Cliff Head Field Onshore Operations Environment Plan Summary

Triangle Energy (Operations) Pty Ltd Controlled Document

No. 10/HSEQ/ENV/PL09/SUM

Revision 5

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1 Introduction

Triangle Energy (Operations) Pty Ltd (TEO) is required to develop and implement an Environment Plan (EP) under the Petroleum Pipelines (Environment) Regulations 2012. This EP has been prepared in accordance with this legislation.

On the 7th of February 2018, Triangle Energy (Operations) Pty Ltd (TEO) took over operatorship of the Arrowsmith Stabilisation Plant (ASP) from Upstream Production Solutions Pty Ltd (Upstream PS) post DMIRS approval of the Arrowsmith Onshore Safety Case (10/HSEQ/GEN/PL10, Revision 3).

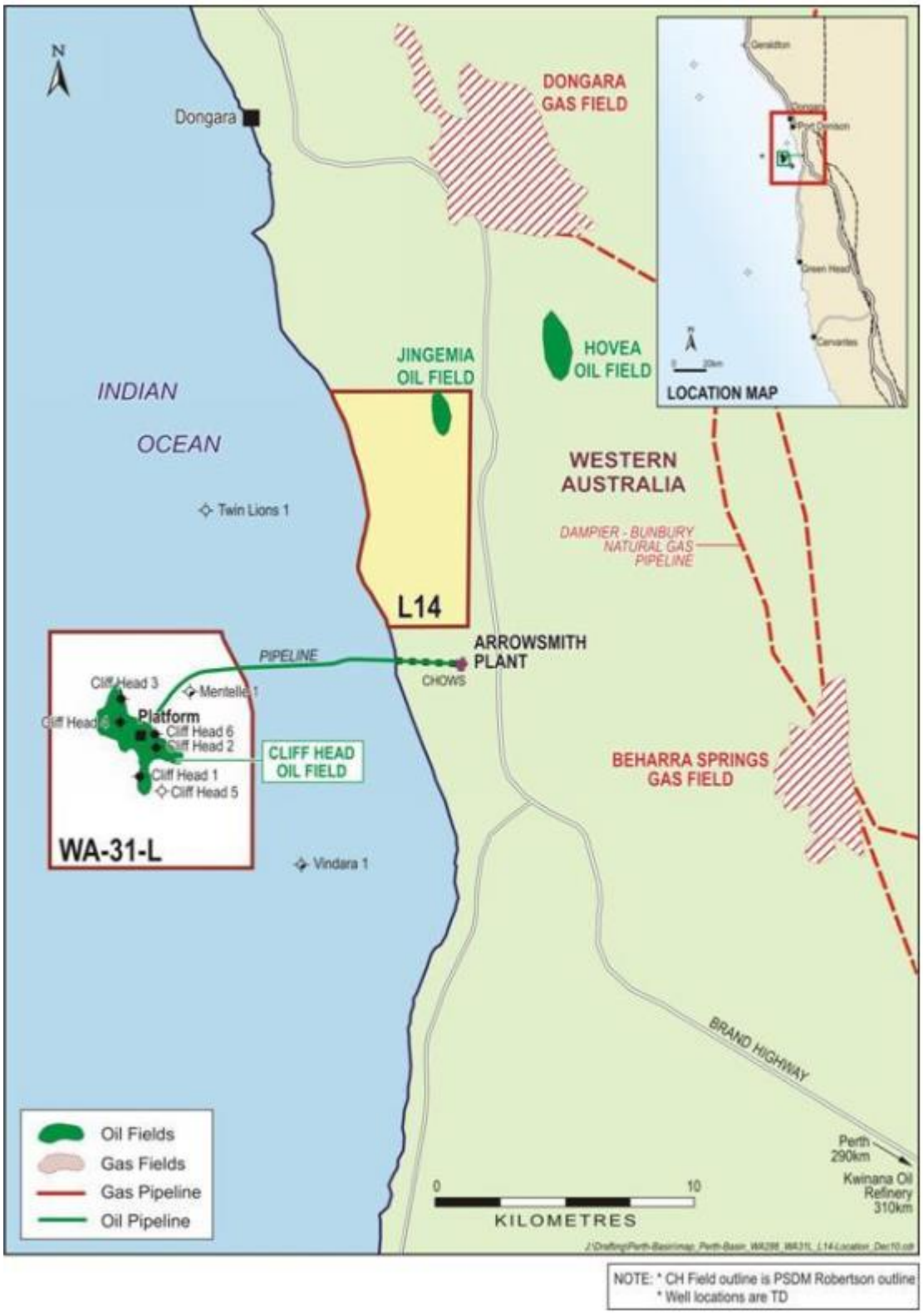
The facility is within production licences L1 and L2 and is located in the central western region of Western Australia; approximately 25 km South of Dongara, within the Shire of Irwin, and 350 km north of Perth.

The ASP is located onshore at 306 179mE 6 742 784mN. This EP is:

- Appropriate for the nature and scale of the Cliff Head Operations;
- Demonstrates that the environmental impacts and risks of the operation will be as low as reasonably practical (ALARP);
- Provides for appropriate environmental performance objectives, environmental performance standards and measurement criteria;
- Includes an appropriate implementation strategy (IS) and monitoring, recording and reporting arrangements;
- Demonstrates that there has been an appropriate level of consultation in developing the plan; and
- Complies with applicable legislation

In this EP CH refers to onshore development including the Production and Injection Water Pipelines and the Main Plant Facilities. ASP refers to the Main Plant only.

Figure 1 - Regional Location of Cliff Head Development



1.1 Triangle Energy (Operations) Pty Ltd Health, Safety & Environment Policy Statement

TriangleEnergy

HEALTH, SAFETY & ENVIRONMENT POLICY STATEMENT

Triangle Energy (Operations) Pty Ltd (Triangle) is committed to protecting the health and safety of all people, ensuring that our activities have minimal impact on the environment and greater community.

Our vision is that while undertaking our activities we will cause "No Harm" and that:

- All accidents are preventable.
- No task is so important that the risk of injury to people is justified.
- Our environment will suffer no long-term effects. We will protect and minimize the impact of our activities on the environment.

To achieve our vision Triangle will:

- Create an HSE culture in which every person involved shares the HSE commitment.
- Require all workers to comply with our HSE expectations.
- Identify, assess and mitigate health, safety and environmental hazards and risks, to as low as is reasonably practicable.
- Consult, listen and respond openly to Workers, to ensure the input of all is included in decision making processes impacting on workplace health and safety.
- Continually strive to improve health and safety performance by establishing clear and measurable objectives and targets, auditing, reviewing and reporting performance.
- Provide training, equipment and facilities necessary to maintain a safe and healthy worksite
- Comply with all applicable HSE legislation, regulations and industry standards

Triangle requires workers to STOP work if they believe their work compromises their personal safety, the safety of others or the protection of the environment.

Robert Towner
Director
Triangle Energy (Operations) Pty Ltd

19th May, 2017
Date

2 Description of the Activity

The Cliff Head oil field is located off the Western Australian coast (Production Licence WA-31- L), west of the Big Horseshoe Reef; approximately 20 km south-southwest of Dongara (refer to Figure 1). The water depth in the vicinity of the field is approximately 16 m and the closest landfall is some 10km due east. The field itself is approximately 1,260 m below sea level. The wells are tied to a wellhead platform located at 293385m E, 6740245m N.

Production facilities construction was completed in December 2005 after which development drilling commenced. Production commenced on 1 May 2006. The first export of crude oil from the ASP was delivered to the BP Kwinana Unloading Facility on 5 May 2006. The Cliff Head Pipeline and ASP facilities (Cliff Head Development-CHD) original design life was 10 years (2006 to 2016).

A CHD Asset Life Extension Project (ALEP) has been an ongoing process implemented to manage the life extension of CHD assets beyond the original basis of design (10 years), until 2029 (Asset Life Extension Project Execution Plan: CHD-00-RA-PP-0001).

The ALEP criteria were to:

- Demonstrate to management, certifying authority, and regulators that facilities can continue through to 2029. The mechanism is the 5-yearly Safety Case revisions;
- Create schedules and costs for capital projects to demonstrate continued business case and extend operational life.

Engineering assessments of SCEs were conducted to determine suitability of the SCE for ongoing operation beyond the original basis of design and to recommend mitigation and deferment strategies to support SCE life extension until 2029 based on:

- Close-out of engineering assessment recommended actions; and
- Continued maintenance, inspection and testing per the Critical Maintenance Register regime.

All completed SCE engineering assessments have confirmed suitability for ongoing operation and the possibility to extend asset life until 2029. This includes both the production fluids and injection water pipelines. This involved third-party verification of the pipeline life extension engineering assessments. (Section 2.36, 10/HSEQ/GEN/PL10, Rev 3).

The Cliff Head oil field facility consists of the following infrastructure:

- An unmanned well head platform, Cliff Head Alpha (CHA) to accommodate the well heads and support equipment;
- Up to five producing wells with electrical submersible pumps (ESPs) to enable artificial lifting of the produced fluid (i.e. crude oil and water);
- Three water injection wells;
- An insulated subsea production pipeline, which transports the produced fluids from CHA to Arrowsmith Stabilisation Plant (ASP), crossing beneath the shoreline and the dune system, by means of a horizontal directionally drilled (HDD) hole;
- An insulated subsea water injection pipeline from ASP to the two injection wells at CHA;
- Arrowsmith Stabilisation Plant (ASP) located approximately 3km inland, which separates the oil and produced formation water (PFW) and stabilises the oil ready for transport;
- Onshore source water well to supply make-up water during the early water injection phase
- A subsea power and control cable, and chemical supply umbilical running from ASP to CHA; and
- Crude oil load-out facilities and transport by road to BP Refinery in Kwinana for refining

Additional activities include:

- Installation and maintenance of five groundwater bores to be installed in Q4 2018;
- Site remediation activities relating to the Onshore Injection Water Pipeline integrity issue on the 29th of November 2018 including contaminated soil removal, pond remediation and HDPE liner removal off site;
- Rehabilitation of land impacted by onshore operations incident which occurred 29th of November 2017.

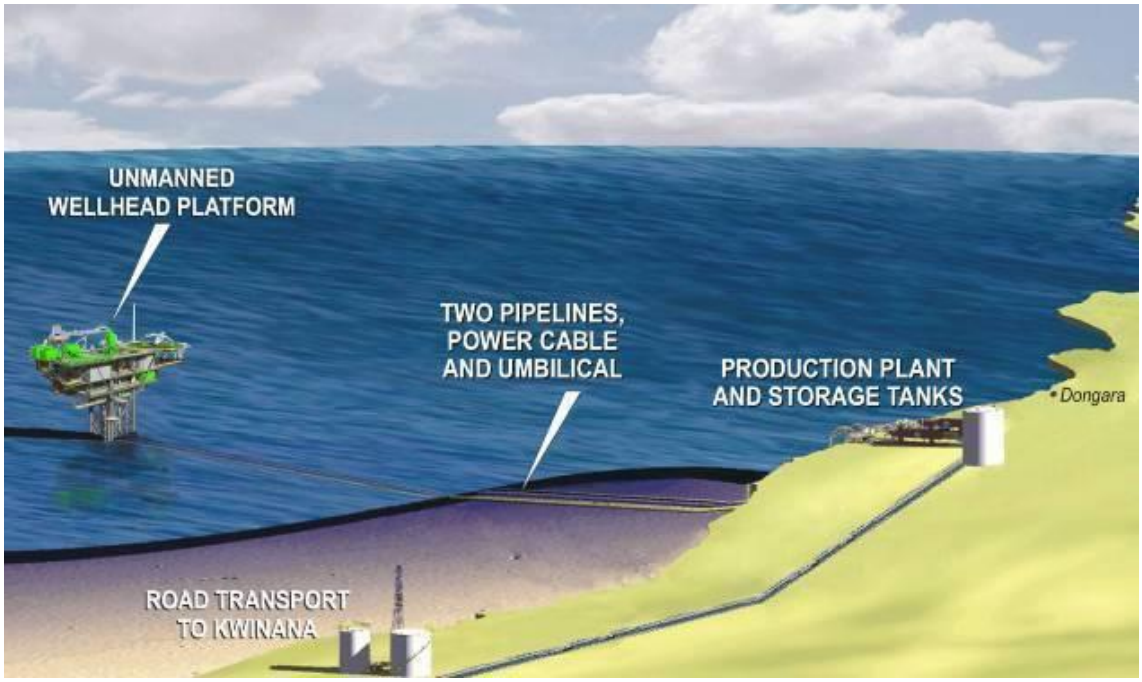
Note all additional activities listed above will only be completed post approval from DMIRS (Environmental). Furthermore, additional activities listed above were risk assessed and a documented management of change process followed to identify all operational changes.

2.1 Scope of this EP

This EP covers the onshore component of the Cliff Head operations operated under Pipeline Licence PL70. Additional documents for Environmental Management for the Cliff Head project include:

- Cliff Head Onshore Operations Oil Spill Contingency Plan [10/HSEQ/ENV/PL08] outlines the procedure for response to an oil spill onshore;
- Cliff Head Field Operations Environment Plan (State Waters) [10/HSEQ/ENV/PL01] outlines the environmental management of operations in state waters;
- Cliff Head Operations Environment Plan (Commonwealth Waters) [10/HSEQ/ENV/PL11];
- CHA Offshore Operations Oil Spill Contingency Plan [10//HSEQ/ENV/PL02] outlines the procedures for response to an oil spill in State and Commonwealth Waters

Figure 2 - Main Components of the Cliff Head Development



2.2 Pipelines

The Cliff Head development includes the operation of two pipelines:

- The production pipeline carries the well stream fluids from the wellhead platform (CHA) to the onshore plant (ASP);
- The water injection pipeline, transports PFW and additional make-up injection water from the ASP to CHA;

The two pipelines are essentially identical in size (273.1mm, i.e. 10") and design, they are constructed from steel (wall thickness 14.3mm).

In addition, there is an 80mm integrated power cable complete with fibre optic cables and a 60mm umbilical flat pack for the chemical injection fluids.

The shore crossing was installed by HDD. The onshore component of the pipeline runs 2.4km from the HDD shore crossing to ASP and is buried.

The shore crossing consists of two separate boreholes, which are lined with a bund sleeve pipe. Both boreholes are approximately 1000m in length. They enter the ground approximately 500m onshore and exit through the seabed approximately 500m offshore.

Onshore are also two 'corrosion monitoring trenches. Approval for the 270m trench was granted to excavate and leave open a 15m span of the onshore Cliff Head (CH) pipeline in order to monitor the corrosion rate of the injection water pipeline. The resulting trench is located on the eastern end of the pipeline easement at S29025'39" E114059'52" and is approximately 15m(length) x 4m(width) x 1.8m(depth). The trench walls are retained with an interlocking non-friable stone pitched wall over a GeoFabric underlay. The entire excavation is enclosed in a permanent 19m x 9m galvanised chainmesh fence 1.8m high with a single strand of barbed wire at the top and a 1.5m wide firebreak at the base of the fence. The design of the monitoring trench provides a safe work environment and also protects local fauna by preventing large animals from entering the trench and allowing a means of climbing out of the trench should smaller animals enter the compound.

The second monitoring trench "1130m pipeline monitoring trench" is installed 1130m west of the ASP (approximately 304916mE 6742989mN [GDA Zone 50]), The pipeline installation was managed under the 1130m Monitoring Trench & HDD Temporary Access Trench Bridging Environment plan (4716-HS-H0107).

Operational activities conducted at the 270m and 1130m trenches are defined in detail in section 6.3.6.

Approval was obtained from the DBCA (both with regards to the deed of easement and the proposal implementation and monitoring).

Arrowsmith Stabilisation Plant (ASP) Appendix A contains a site layout for the ASP.

The ASP is a Petroleum Pipeline facility (licensed under PL70) and is located on the site of the disused lime sand plant approximately 3 km inland and 20 km south of the town of Dongara. Processing at the treatment facility comprises degassing, dewatering and stabilisation of the crude oil. It also serves as the operations control base for the offshore facility.

The facility is designed to have a gross liquid (oil and formation water) capacity of approximately 4,770 m^3 per day (30,000 barrels per day). The site is accessed by sealed road directly from the Brand Highway with a slip lane for entry and an acceleration lane for vehicles exiting towards Perth on the highway. It is fenced with emergency exits at various locations. The main gate is electrically operated from the plant control room and incorporates an intercom and Closed-Circuit Television (CCTV) coverage. CCTV cameras are also used to monitor tanker-loading operations.

The oil is of waxy consistency, therefore heating and insulation is provided to piping, tanks and equipment to keep the oil from depositing the wax. Heat is obtained from waste heat recovery units on each of the power generator exhaust systems and from two electric heaters.

Pipe work containing oil is fitted with electrical trace heating cables. The main activities conducted at ASP are as follows:

- Transport of crude product is via road transport to the BP refinery at Kwinana
- Pig launching and receiving facilities for weekly pigging operations. Pigging is undertaken weekly to clear material build up in the pipeline that can render chemical treatments for bacteria ineffective

3 Description of Existing Environment

A detailed description of the existing environment surrounding the Cliff Head Oil Field Development was presented in Chapter 2 of the PER [Primary Environmental Review (2004)]. The following section provides a summary of the existing environment and describes the existing physical, biological, social, cultural, and economic environment within the L1 Licence Area.

3.1 Climate

The oil field is within a region that has a Mediterranean type climate characterised by seasonal patterns of hot, dry summers and mild, wet winters, with a low number of rain days. The highest temperatures occur in January and February while the lowest temperatures occur in August. There is a dominant winter rainfall with approximately 55% of annual rainfall occurring in June and August. During summer months rainfall is uncommon, resulting in a summer drought that lasts approximately four months.

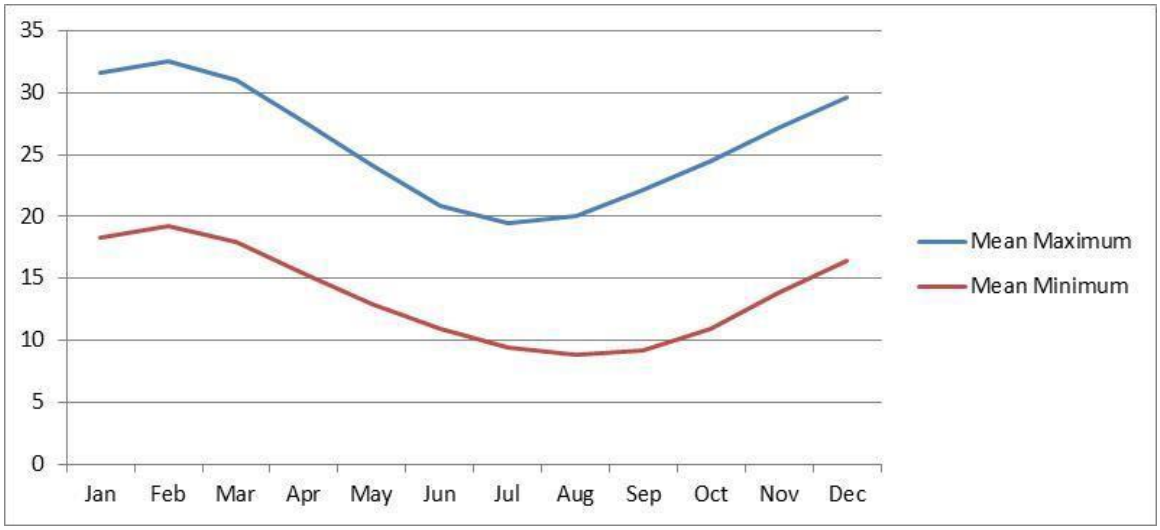
Winds over the region are relatively strong (mean 12–16 knots; maximum 30–35 knots) and are most frequently from the southern sector (southeast to southwest) during the summer months and from the eastern sector (northeast to southeast) during the winter months

3.1.1 Temperature

Average maximum temperatures peak in February in Geraldton, with a monthly mean of about 33°C. Hot days are usually followed by a cool change with fresh to strong southerly sea breezes.

In contrast, winters are mild with the July average maximum temperature being the lowest of any month at 20°C. August minima are the lowest on average at 9°C. Due to the position of the sub-tropical ridge during winter, winds with an onshore component are common and along with increased cloudiness help to moderate temperatures

Figure 3 - Mean Maximum and Minimum Temperatures [°C] (Geraldton)



3.1.2 Rainfall

Annual rainfall at Geraldton Airport averages 444 mm (Figure 4) over approximately 60 days (Figure 5). June is the wettest month, with a long-term average of 100 mm, whilst rain occurs on one day out of every three during an average winter.

Approximately 85% of the annual total falls between May and October, on average, mostly as a result of the passage of cold fronts. Sometimes these fronts are associated with cloud bands from the north-west, which enhance the totals.

The driest months are December and January with means of approximately 5 mm. In summer it rains on about four days over the three months.

Rainfall in summer is often associated with thunderstorms, which can occasionally produce heavy localised falls in short periods. Summer months may also record scattered and irregular thunderstorm rain or the infrequent influence of a decaying tropical cyclone. Thunderstorm days total about 10-15 per annum.

Figure 4 - Mean Monthly Rainfall (mm) (Geraldton)

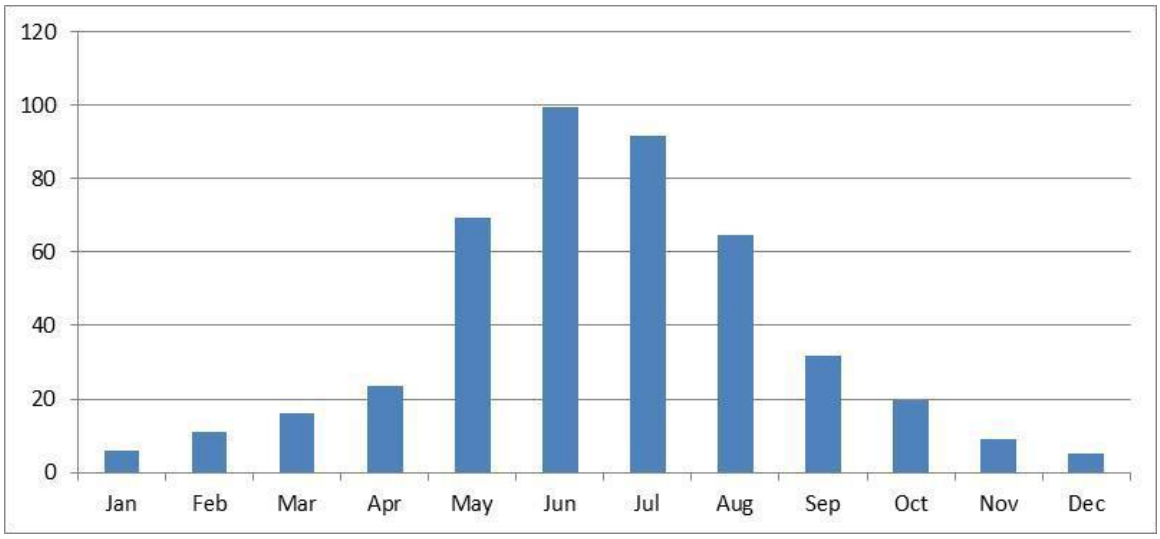
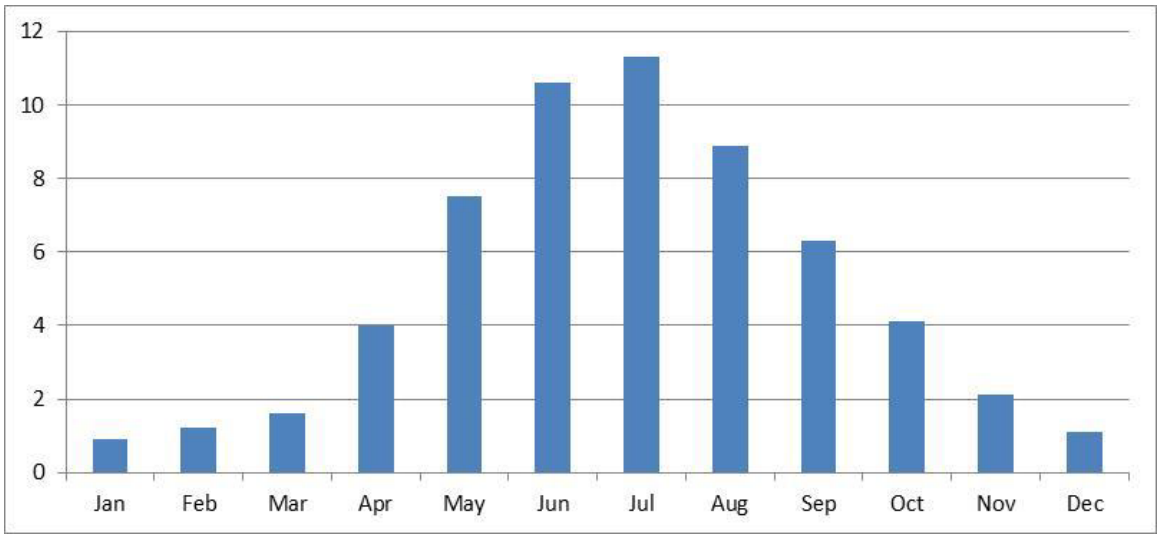


Figure 5 - Mean Number of Rain Days per Month



3.1.3 Wind and Humidity

The wind climatology at Geraldton is strongly dominated by the effects of the land-sea interface where offshore land breezes are common in the morning, whilst afternoon sea breezes are common in the warmer months. Winter tends to be the period of most variability in winds due to the latitude and mobility of the sub-tropical ridge, and a weak land-sea temperature contrast. It also tends to be the season with the lightest winds; however, cold fronts can occasionally bring strong winds and gales to the area.

During the remainder of the year, the sub-tropical ridge is generally south of Geraldton and thus winds with an easterly component prevail overnight and in the morning. The wind speeds average about 20 km/h at 9 am and 25 km/h at 3 pm. Average wind speeds in the October – March period increase to approximately 30 km/h at 3 pm, as a result of the sea breeze. Mean climatic conditions are presented in Table 4.

Table 1: Mean climatic conditions

Aspect	Month												Ave
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mean 9 am wind speed– km/h(easterly)	22	22	21	18	17	17	17	16	16	19	21	21	19
Mean 9 am relative humidity (%)	51	51	53	59	66	75	78	76	67	55	49	49	61
Mean 3 pm wind speed– km/h (south- westerly)	31	30	27	23	20	17	17	18	22	26	29	30	24
Mean 3 pm relative humidity (%)	46	44	44	46	49	55	58	58	53	50	47	47	50

* All figures supplied from www.bom.gov.au: refer to Geraldton Airport

3.2 Land Form and Soils

The Cliff Head Development is situated within the Perth Basin geological province on the coastal fore-plain. The area is part of the Quindalup dune system and dunes comprising Holocene age calcareous sands are the dominant feature of the landscape. There are no watercourses or drainage lines along the pipeline route.

The dunes are generally aligned parallel to the prevailing wind direction in a north to north-easterly direction. The frontal dunes have a parabolic profile with steep, peaked relief and are up to 40 m high. The older dunes are lower and have a more gently undulating relief.

The frontal vegetated dunes have little to no humus content and are very highly susceptible to wind erosion if the vegetation on the crests is damaged or cleared, the older vegetated dunes have a higher humus layer and the erosion is less, but still high.

Throughout the coastal plain there are a number of blow-outs (mobile unvegetated dunes) however none are present within the pipeline route. The soils are characterised by:

- Variable calcium carbonate content depending on the shell content levels of the beach and dune sands from which they originated;
- A typically alkaline pH level, which varies up to 9.5 in the more calcareous patches to close to neutral in swales (depressions between dunes) or where sands overlie limestone;
- Variable salinity levels caused by seawater spray, with salinity decreasing with distance inland
- High porosity and low water holding capacity

3.3 Surface and Groundwater Systems

The Irwin River valley is the only major coordinated drainage indentation within the area of Cliff Head. A number of swamps surrounded by dense scrub, frequent limestone outcrops and the occasional laterite outcrop are the other major features in the region; but these fall outside the CH area. The sub-surface geology of the area consists of the Late Jurassic Yarragadee Formation, which is overlain by Tertiary Sediments.

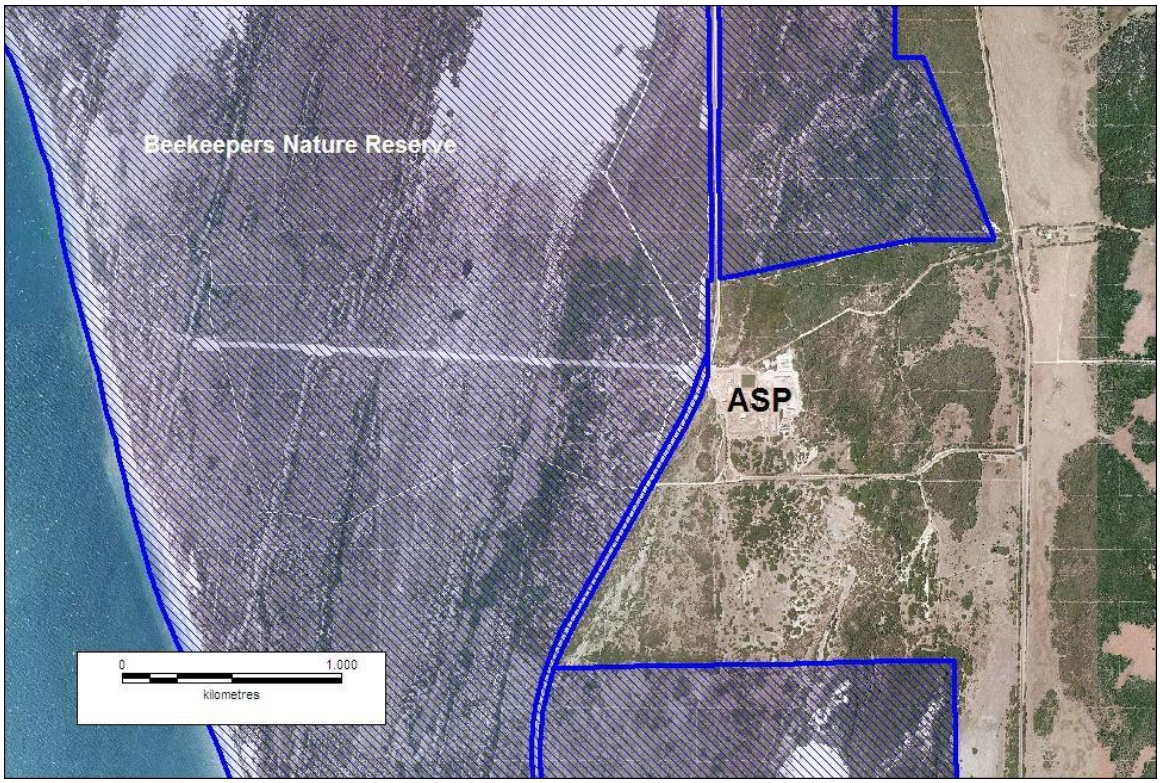
Groundwater is present in the Tertiary sediments and the Yarragadee Formation and the groundwater level is near, or at, surface in the aforementioned swamps and low-lying areas; following the surface topography, but with lower relief.

The porous and permeable coastal limestones and dune systems tend to allow rainwater to percolate vertically to the water table rather than running laterally off the surface.

3.4 Conservation Estate

The Cliff Head pipeline traverses the Beekeepers North Class C Nature Reserve. Figure 6 shows the ASP facility and onshore pipeline with reference to the Nature Reserve.

Figure 6 – Pipeline Locality Map (Beekeepers Nature Reserve)



3.5 Flora

3.5.1 Regional Flora

ASP is located within the Irwin Botanical District (Northern Sandplains Region), within the Southwest Botanical Province as defined by Beard (1976). Beard (1976) mapped the vegetation on a regional scale and categorised the vegetation as part of the Illyarrie system. The Illyarrie system consists of coastal limestone ridges formed from lithified aeolian calcarenite, with a covering of shallow yellow sand. The Illyarrie system is not well conserved locally, with only small areas in the Yardanogo Nature Reserve, but it is well conserved regionally and there are very large areas in the Beekeepers Nature Reserve to the west. The region was subsequently classified as part of the Geraldton Sandplains under the Interim Biogeographic Regionalisation for Australia (EA 2000). The Geraldton Sandplains are described as “mainly proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata. Extensive York Gum and Jam woodlands occur on outwash plains associated drainage.” (EA 2000).

3.5.2 Local Flora

Vegetation condition across the pipeline area varies between very poor in the eastern part adjacent to the plant site to excellent in the western parts. There is some weed invasion on the fore-dunes but the vegetation structure is still intact. The vegetation mapped varied between tall thickets and low heaths. The plant communities present reflect the harsh nature of the environment, with species dominance and morphology within each community dependent on the soil depth and water availability at each site. The coastal heath communities dominate the more exposed sites closer to the coast on dune crests and in exposed sites on flats with little soil covering the limestone basement. The predominantly *Acacia rostellifera* thicket communities occurred in primary dune swales closer to the coast where water harvested from the dunes and shelter from the prevailing winds provides conditions suitable for plant growth. Thicket communities become more dominant further from the coast east of the secondary dunes.

A total of eight vegetation units were described and mapped within the Development area during the spring 2003 survey. These consisted of six plant communities, one mosaic unit and one disturbance unit (refer Table 5 and Figure 7). None of the plant communities mapped are Threatened Ecological Communities as defined by the Department of Biodiversity Conservation and Attractions (DBCA).

Table 2 Vegetation units

Thickets: T1	Dense Thicket of *Acacia rostellifera*, *Acacia rostellifera x xanthina* and Melaleuca species over mixed shrubs on grey sand with occasional limestone outcropping. Plant community T1 was mapped in a small pocket on the northern edge of the plant site survey area. The vegetation within this community was in excellent condition, with no evidence of grazing. The Acacia shrubs were generally over 2 m in height and very dense. Other common shrubs included *Melaleuca systena, Melaleuca cardiophylla* and *Desmocladus asper*. Interspersed within this community were patches of *Eucalyptus alcate subsp*. *Opima* in swales. A total of 32 vascular plant taxa were recorded within this plant community.
Thickets: T1w	Plant Community T1 that has been modified by grazing and other human activities and has a greatly modified understorey with a high weed cover. The majority of the plant site, as well as the eastern end of the pipeline corridor, was mapped as T1w. These areas would originally have been plant community T1 but have been severely modified by grazing and clearing. The herb layer is completely dominated by weed species, with some areas also devoid of taller shrubs. 41 plant taxa were recorded in this unit, 11 of which were weed species.

Thickets: T2	Thicket of *Melaleuca huegelii* subsp. *Huegelii* and *Melaleuca cardiophylla* over *Acanthocarpus preissii* over mixed low shrubs and daisies on grey sand on dune crests. Plant community T2 was mapped on the crests of several narrow dunes within the pipeline corridor. The cover of the vegetation was lower than in surrounding areas due to wind exposure. These crests run into a large mobile dune north of the Development area. Other common shrubs included *Melaleuca leuropoma* and *Scaevola crassifolia*. A total of 41 plant species were recorded within plant community T2.
Heath: H1	Heath dominated by *Melaleuca leuropoma* and *Melaleuca huegelii* subsp. *Huegelii* over a herb layer dominated by sedge and daisy species on grey sand with limestone outcropping. This plant community was mapped over the majority of the pipeline corridor on the plains between the dune systems. It was generally very uniform in cover and height although small patches of emergent *Allocasuarina lehmanniana* subsp. Lehmanniana were present. Common understorey species included *Baumea juncea*, *Lepidosperma pubisquameum* and *Rhodanthe citrina*. It was the most diverse plant community mapped within the Development area, with 64 species recorded.
Heath: H2	Dense Heath dominated by *Lepidosperma gladiatum*, *Scaevola crassifolia* and *Zygophyllum fruticulosum*, with occasional taller shrubs, over herbs on white sand. Plant community H2 was mapped on the plain behind the foredune. It differed structurally from the heaths on the plains further from the beach. The plants here were shorter, probably due to greater exposure to wind. Occasional taller shrubs were present, including Acacia *rostellifera xanthina*, *Santalum acuminatum* and *Allocasuarina lehmanniana* subsp. *Lehmanniana*. This plant community was in excellent condition with a total of 37 species recorded.
Heath: H3	Low Heath dominated by *Scaevola crassifolia*, *Tetragonia decumbens* and *Myoporum insulare* on white sand. This plant community was mapped in a very narrow strip on the ocean side of the foredune. Vegetation cover was low and sparse, with some weeds present. Only nine plant species were recorded.
Thicket/Heath T2/H1	Mosaic of plant communities T2 and H1 on dune crests and swales. An area located between plant communities H2 and H1 was mapped as a mosaic unit. It was situated in an area of high topographical relief where the vegetation on the dunes and swales could not be separated. This area contained both plant community T2 and plant community H1 in small merging patches.
Disturbed Areas	Areas where the vegetation has been almost completely removed by human activity.

3.5.3 Phytophthora Cinnamomi

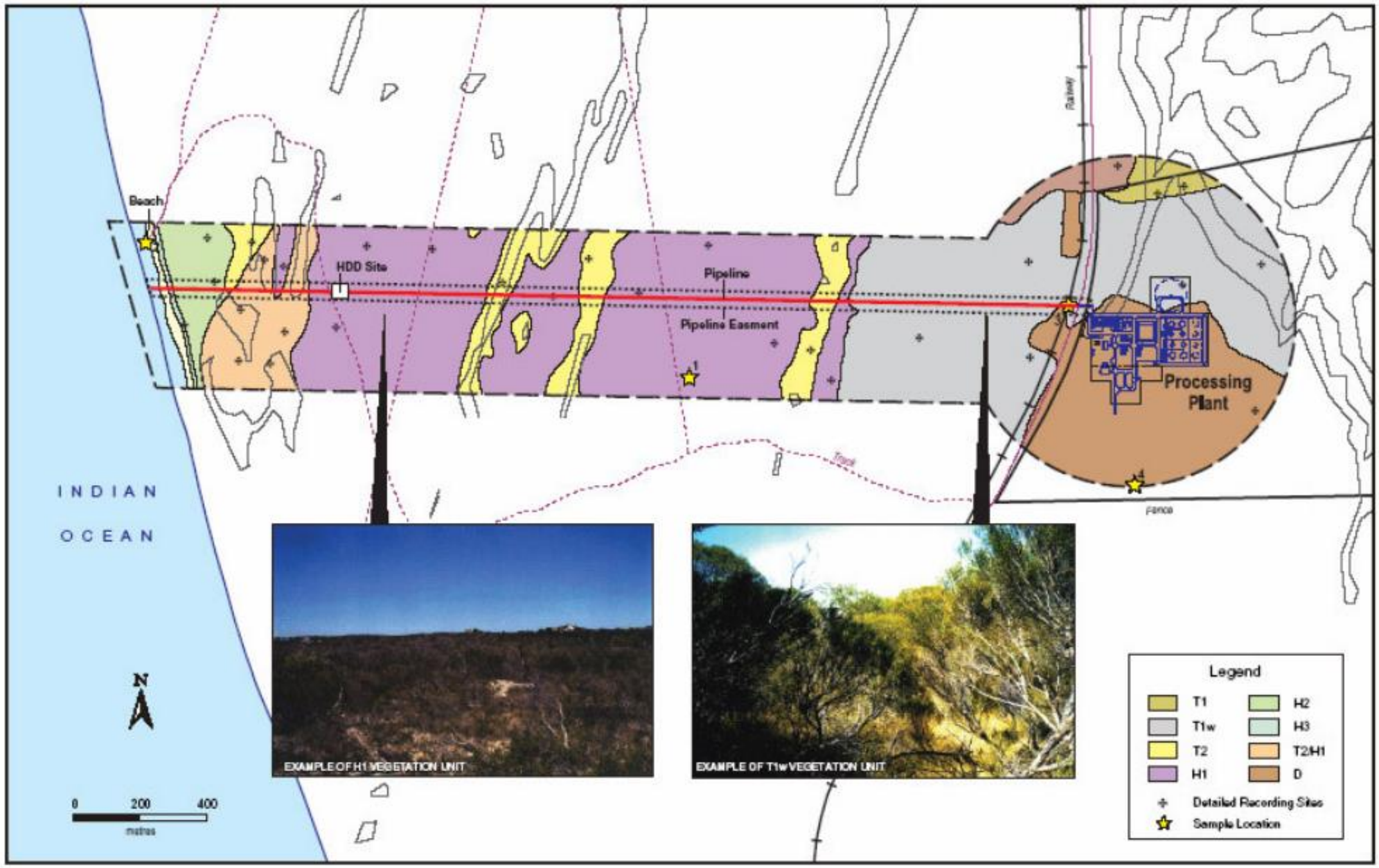
Phytophthora cinnamomi is a virulent plant pathogen (commonly referred to as dieback) that belongs to the water moulds and as such requires moist conditions to propagate, spread and infect hosts. This pathogen causes disease epidemic within native vegetation of the high rainfall areas of Western Australia, particularly in the plant families *Proteaceae, Epacridaceae*, and *Myrtaceae*. The pathogen can spread unaided by root-to-root contact, by native and introduced animal activity and by human vectoring in soil on machinery and footwear.

The pipeline route lies at the northern limit of the portion of Western Australia where plant disease caused by *Phytophthora cinnamomi* is known to occur. The pipeline area was surveyed by two experienced interpreters for the presence of symptoms of plant disease caused by *P. cinnamomi* during October 2003. The survey focused on areas that were most at risk of containing the pathogen through a history of human access such as tracks and previous operational areas.

The pipeline route has been classified as ‘Uninterpretable’ due to the extremely low density of species within the vegetation that are known to be susceptible to the pathogen. Despite the

presence of long utilised fisherman's tracks to the beach and a former mining operation, no clear evidence supporting the presence of *P. cinnamomi* within the Development area was observed during the survey. Soil moistures were adequate to support a recovery of the pathogen from samples in the event that it may have been present and the only observed stressed plants were sampled during the survey. All four samples collected during the survey returned analysis results negative for the presence of *P.cinnamomi.*

Figure 7 - Vegetation Distribution



3.6 Fauna

Fauna species included under conservation acts and/or agreements (e.g., the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the Western Australian *Wildlife Conservation Act 1990*) are formally recognised as having conservation significance under state or federal legislation. In addition, species that are at the limit of their distribution, those that have a very restricted range and those that occur in breeding colonies, such as some waterbirds, can be considered of conservation significance, although this level of significance has no legislative or published recognition and is based on interpretation of distribution information. On the basis of the above comments, three levels of conservation significance are recognised in this report:

- Level 1: Species listed under State or Commonwealth Acts
- Level 2: Species not listed under State or Commonwealth Acts, but listed in publications on threatened fauna or as Priority Species by DBCA
- Level 3: Species not listed under Acts or in publications but considered of at least local significance because of their pattern of distribution.

Table 6 lists the fauna of conservation significance that may be present in the area.

Table 3: Significant Fauna Potential Found Onsite.

Species	Common Name	Significance Level 1		Significance Level 2	Significance Level 3
		EPBC Listed	WA Wildlife Conservation Act Listed		
Reptiles					
Aspidites ramsayi	Ramsay's python (woma)		✓		
Morelia spilota variegata	South-west carpet python		✓		
Phyllodactylus marmoratus	Marbled gecko				✓
Pletholax gracilis	Burton's legless lizard				✓
Egernia multiscutata	King's skink				✓
Birds					
Calyptorhynchus latirostris	Carnaby's black cockatoo	Endangered	✓		
Falco peregrinus	Peregrine falcon		✓		
Haliaeetus leucogaster	White bellied sea eagle	Migratory			
Morops ornatus	Rainbow bee-eater	Migratory			
Thinornis rubricollis	Hooded plover			✓	

Species	Common Name	Significance Level 1		Significance Level 2	Significance Level 3
		EPBC Listed	WA Wildlife Conservation Act Listed		
Ardeotis australis	Australian bustard			✓	
Calamanthus campestris	Striated fieldwren			✓	
Pomatostomus superciliosus ashbyi	White-browed babbler			✓	
Oreioca gutturalis	Crested bellbird			✓	
Larus pacificus	Pacific gull				✓
Lophoictinia isura	Square-tailed kite				✓
Eopsaltria georgiana	White-breasted robin				✓
Mammals					
Macropus irma	Brush wallaby			✓	
Hydromys chysogaster	Water rat			✓	
Rattus fuscipes	Bush rat			✓	
Hemisaga vepreculae	Cricket				✓
Hyaleus globuliferous	Native bee				✓

3.7 Social Environment

The development area is in the Shire of Irwin, in the Mid-West region of Western Australia. The twin towns of Dongara and Port Denison are the nearest townships to the development. The region has supported petroleum exploration since the 1950's with oil and gas production beginning soon after. The Perth Basin has become a prominent oil and gas production province supporting a number of onshore operators. The Arrowsmith Stabilisation Plant is located in private property owned by TEO. The onshore pipeline is within the Beekeepers Nature Reserve.

Similarly, mineral extraction is undertaken in the area, primarily for mineral sands.

3.7.1 Population and Demographics

The Mid West region has a population of approximately 52,000 people. The two largest shires in the region are the City of Geraldton (18,916 persons) and the Shire of Greenough (14,035) persons, which account for about 60% of the region's population. The population of the Shire of Irwin is small in comparison, comprising 3,052 people (ABS, 2006 Census).

Education and Employment

The total employment in the Shire of Irwin in August 2006 was 1,334 people (ABS, 2006 census). The most common industries of employment for persons aged 15 years and over usually resident

in this Shire were Sheep, Beef Cattle and Grain Farming (9.5%); Fishing (4.4%); School Education (4.4%); Supermarket and Grocery Stores (3.8%); and Accommodation 3.5%.

3.7.2 Economic

The key economic features of the mid-western region of WA are as follows[1]:

- A diverse economy built around mining, agriculture, fishing and tourism
- The Mid West's gross regional product was $3.5 Billion in 2005/2006 which is 17 per cent higher than the previous year in real growth terms
- Mining is the most valuable sector. In 2005/06, the mining and petroleum production in the Mid-West reached a value of $2.4 billion

3.7.3 Cultural Environment

No archaeological or ethnographical evidence or sites were identified to be associated with the development area as per Report of an Archaeological Survey for Aboriginal Sites Potential Drill Locations Dongara Region (Quartermaine 1999).

3.7.4 Economic Environment

The significant economic activities in the region include oil, gas and mineral exploration and production, and broad hectare cropping and grazing activities. Other activities in the area include aquaculture and olive growth and production. Early settlement in the Dongara region was by pastoralists.

[1] See http://www.mwdc.wa.gov.au/Economy.aspx

4 Assessment of Environmental Effects and Risks

4.1 Scope

This section assesses the environmental effect of the production phase of the Cliff Head development activities on the environment, identifies mitigation measures to address and minimise these impacts and assesses the residual environmental risk with these measures implemented.

Environmental aspects/activities with the potential for impact from the Cliff Head Operations are:

- Planned Activities: Onshore (ASP & Production Pipelines)
  - Soil Management;
  - Flora and Fauna Management; Noise
  - Atmospheric Emissions; Waste Management
  - Contaminated Drainage Water and Waste Oils
- Unplanned Activities: Onshore (ASP and Production Pipelines)
  - Accidental Releases of Hydrocarbons, Chemicals and Produced Formation Water;
  - Soil Management including contaminated waste removal post incident response);
  - Remediation of temporary storage areas (temporary storage bunds and temporary water storage / Evaporation pond)

These activities have the potential to result in adverse effects on the physical, socio-economic and biological environment of local marine environment.

4.1.1 Key Definitions

Accident Event	An event capable of causing critical, major, moderate, minor damage to the environment, or negligible damage with no significant environmental effect.
Hazard	A physical situation with the potential for damage to the environment, human injury, damage to property or some combination of these.
Risk	The likelihood of a specified undesired event occurring within a specified period or in specified circumstances. It may be either a frequency (the number of specified events occurring in a time unit) or a probability (the probability of specified event following a prior event), depending upon circumstances.

4.1.2 Risk Assessment Methodology

The risk assessment approach used within this Environmental Plan is consistent with the approach outlined in AS14001, ISO31000:2009 Risk Management Principles and Guidelines on Implementation and HB203: 2006 Environmental Risk Management. Qualitative environmental risk is assessed as follows for identified environmental aspects/activities which could result in an environmental impact.

The environmental risk rating presented in this section represents residual risk levels, i.e. the likelihood of occurrence of the end-point environmental impact/consequence taking into account risk management controls implemented as a result of the design, personnel skill training and competency assessments, procedures and emergency response plans.

The environmental risk assessment tools used for this risk assessment are the Triangle Energy (Operations) Pty Ltd Risk Assessment Matrix, Consequence Definitions and Likelihood Definitions (refer Appendix B). An extreme environmental risk is considered to lie in the Risk Level 1 (18-36), a high environmental risk lies in Risk Level 2 (12-16), etc. Also, as defined in Appendix B, a significant environmental impact is defined as lying within consequence levels 3 to 6.

Environmental risk assessment consists of four basic steps:

- Hazard identification
- Hazard analysis
- Risk evaluation
- Risk treatment

These steps are described briefly in the sections below.

4.1.3 Hazard Identification

Hazard identification involves identifying the sources of risk, i.e. those activities or incidents that could result in an environmental impact. Hazards are categorised into those arising from routine operations, and those arising from non-routine operations and incidents.

4.1.4 Hazard Analysis

Hazard analysis determines the likelihood of an activity or event occurring, and the consequences of that activity or event on the environment. The Risk Matrix Toolkit [00/HSEQ/GEN/PC01/FM01], given in Appendix B, was used to assess the consequence and likelihood of all identified events. The matrix is based on six classifications of severity and six for the likelihood of a hazard.

4.1.5 Risk Evaluation

Risk evaluation prioritises the risks, i.e. determines if the risk of an activity or incident is acceptably low, or if management actions are required to reduce the risk to ALARP. The risk evaluation presented in Appendix C takes existing safeguards, or management measures into consideration, i.e. it represents the residual risk with existing safeguards in place.

4.1.6 Risk Treatment

Appendix C presents the detailed assessment of risks, impacts and their management for the operation of ASP and pipeline facilities. The Implementation Strategy in Section 8 focuses on the significant issues identified to ensure the ongoing management of environmental risks to ALARP.

5 Implementation Strategy

5.1 Key Performance Indicators (Targets)

TEO has committed to the key performance indicators presented in Table 1 to ensure that environmental performance objectives for the CH are met.

5.2 General

The primary goal of the Implementation Strategy is to ensure that the environmental performance objectives and standards outlined in Section 7 of this EP are achieved.

The Implementation Strategy includes operational systems and procedures that:

- Identify specific systems, practices and procedures to be used to ensure that environmental risks and effects are reduced to as low as reasonably practicable (ALARP) (Section 8.3)
- Comply with all relevant legislation applying to the activity
- Establish a clear chain of command that sets out the roles and responsibilities of Personnel in relation to the implementation, management and review of the EP (Section 8.4)
- Ensure that each Employee or Contractor working on, or in connection with the CH is aware of their responsibilities in relation to the environment and has the appropriate skills and training (Section 8.5)
- Monitor, audit and review environmental performance and the Implementation Strategy. Maintain an up-to-date emergency response manual that includes detailed response and investigative arrangements
- Maintain quantitative records of emissions and discharges to the environment that are accurate and can be monitored and audited against environmental performance standards and measurement criteria
- Ensure that the agreed environmental performance objectives and standards are met (Section 9)
- Provide for appropriate consultation with relevant government authorities and other interested persons or organisations (Section 10)

5.3 Roles & Responsibilities

This section outlines the roles and responsibilities of personnel in relation to the implementation, management and review of this EP.

5.3.1 TEO Personnel

5.3.1.1 PIC

It is the responsibility of the PIC to:

- Demonstrate "duty of care" through personal example and clearly defined team responsibilities
- Ensure that the requirements of this EP are implemented (including seeking advice from HSEQ representatives)
- Ensure funds are available to ensure all Cliff Head Operations are conducted in an environmentally responsible manner
- Maintain an easily accessible copy of this EP and the OSCP
- Oversee management of Cliff Head Operations (including directing staff on required environmental actions)

- Attend all HSEQ meetings and daily operations meetings and raise any environmental issues
- Establish systems that encourage free and open communication and consultation on HSEQ issues
- Ensure that all environmental incidents are recorded and reported to TEO Perth
- Perth Basin HSEQ Advisor and Senior Environmental Advisor
- Participate in all incident investigations as required
- Participate in regular emergency response drills

5.3.1.2 Operators

It is the responsibility of Operators and Maintenance Staff to:

- Carry out all aspects of this EP for which he/she is responsible
- Follow good housekeeping procedures and work practices
- Complete all activities as prioritised and defined by the PIC
- Never undertake any task that does not meet TEO HSEQ standards
- Verbally report all HSEQ hazards, incidents and near misses to the PIC immediately
- Identify hazards and correct them on a “see and fix” basis where it is in their ability to do so
- Access, review and comply with MSDSs for all hazardous substances
- Participate in training as appropriate
- Attend HSEQ meetings and raise any environmental issues
  Participate in regular emergency response drills

5.3.1.3 Senior Environmental Advisor

It is the responsibility of the Senior Environmental Advisor to:

- Ensure that the requirements of this EP are implemented (including seeking advice from HSEQ representatives)
- Demonstrate "duty of care" through personal example
- Establish systems that encourage free and open communication and consultation on HSEQ issues
- Ensure regulator reportable incidents are reported
- Ensure that the site requirements of this EP are implemented
- Maintain an easily accessible copy of this EP and the OSCP
- Ensure that the requirements of this EP are implemented
- Provide advice on environmental matters
- Maintain an easily accessible copy of this EP and the OSCP
- Participate in environmental incident investigations
- Conduct AIEA and participate in regulator environmental audits / inspections
- Keep this EP up to date
- Participate in major incident investigations
- Contact person for liaising with Environmental Regulators
- Liaise with external stakeholders
- Ensure that all environmental incidents are recorded and reported to TEO

5.3.1.4 Senior HSE Advisor

It is the responsibility of the Senior HSE Advisor to:

- Demonstrate "duty of care" through personal example
- Attend HSEQ meetings and raise awareness of environmental issues / aspects
- Establish systems that encourage free and open communication and consultation on HSEQ issues

- Ensure that all environmental incidents are recorded and reported to the TEO General Manager and documented in myOSH;
- Lead all incident investigations as required
- Participate in environmental audits as required
- Participate in major incident investigations

5.3.1.5 Administrations officer

It is the responsibility of the Administrations officer to:

- Issue site inductions to TEO personnel and Contractors;
- Maintain SharePoint system for document management;
- Maintain access to key Environmental and HSE documents including o the Cliff Head Onshore Operations Environment Plan.

5.3.2 Contractors and Visitors

It is the responsibility of all contractors working in the CH to:

- Undertake Comprehensive and site induction
- Ensure all licences, certificates and permits are current and valid
- Understand environmental management relevant to the tasks performed
- Follow all CH procedures and requirements
- Report all incidents

11.5 Training

Environmental related training courses undertaken by personnel include:

- ASP Comprehensive Induction which includes environmental management. It is an TEO requirement that all employees, contractors and visitors to site undertake this induction annually
- Safety and Environment Competency Based Training
- Emergency Response Competency Based Training
- Risk analysis, risk assessment, permit to work and Job Safety Environment Analysis
- Competency Based Training
- Chemical Management Competency Based Training
- Basic Fire Fighting
- Oil Spill Response Training
- Pigging Competency Based Training
- Tanker Loading Competency Based Training

6 Reporting Arrangements

This section outlines the following reporting requirements:

- Reporting by Triangle Energy (Operations) Pty Ltd on routine operations;
- Reporting by Triangle Energy (Operations) Pty Ltd on incidents;
- Auditing routine operations;
- Reports by Contractors to TEO; and
- Review of this EP

6.1 Reporting on Routine Operations

MyOSH is a Triangle Energy (Operations) Pty Ltd. Online Database which stores incident reports, hazards, audits and inspections and action tracking. Triangle Energy (Operations) Pty Ltd personnel undertake regular workplace inspections of different components of Operations.

Hazard cards are raised by TEO Personnel when they observe safety or environmental concerns. Items requiring action (during workplace inspections or on hazard cards) are addressed immediately, where possible. Actions and remedial actions are documented in MyOSH and closed out on completion.

A Daily Production Report is produced by the ASP Personnel, summarising routine operations. This report also documents any unusual occurrences or accidents that occur in the Cliff Head. A Visitor's Log is maintained to record all persons visiting the site.

TEO has an Environmental Protection Act 1986 licence L8096/2005/3 for operation of the Arrowsmith Stabilisation Plant. A report on the conditions within the licence is submitted annually to the Department of Water and Environment Regulation (DWER).

An Annual Environmental Report is submitted (in October) to provide evidence that environmental performance objectives have been met and the implementation strategy of the EP has been complied with. The Annual Environmental Report includes details of:

- Summary of Activities;
- Meeting of Objectives and Standards;
- Summary of Audits and Incidents;
- Planned Emissions and Discharges;
- Biological Monitoring/Research;
- Identification of New or Increased Risks;
- Training and Exercises; and
- Ongoing Consultation

An emissions and discharges report is submitted to DMIRS PEB quarterly in the Quarterly Emissions and Discharges Report Form (ENV-PEB-088). The report will include a description and quantity of:

- Injection Water Volume (metered daily);
- Spill Volumes (Crude Oil, Injection Water, Chemicals and Oils) (estimated where spill occurs)
- Volume of gas flared ((mass balance based on other gas metering
- Volume of gas vented (gas to flare not vented)
- Discharges to Water (no discharges to water)
- Waste disposed (volume, type – invoices)
- Chemical Injected Down Hole (injection rates)
- Monitoring Equipment (intervals as per maintenance policy for individual equipment)

6.2 Reporting on Incidents

6.2.1 Internal

Hazards and incidents are reported in accordance with Cliff Head Incident and Investigation Reporting Procedure (10/HSEQ/GEN/PC23).

6.2.2 External

6.2.2.1 Reportable Incidents

A reportable incident is an incident arising from the activity if the incident has caused or has the potential to cause an adverse environmental impact, this includes:

- Spill of >80 L hydrocarbons in areas of inland waters
- Spill of >500 L hydrocarbons in other areas
- Emission of petroleum in a gaseous form in excess of 500 m^3

- Any uncontrolled escape or ignition of petroleum or any other flammable or combustible material causing a potentially hazardous situation
- Any spillage of hydrocarbons or other material (including drilling fluids, chemicals, produced formation water or substances that have the potential to adversely affect surface vegetation, soil or subsurface ground water) that affects a ground surface area greater than 100 m^2.
- Fire from the Cliff Head Operation impacting the Bee Keepers Nature Reserve
- Onshore spills of hydrocarbon with the potential to impact the marine environment
- Any incident with raw consequence level of 'moderate' or higher

Reportable incidents shall be reported orally to DMIRS PEB on 0419 960 621 immediately and followed by a written report (to petroleum.environment@DMIRS.wa.gov.au) within 3 days of the first occurrence of the incident. The report will be in the DMIRS Environmental Incident Report Form (ENV-PEB-189).

6.2.2.2 Recordable Incidents

A recordable incident is an incident that breaches an environmental performance objective or environmental performance standard documented in the EP for the activity and is not a reportable incident. Recordable incidents shall be reported to DMIRS PEB on the Monthly Recordable Environmental Incident Report Form (ENV-PEB-190) by the 15th of the following month.

6.3 Auditing Routine Operations

TEO conducts an Annual Environmental Compliance Audit annually. The audit brief includes the commitments in this EP and conditions from all Environmental Licences.

Annual management reviews are conducted to determine the continuing suitability, adequacy and effectiveness of HSE management systems. Information reviewed includes audit results, incident reports, performance reports and relevant views from stakeholders. Reviews are documented including observations, conclusions, recommendations and follow-up;

Corporate audits are conducted every three years at all sites and organisational levels to establish the extent of conformance with these Standards. Audits may be more frequent depending on the organisation's HSE risk profile and performance history. Audit teams comprise of auditors who are independent of the part of the organisation being audited. Performance improvement plans are prepared and executed to address non-conformities.

The HSE Policy and these Standards are reviewed at least every three years and revised as required. Refer to section 11.3 for the relevant TEO HSE standards and section 10.2 of the HSE Management System description (10/HSEQ/GEN/POL3544, Rev 0) for Monitoring, Audit and review requirements. Additional related documents include the CHA and ASP Operations CPS Audit Procedure (10/OP/INT/PC02) and the ASP CHA Audit schedule (10/HSEQ/GEN/PL15).

The TEO General Management will see assurance of conformance with these Standards and will regularly review HSE performance, risks and strategic issues. Annual self-assessments are conducted at each site to establish the extent of conformance with the High Risk Control Protocols. Improvement plans are prepared and executed to address non-conformities.

Systems are in place to identify, report, respond to and manage non-conformities and improvement opportunities. Non-conformities are investigated, and corrective and preventative actions implemented, and their effectiveness reviewed to avoid recurrence.

6.4 Contractors Reporting to TEO

Contractors and third parties are required to complete a HSEQ prequalification report, on request, which includes evidence of operational and technical data for the Contractor's equipment and how that equipment is maintained. Lost and damaged equipment or other incidents (e.g. spills)

that may occur during Contractor activities shall be reported orally to the TEO Manager Production and development – WA (or delegate) immediately and be formally reported in MyOSH.

6.5 Consultation

TEO endeavour to consult with relevant government authorities, interested persons and organisations on all operations. TEO Production Solutions commit to being available for ongoing consultation. Consultation on environmental management issues has historically been undertaken with the stakeholders listed in Table 9.

Table 4:Cliff Head Environmental Stakeholders

Stake Holder	Area of Interest	Events Where Contact is Initiated
City of Geraldton	Waste management for Cliff Head (Onshore)	Management of contaminated waste disposal off site at the Meru waste facility.
Department of Water and Environment Regulation (DWER)	All areas of the Cliff Head (onshore)	Reportable incidents, developments and environmental management Annual reporting Inspections
Department of Mines, Industry Regulation and Safety (DMIRS) Petroleum Environment Branch (PEB)	All areas of the Cliff Head (Onshore)	Reportable and Recordable incidents Developments Emissions and discharges reporting Annual reporting Audits
Department of Water and Environment Regulation (DOW)	ASP Abstraction Bore	Annual Reporting on conditions of licence to take water
Department of Fire and Emergency Services (DFES)	All areas of the Cliff Head (Onshore)	Fire emergencies (including drills)
Shire of Irwin	All areas of the Cliff Head (Onshore)	Any operation or development affected by local government restrictions Fire
Department of Biodiversity, Conservation and Attractions.	Onshore pipeline easement	Annual site visit and rehabilitation consultation

Appendix A ASP Layout

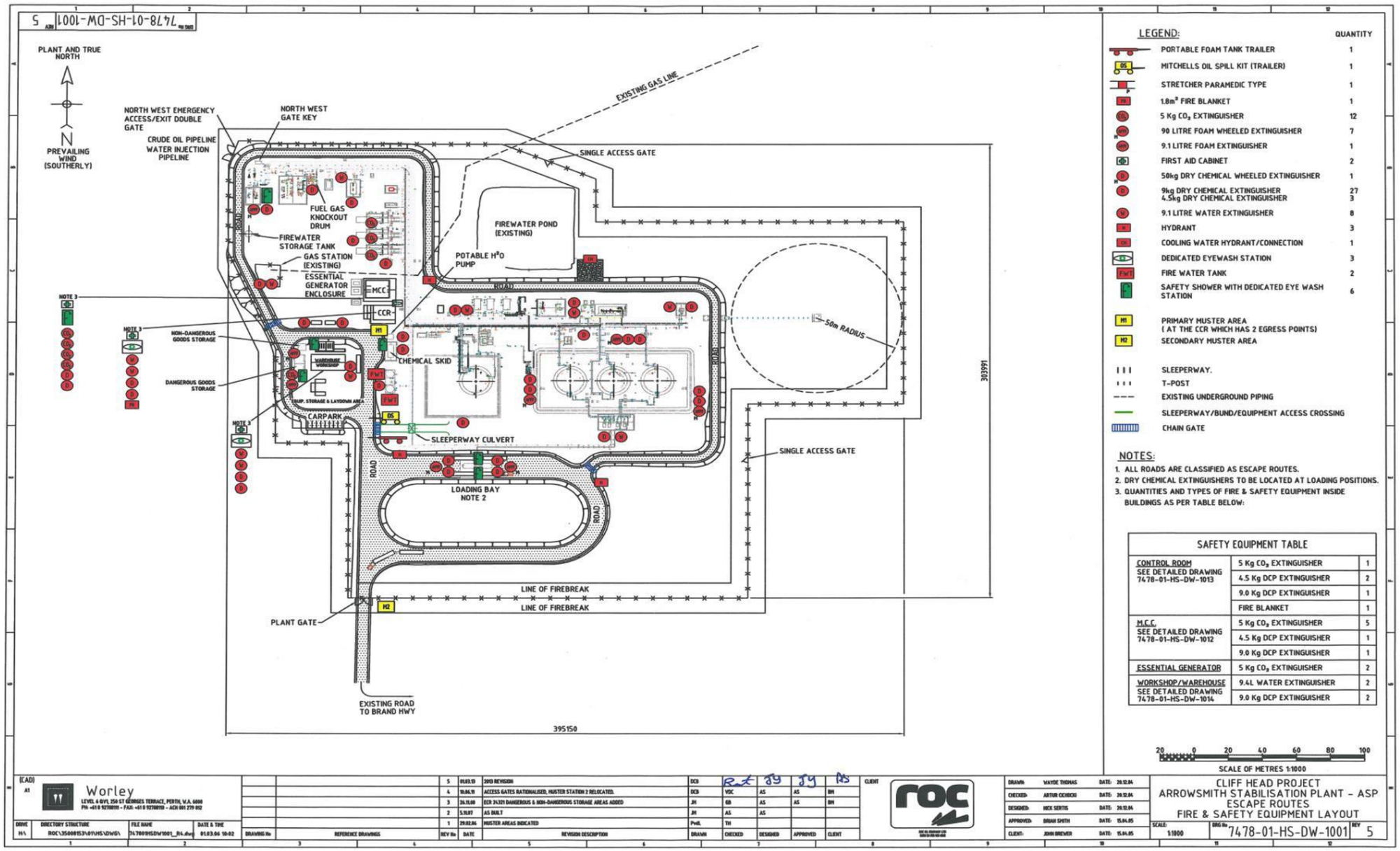


Figure 8: ASP Layout

Appendix B Triangle Energy Risk Matrix Toolkit (10/HSEQ/GEN/PC23/RG01

Risk Matrix

To be used for personal safety type events

To be used for health or environmental exposure type events

To be used for process safety type events

Likelihood	Extremely unlikely	Very unlikely	Unlikely	Likely	Very likely	Almost certain
Exposure	Less than once per 100 years	Between once per 100 years and once per 10 years	Between once per 10 years and once per year	Between once every year and 4 times a year	At least once per month	At least once per week
Frequency	Not known to occur in a comparable activity internationally but plausible	Known to occur in a comparable activity internationally but unlikely	Has occurred or could occur in a comparable activity in Australia	Has occurred once or twice in the company	Has occurred frequently in the company	Has occurred frequently at the facility

	Injury / Health Effect	Regulatory	Environment	Asset Production Loss	Business Reputation	Risk Level	A	B	C	D	E	F
Catastrophic	2 or more fatalities OR severe irreversible illness / disability to more than 10 persons.	Civil / criminal prosecution OR potential jail terms for directors or fines for company OR Loss of operating licenses.	Extremely severe environmental impact with significant recovery work over a few years or Global media interest.	Extreme > $5M	Extreme adverse public, political or media outcry, resulting in international coverage. Critical impact on business reputation & future.	6	High (11)	High (12)	Very High (18)	Very High (24)	Extreme (30)	Extreme (36)
Severe	1 fatality OR serious irreversible illness / disability (>30%) to less than 10 persons.	Civil prosecution OR unfavourable tariff outcomes.	Major environmental impact with significant site impact and recovery work over a few months. Regional / national media interest.	Severe $ 2.5M to < $5M	Major adverse national media /public / political attention.	5	Medium (5)	High (12)	High (15)	Very High (20)	Very High (25)	Extreme (30)
Major	Serious permanent disability / illness (<30%) to 1 person.	Unfavourable policy outcomes OR systemic breaches (small and large). Enforceable undertakings.	Significant environmental impact with off-site impact and recovery work over a few weeks. Some local and regional media interest.	Major $1M to < $2.5M	Significant impact on business reputation and/or national media exposure.	4	Medium (4)	Medium (8)	High (12)	High (16)	Very High (20)	Very High (24)
Serious	Serious injury or serious health effects resulting in more than 5 days lost time OR more than 1-month alternate / restricted duties.	Systemic minor PIN or regulatory breaches OR 1 large breach OR no formal conviction.	Serious environmental impact with some on-site impact and recovery work over a few days. Some local media interest.	Serious $300k to < $1M	Serious, adverse local public or media attention or complaints.	3	Low (3)	Medium (6)	Medium (9)	High (12)	High (15)	Very High (18)
Moderate	Injury / health effect to individual requiring medical treatment by a medically qualified person with less than 5 days lost time OR less than 1-month alternate / restricted duties.	Local investigation OR on the spot, fine OR PIN.	Minor environmental impact, slight or negligible impact, negligible remedial / recovery work.	Moderate $30k to < $300k	Minor impact. Public awareness, but no public concern.	2	Low (2)	Low (4)	Medium (6)	Medium (8)	High (12)	High (12)
Minor	Injury or illness requiring first aid (no lost time or alternate / restricted duties).	Minor regulatory breach OR compulsory reporting of incident.	Negligible environmental impact, effect contained locally.	$0k to < $30k	Negligible impact on reputation.	1	Low (1)	Low (2)	Low (3)	Medium (4)	Medium (5)	High (11)

Management Approach Adopted

Step 1 Determine Inherent Consequence and Gross Exposure

Inherent Consequence Severity	Gross Exposure in $ or Safety impact	Action Required	Management Approach Adopted	Reporting requirements	Acceptance Authority
6 Catastrophic	>$5M or Extremely severe environmental impact Single or Multiple Fatalities or severe irreversible disability to large group of people (>10).	Managed jointly by Managing Director & General Managers	Formal Risk assessment processes used to identify and implement with the highest priority the necessary additional controls for risk reduction. If the potential event threatens Business Continuity, then it is to be covered by a Business Continuity Plan and a Disaster Recovery Plan. Existing controls must be maintained and critical controls to be monitored quarterly.	ASAP report to Board	Managing Director (MD)
5 Severe	$2.5M to < $5M or Major environmental impact fatalities or serious irreversible disability (>30%) to multiple persons (<10)	Managed by the General Managers	Formal Risk assessment processes used to identify appropriate treatment for risk reduction. Existing controls must be maintained and critical controls to be monitored quarterly.	Monthly report to Board	Managing Director (MD)
4 Major	$1M to < $2.5M or Serious permanent injury/illness or moderate irreversible disability (<30%) to one or more persons	Managed by General Managers	Existing controls must be maintained, and Formal Risk assessment processes used to identify appropriate treatment for risk reduction.	Monthly Report to EMT ASAP to GM	Managing Director (MD)
3 Serious	$300k to < $1 M or Serious environmental impact serious reversible/temporary injury/illness irreversible disability to 1 person OR More than 5 days lost time;	Managed by Asset/Site/Project Managers and monitored by General Managers	• Appropriate documentation kept updated in Risk Register	Monthly Report to MD ASAP to RM	General Manager
2 Moderate	$30k to < $300k or reportable Minor environmental impact Reversible temporary injury / illness requiring medical treatment OR Less than 5 days lost time	Managed by Project / Operations Managers		Monthly Report to RM	Project/ Operations Manager
1 Minor	< $30K or minor impact on personnel such as First Aid injury	Day to day processes managed and monitored by BU Supervisors/Team Leader		Project/Operations Manager	PIC Supervisor

Step 2 Determine Management Action Required and Authorities

Risk Ranking	Management Action Required and Authorities	Reporting requirements	Acceptance Authority
Extreme	If Risk is related to Health, Safety or Environmental issues then immediate reduction action (including consideration of the immediate cessation of the activity) is to be undertaken. If the risk is to be accepted temporarily then approval from the CEO must be obtained and the Board should be consulted. Managed by the GM's and monitored by the Executive Management Team (EMT), Risk Committee (RC) and the board.	ASAP to MD	Managing Director (MD)
Very High	Act to reduce residual risk to lower level by a Risk Treatment Plan to be developed as soon as possible and managed by General Manager and monitored by MD.	ASAP to RM Monthly to MD for Review	Managing Director (MD)
High	Risk Treatment Plan to be developed as soon as reasonably practicable when risk reduction is possible by additional controls. Plan to deal with in keeping with the business plan. Managed by Asset/Project Manager and monitored by General Manager	Monthly Report to RM	General Manager
Medium	Risk Treatment Plan implemented in keeping with other priorities. Safety and Health related consequences prioritised accordingly Managed and monitored by Asset Managers	Monthly Report to RM	Project/ Operations Manager
Low	No Risk Treatment Plan required. Attention from management required specifically for Safety and Health consequences Managed and monitored by BU Supervisors/Team Leader. Any actions managed through action tracking system KPI's	Project/ Operations Manager	PIC Supervisor

Appendix C Cliff Head (Onshore) Environmental Risk Assessment

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
Soil Disturbance	Soil Erosion Reduction of local biodiversity, loss of fauna habitat	• Maintenance wherever practicable of the existing vegetation cover since this protects the mobile sands from being lifted and eroded by winds. • A Rehabilitation Plan (Woodman Consulting, 2006) was prepared by Triangle Energy (Operations) Pty Ltd (TEO) to guide revegetation of disturbed areas, i.e. pipeline easement and dune areas around the ASP. Implementation of the Rehabilitation Plan has been documented in annual progress/rehabilitation monitoring reports to DBCA. • Access to ASP via Brand Highway (sealed road) Excavation / Penetration Procedure in place • No clearing without a permit or written notice of exemption • Access to easement is via existing tracks at slow speed (<60 km/h)	**2**	**B**	**Low**
Pipeline access: disturbance to native vegetation and wildlife	Reduction of local biodiversity, loss of fauna habitat	• No vehicle access permitted on pipeline easement in Beekeepers Reserve. Inspections undertaken by foot in areas without access via easements • Revegetation with indigenous species (Refer: Rehabilitation Plan (Woodman Environmental Consulting, 2006) • In areas of poor vegetation cover, where further impacts are likely, appropriate corrective actions shall be taken • Where possible, areas that have been recently revegetated should be avoided by vehicular machinery movements • No disturbance to areas of native vegetation • Revegetation success to be monitored in accordance with Rehabilitation Plan • Further restoration works may be required in areas where vegetation establishment has been less than acceptable • Access to easement will be via existing tracks at slow speeds (<60 km/h) Physical barriers (including revegetation) will be used to stop public • access to the pipeline easement Only clean fill certified as weed free shall be used if additional material is required. Fill material will be similar to the natural soil of the area. Top-soil will be returned to facilitate vegetation • If area requiring earthworks is within a sensitive environment only weed free certified soil should be used • Consultation with DBCA and DMIRS regarding disturbance to native vegetation and wildlife on a case by case basis • Easement rehabilitation consists of local endemic species • Access tracks should be kept navigable by adequately controlling vegetation growth • Use of appropriate signage to deter third party access • Regular monitoring to be undertaken along the easement to observe for erosion, sedimentation and associated environmental impacts • Pipeline easement signposted along entire route • If significant erosion is encountered, erosion and sediment control structures will be constructed • Excavation / Penetration Procedure in place • Pipeline right of way is accessed via exiting tracks and speed limited to 60 km/h	**2**	**B**	**Low**
Pipeline Access- Introduction of weeds or pathogens along easement	Reduced Rehabilitation success, loss of biodiversity and loss of habitat	• Regular inspection, monitoring and auditing of the pipeline route will include an assessment of weed impacts. (Refer: Rehabilitation Plan – Woodman Environmental Consulting, 2006) • The presence of noxious weeds will be reported to local authorities and their control conducted in conjunction with local authorities • Maintenance crews made aware of weed control requirements • In identified weed infestation areas, all vehicles and machinery brought onto the pipeline corridor or other work sites shall be washed down before entering the pipeline corridor. All soil and organic matter should be removed including under the vehicle • The pipeline corridor shall not be used for access into the Beekeepers Reserve	**2**	**B**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
		• Physical barriers to stop public access to pipeline easement			
Pipeline Access- Third party access causing damage along the pipeline right of way	Soil erosion; Reduction of local biodiversity, loss of fauna habitat; Reduced Rehabilitation success, loss of biodiversity and loss of habitat	• Signage along pipeline right of way installed (access points); • Regular monitoring to be undertaken along the easement to observe for erosion, sedimentation and associated environmental impacts • The pipeline corridor shall not be used for access into the Beekeepers Reserve • Physical barriers to stop public access to pipeline easement including bollards and fences at pipeline inspection trenches; • No vehicle access permitted on pipeline easement in Beekeepers Reserve. Inspections undertaken by foot in areas without access via easements • Pipeline easement signposted along entire route; • If significant erosion is encountered, erosion and sediment control structures will be constructed;	**2**	**B**	**Low**
Plant operations- Pest animal invasion	Loss of fauna diversity and abundance and loss of fauna habitat	• Keep facilities clean and litter free to discourage vermin from being attracted to site • Discourage weeds generally so as not to provide habitat for vermin • Maintain ASP weed free to discourage habitat for vermin	**1**	**C**	**Low**
Bushfire originating from maintenance activity	Loss of fauna, personnel or public third-party damage	• Ensure all equipment complies with relevant fire safety standards • Fire break will be maintained around the ASP outside the perimeter fence • Vehicles and machinery not parked in areas of high fire risk (i.e. over tall grass or cleared vegetation debris) • Ensure all operations and maintenance vehicles have a fire extinguisher, communications units and first aid kit • Where flammable or combustible materials are required to be stored on site, appropriate fire prevention (e.g. spark guards for welding) and firefighting equipment is available on site. • Incompatible chemicals not stored together • When undertaking hot work, ensure the immediate area is clear of flammable materials • Consult with DFES regarding weather conditions, fire hazards, fire restrictions, notifications and permitting requirements prior to any maintenance” ‘hot works” activities on easement • Do not light fires for recreational purposes or rubbish disposal • Provide maps showing the location of all onshore project infrastructure to the relevant authorities (DFES,DMIRS, Shire of Irwin) • DFES and TEO will be notified as soon as possible in the event of a fire outbreak that is outside the control of site personnel • Restricted burning permit in place (as per Bushfires Act 1954) and conditions adhered to Licence to take water	**3**	**A**	**Low**
Plant Operations- fire emanating from facilities	Bushfire, damage to vegetation and fauna, possible injury to personnel or public, possible third party damage	• Smoke detection in equipment rooms • Portable fire extinguishers • Pipeline operations and maintenance in accordance with Department of Fire and Emergency Services (DFES) requirements including complying with relevant fire restrictions, notification requirements and permitting procedures • Ensure all equipment complies with relevant fire safety standards • Vehicles and machinery parked in designated areas • Regular check vehicles to ensure that combustible materials such as grass and debris have not built up in critical areas where ignition could occur • All vehicles contain a fire extinguisher, satellite phone and first aid kit • Where flammable or combustible materials are required to be stored on site appropriate fire prevention (e.g. spark guards for welding) and firefighting equipment is available on-site (e.g. fire extinguishers, water knapsacks and rake hoes) • Incompatible chemicals not stored together • When undertaking hot work, ensure the immediate area is clear of flammable materials • Create and maintain fire breaks around the ASP outside perimeter fence	**3**	**A**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
		• Consult with DFES regarding weather conditions, fire hazards, fire restrictions, notification and permitting requirements prior to any maintenance hot works • Do not light fires for recreational or rubbish disposal • Establish fire evacuation procedures and an emergency assembly area and communicate this to all personnel working or visiting at the site (verbally and via a diagram) • Provide maps showing the location of all project infrastructure to relevant fire authorities, such as DFES, DBCA, DMIRS, Town of Dongara and Shire of Irwin • Evacuate any site subject to fire that cannot be immediately extinguished • Notify DFES and TEO as soon as possible in the event of an outbreak that is outside the control of site personnel • Power generator enclosure equipped with fire and gas detection and fire suppression systems • A flare system is provided for safe disposal of flash gas and emergency release. Vegetation cleared from flare for 50m radius • In the event of fire, a fire water pond is available to provide water for local fire crews hydrants • In addition, 2 plastic fire water storage tanks will be available each containing 46,000 L capacity • A fire water booster pump (standalone diesel unit) and fire water distribution system (3 hydrants) is available • All plant instrumentation and control systems contained in air-conditioned rooms to reduce the risk of over-heating in summer • ASP is located on former lime facility • ASP is manned 24 hrs/d Designated smoking area Licence to take water			
Plant operations – excessive noise emissions	Disturbance to fauna and surrounding neighbours	• Generators are housed in specially designed acoustic enclosures which reduce the noise emissions • Generators are fitted with exhaust silencers • The ASP has been designed to produce noise levels in the order of 85 dB (A) at 1m from the noise source and approximately 62dB (A) at the nearest sensitive receptor. • Plant equipment maintained	**1**	**B**	**Low**
Gas emissions from maintenance vehicles	Short term impacts to local air quality	• Gas emission from maintenance vehicles are minor • Ensure all maintenance vehicles are equipped with appropriate pollution devices e.g. mufflers	**1**	**B**	**Low**
Plant operations- air pollution from equipment (generators, flare) and unplanned atmospheric emissions	Short term impact to local air quality	• Regular maintenance of vehicles and power generations equipment to minimise emissions • Monitoring of fuel and flare rates • Plant equipment maintained • Automatic/manual re-ignition of flare • Wind monitor – Wireless weather station (IC0348) used to measure wind; • Procedure to increase purge gas when high winds or inclement weather is expected (10/OP/PS/PC01/WI06) • PCS – flare pilot burner extinguished alarms and countdown alarm configured to alert of flare outage and incident reporting requirements	**2**	**D**	**Medium**
Plant operations- Handling and transport of hazardous materials that may result in spillage	Pollution of the environment that could affect flora, fauna and humans	• Chemicals stored in leak proof area during transit • Transfer of chemicals will not be undertaken during extreme weather conditions • Chemicals handled with extreme care to prevent spillage • MSDS's on site for all chemicals and hazardous goods, and available for personnel use and review • Designated hazardous storage area • Drip trays in place for transfer operations • Incident reporting via MyOSH and follow up investigation • Drip trays in place for transfer operations	**1**	**B**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
		• Plant equipment maintained			
Plant operations- Hydrocarbon spill from rupture of the PW storage tank	Oil spill causing injury or death of flora and fauna and contamination of environment	• All produced water is injected into the CHA reservoir or CHOWS Triennial integrity testing of CHOWS (where operational) • Tanks are contained in fully bunded and sealed areas • Handling procedures adopted which aim to avoid spills to land or water • Appropriate spill response equipment for containment and recovery available on site • Detailed spill response procedures are detailed in OSCP • Workforce training shall be conducted in chemical handling, spill response and recovery procedures • Regular pumping out of bunds that do not connect with the water treatment system • Plant equipment maintained	**1**	**B**	**Low**
Plant operations- waste management	Contamination of soil and water, damage to flora and fauna, reduction in visual amenity	• SDS to be available to personnel which identify hazardous materials and their safe handling, storage and disposal • Personnel trained in the safe handling, storage and disposal of all wastes streams • Wastes created by personnel conducting operations or maintenance activities at the ASP and along the easement have a carry-in/carry- out policy • Hazardous wastes managed in compliance with relevant regulatory requirements including: • Safe storage prior to collection and transport off-site for reuse, recycling, treatment or disposal at locations approved in accordance with AS 1940 Storage and Handling of Combustible and Flammable Liquids • Storage areas designed to prevent contamination of soil and water and adequately contain any spills • Spill response equipment stored in the vicinity of storage facilities, where immediate access is unhindered • Spillages immediately contained and cleaned up • Contaminated soils managed according to the concentration of contaminants and leachability. • Vehicles, plant and equipment are checked as operating correctly, including identification and rectification of any leaks • Non-prescribed wastes managed in accordance with the policy of avoid, reduce, reuse and recycle • Reusable and recyclable wastes such as timber skids, pallets, drums and scrap metal stockpiled for salvage • Designated collection bins at work sites for aluminium cans, glass and paper recycling • Sewage and sullage will be via approved septic systems and disposed to municipal sewage treatment plant • ASP maintained to an orderly and hygienic standard • Putrescible waste receptacles covered • No waste left on site • Licenced waste contractor records showing type and location of waste disposal	**2**	**B**	**Low**
Onshore drainage system operation	Pollution to local environment	• Local containment bunds (concrete slab and collection sump) processes to control Water Discharge from Process Bund Areas 10/HSEQ/ENV/PC01 and Storm and Ground Water Management 10/HSEQ/ENV/PC05 • All the oily waste fluids are educted and removed to the Tanker Loading Oil Containment Tanks or reinjected back into the process. Waste is then removed from the manhole by a licensed liquid waste contractor for treatment and disposal in accordance with EPA regulations.	**1**	**C**	**Low**
Transfer of crude oil via tanker	Pollution to local environment	• The ASP Load-out Work Instruction (10/OPPSPC/07/WI01) details the safe load-out of crude oil into oil tanker at the ASP site to the BP refinery in Kwinana. This document is at the load-out terminal for reference by tanker loading personnel	**1**	**B**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
		• All oily waste liquid is recovered from the process bunds and returned to the process or removed from site • A weather shelter located over the loading equipment to minimise impact of weather • Road tanker filling control system and auto shut-off • Road tanker contractor selection • Collection pit installed to contain spills • CCTV cameras will be used within the plant to monitor the tanker loading operations • Tanker loading bay designed to contain potential spills within concrete pad and collection drains and sump • Onshore OSCP available to deal with spills			
Failure of Crude Oil Storage tank	Oil spill causing injury or death of flora and fauna and contamination of environment	• All hydrocarbons and dirty water that are released will be collected and all oily waste liquid will be recovered from the process bunds and returned to the process • The storage tank is fully bunded and contained in a sealed area • Regular tank inspection	**2**	**A**	**Low**
Failure of pipelines	Oil spill causing injury or death of flora and fauna and contamination of environment	• The plant is illuminated 24hrs a day • Continuous corrosion control monitoring program to minimise the risk of leaks in piping and flanges • Routine Inspections to measure rate of corrosion in the pipeline • Use of corrosion inhibitor. The rate will be adjusted to effectively eliminate corrosion in the pipeline • All relevant personnel undergo a corrosion awareness training program Reduced number of flanges, valves and connection points (leak locations) Heavy walled pipe • Absorption materials on site for clean-up of spills • Onshore OSCP available to deal with spills • Personnel trained Emergency Response Plan and Oil Spill Contingency • Plan (OSCP) procedures for efficient first response • All oil spill equipment maintained to ensure it is functional and accessible • Inductions covering oil spill prevention, response, recovery, and waste management for all relevant personnel • 24 hr observation via control room • Pigging to remove corrosive fluids (corrosion mitigation) Capped pipework • Cathodic protection	**3**	**A**	**Low**
Plant Operations- Chemical Injection process failing causing chemical spill from storage tank or pump failure	Pollution to environment	• Tanks are contained with fully bunded and sealed areas • Chemical injection package located onshore to enable more frequent monitoring and maintenance • Pumps status is monitored continuously • The minimum practicable volume of chemicals is stored on-site • SDS will be available on-site where the chemical is stored and handled Chemicals are not stored or handled in the vicinity of water storage areas Appropriate handling procedures adopted which aim to avoid spills to land • and water • Appropriate spill response equipment, including containment and recovery equipment available on site • Onshore OSCP to deal with spills • Workforce training in chemical handling and spill response and recovery procedures	**2**	**B**	**Low**
Produced Water Spills (valve or pump leak)	Pollution to environment tie soils, groundwater, vegetation	• Major vessels onsite (Production Separator, IGF, Tanks) are contained within separate bunded areas The tank storage bunds are graded towards one corner where a normally-closed bund valve is provided for the discharge of clean storm-water to the nearest soak pit • Routine surveillance of onshore facilities (note that plant is permanently manned) Inductions to all personnel, contractors and visitors covering PFW management.	**2**	**B**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
		• The onshore pipeline is inspected on a monthly basis as per the Pipeline Inspection Procedure (10/HSEQ/GEN/PC11). Onshore there is a 'corrosion monitoring trench'. • OSCP in place Investigation into spills Maintenance Scheduler			
Pipeline maintenance and clearing Risk assessment					
Soil and landform impact from Vegetation clearing	• Loss of habitat; • Exceeding approved licence; • Erosion; • Impact to pipeline markers • Increased environmental footprint; • Soil compaction	• TEO personnel and CE spotters to assess track prior to clearing; • Internal approval by Environmental Advisor; • Clearing will be dedicated to maintaining previously cleared areas; • No additional clearing; • Clearing plan to define use of mulched material to be spread evenly across PPL ROW (As per AS 2885= • Objective to maintain line of site - options for clearing to include leave trees in low lying gully; • Maintain width of ROW as per EP; • Minimal runs required (e.g. run over twice for full PPL	**1**	**B**	**Low**
Weeds/dieback introduction from soil for road or site stabilisation and vehicle movement	Invasive species into nature reserve	• Weed spraying program in place; • Vehicle washdown /Weed and seed certification provided from CE; • Environment Management Plan; • Daily maintenance sheet; • Vehicles/equipment to be blown down with pressure air cleaner at location (on PPL ROW); • Weed and dieback procedure (10/HSEQ/ENV/PL09/WI01)	**3**	**A**	**Low**
Fauna impact due to vehicle movement	Loss of Fauna life	• Site meeting with client and contractor at launch of project, prior planning communicated clearly to team; • Clearing plan; • Clear communications between team and client • Relocate fauna approximately 100 metres; CE team capable of relocating fauna as required; if hazardous then leave (e.g. hives); • TEO personnel and CE spotters to assess track prior to clearing; • Operators experienced in snake/reptile handling; • Pre-cleared land/PPL ROW clearing and maintenance.	**1**	**C**	**Low**
Clearing foreign Flora/priority species	• Over clearing; • Damage to priority species; • Regulatory impact	• Site meeting with TEO and CE at launch of project, prior to planning communicated clearly to the team; • Clearing plan – define pipeline clearing area; • Clear direction maps given by supervisor; • EP to define waste management (to reduce impact on fauna); • Relocate fauna approximately 100m; CE team capable of relocating fauna as required; if hazardous then leave (e.g. Hives); • Daily report to be sent to the Environmental Advisor with pre and post images of progress for clearing work. Environmental advisor to provide report to DMIRS/DBCA; • Pipeline markers	**2**	**B**	**Low**
Fire due to vehicle movement, equipment and clearing activities	Impact of fire on surrounding vegetation (Flora and Fauna)	• Clearing during low/medium fire risk season; • Equipment not likely to cause a spark; • Firefighting equipment (engine fire suppression, LC has 400L of water and 2 x 10L water); • All personnel are trained for firefighting; • Review weather conditions each day of operation (call DFES – CE); • Support from ASP available – fire trailer to be on standby during PPL clearing and maintenance work; • DFES available for support	**4**	**C**	**Medium**
Spills (diesel/oil spills) due to: vehicle movement /equipment /refuelling	Impact of fire on surrounding vegetation (Flora and Fauna)	• Double bunded diesel tank (400L of diesel); • Spill kits standard on tractor and vehicles;	**1**	**B**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
		• Refuelling will occur on bunded areas – not infield; • Minimal volumes of oil held (approximately 3 x 20Lt drums) which are bunded; • Work instruction for spill kit use – all part of induction for CE. Must understand spill scenarios			
Waste generation from pipeline clearing and maintenance activities	No significant consequences	All waste material will be mulched and left on site	**1**	**A**	**Low**
Air quality impact from emissions	No significant consequences	All waste material will be mulched and left on site	**1**	**A**	**Low**
Noise impact	No significant consequences	All waste material will be mulched and left on site	**1**	**A**	**Low**
Emergency Clearing activities for Injection Water Pipeline incident					
Soil and landform impact from Vegetation clearing	• Loss of habitat; • Exceeding approved licence clearing area; • Erosion; • Increased environmental footprint;	• External approval obtained for clearing by DMIRS, DWER (formerly OEPA, DBCA, DER); • Maps provided to contractor documenting where we are permitted to clear (as per DMIRS notification letter dated1st of December 2017) • Communicate through tool box talk/pre-start meeting all clearing requirements	**1**	**B**	**Low**
Weeds/dieback introduction via vehicular access to site during clearing and stabilisation activities.	Invasive species into nature reserve	• Weed spraying program in place; • Vehicle washdown /Weed and seed certification provided from Lenane Holdings; • Environment Management Plan; • Weed and dieback procedure (10/HSEQ/ENV/PL09/WI01) • Lenane Holdings Clean down procedure (Procedure 52) • Lenane Holdings Machinery and Vehicle hygiene inspection procedure (Procedure 57) • Lenane Holdings Pressure washer procedure (Procedure 39) • Lenane Holdings Workshop washdown bay (Procedure 46) • Lenane Holdings Clean down vehicles and machinery (Procedure 52) • Lenane Holdings Hygiene inspection checklists (LH Sems/Checklist, Inspections and Audit/ Hygiene Inspections/Excavator	**3**	**A**	**Low**
Fauna impact due to vehicle movement	Loss of Fauna life	• Site meeting with client and contractor at launch of project, prior planning communicated clearly to team; • Relocate fauna approximately 100 metres; (e.g. hives); • Operators experienced in snake/reptile handling	**1**	**C**	**Low**
Clearing foreign Flora/priority species	• Over clearing; • Damage to priority species; • Regulatory impact	• Site meeting with TEO and contractors at launch of project, prior to planning communicated clearly to the team; • External approval obtained for clearing by DMIRS, DWER (formerly OEPA, DBCA, DER); • Maps provided to contractor documenting where we are permitted to clear (as per DMIRS notification letter dated1st of December 2017) • EP to define waste management (to reduce impact on fauna);	**2**	**B**	**Low**
Fire due to vehicle movement, equipment and clearing activities	Impact of fire on surrounding vegetation (Flora and Fauna)	• Clearing during low/medium fire risk season; • Equipment not likely to cause a spark; • Firefighting equipment; • All Lenane Holdings personnel are trained for firefighting; • Support from ASP available – fire trailer to be on standby during PPL clearing and maintenance work; • DFES available for support	**1**	**B**	**Low**
Waste generation from emergency clearing activities	No significant consequences	All waste material will be placed in appropriate waste receptacles on site and disposed of as per Section 7.9 of the Cliff Head Onshore Environment Plan.	**1**	**A**	**Low**
Air quality impact from emissions	No significant consequences	All equipment used to clear vegetation is maintained.	**1**	**A**	**Low**
Noise impact	No significant consequences	All equipment used to clear vegetation is maintained.	**1**	**A**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
Site remediation activities post emergency response for incident 29th November 2017 (contaminated soil removal, pond remediation and HDPE liner removal off site).					
Removal of native vegetation and potential habitat	Loss of vegetation; Destruction of fauna habitat; Introduction of noxious weeds and vermin, exotic species, flora and animal diseases; Prosecution	• Existing access tracks used; • Only contaminated soil and HDPE liner to be removed offsite; • Topsoil which was stockpiled during emergency incident response to be reinstated post contaminated soil and HDPE liner removal and temporary water storage pond remediation; • Personnel trained in local environmental sensitivities during RapidInduct induction; • Approval obtained from DMIRS, DWER, DBCA and GCC; • Further rehabilitation assessment work to be conducted in July to confirm re-seeding requirements;	**1**	**A**	**Low**
Soil disturbance	Increased Erosion Compaction Subsidence Dust from vehicular movement	• Temporary contaminated soil storage bunds and water storage pond to be rehabilitated as soon as possible; • Region is underlain by limestone so there is a low potential of subsidence; • Dust control measures implemented (e.g. water spraying) if dust generation becomes a problem; • Use existing road and tracks only; • Soil removal zones restricted to temporary contaminated soil storage bund and temporary waste water pond locations only	**2**	**B**	**Low**
Introduction of noxious weeds and vermin, exotic species and animal diseases to the receiving environment	Mobilisation of equipment to site Vehicles carrying seeds from affected areas Weeds and contaminated soil on vehicles	• Designated access tracks used only • Vehicle weed hygiene inspections • RapidInduct induction • Equipment cleaned and inspected for soil, plant material and pest animal contamination prior to mobilisation to minimise risk of introducing exotic species with advice from DBCA	**2**	**B**	**Low**
Disposal of wastes: Release of waste oils into the environment Loss of rubbish into the environment Environmental damage due to spill of waste product Litter left around worksite	Waste discharge to the environment due to inadequate waste disposal practices; Soil, surface water and groundwater contamination Potential contamination of soils surrounding bund locations	• Minimal waste generated during soil remediation activities; • Focus will be on removing all contaminated waste from site including contaminated soil and HDPE liner for all bunds and disposing this waste at the Meru Waste Facility; • All other waste material will be placed in appropriate waste receptacles on site and disposed of as per Section 7.9 of the Cliff Head Onshore Environment Plan; • All general waste (e.g. drinking bottles) will be taken back to ASP for offsite disposal; • Approval obtained from the Greater City of Geraldton (GCC) to transport and accept all contaminated soil waste as well as HDPE liner at the Meru Waste Facility	**2**	**B**	**Low**
Groundwater contamination	Contaminated soils causing potential groundwater contamination through seepage out of bund	• Controlled soil removal and HDPE liner removal offsite to ensure no loss of contaminated soil to the environment during removal and transport; • Trucks used are secure and designed to contain all liquid/hydrocarbon waste that has the potential to leak during contaminated soil removal and HDPE liner removal; • Install groundwater monitoring bores to confirm no groundwater contamination as a result of the Environmental incident which occurred on the 29th of November 2017, as well as any potential contamination caused by soil removal offsite and temporary water storage pond remediation; • All Groundwater monitoring to be in compliance with AS/NZS 5667 Water Quality Sampling; • All laboratory analysis to be processed by NATA accredited laboratory's; • Groundwater analysis results to be compared against	**2**	**A**	**Low**
Impact of noise on local residents, wildlife or adjacent activities	Disturbance to local residents, wildlife or adjacent activities; Noise levels above occupational health levels; Disruption of sensitive fauna habitats	• General area has low population density and is remote from high density populations e.g. Dongara; • Ear protection for workforce; • Avoidance of sensitive fauna habitats; • Noisy activities scheduled for daylight hours	**1**	**A**	**Low**

Aspects	Impacts	Management/Mitigation Measures	C	L	Residual Risk
Fire	Bushfire – loss of vegetation, fauna and/or habitat; Disruption of operations and site access Damage to equipment Damage to site office Destruction of fauna habitat	• Adequate fire equipment located on site and personnel trained in its use; • Smoking allowed at designated smoking area only; • All vehicles fitted with fire extinguisher; • Diesel vehicles only on site; • Exemption under the Bushfires Act 1954 for restricted burning periods • Emergency response plan; • ASP site induction; • Local emergency response – fire brigade and DFES; • Permit to work system	**3**	**A**	**Low**
Failure to comply with Environmental reporting requirements Failure to meet Environmental Licence commitments	Prosecution	• Site specific induction contains explanation of Environmental Licence Requirements and Environmental management plan commitments; • Monthly recordable incident reporting; • Quarterly emissions and discharges reports; • Environment Plan review and resubmission to DMIRS to include all operational tasks	**1**	**B**	
Groundwater bore installation					
Groundwater, surface water or soil contamination	Loss of containment Spills	• All water purged during initial ground water bore installation will be contained in IBC containers on site and disposed of offsite as per the Cliff Head waste management procedure; • Purge volumes will be dependent on depth and diameter of bore piping; • Spill kits available for any hydraulic leak from equipment; • All groundwater bore installation activities are supervised by Environmental specialist (Senior Environmental advisor/ Environmental consultant (i.e. GEMEC)	**1**	**B**	
Noise during groundwater bore drilling operations	Noise levels above occupational health levels; Disruption of sensitive fauna habitats	• Ear protection for workforce (as required); • Avoidance of sensitive fauna habitats; • All activities scheduled for daylight hours	**1**	**A**	
Waste management	PVC pipework/ drilling material/ waste water waste	• All waste material will be placed in appropriate waste receptacles on site and disposed of as per Section 7.9 of the Cliff Head Onshore Environment Plan; • All hazardous wastes are to be handled and disposed of in accordance with the Prescribed Waste Management Procedure (10/HSQ/ENV/PC04); • Inspection during activity to confirm that hazardous wastes are managed in accordance with Prescribed Waste Management Procedure (10/HSEQ/ENV/PC04); • All personnel receive environmental induction detailing waste management expectations	**1**	**C**	
Weed management	Weeds/dieback introduction from vehicle movement	• Weed spraying program in place; • Vehicle washdown /Weed and seed certification provided from Dongara Drilling or alternate service provider that will be drilling the ground water bores; • Environment Management Plan; • Weed and dieback procedure (10/HSEQ/ENV/PL09/WI01)	**2**	**B**	
Bush fire or process plant fire caused by equipment	Bushfire – loss of vegetation, fauna and/or habitat; Disruption of operations and site access Damage to equipment Damage to site office Destruction of fauna habitat	• Permit to work/JSA reviewed by PIC/Senior Environmental Advisor pre-start to confirm all risks are identified and corresponding controls are sufficient; • Personnel gas detectors to be warn during any hot works; • Ensure all groundwater bores are located as per figure	**3**	**A**	