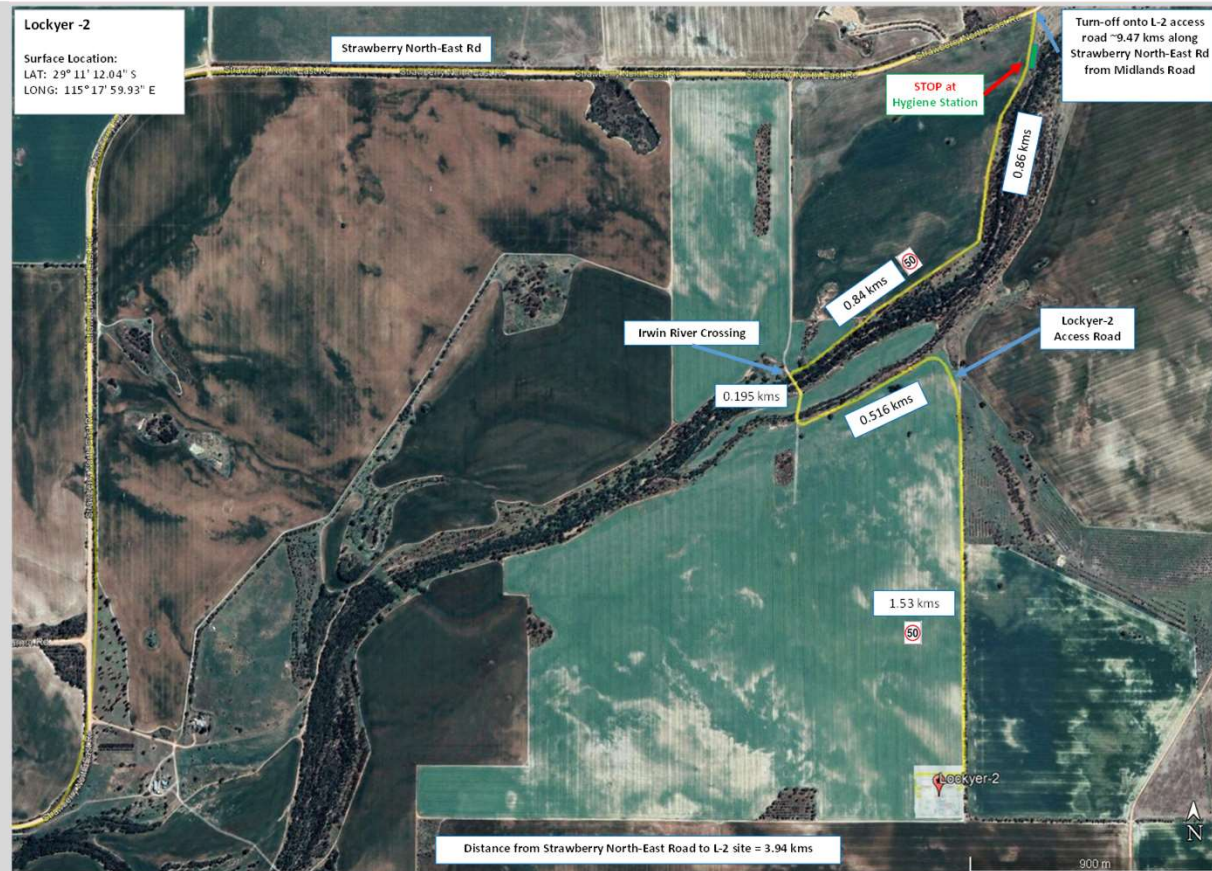
SITE ACCESS ROADS - GENERAL RULES



- **SPEED** – Once you leave public roads on to the gravel access roads, drive to conditions and in **NO** circumstances faster than 50kph on these roads
 - 5kph on the rig site
- Be aware of trains on approach to the railway crossing from Midlands Road onto Strawberry North-East Road and the location of your trailer
- Always remember to drive on the **left side** of unmarked gravel access roads – especially when approaching a **blind crest**
- Be aware of the potential for farm vehicles and machinery to be operating on the access roads or in the near vicinity of the well location. **ALWAYS** act in a courteous manner and be mindful we are guests on **THEIR** private property.
- Do **NOT** cross the Irwin river if water is flowing over the crossing
- Light vehicles to **ALWAYS** to give way to heavy vehicles on the access roads and river crossing
- All vehicles are to be parked in the designated parking areas
- A **ZERO** tolerance drug and alcohol policy is in place for this activity
- ALL personnel to check in at the Wellsite Supervisor's office on arrival at the rig site
 - If first time at rig site then must complete Ensign site induction on arrival

SITE ACCESS ROADS - LOCKYER-2

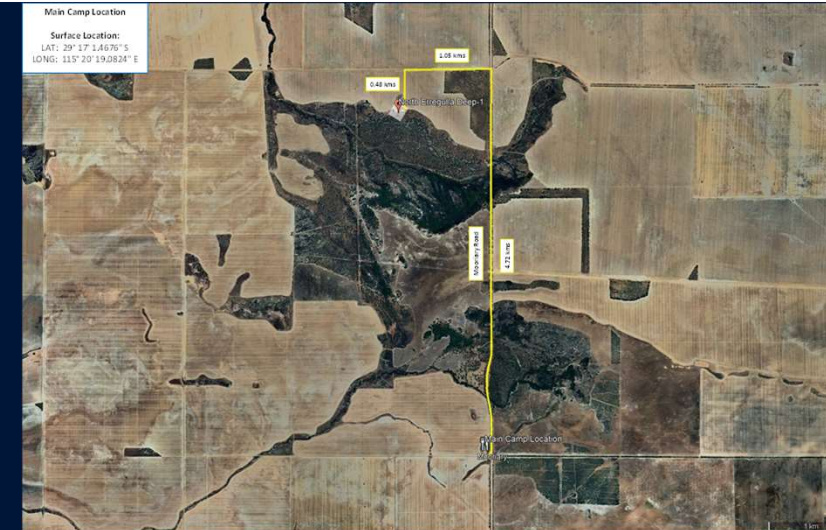
- Turn off onto Strawberry North-East Road from Midlands Road and travel ~9.47 kms to the Lockyer-2 turn off on the right
- **Stop** at the Hygiene Station, inspect and brush down vehicle into garbage bags provided (if minor amount of mud, dirt, dust build up, plant seeds present) and bring waste with you.
 - Register inspection in book at hygiene station
 - Note: Requirement is for vehicles to arrive clean
- Travel 1.7 kms along the access road to the Irwin river crossing
 - Do **NOT** cross the river if there is water flowing over the river crossing (i.e. no depth visibility or more than 10cm in depth)
 - Contact the MRE Operations Superintendent or Lead Contractor Site PIC for advice on how to proceed.
- After crossing the river, continue to travel along the access road for another ~2.05 kms to the Lockyer-2 site



SITE ACCESS ROADS – NORTH ERREGULLA DEEP-1 & MAIN CAMP

North Erregulla Deep-1 (NED-1) Well Location

- If travelling west along Midlands Road, continue another ~9.7 kms west along Midlands Road past the Strawberry North-East Road intersection to Mooriary Road turn-off.
- Turn right onto Mooriary Road and drive south for 4.32 kms to the turn-off onto the North Erregulla Deep-1 wellsite access road
- Drive east along the access road for 1.05 kms, turn south and travel for an additional 0.48 kms along the access road to arrive at the North Erregulla Deep-1 well location



Main Camp Location

- Turn right onto Mooriary Road as you depart the NED-1 access road and drive south for 4.72kms
- If arriving from Midlands Road then turn south onto Mooriary Road and drive south for 8.93kms
- Turn right into the main camp access road as you approach the intersection.

BE AWARE AND ALWAYS GIVE WAY TO ANY ONGOING FARM ACTIVITY ON THE ACCESS ROADS TO THE SITE

PROJECT ENVIRONMENTAL CONSIDERATIONS

- **ALL** vehicles and equipment travelling to the well locations **MUST** be cleaned free of mud, dirt, dust build up, plant seeds or any other flora or fauna species that are not native to this area
 - Vehicles which arrive in a state which is considered unsuitable will be sent off Site for cleaning. If unsure, contact the MRE Operations Superintendent (OSI) to discuss
- Except in an emergency situation, vehicles can only travel on the existing access tracks
- The Sites are on privately owned agricultural farmland. Personnel are to refrain from walking onto the areas surrounding the Sites
- Please ensure you have forwarded an electronic copy of all **SDSs** and **DG** documentation to the MRE Operations Engineer and WSS prior to mobilising to location
- If encountered, leave any gates as you find them
- Except in an emergency situation, **NO** personnel are permitted onto local private properties or near to homes in the area
- MRE's activities will be conducted in compliance with the applicable Environment Plan (EP) as approved by the Department of Mines, Industrial Regulation and Safety (DMIRS)



OTHER PROJECT CONSIDERATIONS

Where possible, travel between the main camp site and well location should be via crew change bus

- Vehicles should preferentially remain at the main camp site
- Crew change trips occur at around 05:30 hrs, 11:30 hrs, 17:30 hrs and 23:30 hrs
- If driving to the well location, please use designated parking areas
- Large vehicles will be routinely driving through the location – keep out of their way

Mandatory PPE to be brought and worn on site

- Steel cap boots,
- Safety helmet
- Eye protection with side shields
- Hearing protection
- Long sleeve cotton shirt with reflective strips
- Long leg cotton trousers with reflective strips
- Good quality protective gloves



PROJECT CONTACT DETAILS

The following are contact details for the key resources involved in execution of the well operations.
If you already have established chains of communications, then continue with those accordingly.

Name	Position	Email	Office No	Mobile
Roo / Shaughan	Wellsite Supervisor	Mre.wss@aztechwc.com.au	-	0439 310 795
Mark / Sean	Wellsite HSE & Logistics	Mre.hsel@aztechwc.com.au	-	0458 808 826
Paul O'Shea	Operations Superintendent	poshea@aztechwc.com.au	+61 (0)8 6228 6300	0404 095 145
Rob Schenberg	Drilling Engineer	rschenberg@aztech.com.au	+61 (0)8 6228 6300	0431 914 747
Sundar Veerappan	Logistics Superintendent	sveerappan@aztechwc.com.au	+61 (0)8 6228 6300	0414 922 945
Nick Merdith	Project HSE Advisor	nmerdith@aztechwc.com.au	+61 (0)8 6228 6300	0400 088 666
Darrell Girgenti	Project Manager	darrell.girgenti@mrl.com.au	+61 (0)8 6228 6303	0409 055 989
Leah Fuller	Land Access Manager	leah.fuller@mrl.com.au	+61 8 9315 8537	0409 807 416



HEALTH, SAFETY AND ENVIRONMENT MANAGEMENT SYSTEM BRIDGING DOCUMENT

PERTH BASIN WELLS - DRILLING

EOC-SAF-PLN-008-APX4

Revision Number	Issue Date	Prepared By	Reviewed By	Approved By
0	8/02/2021	N Merdith	D Girgenti S Daniels T O'Keefe	S Daniels
1	01/04/2021	N Merdith	D Girgenti S Daniels T O'Keefe	S Daniels
2	22/06/2021	N Merdith	D Girgenti A Buchan T O'Keefe	S Daniels
3	24/11/2022	N Merdith	D Girgenti S Lee C Nesbitt	N Thompson
4	01/12/2022	N Merdith	D Girgenti S Lee C Nesbitt	N Thompson
5	17/01/2023	N Merdith	D Girgenti	N Thompson

DISTRIBUTION LIST

Position	Company
General Manager Exploration - Energy	MinRes Energy
Safety Manager	MinRes Energy
Project Manager	MinRes Energy/Aztech
Project Manager	MinRes Energy/Aztech
Operations Superintendent	MinRes Energy/Aztech
Project HSE Advisor	MinRes Energy/Aztech
Wellsite Supervisor	MinRes Energy/Aztech
Site HSEL	MinRes Energy/Aztech
Drilling Superintendent	Ensign Australia Pty Ltd
National HSEQT Manager	Ensign Australia Pty Ltd
Rig Manager	Ensign Australia Pty Ltd
Rig HSE Advisor	Ensign Australia Pty Ltd
Main Camp Manager	ASCO
The Minister's Delegate, WA Department of Mines, Industry, Regulations and Safety	DMIRS

REVISION HISTORY

Revision Number	Revision Details
1	Reissued following DMIRS review
2	Revised following HAZID Workshop and updated risk register
3	Revised to cover North Perth Basin drilling and completion activities under new WHS(PAGEO) Regulations 2022
4	Revised for acceptance of Ensign Rig 970 Safety Case (including transfer of drilling MAEs)
5	Revised following DMIRS SSRN. Updated title.

DOCUMENT CUSTODIAN

This *Health, Safety and Environmental Management System Bridging Document (HSEMSBD)* has been approved by the relevant officer of MinRes Energy prior to submission to the Regulator for review and assessment.

Details are provided below:

Neil Thompson

General Manager Exploration - Energy

MinRes Energy (Energy Resources Limited)

20 Walters Drive, Osborne Park, WA 6017

neil.thompson@mrl.com.au

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Definitions & Abbreviations

Activity	The drilling and completion phase of the Project
ALARP	As Low As Reasonably Practicable
ASCO	ASCO Australia Pty Ltd
BOP	Blow Out Preventer
Camp	ASCO managed Pye Rd or Mobile Main Camp capacity to accommodate up to 52 personnel
CAR	Corrective Action Register
DMIRS	Department of Mines, Industry, Regulation and Safety
Ensign	Ensign Australia Pty Ltd
EP	Exploration Permit
ERCL	Emergency Response Contact List
FSA	Formal Safety Assessment
HSE	Health, Safety and Environment
HSEA	Health, Safety and Environment Advisor – Ensign Site-Based HSE Advisor
HSEL	Health, Safety, Environment and Logistics
HSEMS	Health, Safety and Environment Management System
HSEMS-BD	Health, Safety and Environment Management System Bridging Document (this document) An addendum to the approved MinRes SMS covering a specific Activity (Safety Case Revision under WHS(PAGEO)R)
HSE&T	Health, Safety, Environment and Training
JSA	Job Safety Analysis
Lead Contractor	The contractor whose MinRes Energy (Energy Resources Limited) approved HSEMS will be in force at the Project Site for the Activity <ul style="list-style-type: none">Well Site – EnsignMain Camp – ASCO

LTI	Lost Time Injury
MAE	Major Accident Event
Mini-Camp	Rig 970 includes site camp with accommodation for six operationally critical staff
MinRes Energy	Energy Resources Limited – Permit Title Holder
MOC	Management of Change
MTI	Medical Treatment Injury
OEM	Original Equipment Manufacturer
PAGERA	Petroleum and Geothermal Energy Resources Act 1967
PAGER(MoS)R	Petroleum and Geothermal Energy Resources (Management of Safety) Regulations 2010
PIC	Person in Charge
PMS	Preventative Maintenance System
PPE	Personal Protective Equipment
Project	The drilling, completion, well testing, well intervention or well decommissioning of a Well and all associated activities.
Psychosocial Hazards	Hazards that may cause psychological and physical harm and arise from or relate to, the design or management of work, the working environment, plant at a workplace or workplace interactions or behaviours (Safe Work Australia)
Safety Case	Ensign Rig 970 Safety Case (EN-AUS-HSE-SC-001)
SDS	Safety Data Sheet
SFAIRP	So Far As Is Reasonably Practicable
SIMOPS	Simultaneous Operations
Site or Location	Locations at which the Activity is being undertaken which may include the Well site, main camp site and access roads thereto
SMART	Specific, Measurable, Accountable, Reasonable and Timely

SMS	MinRes Energy (ERL) Safety Management System (EOC-SAF-PLN-00)
SOP	Safe or Standard Operating Procedure
SWA	Stop Work Authority
TPC	Third Party Contractor
TRI	Total Recordable Injuries
Well	An exploration, appraisal or development well with a DMIRS accepted WMP in force for the Activity within an MinRes Energy (Energy Resources Limited) operated permit area in the North Perth Basin
W-EP	Well Environment Plan
WHS	Workplace Health and Safety
WHS(PAGEO)R	Work Health and Safety (Petroleum and Geothermal Energy Operations) Regulations 2022
WMP	Well Management Plan (Drilling Program)
WSS	Well Site Supervisor

1 INTRODUCTION

1.1 Project Overview

MinRes Energy (previously Energy Resources Limited or ERL), a wholly owned subsidiary of Mineral Resources Limited, is the title holder of several exploration permits located in the North Perth Basin, including EP 368, EP 389, EP 426 and EP 507.

Within these permit areas, MinRes Energy are proposing to drill several Wells, including North Erregulla Deep-1, Lockyer-2, Lockyer-3, Lockyer-4, Dandaragan Deep-1 and Romanesque-1 and additional Wells as prospects are generated within the MinRes Energy permit areas.

The geographic location of the MinRes Energy permit areas is shown in Figure 1.

Most Activities will be undertaken in relative proximity to location of the previous Lockyer Deep-1 Well within EP 368, which was a significant gas discovery well for MinRes Energy in 2021.

As with the previously drilled Lockyer Deep-1, Project Wells will be drilled using the Ensign Rig 970. The Ensign Rig 970 Rig will operate under an accepted Safety Case [EN-AUS-HSE-SC-001] under the *Work Health and Safety (Petroleum and Geothermal Energy Operations) Regulation 2022* (WHS(PAGEO)R).

1.2 Purpose

This *Health, Safety and Environmental (HSE) Management System Bridging Document* (HSEMS-BD) is a revision in part of the current Regulator accepted HSEMS-BD and covers the proposed Activities described above.

The HSEMS-BD is an addendum to the accepted *Safety Management System Perth Basin* (EOC-SAF-PLN-008), in accordance with the *Work Health and Safety (Petroleum and Geothermal Energy Operations) Regulation 2022* (WHS(PAGEO)R).

Note: The current revision of the *MinRes Energy Safety Management System Perth Basin* (EOC-SAF-PLN-008) was accepted under the repealed *Petroleum and Geothermal Energy Resources (Management of Safety) Regulations 2010* (PAGER(MoS)R).

This HSEMS-BD:

- Describes the Activity
- Identifies the agreed interfaces between the *MinRes Energy Safety Management System Perth Basin Exploration Permits* (EOC-SAF-PLN-008) and the *Ensign Rig 970 Safety Case* (EN-AUS-HSE-SC-001)
- Describes the hazard identification, risk assessment and risk management processes applied to ensure the risks associated with the Activity and not addressed within the Safety Case have been reduced SFAIRP (SFAIRP – broadly synonymous with ALARP)

Management of day-to-day operations of the Well Site during the Activity will be as per the DMIRS accepted Ensign Rig 970 Safety Case.

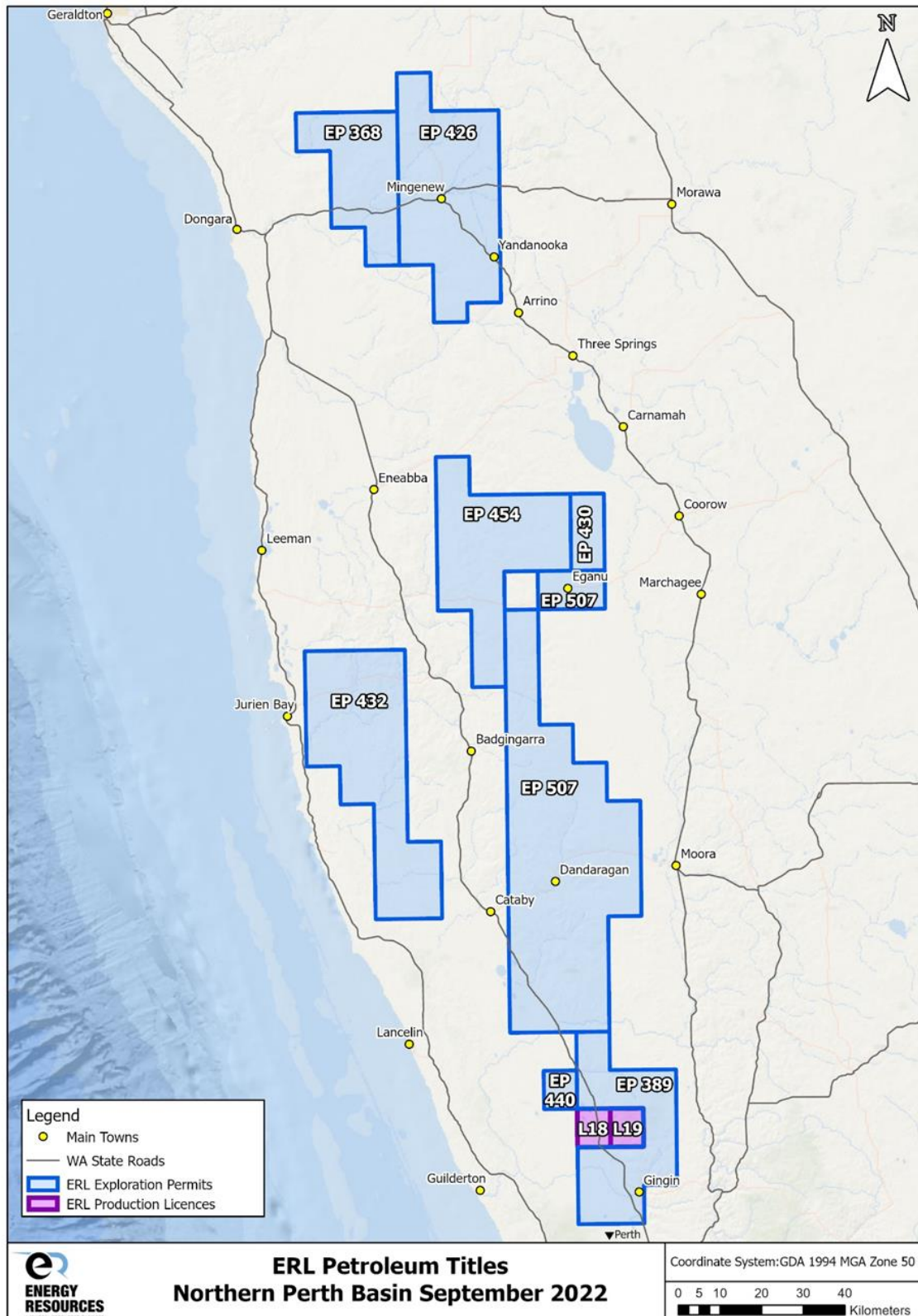


Figure 1. MinRes Energy North Perth Basin Permits

1.3 Revision

The MinRes Energy General Manager Exploration - Energy is responsible for ensuring the adequacy and control of this HSEMS-BD.

In accordance with WHS(PAGEO)R, this HSEMS-BD will be revised in the following circumstances:

- The technical knowledge relied upon to formulate this HSEMS-BD, including the knowledge of systems for identifying hazards and evaluating risks of major accident events, becomes outdated
- MinRes Energy proposes to modify or decommission a relevant facility, and the Safety Case for the operation does not provide, or adequately provide, for the proposed modification or decommissioning of the facility
- There are reasonable grounds for believing that a series of proposed modifications to a relevant facility would result in a significant cumulative change in the overall level of risk of major accident events
- MinRes Energy proposes to significantly change the safety management system for the operation (this would include a change in drilling contractor)
- the activities to be carried out as part of the operation are different from the activities contemplated in the HSEMS-BD.

It should be noted that this revision of the HSEMS-BD does not meet the above triggers for a resubmission. The updates in this revision largely result from the MAEs associated with the drilling operations that now fall within the Safety Case under the WHS(PAGEO)R.

1.4 Scope

1.4.1 In-Scope

The scope of this HSEMS-BD includes:

- HSE planning activities, in particular aspects of the Formal Safety Assessment (FSA) not specific to the Safety Case
- All Project Drilling Activities where the Ensign Rig 970 is on the Well Site
- Personnel movement between the Camp and Well Site by light vehicles or mini-bus

The ASCO Camp, Project personnel travelling in light vehicles to the Well Site and environmental aspects of the Activity are outside the scope of the WHS(PAGEO)R but are included in the HSEMS-BD as important aspects of general Project HSE management.

1.4.2 Out-of-Scope

Activities outside the scope of this HSES-BD:

- Rig mobilisation to Site and demobilisation activities off Site
- Freight transport off Site other than the requirements under the Western Australian Road Traffic Chain of Responsibility legislation.

1.5 Legal and Other Requirements

The following legislation applies to this bridging document:

- *Work Health and Safety Act 2020*
- *Work Health and Safety (Petroleum and Geothermal Energy Operations) Regulations 2022*
- *Work Health and Safety (General) Regulation 2022*
- *Dangerous Goods Safety Act 2004*
- *Workers Compensation and Injury Management Act 1981*
- *Workers Compensation and Injury Management Regulations 1982*
- *Petroleum and Geothermal Energy Resources Act 1967*
 - *Petroleum and Geothermal Energy Resources (Environment) Regulations 2012*
 - *Petroleum and Geothermal Energy Resources (Resource Management and Administration) Regulations 2015*
- *Environmental Protection Act 1986*
 - *Environmental Protection Regulations 1987*
- *Bush Fires Act 1954*
 - *Bush Fires Regulations 1954*
- *Wildlife Conservation Act 1950*
- *Conservation and Land Management Act 1984*
- *Native Titles Act 1993*
- *Aboriginal Heritage Act 1972*

Standards and Codes of Practice applicable to the Project are identified in the Ensign Safety Case and ASCO HSEMS.

2 PROJECT

2.1 General Description

The key operations of the Activity are:

- MinRes Energy - Handover site to Ensign
- Ensign - Mobilise the drilling rig package, personnel and supplies
- MinRes Energy - Mobilise 3rd party services as required to support the Project
- Ensign - Rig-up the drilling rig and 3rd party services at the Well Location
- Ensign - Drill the Well as per the approved Well Management Plan (WMP)
- Ensign - Suspend or abandon the Well as per the WMP
- Ensign - Rig down and demobilise the rig, personnel and supplies
- MinRes Energy - Demobilise 3rd party services from the Well Location
- Ensign - Hand back site to MinRes Energy

The Activity is scheduled to commence Q1 of 2023 with this timing subject to the arrival date of the Ensign Rig 970 into Western Australia. On a successful case (suspension pending later completion), each Well is planned for ~60 days including mobilisation and rig up time.

2.2 Project Management

MinRes Energy, as permit title holder, is responsible for site preparation and the approved WMP.

On handover of the Site to Ensign (as the nominated operator of Rig 970), Ensign will be responsible for day-to-day drilling operations on the Well Site as per the accepted Safety Case and for the implementation of the WMP at the Well Site, as instructed by MinRes Energy.

Management of environmental aspects on Site will meet the requirements of the approved Well Environment Plan (W-EP) applicable to the Site.

2.3 Location

The initial proposed Wells are typically located on privately owned farmland in the local government shires of Dandaragan, Mingenew and Gingin (**Figure 2** and **Figure 3** below).

Note: Romanesque-1 location is still to be finalised.

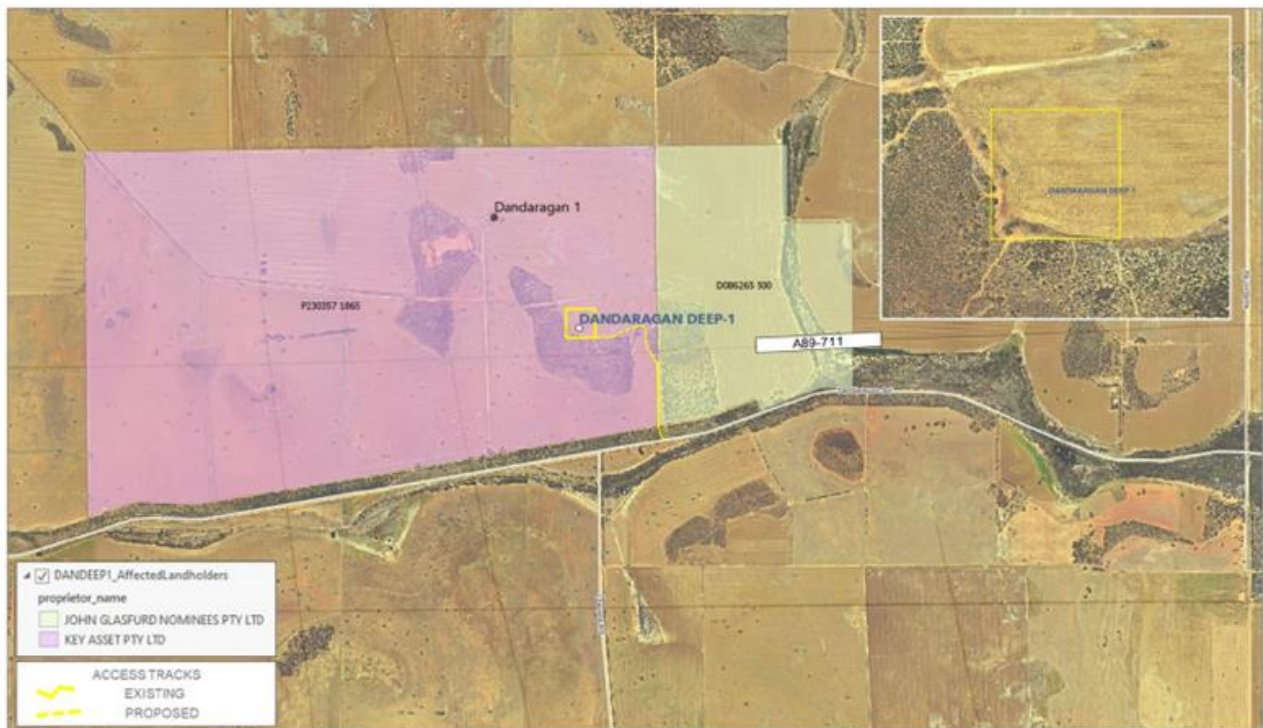


Figure 2. Dandaragan Deep-1 Well Location

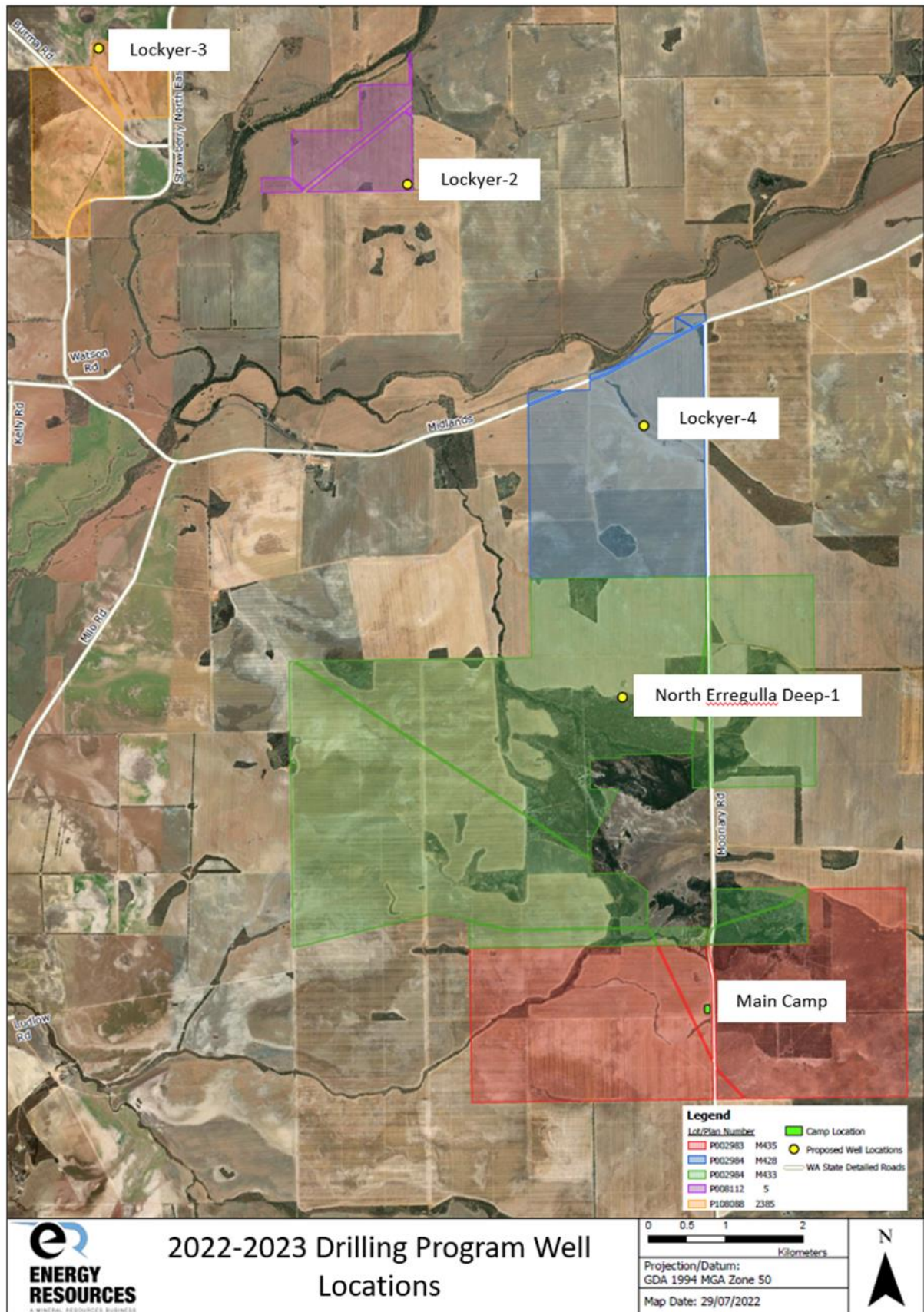


Figure 3. Proposed Well Locations – Mingenew

2.4 SIMOPS

The Well Sites are typically on privately owned farmland with the Site access roads likely to be shared with occasional farming operations, depending on the time of the season.

Due to the relative isolation of the Well Sites from general civilian activities, there are no interactions/SIMOPS with other petroleum operations identified for this Project.

2.5 Well Site Layout

The Well Site layout may vary according to site details. A typical Well Site layout is provided in **Figure 4** below.

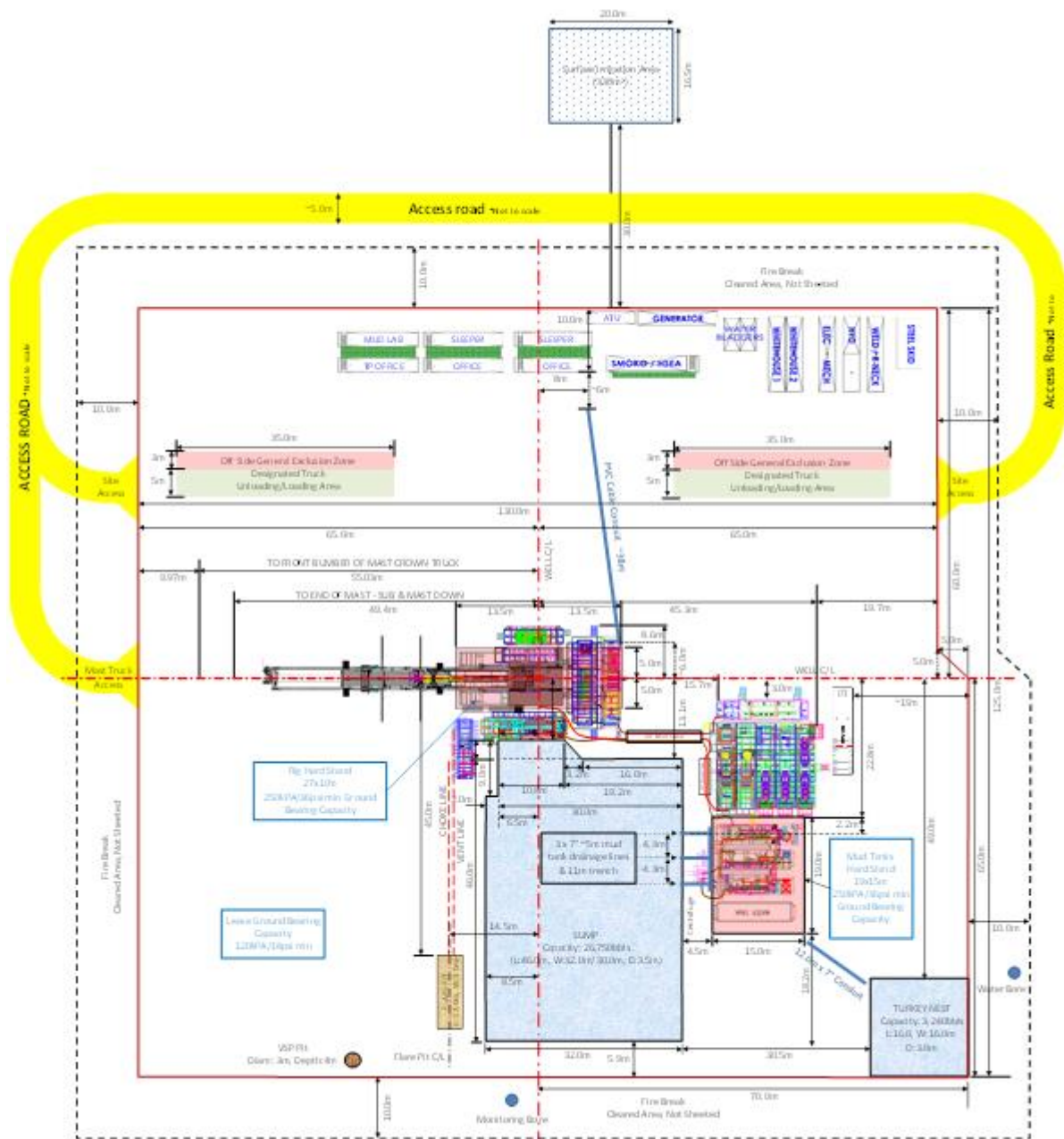


Figure 4. Typical Rig 970 Site Layout

2.6 Drill Rig – Rig 970

The Ensign Rig 970 is an automated drilling rig (ADR) 1500 with a 41 m mast height capable of racking up to 208 stands of drill pipe and with a drawworks capacity of 1500 hp.

Rig 970 includes a Site mini-camp with accommodation for six operationally critical staff.

For further details refer to the Safety Case.

2.7 Main Camp

An ASCO mobile Camp, will be used to accommodate personnel working on the Project and be typically located within 35kms travel distance to the Well Sites. This Camp has a capacity to accommodate up to 52 personnel.



Figure 5. ASCO Mobile Camp Photo

On arrival at the Camp Site, personnel will be required to register with the Camp Manager and complete an ASCO Camp induction.

Each person will be allocated a room, with their room number maintained in the Camp kitchen by the Camp Manager. On final departure from the Main Camp, each person must advise the Camp Manager accordingly and their names removed from the Camp personnel register.

To minimise traffic between the Camp and the Well Site, primary crew changes will be provided by the ASCO minibus.

3 SAFETY MANAGEMENT SYSTEM

The following section describes the Project specific process and agreed bridges between the approved MinRes Energy SMS and Safety Case.

A HSEMS Bridging Table is attached in Appendix 1 of this document.

3.1 Ensign HSE Management System Overview

The Ensign HSEMS, including on-site maintenance and operation of drilling units, is certified to AS/NZS ISO 45001:2018 and is based around seven elements (refer to Table 1 below).

Table 1. Ensign HSEMS elements and document framework

Element	Policy, Manuals and Procedures	
1 Leadership & Commitment	HSE Policy 1.0 HSES Manual	1.1 Mental Health & Wellbeing 1.2 *Leadership Visits
2 Policy	2.0 Policy Manual	2.1 Policy Development
3 Organisation Resources	3.1 Training and Development 3.2 Employee Information 3.3 Document Change 3.4 Legal and Other Compliance 3.5 Register of Legal Compliance	3.6 Evaluation of Legal Compliance 3.7 Corrective Preventive Actions 3.8 HSE Document Control 3.9 Document Retention and Records Management
4 Risk Management	4.1 Risk Management 4.2 Personal Protection Equipment 4.3 Environmental Management 4.4 Dangerous Goods Management 4.5 Land Transport Management 4.6 Subcontractor Management 4.7 Plant and Equipment	4.8 Pressure Systems 4.9 Confined Space 4.10 Fatigue Management 4.11 Waste Management 4.12 Hazard Management 4.13 Air Transport Management 4.14 Process Safety Asset Integrity
5 Planning & Implementation	1 HSE Planning 5.2 Consultation and Communications 5.3 Permit to Work 5.4 Fall Protection 5.5 Slings and Lifting Equipment 5.6 Management of Change 5.7 Health and Medical Management 5.8 Injury Management & Rehabilitation 5.9 Emergency Planning 5.10 Travel Security 5.11 Isolation, Lock-Out, Tag-Out & Testing	5.12 Noise / Hearing Conservation 5.13 Hazardous Substances 5.14 Manual Handling Tasks 5.15 Hygiene Management 5.16 Heat Stress Management 5.17 Electrical Work Safety 5.18 Radiation 5.19 Dropped Object Prevention 5.19 Dropped Object Prevention 5.20 *Job Safety Analysis 5.21 Exclusion Zone & Barricading 5.22 Short Service Employees 5.23 Hydrogen Sulphide Management
6 Monitoring Implementation	6.1 Monitoring, Measuring & Reporting 6.2 *Incident Response and Reporting	6.3 * Incident Investigation 6.4 * Incident Review Board
7 Audit and Management Review	7.1 Auditing Procedure 7.1b Audit Procedure OHSAS 18001-2007	7.2 Management Review

*Ensign Global Procedures

3.2 ASCO HSE Management System Overview

The ASCO Main Camp is operated under the ASCO HSEMS with the Camp Manager as Site PIC. Key ASCO HSE processes are:

- *ASCO Safety Management Plan (PL-AUS-HSEQ-01)*
- *ASCO Remote Camps Operations Manual (OP-AUS-CMP-01)*
- *ASCO Camp Emergency Response Plan (ERP-CMP-HSEQ-01)*
- *ASCO Environment Management Plan (PL-AUS-HSEQ-06)*

3.3 Leadership and Commitment

3.3.1 Policy and Leadership

MinRes Energy and Ensign are committed to ensuring that the health and safety of employees, contractors and visitors is protected throughout the Activity by controlling risks to SFAIRP in line with corporate policy objectives. Both companies also adopt a systematic approach to managing the potential impacts of operations on the environment, the community and heritage values.

MinRes Energy and Ensign's policies are endorsed by senior management who continue to take direct responsibility for implementation and maintenance of these policies, which include the health and safety policy (refer to Appendix 2).

Policies will be displayed in prominent locations at the Site. These locations include:

- Ensign Rig Managers Office
- WSS Office
- HSEA Office
- Crib Room
- Main Camp

Policies will be communicated to personnel, contractors and visitors during inductions.

3.3.2 Stop Work Authority

Both MinRes Energy and Ensign support the Stop Work Authority (SWA).

All personnel on the Project have the authority to stop work if they believe it is unsafe to proceed. The stop work will be reported to and recorded by the Rig Manager. Work can only resume when all involved parties have assessed the situation and identified appropriate controls to a level that is both acceptable and SFAIRP.

References:

- Ensign EN-AUS-POL-023 *Stop Work Authority Policy*

3.3.3 Objectives and Targets

MinRes Energy is committed to achieving a high-performance standard in HSE and has set the Project objectives and targets in consultation with Ensign - refer to Table 2 below. KPIs will be communicated at the pre-spud meeting and regularly reviewed during the Project.

Table 2. Project HSE KPIs

HSE Management System KPI	Measure	Target
Lead Indicators		
Compliance with this HSE Management System Bridging Document	Commitments Register	>90%
Risk Register Review	Commitments Register	100%
Corrective actions closed out by due date	Due date	90%
All HSE meetings held as per the schedule	Pre-Tour/Pre-Job Safety Meeting reports - Planned/Actual	90%
Stop Work Authority is communicated to all personnel working at Site	Inductions	100%
1 x Workplace Daily Inspection	Planned/Actual	100%
1 x Project Emergency Response Drill (desktop comms exercise)	Planned/Actual	100%
Lag Indicators		
Fatalities		0
Lost Time Injuries	LTI	0
Total Recordable Injuries	TRI	0
Random or For-Cause BAC testing on Site	BAC Test Report	100% 0 results

3.3.4 Organisation and Responsibilities

3.3.4.1 Organisation

The organisation structure for the Wellsite, including office-based support and the reporting relationships between the parties during the Activity, is defined in the below Project Operations HSE Organisation Chart provided in **Figure 6** below.

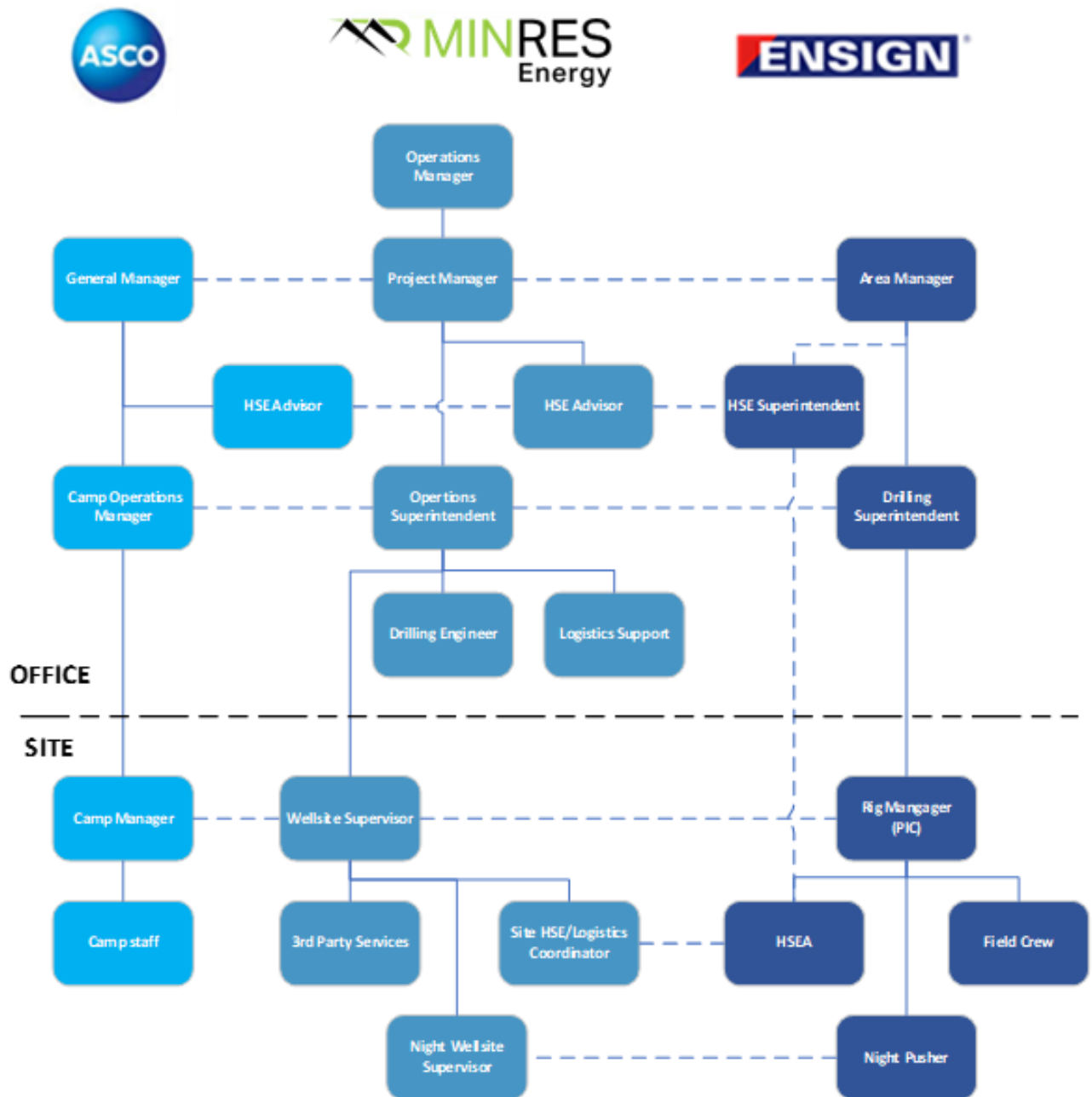


Figure 6. Project Operations HSE Organisation Chart

3.3.4.2 Responsibilities

Oversight and accountability to DMIRS for the Activity will be the responsibility of MinRes Energy with Site specific responsibility assigned as follows:

Well Site – On handover of the Well Site from MinRes Energy to Ensign:


- Ensign, as the Nominated Operator and Lead Contractor, will assume operational control of the Well Site which will be managed under the Safety Case
- The Rig Manager assumes the role of PIC as Operator's Representative at the Well Site
- The MinRes Energy WSS will direct and give guidance to the Ensign Rig Manager as to the objectives of the WMP but primary responsibility for drilling operations and well control remains with Ensign
- Site-based emergency response will be as per the Ensign Emergency Response Plan (ERP) with the Rig Manager filling the role of On Scene Commander, except where that role is assumed by emergency services or police (see Section 5 Emergency Response).




Camp Site:




- ASCO, as the Lead Contractor, has operational control of the Camp Site which will be managed under the ASCO HSEMS unless otherwise identified in this HSEMS-BD
- The Camp Manager assumes the role of PIC at the Camp Site
- Site-based emergency response will be as per the ASCO ERP with the Camp Manager filling the role of On Scene Commander, except where that role is assumed by emergency services or police.


Specific HSE responsibilities for the Activity are allocated to each role as described in **Table 3** below.

Table 3. HSE Roles and Responsibilities

Position	Responsibilities
 MinRes Energy Project Manager	<ul style="list-style-type: none"> • Ensure appropriate HSE management systems are in place to meet regulatory requirements and MinRes Energy standards. • Complete a hazard identification and risk assessment of the Activity with key Project, Lead Contractor and Third Party Contractor (TPC) personnel • Ensure all actions identified to reduce risks to SFAIRP are implemented. • Ensure the required regulatory approvals for HSE management are obtained prior to commencement of the Activity. • Ensure adequate resources are available to manage the work in accordance with the SMS and this HSEMS-BD

Position	Responsibilities
 MinRes Energy Operations Superintendent	<ul style="list-style-type: none"> • Ensure this HSEMS-BD is effectively implemented for the Activity • Supervisory responsibility for the drilling operation and all MinRes Energy personnel on Site • Conduct a pre-spud meeting at the Site to reinforce the MinRes Energy HSE and operational objectives for the Activity with the Rig crew and other third-party contractor personnel involved in the Activity • Monitor and assess HSE performance throughout the Activity • Ensure that appropriate communications are in place between MinRes Energy and other local stakeholders, and to keep them informed of Project issues and developments that may affect their activities.
 MinRes Energy WSS	<ul style="list-style-type: none"> • Continuously monitor effective implementation of all aspects of the Project HSE management plans and this HSEMS-BD ensuring they are consistent with the agreed operational standards throughout the Activity • Ensure site inductions are provided to all MinRes Energy service providers prior to the performance of any Site work • Maintain interface and communication links between Site and office-based MinRes Energy management and personnel • Provide daily reports and updates on the Activity HSE performance • Ensure environmental procedures specific to this Activity are adhered to by all personnel entering the Sites • Support effective management of any incidents at the Sites and ensure all incidents are reported to MinRes Energy management in Perth at the soonest reasonable opportunity
 MinRes Energy Site HSEL Coordinator	<ul style="list-style-type: none"> • Support the WSS to ensure correct implementation of the HSEMS-BD • Monitor and support the effective implementation of Safety Case and processes relevant to all Activity being undertaken at the Site • Routinely inspect the Sites to ensure that appropriate corrective actions relating to statutory or management system non-compliance and/or substandard work practices, are implemented • Provide guidance to all personnel on Site with a focus to achieving the HSE objectives of the Project

Position	Responsibilities
 Ensign Rig Manager	<ul style="list-style-type: none"> Operator's Representative under the Safety Case - PIC at the Well Site for the drilling and completion Activity including during emergencies. Ensure all relevant aspects of the Safety Case are implemented at the Well Site Ensure an Ensign Well Site induction is provided to all personnel working at the Well Site prior to commencing work Ensure safe execution of the Project Activity in accordance with SOPs and the works program Ensure all legislative regulatory and other standards, including environmental standards and procedures, specific to the Activity are adhered to by all personnel and sub-contractors entering the Well Site Provide daily reports and updates to MinRes Energy in accordance with reporting requirements
 Ensign Site HSE Advisor (HSEA)	<ul style="list-style-type: none"> Co-ordinate Ensign's HSE initiatives at the Well Site Provide regular reports to the HSE&T Superintendent on safety performance, incidents, and other HSE issues Provide HSE advice and guidance to Site based personnel Conduct Site inspections and prepare inspection reports Conduct and record regular emergency drills as per schedule Monitor and report on Ensign's compliance with relevant legislative requirements Advise and assist supervisors in the investigation of any workplace injuries, illnesses or dangerous occurrences Review incident reports and follow up actions arising from these reports. Provide input and advice on HSE considerations in relation to the MOC process Identify and recommend HSE training and development activities and promotions. Conduct Well Site inductions and specific safety awareness training. Effectively assist Ensign Human Resources Group in managing injuries and rehabilitation programmes to ensure early recovery and return to work. Maintain HSE records and statistics. Liaise with the MinRes Energy WSS (as directed by the Rig Manager) on all relevant HSE issues.
 MinRes Energy Project HSE Advisor	<ul style="list-style-type: none"> Develop and maintain this HSEMSBD and supporting MinRes Energy systems Facilitate the risk management process including HAZID workshops and MOCs Develop and maintain the compliance register

Position	Responsibilities
	<ul style="list-style-type: none"> • Provide HSE support to the Project Manager and Project team members • Provide support for incident investigations as required
 ASCO Camp Manager	<ul style="list-style-type: none"> • Ensure all aspects of the ASCO HSEMS are implemented at the Main Camp • Manage the day-to-day maintenance and operations of the Camp • Provide a Camp induction to all personnel being accommodated at the Camp on their first arrival • Manage safe operations of ASCO employees during the Activity • Act as On Scene Commander for Camp emergencies

3.3.5 Employee Involvement and Communications

3.3.5.1 General

The Project team will seek the involvement of Project personnel in the development and evolution of the HSE management for an Activity through the identification and control of HSE aspects of the Site. Employee involvement is recognised as an opportunity to contribute to the continuous improvement of the HSE management of the Activity.

Suitable on-site communications for normal operations and emergency response will be provided, consisting of:

- Voice communications between Site personnel, the Well Site, the Camp Site and the MinRes Energy Perth Project offices by mobile phone.
- Data communications between Site personnel, the Well Site, the Camp Site and the MinRes Energy Perth Project offices by Telstra 3G or 4G network.
- Office-based MinRes Energy and Lead Contractor personnel involved in day-to-day operational support and emergency response management will be equipped with mobile phones to facilitate after-hours communication.
- Alternative communications will be via UHF radios and satellite phone.

3.3.5.2 Project HSE Communications

In addition to the communication described in the Safety Case, key Project meetings will be held as described in **Table 4** below

Table 4. Key Project HSE Meetings

Description	Frequency	Responsible	Attendees	Estimated Duration
Project HAZID Workshop	Prior to commencement of the Activity	MinRes Energy	MinRes Energy, Ensign Service Providers	½ Day
Project Introduction / DWOP	Prior to commencement of the Activity	MinRes Energy	MinRes Energy, Ensign Service Providers	¾ Day
Site Pre-spud Meeting	Prior to commencement of drilling operations	MinRes Energy	Site Personnel	2 hours

3.3.5.3 Consultation

In accordance with MinRes Energy and Ensign policies and WA legislation, MinRes Energy and Ensign will consult with their employees and contractors regarding health and safety matters.

The Project will support and collaborate with Site Safety and Health Representatives (where elected) and Safety and Health committees (where established).

Reference:

- MinRes Energy *Communication HSEQ 1.07*
- Ensign EN-AUS-HSE-P-5.02 *Consultation, Meetings and Communications*

3.3.6 Training and Competency

MinRes Energy and Ensign have the responsibility to ensure their respective management, supervisors, employees and contractors have the necessary skills and knowledge to advise and enforce compliance of the Site HSE system requirements. To meet this requirement:

- Personnel working on Site will be appropriately trained relevant to the scope of work in which they are engaged.
- No person is to execute work, which requires a permit, license and/or certificate unless that person has received relevant training and possesses the relevant authorised permit, license and/or certificate.

Well control competencies are described in Table 5.

Copies of certificates will be provided to MinRes Energy.

Table 5. Minimum Well Control Certification Requirements

Position	Company	Certificate
Operations Superintendent	MinRes Energy	WellCap or IWCF - Supervisor level
Wellsite Supervisor	MinRes Energy	WellCap or IWCF - Supervisor level
Drilling Superintendent	Ensign	WellCap or IWCF - Supervisor level
Rig Manager	Ensign	WellCap or IWCF - Supervisor level
Night Tool Pusher	Ensign	WellCap or IWCF - Supervisor level
Driller	Ensign	WellCap or IWCF - Driller level
Assistant Driller	Ensign	WellCap or IWCF - Driller level

References:

- Ensign EN-AUS-Pol 022 *Training and Development*
- Ensign EN-AUS-HSE-P-3.01 *Training and Development*
- National Training Package RII – Drilling Onshore
- Ensign Rig 970 *Training Standard Matrix*

3.3.7 Project Inductions

As well as the Rig's site induction, all personnel will complete a Project induction covering:

- Project summary
- HSE policies
- HSE expectations
- Stop work authority
- Project HSE management
- Risk assessment, risk management and MAEs
- COVID-19 management (as appropriate)
- Journey management
- Environment Plan
- Oil Spill Contingency Plan
- Emergency Response

3.3.8 Site Inductions

Ensign will provide a Site-specific induction for all personnel before commencing work at the Well Site.

ASCO will provide a Site-specific induction for all personnel before being accommodated at the Camp Site.

3.4 Visitors

Visitors to Site require the written approval of the Operations Superintendent and must report to the Rig Manager on arrival at the Site.

Visitors to the Well Site will, as a minimum, receive a Well Site visitor's induction prior to being able to move around the Site away from the Rig Manager's office area. All visitors who have only received the Site visitor's induction must always be accompanied by a fully inducted person while on the Site.

Day visitors to the Camp Site who have not received the Camp Site induction must always be accompanied by a fully inducted person while on the Site.

Transportation providers will be considered as visitors to the Sites.

3.4.1 Access to the Well Site and Site Security

Unauthorised access will be managed under the Ensign ERP. Where trespassers refuse to leave the Site, local police will be called to manage.

3.5 Planning and Implementation

3.5.1 Hazard Identification and Risk Management

The *MinRes Energy Risk Management Standard* (EOC-SAF-STD-0002) applies to:

- Project execution risk (high level)
- Environmental risk assessment
- Well design and integrity
- Project specific health, safety and system interface risk.

The *Ensign Risk Management Procedure* (EN-AUS-HSE-P-4.1) applies to the existing Ensign hazard register and the management of ongoing drilling rig operational risk.

Both systems apply the hierarchy of controls when assessing control effectiveness and identifying additional controls to reduce residual risk – refer to **Figure 7** below.

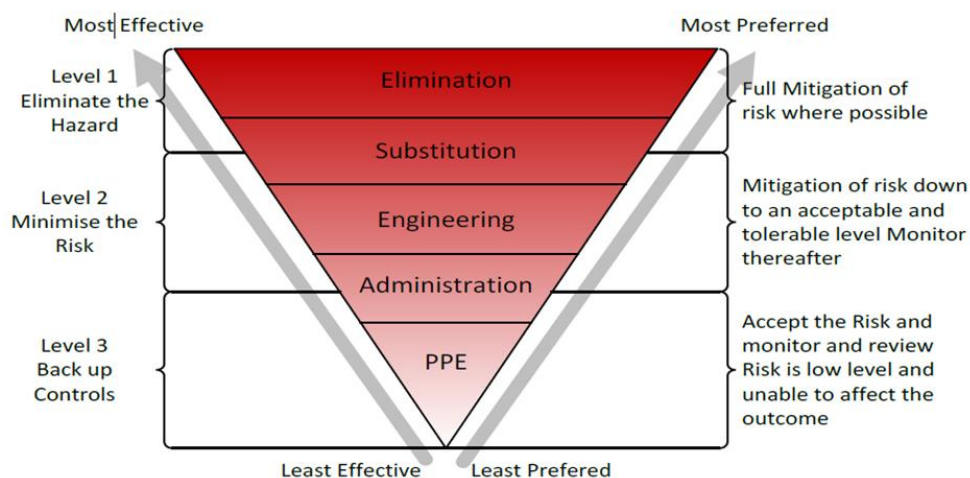


Figure 7. MinRes Energy Hierarchy of Controls

References:

- Ensign EN-AUS-POL-002 *Risk Management*
- Ensign EN-AUS-HSE-P 4.1 *Risk Management Procedure*
- Ensign EN-AUS-HSE-P-4.14 *Process Safety and Asset Integrity Procedure*
- Ensign Rig 970 – *Risk Register*
- MRL MRL-SAF-PRO-0014 *Hazard and Risk Management Procedure*
- MinRes Energy EOC-SAF-STD-0002 *Risk Management Standard*
- MinRes Energy Project Risk Register

3.5.2 Document and Records Management

Regulatory required documentation generated specific to the Project by the MinRes Energy Project Team will be managed through the MinRes Energy Project document control process.

The Project Manager is responsible for ensuring Project documentation is effectively controlled through the document control process.

As per WHS(PAGEO)R r.31 and r.50:

- A copy of the accepted HSEMS-BD along with the associated HSEMS documents must be kept for a period of 5 years after the date of acceptance.
- A copy of any written audit report of this HSEMS-BD must be kept for a period of 5 years.

During the Activity, MinRes Energy and Lead Contractors will maintain records relating to the ongoing operational and HSE performance for the Activity and make these available for audit and reviews as required.

References:

- MinRes MRL-SAF-STD-0009 *Document Control and Records Management*
- Ensign EN-AUS-HSE-P-3.8 *HSE Document Control*
- Ensign EN-AUS-HSE-P-3.9 *Document Retention and Records Management*

3.5.3 Design and Construction

Design of the Wells is managed by MinRes Energy as documented in the DMIRS approved WMPs and in accordance with Project and industry standards. Key stakeholders are invited to attend a workshop at which the Well design and implementation plan is reviewed prior to commencement of Well operations.

Ensign is responsible for review of the WMP to ensure the plan is compliant with Ensign's operating standards and subsequent construction of the Well as designed with implementation oversight by MinRes Energy.

3.5.4 Handover

MinRes Energy will hand management control of the Well Site over to Ensign prior to the start of the Activity. Site handover is via formal acknowledgement by both parties using a signed MinRes *Site Handover Form*.

Following completion of the Activity, the Site will be formally handed back to MinRes Energy and the MinRes Energy SMS re-instated as the in-force SMS at the Site.

References:

- MinRes Energy MERL-SAF-FRM-008 *Site Handover Form*

3.5.5 Management of Change

A change management process is required where a significant variation to any approved plan, procedure or practice, a change to HSE critical equipment, or a change to a HSE critical position is proposed that has the potential to impact the management of HSE, quality or technical requirements for the Activity.

Changes to the approved WMP, key contractors or temporary changes to a commitment made under a permissioning document, will be managed under the MinRes Energy *Management of Change (MOC) Standard*.

All significant modifications or changes to the rig equipment or its standard operating procedures will be carried out in accordance with the Ensign MOC procedure.

All significant modifications or changes to the Camp equipment or its standard operating procedures will be carried out in accordance with the ASCO MOC procedure.

References:

- MinRes Energy ECO-SFA-STA-0001 *Management of Change Standard*
- Ensign EN-AUS-HSE-P-5.06 *Management of Change Procedure*
- ASCO HSEQP033 *Management of Change Procedure*

3.5.6 Contractor Management

MinRes Energy and Ensign are each responsible for managing their contractors, including subcontractors, in a way that does not cause injury to people, damage to plant and equipment or the environment and that ensures no other detrimental impact on the Activity.

Contractors are accountable for:

- Promoting, demonstrating and building commitment to manage risks to SFAIRP
- Demonstrating personal leadership and commitment by visiting work sites regularly and engaging with all contractor personnel
- Complying with all Site HSE requirements
- Preparing and submitting to the contracting party specific HSE management documentation required for the completion of the Project Activity prior to working on Site
- Meeting with the Rig Manager and WSS before starting work on Site to confirm HSE requirements
- Ensuring all contractor provided plant and equipment used on or in connection with the Activity is fit for purpose, meets Site-specific standards and holds all required compliance/maintenance records for such plant and equipment

- Ensuring all works under the Activity are completed in a safe manner
- Supporting, attending and contributing to any incident analysis.

References:

- Ensign EN-AUS-HSE-P-4.6 *Subcontractor Management*
- Ensign *Third Party Contractor Checklist*

3.5.7 Journey Management

All travel to and from Site by light vehicle greater than 2 hours will be covered by the driver's organisation's journey management procedures. Where there is no journey management procedure covering TPC personnel travel to Site, the MinRes Energy Project Journey management process will be used.

References:

- MinRes MRL-SAF-PRO-0035 *Journey Management Procedure*
- Ensign EN-AUS-HSE-P-4.05 *Transport Management, Land and Air Procedures*
- ASCO FRM-AUS-HSEQ-10 *Journey Management Plan*

3.5.8 COVID-19 Management

COVID-19 controls for the Activity will be maintained in compliance with the latest Australian Department of Health, Western Australian Department of Health and Western Australian Government regulations and restrictions in force.

A COVID-19 Management Plan may be developed to ensure the Activity is conducted in a manner to minimise the risk of spread of the virus among the work force and within the general community.

References:

- MinRes MRL-SAF-PRO-0092 *Infectious Diseases Management Procedure*

3.5.9 Standard Operating Procedures

Ensign Standard Operating Procedures (SOPs) apply on the Well Site and other operations under Ensign management to support the implementation of Ensign Corporate, Vision, HSE Policy, Global HSE Standards and Procedures. Applicable SOPs are listed in the Safety Case.

3.5.10 Permit to Work

Ensign will use the Wellsite Permit to Work Rev 3 on the Well Site.

The Rig Manager / Tour Pusher is the Wellsite Permit Authority for all permits.

The WSS will review and sign permits raised at the Well Site during the Activity.

Ensign is responsible for ensuring the training and competency of all personnel, including contractors, using the Permit to Work system at the Well Site throughout the Activity.

References:

- Ensign EN-AUS-HSE-P-5.03 *Permit to Work*
- WPTW Rev3 Handbook

3.5.11 Confined Space Entry

Confined spaces, such as mud tanks and cellars (the cellar becomes a confined space after drilling has commenced when there is a potential for a hazardous atmosphere to be present) will be managed in accordance with the *Ensign Confined and Restricted Space Procedure*.

References:

- Ensign EN-AUS-HSE-P-4.09 *Confined and Restricted Spaces*
- Ensign EN-AUS-HSE-P-5.03 *Permit to Work procedure*
- WPTW Rev3 Handbook

3.5.12 Job Safety Analysis

Ensign has a Job Safety Analysis (JSA) process that will be used for:

- Jobs that have a history of or a potential for injury or harm to personnel
- New jobs or new equipment
- Jobs where new personnel are performing the task or the job is unfamiliar

TPCs, when required and specific to their equipment or task, may use their own JSA process.

Reference:

- Ensign EN-AUS-HSE-P-5.20 *Job Safety Analysis*

3.5.13 Radioactive Sources

Radioactive sources on Site are managed under the providing TPC's radiation safety plan.

Reference:

- Ensign EN-AUS-HSE-P-5.18 *Radiation Procedure*

3.5.14 Explosives

Explosives will only be handled at the Well Site by the suitably trained and licensed TPC personnel. The TPC will maintain a list of explosives on Site and ensure that the correct storage and transportation procedures are applied.

Reference:

- Ensign H-06.001 *Explosives*

3.5.15 Well Control

Well control and BOP testing will be managed as specified in the Ensign Well Control Manual and the relevant Well Management Plan. Ensign's W006 Well Control Standards will be implemented in the event of a well control situation.

References:

- Ensign EN-AUS-HSE-P-4.14 *Process Safety and Asset Integrity Procedure*
- Ensign W006 *Well Control Standards*
- MinRes Energy-DR-PL-07-1 *Well Management Plan for the Well*

3.5.16 Management of Waste Fuel, Lubricants and Hazardous Substances

MinRes Energy is responsible for the provision of waste management services on Site.

Management of waste, fuel, lubricants and hazardous chemicals are described in the W-EP.

The MinRes Energy WSS, in consultation with the Ensign Rig Manager, will be responsible for monitoring the storage and disposal of waste, ensuring it is in accordance with local shire, legislative and W-EP requirements.

Ensign is responsible for the implementation of the hydrocarbon spill practices described in the *North Perth Basin Well Operations* (OSCP EOC-EN-PLN-0005) at the Site should a significant spill occur.

References:

- The relevant Well Environment Plan
- MinRes Energy EOC-EN-PLN-0005 *North Perth Basin Well Operations OSCP*
- Ensign EN-AUS-HSE-P-4.11 *Waste Management*

3.5.17 Traffic Management

No unauthorised vehicles are permitted at the Well Site. All vehicles on Site will drive to the Site speed limit and observe all traffic controls imposed at the Site.

A designated parking area will be allocated at the Well Site where vehicles can park on arrival.

There are two designated truck loading and unloading areas identified at the Well Site. Loading, unloading exclusion zone principles will be applied to ensure the separation of people and vehicles.

Reference:

- Ensign EN-AUS-HSE-P-4.5 *Land Transport Management*

3.5.18 Materials Handling and Storage

3.5.18.1 Mobile Plant

Forklift trucks and front-end loaders must only be driven by trained and competent licensed drivers.

The Site has two designated truck unloading/loading areas with off-side general exclusion zone. Other exclusion zones will be established and communicated as required.

Seat belts must always be worn while operating mobile plant fitted with a roll-over protection system.

Reference:

- Ensign EN-AUS-HSE-P-4.05 *Transport Management, Land and Air Procedures*
- Ensign EN-AUS-HSE-P-5.12 *Exclusion Zones & Temporary Barricading*

3.5.18.2 Hazardous Substances

Ensign will maintain a register of all hazardous materials and dangerous goods stored at the Well Site along with a complete compilation of Safety Data Sheets (SDSs) for each of these materials.

TPCs are required to complete the Third-Party Contractor Checklist, provide SDSs and submit to Ensign prior to mobilising hazardous substances to Site.

All hazardous materials on Site will be appropriately stored in compliance with its classification, SDS, applicable codes and regulations, and the W-EP.

References:

- Ensign EN-AUS-HSE-P-4.4 *Dangerous Goods Management*
- Ensign EN-AU-HSE-P-5.13 *Hazardous Substances*
- Ensign EN-AU-HSE-P-4.6 *Sub-contractor Management*

3.5.19 Lifting Operations

It is the responsibility of all personnel to ensure they, and all others working on the Site, use lifting equipment which is:

- Certified and approved in accordance with applicable regulations and Australian standards
- Suitable for the task
- In a safe condition

Ensign uses a tagging system on all lifting equipment including the lifting equipment of TPCs.

Lifting equipment is inspected by a competent person and tags are updated following inspection in accordance with the lifting/sling register.

If the equipment date is found to have expired or the equipment is damaged, it is withdrawn from service and reported to the Ensign Rig Manager and HSEA.

Personnel operating lifting equipment must be trained and competent in the use of the specific equipment item and in the case of crane operations, be assessed and hold the appropriate high-risk work licence for the class of equipment being used.

Where a crane may be required for TPC equipment lifts a competent third-party crane operator will be engaged.

References:

- Ensign EN-AUS-HSE-P-5.3 *Permit to Work*
- Ensign EN-AUS-HSE-P-5.5 *Sling and Lifting Equipment*
- Ensign EN-AUS-HSE-P-12 *Exclusion Zones and Barricading*
- Ensign EN-AU-HSE-P-4.6 *Sub-contractor Management*

3.5.20 Workplace Environment

3.5.20.1 Atmospheric Contaminants

Atmospheric contaminants will be managed on Site to comply with the requirements of Code of Practice – Managing risks of hazardous chemicals in the workplace 2008. Exposure standards will be determined from the Hazardous Chemicals Information System (HCIS) database.

Management of atmospheric contaminants at the Well Site will include:

- Gas detectors will be strategically placed in high-risk areas to detect gas emissions in the atmosphere and to alert of any hazards
- Dust suppression as required
- Equipment and plant which may cause particulates and emissions will be maintained in line with Ensign's maintenance systems to minimise contamination potential
- Specific respiratory PPE will be required for tasks that may involve personnel exposure to atmospheric contaminants and will be determined by SDS, JHA and SOP requirements.

Reference:

- Ensign EN-AUS-HSE-P-5.7 *Health & Medical Management Procedure*

3.5.20.2 Housekeeping

Ensign is responsible for maintaining housekeeping to a high standard at the Well Site. This includes:

- Rubbish and waste receptacles are in place and used
- Food waste will be disposed of appropriately so as not to attract rats, mice, snakes, insects, birds and other animals
- Access ways always kept clear of obstructions
- Leads/hoses are rolled up and stored when not in use
- Hazardous materials are stored appropriately
- Floors are maintained free from any build-up of dirt, grease etc
- Unserviceable/derelict equipment is removed to an appropriate quarantine storage area

MinRes Energy is responsible for the provision of bulk waste bins at the Well Site, waste collection and disposal, and will ensure:

- Bins will be available for the segregation of waste
- Bins will have suitable lids or covers to prevent rubbish from being blown out-and prevent wildlife entering

Reference:

- Ensign EN-AUS-HSE-P-4.11 *Waste Management Procedure*

3.5.20.3 Lighting and Ventilation

Ensign is responsible for maintaining suitable lighting and ventilation at the Well Site. All internal work areas will be appropriately lit and air-conditioned.

Lighting for night operations will be maintained to provide adequate visibility in all work and common pedestrian areas at the Well Site.

Reference:

- Ensign EN-AUS-HSE-P-5.7 *Health & Medical Management Procedure*

3.5.20.4 Noise and Vibration

Ensign will manage personnel exposure to noise, limiting exposure to 85 dB(A) averaged over an eight-hour period, 82 dB(A) over 12 hours or a peak noise level of 140 dB(C).

Where these values are exceeded, Ensign is responsible for taking all practicable measures to reduce the noise level by engineering noise control.

Ensign will report to MinRes Energy any concerns regarding any MinRes Energy contractor equipment that requires additional noise management measures to be implemented to reduce personnel exposure to excessive noise levels.

MinRes Energy will be responsible for addressing the issue with the MinRes Energy contractor and monitoring implementation of suitable controls.

Reference:

- Ensign EN-AUS-HSE-P-5.12 *Noise Pollution and Hearing Conservation*
- MinRes MRL-SAF-PRO-0096 *Exposure Risk Management Governance*

3.5.20.5 PPE

The minimum mandatory PPE for the Site is:

- Hard hat
- Reflective non-static coveralls or long-sleeved shirt and trousers
- Safety Glasses
- Gloves as appropriate to the task being performed
- Lace up steel capped safety boots (min 150mm high)
- Hearing protection for where signs indicate hearing protection is required
- Specific PPE where appropriate to the task being performed.

The WSS and the Rig Manager are responsible for ensuring their respective personnel, contractors and visitors either supply or are supplied with all PPE required for the protection of personnel at the Site for the task being undertaken.

References:

- Ensign EN-AUS-POL 017 *Personal Protective Equipment Policy*
- Ensign EN-AUS-HSE-P-4.02 *Personal Protective Equipment Procedure*

3.5.20.6 Working in Hot Climates

Ensign conducts in-house training to all crew members for the management of heat stress and heat stress awareness will be incorporated into the Well Site induction programs when appropriate.

References:

- Ensign EN-AUS-Pol 006 *Hours of Operation Policy*
- Ensign EN-AUS-Pol 012 *Exposure to Ultraviolet Radiation Policy*
- Ensign EN-AUS-HSE-P-5.16 *Heat Stress Management*

3.5.21 Fitness for Work

3.5.21.1 Medical Fitness

All personnel must report to work medically fit to safely conduct their work. Where personnel have an illness or are taking prescription or over the counter medications that may impair performance, they must notify their supervisor.

Personnel are notified of the requirement to report the taking of prescription medication which may impair work performance to their supervisor on arrival at site through both the MinRes Energy Project induction and Ensign Site induction.

Reference:

- Ensign EN-AUS-HSE-P-5.7 *Health & Medical Management Procedure*

3.5.21.2 EpiPens

Individuals who are required to carry an EpiPen must notify their supervisor and the Ensign HSEA of their specific sensitivities and location of their EpiPen(s). It is considered prudent to bring additional EpiPens to Site. This requirement is communicated in the Project induction.

3.5.21.3 Fatigue

The Ensign Rig Manager, WSS, Site HSEL Coordinator and all senior contractor personnel on Site are responsible for monitoring their own and their subordinates work hours to ensure work hours are maintained within those specified in the respective companies OH&S requirements and in compliance with the below guideline.

To minimise the effects of fatigue the following minimum standards will apply during the Project:

- Site based personnel usually work a 12-hour shift. In exceptional circumstances, personnel may be asked to work in excess of 12 hours but not for more than 3 consecutive days
- Work in excess of 14 hours requires the approval of the PIC
- The absolute maximum hours that can be worked is 16 hours in a 24-hour period
- A least 8 hours of rest must be provided between shifts
- A continuous work period on Site should not exceed 28 days without a minimum of 7 continuous days of rest away from the Site.

References:

- Ensign EN-AUS-HSE-P-4.10 *Fatigue Management*
- Ensign EN-AUS-POL-006 *Hours of Operation*

3.5.21.4 Drugs and Alcohol

There is a zero tolerance for alcohol and illicit drugs on Site. Personnel taking prescription medication that may affect their ability to undertake works or drive vehicles during the Project will be required to declare these to their supervisor as part of their Fitness for Work and managed accordingly.

MinRes Energy and the Lead Contractors reserve the right to conduct drug and alcohol testing at random or for cause.

All Ensign personnel will undergo a daily pre-start alcohol breath test with a required blood alcohol content (BAC) of 0.00%.

References:

- MinRes Energy EOC-STA-STD-0004 *Drug and Alcohol Management Standard*
- Ensign EN-AUS-POL-011 *Fitness for Work – Alcohol & Other Drugs Policy*
- Ensign *Fitness for Work Questionnaire*

3.5.22 General Health and Wellbeing

It is important that a healthy workplace is maintained, and this will be communicated through inductions and safety meetings. This includes providing nutritious food options, making sure the workforce remains well hydrated and understands the dangers of heat stress, ensuring there are appropriate rest and recreation facilities, and controlling health hazards so that the risk is SFAIRP.

Psychosocial hazards will be identified as part of the risk management process and controls put in place for the Project, including:

- Pre-employment drug and alcohol screening
- Fatigue management
- Code of Conduct / Respectful behaviours (Harassment and bullying policy)
- Pre-tour meetings – discuss workload
- Safety committee (when in place)
- Safety meetings
- Employee Assistance Program

These will be communicated through inductions, training and health and well-being programs throughout the Project. Project personnel will be encouraged to check-in on their mates and make proactive use of Employee Assistance Programs.

References:

- Ensign EN-AUS-POL-025 *Mental Health & Wellbeing Policy*
- Ensign Global-003 - *Harassment, Discrimination and Bullying Policy*
- Ensign EN-AUS-HSE-P-1.01 *Mental Health & Wellbeing*
- Ensign EN-AUS-HSE-P-5.7 *Health & Medical Management Procedure*

3.5.23 First Aid Facilities and Access to Medical Services

First aid kits at the Well site are in the Rig Managers office, the doghouse and the lunchroom, as well as all Ensign vehicles.

Rig 970 has four eye wash stations and two safety showers.

In addition to standard occupational first aid equipment there are two automated external defibrillators and three snake bite kits available at the Well Site.

The Well Site HSEAs hold St Johns Occupational First Aid certificates.

Medical facility details can be found in the Emergency Response Contact List.

Reference:

- Ensign EN-AUS-HSE-P-5.7 *Health & Medical Management Procedure*
- Ensign *Emergency Response Contact List*

3.6 Monitoring and Evaluation

3.6.1 Workplace and Site Inspections

Rig safety inspections will be conducted as described in the Safety Case.

Ensign HSEAs will conduct regular safety inspections as per Project Audit and Inspection schedule.

MinRes Energy will conduct rolling audits of both the Well Site and Camp Site against the requirements in this HSEMS-BD, commensurate with the Project duration.

Reference:

- Ensign EN-AUS-HSE-P-6.01 *Monitoring, Measuring and Reporting*

3.6.2 Integrity Management

All periodic inspections, certification of critical equipment and HSE audit / inspection schedules will be managed through Ensign's preventative maintenance system and will be in accordance with the appropriate standards.

All well control equipment tests are recorded on the IADC Daily Drilling Report.

An inspection and review of Rig 970 equipment and processes was undertaken by an independent rig inspection company in accordance with reg 21(2)(e) of the PAGER(MOS)R prior to the commencement of the Strike Energy 2020 / 2021 Project in the north Perth Basin and again in July of 2021 by MinRes Energy immediately prior to the commencement of drilling the Lockyer Deep-1 well.

All corrective actions resulting from the inspection were closed out to the reasonable satisfaction of MinRes Energy.

A new 3rd party inspection may be conducted on the drilling rig prior to commencement of the drilling operations on the Wells. Verification of any critical and major corrective action closeouts will be reviewed prior to spud of the Wells. The WSS, in conjunction with the Rig Manager, will conduct a pre-spud inspection using the Ensign checklist.

References:

- Ensign EN-AUS-HSE-P-6.01 *Monitoring, Measuring and Reporting*
- Ensign EN-AUS-HSE-P-4.14 *Process Safety and Asset Integrity Procedure*

3.7 Incident and Hazard Reporting and Investigation

3.7.1 Reporting

All incidents, including near misses, must be reported to the Well Site PIC and the MinRes Energy WSS in accordance with **Table 6**.

Note that notification and investigation consider the potential consequences of the incident, that is, the worst credible consequences in slightly different circumstances.

Table 6. Incident Notification Matrix

Consequences		Notification
Actual	Potential	
Minor	Low	Rig Manager advises WSS verbally as soon as practical and before end of shift. Recorded on DDR and HSE Scorecard
Low	Medium	Rig Manager notifies WSS verbally as soon as practical (within 2 hours) WSS notifies Operations Superintendent verbally as soon as practical (within 2 hours) Incident Report Form to be provide as soon as practical (within 4 hours)
Medium	High (HiPo)	Rig Manager notifies WSS immediately WSS notifies Operations Superintendent/Project Manager immediately Project Manager notifies DMIRS as required Activate emergency response as required – See ERIP
High/ Extreme	Extreme	For fatality PIC notify police immediately WSS notifies Operations Superintendent/ Project Manager immediately Project Manager notifies DMIRS Activate emergency response

Note: incidents of medium actual consequences and some safety related incidents of medium potential may be reportable to DMIRS

References:

- Ensign EN-AUS-HSE-P-6.02 *Incident Reporting and Investigation*
- Ensign MS15-PRO1.1 *Incident Response, Notification, Reporting, Classification and Claims Procedure*

- Ensign EN-AUS-HSE-P-4.14 *Process Safety and Asset Integrity Procedure*

3.7.2 Investigation

The level of the investigation and investigation team make-up will be determined by the potential consequences of the incident in **Table 7** below.

Table 7. Investigation Levels

Incident Potential	Investigation		Requirements
	Level	Method	
Minor	-	Report only	Not routinely investigated but may be, at Ensign or MinRes Energy management discretion, where it has been determined the value of the learnings outweighs the cost
Low / Medium	1	5 Whys	Conducted by Ensign
	2	TapRoot	Led by Ensign but may have MinRes Energy input / participation
High / Major	3	TapRoot	Led by Ensign with active participation of MinRes Energy Must have trained and experienced investigation facilitator Team members should be independent with no direct supervisory relationship with key people involved Should include a team member with an understanding of human and organisational factors MinRes Energy may conduct independent investigation

References:

- Ensign EN-AUS-HSE-P-6.02 *Incident Reporting and Investigation*
- Ensign EN-AUS-HSE-P-6.03 *Incident Investigation*
- Ensign EN-AUS-HSE-P-4.14 *Process Safety and Asset Integrity Procedure*
- Ensign EN-AUS-HSE-P-6.04 *Incident Review Boards*
- MinRes Energy MRL-SAF-PRO-0007 *Incident Management Procedure*

3.7.3 Recording

Rig 970 uses the Ensign Online Incident Reporting Program (EHS Insight), to capture and manage all incidents that occur on the Well Site. An initial report is entered into the system to advise management immediately by group email that an incident has occurred. Information regarding the actions taken at the time of the incident and further preventative actions can be added along with supporting evidence such as photos and statements.

MinRes Energy will maintain copies of all incident records on the INX-InControl database.

3.7.4 DMIRS Notification

Health and safety incidents (dangerous incidents and occurrences) will be reported to DMIRS by Ensign as described in the Safety Case.

Environmental incidents will be reported by MinRes Energy in accordance with the approved W-EP (Appendix 3).

Well integrity events will be reported by MinRes Energy in accordance with the approved WMP (Appendix 3).

3.8 Safety and Health Information and Reports

Ensign, unless otherwise agreed or requested in writing, will provide copies of the relevant Site related information as scheduled in **Table 8** to MinRes Energy WSS and Operations Superintendent.

Table 8. HSE Reporting

Description	Duration
HSE report, Stop Work & Hazard observation cards	Daily
HSE training records	On request
Serious hazard / incident injury and HSE-related property damage, loss and/or Project interruption investigation reports	<i>See Incident Notification Matrix</i>
Injury statistical information: Numbers of Non-Lost Time Incidents MTIs LTI TRIs TRI Frequency Rate LTI Frequency Rate Hours worked	Monthly
Workplace Inspection Reports / Corrective Actions	Monthly
SDS Register	On request
JSA for each element of operational / maintenance activity	On request
Specific licenses, permits, certifications and/or registrations for the conduct of operational / maintenance activity	On request
Plant and equipment operating manuals, and inspection and maintenance records	On request
Environmental performance statistics	Monthly

4 Audits, Review and Continual Improvements

MinRes Energy and Ensign will undertake active monitoring and review throughout the Project to ensure all HSEMS standards and procedures are in place and effective. These will be conducted as per MinRes Energy and Ensign Audit Schedules. Any non-conformances and opportunities for improvement will be identified and managed under appropriate MinRes Energy and Ensign HSEMS procedures and systems to ensure effective close-out of identified actions.

A Commitments Register has been developed based on the approved MinRes SMS, this HSEMS-BD, the W-EP, OSCP and the Emergency Response Interface Document. The commitments documented in the Commitments Register will be managed by the MinRes Energy Project HSE Advisor and progressively monitored and closed out during the planning and operational phases of the Project.

Non-conformances and identified preventative and corrective actions and the assigned responsible person are recorded in the CAR. Actions must be Specific, Measurable, Accountable, Reasonable and Timely (SMART) with a target close out date assigned to each item. The MinRes Energy Project HSE Advisor will be responsible for monitoring performance against the CAR.

References:

- Ensign EN-AUS-HSE-P-6.02 *Incident Reporting and Investigation*
- Ensign EN-AUS-HSE-P-6.03 *Incident Investigation*

5 Corrective Action Register

The Ensign Online Incident Reporting Program (EHS Insight) will be used to track corrective actions resulting from incident investigations, routine inspections, hazard observations, etc during Well Site Activities.

Corrective actions that impact the broader Project scope or have Company level learnings will be recorded in the Project CAR.

6 Formal Safety Assessment

6.1 FSA Objectives

Safety, health and environmental hazards will be identified, assessed and managed to reduce the risk to personnel and the environment to SFAIRP. This requirement applies to all phases of the Project.

An integral task of risk management is the hazard identification and risk assessment process initiated through several forums during the planning phase and ongoing throughout the Project. This section further describes the process in relation to Project health and safety risks that are associated with the Activity but not covered specifically by the Safety Case. The hazard identification and risk assessment process in relation to the Project environment related hazards is addressed in more detail within the Project W-EP.

6.2 Risk Acceptance Criteria

The risk matrix and risk acceptance criteria are attached as Appendix 4.

6.3 Risk Assessment Review

MinRes Energy, Ensign and ASCO have existing hazard registers which are live documents.

These registers were reviewed by the Project team to assess those risks that relate to the Activity that are not covered either the Safety Case, the MinRes Energy SMS or the ASCO management system, in relation to MAEs.

These MAEs were then subjected to a workshop review by MinRes Energy on 22/01/21.

A subsequent Project HAZID workshop was held on third of June 2021, with members of the MinRes Energy Project team, Ensign personnel including representatives from the rig crew, and key TPC personnel. The focus of the HAZID was to review the previously identified MAEs and controls and identify and assess project specific hazards associated with the Activity, the locations or the general environment that may not be covered in the Ensign and ASCO risk registers.

A Project-specific HAZID Workshop will be held with representatives of the workforce prior to commencing in 2023/24. Actions identified at the HAZID Workshop will be recorded and tracked in the project corrective action register. The CAR will be monitored by MinRes management to ensure all HAZID actions are closed out as agreed during the HAZID.

6.4 Major Accident Events

Table 9 lists three additional MAEs that have been identified for the Activity that are not covered by the Rig 970 Safety Case. Note that, although these MAEs are not petroleum activities, they are assessed as Project related MAEs.

Table 9. Major Accident Events

No	MAE	Description
MAE-01	Motor vehicle accident	An accident involving a light vehicle (car, ute or 4WD) on public roads or access roads. Assumption is that the vehicle is carrying passengers or the accident involves other road users.
MAE-02	Dropped load during transit causing vehicle	A load (equipment and/or freight) is lost on a public road resulting in an accident involving other road users.
MAE-03	Camp Fire	Fire in the Main Camo

6.5 Demonstration of SFAIRP

The SFAIRP assessment for each MAE was based on good practice (*Risk Related Decision Making Framework – OGUK Guidance on Risk Related Decision Making (Figure 8)*) according to the following Project context:

- Type of activity
 - Well understood
 - Nothing new or unusual
 - Good practice is well defined

- Risk and uncertainty
 - Risks are well understood
 - Uncertainty is minimal
- Stakeholder influence
 - No conflict with company values
 - No significant media interest

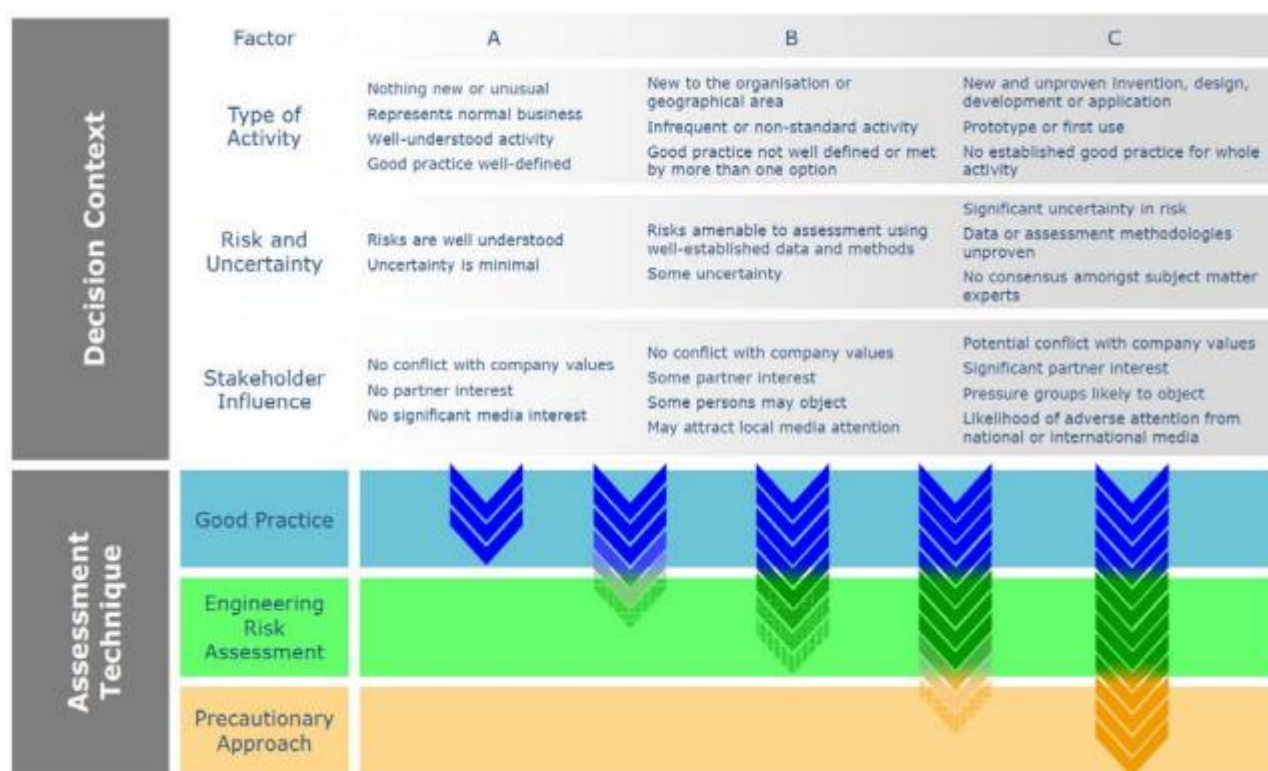


Figure 8. Risk Related Decision Making Framework (OGUK, 2014)

The preliminary SFAIRP assessments are detailed in Appendix 5. This assessment will be further reviewed and updated as required during the HAZID Workshop closer to the commencement of Project operations.

The MAEs are also graphically represented in a series of bowties diagrams (Appendix 6) which demonstrate the relationship between controls and each cause and consequence, the nature and effectiveness of controls, and those that are identified as safety critical.

6.6 Performance Standards

Performance standards for the safety critical controls associated with MAEs are listed in Appendix 7.

7 Environmental Management

Environmental management during the Activity will be in accordance with the approved W-EP which ensures the impact to the receiving environment of the Activity is reduced to SFAIRP.

The W-EP incorporates the following:

- Relevant environmental legislation
- Description of the Activity
- Description of the regional and local existing environments
- Assessment and protection of the receiving environment
- Stakeholder engagement, consultation processes and outcomes including
 - Native Title and Aboriginal Heritage compliance requirements
 - Land holder agreement
- An environmental impact identification assessment and mitigation measures
- The objectives, standards and criteria for the environmental management of the Activity
- The implementation strategy
- Reporting arrangements (internal and external).

The environmental management practices of Ensign have been reviewed to ensure they complement the general requirements of the MinRes Energy environment management standards to reduce the environmental impacts of the Activity on the receiving environment to SFAIRP.

It is the responsibility of MinRes Energy to ensure the requirements of the appropriate W-EP are suitably incorporated into the Activities and for ensuring all personnel working at or visiting the Sites are aware of the commitments made within.

It is the responsibility of the Lead Contractors to ensure the Site Activities under their respective control are conducted in compliance with the environmental standards and procedures as stated in their HSEMS and additionally to the commitments and procedures as specified in the appropriate W-EP.

8 Emergency Response

8.1 PIC

The Rig Manager, as PIC, will assume the role of on scene commander during an emergency at the Well Site, except where that role is assumed by emergency services or police.

The Camp Manager, as PIC, will assume the role of on scene commander during an emergency at the Camp Site, except where that role is assumed by emergency services or police.

The MinRes Energy WSS is responsible for ensuring an appropriate level of emergency response is being implemented at the Site where the emergency has occurred and to support the Site PIC in providing the most effective response.

8.2 Emergency Response Plan

Site based emergency response is managed under:

- Ensign Rig 970 Emergency Response Plan – WA
- Ensign Rig 970 Wellsite Emergency Response Plan
- ASCO Emergency Response Plan (ERP-CMP-HSEQ-01)

An *Emergency Response Interface Plan* (EOC-SAF-PLN-002-APX1) has been prepared by MinRes Energy specific to the Activity. This describes the interfaces between the Lead Contractor's emergency response processes and the *MinRes Energy Emergency Response Plan* (EOC-SAF-PLN-0002).

8.3 Exercises

A desktop emergency response exercise will be conducted annually during the Project. This exercise will test the office-based emergency response teams and the communication interfaces between both MinRes Energy and Ensign and the office and the field.

Any corrective actions arising from the exercise will be entered in the Project CAR.

Well control drills will be routinely conducted during well operations at a frequency determined by crew performance during these drills and other emergency response drill scenarios conducted weekly during well operations.

8.4 Well Control

A Well Control situation may progress through three phases which are described as follows:

Phase I (Alert)

Well has kicked and is being killed using normal well control procedures.

Phase II (Alert)

Well Control may not be achieved due to equipment failure or operational problems. When a Phase II alert is declared, all non-essential personnel are to evacuate the Well Site and assemble at the Designated Muster Station.

All attempts are to be made to control the Well, provided personnel safety is not jeopardised.

Phase III (Emergency)

Uncontrolled blow-out and control of the Well can no longer be regained. The crew, equipment, Well and environment is in imminent danger. Alarm is to be sounded. All personnel are to evacuate the Site and assemble at the Designated Muster Station. All personnel are to be accounted for.

In the case of Phase III emergency MinRes Energy will activate third party well control services.

8.5 Oil Spill Contingency Plan

Ensign is responsible for the implementation of the hydrocarbon spill practices described in the *North Perth Basin Well Operations* (OSCP EOC-EN-PLN-0005) at the Site should a significant spill occur.

Appendix 1 - HSEMS Bridging Table

Element	MinRes Energy	Ensign	ASCO
HSE Policies	X	X	X
Stop Work Authority		X	X
Project Objectives and Targets	X		
Training and Competency	X	X	X
Site Handover	X	X	
Management of Change	X	X	X
Contractor Management	X	X	X
Journey Management	X	X	X
Site Security		X	X
Site Induction		X	X
Project Induction	X		
SOPs		X	X
Incident Investigation	X	X	X
Environmental Reporting	X		
Health and Safety Reporting		X	X
Well Integrity Reporting	X		
Site-Based Emergency Response		X	X
Site-Based Well Control		X	
Third-Party Well Control	X		

Appendix 2 - MinRes Energy and Ensign HSE Policies

HEALTH AND SAFETY POLICY



Mineral Resources Limited (MRL) strives to incorporate health and safety as a culture, as a value, and as a priority for our employees, contractors, visitors and the communities within which we operate (our Stakeholders).

OUR COMMITMENT

Via our Health and Safety Policy (this Policy) we will:

- ▶ Conduct business in a healthy, safe, and sustainable manner in recognition of the fundamental role that Health and Safety plays in enabling and supporting MRL to achieve its Purpose, Vision and Values
- ▶ Comply with all applicable legislation, standards, and codes
- ▶ Maintain appropriate objectives and targets to continually monitor and improve safety within our business
- ▶ Maintain all necessary Safety Standards and Management Systems to assist us in conducting our business safely and effectively
- ▶ Regularly review and refine safety policies and procedures and ensure their efficient communication.
- ▶ Prevent injury through the early identification and management of hazards and operational risks
- ▶ Prevent occupational illnesses through the identification, assessment, and management of risk factors, and monitoring the health status of our workforce
- ▶ Ensure incidents are promptly managed and seize opportunities for corrective action
- ▶ Facilitate health and safety education and targeted training
- ▶ Provide and maintain employee awareness of MRL's expectations
- ▶ Ensure Stakeholders are treated with dignity, care, and respect
- ▶ Recognise the health and safety achievements and outcomes of our Stakeholders
- ▶ Ensure this Policy is appropriately communicated to all Stakeholders and is made available to interested parties.

OUR GOALS

Safety is an integral part of how we do business at MRL and, through our commitment to this Policy, MRL aims to protect the health and safety of all our Stakeholders.

OUR RESPONSIBILITY

We shall continue to:

- ▶ Prioritise our own individual health and safety and do all things possible to avoid adversely affecting the health and safety of any other person
- ▶ Take a proactive approach toward creating a safe and healthy work environment
- ▶ Seek continual commitment and development in improving our safety performance
- ▶ Ensure resources are made available to achieve our Commitment to this Policy.

This Policy will be reviewed every two years.



Derek Oelofse
Group Financial Controller and Company Secretary
25 January 2022



ENVIRONMENT POLICY

PURPOSE

As a leading Australian mining services, contracting and resource development company, Mineral Resources Limited (MinRes/the Group) is committed to environmental management that maintains our licence to operate in an environmentally responsible and sustainable manner.

SCOPE

This Policy applies to all MinRes Stakeholders, defined for this purpose as employees (including contractors and consultants) and Directors for all entities within the Group.

OUR COMMITMENT

MinRes commits to:

- ▶ Develop, implement, and continually improve environmental management systems that enable MinRes to identify and manage environmental risks and opportunities at all stages of our operations
- ▶ Measure and continuously improve our environmental performance through setting environmental objectives, performance measures and performance targets
- ▶ Minimise the adverse environmental impacts associated with our operations and where possible protect the environment through the efficient use of natural resources such as energy and water; reduction of waste; prevention of pollution; minimisation of dust, air quality and operational GHG emissions; and the responsible management of land and biodiversity
- ▶ Continually improve practices to manage the safe operation and closure of tailings storage facilities
- ▶ Integrate rehabilitation and closure considerations throughout all stages of our activities to transition to closure effectively
- ▶ Implement environmental initiatives and encourage the development of environmental technologies that contribute to greater environmental responsibility
- ▶ Commit resources to comply with this Policy and to manage and monitor our environmental performance
- ▶ Comply with all applicable legislation, standards, compliance obligations and codes of practice
- ▶ Understand and consider the expectations of all stakeholders in our operations for diligent environmental management
- ▶ Report our Environmental performance to stakeholders in a transparent, timely and regular manner.

OUR GOALS

We will ensure we cause no environmental harm beyond that which is absolutely necessary to conduct our businesses and for which statutory approval has been received.

OUR RESPONSIBILITY

Every employee has a personal responsibility to maintain a high level of environmental awareness and to comply with the principles of this Policy and any associated policies, procedures, or processes.

Leaders at all levels in the group are required to communicate this Policy to all Stakeholders and involve them in its ongoing enforcement.

REVIEW OF POLICY

This policy will be reviewed, revised, and re-published where necessary to ensure that it remains relevant and appropriate to MinRes' activities.

Signed



Derek Oelofse
Group Financial Controller and Company Secretary
1 July 2022



Health Safety & Environmental Policy

Ensign Australia recognises its responsibilities and is totally committed to the health and safety of its employees and to the protection of the environment. Ensign will conduct its activities to ensure:

- That the risks to the health and safety of all workers are eliminated or minimised so far as is reasonably practicable
- The safe operation and maintenance of all plant and equipment.
- The protection of the environment from pollution and damage.
- The prevention of personal injury and property damage to third parties, arising from the company's operations.

Ensign expects its employees to make every effort to protect their own and fellow workers' health and safety, and to participate in, and contribute to the establishment and observance of safe working practices and procedures. While at their place of work all employees will use the equipment provided to them in a safe and correct manner, obey all practical instructions as issued by their supervisors, and comply with the policies and procedures published and approved by the Company with the aim of protecting the local environment, the health and safety of all individuals at the work site. These instructions, policies and procedures comply with relevant legislation governing workplace health, safety and environmental matters. The Policies are set out in detail in the Ensign Global Risk Management System. Each of these documents is available to all employees.

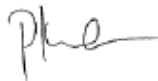
This Policy and the pursuit of the Company's objectives are based on the conviction and resolute determination to ensure that all activities are carried out in a healthy, safe and environmentally sensitive manner. This Policy and its safety objectives are designed to reduce individual suffering and loss as well as contribute directly to the efficiency and success of the Company's core business of drilling contracting.

Ensign believes that all incidents can be prevented and a safe, healthy, clean and productive working environment can be maintained through leadership, participation, accountability, consistency, communication and training of all employees.

The HSE objectives will be achieved by:

- The promotion of Health, Safety and Environmental Protection as an integral part of the business.
- The promotion of Mental Health and Wellbeing initiatives and programs to all parts of the business
- Establishing annual measurable objectives and targets for continuous improvement that are aimed at the elimination of workplace injuries and illnesses
- Complying with all Legal and Legislative requirements
- Promoting a belief that all incidents are preventable.
- Investigating all work related injuries and high potential near misses.
- By encouraging all employees to participate in discussion about incident prevention.
- Consulting with employees on matters of HSE relative to their work.
- Implementing rehabilitation and claims management processes in respect to all workers suffering a work-related injury or illness.
- Empowering all employees and subcontractors to stop the job if the job is not safe to start or continue.

This policy will be reviewed on a 2 yearly basis or as required to suit any relevant changes in legislation.



Peter Koutsoukos
Vice President
Australia



All downloaded and printed documents are uncontrolled documents.

Controlled copies are located on the Ensign Compass site in global risk management system (GRMS)

EN-AUS-Pol 001	VERSION: 1.0: REVISION 0.5	REVIEWED: APRIL 2021	NEXT REVIEW DATE: Feb 2023	Page 1 of 1
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Appendix 3 – Regulatory Reporting Guideline

Well Integrity Incidents

For reporting significant matters relating to well integrity contact the DMIRS Resource and Environment Compliance Incident Line on 0419 960 621 (recorded message) with follow up written reports to petroleum.reports@dmirs.wa.gov.au

Reportable Environmental Incidents

If any answer to Statement 2 is YES, the incident is classified as a **Reportable Environmental Incident**.

Statement 2 – is the incident a:		
Accidental release of hydrocarbons or hazardous materials in excess of 80L on inland waters	<input type="checkbox"/> Yes	Reportable Incident
	<input type="checkbox"/> No	
Accidental release of hydrocarbons or hazardous materials in excess of 500L (eg. Diesel, hydrocarbons / reservoir fluids etc.),	<input type="checkbox"/> Yes	Reportable Incident
	<input type="checkbox"/> No	
Accidental release of hydrocarbons or hazardous materials that affect a ground surface area greater than 100m ² (eg. Diesel, hydrocarbons / reservoir fluids etc.).	<input type="checkbox"/> Yes	Reportable Incident
	<input type="checkbox"/> No	
Accidental release of hydrocarbon gas in excess of 500m ³ ,	<input type="checkbox"/> Yes	Reportable Incident
	<input type="checkbox"/> No	
Bush-fire event caused by the activity	<input type="checkbox"/> Yes	Reportable Incident
	<input type="checkbox"/> No	
Any additional incidents specified as reportable incidents in Project Specific Environment Plans	<input type="checkbox"/> Yes	Reportable Incident
	<input type="checkbox"/> No	

Reportable Environmental Incident Reporting Requirements

If the incident is classified as a Reportable environmental incident implement the following reporting requirements.

Reporting Requirements	Report to
<p>Verbal or written notification must be undertaken within two hours of the incident or as soon as practicable (written is preferred).</p> <p>This information is required:</p> <ul style="list-style-type: none"> the incident and all material facts and circumstances known at the time, any actions taken to avoid or mitigate any adverse environmental impacts. 	<p>Preferred method:</p> <p>Email: petroleum.environment@dmirs.wa.gov.au</p> <p>Alternative method:</p> <p>Phone: 0419 960 621</p> <p>DMIRS Submissions Portal</p>
<p>Verbal notifications must be followed by a written report as soon as practicable, and not later than 3 days following the incident.</p> <p>The Environmental & Reportable Incident / Non-compliance Reporting Form should be completed (and can be found here): http://dmirs.wa.gov.au/Documents/Environment/ENV-PEB-189.docx</p> <p>Per the regulations, at a minimum, the written incident report will include:</p> <ul style="list-style-type: none"> the incident and all material facts and circumstances, actions taken to avoid or mitigate any adverse environmental impacts, any corrective actions already taken, or that may be taken, to prevent a recurrence. <p>If initial notification of a reportable incident was verbal, this information must be included in the written report.</p>	<p>DMIRS Submissions Portal</p>

Recordable Environmental Incidents

If any answer to Statement 3 is YES, the incident is classified as a **Recordable Environmental Incident**.

Statement 3 – is the incident a:		
Breach of an Environmental Performance Objective	<input type="checkbox"/> Yes	Recordable Incident
	<input type="checkbox"/> No	
Breach of an Environmental Performance Standard	<input type="checkbox"/> Yes	Recordable Incident
	<input type="checkbox"/> No	

Recordable Environmental Incidents Reporting Requirements

If the incident is classified as a Recordable Environmental Incident implement the following reporting requirements

Reporting Requirements	Report to
<p>Written notification to DMIRS by the 15th of each month</p> <p>As a minimum, the written incident report must describe:</p> <ul style="list-style-type: none">• the incidents and all material facts and circumstances concerning the incidents• any actions taken to avoid or mitigate any adverse environmental impacts• any corrective actions already taken, or that may be taken, to prevent a repeat of similar incidents. <p>If no recordable incidents occur during the reporting month, a 'nil report' will be submitted.</p>	<p>Email: petroleum.environment@dmirs.wa.gov.au</p>

Appendix 4 – Risk Matrix

RISK MATRIX					
Event Risk Rating / Priority					
Consequence Likelihood	1 Minor (FAI) (nil or minor impact) (<\$20,000)	2 Low (MTI / RWI) (minor impact) (>\$20,000 ≤\$100,000)	3 Medium (LTI) (moderate impact) (>\$100,000 ≤\$500,000)	4 High (Fatality) (significant impact) (>\$500,000 ≤\$1,000,000)	5 Major (> 1 Fatality) (major impact) (>\$1,000,000)
A Almost Certain (one or more per year)	Medium (11)	High (16)	High (20)	Extreme (23)	Extreme (25)
B Likely (< once a year)	Medium (7)	Medium (12)	High (17)	Extreme (21)	Extreme (24)
C Possible (one in 5 - 10 years)	Low (4)	Medium (8)	High (13)	High (18)	Extreme (22)
D Unlikely (one in 10 - 20 years)	Low (2)	Low (5)	Medium (9)	High (14)	High (19)
E Rare (not likely in 20 years)	Low (1)	Low (3)	Medium (6)	Medium (10)	High (15)

IMPACT TYPE	CONSEQUENCE LEVEL (consider the maximum reasonable potential consequence from an unwanted event)				
	Serious event classification is based on actual outcome or near miss potential outcome (e.g. fatality – legal privilege)		SERIOUS OUTCOME EVENT		
	Incident Report Required		ICAM Required* See MRL-SAF-PRO-0007 – Incident Management Procedure Section 3.5 Based on Actual or Potential outcome		
	Level 1 Minor	Level 2 Low	Level 3 Medium	Level 4 High	Level 5 Major
Health (H) Harm to people – occupational health	No or minimal exposure to health hazard resulting in no effect or minor discomfort.	Exposure to health hazard resulting in symptoms requiring medical intervention and full recovery (no lost time).	Exposure to health hazards / agents (over the OEL) resulting in reversible impact on health (with lost time) or permanent change with no disability or loss of quality of life.	Exposure to health hazards / agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life (permanent disability) or single fatality.	Exposure to health hazards / agents (significantly over the OEL) resulting in irreversible impact on health with loss of quality of life for multiple persons or multiple fatalities.
Safety (S) Harm to people – safety	No treatment or First Aid Injury (FAI).	Medical Treatment Injury (MTI) Restricted Work Injury (RWI)	Lost Time Injury (LTI). Direct breach of MRL Cardinal Rule(s)	Single permanent disability or single fatality. Direct breach of MRL Cardinal Rule(s) over multiple periods	Multiple permanent disabilities or fatalities.
Environment (E) Harm to environment – negative impact	Nil or minor environmental impact. Insignificant fauna / flora, habitat, soil, aquatic and land ecosystems, atmosphere or water resources affected (e.g. oil spill > 20 litres but ≤ 100 litres in contained area).	Minor impact on fauna / flora, habitat, soil, aquatic and land ecosystems, atmosphere or water resources (e.g. single wildlife death, oil spill > 100 litres ≤ 250 litres in contained area).	Moderate impact on fauna / flora, habitat, soil, aquatic and land ecosystems, atmosphere or water resources (e.g. multiple wildlife deaths, unapproved clearing / damage to vegetation, oil spill > 250 litres ≤ 1,000 litres in contained area).	Significant adverse impact on fauna / flora, habitat, soil, aquatic and land ecosystems, atmosphere or water resources lasting typically up to a year (e.g. oil spill > 1,000 litres in uncontained area).	Major adverse impact on fauna / flora, habitat, soil, aquatic and land ecosystems, atmosphere or water resources lasting typically multiple years.
Community / Social (C) Harm to community / social structures – negative impact	Nil or minor disturbance of local community / social structures.	Low impacts on local community / social structures, fully repairable (e.g. single community / stakeholder complaint).	Ongoing local community / social issues, mostly repairable (e.g. isolated complaints from several local community members / stakeholders).	Significant adverse community impact and reaction (e.g. organised community protests threatening business continuity).	Major adverse community impact and reaction affecting long term business continuity. "License to operate" revoked or under jeopardy.
Legal / Regulatory (L & R)	Questionable or minor non-compliance with operating condition. No fine or prosecution. Unlikely to attract regulatory interest. Easy to resolve.	Non-compliance with operating condition. Could attract low level administrative response from regulator. No court appearance required.	Minor breach of local or national law with potential prosecution by regulator. Continuing occurrence of minor breaches.	Significant breach of local or national law. Prosecution or penalties by regulator likely. Short term threat to operations continuing. Civil action initiated.	Major breach of national or international law with potential prison sentences. Operations suspended or cease (short or long term). Licenses withdrawn or revoked. Class action initiated.

IMPACT TYPE	CONSEQUENCE LEVEL (consider the maximum reasonable potential consequence from an unwanted event)				
	Serious event classification is based on actual outcome or near miss potential outcome (e.g. fatality – legal privilege)			SERIOUS OUTCOME EVENT	
	Incident Report Required			ICAM Required* See MRL-SAF-PRO-0007 – Incident Management Procedure Section 3.5 Based on Actual or Potential outcome	
	Level 1 Minor	Level 2 Low	Level 3 Medium	Level 4 High	Level 5 Major
Material Losses / Business Interruption (M)	Minor impact, easily corrected with no loss of operations, and/or < \$20,000 asset damage / material loss.	Minor damage to equipment or infrastructure with minimal loss of operations (< 1 day), > \$20,000 and/or ≤ \$100,000 asset damage / material loss.	Damage to equipment or infrastructure causes temporary loss of operations (< 1 week), > \$100,000 and/or ≤ \$500,000 asset damage / material loss.	Significant damage to equipment or infrastructure causes operations to cease (< 1 month), > \$500,000 and/or ≤ \$1,000,000 asset damage / material loss.	Major damage to equipment or infrastructure causes operations to cease (> 1 month), and/or > \$1,000,000 asset damage / material loss.
Reputation (R)	Minor public concern restricted to local individual complaints. Infrequent scrutiny / attention from regulator (e.g. less than once every 2 years).	Infrequent local public or media attention and complaints. Infrequent scrutiny / attention from regulator (e.g. at least once per year).	Frequent adverse attention from local media and/or heightened concern by local community. Ongoing scrutiny / attention from regulator (e.g. more than once per year). Some difficulties in gaining approvals.	Significant adverse national media / public attention. Licence to operate threatened. Significant difficulties in gaining approvals for future projects.	Ongoing adverse public or media outcry (international coverage). May temporarily lose license to operate. Reputation adversely affected. Share price may be affected.

LIKELIHOOD	DESCRIPTION
A Almost Certain	The unwanted event is almost certain to happen within a MRL controlled workplace. In the case of repetitive / frequent tasks <i>the unwanted event has or will occur in order of one or more times per year</i> . In terms of major events, as also in the case of long term health, environmental or social impacts, it may happen only once in a MRL controlled workplace.
B Likely	There is a high probability that the unwanted event will occur within a MRL controlled workplace. In the case of repetitive / frequent tasks <i>the unwanted event has occurred or is likely to occur in order of less than once per year</i> . In terms of major events, as also in the case of long term health, environmental or social impacts, it might happen once in a MRL controlled workplace.
C Possible	It is possible that the unwanted event can occur within the LOM or Project. In the case of repetitive / frequent tasks <i>the unwanted event has occurred or is likely to occur in order of once every 5-10 years</i> . In terms of major events, as also in the case of long term health, environmental or social impacts, it may possibly happen once in the LOM or Project.
D Unlikely	There is a low probability for the unwanted event to occur within a MRL controlled workplace. In the case of repetitive / frequent tasks <i>the unwanted event has occurred sometime or is likely to occur not more than once every 10-20 years</i> . In terms of major events, as also in the case of long term health, environmental or social impacts, there is a low probability for the event to happen in a MRL controlled workplace.
E Rare	There is a very low probability for the unwanted event to occur within a MRL controlled workplace. In the case of repetitive / frequent tasks <i>there are no records of the event occurring or it is highly unlikely that it will occur within the next 20 years</i> . In terms of major events, as also in the case of long term health, environmental or social impacts, there is a very low probability for the event to ever happen.

Appendix 5 – SFAIRP Assessment

Note: controls assume standard prevention controls, such as inductions, JSA, pre-tours, and mitigation controls, such as ERP processes, 1st aid, emergency services, are in place.

SFAIRP Demonstration			
MAE	Motor vehicle accident	Ref	MAE-01
Hazard	Vehicle transport – Excluding Commercial Heavy Vehicles		
Assumptions	An accident involving a vehicle on public roads or access roads. Assumption is that vehicle is carrying passengers or accident involves other road users.		
Cause	Control		
Driver under the influence of alcohol or drugs	Daily pre-start BAC test (covers travel from Site only)		
	Road safety laws		
	Use of crew change bus at Site		
Driver fatigue	Journey management process - rest breaks		
	Daylight driving – night driving, that requires journey management to be conducted only with the permission of direct line manager and Operations Superintendent (Excludes freight transportation)		
	Use of crew change bus at Site		
Driver distraction	Road safety laws		
Wildlife / livestock	Daylight driving – night driving, that requires journey management to be conducted only with the permission of direct line manager and Operations Superintendent (Excludes freight transportation)		
	Speed limit signs posted on access road		
Speeding	IVMS in Ensign vehicles		
	Use of crew change bus at Site		
	Speed limit signs posted on access road		
Adverse driving conditions	Daylight driving – night driving, that requires journey management to be conducted only with the permission of direct line manager and Operations Superintendent (excludes freight transportation)		

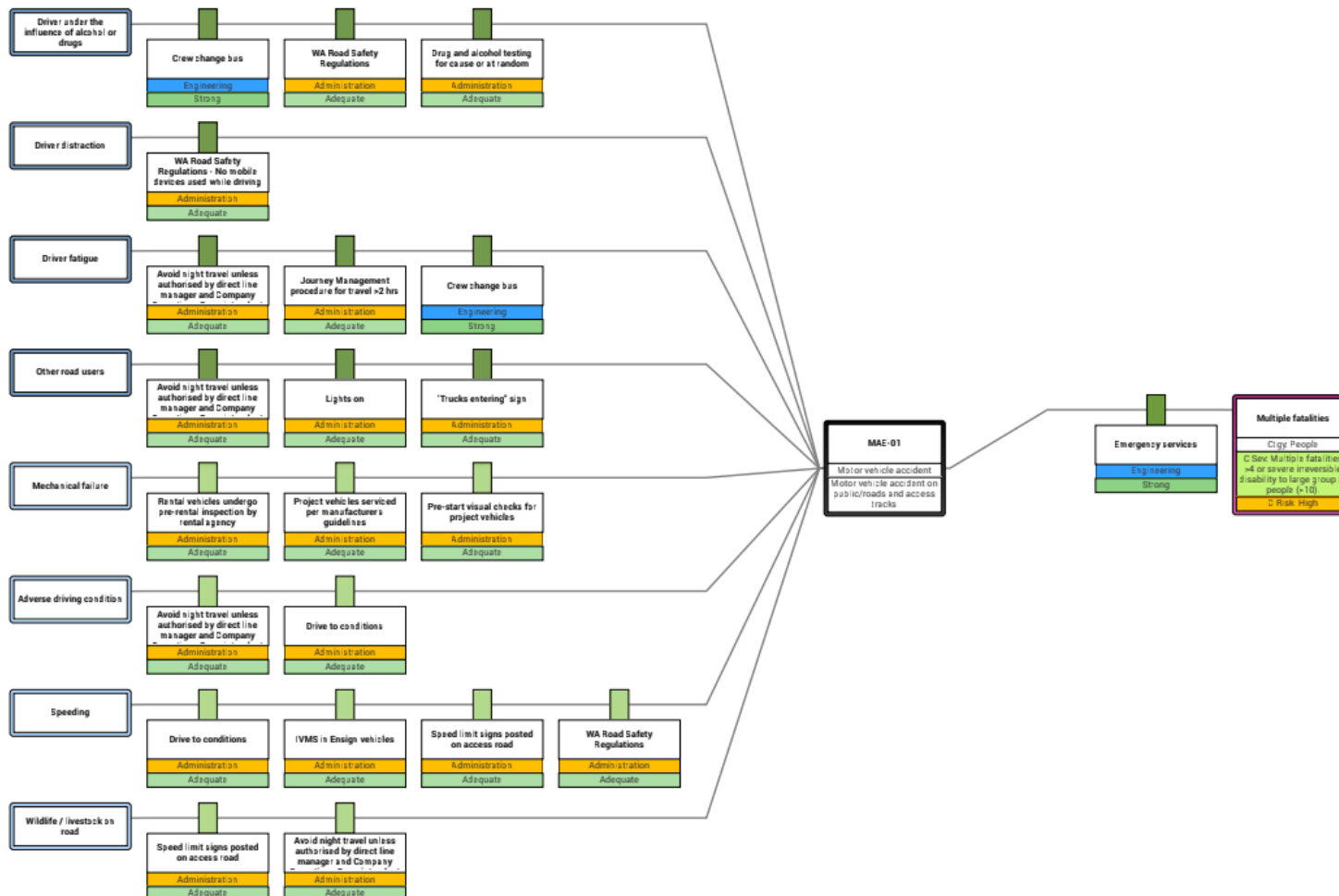
	Use of crew change bus at Site				
	Drive to conditions				
Mechanical failure	Pre-start visual checks				
	Project vehicles serviced per manufacturer's guidelines				
	Rental vehicles undergo pre-rental inspection by rental agency				
Human error	Drivers to hold current Australian driver's licence				
Other road users	Daylight driving – night driving, that requires journey management to be conducted only with the permission of direct line manager and Operations Superintendent (Excludes freight transportation)				
	Use of crew change bus at Site				
Consequence	Control				
Multiple fatalities	No Project specific controls				
Rejected additional controls and reason					
1. Rental vehicles for travel between Perth/Geraldton and Site can be requested to be fitted with IVMS but not always available and without a system to download and analyse post travel IVMS does not offer significant risk reduction					
Consequence	5	Likelihood	D	Risk	High
SFAIRP Summary					
The risk is well understood, and controls are based on good practice. The level of residual risk is similar and maybe less than that for non-work-related travel along the same roads. The risk is therefore assessed as SFAIRP.					

SFAIRP Demonstration					
MAE	Dropped load during transit causing vehicle accident			Ref	MAE-02
Hazard	Road transport of freight or equipment				
Assumptions	A load (equipment and/or freight) is lost on a public road resulting in an accident involving other road users				
Cause	Control				
Incorrectly restrained load	Training in load restraint				
	Implementation of the Australian Load Restraint Guide by Project transport service provider				
	Awareness and implementation of Chain of Responsibility Legislation				
	Trailer Load & Restraint Check List				
Failed restraint	Implementation of the Australian Load Restraint Guide by Project transport service provider				
	Awareness and implementation of Chain of Responsibility Legislation				
	Use fit for purpose restraint equipment				
Road conditions	Awareness and implementation of Chain of Responsibility Legislation				
Consequence	Control				
Multiple fatalities	No Project specific controls				
Rejected additional controls and reason					
Consequence	5	Likelihood	E	Risk	High
SFAIRP Summary					
The risk is well understood, and controls are based on good practice. The risk is therefore assessed as SFAIRP.					

SFAIRP Demonstration						
MAE	Camp fire				Ref	MAE-03
Hazard	Combustible materials / flammable liquids /gas on camp site					
Assumptions	Excludes impact of bushfire as covered in MAE-03					
Cause	Control					
Galley operations	Qualified cook					
	Galley and laundry separated from accommodation					
Smoking	Designated smoking area					
Vehicles	Designated parking area					
Gas storage	Gas stored away from ignition sources					
Electrical fault	Earthing/Miniature circuit breakers (MCBs)					
Hot work	PTW for hot work					
Laundry	Galley and laundry separated from accommodation					
Consequence	Control					
Multiple fatalities	Smoke alarms					
	Fire alarm					
	Fire extinguishers					
	Galley and laundry separated from accommodation					
Rejected additional controls and reason						
Consequence	5	Likelihood	E	Risk	High	
SFAIRP Summary						
The risk is well understood, and controls are based on good practice. The risk is therefore assessed as SFAIRP.						

Appendix 6 – Bowties

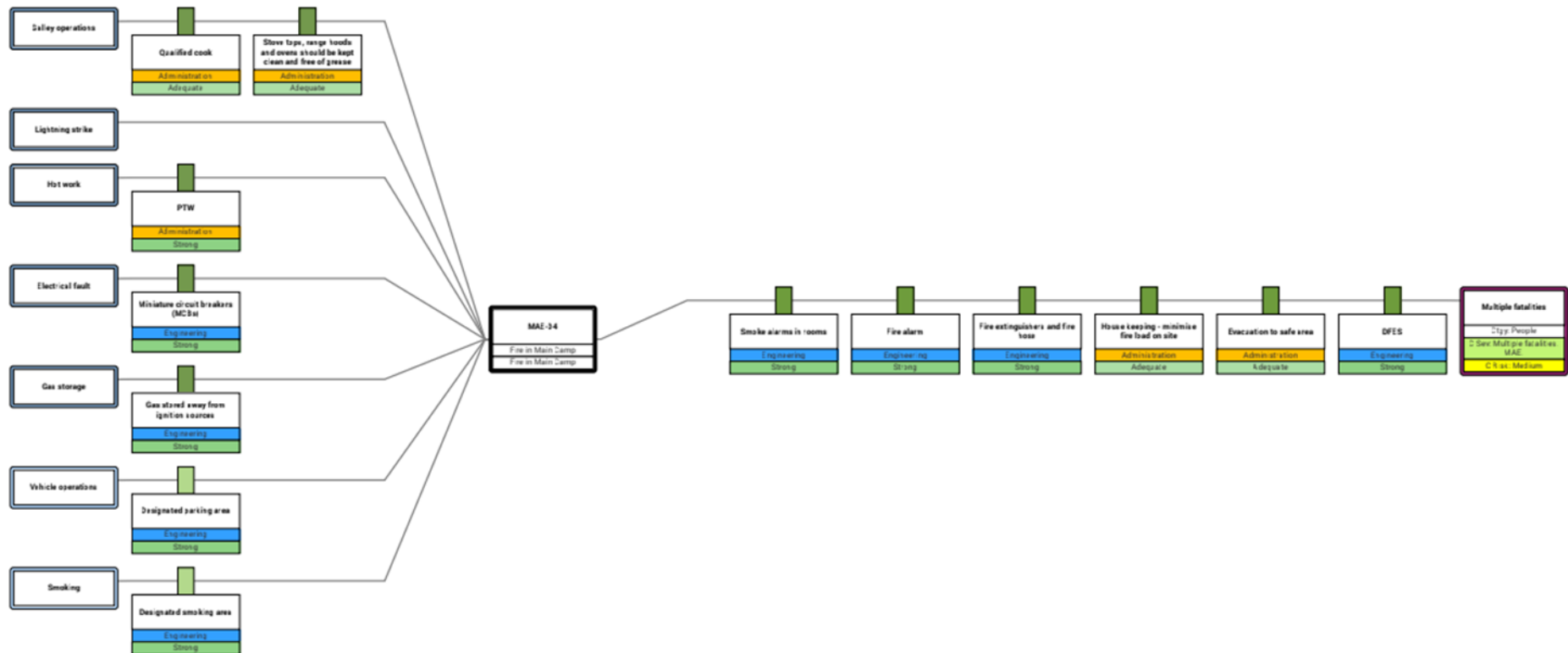
MAE-01 Motor Vehicle Accident



MAE-02 Dropped Load during transit causing Vehicle Accident



MAE-03 - Camp Fire



Appendix 7 – MAE Performance Standards

MAE	Critical Control	Function	Performance requirements	Verification
MAE-01 Motor vehicle accident	Crew change bus	Provide for safe transport between Camp and Site Reduce the number of vehicles travelling between Camp and Site Eliminate driver fatigue at end of 12-hour shift	Crew change bus used for personnel transfers between Camp and Site	DOT Certificate of Inspection Driver's license
	Journey Management	Ensure longer distance travel is managed to minimise travel risk	All Service providers utilising their journey management procedures for the project	Journey management plan records
MAE-02 Dropped load during transit causing vehicle accident	Minimum standard for load restraint is in accordance with the National Australian Load Restraint Guide 2004 (2018 does not apply in WA)	Ensure loads are restrained to a minimum safe standard to reduce likelihood of a dropped load during transit	All loads leaving the Site are correctly restrained and potential dropped objects removed or secured.	ASCO Trailer Load & Restraint Check List FRM-WA-GOP-TRAN-002.05.01

MAE	Critical Control	Function	Performance requirements	Verification
MAE-03 Camp Fire	Earthing / MCB	Prevent electric short circuits over overload	Trip test to confirm performance	Inspection/test records
	Fire alarm	To alert occupants of fire emergency	Alarm sounds on activation	Emergency training drills / records
	Fire extinguishers	To extinguish small fires	Extinguishers must be fit for purpose and functional	Inspection stamps on extinguishers
	Smoke detectors / alarms	To alert occupants of smoke presence	Smoke detectors alarm in the presence of smoke	Inspection/test records

Appendix 8 - Concordance Table

Regulation	Guide Section	Topic	Safety Case Section	Page #
Work Health & Safety (Petroleum and Geothermal Energy Operations) Regulations 2022				
<i>Part 2 – Petroleum and geothermal energy operations Division</i>				
<i>1 – Operators, Division 2 – Operator's representative</i>				
r. 20	1	Facility to have an operator	Rig SC	
r. 21	1	Duties of an operator	Rig SC	
<i>Division 4 Safety Cases</i>				
<i>Subdivision 2 – Duties as to safety cases</i>				
r. 27	1	Safety case required for operations	11	11
r. 28	1	New or increased risks	1.3	13
r. 29	2.11, 3.3.3	Compliance with safety case	Rig SC	
r. 30	2.11, 3.3.1	Persons to comply to safety case	Rig SC	
r. 31	2.10	Maintaining records for safety case	30	30
<i>Subdivision 3 – Contents of safety cases</i>				
r. 32 (1)(a-d)	3.1.1	Operation description, formal safety assessment, safety management system and emergency response plan	All	
r. 32 (2)(a-j)	3.2.1	Drill rig overview	Rig SC	
	3.2.2	Drill rig layout	Rig SC	
	3.2.3	Major modifications and upgrades	Rig SC	
	3.2.4	Drill rig moves including rigging up/down	Rig SC	
	3.2.5	Primary structure	Rig SC	
	3.2.6	Drilling, completion and well control	Rig SC	
	3.2.7	Plant and utilities	Rig SC	
	3.2.8	Design, control systems, structural integrity and safety critical items	Rig SC	
	3.2.9	Fire and explosion protection	Rig SC	
	3.2.10	Emergency systems	Rig SC	
	3.2.11	Accommodation/camp site	Rig SC	
	3.2.12	Well testing	Rig SC	
	3.2.13	Other third party equipment	Rig SC	
	3.2.14	Major accident events, safety critical elements and performance standards	Rig SC	
	3.2.15	Provision of drawings	Rig SC	

Regulation	Guide Section	Topic	Safety Case Section	Page #
Work Health & Safety (Petroleum and Geothermal Energy Operations) Regulations 2022				
r. 32 (3)(a)	3.4.1, 3.4.2, 3.4.3	Purpose, scope and objective of FSA	Rig SC	
r. 32 (3)(b)	3.4.5	Major accident events	Rig SC	
r. 32 (3)(c)	3.4.6	Safety critical elements and bowtie diagrams	Rig SC	
r. 32 (3)(d)	3.4.7	Demonstration of SFAIRP	Rig SC	
r. 32 (3)(e)	3.4.4	Methodology	Rig SC	
	3.4.8	Summary of risk assessment studies	Rig SC	
r. 32(4)(a)	3.3.1	General requirements	Rig SC	
r. 32 (4)(b)	3.3.2	Policy and leadership	3.3.1	20
r. 32 (4)(c)	3.3.20	Permit to work system for safe performance of various activities	Rig SC	
r. 32 (4)(d)	3.3.11	Managing risks to health and safety	Rig SC	
r. 32 (4)(e)	3.3.26	Incident/hazard reporting and investigation	3.7	41
r. 32 (4)(f)	3.3.11	Managing risks to health and safety	Rig SC	
r. 32 (4)(g)	3.3.22	Maintenance and repair	Rig SC	
	3.3.23	Inspection, testing and monitoring	Rig SC	
	3.3.24	Integrity management	Rig SC	
r. 32 (4)(J)	3.3.12	Health and safety performance standards	3.3.3	21
r. 32 (4)(k)	3.3.6	Sources of information	Rig SC	
	3.3.10	Resources	Rig SC	
	3.3.15	Simultaneous operations and bridging documents	This Document	
	3.3.17	Management of change	3.5.5	31
	3.3.18	Deployment of drill rig to petroleum sites	Rig SC	
	3.3.19	Purchasing and control of materials and services	Rig SC	
	3.3.21	Materials handling and storage	Rig SC	
	3.3.26	Incident/hazard reporting and investigation	3.7	41
	3.3.30	Health monitoring systems	Rig SC	
r. 32 (4)(l)	3.3.25	Performance standards for safety critical elements	Rig SC	
r. 33 (a)	3.3.4	Implementation and improvement of safety management system	5	44
r. 32 (4)(l) r. 33 (b)	3.3.32	Safety management system audits	4	44

Regulation	Guide Section	Topic	Safety Case Section	Page #
Work Health & Safety (Petroleum and Geothermal Energy Operations) Regulations 2022				
r. 33 (c)	3.3.33	Review and continual improvement	4	44
r. 34	3.3.5	Standards to be applied	Rig SC	
r. 35	3.3.7	Command structure	3.3.4	21
r. 36	3.3.8	Competence of workers	3.3.6	27
r. 37	3.3.20	Permit to work system for safe performance of various activities	Rig SC	
r. 38	2.7, 3.3.9	Involvement of workers	3.3.5	26
r. 39	3.3.14	Adequacy of design, construction, installation, modification or maintenance	Rig SC	
r. 40	3.3.31	Medical and pharmaceutical supplies and services	Rig SC	
r. 41	3.3.22	Machinery and equipment	Rig SC	
r. 41 (1)	3.3.22	Maintenance and repair	Rig SC	
r. 41 (2)	3.3.23	Inspection, testing and monitoring	Rig SC	
r. 41 (2)	3.3.24	Integrity management	Rig SC	
r. 42	3.3.31	Drugs and intoxicants	3.5.21.4	39
r. 43	3.5.2	Emergency analyses	Rig SC	
r. 44	3.5.5	Emergency communications systems	Rig SC	
r. 45	3.5.6	Control systems	Rig SC	
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<i>Division 1 – Miscellaneous</i>				
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r. 105	3.3.27	Dangerous incident (Act s.37)	Rig SC	
<i>Division 2 – Managing risks to health and safety</i>				
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	3.3.29	Managing the risk to health from psychosocial hazards	Rig SC	
r. 110	3.3.11	Hierarchy of control measures	Rig SC	
r. 111	3.3.11	Maintenance of control measures	Rig SC	
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<i>Part 3 – Incident notification</i>				
s. 38	3.3.27	Duty to notify of notifiable incidents	Rig SC	
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**LOCKYER-2, LOCKYER-3, LOCKYER-4 AND
NORTH ERREGULLA DEEP-1 EXPLORATION /
APPRAISAL WELLS
ENVIRONMENT PLAN SUMMARY
EOC-EN-PLN-0018**

Revision Number	Issue Date	Prepared By	Reviewed By	Approved By
0	13/05/2022	A. Fertch	D. Girgenti	B. Riegler
1	28/07/2022	T. Nottage	D. Girgenti	B. Riegler
2	10/11/2022	I. Sulaiman	D. Girgenti	B. Riegler
3	12/01/2023	I. Sulaiman	D. Girgenti	D. Girgenti

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Abbreviations and Definitions

Acronym / Word	Definition
APPEA	Australian Petroleum Production & Exploration Association
DMIRS	Department of Mines, Industry Regulation and Safety
DoW	Department of Water
DPLH	Department of Planning, Lands and Heritage
DRF	Declared Rare Flora
DWER	Department of Water and Environment Regulation
EP	Environment Plan
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
ERL	Energy Resources Limited
ESAs	Environmentally Sensitive Areas
ha	hectares
HSEQ	Health, Safety, Environment and Quality
HSEQMS	Health, Safety, Environment and Quality Management System
LKR-2	Lockyer-2
LKR-3	Lockyer-3
LKR-4	Lockyer-4
LOWC	Loss Of Well Control
NED-1	North Erregulla Deep-1
OSCP	Oil Spill Contingency Plan
PGER(E)R	Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 (WA)
TDS	Total Dissolved Solids
VSP	Vertical Seismic Profiling

1 Introduction

1.1 Background

Energy Resources Limited (ERL) are the titleholder and operator of the exploration permit EP 368, located in the North Perth Basin. Within EP 368, ERL are proposing to drill three exploration / appraisal wells, named Lockyer-2, Lockyer-3, Lockyer-4 and North Erregulla Deep-1, primarily targeting the Kingia sandstone. Secondary targets for these wells include the High Cliff, Dongara / Wagina and Arranoo sandstones.

The Lockyer-2 well is located on the northern side of Midlands Road and south off Strawberry North-East Road, approximately 3.2 km east northeast of the Lockyer Deep-1 well. The Lockyer-3 well is located on the northern side of Midlands Road and west off Strawberry North-East Road, approximately 4.38 km northwest of the Lockyer Deep-1 well. The Lockyer-4 well is located on the southern side of Midlands Road off Moorriary Road, approximately 6.6 km southeast of Lockyer Deep-1. The North Erregulla Deep-1 well is located on the southern side of Midlands Road off Moorriary Road, approximately 8.3 km southeast of the Lockyer Deep-1 well. The wells lay between the townships of Dongara and Mingenew, being approximately 19 kms west of Mingenew (Figure 2-1).

1.2 Scope

The EP covers the following activities:

- Site preparation operations;
- Drilling operations (including completion operations, suspension or decommissioning of the wells);
- Well test operations;
- Site reinstatement; and
- Care and maintenance.

1.3 Instrument Holder and Nominated Operator

The instrument holders for petroleum licence EP 368 include:

- Energy Resources Limited: 80% participating interest and operator; and
- Westranch Holdings Pty Ltd: 20% participating interest.

In accordance with the Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 (WA) (PGER(E)R), contact details for the operator are listed below:

Operator: Energy Resources Limited

Contact Person: Bernie Riegler, Senior Environmental Advisor

Address: 20 Walters Drive, Osborne Park

Western Australia 6017

Phone: (08) 9329 3600

Email: bernie.riegler@mrl.com.au

2 Description of the Activity

2.1 Location of the Project

The Lockyer-2, Lockyer-3, Lockyer-4 and North Erregulla Deep-1 well locations are within the Shire of Mingenew, located approximately 35 km east of Dongara and 312 km north of Perth (Figure 2-1).

The coordinates for the surface hole locations are:

- Lockyer-2: 29° 11' 12.27" S, 115° 18' 00.9" E;
- Lockyer-3: 29° 10' 12.5758" S, 115° 15' 32.7179" E;
- Lockyer-4: 29° 12' 55.3231" S, 115° 19' 52.6542" E and
- North Erregulla Deep-1: 29° 14' 49.52" S, 115° 19' 40.47" E.

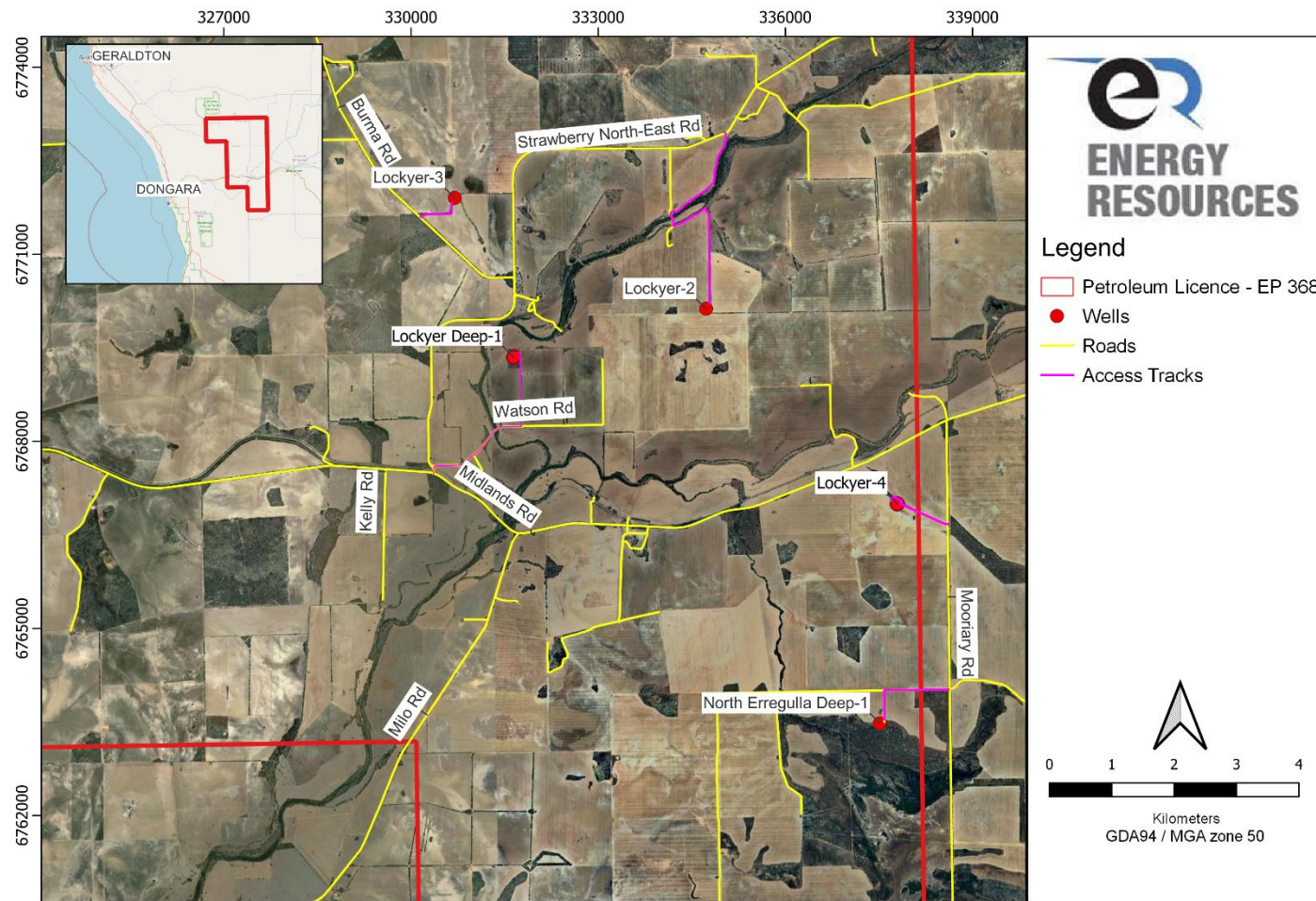


Figure 2-1: Regional map

2.2 Overview of Activities

The activity involves the following key phases:

Site preparation operations:

- Well site construction – comprising clearing, levelling, sheeting and preparation of surfaces to support compressive loads and limit erosion to the existing landscape;
- Groundwater extraction bore / monitoring bore and conductor installation;
- Construction of the lined mud sump, turkey's nest, Vertical Seismic Profiling (VSP) pit and well cellar; and
- Installation of the flare pits – drilling and well test flare pits.

Drilling operations:

- Mobilisation of the drilling package, ancillary services, rig camp, personnel and supplies;
- Conducting the drilling activities;
- Evaluating the well, suspension or decommissioning of the well;
- Demobilisation of the drilling package, ancillary services, rig camp, personnel and supplies; and
- Completion activities (if the well is successful and not completed with the drilling rig);
 - Mobilisation of work-over rig package, ancillary services, personnel and supplies;
 - Conducting the well completion activities; and
 - Demobilisation of work over rig package, ancillary services, site office, personnel and supplies.

Well Test Operations: (If the well is successful)

- Construction of the well test flare pit (if not done during site preparation operations);
- Mobilisation of the well test package, ancillary services, personnel and supplies;
- Conduct the well test activities to evaluate the well; and
- Demobilisation of the well test package, ancillary services, site support facilities, personnel and supplies.

Site Reinstatement operations, including sampling and removal of the:

- Drilling flare pit;
- VSP pit;
- Well test flare pit;

- Mud sump;
- Turkey nest; and
- Well head.

Care and maintenance operations, including inspection of the well site and site infrastructure.

Well handover comprises the final administrative step after which the Environment Plan can be closed out.

2.3 Timeframe and Schedule

Activities covered under the EP are planned to commence in Q2 of 2022. A summary of the proposed schedule is provided as Table 2-1.

TABLE 2-1: WELL SCHEDULE

Activities	Approximate duration (per well)	Indicative timing	Environmental considerations
Site preparation operations	35 - 42 days	Q4 2022 - Q2 2023	12-hour operations (day light hours)
Mobilisation of drilling package, ancillary services, site office, personnel and supplies.	10 - 15 days	Q4 2022	Movement of vehicles and fauna impact potential
Drilling, evaluation, and suspension Or Drilling and well decommissioning	56 – 65 days	Q4 2022 – Q4 2023	24-hour operations – fauna impact potential from driving at dawn / dusk General impact of site operations
Well completion	3 – 5 days	TBA	24-hour operations – fauna impact potential from driving at dawn / dusk General impact of site operations
Well test and shut in or suspension	60 - 90 Days	Q1 2023 - Q4 2023	24-hour operations - fauna impact potential from driving at dawn / dusk General impact of site operations
Care and maintenance	2 years	Subsequent to drilling	12-hour operations – fauna impact potential from driving at dawn / dusk

3 Description of the Environment

3.1 Regional Landform and Climate

The wells are located within the coastal highlands of the Mid-West region of WA, within the Geraldton Hills Sandplain subregion of the Geraldton Sandplains Bioregion (Department of the Environment 2012).

The Geraldton Sandplains Bioregion (Interim Biogeographic Regionalisation for Australia, Version 7) is composed mainly of proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata (Department of Conservation and Land Management 2002).

The regional climate is classified as dry Mediterranean with cool wet winters and hot dry summers. The mean monthly minimum temperature recorded at the nearest Bureau of Meteorology station (Geraldton Airport) ranges from 8.9 °C in August to 19.2 °C in February and the mean monthly maximum temperatures range from 19.5 °C in July to 32.6 °C in February (Bureau of Meteorology 2022).

The average annual rainfall is 440.9 mm with the majority of rainfall occurring during the winter months (Bureau of Meteorology 2022). A strong south-west sea breeze is a part of summer weather conditions. The winds arrive between 10:00 am and 12:00 pm and can reach 30 knots. The winds during the winter months are more variable and influenced by the cold fronts coming in from the Indian Ocean.

3.2 Geology and Soils

The well locations lie within the sedimentary Perth Basin. This basin lies both onshore and offshore and extends for about 700 km along the southern portion of the west coast of Western Australia. The basin is bounded to the east by the Darling Fault, which extends the full length of the basin. The onshore portion of the basin averages 65 km in width and extends from the southern coast to Geraldton in the north. The dominant feature in the northern section of the Perth Basin is the Dandaragan Trough, in which up to 20 km of sediments have been deposited.

3.2.1 Geomorphology

The well locations are situated in the geomorphic unit 'Eneabba Plain' (Playford, Cockbain and Low 1976). This unit is a low-lying area between the Spearwood Dune System and the Gingin Scarp. The plain is restricted to the area north of Cockleshell Gully. The plain consists of a series of shoreline, lagoon and dune deposits of early Pleistocene to possibly late Tertiary age, which locally have high concentrations of heavy minerals. These deposits are associated with a series of low alluvial fans fronting the Gingin Scarp (Playford, Cockbain and Low 1976). The streams have ill-defined channels and form ephemeral lakes.

3.2.2 Soils

The well locations are situated in the northern agricultural region of West Midlands and the soil-landscape zone is 'Arrowsmith Zone' code 224 (Schoknecht, Tille and Purdie 2004). This soil landscape zone is characterised as dissected lateritic sandplain on Cretaceous and Jurassic sediments. It is bounded in the east by the Dandaragan Scarp and in the south and west by the Gingin Scarp and comprises sandy and gravelly soils formed in colluvium and rock weathered in situ (Schoknecht, Tille and Purdie 2004).

The soil systems that overlap the Lockyer-2, Lockyer-3, Lockyer-4 and North Erregulla Deep-1 well locations as identified by the Department of Primary Industries and Regional Development (2022) are classified as:

- Mount Horner System (224Mh): Long gentle slopes broken by low gravel ridges and broad open depressions. Some lateritic breakaways with spillway sands.

3.3 Hydrology

3.3.1 Surface Water and Drainage

The well locations are situated in the Irwin River surface water catchment of the West Midlands Region (DoW 2017). The closest river to the Lockyer-2 well site is the Irwin River, located approximately 900 m north-west (with the Lockier River) located approximately 2.8 km south-east of this well. The nearest point of the Irwin River runs approximately 2.2 km south southeast of the Lockyer-3 well location. The Lockyer-4 well site is located ~900m south of the Lockier River and additionally separated by the built up Midlands Road. Approximately 550 m south-west of the North Erregulla Deep-1 well site is an un-named non perennial watercourse that branches from the Lockier River located approximately 4.5 km to the north.

The following information is provided by the Department of Water (DoW) on the hydrology of the Irwin River catchment (DoW 2017).

The river flows in a southerly direction between Geraldton, Mount Magnet Road and the Mullewa–Wubin Road, where it expands into a relatively wide river. It then turns south-westerly and constricts as it passes through hilly terrain before flowing into Arurine Bay near Dongara. The Irwin River catchment is 6071 km². As of 2016, there are six operational streamflow gauging stations in the catchment, with the first opening in 1976. Mountain Bridge gauging station, with a catchment area of 5264 km², has a mean annual flow recorded since 2000 of 16 GL/a.

Permanent summer baseflow is maintained by groundwater discharge from the Yarragadee aquifer between the Strawberry Bridge and Mountain Bridge gauging stations (Allen 1980, Commander, Groundwater prospects for irrigation in the Irwin River valley, Western Australia, Hydrogeology report HR10 1996, Schafer 2016, DoW 2017).

The river is moderately saline and becomes increasingly more so where saline groundwater discharges from Permian aquifers east of Mingenew (Mayer, Ruprecht and Bari 2005). The

river is less saline in areas where it or its tributaries receive fresh groundwater discharge from the Yarragadee aquifer (e.g. Springy Creek).

3.3.2 Groundwater

The primary major aquifers of the northern Perth Basin are the Superficial, Leederville, Leederville–Parmelia and Yarragadee aquifers (DoW 2017). A review of National Groundwater Information System Australian Groundwater Insight aquifer boundaries data (Bureau of Meteorology 2022) indicate that aquifers relevant to this Activity include the Superficial, Leederville-Parmelia and Yarragadee Aquifers.

DWER (2022) provides information for depth to groundwater measured in water bores licenced / managed by the department. The depth to groundwater at the Lockyer-2, Lockyer-3, Lockyer-4 and North Erregulla Deep-1 well sites is expected to be <25 m, given the proximity to the to the nearby surface water bodies.

3.3.3 Superficial Aquifer

The Superficial aquifer is a laterally extensive but relatively thin unconfined aquifer, extending throughout the Swan Coastal Plain found in the western portion of the northern Perth Basin between Geraldton in the north, Gingin in the south and bound by the Gingin Scarp to the east (DoW 2017). The Superficial aquifer is typically 20–30 m thick, with a maximum saturated thickness of about 60 m west of Regans Ford (Moncrieff and Tuckson 1989, Kern 1993).

Groundwater recharge to the Superficial aquifer is mainly by direct infiltration from rainfall over permeable sand and limestone, predominantly during winter and early spring. However, the Superficial aquifer also receives groundwater recharge by infiltration of surface water from lakes and streams, and from upward groundwater flow where it is present.

Groundwater flow in the Superficial aquifer is predominantly east to west, from the elevated areas along the Gingin Scarp towards the coast. The water table is highest adjacent to the Gingin Scarp, where it is up to approximately 90 m AHD near Eneabba and Cataby.

3.3.4 Leederville-Parmelia Aquifer

The Leederville–Parmelia aquifer extends from Mingenew to Gingin over an area of about 6650 km² beneath the Dandaragan Plateau, within a predominantly eastward-deepening portion of the Perth Basin (DoW 2017).

The Leederville–Parmelia aquifer thickens eastward from the margin of the Otorowiri Formation outcrop, reaching a maximum thickness of about 1300 m west and south of Moora, but elsewhere it is generally between 300 and 500 m thick (DoW 2017).

Groundwater salinity in the Leederville–Parmelia aquifer ranges from 200 mg/L to 4500 mg/L except along the eastern margin of the aquifer but is mostly between 500 and 1000 mg/L total dissolved solids (TDS) (Commander 1981, Bekele, Salama and Commander 2006).

In the western part of the aquifer, groundwater with less than 500 mg/L TDS is associated with palaeodrainage valleys (Commander 1981). Groundwater with a salinity of about 200 mg/L TDS is also present east of Eneabba Spring (Commander 1981).

3.3.5 Yarragadee Aquifer

The major aquifer which underlies the well locations is the Yarragadee Aquifer. The formation is multi-layered with groundwater occurring within beds of fine to course-grained sandstone confined between thick sequences of shale and siltstone. The potentiometric surface is fairly deep, ranging up to as much as 150 m below the surface. The potentiometric surface reaches the ground surface in the Hill River valley where the aquifer is artesian around Hill River Spring (Earth Tech Engineering 2002).

Groundwater salinity is lowest (500-700 mg/L) within the middle of the catchment and highest (1,000-1,500 mg/L) towards the east of the catchment along the boundary with the Urella Fault (Earth Tech Engineering 2002). Areas of higher salinity occur along the Arrowsmith River and the Irwin River due to recharge of brackish runoff water. Groundwater salinity is also known to vary within the different sandstone beds and there is a general trend of increasing salinity with depth (Johnson and Commander 2006).

3.4 Vegetation

The Lockyer-2 well pad is located within cleared paddocks that have been historically used for agricultural purposes. Similarly, the Lockyer-3 well pad area is primarily within cleared paddocks which includes a 0.15 hectares (ha) thicket of *Eucalyptus camaldulensis* (river gum) regrowth saplings. The Lockyer-4 well pad is located within cleared paddocks that have historically been used for agricultural purposes. The North Erregulla Deep-1 well is located within a cleared paddock with approximately half of the well site (approximately 1.25 hectares) intersecting an area of degraded vegetation associated with a historical stockyard.

3.4.1 Flora

A desktop flora survey (Strategen-JBS&G 2022) found that the vegetation communities immediately adjacent to the North Erregulla Deep-1 well site are described as '*Allocasuarina huegeliana* tall shrubland over *Rhagodia preissii* shrubland' With the vegetation communities approximately 100 m away described as '*Eucalyptus flocktoniae* subsp. *flocktoniae* open mallee woodland over *Allocasuarina huegeliana* and *Hakea recurva* subsp. *recurva* tall open shrubland.' None of these vegetation communities are known Groundwater Dependent Ecosystems or priority communities.

The proposed Lockyer-3 well location is within a cleared paddock. Section 3.4 describes a 0.15 ha of *Eucalyptus camaldulensis* (river gum) regrowth saplings that will require clearing in the southwest portion of the proposed well site. As the vegetation is regrowth in nature, specific information on flora composition is not provided.

The proposed Lockyer-2 and Lockyer-4 well locations are within cleared paddocks, and with no native vegetation planned to be impacted, specific information on flora composition is not provided.

3.4.2 Declared Rare Flora and Priority Listed Flora

Given that the proposed activity is within cleared paddocks and areas of degraded remnant vegetation and regrowth vegetation, it is expected that no Declared Rare Flora (DRF) or Priority Listed Flora will be encountered.

3.4.3 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared under section 51B of the *Environmental Protection Act 1986* (WA) and protected under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (WA). ESAs are selected for their environmental values at state or national levels and may include:

- Defined wetlands and riparian vegetation within 50 m;
- Areas covered by Threatened Ecological Communities;
- Area of vegetation within 50 m of DRF; and
- Declared World Heritage property sites.

The closest designated ESAs are located approximately 5.5 km to the northeast of the Lockyer-2 well location, 7.5 km east northeast of the Lockyer-3 well location. 6.8 km north of the Lockyer-4 well location, and approximately 10.5 km to the northeast of the North Erregulla Deep-1 well location.

3.4.4 Ecological Communities

Given that the Lockyer-2 and Lockyer-4 well sites are within cleared paddocks, no ecological communities are planned to be impacted.

3.5 Weeds and Pathogens

Given the proposed activity is within highly disturbed cleared paddocks and degraded remnant vegetation, there is the potential for weeds and pathogens to be present. A survey of the area in 2021, recorded 28 species within vicinity of the well locations. One species (*Echium plantagineum*) is a Declared Plant species in Western Australia pursuant to Section 22 of the Biosecurity and Agriculture Management Act 2007 (BAM Act). However, only one location of this species was recorded, approximately 12 km to the north, and it is not considered to have a contiguous connection with the operational area.

3.6 Fauna

A search of the Living Atlas of Australia database (accessed 31 January 2022) with a 5 km buffer around the well locations returned records for no threatened fauna species.

The Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth) Protected Matters search conducted for the well locations identified nine listed threatened species (six birds, one mammal, one reptile and one invertebrate) and eight listed migratory species as known or likely to occur within a 5 km buffer around the well locations.

Given that the proposed activity is within cleared paddocks and areas of degraded remnant vegetation and regrowth vegetation, no significant fauna habitat is expected to be encountered.

3.7 Socio-economic Environment

3.7.1 Land Use and Economic Environment

The Shire of Mingenew's major industry is agriculture and is the Southern Hemisphere's largest grain facilitator. The major tourism drawcards for the Shire are the historical town centre and wildflowers during the wildflower season. The current land use for each of the well sites is for agricultural purposes.

3.7.2 Visual Amenity

The Lockyer-2, Lockyer-3, Lockyer-4 and North Erregulla Deep-1 well locations are located approximately 3.8 km north, 4.5 km north, 0.72 km southeast and 4.4 km south respectively of the Midlands Road which is the main transit route between Dongara and Mingenew. The well sites are located away from residential developments and local tourist attractions.

The nearest dwelling to the Lockyer-2 well location is located approximately 2.6 km to the west on the opposite side of the Irwin River. The nearest dwelling to the Lockyer-3 well location is located approximately 2.1 km to the southeast on the opposite side of the Strawberry North-East Road. The nearest dwelling to the Lockyer-4 well location is located approximately 2.4 km to the northeast off Midlands Road. The nearest dwelling to the North Erregulla Deep-1 well location is located approximately 4.7 km to the northwest.

3.8 National Heritage

The National Heritage List is Australia's list of natural, historic and Indigenous places of outstanding significance to the nation. There are no National Heritage places within proximity of the well locations. The closest Natural Heritage Property, the Lesueur National Park, is more than 88 km south of the nearest well locations.

3.9 Indigenous and Non-Indigenous Cultural Heritage

3.9.1 Native Title Applications

A search of the National Native Title Tribunal database (<http://www.ntv.nntt.gov.au/ntv.asp>) on 03 February 2022 reveals one registered Native Title in effect at the location of the well sites; the Native Title of the Yamatji Nation (WCD2020/001).

3.9.2 Archaeology and Ethnology

Searches of the Aboriginal Heritage Inquiry System (AHIS), maintained by the Department of Planning, Lands and Heritage (DPLH) were undertaken for the well locations on 03 February 2022.

The searches show that within EP 368 there are three registered aboriginal sites associated with the Irwin and Lockier Rivers:

- The access track to Lockyer-2 passes through Registered Aboriginal Site 18907 Irwin River (SC04); however, the access track does not extend beyond the existing disturbed footprint. Acceptance of the planned activity will be provided by the PBC & DPLH prior to undertaking the activity. Engagement with these stakeholders is provided for in **Error! Reference source not found.** and is ongoing;
- The proposed location of the Lockyer-2 well site is outside the boundary of the Registered Aboriginal Site 18907 Irwin River (SC04);
- The L4 well location and ~200m of access road fall within the open site boundary for the Lockier River Registered Site (24381) by virtue of the graticular block system used to demarcate this registered site. The close site boundary is based on the actual Lockier River banks with the activity being close to 900m in distance from the close site boundary on the southern side of midlands Road. There will be no impact to the Lockier River itself. Clarification is being sought from the DPLH to confirm the Lockyer-4 access road and site are outside of the close site boundary with no potential for disturbance of the Lockier River Register Site (24381);
- The activity area for the Lockyer-3 and North Erregulla Deep-1 well locations do not fall within any registered aboriginal sites;
- A single artefacts / scatter (5683) named Santa Fe is located south of Midlands Road along the Irwin River to the northwest of the Lockyer-4 and North Erregulla Deep-1 well sites and south of the Lockyer-2 and Lockyer-3 well sites.

4 Environmental Risk Assessment Methodology

A risk assessment of the aspects that will and may occur during operations was undertaken using ERL's risk assessment methodology which follows Australian Standard AS/NZS ISO 31000:2009: Risk management – Principles and guidelines. Hazards, their associated aspects and their associated management and mitigation measures are detailed below in Table 4-1.

TABLE 4-1: SUMMARY OF ENVIRONMENTAL HAZARDS, THEIR ASSOCIATED ASPECTS AND MANAGEMENT AND MITIGATION MEASURES

Aspect	Hazard	Management and Mitigation Measures
Physical Interaction – Soil and Vegetation	<ul style="list-style-type: none"> Spread of non-indigenous species (weeds / pathogens) Damage to heritage sites / artefacts Unintentional clearing of native vegetation Inadequate site reinstatement 	<ul style="list-style-type: none"> Construction fill verified as having low weed/dieback risk Hygiene management requirements Induction Desktop heritage evaluation Consultation Complaints management system Heritage artefact identification procedure Land Access Agreement
Atmospheric Emissions	<ul style="list-style-type: none"> Disturbance to sensitive fauna / relevant stakeholders 	<ul style="list-style-type: none"> Emissions are monitored and reported Complaints management system Use of pilot flame during flaring, National Greenhouse and Energy Reporting
Extraction of Groundwater	<ul style="list-style-type: none"> Damage to vegetation due to drawdown of shallow groundwater 	<ul style="list-style-type: none"> Ground water licences Meter calibration and monitoring
Physical Interaction – Fauna	<ul style="list-style-type: none"> Injury or fatality to terrestrial fauna 	<ul style="list-style-type: none"> Fauna exclusion and egress Site inspections Speed limits Induction
Fire	<ul style="list-style-type: none"> habitat and vegetation loss; fauna injury / fatality; and damage to adjacent pastoral lands and crops. 	<ul style="list-style-type: none"> Gas flaring exemption Bush Fires Regulations 1954 (WA) Emergency Response Plan Permit to Work (PTW) Induction Consultation Fire breaks
Erosion / Contamination surface water run-off	<ul style="list-style-type: none"> Unplanned disturbance to adjacent pastoral land / soil contamination 	<ul style="list-style-type: none"> HSE Inspection Mud sump design Inspection of sumps

Aspect	Hazard	Management and Mitigation Measures
Accidental release of drilling or completion fluid	<ul style="list-style-type: none"> Surface spill of drilling or completion fluid resulting in contamination of soil / useable groundwater aquifers; Subsurface spill of drilling fluid resulting in contamination of useable groundwater aquifers. 	<ul style="list-style-type: none"> Rig inspection Surface casing cemented across all useable freshwater aquifers Chemical disclosure Bund construction Soil sampling Low toxicity drilling fluid Site will be manned 24 hours a day Monitoring of groundwater bore Oil Spill Contingency Plan Fugitive discharges are monitored and reported
Accidental release of solid waste	<ul style="list-style-type: none"> Attraction and / or injury of protected fauna species within the vicinity of the well locations. 	<ul style="list-style-type: none"> Appropriate rubbish bins and waste segregation Appropriately licensed waste contractor Waste sampling Waste register Induction
Accidental release of Hydrocarbons or Hazardous Materials (excluding Loss of Well Control [LOWC])	<ul style="list-style-type: none"> Contamination of soil / groundwater 	<ul style="list-style-type: none"> Spill protection during refuelling Chemical and hazardous liquid material storage Groundwater sampling Well testing – equipment pressure testing Well testing – Emergency Shut Down Induction Spill kits Oil Spill Contingency Plan Emergency Response Plan
Accidental Release of Hydrocarbons - LOWC	<ul style="list-style-type: none"> Atmospheric emissions and contamination of soil / groundwater Fire 	<ul style="list-style-type: none"> Well Management Plan HSE Management Plan / bridging document Groundwater sampling Induction Spill Kits Oil Spill Contingency Plan Blow out control equipment and expertise Emergency Response Plan
Noise Emissions	<ul style="list-style-type: none"> Noise emission disturbance of nearby occupied residential housing from gas flaring during well testing 	<ul style="list-style-type: none"> Well test design Flare noise modelling to determine noise impact radius.

5 Implementation Strategy

To meet the requirements of Regulation 15(1) of the PGER(E)R, Implementation Strategy for the EP, this Section describes the implementation strategy—the systems, practices, and procedures used to ensure that the environmental impacts and risks of the activities are continuously reduced to ‘As Low As Reasonably Practicable’, and the environmental performance objectives and standards detailed in Section 4 are achieved.

5.1 Management System Overview

The ERL Health, Safety, Environment & Quality Management System (HSEQMS) aligns with the Plan/Do/Check/Act approach. Figure 6-1 illustrates how the ERL HSEQMS elements fit this model

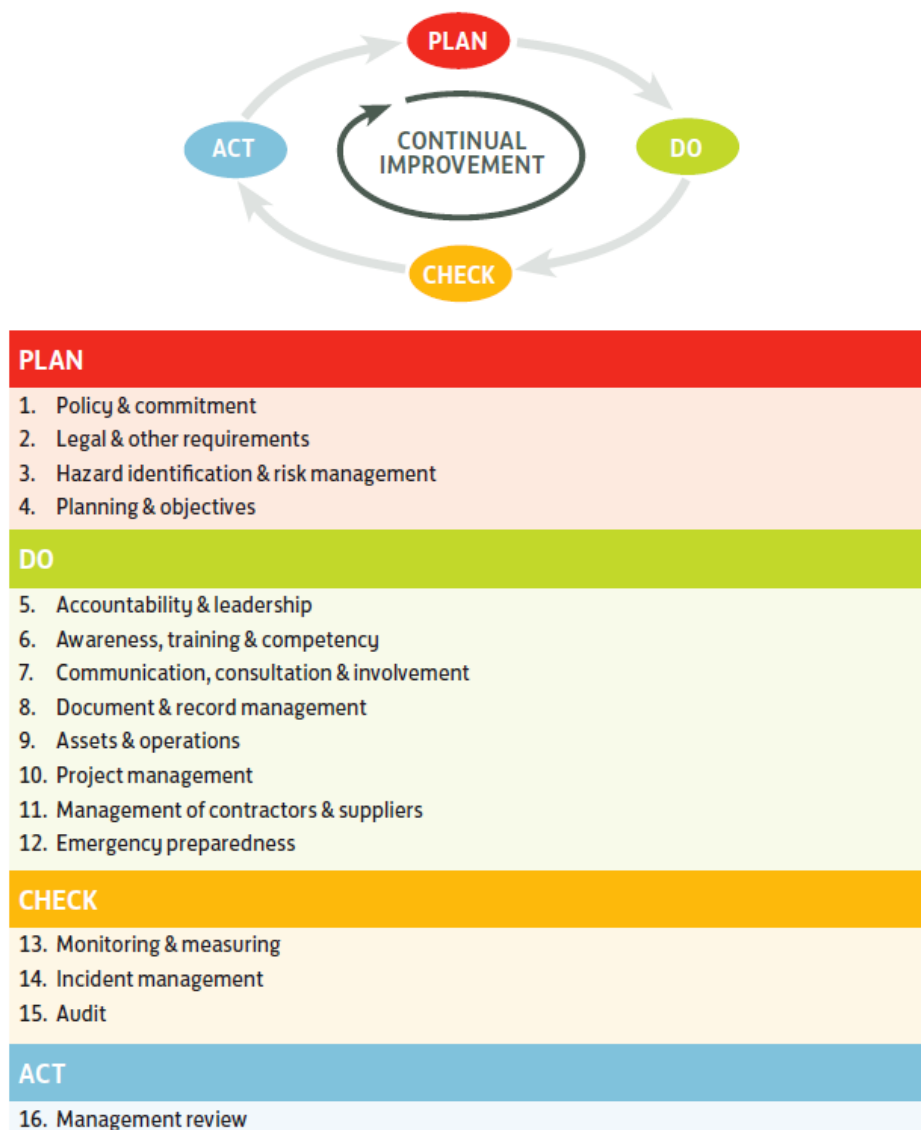


FIGURE 6-1: ERL HSEQMS

5.1.1 Oil Spill Contingency Plan

The ERL North Perth Basin Well Operations Oil Spill Contingency Plan (OSCP) (EOC-EN-PLN-0005) outlines the response structure and considers the four key aspects of prevention, preparedness, response and recovery. An OSCP is required to set out the following:

- Preparations are on hand for the possibility of an oil spill;
- Emergency response arrangements are implemented if an oil spill occurs; and
- Recovery arrangements are implemented if an oil spill occurs.

The OSCP describes the Emergency Management framework that is in place to ensure any emergency events are managed effectively.

5.2 Environment Plan Revision

Regulation 18 of the PGER(E)R requires that ERL review and submit a proposed revision of the accepted EP:

- before the commencement of a new activity;
- or any significant modification, change of a new stage of an existing activity; and
- before, or as soon as practicable after, the occurrence of any significant new environmental impact or risk, or significant increase in an existing environmental impact or risk which occurred or is to occur.

Additionally, Regulation 20 of PGER(E)R requires that ERL submit a proposed revision of the EP five years from the date when the EP is accepted by the Minister.

6 Stakeholder Consultation

Minimising and mitigating the potential environmental impacts associated with the well activities is assisted by the engagement of key stakeholders to ensure all issues are identified and addressed.

In accordance with Regulation 17 of PGER(E)R, ERL completed a scoping exercise to determine which authorities, persons and organisations were considered to be relevant.

Given the isolated location of the well locations, limited stakeholders were identified but include:

- Department of Mines, Industry Regulation and Safety (DMIRS);
- Department of Water and Environmental Regulation (DWER);
- Department of Planning, Lands and Heritage;
- Environmental Protection Authority;
- Shire of Mingenew;
- Prescribed Body Corporate for Southern Yamatji;
- Southern Yamatji people (Traditional Land Owners); and
- Landowners.

In addition to these stakeholders, ERL also identified other contractors that may be called upon in the event of a major spill to support response and recovery operations. Although not relevant to the petroleum activities, they were identified and may be consulted over the course of the program. These companies include:

- Lenane Holdings civil earthworks;
- Toxfree;
- Clean away; and
- SGS.

A summary of the consultation with these stakeholders is include as Table 6-1.

TABLE 6-1: SUMMARY OF STAKEHOLDER CONSULTATION AND ASSESSMENT OF MERITS

Stakeholder	Date	Summary of Consultation	Objections / claims raised	ERL response	Close out of Issues (if any)
Landowner #1	11/02/2019 to present	Ongoing routine communication with the landowner regarding all activities at the Lockyer Deep-1 well location and future potential work scopes.	Through a positive working relationship there is ongoing guidance being provided by the landowner in relation to improvements that can be incorporated into the engagement process.		N/A

Stakeholder	Date	Summary of Consultation	Objections / claims raised	ERL response	Close out of Issues (if any)
Shire of Mingenew	14/08/2019 to present	Ongoing communication with the Mingenew Shire CEO on various issues relating to the Lockyer Deep-1 well operations, other work in the area and associated services and road use in the area.	None.	Ongoing	N/A
YSRC	7 – 16 December 2021	EMAIL correspondence with YSRC regarding entering a Yamatji Proponent Standard Heritage Agreement (YPSHA) for EP 368, EP 426, EP 430 and EP 454.	EnRes requested amendments to YPSHA to provide for petroleum activities and Joint Venture provisions.	Parties discussed proposed amendments.	Meeting held 16 December 2022.
YSRC	16 December 2021	MEETING with YSRC to discuss YPSHA and present activities for next 6 months.	YSRC require advice from State Solicitor's Office on amendments to YPSHA.	Parties agree to cooperation in good faith as if agreement was in place.	N/A
YSRC	December 2021 – January 2022	EMAIL correspondence with YSRC regarding YPSHA.	N/A	N/A	N/A
Landowner #2	18/01/2022	Call and text message to landowner to arrange on site meeting regarding NED-1 well.	Landowner proposed a date, Aztech responded to confirm date.	N/A	N/A
Landowner #3	18/01/2022	Call and text message to landowner to arrange on site meeting regarding LKR-2 well.	Landowner proposed a date, Aztech responded to confirm date.	N/A	N/A
Landowner #2	01/02/2022	Aztech Drilling Project Manager and Land Access & Approvals Manager met with landowner in person in ERL office to discuss drilling NED-1 location and present plans for consideration. We discussed access locations, pad size, disruption, duration etc.	No objections.	Maps sent to landowner – location agreed in principal. Access allowed for location scouting. Agreement for seismic surveys finalised – landowner progressing agreement for drilling using same template.	Aztech to continue to work with landowner to progress agreement through corporate hierarchy. They are aware and agreeable to timing.
Landowner #3	03/02/2022	Aztech Drilling Project Manager and Land Access & Approvals Manager met with the landowner in person to discuss drilling Lockyer-2 and present	No objections.	Maps sent to landowner for consideration – location agreed in principal.	Agreement to be reviewed and signed

Stakeholder	Date	Summary of Consultation	Objections / claims raised	ERL response	Close out of Issues (if any)
		plans for consideration. We discussed access locations, pad size, disruption, duration etc. Access allowed by landowner to scout the proposed access track and river crossing to well location.		Aztech drafting agreement with compensation particulars for consideration and signing.	
Landowner #1	03/02/2022	Aztech Drilling Project Manager and Land Access & Approvals Manager met with the landowner in person to discuss drilling Lockyer-3 and present plans for consideration. We discussed access locations, pad size, disruption, duration etc. Access allowed by landowner to scout the proposed access track and river crossing to well location. Ongoing discussions in relation to this work scope	No objections.	Maps provided to landowner for consideration – location agreed in principal. Aztech drafting new agreement with compensation particulars for consideration and signing.	Agreement to be reviewed and signed
Landowner #3	11-14 March 2022	EMAIL: Correspondence regarding proposed access route to the drilling location	Response by email accepting the proposed location 14/3	N/A	Access approved in principle
DMIRS	23/03/2022	Communication with DMIRS to advise of the pending submission of this EP and the person taking over role as the Environmental Officer assigned to ERL.	N/A	N/A	N/A
Landowner #3	10 May 22	EMAIL: Draft access and compensation agreement sent for consideration	No objections	N/A	N/A
YSRC	10 – 31 May 2022	EMAIL correspondence to set up meeting with YSRC and Knowledge Holders for EnRes to present on upcoming activities in 2022-2023 (including wells on EP 368).	N/A	N/A	Meeting held 7 June 2022.
Landowner #2	11 May 22	EMAIL: Draft access and compensation agreement sent for consideration	No objections	N/A	N/A
Landowner #3	16 -20 May 22	EMAIL: request for bore location and provided drawings for proposed river crossing improvements	No objections/response	N/A	N/A

Stakeholder	Date	Summary of Consultation	Objections / claims raised	ERL response	Close out of Issues (if any)
Landowner #2	16 – 20 May 22	EMAIL: correspondence regarding location of the water bores and drilling camp	No objections	Landowner advised he was discussing water bore and camp location with the farm manager and would revert back with location.	Responded with agreement of locations and acceptance of proposed compensation.
Landowner #3	31 May 22	EMAIL: ERL follow up email to bore and crossing request	No objections/response	N/A	N/A
YSRC	June – July 2022	EMAIL correspondence regarding YPSHA.	N/A	N/A	Draft deed of variation provided to EnRes.
YSRC	3 June 2022	EMAIL correspondence providing YSRC with copy of presentation on upcoming activities on EP 368.	N/A	N/A	N/A
DPLH	15 June 2022	EMAIL correspondence with DPLH seeking advice on approvals required for river crossing improvement works.	DPLH requested details of activity and letter of support from Traditional Owners/YSRC.	N/A	Details of activity provided 11 July 2022.
Landowner #4	15 June 2022	Darrell Girgenti (Wells Project Manager) & Leah Fuller (Land Access & Approvals Manager) met with the Michaels family in person to discuss drilling Lockyer-4 and present plans for consideration. We discussed access locations, pad size, disruption, duration etc. Access allowed by family to scout the proposed access track and well location. Ongoing discussions in relation to this workscope.	While not enthusiastic about the presence of the well, no objections were raised	Maps provided to Michaels family for consideration – location agreed in principal. Leah drafting new agreement with compensation particulars for consideration and signing.	Agreement to be reviewed and signed
Landowner #3	22 June 22	EMAIL: Response to draft access agreement with comments	Some minor amendments to the agreement T&C, and amendments required to compensation	Some follow up phone calls and meeting planned for 10/7	N/A
YSRC	30 June 2022	EMAIL – Activity description for North Erregulla Deep-1 exploration well provided to YSRC.	Pending – no response as at 21 July 2022.	N/A	Pending

Stakeholder	Date	Summary of Consultation	Objections / claims raised	ERL response	Close out of Issues (if any)
YSRC	July 2022	PHONE and EMAIL correspondence requesting updates on activity descriptions.	N/A	N/A	N/A
YSRC	11 July 2022	EMAIL – Activity description for Irwin River crossing improvement works provided to YSRC.	Heritage survey required for river crossing	Pre activity survey conducted and monitors on site for the activity – no items of heritage significance encountered	Closed
DPLH	11 – 13 July 2022	EMAIL – Activity Management Plan for Irwin River Crossing Improvement Works provided to DPLH.	Clarification on scope of works and noting support from Traditional Owners/YSRC.		Approval received on the 6 th Oct 2022
Landowner #2	15 June 22	EMAIL: response with questions for drilling and camp location and water bore location, some questions to answer and request for execution version of agreements.	No objections	Some further questions regarding vegetation and agreement specifics.	Answers sought from Project Manager/Legal.
Landowner #2	5 July 22	EMAIL: Clean version of drilling and camp access and compensation agreement attached and answers to questions provided.	No objections	Answers to all questions provided by email.	N/A
Heritage consultant	20 July 2022	PHONE – Call to discuss the activity notices that were submitted to the YSRC. Consultant advised that these would be discussed at the weekly heritage meeting and the YSRC should come back to EnRes with any feedback on the activity notices.	N/A	Pre activity survey conducted and monitors on site for the activity – no items of heritage significance encountered	Closed
Landowner #4	04 Aug 2022	Darrell Girgenti (Wells Project Manager) and Allan Lenane (Civils contractor) met with Daniel to discuss civils plan and revisit the proposed well location. Also discussed alternate access for Lockyer-2 through their farm.	No objections RE Lockyer-4 discussion however not enthusiastic about alternate access to Lockyer-2	N/A	N/A
Perpetual	27 Sept 2022	Land Access Agreement finalised between the parties	No objections raised	N/A	Closed
Rob Holmes	13 Oct 2022	Land Access Agreement finalised between the parties	No objections raised	N/A	Closed

Stakeholder	Date	Summary of Consultation	Objections / claims raised	ERL response	Close out of Issues (if any)
Rebecca, Paul and Sue Kelly	28 Nov 2022	Land Access Agreement finalised between the parties	No objections raised	N/A	Closed
DPLH	23 Nov 2022	Response letter advising the L-4 activity area is outside the closed boundary for Aboriginal site ID 24381 (Lockier River)	N/A	N/A	N/A
YSRC	30 Nov 2022	EMAIL – Activity description for Lockyer-4 exploration well provided to YSRC	No objections raised - no heritage survey is required	Invitations for monitors to be on site during stripping of top soil	Closed

6.1 Ongoing Consultation

ERL will continue to engage with identified relevant stakeholders for the duration of the project. ERL plans to be operating in the Perth Basin for a long time, and wishes to ensure we are seen as a valued and respected member of the communities we will be working in. ERL aim to ensure all dealings with the community are transparent and based on honesty and integrity.

ERL is committed to working with the local community to ensure people are kept informed and can ask questions and raise issues if required. All questions, feedback or concerns are considered and responded to. Some of the stakeholder engagement activities related to the wells and other activities in EP 368 are summarised in Table 6-2.

TABLE 6-2: SUMMARY OF ONGOING STAKEHOLDER ENGAGEMENT

ENGAGEMENT	PROCESS/ACTIVITY	RATIONALE
Landowner meetings	Ensure suitable timing to landowner for meetings.	Used for consultation about land access agreements for flora and fauna surveys and seismic activities.
1:1 face-to-face meetings	Special face to face meetings with key stakeholders on as needs basis.	Used for consultations with decision making authorities, regulatory agencies, Traditional Owners, industry peers, community groups and individual stakeholders.
Letters and direct correspondence	Targeted correspondence providing information on planned well operations will be provided to specific stakeholders as appropriate. This correspondence may offer further contact or seek comments or feedback, as appropriate.	Used for specific stakeholders with specific areas of interest.
Site visits	Site visits to drilling and seismic activities, demonstrating transparency of the work and its impacts on local environment	Offered to interested stakeholders to visually demonstrate well activities in progress on an as needs basis.
Face to face information and Q&A sessions	Targeted meetings will be convened with key stakeholders and community groups on an as needs basis, to address specific issues.	Used for consultations with decision making authorities, regulatory agencies, Traditional Owners, industry peers, community groups and individual stakeholders
Facts sheets	Collaborative industry information obtained from technical specialists, peers, APPEA, GISERA, DoW, DMIRS.	Used to educate stakeholders on operational capability and explain how ERL plans to manage key issues/risks. Content will be presented in an

		informative, but non-technical way. Visual element essential. May also be used for public events such agricultural shows and other community events.
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Appendix 1 Chemical Disclosure

1. Drilling Fluid Chemical Disclosure

A. SYSTEM DETAILS:	
OPERATOR:	ERL
PROJECT / WELL NAME:	Lockyer-2, Lockyer-3, Lockyer-4, North Erregulla Deep-1 Exploration Wells
SYSTEM:	Drilling Fluids, HT Logging Pill & Completion Brine
TOTAL VOLUME OF SYSTEM (m³):	*3180 m³ per well

* includes 100% contingency volume

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
Water	N/A	Base Fluid	Bore water sourced onsite	69.31%	N
Barite / API Barite	Newpark	Weighting Agent	<p><u>Constituents:</u> BARIUM SULPHATE QUARTZ (CRYSTALLINE SILICA)</p> <p><u>Toxicity:</u> Low toxicity. Under normal conditions of use, adverse health effects are not anticipated. QUARTZ (SILICA CRYSTALLINE) (14808-60-7) LCLo (inhalation) 300 ug/m³/10 years (human) TCLo (inhalation) 16 000 000 particles/ft³/8 hours/17.9 years (human-fibrosis)</p> <p><u>Aquatic toxicity:</u> Fish Toxicity LC50 (Rainbow trout) > 7500 ppm/96hrs. LC50 (Fresh Water Trout) > 21,000 ppm/96hrs. LC50 (Salt Water StickleBack) > 56,000 ppm/96hrs.</p> <p><u>Biodegradation/bioaccumulation:</u> Barium sulphate (major ingredient of barite (60-100%)) is insoluble in water and not biodegradable. Not expected to bioaccumulate.</p>	0.19%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities.</p> <p>OCNS Rated E - 24310, Exp 09/08/2021</p>		
Bentonite / Maxigel / API Bentonite	Newpark	Viscosifier	<p><u>Constituents:</u> BENTONITE QUARTZ (CRYSTALLINE SILICA) SODA ASH</p> <p><u>Toxicity:</u> The main component/s of this product are not anticipated to cause any adverse effects to plants or animals. QUARTZ (SILICA CRYSTALLINE) (14808-60-7) LCLo (inhalation) 300 ug/m³/10 years (human) TCLo (inhalation) 16 000 000 particles/ft³/8 hours/17.9 years (human-fibrosis) BENTONITE (1302-78-9) LD50 (intravenous) 35 mg/kg (rat) LD50 (oral): >2000mg/kg (rat) LDLo (intravenous) 10 mg/kg (dog) Inhalation LC 50: >5.27 mg/L, 4hr (rat)</p> <p><u>Ecotoxicity Data:</u> Bentonite (1302-78-9) EC50 Daphnia > 100 mg/l, 48 hours EC50 Freshwater algae > 100 mg/l, 72 hours LC50 Freshwater fish 16000 mg/l, 96 hours LC 50 Marine water fish 2800 - 3200 mg/l, 24 hours EC50 Coon stripe shrimp (<i>Pandalus danae</i>) 24.8 mg/l, 96 hours EC 50 Dungeness or edible crab (Cancer magister) 81.6 mg/l, 96 hours LC50 Rainbow trout, donaldson trout (<i>Oncorhynchus mykiss</i>) 19000 mg/l, 96 hours</p> <p><u>Persistence and degradability:</u> Not relevant for inorganic substances</p> <p><u>Mobility:</u> Low water solubility, expected to sink and migrate into the sediment. Expected to partition to</p>	2.00%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			sediment and wastewater solids. <u>Bioaccumulation:</u> Will not bio-accumulate. <u>Other adverse effects:</u> No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component. OCNS Rated E - 26210 Exp 01/02/2021		
Potassium Chloride	Newpark	Shale swelling inhibition (smectite & illite clays)	<u>Constituents:</u> POTASSIUM CHLORIDE <u>Toxicity:</u> Acute toxicity: LD50 (Ingestion): 1500 mg/kg (mouse) LD50 (Intraperitoneal): 620 mg/kg (mouse) LD50 (Intravenous): 117 mg/kg (mouse) LDLo(Ingestion): 20 mg/kg (man) LDLo (Intraperitoneal):900 mg/kg (guinea pig) LDLo (Intravenous): 77 mg/kg (guinea pig) LDLo (Subcutaneous): 2120 mg/kg (frog) TDLo (Ingestion): 60 mg/kg/days (woman) <u>Ecotoxicity:</u> In short-term acute toxicity tests with fish, daphnia and algae the following results were found (lowest test result values): <i>Ictalurus punctulus</i> 48h-LC50 = 720 mg/l; <i>Daphnia magna</i> : 48h-LC50 = 177 mg/l; <i>Nitzschia linearis</i> : 120 h-EC50 = 1337 mg/l. A chronic reproductive test with the invertebrate <i>Daphnia magna</i> gave a LOEC of 101 mg/l. All the studies compiled on the acute and chronic aquatic toxicity were > 100 mg/L. Thus, it is concluded that KCl is not hazardous to freshwater organisms. Taking into considerations the background concentrations of KCl in seawater (380 mg/l K+ and 19,000 mg/l Cl-), it is concluded that there is no reason for further investigations of KCl on marine species. The low concern for the environment is supported by the absence of a bioaccumulation potential for the substance. <u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Does not	3.66%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			bioaccumulate. Mobile in Soil: No impact if small amount is released to the soil. OCNS Rated E - 24330, Exp 11/03/2021		
Calcium Carbonate Various Grades – TrueCarb's, Limestone t / Circal's / Unical C300C, Omyacarb's	Newpark	Bridging & Weighting Agent	CONSTITUENT 1 (>96%) <u>Toxicology Data:</u> Oral Toxicity (LD50) – > 5000 mg/kg (rat) CONSTITUENT 2 (<1%) <u>Toxicology Data:</u> LCLo (inhalation) = 300 ug/m ³ /10 years (human) TCLo (inhalation) = 16 000 000 particles/ft ³ /8 hours/17.9 years (human-fibrosis) <u>Ecotoxicity Data:</u> Calcium carbonate occurs naturally in a wide variety of substances including limestone, marble and egg shells. It is not anticipated to cause adverse environmental effects. <u>Biodegradation/Bioaccumulation:</u> This product does not bioaccumulate.	2.93%	Y
Salt (Sodium Chloride all grades)	Newpark	Weighting Agent	<u>Constituents:</u> SODIUM CHLORIDE INORGANIC SALT(S) WATER <u>Toxicity:</u> Acute toxicity: LC50 (Inhalation): > 42000 mg/m ³ /1 hour (rat) LD50 (Ingestion): 3000 mg/kg (rat) LD50 (Skin): > 10000 mg/kg (rabbit) <u>Ecotoxicity:</u> LC50 (water flea) is 2122 mg/L/48 hours;	19.80%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>LC50 (fathead minnow) is 6.57 g/L/96 hours.</p> <p>This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities.</p> <p><u>Biodegradation/Bioaccumulation:</u></p> <p>Biodegradability does not pertain to inorganic substances. Does not bioaccumulate.</p>		
NewZan D/Xanthan gum	Newpark	Viscosifier	<p><u>Constituents:</u></p> <p>XANTHAM GUM</p> <p>WATER</p> <p><u>Toxicity:</u></p> <p>Acute toxicity:</p> <p>LD50 (oral) > 1000 mg/kg (mouse)</p> <p>LD50 (oral) > 45,000 mg/kg (rat)</p> <p>LD50 (oral) > 20,000 mg/kg (dog)</p> <p>LD50 (intraperitoneal): > 50 mg/kg (mouse)</p> <p>LD50 (intravenous): 100-250 mg/kg (mouse)</p> <p><u>Biodegradation/Bioaccumulation:</u></p> <p>This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities. Not expected to bioaccumulate.</p> <p>OCNS Rated E - 26280, Exp 22/02/2021</p>	0.43%	Y
NewPac LV / NewPac PLV / Drispac SL	Newpark	Fluid Loss	<p><u>Constituents:</u></p> <p>SODIUM CARBOXYMETHYL CELLULOSE</p> <p>SODIUM CHLORIDE</p> <p>WATER</p> <p>SODIUM GLYCOLATE</p> <p><u>Toxicity:</u></p> <p>Acute toxicity data available for ingredients:</p> <p>SODIUM CARBOXYMETHYL CELLULOSE (9004-32-4)</p>	0.52%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>LD50 (Ingestion): 16000 mg/kg (guinea pig) LD50 (Skin): > 2000 mg/kg (rabbit) TDLo (Ingestion): 140 mg/kg (rat) SODIUM CHLORIDE (7647-14-5) LC50 (Inhalation): > 42000 mg/m3/1 hour (rat) LD50 (Ingestion): 3000 mg/kg (rat) LD50 (Intraperitoneal): 2602 mg/kg (mouse) LD50 (Intravenous): 645 mg/kg (mouse) LD50 (Skin): > 10000 mg/kg (rabbit) LD50 (Subcutaneous): 3000 mg/kg (mouse) LDLo (Ingestion): 8000 mg/kg (rabbit) LDLo (Intravenous): 300 mg/kg (guinea pig) LDLo (Subcutaneous): 2160 mg/kg (guinea pig) TDLo (Ingestion): 12357 mg/kg (human) SODIUM GLYCOLATE (2836-32-0) LD50 (Ingestion): 6700 mg/kg (mouse) LDLo (Ingestion): 500 mg/kg (cat)</p> <p><u>Ecotoxicity:</u> LC50 (Fresh Water Trout) > 21,000 ppm/96hrs. LC50 (Salt Water StickleBack) > 56,000 ppm/96hrs.</p> <p><u>Biodegradation/Bioaccumulation:</u> This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities. Not expected to bioaccumulate.</p> <p>NewPac LV - OCNS Rated E - 28129, Exp 18/05/2021</p>		
NDFT 376 & NDFT 377	Newpark	Prevent lost circulation	<p><u>Constituents:</u> ORGANIC FIBRE(S) Not classified as hazardous according to Safe Work Australia criteria.</p> <p><u>Toxicity:</u></p>	0.05%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>This product is expected to be of low acute toxicity. Under normal conditions of use, adverse health effects are not anticipated.</p> <p>Oral Toxicity (LD50) > 5000 mg/kg (rat), Dermal Toxicity (LD50) > 2000 mg/kg (rabbit)</p> <p><u>Biodegradation/Bioaccumulation:</u> No information provided.</p>		
Ancor 1	Newpark	Corrosion Inhibitor	<p>CONSTITUENT 1 (68-72%)</p> <p><u>Toxicology Data:</u> Oral Toxicity (LD50) 6400 mg/kg (rat) Dermal Toxicity (LD50) > 2000 mg/kg (rabbit) LD50 (Ingestion): 2200 mg/kg (rabbit) LD50 (Intraperitoneal): 1450 mg/kg (mouse) LD50 (Skin): > 20 mL/kg (rabbit) TDLo (Ingestion): 16 g/kg/64 weeks (mouse - cancer)</p> <p><u>Ecotoxicity Data:</u> LC50 (shrimp): > 100 ppm.</p> <p><u>Biodegradation/bioaccumulation:</u> Not expected to bioaccumulate.</p> <p>CONSTITUENT 2 (28-32%) Non-hazardous ingredient.</p>	0.04%	Y
AvaPolymer 5050	Newpark	Encapsulating Agent - provides shale inhibition	<p><u>Constituents:</u> Not applicable – Non-hazardous ingredients</p> <p><u>Hazard Identification:</u> Not a dangerous substance or mixture according to the Globally Harmonized System (GHS).</p>	0.15%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>Constituent 1 – (60%) ATEmix (oral) 27,000.00 mg/kg ATEmix (dermal) 2,002.00 mg/kg Constituent 2 - (40%) Oral Toxicity (LD50) - 16000 mg/kg (guinea pig) Dermal Toxicity (LD50) - > 2000 mg/kg (rabbit) TDLo (oral) 140 mg/kg (rat) <u>Ecotoxicity:</u> The environmental impact of this product has not been fully investigated. 100% of the mixture consists of component(s) of unknown hazards on the aquatic environment. This product has an CEFAS OCNS Gold rating. Registration number 27397 <u>Biodegradation/Bioaccumulation:</u> No information available.</p>		
Caustic Soda	Newpark	pH control- prevents bacteria & corrosion.	<p><u>Constituents:</u> SODIUM HYDROXIDE <u>Toxicity:</u> Toxicity Data available for the ingredients: SODIUM HYDROXIDE (1310-73-2): LD50 (Intraperitoneal): 40 mg/kg (mouse) LDLo (Ingestion): 1.57 mg/kg (human) SILICA, AMORPHOUS (7631-86-9): LD50 (ingestion): 3160 mg/kg (rat)</p>	0.10%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Does not bioaccumulate. WATER: If released to waterways, alkaline products may change the pH of the waterway. Fish will die if the pH reaches 10-11 (goldfish 10.9, bluegill 10.5). SOIL: May leach to groundwater with toxic effects on aquatic life as above. ATMOSPHERE: Not expected to reside in the atmosphere. Drops or particles released to atmosphere should be removed by gravity and/or be rained out. OCNS category and registration number E - 24316		
Sodium Sulphite	Newpark	Oxygen Scavenger	<u>Constituents:</u> SODIUM SULPHITE SODIUM SULPHATE SODIUM CARBONATE WATER <u>Toxicity:</u> Acute toxicity: LD50 (Ingestion): 820 mg/kg (mouse) LD50 (Intraperitoneal): 950 mg/kg (mouse) LD50 (Intravenous): 175 mg/kg (mouse) LDLo (Ingestion): 2825 mg/kg (rabbit) LDLo (Intravenous): 400 mg/kg (cat) LDLo (Subcutaneous): 600 mg/kg (rabbit) SODIUM CARBONATE (497-19-8) LC50 (inhalation) 800 mg/m ³ /2 hours (guinea pig) LD50 (ingestion) 4090 mg/kg (rat) LD50 (intraperitoneal) 117 mg/kg (mouse) LD50 (subcutaneous) 2210 mg/kg (mouse) SODIUM SULPHATE (7757-82-6) LD50 (ingestion) 5989 mg/kg (mouse) LD50 (intravenous) 1220 mg/kg (rabbit)	0.16%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			LDLo (intravenous) 1220 mg/kg (mouse) TDLo (ingestion) 14 g/kg (mouse - 8-12 days pregnant) TDLo (subcutaneous) 806 mg/kg/26 weeks intermittently (mouse) <u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Does not bioaccumulate. OCNS category and registration number E - 26232		
Soda Ash	Newpark	pH / Hardness control	<u>Constituents:</u> SODIUM CARBONATE <u>Toxicity:</u> LD50 (Ingestion): 4090 mg/kg (rat) LC50 (Inhalation): 800 mg/m3/2 hours (guinea pig) LD50 (Intraperitoneal): 117 mg/kg (mouse) LD50 (Subcutaneous): 2210 mg/kg (mouse) <u>Ecotoxicity:</u> Fishes, <i>Lepomis macrochirus</i> , LC50, 96 h, 300 mg/l Crustaceans, <i>Ceriodaphnia dubia</i> , EC50, 48 h, 200 - 227 mg/l <u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Does not bioaccumulate. WATER: If released to waterways, alkaline products may change the pH of the waterway. Fish will die if the pH reaches 10-11 (goldfish 10.9, bluegill 10.5). SOIL: May leach to groundwater with toxic effects on aquatic life as above. ATMOSPHERE: Not expected to reside in the atmosphere. Drops or particles released to atmosphere should be removed by gravity and/or be rained out. OCNS category and registration number E - 26180	0.11%	Y
Sodium Bicarbonate	Newpark	pH Buffer, Contamination Treatment	<u>Constituents:</u> SODIUM BICARBONATE <u>Toxicity:</u>	0.15%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>Acute toxicity: LD50 (Ingestion): 3360 mg/kg (mouse) LC50 (inhalation): 4.74 mg/L (rat) <u>Ecotoxicity:</u> Fishes, <i>Lepomis macrochirus</i>, LC50, 96 h, 300 mg/l Crustaceans, <i>Ceriodaphnia dubia</i>, EC50, 48 h, 200 - 227 mg/l Ecotoxicity Data: LC50 (<i>Oncorhynchus mykiss</i>), 96 h, 7.700 mg/l LC50 (<i>Lepomis macrochirus</i>), 96 h, 7.100 mg/l EC50 (Crustaceans, <i>Daphnia magna</i>) 48 h, 4.100 mg/l LOEC (Crustaceans, <i>Daphnia magna</i>) 48 h, 3.100 mg/l <u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Not expected to bioaccumulate. This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities. OCNS category and registration number E - 26175</p>		
Idcide-20	Newpark	Biocide/Prevents bacterial contamination of the mud	<p><u>Constituents:</u> TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE(2:1) WATER <u>Toxicity:</u> Toxicity data available for ingredient: TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE (55566-30-8) LD50 (ingestion) 248 mg/kg (rat) TDLo (ingestion) 650 mg/kg/13 weeks - intermittent (rat) <u>Ecotoxicity:</u> 75% TETRAKIS(HYDROXYMETHYL)PHOSPHONIUM SULPHATE (55566-30-8): LC50 (Rainbow Trout) = 119 mg/L/96 hr LC50(Bluegill Sunfish) = 93 mg/L/ 96 hr</p>	0.09%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			EC50 (Daphnia Magna) = 19 mg/L/48 hr LC50 (Brown Shrimp) = 340 mg/L/96 hr LC50 (Mysid Shrimp) = 9.5 mg/L/96 hr LC50 (Sheepshead Minnow) = 94 mg/L/96 hr LC50 (Jevenile Plaice) = 86 mg/L/96 hr Waste Water management EC50 (Activated Sludge) = 24 mg/L/3 hr <u>Persistence and degradability:</u> This product is readily biodegradable. http://www.inchem.org/documents/ehc/ehc/ehc218.htm		
Citric Acid	Newpark	pH Buffer	<u>Constituents:</u> CITRIC ACID WATER <u>Toxicity:</u> Acute toxicity: LD50 (Ingestion): 3000 mg/kg (rat) LD50 (Intraperitoneal): 290 mg/kg (rat) LD50 (Intravenous): 42 mg/kg (mouse) LDLo (Ingestion): 7000 mg/kg (rabbit) <u>Ecotoxicity:</u> LC50 (<i>Leuciscus idus melanotus</i>): 440 mg/L - 48 h LC 50 (<i>Daphnia magna</i>) (Water flea) - 1.535 mg/L - 24 h <u>Biodegradation/Bioaccumulation:</u> Readily Biodegradability. Does not bioaccumulate. If citric acid is released to water, it is expected to biodegrade rapidly. May be toxic to fish at moderately high levels (120 ppm is fatal to daphnia; 894 ppm with pH 4 is fatal to goldfish) due to acidic nature. Fairly high biological oxygen demand (BOD) which may cause oxygen depletion in large spills. Citric acid occurs naturally in many plants.	0.03%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			OCNS category and registration number E - 24317		
Magnesium Oxide	Newpark	pH Indicator	<p><u>Constituents:</u> MAGNESIUM OXIDE CALCIUM OXIDE SILICON DIOXIDE (SILICA, AMORPHOUS) Not classified as hazardous according to Safe Work Australia criteria.</p> <p><u>Toxicity:</u> Acute toxicity: This product is expected to be of low toxicity.</p> <p><u>Ecotoxicity:</u> No information provided.</p> <p><u>Bioaccumulation/Biodegradation:</u> No information provided.</p> <p>OCNS category and registration number E - 28127</p>	0.05%	Y
TEA	Newpark	Polymer stabiliser which effectively reduces the degradation of polymers at high temperatures	<p><u>Constituents:</u> TRIETHANOLAMINE DIETHANOLAMINE</p> <p><u>Toxicity:</u> Acute toxicity: CONSTITUENT 1 (>60%) Oral Toxicity (LD50) 2200 mg/kg (rabbit), Dermal Toxicity (LD50) > 20 mL/kg (rabbit) CONSTITUENT 2 (10 – 30%) Oral Toxicity (LD50) 620 uL/kg (rat), Dermal Toxicity (LD50) > 20 mL/kg (rabbit) CONSTITUENT 3 (<10%) Component is naturally occurring and not intrinsically hazardous.</p> <p><u>Biodegradation/Bioaccumulation:</u> The substance is expected to be readily biodegradable according to the AS 4351 Part 2 test method.</p>	0.12%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			In soil and water, triethanolamine will biodegrade fairly rapidly following acclimation (half-life in the order of days to weeks). In soil, residual triethanolamine may leach to groundwater. LC50 (shrimp): > 100 ppm.		
Driscal D	Newpark	High temperature polymer	<p><u>Constituents:</u> Not applicable – Non-hazardous ingredients. Not a dangerous substance or mixture according to the Globally Harmonized System (GHS).</p> <p><u>Toxicity:</u> LCLo (Inhalation): 300 ug/m3/10 years (human), LDLo (Intratracheal): 200 mg/kg (rat) LDLo (Intravenous): 20 mg/kg (dog), TCLo (Inhalation): 16 000 000 particles/ft3/8 hours/17.9 years (human-fibrosis) The product contains no substance classified as hazardous to health in concentrations which should be taken into account.</p> <p><u>Bioaccumulation:</u> Accumulation in aquatic organisms is unlikely.</p> <p><u>Biodegradability:</u> Taking into consideration the properties of several ingredients, the product is estimated not to be readily biodegradable according to OECD classification.</p>	0.03%	Y
Gagetrol	Newpark	HT Fluid Loss	<p><u>Constituents:</u> CARBOXYMETHYL STARCH Not classified as hazardous according to Australian WHS Regulations.</p> <p><u>Toxicity:</u> Low toxicity - low irritant. Under normal conditions of use, adverse health effects are not anticipated.</p> <p><u>Ecotoxicity:</u></p>	0.03%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities.</p> <p><u>Biodegradation/Bioaccumulation:</u> Not expected to bioaccumulate.</p> <p>OCNS category and registration number Gold - 27759</p>		
Defoam-AP400	Newpark	Defaomer suitable for High Temperatures	<p><u>Constituents:</u> POLYETHYLENE GLYCOL OCTAN-2-OL Not classified as hazardous according to Safe Work Australia criteria.</p> <p><u>Toxicity:</u> Low toxicity - low irritant. This product has the potential to irritate mucous membranes. Use safe work practices to avoid eye or skin contact and inhalation. Due to the low vapour pressure of this product, an inhalation hazard is not anticipated with normal use. Chronic exposure to some glycols may result in liver and kidney damage. POLYETHYLENE GLYCOL (25322-68-3) LD50 (ingestion) 33750 mg/kg (rat)</p> <p><u>Ecotoxicity:</u> No information provided.</p> <p><u>Biodegradation/Bioaccumulation:</u> No information provided.</p> <p>ATMOSPHERE: Vapour phase glycols are expected to degrade fairly rapidly by reaction with hydroxyl radicals (eg half-life 32 hours for propylene glycol). Removal from air by rainfall is possible. WATER: Should degrade relatively rapidly via biodegradation. SOIL: If released to soil, relatively rapid biodegradation should also occur. Leaching to groundwater may occur.</p>	0.05%	Y
TOTAL				100%	

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
Ancor 1	Newpark	Corrosion Inhibitor	<p>CONSTITUENT 1 (68-72%)</p> <p><u>Toxicology Data:</u></p> <p>Oral Toxicity (LD50) 6400 mg/kg (rat)</p> <p>Dermal Toxicity (LD50) > 2000 mg/kg (rabbit)</p> <p>LD50 (Ingestion): 2200 mg/kg (rabbit)</p> <p>LD50 (Intraperitoneal): 1450 mg/kg (mouse)</p> <p>LD50 (Skin): > 20 mL/kg (rabbit)</p> <p>TDLo (Ingestion): 16 g/kg/64 weeks (mouse - cancer)</p> <p><u>Ecotoxicity Data:</u></p> <p>LC50 (shrimp): > 100 ppm.</p> <p><u>Biodegradation/bioaccumulation:</u></p> <p>Not expected to bioaccumulate.</p> <p>CONSTITUENT 2 (28-32%)</p> <p>Non-hazardous ingredient.</p>	0.04%	Y
AVADEFOAM NS	Newpark	Defoamer suitable for WBM	<p><u>Constituents:</u></p> <p>Not applicable – Non-hazardous ingredients.</p> <p>Not a dangerous substance or mixture according to the Globally Harmonized System (GHS).</p> <p><u>Toxicity:</u></p> <p>CONSTITUENT 1 (95%) - Acute toxicity - Acute oral toxicity (LD50): 9380 mg/kg [Rat].</p> <p><u>Ecotoxicity:</u></p> <p>Ecotoxicity in water (LC50): 100 mg/l 96 hours [Fish]. Possibly hazardous short-term degradation products are not likely. However, long term degradation products may arise. The product itself and its products of degradation are not toxic.</p> <p><u>Toxicity:</u></p>	0.03%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>CONSTITUENT 2 (5%) - Acute toxicity - Dermal LD50 Albino rabbit - > 2000 mg/kg, 14 days At this dose no death occurred. LD50 Oral Albino Sprague-Dawley rat > 10000 mg/kg, 14 days At this dose no death occurred.</p> <p><u>Ecotoxicity:</u> Product Information: Product does not present an acute toxicity hazard based on known or supplied information. The following values are calculated based on chapter 3.1 of the GHS document ATEmix (oral) 10,010.00 mg/kg. The product is not classified as environmentally hazardous. Components Species Test Results Tall Oil Fatty Acids EC50 Bacteria (<i>Pseudomonas putida</i>) > 10000 mg/l, 16 hr Aquatic Algae EL50 > 1000 mg/l, 72 hr Growth rate; OECD 201 Green algae (<i>Selenastrum capricornutum</i>) Crustacea EL50 Water flea (<i>Daphnia magna</i>) > 1000 mg/l, 48 hr OECD 202 Fish LL50 Zebra danio (<i>Danio rerio</i>) > 10000 mg/l, 96 hr 95 % of the mixture consists of component(s) of unknown hazards to the aquatic environment</p> <p><u>Biodegradation/Bioaccumulation:</u> - Percent degradation (Aerobic biodegradation) Tall Oil Fatty Acids 88 - 100 % CO2 Evolution Test Species: Activated sewage sludge Test Duration: 28 d</p> <p>OCNS category and registration number Gold - 27915</p>		
New Perm NF / AvaPerm NF	Newpark	Prevent swelling clays by blocking the site for water hydration.	<p>An equivalent product to AVAPERM NF has been registered on the CEFAS Offshore Chemical Notification Scheme with a 'Gold' rating & Registration # 24780</p> <p>Constituents (mixture): HEXANEDINITRILE, HYDROGENATED, HIGH-BOILING FRACTION – (30 to 50%)</p>	0.80%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>HYDROCHLORIC ACID (<15%) NON-HAZARDOUS INGREDIENTS – (Remainder) <u>Toxicity:</u> Skin corrosion/irritation: Not corrosive (B.40 Bis - Reg. 440/2008/EC). Skin contact: Harmful and irritant. Eye contact: Irritant. Inhalation: Irritant. Ingestion: Harmful. Acute oral toxicity on rats (LD50): > 500 < 1000 mg/kg.* (based on components)</p> <p>Following information is confidential: <u>Ecotoxicity:</u> EC 50 (Skeletonema costatum) 54.4 mg/l LC50 (Acartia tonsa) 52.4 mg/l LC50 (Scophthalmus maximus juvenile) >51.0 mg/l <u>Biodegradation/Bioaccumulation:</u> Biodegradation Seawater test OECD 306 75 % Bioaccumulation OECD 117 LogPow ≤ 1.36</p>		
Barite / API Barite	Newpark	Weighting Agent	See Above	6.49%	Y
TrueScav HD	Newpark	Oxygen Scavenger Non-sulphur based,	<p><u>Constituents:</u> SODIUM ERYTHORBATE <u>Toxicity:</u> Constituent 1 – (>99%) The following values are calculated based on chapter 3.1 of the GHS document ATEmix (oral) 5,005.00 mg/kg Oral LD50 > 5 g/kg (Rat)</p>	0.02%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<u>Ecotoxicity:</u> The environmental impact of this product has not been fully investigated. Unknown aquatic toxicity. 100 % of the mixture consists of component(s) of unknown hazards to the aquatic environment. <u>Biodegradation/Bioaccumulation:</u> Persistence/Degradability: Possibly hazardous short-term degradation products are not likely; However, long term degradation products may arise.		
Thinpol	Newpark	Liquid dispersant	CONSTITUENT 1 (30-60%) <u>Toxicology Data:</u> This product is expected to be of low acute toxicity. Under normal conditions of use, adverse health effects are not anticipated Oral Toxicity LD50 - 2500 mg/kg (rat) LD50 (intraperitoneal) 39 mg/kg (mouse) LD50 (intravenous) 70 mg/kg (mouse) CONSTITUENT 2 (<100%) <u>Toxicology Data:</u> Non-hazardous ingredient. <u>Ecotoxicity Data:</u> (10000 ppm test concentration) (EPA-821-R-02-012) Mysidopsis Bahia = 48HR LC50 = 16.2mg/L. Menidia Beryllina = 48hr LC50 = 34.2 mg/L. Scopthalmus Maximus = 96hr LC50 > 1000 mg/L. Skeletonemia Costatum = 72hr EC50 = 393 mg/L [NOEC = 118 mg/L] Acartia Tonsa = 48hr EC50 = 393 mg/L [NOEC = 112 mg/L] Corophium Volutator = 10 day LC50 = 9338 mg/Kg [NOEC = 1000mg/Kg] <u>Biodegradation/bioaccumulation:</u>	0.10%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			No information available.		
NDFT 376 & 377	Newpark	Prevent lost circulation	<u>Toxicology Data:</u> Oral LD50 - > 5000 mg/kg (rat) Dermal LD50 - > 2000 mg/kg (rabbit) Inhalation LC50 - > 5800 mg/m ³ /4 hours (rat) <u>Ecotoxicity Data:</u> No information available. <u>Biodegradation/bioaccumulation:</u> No information available.	0.11%	Y
Calcium Chloride (94%) Powder	Newpark	Weighting Agent	<u>Constituents:</u> CALCIUM CHLORIDE ANHYDROUS SODIUM CHLORIDE WATER <u>Toxicity:</u> Acute toxicity: Based on available data, the classification criteria are not met. Toxicity Data available for the ingredients: CALCIUM CHLORIDE ANHYDROUS (10043-52-4) LD50 (Ingestion): 1000 mg/kg (rat) LD50 (Intraperitoneal): 210 mg/kg (mouse) LD50 (Intravenous): 42 mg/kg (mouse) LD50 (Subcutaneous): 823 mg/kg (mouse) LDLo (Ingestion): 1384 mg/kg (rabbit) LDLo (Intravenous): 150 mg/kg (guinea pig) LDLo (Subcutaneous): 249 mg/kg (cat) TDLo (Intravenous): 20 mg/kg/1 hour (woman) SODIUM CHLORIDE (7647-14-5) LC50 (Inhalation): > 42000 mg/m ³ /1 hour (rat) LD50 (Ingestion): 3000 mg/kg (rat)	0.07%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			LD50 (Intraperitoneal): 2602 mg/kg (mouse) LD50 (Intravenous): 645 mg/kg (mouse) LD50 (Skin): > 10000 mg/kg (rabbit) LD50 (Subcutaneous): 3000 mg/kg (mouse) LDLo (Ingestion): 8000 mg/kg (rabbit) LDLo (Intravenous): 300 mg/kg (guinea pig) LDLo (Subcutaneous): 2160 mg/kg (guinea pig) TDLo (Ingestion): 12357 mg/kg (human) <u>Ecotoxicity:</u> No information provided. <u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Does not bioaccumulate.		
MEG	Newpark	Agent to free differentially stuck pipe	<u>Constituents:</u> ETHYLENE GLYCOL <u>Toxicity:</u> Toxicity data available for ingredient: ETHYLENE GLYCOL (107-21-1) LC50 (inhalation) 10 876 mg/kg (rat) LD50 (ingestion) 1650 mg/kg (cat) LD50 (skin) 9530 ug/kg (rabbit) LDLo (ingestion) 398 mg/kg (human) TCLo (inhalation) 10,000 mg/m ³ (human - cough) TDLo (ingestion) 5500 mg/kg (child - anaesthesia) Ethylene glycol will mainly exist in the vapour phase in the ambient atmosphere where it will be degraded by reaction with hydroxyl radicals. Expected to be very highly mobile in soil. Not anticipated to volatilise from moist soil or water surfaces. <u>Ecotoxicity:</u> LC50 (Aquatic species): >100mg/L/96hrs. Non-hazardous to aquatic organisms. <u>Biodegradation/Bioaccumulation:</u>	0.33%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>Biodegradation in both soil and water is expected to be a major fate process for this compound. Not expected to bioconcentrate in aquatic organisms.</p> <p>Safe Work Australia Exposure Standards: http://hsis.ascc.gov.au/DocumentationES.aspx?ID=722 http://hsis.ascc.gov.au/DocumentationES.aspx?ID=271</p> <p>CICADS Available: http://inchemsearch.ccohs.ca/inchem/jsp/search/search.jsp?inchemcasreg=1&Coll=inchemall&serverSpec=22vailab.ccohs.ca%3A9900&QueryText1=107-21-1&QueryText2=&Search.x=52&Search.y=10</p>		
Strata-Vanguard	Newpark	Bridging Agent	<p>Constituents:</p> <p>CELLULOSE DIATOMACEOUS EARTH, FLUX CALCINED FULLERS EARTH LIMESTONE (CALCIUM CARBONATE) CRISTOBALITE QUARTZ (CRYSTALLINE SILICA) MAGNESIUM OXIDE 1,3 BUTADIENE/STYRENE COPOLYMERS 2-PROPENENITRILE-1,3-BUTADIENE RUBBER NATURAL RUBBER POLYISOPRENE POLYETHYLENE</p> <p>Toxicity: Toxicity data available for the ingredients: CRISTOBALITE (14464-46-1) TCLo (inhalation) 16 mppcf/8hours/17.9 years (human-fibrosis) QUARTZ (SILICA CRYSTALLINE) (14808-60-7) LCLo (inhalation) 300 ug/m³/10 years (human)</p>	0.30%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			TCLo (inhalation) 16 000 000 particles/ft3/8 hours/17.9 years (human-fibrosis) CELLULOSE (9004-34-6) LC50 (inhalation) > 5800 mg/m ³ /4 hours (rat) LD50 (ingestion) > 5000 mg/kg (rat) LD50 (intraperitoneal) > 31600 mg/kg (rat) LD50 (skin) > 2000 mg/kg (rabbit) POLYETHYLENE (9002-88-4) LDLo (ingestion) 3000 mg/kg (rat) MAGNESIUM OXIDE (1309-48-4) TCLo (inhalation) 400 mg/kg (human) <u>Ecotoxicity:</u> This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities <u>Biodegradation/Bioaccumulation:</u> Not expected to bioaccumulate. This product has low mobility in soil.		
Frac Attack	Newpark	Prevent lost circulation	<u>Constituents:</u> CELLULOSE DIATOMACEOUS EARTH FULLERS EARTH CALCIUM OXIDE CALCIUM HYDROXIDE CRISTOBALITE QUARTZ (CRYSTALLINE SILICA) MAGNESIUM OXIDE 1,3 BUTADIENE/STYRENE COPOLYMERS 2-PROPENENITRILE-1,3-BUTADIENE RUBBER NATURAL RUBBER POLYISOPRENE	0.05%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p><u>Toxicity:</u> Toxicity data available for the ingredients: CALCIUM HYDROXIDE (1305-62-0) LD50 (ingestion) 7300 mg/kg (mouse) CRISTOBALITE (14464-46-1) TCLo (inhalation) 16 mppcf/8hours/17.9 years (human-fibrosis) QUARTZ (SILICA CRYSTALLINE) (14808-60-7) LCLo (inhalation) 300 ug/m³/10 years (human) TCLo (inhalation) 16 000 000 particles/ft³/8 hours/17.9 years (human-fibrosis) CELLULOSE (9004-34-6) LC50 (inhalation) > 5800 mg/m³/4 hours (rat) LD50 (ingestion) > 5000 mg/kg (rat) LD50 (intraperitoneal) > 31600 mg/kg (rat) LD50 (skin) > 2000 mg/kg (rabbit) MAGNESIUM OXIDE (1309-48-4) TCLo (inhalation) 400 mg/kg (human)</p> <p><u>Ecotoxicity:</u> The manufacturer reports that this product is harmful to aquatic life. Acute aquatic toxicity. CALCIUM HYDROXIDE (1305-62-0) EC50 Crustacea – 49.1 mg/L (<i>Daphnia magna</i> (water flea); 48-hour) ErC50 Algae – 184.6 mg/L (<i>Pseudokirchneriella subcapitata</i> (algae); 72-hour)</p> <p><u>Biodegradation/Bioaccumulation:</u> No information was located.</p>		
JK-161 LV / JK-261 / JK-261HP	Newpark	Encapsulating Agent - provides shale inhibition	<p><u>Constituents:</u> ACRYLAMIDE, SODIUM ACRYLATE COPOLYMER WATER</p> <p><u>Toxicity:</u></p>	0.07%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>This product is expected to be of low toxicity. Under normal conditions of use, adverse health effects are not anticipated. LD50 rat (oral): > 2,000 mg/kg (OECD Guideline 401).</p> <p><u>Ecotoxicity:</u></p> <p>(10000 ppm test concentration) (EPA-821-R-02-012) <i>Mysidopsis bahia</i> = 48hr LC50 = 16.2 mg/L. <i>Menidia beryllina</i> = 48hr LC50 = 34.2 mg/L. <i>Scophthalmus Maximus</i> = 96hr LC50 > 1000 mg/L. <i>Skeletonemia costatum</i> = 72hr EC50 = 393 mg/L [NOEC = 118 mg/L] <i>Acartia tonsa</i> = 48 hr EC50 = 393 mg/L [NOEC = 112 mg/L] <i>Corophium Volutator</i> = 10 Day LC50 = 9338 mg/Kg [NOEC = 1000 mg/Kg]</p> <p><u>Biodegradation/Bioaccumulation:</u></p> <p>Not readily biodegradable (by OECD criteria).</p> <p>Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.</p>		
Driscal D	Newpark	High temperature fluid loss control agent	<p><u>Constituents:</u></p> <p>Not applicable – Contains no hazardous ingredients (substance or mixture) according to GHS.</p> <p><u>Toxicity:</u></p> <p>LCLo (Inhalation): 300 ug/m3/10 years (human), LDLo (Intratracheal): 200 mg/kg (rat) LDLo (Intravenous): 20 mg/kg (dog), TCLo (Inhalation): 16 000 000 particles/ft3/8 hours/17.9 years (human-fibrosis)</p> <p><u>Ecotoxicity:</u></p> <p>This material is not expected to be harmful to aquatic organisms.</p> <p><u>Biodegradation/Bioaccumulation:</u></p> <p>Taking into consideration the properties of several ingredients, the product is estimated not to be readily biodegradable according to OECD classification. Accumulation in aquatic organisms is unlikely.</p>	0.02%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
Defoam-AP400	Newpark	Defoamer suitable for High Temperatures	<p>CONSTITUENT 1 – (45-60%) <u>Toxicology Data:</u> LD50 (ingestion) 33750 mg/kg (rat)</p> <p>CONSTITUENT 2 – (45-50%) <u>Toxicology Data:</u> This product is expected to be of low toxicity. Under normal conditions of use, adverse health effects are not anticipated.</p> <p><u>Ecotoxicity Data:</u> Toxicity to Algae - No information available Toxicity to Fish – No information available Toxicity to Microorganisms - No information available Toxicity to Invertebrates – No information available</p> <p><u>Biodegradation/bioaccumulation:</u> Component is considered not Bioaccumulative.</p>	0.04%	Y
DSCO™ Defoam	Newpark	Defoamer	<p><u>Constituents:</u> POLYPROPYLENE GLYCOL</p> <p><u>Toxicity:</u> This product is expected to be of low acute toxicity. Under normal conditions of use, adverse health effects are not anticipated. Not classified as hazardous according to Safe Work Australia criteria.</p> <p>Constituent 1 – (>60%) Oral Toxicity: An oral LD50 300 - 57000 mg/kg (range) Constituent 2 – (remainder) No Hazard</p> <p><u>Biodegradation/Bioaccumulation:</u> This product is not expected to bioaccumulate.</p>	0.04%	Y
SAPP	Newpark	Deflocculate or disperse	<p><u>Constituents:</u></p>	0.07%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
		bentonite muds or fluids with high levels of low gravity solids.	<p>DISODIUM PYROPHOSPHATE</p> <p><u>Toxicity:</u> Acute toxicity: Low toxicity. Ingestion of large quantities may result in nausea, vomiting and gastrointestinal irritation. Ingestion of large quantities may also result in serious disturbances in calcium metabolism. LD50 (Ingestion): 2650 mg/kg (mouse) LD50 (Intraperitoneal): 1 g/kg (mouse) LD50 (Intravenous): 59 mg/kg (mouse) LD50 (Subcutaneous): 480 mg/kg (mouse)</p> <p><u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Does not bioaccumulate.</p> <p>OCNS category (actual or equivalent chemical) and Registration number. E-2449</p>		
Sandseal Fine	Newpark	LCM	<p><u>Toxicology Data:</u> This product is expected to be of low acute toxicity. Under normal conditions of use, adverse health effects</p> <p><u>Ecotoxicity Data:</u> No information available.</p> <p><u>Biodegradation/bioaccumulation:</u> No information available.</p>	0.08%	Y
Calcium Carbonate Various Grades – TrueCarb's, Limestone t / Circal's / Unical	Newpark	Bridging & weighting agent	<p><u>Constituents:</u></p> <p>LIMESTONE (CALCIUM CARBONATE) QUARTZ (CRYSTALLINE SILICA)</p> <p>No classified as hazardous according to Australian WHS Regulations.</p> <p><u>Toxicity:</u></p>	0.16%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
C300C, Omyacarb's			<p>This product is expected to be of low toxicity. Under normal conditions of use, adverse health effects are not anticipated. LD50 (Ingestion): 6450 mg/kg (rat).</p> <p><u>Ecotoxicity:</u> Calcium carbonate occurs naturally in a wide variety of substances including limestone, marble and eggshells. It is not anticipated to cause adverse environmental effects.</p> <p><u>Biodegradation/Bioaccumulation:</u> Biodegradability does not pertain to inorganic substances. Dissolved calcium carbonate dissociates into calcium and carbonate ions. Calcium ions will be assimilated by living organisms in the water and the carbonate will become part of the carbon cycle.</p> <p>This product does not bioaccumulate.</p> <p>Due to its limited solubility, calcium carbonate precipitates and deposits on the sediment.</p>		
Flexfirm KA	Newpark	Inhibits dispersion of drilled shale cuttings	<p><u>Toxicology Data:</u> Oral Toxicity (LD50) 1600 mg/kg (rat)</p> <p><u>Ecotoxicity Data:</u> The ecotoxicity of potassium silicate has not been tested. The following data is reported for chemically similar sodium silicates on a 100% solids basis: A 96 hour median tolerance for fish (<i>Gambusia affinis</i>) of 2320 ppm; a 96 hour median tolerance of water fleas (<i>Daphnia magna</i>) of 247 ppm; a 96 hour median tolerance for snail eggs (<i>Lymnea</i>) of 632 ppm; and a 96 hour median tolerance for Amphipoda of 160 ppm</p> <p><u>Biodegradation/bioaccumulation:</u> Neither silica nor potassium will appreciably bio-concentrate up the food chain.</p>	0.13%	Y
SPA	Newpark	High temperature	<p><u>Constituents:</u> ACRYLATE – ACRYLAMIDE COPOLYMER</p> <p><u>Toxicity:</u></p>	0.05%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
		fluid loss control agent	<p>This product is expected to be of low toxicity. Based on available data, the classification criteria are not met.</p> <p><u>Ecotoxicity:</u> (10000 ppm test concentration) (EPA-821-R-02-012) <i>Mysidopsis Bahia</i> = 48HR LC50 = 16.2 mg/L. <i>Menidia Beryllina</i> = 48hr LC50 = 34.2 mg/L. <i>Scophthalmus Maximus</i> = 96hr LC50 > 1000 mg/L. <i>Skeletonemia Costatum</i> = 72hr EC50 = 393 mg/L [NOEC = 118 mg/L] <i>Acartia Tonsa</i> = 48hr EC50 = 393 mg/L [NOEC = 112 mg/L] <i>Corophium Volutator</i> = 10 day LC50 = 9338 mg/Kg [NOEC = 1000 mg/Kg]</p> <p><u>Biodegradation/Bioaccumulation:</u> No information provided.</p>		
Fracseal F / M / C	Newpark	LCM	<p><u>Toxicology Data:</u> Oral LD50 (rat) is > 5000 mg/kg. Dermal LD50 (rabbit) is > 2000 mg/kg. LC50 (rat) is 510 mg/m³/2 hours. Inhalation LC50 - > 5800 mg/m³/4 hours (rat) LD50 (intraperitoneal) > 31600 mg/kg (rat)</p> <p><u>Ecotoxicity Data:</u> No information available.</p> <p><u>Biodegradation/bioaccumulation:</u> No information available.</p>	0.06%	Y
QUICKSEAL F / M / C	Newpark	LCM / Well Bore Strengthening	<p><u>Constituents:</u> CELLULOSE</p> <p><u>Toxicity:</u> This product is expected to be of low toxicity. Under normal conditions of use, adverse health effects are not anticipated</p> <p>Acute Toxicity: Acute Oral Toxicity: LD50 (oral) > 5000 mg/kg (rats).</p>	0.18%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			Acute Dermal Toxicity: LD50 (dermal) > 2000 mg/kg (rats). Acute Inhalation Toxicity: LC50 (Inhalation) = 5800 mg/m3/4hrs (rat). <u>Ecotoxicity:</u> Low toxicity to aquatic organisms. <u>Biodegradation/Bioaccumulation:</u> This product is readily biodegradable. This product is not expected to bioaccumulate.		
AvaGreenLube	Newpark	Lubricant	<u>Constituents:</u> METHYL ESTERS OF FATTY ACIDS <u>Ecotoxicity:</u> LC50 (Fish) 48 h: > 10000 µg / L LC50 (Mollusc) 48 h: > 10000 µg /L LC50 (Amphibious) 48 h: > 7600 µg/L <u>Biodegradation/Bioaccumulation:</u> Persistence and degradability: 70% 28 days (method OECD 301 B). Low potential for bioaccumulation in aquatic organisms or terrestrial even after repeated exposure. It is not volatile and not expected to persist in the environment	0.53%	Y
Zinc Oxide	Newpark	H2S Scavenger	<u>Constituents:</u> ZINC OXIDE <u>Toxicity:</u> Acute toxicity: This product is expected to be of low toxicity. Based on available data, the classification criteria are not met. ZINC OXIDE (1314-13-2) LD50 (Oral) 7950 mg/kg (mouse) LC50 (Inhalation): 2500 mg/m ³ (mouse) Additional ingredient toxicity values:	0.13%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			LD50 (intraperitoneal) 240 mg/kg (rat) LDLo (oral) 500 mg/kg (human) TCLo (inhalation) 600 mg/m ³ (human) <u>Ecotoxicity:</u> Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. <u>Biodegradation/Bioaccumulation:</u> This product is not readily biodegradable		
Victosal HT	Newpark	HT Fluid Loss Additive	<u>Toxicology Data:</u> Low toxicity - low irritant. Under normal conditions of use, adverse health effects are not anticipated <u>Ecotoxicity Data:</u> This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities. <u>Biodegradation/bioaccumulation:</u> Not expected to bioaccumulate.	0.05%	Y
Victosal NS	Newpark	Modified Starch	<u>Toxicology Data:</u> This product is expected to be of low acute toxicity. Under normal conditions of use, adverse health effects are not anticipated. <u>Ecotoxicity Data:</u> This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities. <u>Biodegradation/bioaccumulation:</u> No information available.	0.05%	Y
Salt (Sodium Chloride all grades)	Newpark	Weighting Agent	<u>Toxicology Data:</u> LC50 (Inhalation): > 42000 mg/m ³ /1 hour (rat) LD50 (Ingestion): 3000 mg/kg (rat)	4.00%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>LD50 (Skin): > 10000 mg/kg (rabbit)</p> <p>LD50 (intraperitoneal) 2602 mg/kg (mouse)</p> <p>LD50 (intravenous) 645 mg/kg (mouse)</p> <p>LD50 (subcutaneous) 3000 mg/kg (mouse)</p> <p>LDLo (intravenous) 300 mg/kg (guinea pig)</p> <p>LDLo (oral) 8000 mg/kg (rabbit)</p> <p>LDLo (subcutaneous) 2160 mg/kg (guinea pig)</p> <p>TDLo (oral) 12357 mg/kg (human)</p> <p><u>Ecotoxicity Data:</u></p> <p>LC50 (water flea) is 2122 mg/L/48 hours;</p> <p>LC50 (fathead minnow) is 6.57 g/L/96 hours.</p> <p>This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities.</p> <p><u>Biodegradation/bioaccumulation:</u></p> <p>Biodegradability does not pertain to inorganic substances. Does not bioaccumulate.</p>		
Gagetrol	Newpark	HT Fluid Loss Additive	<p>Low toxicity - low irritant. Under normal conditions of use, adverse health effects are not anticipated.</p> <p><u>Ecotoxicity Data:</u></p> <p>This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities.</p> <p><u>Biodegradation/bioaccumulation:</u></p> <p>Not expected to bioaccumulate.</p> <p>OCNS category and registration number Gold - 29306</p>	0.05%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
CleanTrol **(Alternative for Gagetrol)	Newpark	HT Fluid Loss Additive	<p>The product contains no substances which at their given concentration, are considered to be hazardous to health.</p> <p><u>Ecotoxicity Data:</u> The environmental impact of this product has not been fully investigated.</p> <p><u>Biodegradation/bioaccumulation:</u> No information available.</p>	0.05% **	Y
NDFT 530 **(Alternative for Cleanrol)	Newpark	HT Fluid Loss Additive	<p>The product contains no substances which at their given concentration, are considered to be hazardous to health.</p> <p><u>Ecotoxicity Data:</u> The environmental impact of this product has not been fully investigated.</p> <p><u>Biodegradation/bioaccumulation:</u> No information available.</p>	0.05% **	Y
Magnesium Oxide	Newpark	Ph Buffer	<p>CONSTITUENT 1 – (>94%) <u>Toxicology Data:</u> This product is expected to be of low toxicity.</p> <p>CONSTITUENT 2 – (<3.5%) <u>Toxicology Data:</u> This product is expected to be of low toxicity.</p> <p>CONSTITUENT 3 – (<2.5%) <u>Toxicology Data:</u> LD50 (oral) 3160 mg/kg (rat)</p> <p><u>Ecotoxicity Data:</u> This product is expected to be of low toxicity.</p> <p><u>Biodegradation/bioaccumulation:</u> Not expected to bioaccumulate.</p>	0.09%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			OCNS category and registration number E – 28127		
TEA	Newpark	Polymer stabiliser which effectively reduces the degradation of polymers at high temperatures	<p>CONSTITUENT 1 (>60%) <u>Toxicology Data:</u> Oral Toxicity (LD50) 2200 mg/kg (rabbit) Dermal Toxicity (LD50) > 20 mL/kg (rabbit) LD50 (intraperitoneal) 1450 mg/kg (mouse) TDLo (oral) 16 g/kg/64 weeks (mouse – cancer)</p> <p>CONSTITUENT 2 (10 – 30%) <u>Toxicology Data:</u> LD50 (intramuscular) 1500 mg/kg (rat) LD50 (intraperitoneal) 120 mg/kg (rat) LD50 (intravenous) 778 mg/kg (rat) LD50 (subcutaneous) 2200 mg/kg (rat) LDLo (oral) 3 g/kg (rat)</p> <p>CONSTITUENT 3 (<10%) Non-hazardous ingredient. <u>Ecotoxicity Data:</u> No information available. <u>Biodegradation/bioaccumulation:</u> No information available.</p>	0.09%	Y
Geovis	Newpark	High temperature viscosifier	<p><u>Constituents:</u> D-GLUCURONO-6-DEOXY-L-MANNO-D-GLUCAN, ACETATE, CALCIUM MAGNESIUM POTASSIUM SODIUM SALT</p> <p><u>Toxicity:</u> This product is expected to be of low toxicity. Under normal conditions of use, adverse health effects are not anticipated.</p>	0.05%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>Oral Toxicity – (LD50) - > 5000 mg/kg (rat)</p> <p><u>Ecotoxicity:</u> The notified polymer is not toxic to fish (rainbow trout), aquatic invertebrates (<i>daphnia magna</i>) and marine invertebrates (<i>acartia tonsa</i>) under test conditions.</p> <p><u>Biodegradation/Bioaccumulation:</u> Considered readily biodegradable. No experimental results provided. However, based on the molecular weight, water solubility and 35now value the notified polymer is not expected to bioaccumulate.</p>		
Microflow	Newpark	Stimulation Additive	<p><u>Constituents:</u> SWEET ORANGE OIL ISOPROPYL ALCOHOL</p> <p><u>Toxicity:</u> Acute toxicity: May be harmful if swallowed. Constituent 1 : ISOPROPANOL – (15-50%) Oral Toxicity: An oral LD50 in mice of 3600 mg/kg Constituent 2 : SWEET ORANGE OIL – (20-60%) No Hazard</p> <p><u>Ecotoxicity:</u> Not expected to be dangerous to the aquatic environment.</p> <p><u>Biodegradation/Bioaccumulation:</u> This product is readily biodegradable. This product is not expected to bioaccumulate. Relatively volatile and would therefore readily evaporate from dry soil and surfaces.</p>	0.03%	Y
INCORR	Newpark	Corrosion Inhibitor	<p>CONSTITUENT 1 – (10-30%)</p> <p><u>Toxicology Data:</u> Oral LD50 = 1500 mg/kg (Rat)</p> <p><u>Ecotoxicity Data:</u></p>	0.04%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<p>The environmental impact of this product has not been fully investigated.</p> <p>CONSTITUENT 2 – (1-10%)</p> <p><u>Toxicology Data:</u></p> <p>The environmental impact of this product has not been fully investigated.</p> <p><u>Ecotoxicity Data:</u></p> <p>The environmental impact of this product has not been fully investigated.</p> <p>CONSTITUENT 3 – (1-10%)</p> <p><u>Toxicology Data:</u></p> <p>Oral LD50 = 3310 mg/kg (Rat)</p> <p>Dermal LD50 = 1060 mg/kg (Rabbit)</p> <p>Inhalation LC50 = 1060 mg/kg (Rabbit)</p> <p><u>Ecotoxicity Data:</u></p> <p>Fish 79: 96 h Pimephales promelas mg/L LC50 static 75: 96 h Lepomis macrochirus mg/L LC50 static</p> <p>Toxicity to microorganisms EC50 = 8.8 mg/L 15 min, EC50 = 8.8 mg/L 25 min, EC50 = 8.8 mg/L 5 min</p> <p>Crustacea 65: 48 h Daphnia magna mg/L EC50 Static 47: 24 h Daphnia magna mg/L EC50</p> <p>CONSTITUENT 4 – (Remainder)</p> <p>Non-hazardous ingredient.</p> <p><u>Biodegradation/bioaccumulation:</u></p> <p>Partition coefficient -0.31</p> <p>OCNS category and registration number Gold – 27554</p>		
TOTAL				114.34%	
*Contingent chemicals are highlighted grey.					

C. Chemical List (Chemicals within fluid system identified in Table B)		
Chemicals Name	CAS number	Mass fraction (%)
Water	7732-18-5	70.18%
Bentonite	1302-78-9	1.83%
Potassium Chloride	7447-40-7	3.55%
Calcium Carbonate (Limestone)	471-34-1	2.82%
Sodium Chloride	7647-14-5	19.14%
Barium Sulphate	7727-43-7	0.24%
Sodium carboxymethyl Cellulose	9004-32-4	0.59%
Xanthan Gum	11138-66-2	0.39%
Polyvinylalcohol	9002-89-5	0.07%
Quartz (Silica Crystalline)	14808-60-7	0.10%
Sodium Hydroxide	1310-73-2	0.10%
Sodium Carbonate (Soda Ash)	497-19-8	0.14%
Sodium Sulphite	7757-83-7	0.16%
Sodium Sulphate	7757-82-6	0.004%
Sodium Bicarbonate	144-55-8	0.15%
Citric Acid, Anhydrous	77-92-9	0.03%
Sodium Glycolate	2836-32-0	0.004%
Magnesium Oxide	1309-48-4	0.05%
Calcium Oxide	1305-78-8	0.002%
Silicon Dioxide	7631-86-9	0.001%
Carboxymethyl Starch	9057-06-1	0.20%

C. Chemical List (Chemicals within fluid system identified in Table B)		
Chemicals Name	CAS number	Mass fraction (%)
Polyethylene Glycol	25322-68-3	0.03%
Octan-2-ol	123-96-6	0.02%
2-acrylamido-2-methylpropane Sulfonic Acid	5165-97-9	0.03%
Tetrakis(hydroxymethyl)phosphonium Sulphate(2:1)	55566-30-8	0.10%
Diethanolamine	111-42-2	0.02%
Organic Fiber(s)	9004-34-6	0.046%
TOTAL		100%
Octan-2-ol	123-96-6	0.02%
Cellulose	9004-34-6	0.06%
Calcium Chloride	10043-52-4	0.06%
Sodium Chloride	7647-14-5	3.91%
Ethylene Glycol	107-21-1	0.33%
Quartz (Silica Crystalline)	14808-60-7	0.20%
Natural Rubber	9006-04-6	0.15%
Polyisoprene	9003-31-0	0.015%
Diatomaceous Earth	68855-54-9	0.045%
Fuller's earth	8031-18-3	0.03%
D-glucurono-6-deoxy-L-manno-D-glucan, Acetate, calcium magnesium potassium sodium Salt	595585-15-2	0.03%
Calcium Carbonate	1317-65-3	0.15%
Polyethylene	9002-88-4	0.01%
Cristobalite	14464-46-1	0.015%
Isopropyl Alcohol	67-63-0	0.01%

C. Chemical List (Chemicals within fluid system identified in Table B)		
Chemicals Name	CAS number	Mass fraction (%)
Calcium Oxide	1305-78-8	0.003%
Organic fibres	9004-34-6	0.11%
Magnesium oxide	1309-48-4	0.09%
Triethanolamine	102-71-6	0.05%
Hydrochloric acid	7647-01-0	0.12%
Zinc Oxide	1314-13-2	0.13%
Carboxymethyl starch	9057-06-1	0.11%
Acrylamide, Sodium Acrylate Copolymer	25987-30-8	0.06%
Barium Sulphate	7727-43-7	5.89%
Methyl esters of fatty acids	68990-52-3	0.53%
Sweet Orange Oil	68647-72-3	0.01%
Fatty Acids – Avade foam NS	68990-52-3	0.03%
Hexanedinitrile, Hydrogenated, High-Boiling Fraction	68411-90-5	0.32%
Silicon Dioxide	7631-86-9	0.002%
Polyethylene Glycol	25322-68-3	0.02%
Polypropylene Glycol	25322-69-4	0.04%
Potassium Silicate	1312-76-1	0.13%
Vegetable Materials	100209-45-8	0.08%
Disodium Pyrophosphate	7758-16-9 231-	0.07%
2-Propenoic Acid, Homopolymer	9003-01-4	0.05%
Diethanolamine	111-42-2	0.02%
Sodium Erythorbate	6381-77-7	0.02%

C. Chemical List (Chemicals within fluid system identified in Table B)		
Chemicals Name	CAS number	Mass fraction (%)
Modified Starch	9005-25-8	0.06%

2. Cement and Spacer Chemical Disclosure

A. SYSTEM DETAILS:	
OPERATOR:	ERL
PROJECT / WELL NAME:	Lockyer-2, Lockyer-3, Lockyer-4, North Erregulla Deep-1 Exploration Wells
SYSTEM:	Pre-job Cement System
TOTAL VOLUME OF SYSTEM:	CEMENT Blend: 251,118 gal per well

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
Cement – Class A	Halliburton	Cement	<p><u>CONSTITUENT 1 (≤ 90%):</u> LD50 Oral: >2000 mg/kg (Rat), LD50 Dermal: >2000 mg/kg, LC50 Inhalation: >1.0 mg/L (4h) (Rat) After hardening with water or moisture, cement presents no ecotoxicity risks. (Source: IUCLID 2000) Static Aquatic Toxicity – Freshwater and Marine Algae: - 72-hour EC50: >1,000 mg/L Static Aquatic Toxicity -Freshwater and Marine Invertebrates: - 48-hour LC50: >1,000 mg/L Static Aquatic Toxicity- Freshwater and Marine Fish: - 96 hour LC50: >1,500 mg/L Partition Coefficient, n-Octanol/Water: Not Applicable for inorganics Oxygen Demand, Chemical Oxygen Demand: Not Applicable for inorganics Biodegradability, Seawater – Indigenous microbes: Not Applicable for inorganics</p> <p><u>CONSTITUENT 2 (≤ 8%):</u> LD50 Oral: 3000 mg/kg (Rat), LD50 inhalation: >3.26 mg/L Freshwater Algae Toxicity 72h EC50: > 14 mg/L (Desmodesmus subspicatus) [ECHA] (Solubility Limit); Freshwater Crustacean Toxicity 48h EC50: > 14 mg/L (Daphnia magna) [ECHA] (Solubility Limit);</p>	21.234%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p>Freshwater Fish Toxicity 96h LC50: > 14 mg/L (Oncorhynchus mykiss) [ECHA] (Solubility Limit);</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p><u>CONSTITUENT 3 (≤ 5%):</u></p> <p>LD50 Oral: 6450 mg/Kg (Rat), LD50 Inhalation: >3.0 mg/L (Rat), LD50 Dermal: >2000 mg/Kg (Rat)</p> <p>Freshwater Algae Toxicity 72h EC50: > 100 mg/L (Selenastrum capricornutum) [OECD SIDS] (similar substance);</p> <p>Freshwater Crustacean Toxicity 48h EC50: > 100 mg/L (Daphnia magna) [OECD SIDS] (similar substance);</p> <p>Freshwater Fish Toxicity 96h EC50: > 100 mg/L (Oryzias latipes) [OECD SIDS] (similar substance);</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p><u>CONSTITUENT 4 (≤ 5%):</u></p> <p>LD50 Oral: >2000 mg/Kg (Rat), LD50 Inhalation: >5.235 mg/L (Rat), LD50 Dermal: >4000 mg/Kg (Rat)</p> <p>Freshwater Algae Toxicity 72hr EC50: >100 g/L (Desmodesmus subspicatus)</p> <p>Freshwater Crustacean Toxicity 48hr EC50: > 100 g/L (Daphnia magna)</p> <p>Freshwater Fish Toxicity 96hr LC50: >100 g/L (Leuciscus idis)</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p>Chronic Effects: Portland Cement is not classified as a carcinogen by NOHSC. Crystalline silica and hexavalent chromium compounds are classified as carcinogenic to humans (IARC Group 1), however due to low levels present and product application, the criterion for classification is not met.</p>		
Cement – Class G + 35% SSA-1	Halliburton	Cement	<u>CONSTITUENT 1 (≤65%):</u>	19.601%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p>LD50 Oral: >2000 mg/kg (Rat), LD50 Dermal: >2000 mg/kg, LC50 Inhalation: >1.0 mg/L (4h) (Rat)</p> <p>After hardening with water or moisture, cement presents no ecotoxicity risks. (Source: IUCLID 2000)</p> <p>Static Aquatic Toxicity – Freshwater and Marine Algae: - 72 hour EC50: >1,000 mg/L</p> <p>Static Aquatic Toxicity -Freshwater and Marine Invertebrates: - 48 hour LC50: >1,000 mg/L</p> <p>Static Aquatic Toxicity- Freshwater and Marine Fish: - 96 hour LC50: >1,500 mg/L</p> <p>Partition Coefficient, n-Octanol/Water: Not Applicable for inorganics</p> <p>Oxygen Demand, Chemical Oxygen Demand: Not Applicable for inorganics</p> <p>Biodegradability, Seawater – Indigenous microbes: Not Applicable for inorganics</p> <p><u>CONSTITUENT 2 (≤35%):</u></p> <p>LD50 Oral: >15000 mg/kg (human)</p> <p>Freshwater Crustacean Toxicity 24h LL50: > 10000 mg/L (Daphnia magna) [Health Canada] (similar substance);</p> <p>Freshwater Fish Toxicity 96h LL0: 10000 mg/L (Danio rerio) [Health Canada] (similar substance);</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p>Carcinogenicity: Classified as a human carcinogen (IARC Group 1)</p>		
Barite	Halliburton	Weighting Agent	<p>PRODUCT CEFAS LISTED</p> <p>100% PLONOR</p> <p><u>CONSTITUENT 1 (≤100%):</u></p> <p>Oral LD50: >5000 mg/kg (Rat), Oral LD50: >3000 mg/kg (Mouse), Inhalation LC50: >1.1 mg/L (Rat, Aerosol, 4h) (similar substance)</p> <p>Freshwater Algae Toxicity 72h EC50: > 61.1 mg/L (Pseudokirchneriella subcapitata) [ECHA];</p>	5.575%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p>Freshwater Crustacean Toxicity 48h LC50: 14.5 mg/L (Daphnia magna) [ECHA] (similar substance);</p> <p>Freshwater Fish Toxicity 96h LC50: > 3.5 mg/L (Danio rerio) [ECHA];</p> <p>No Marine Data</p> <p>Marine sub-chronic Crustacean Toxicity NOEC (7d) 100 mg/L (Cancer anthonyi)</p> <p>Bioaccumulation Fish BCF: 1.2-74.4 (Lepomis macrochirus) [ECHA];</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p><u>CONSTITUENT 2 (≤5%):</u></p> <p>LD50 Oral: >15000 mg/kg (human)</p> <p>Freshwater Crustacean Toxicity 24h LL50: > 10000 mg/L (Daphnia magna) [Health Canada] (similar substance);</p> <p>Freshwater Fish Toxicity 96h LL0: 10000 mg/L (Danio rerio) [Health Canada] (similar substance);</p> <p>Marine Water Algae Toxicity 72h EC50: 4717 mg/L (Skeletonema costatum)</p> <p>Marine Water Crustacean Toxicity 48h LC50: 7713 mg/L (Acartia tonsa)</p> <p>Marine Water Fish Toxicity 96h LC50: > 4200 mg/L (Scophthalmus maximus) [Halliburton Sponsored Study];</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p>Carcinogenicity: Classified as a human carcinogen (IARC Group 1)</p>		
Econolite Liquid	Halliburton	Cement Additive Stabiliser	<p>PRODUCT CEFAS LISTED</p> <p>100% PLONOR</p> <p><u>CONSTITUENT 1 (≤60%):</u></p> <p>LD50 Oral: 800 mg/kg (Rat), LD50 Oral: 770 mg/kg (Mouse), LD50 Dermal: > 5000 mg/kg (Rat) (Similar substance), LC50 Inhalation >2.06 mg/L (Rat) 4h (Similar substance)</p> <p>Freshwater Algae Toxicity 72h EC50: > 345 mg/L (Scenedesmus subspicatus) [ECHA];</p>	1.399%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p>Freshwater Crustacean Toxicity 48h EC50: 1700 mg/L (Daphnia magna) [OECD SIDS];</p> <p>Freshwater Fish Toxicity 96h LC50: 1108 mg/L (Danio rerio) [OECD SIDS];</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p><u>CONSTITUENT 2 (≤60%):</u></p> <p>Component is naturally occurring and is not intrinsically hazardous</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>		
Tuned Spacer III	Halliburton	Mud/ Cement Spacer	<p><u>CONSTITUENT 1 (≤30%):</u></p> <p>Marine Water Acute Algae Toxicity 72h EC50: > 10000 mg/L (Skeletonema costatum) [Halliburton Funded Study];</p> <p>Marine Water Acute Crustacean Toxicity 48h LC50: > 10000 mg/L (Acartia tonsa) [Halliburton Funded Study];</p> <p>Marine Water Acute Fish Toxicity 96h LC50: > 5600 mg/L (Scophthalmus maximus) [Halliburton Funded Study];</p> <p>Constituent is a clay mineral of soil and therefore biodegradability is not applicable.</p> <p>Constituent is a clay mineral of soil and therefore bioaccumulation is not applicable.</p> <p><u>CONSTITUENT 2 (≤10%):</u></p> <p>Oral LD50: >5000 mg/kg (Similar Substance), Inhalation LC0 >0.139 mg/L (Similar Substance), Dermal LC50: > 5000 mg/kg (Rabbit)</p> <p>Freshwater Acute Algae Toxicity 72h EC50: > 10000 mg/L (Scenedesmus subspicatus) [OECD SIDS] (similar substance);</p> <p>Freshwater Acute Crustacean Toxicity 24h EC50: > 10000 mg/L (Daphnia magna) [OECD SIDS] (similar substance);</p> <p>Freshwater Acute Fish Toxicity 72h LC50: > 10000 mg/L (Cyprinus carpio) [LOLI];</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p>	1.329%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p><u>CONSTITUENT 3 (≤5%):</u> Component is naturally occurring and not intrinsically hazardous. CONSTITUENT 4 (≤1%): Oral LD50 5400 mg/kg (Rat), Dermal LD50 >2000 mg/kg Freshwater Acute Crustacean Toxicity 48h EC50: > 50 mg/L (Daphnia magna) [ECHA]; Freshwater Acute Fish Toxicity 96h LC50: > 100 mg/L (Pimephales promelas) [ECHA]; Freshwater Acute Plant Toxicity 72h EC50: 990 mg/L (Lactuca sativa) [ECHA]; Bioaccumulation BCF: 3.2 [ECHA]; Freshwater Biodegradation 28d: 97 % [ECHA];</p> <p><u>CONSTITUENT 5 (≤100%):</u> Oral LD50: >15000 mg/kg (Human) Freshwater Acute Crustacean Toxicity 24h LL50: > 10000 mg/L (Daphnia magna) [Health Canada] (similar substance); Freshwater Acute Fish Toxicity 96h LL0: 10000 mg/L (Danio rerio) [Health Canada] (similar substance); Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable. Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p><u>CONSTITUENT 6 (≤1%):</u> Oral LD50: >15000 mg/kg (Human) (Similar Substance) Freshwater Acute Crustacean Toxicity 24h LL50: > 10000 mg/L (Daphnia magna) [Health Canada] (similar substance); Freshwater Acute Fish Toxicity 96h LL0: 10000 mg/L (Danio rerio) [Health Canada] (similar substance); Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable. Biodegradation: Substance is inorganic – biodegradation is not applicable.</p>		

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
Halad-413L	Halliburton	Fluid Loss Additive	<p>PRODUCT CEFAS LISTED</p> <p><u>CONSTITUENT 1 (≤30%):</u></p> <p>Oral LD50: >2000 mg/kg (Rat)</p> <p>Marine Water Algae Toxicity 72h EC50: 1102 mg/L (Skeletonema costatum) [OSPAR];</p> <p>Marine Water Crustacean Toxicity 48h LC50: > 2000 mg/L (Acartia tonsa) [OSPAR];</p> <p>Marine Water Fish Toxicity 96h LC50: > 1000 mg/L (Scophthalmus maximus) [OSPAR];</p> <p>Bioaccumulation Log 47now: < 3.5 [Halliburton Funded Study];</p> <p>Marine Water Biodegradation 28d: 6 % [Halliburton Funded Study];</p> <p><u>CONSTITUENT 2 (≤100%):</u></p> <p>Product is naturally occurring and not intrinsically hazardous</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>	0.437%	Y
Gascon 469	Halliburton	Cement Additive Stabiliser	<p>PRODUCT CEFAS LISTED</p> <p>100% PLONOR</p> <p><u>CONSTITUENT 1 ≤1%</u></p> <p>Oral LDL: 500 mg/kg (Rabbit), Dermal LD50: 1350 mg/kg (Rabbit)</p> <p>Freshwater Crustacean Toxicity 48h EC50: 40.4 mg/L (Ceriodaphnia sp.) [ECHA];</p> <p>Freshwater Fish Toxicity 96h LC50: 45.4 mg/L (Oncorhynchus mykiss)</p> <p>Freshwater Fish Toxicity 96h LC50: 125 mg/L (Gambusia affinis) [OECD SIDS];</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p><u>CONSTITUENT 2 ≤60%</u></p> <p>Oral LD50: >10,000 mg/kg, Inhalation LC50: >0.69 mg/L (4h) (Rat)</p> <p>Freshwater Algae Toxicity 72h EC50: 440 mg/L (Selenastrum capricornutum) [IUCLID; LOLI];</p> <p>Freshwater Crustacean Toxicity 48h EC50: 7600 mg/L (Ceriodaphnia dubia) [IUCLID; LOLI];</p>	0.365%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p>Freshwater Fish Toxicity 96h LC50: 5000 mg/L (Brachydanio rerio) [IUCLID; LOLI];</p> <p>Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable.</p> <p>Biodegradation: Substance is inorganic – biodegradation is not applicable.</p> <p>CONSTITUENT 3 <= 100%</p> <p>Component is naturally occurring and is not intrinsically hazardous</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>		
CFR-8L	Halliburton	Friction Reducer	<p>PRODUCT CEFAS LISTED</p> <p><u>CONSTITUENT 1 (≤60%):</u></p> <p>Oral LD50: >5000 mg/kg (Rat)</p> <p>Marine Water Algae Toxicity 72h EC50: 7631.73 mg/L (Skeletonema costatum);</p> <p>Marine Water Crustacean Toxicity 48h LC50: 2200 mg/L (Acartia tonsa);</p> <p>Marine Water Fish Toxicity 96h LC50: 1006 mg/L (Scophthalmus maximus);</p> <p>Fresh Water Crustacean Toxicity 48h LC50: >100 mg/L (Daphnia magna);</p> <p>Bioaccumulation Log Pow: < 0;</p> <p>Inherently biodegradable: Biodegradation 28d: 38%.</p> <p><u>CONSTITUENT 2 (≤100%):</u></p> <p>Component is naturally occurring and not intrinsically hazardous</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>	0.343%	Y
HR-6L	Halliburton	Cement Retarder	<p>PRODUCT CEFAS LISTED</p> <p>100% PLONOR</p> <p><u>CONSTITUENT 1 (≤100%):</u></p> <p>Component is naturally occurring and not intrinsically hazardous</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>	0.031%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p><u>CONSTITUENT 2 (≤60%):</u></p> <p>Oral LC50: >5000 mg/L, Inhalation LC50: > 480 mg/m³</p> <p>Freshwater Fish Toxicity LC50: > 1000 mg/L (Danio rerio)</p> <p>Marine Water Algae Toxicity 72h EC50: 301 mg/L (Skeletonema costatum) [Halliburton Funded Study];</p> <p>Marine Water Crustacean Toxicity 48h LC50: 1261 mg/L (Acartia tonsa) [Halliburton Funded Study];</p> <p>Bioaccumulation Log Pow: -3.45 (Calculated) [Halliburton Funded Study];</p> <p>Biodegradation: No data – expected to be inherently biodegradable</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>		
NF-6	Halliburton	Reduces air entrainment into cement slurry	<p>PRODUCT DATA</p> <p>Marine Water Algae Toxicity 72h EC50: 1100 mg/L (Skeletonema costatum) [Halliburton Funded Study];</p> <p>Marine Water Crustacean Toxicity 48h LC50: > 1000 mg/L (Acartia tonsa) [Halliburton Funded Study];</p> <p>Marine Water Fish Toxicity 96h LC50: > 1000 mg/L (Scophthalmus maximus) [Halliburton Funded Study];</p> <p>Marine Water Biodegradation 28d: 70% [Halliburton Funded Study];</p> <p><u>CONSTITUENT 1 (≤10%)</u></p> <p>Marine Algae Toxicity 72h EC50: 991.02 mg/L (Skeletonema costatum)</p> <p>Marine Crustacean Toxicity 48h LC50: 2500 mg/L (Acartia tonsa);</p> <p>Marine Fish Toxicity 96h LC50: >3200 mg/L (Scophthalmus maximus);</p> <p>Bioaccumulation: Calculated Log Pow: 7.45</p> <p><u>CONSTITUENT 2 (≤5%):</u></p> <p>Oral LD50: >15900 mg/kg (Mouse), Inhalation LC50: >5 mg/L (4h) (Rat)</p> <p>Marine Algae Toxicity 72h EC50: 41 mg/L (Skeletonema costatum)</p>	0.0905%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p>Marine Crustacean Toxicity 48h LC50: > 10000 mg/L (Acartia tonsa); Marine Fish Toxicity 96h LC50: > 1800 mg/L (Scophthalmus maximus); Bioaccumulation: Calculated Log Pow: 4.28</p> <p><u>CONSTITUENT 3 (≤5%)</u></p> <p>Oral LD50: > 5000 mg/kg (Rat), Dermal LD50: > 5000 mg/kg (Guinea Pig) Marine Algae Toxicity 72h EC50: 6488.87 mg/L (Skeletonema costatum) Marine Crustacean Toxicity 48h LC50: 5085.71 mg/L (Acartia tonsa); Marine Fish Toxicity 96h LC50: > 5600 mg/L (Scophthalmus maximus); Bioaccumulation: Calculated Log Pow: 22.69 (MW>700)</p> <p><u>CONSTITUENT 4 (≤10%)</u></p> <p>No Hazard Product is naturally occurring</p> <p><u>CONSTITUENT 5 (≤100%)</u></p> <p>Oral LD50: 90 mg/kg (Mouse) (Similar Substance) Marine Algae Toxicity 72h EC50: > 3200 mg/L (Skeletonema costatum) Marine Crustacean Toxicity 48h LC50: > 10000 mg/L (Acartia tonsa); Marine Fish Toxicity 96h LC50: > 5600 mg/L (Scophthalmus maximus); Bioaccumulation: Calculated Log Pow: 7.09</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>		
Halad-344	Halliburton	Fluid Loss Additive for High Temperature	<p>PRODUCT CEFAS LISTED</p> <p><u>CONSTITUENT 1 ≤100%</u></p> <p>Marine Water Algae Toxicity EC50: > 3300 mg/L (Skeletonema costatum [HES Internal Study]) Marine Water Crustacean Toxicity EC50: > 2000 mg/L (Acartia tonsa) [HES study] Marine Fish Toxicity LC50: > 1000 mg/L (Scophthalmus maximus) [HES study] Bioaccumulation Log Pow: < 0 OECD 117 [HES Study]</p>	0.0693%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			0% (OECD 306) [HES Study] <u>CONSTITUENT 2 <=5%</u> PLONAR <u>CONSTITUENT 3 <= 5%</u> PLONAR <u>CONSTITUENT 4 <=5%</u> PLONAR Effect concentrations in the aquatic environment are attributable to a change in pH value. Oral LD50: 7340 mg/kg (Rat), Dermal LD50: >2500 mg/kg (Rabbit) Freshwater Crustacean Toxicity 48h EC50: 49.1 mg/L (Daphnia magna) [ECHA]; Freshwater Fish Toxicity 96h LC50: 50.6 mg/L (Oncorhynchus mykiss) [ECHA]; Marine Water Crustacean Toxicity 96h LC50: 158 mg/L (Crangon septemspinosa) [ECHA]; Bioaccumulation: Substance is inorganic – bioaccumulation is not applicable. Biodegradation: Substance is inorganic – biodegradation is not applicable. <u>PRODUCT DATA</u> Oral LD50: >2000 mg/kg (similar Product) Marine Water Fish Toxicity 96h LC50: > 1000 mg/L (Scophthalmus maximus) [Halliburton Funded Study]; Bioaccumulation Log Pow: <0 [Halliburton Funded Study]; Marine Water Biodegradation 28d: 0% [Halliburton Funded Study];		
SCR-100L	Halliburton	Cement Retarder	PRODUCT CEFAS LISTED <u>PRODUCT DATA</u> Oral Toxicity LD50: >5000 mg/kg (Rat), Dermal LD50 : >2000 mg/kg (Rabbit) Freshwater Fish Toxicity 96h LC50: 4900 mg/L (Oncorhynchus mykiss) Freshwater Crustacean Toxicity 48h LC50: 2800 mg/L (Daphnia magna)	0.0394%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			<p>Marine Water Algae Toxicity 72h EC50: > 3300 mg/L (Skeletonema costatum) [Halliburton Funded Study];</p> <p>Marine Water Crustacean Toxicity 48h LC50: > 2000 mg/L (Acartia tonsa) [Halliburton Funded Study];</p> <p>Marine Water Fish Toxicity 96h LC50: > 1000 mg/L (Scophthalmus maximus) [Halliburton Funded Study];</p> <p>Marine Water Biodegradation 28d: 14% [Halliburton Funded Study];</p> <p>Product was tested using OECD 117 no peaks detected MW>700Da. Product is not expected to be bioaccumulating</p> <p>No data available to indicate product or components present at greater than 0.1% are chronic health hazards</p>		
SA-1015	Halliburton	Suspension Agent	<p><u>PRODUCT DATA</u></p> <p>Freshwater Algae Toxicity 72h EC50: >100 mg/L (Scenedesmus subspicatus);</p> <p>Freshwater Crustacean Toxicity 48h EC50: >100 mg/L (Daphnia magna);</p> <p>Freshwater Fish Toxicity 96h LC50: >100 mg/L (Oncorhynchus mykiss);</p> <p>Marine Water Algae Toxicity 72h EC50: > 5600 mg/L (Skeletonema costatum);</p> <p>Marine Water Crustacean Toxicity 48h LC50: 234.22 mg/L (Acartia tonsa);</p> <p>Marine Water Fish Toxicity 96h LC50: > 234.22 mg/L (Cyprinodon variegatus);</p> <p>Readily biodegradable (95% at 28 days);</p> <p>Bioaccumulation Log Pow: 0</p>	0.0134%	Y
HR-25L	Halliburton	Cement Retarder	<p>PRODUCT CEFAS LISTED</p> <p><u>CONSTITUENT 1 (≤60%):</u></p> <p>No Hazard</p> <p><u>CONSTITUENT 2 (≤60%):</u></p> <p>Freshwater Algae Toxicity 72h EC50: 51.4 mg/L (Pseudokirchneriella subcapitata) [ECHA];</p> <p>Freshwater Crustacean Toxicity 48h EC50: 93.3 mg/L (Daphnia magna) [ECHA];</p>	0.031%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Ecotoxicity Info	Product in system fluid (mass %)	SDS Attached
			Freshwater Fish Toxicity 96h LC50: > 100 mg/L (Danio rerio) [ECHA]; Bioaccumulation Log Pow: 0.24 [Halliburton Funded Study]; Marine Water Biodegradation 28d: 85 % [ECHA];		
Water	Customer Supplied	Water	None	49.418%	N
Total				100%	

C. Chemical List		
Chemicals within products in Part B	CAS number	Maximum Mass fraction in System (%)
Portland cement	65997-15-1	49.4%
Water (Including Mix Water Supplied by Client) *	-	31.2%
Crystalline silica (impurity)	14808-60-7	8.1%
Barium Sulfate	7727-43-7	5.3%
Water in Products	7732-18-5	1.66%
Limestone	1317-65-3	1.49%
Calcium sulfate dihydrate	10101-41-4	0.849%
Sodium silicate	1344-09-8	0.560%
Granulated Blast Furnace Slag	65996-69-2	0.425%
Sepiolite	63800-37-3	0.266%
Silica, amorphous – fumed	7631-86-9	0.146%

C. Chemical List		
Chemicals within products in Part B	CAS number	Maximum Mass fraction in System (%)
Humic acids, sodium salts, polymers with N,N-dimethyl-2-propenamide, sodium 2-methyl-2-[(1-oxo-2-propen-1-yl)amino]-1-propanesulfonate (1:1) and 2-propenenitrile, sodium bisulfite-terminated	473268-27-8	0.131%
Sulfonated organic polymer	526203-62-3	0.0990%
Rape Oil	8002-13-9	0.0796%
Diatomaceous earth	61790-53-2	0.0664%
N,N-dimethylacrylamide copolymer with calcium AMPS	103115-52-2	0.0589%
Sodium Lignosulfonate	8061-51-6	0.0546%
Acrylic acid polymer with sodium AMPS, sodium salt	37350-42-8	0.0157%
Dilutan Gum	125005-87-0	0.0134%
Citric acid	77-92-9	0.0133%
Crystalline silica, cristobalite	14464-46-1	0.0133%
Welan gum	72121-88-1	0.0133%
Monopropylene glycol monooleate	1330-80-9	0.00453%
Tartaric acid	87-69-4	0.00408%
Sodium hydroxide	1310-73-2	0.00365%
Calcium hydroxide	1305-62-0	0.00346%
Lecithins	8002-43-5	0.00346%
Sodium sulfate	7757-82-6	0.00346%
Aluminium stearate	637-12-7	0.000905%
Sorbitan, monopalmitate	26266-57-9	0.000905%
2-Bromo-2-(bromomethyl)pentanedinitrile	35691-65-7	0.0000394%
FD&C Blue 1	3844-45-9	0.0000394%
Total		~100.00%

3. Alternative Drilling Fluid system

A. SYSTEM DETAILS:	
OPERATOR:	ERL
PROJECT / WELL NAME:	Lockyer-2, Lockyer-3, Lockyer-4, North Erregulla Deep-1 Exploration Wells
SYSTEM:	Alternative Drilling Fluid System / Alternative Plug and Abandonment Fluid System
TOTAL VOLUME OF SYSTEM (m ³):	301 m ³ per well

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
Water	N/A	Base Fluid	N/a	98.74%	N/A
Soda Ash	Redox	Calcium Sequester	<p><u>Constituents:</u> SODIUM CARBONATE</p> <p><u>Acute Toxicity:</u> LD50 Oral (Rat): 4090 mg/kg LC50 Inhalation (Rat): 2300 mg/m3 (2h)</p> <p><u>Chronic Toxicity:</u> No known sensitizing, carcinogenic, reproductive, or mutagenic effects.</p> <p><u>Ecotoxicity:</u> This product is not considered toxic to algae, fish, daphnia, or invertebrates. LC50 (96h) Lepomis macrochirus: 300 mg/l LC50 (96h) Pimephales promelas: 310-1220 mg/l EC50 (120h) Nitzschia: 242 mg/l EC50 (48h) Daphnia magna: 265 mg/l</p> <p><u>Biodegradation/Bioaccumulation:</u></p>	0.02%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			Not applicable – inorganic material		
POLY-PLUS	MI Swaco	Viscosifier	<p><u>Constituents:</u> HYDROTREATED LIGHT PETROLEUM DISTILLATE</p> <p><u>Acute Toxicity:</u> None</p> <p><u>Chronic Toxicity:</u> Does not contain any components suspected to be sensitizing, mutagenic, or carcinogenic. No known reproductive or developmental toxicity</p> <p><u>Ecotoxicity:</u> Not considered toxic to algae, fish, or invertebrates.</p> <p><u>Biodegradation/Bioaccumulation:</u> No data available</p>	0.18%	Y
DUO-VIS	MI Swaco	Viscofier	<p><u>Constituents:</u> GLYOXAL</p> <p>The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment</p> <p><u>Acute Toxicity:</u> None</p> <p><u>Chronic Toxicity:</u> No known sensitizing or reproductive effects.</p> <p><u>Ecotoxicity:</u> This product is not considered toxic to algae, fish, or invertebrates</p> <p><u>Biodegradation/Bioaccumulation:</u> Product is biodegradable, does not bioaccumulate</p>	0.16%	Y
POLYPAC	MI Swaco	Fluid Loss	<u>Constituents:</u>	0.25%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			POLYANIONIC CELLULOSE <u>Acute Toxicity:</u> LD50 Oral (Rat): 27000 mg/kg LD50 Dermal (Rabbit): >2 g/kg LC50 Inhalation (Rat): > 5800 mg/m3 (4h) <u>Chronic Toxicity:</u> No known carcinogenic properties or chronic impacts <u>Ecotoxicity:</u> Not considered toxic to algae, fish, or invertebrates. <u>Biodegradation/Bioaccumulation:</u> Product is biodegradable, does not bio accumulate.		
`Nuosept 78	Troy	Biocide	<u>Constituents:</u> HEXAHYDRO-1,3,5-TRIS-(-2-HYDROXYETHYL)-S-TRIAZINE <u>Acute Toxicity:</u> LD50 Oral (Rat - Female): 2000 mg/kg LC50 Dermal (Rat): > 1009-3950 mg/kg <u>Chronic Toxicity:</u> No known carcinogenic, reproductive, or teratogenic effects. Skin sensitizing <u>Ecotoxicity:</u> Hexahydro-1,3,5-Tris-(-2-Hydroxyethyl)-S-Triazine LC50 (96h) (Danio rerio (zebra fish)): > 100 mg/l EC50 (48h) (Water flea (Daphnia magna)): > 100 mg/l EC50 (72h) (Algae, algal mat (Algae)): > 10 < 100 mg/l 2,2',2''-(Hexahydro-1,3,5-triazine-1,3,5-triyl) triethanol	0.01%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			LC50 (96h) (oncorhynchus mykiss (rainbow trout)): > 100 mg/l EC50 (48h) (Water flea (Daphnia magna)): 27,9 mg/l ErC50 (72h) (Green Algae): > 10-100 mg/l <u>Biodegradation/Bioaccumulation:</u> 2,2',2''-(Hexahydro-1,3,5-triazine-1,3,5-triyl) triethanol Biodegradation: >70% (28d) Readily Biodegradable. Has low bioaccumulation potential.		
PLATINUM ROD EASE	MI Swaco	Lubricant	<u>Acute Toxicity:</u> The product component(s) are not classified as environmentally hazardous. <u>Chronic Toxicity:</u> Does not contain any components suspected to be sensitizing, mutagenic, or carcinogenic. No known reproductive or developmental toxicity <u>Ecotoxicity:</u> This product is not considered toxic to algae. This product is not considered toxic to fish. This product is not considered toxic to invertebrates. <u>Biodegradation/Bioaccumulation:</u> No product level data available.	0.14%	Y
KLA-GARD	MI Swaco	Shale Control Agent	<u>Acute Toxicity:</u> The product component(s) are not classified as environmentally hazardous. <u>Chronic Toxicity:</u> Does not contain any components suspected to be sensitizing, mutagenic, or carcinogenic. No known reproductive or developmental toxicity	0.22%	Y

B. PRODUCT LIST					
Trade name	Supplier	Purpose	Toxicity & Eco toxicity Info	% Product in system fluid	SDS Attached
			<u>Ecotoxicity:</u> This product is not considered toxic to algae. This product is not considered toxic to fish. This product is not considered toxic to invertebrates. <u>Biodegradation/Bioaccumulation:</u> Readily biodegradable (ECHA data) (PRODUCT). Bioaccumulation is unlikely. (ECHA data) (PRODUCT)		
RING FREE	MI Swaco	Drill fluid additive	<u>Constituents:</u> POLYMER <u>Acute Toxicity:</u> None <u>Chronic Toxicity:</u> No known carcinogenic, mutagenic, or sensitizing properties or chronic impacts <u>Ecotoxicity:</u> The product component(s) are not classified as environmentally hazardous. Toxicity to algae: This product is not considered toxic to algae. LC50 / 72 hrs: > 100 mg/l (estimated). <u>Biodegradation/Bioaccumulation:</u> Not readily biodegradable. Does not bioaccumulate.	0.27%	Y
Total					100.00%

C. Chemical List (Chemicals within fluid system identified in Table B)		
Chemicals Name	CAS number	Mass fraction (%)
Water	-	97.71410 %
Sodium carboxymethylcellulose	9004-32-4	0.58128 %
Xanthan Gum	11138-66-2	0.38403 %
2-hydroxy-N,N,N-trimethylethanaminium chloride	67-48-1	0.37396 %
Soybean oil, crude	8001-22-7	0.29175 %
Sodium polyacrylate	9003-04-7	0.29031 %
2-Propenoic acid, polymer with 2-propenamide, sodium salt	25987-30-8	0.10518 %
Distillates, petroleum, hydrotreated light	64742-47-8	0.10518 %
Sodium carbonate	497-19-8	0.04844 %
Oils, animal, mixed with vegetable oil Me esters, sulfurized	68990-81-8	0.04462 %
2,2',2''-(Hexahydro-1,3,5-triazin-1,3,5-triyl)triethanol	4719-04-4	0.02591 %
Sorbitan, mono-(9Z)-9-octadecenoate	1338-43-8	0.01052 %
Isotridecanol, ethoxylated	69011-36-5	0.01052 %
Polyoxyethylene sorbitan trioleate	9005-70-3	0.00686 %
Glyoxal	107-22-2	0.00349 %
Ethane-1,2-diol (impurity)	107-21-1	0.00267 %
2-aminoethanol	141-43-5	0.00100 %
N,N-dimethylmethanamine (impurity)	75-50-3	0.00016 %
Total		100.00%