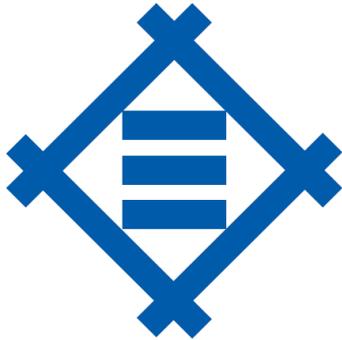


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mitsui E&P
Australia

Waitsia Gas Project Stage 2: Flora and Vegetation Management Plan

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TERMS AND DEFINITIONS

Abbreviation / Terms	Definition
AHD	Australian Height Datum
ARI	Assessment on Referral Information
AWE Perth Pty Limited	AWE Perth Pty Limited is the legal entity, operator of the relevant Production Licences (L1 and L2), the proponent for the Proposal and operates under the Mitsui E&P Australia (MEPAU) brand.
BC Act	Biodiversity Conservation Act 2016
Clearing envelope	The area of native vegetation that is present within the proposal's development envelope that may be cleared
DBCA	Department of Biodiversity, Conservation and Attractions
DBNGP	Dampier Bunbury Natural Gas Pipeline
Development envelope	the maximum area within which the proposal footprint will be located (EPA, 2016b)
DMIRS	Department of Mines, Industry Regulation and Safety
DoEE	Commonwealth Department of the Environment and Energy
DPLH	Department of Planning Lands and Heritage
DWER	Department of Water and Environmental Regulation
Environmental Referral Supporting Report	Detailed information supporting the Waitsia Gas Project Stage 2 referral http://www.epa.wa.gov.au/proposals/waitsia-gas-project-stage-2
EP Act	Environmental Protection Act 1986
EPA	Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPs	Environmental Plans
Final Flowline Easement	Final flowline easement selected once absence or presence of sub-surface obstructions has been determined.
Flora	"native vascular plants" (EPA, 2016a)
Flowline	Pipes that carry raw oil or gas products from the wells to a processing facility.
General Vegetation Area	A subset of the clearing envelope that that comprises vegetation in poor condition
ha	hectares
IBSA	Index of Biodiversity Surveys for Assessments
Indicative Flowline Easement	Construction widths for individual flowline or pipeline installation will be 30 m for the route. Sub-surface obstructions (e.g. rocks) may require flowline deviations – hence the use of the term indicative.

Abbreviation / Terms	Definition
km	kilometres
m	metres
MEPAU	Mitsui E&P Australia Group AWE Perth Pty Limited is the legal entity, operator of the relevant Production Licences (L1 and L2), the proponent for the Proposal and operates under the Mitsui E&P Australia (MEPAU) brand.
mm	millimetres
NVCP	Native Vegetation Clearing Permit issued under Part V of the EP Act
PGER (E) R	Petroleum and Geothermal Energy (Environment) Regulations 2012
Pipeline	Pipes that carry processed oil or gas products from a processing facility to market.
Proposal or Waitsia Gas Project Stage 2	Waitsia Gas Project Stage 2 (EPA Assessment 2226) as described Section 2.1
The Plan	Waitsia Gas Project Stage 2: Flora and Vegetation Management Plan
The Plant or WGP	Waitsia Gas Plant (proposed)
The Proposal	The Waitsia Gas Project Stage 2 – referred to the EPA under section 38 of the <i>Environmental Protection Act 1986</i>
The Site	The Proposal location within the existing Waitsia Gas field located approximately 16 km south-east of Dongara, in the Shire of Irwin, Western Australia and shown on Figure 2-1.
TJ	terajoule
Vegetation	“defined as groupings of different flora patterned across the landscape that occur in response to environmental conditions”. (EPA, 2016a)
VSAs	Vegetation and Substrate Associations
WA	Western Australia
Waitsia-03 Area Vegetation	A subset of the clearing envelope that that comprises vegetation in good condition
Waitsia Gas Field	The known gas field resource subject to the existing and proposed operations
WC Act	Wildlife Conservation Act
WGP	Waitsia Gas Plant
XPF	Xyris Production Facility

1.0 SUMMARY

The context and purpose of the Flora and Vegetation Management Plan (the Plan) in the context of the EPA environmental objectives is provided in Table 1-1.

Table 1-1: Summary of the Proposal

Proposal title	Waitsia Gas Project Stage 2 (the Proposal) - EPA Assessment 2226
Proponent Name	AWE Perth Pty Ltd operating as MEPAU
Purpose of this Flora and Vegetation Management Plan	<p>The purpose of this Plan is to identify the direct and potential indirect impacts on flora and vegetation and develop management measures that minimises impacts associated with the implementation of the Proposal.</p> <p>This Plan has been written in accordance with the “Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans” (EPA, 2018).</p>
Ministerial Statement	The Proposal is currently being assessed by the EPA (Assessment 2226) and a Ministerial Statement and associated proposal implementation conditions are yet to be issued.
Condition Clauses	No ministerial statement at the time of preparation of the Plan.
Key Environmental Factor/s and Objective/s	<p>Key environmental factor: Land – Flora and Vegetation</p> <p>EPA Objective: To protect flora and vegetation so that biological diversity and ecological integrity are maintained. (EPA, 2016)</p>
Key Provisions in the Plan	<ul style="list-style-type: none"> • Baseline flora and vegetation assessments and studies • Analysis of direct and indirect impacts associated with implementing the Proposal. • Ongoing monitoring for weeds and dieback • Implementation of management actions • Annual reporting (including results of monitoring)

2.0 CONTEXT, SCOPE AND RATIONALE

This Plan has been prepared by Mitsui E&P Australia (MEPAU)¹. This Plan is intended to support the assessment, approval and implementation of the Proposal under Part IV of the Environmental Protection Act 1986 (EP Act).

MEPAU referred the Proposal to the Environmental Protection Authority (EPA) under Part IV of the EP Act on 22 August 2019 (EPA Assessment 2226). The EPA have decided to assess the Proposal as a significant proposal, through Assessment of Referral Information (ARI). The ARI is to include additional information requested under Section 40(2)(a) of the EP Act, including this Plan, which will be subject to a two-week public review period.

This plan has been written in accordance with the “Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans” (EPA, 2018).

2.1 Proposal

The petroleum exploration and production sector has been continually active in the northern Perth Basin since the 1960s. MEPAU is building on this long-standing presence and is progressively developing the Waitsia gas field, a free-flowing², conventional gas reservoir. The proposal is located in an agricultural area approximately 16 kilometres (km) east-south-east of Dongara-Port Denison townsites in Western Australia (refer Figure 2-1). It is expected this will continue to provide ongoing operator presence in the region for up to 20 years. The Waitsia Gas Project Stage 1 (Waitsia Stage 1) was commissioned in 2016 and has been producing from two existing wells through the Xyris Production Facility (XPF). The Waitsia Gas Project Stage 1 Expansion is now under construction and will connect an additional existing well to XPF and construct a pipeline connecting XPF to the nearby Dampier to Bunbury Natural Gas Pipeline (DBNGP).

The Proposal (known as the Waitsia Gas Project Stage 2 or WGP2) includes the construction and operation of the Waitsia Gas Plant (WGP), related wells and gas gathering infrastructure. Table 2-1 provides a summary of the Proposal.

Table 2-1: Proposal Overview

Proposal Title	Waitsia Gas Project Stage 2 (The Proposal)
Proponent Activities	Development of a conventional gas reservoir by designing and constructing wells, a gathering system, gas processing plant and export pipeline to the DBNGP
Short Description	<p>The Proposal includes the development of a gas plant, six new production wells, four hubs and a number of flowlines/pipelines.</p> <p>The Proposal includes the following components:</p> <ul style="list-style-type: none"> • Construction and operation of the WGP with a maximum export capacity of 250 terajoules (TJ) per day, • The operation of two existing wells,

¹ AWE Perth Pty Limited is the legal entity, operator of the relevant Production Licences (L1 and L2), the proponent for the Proposal and operates under the Mitsui E&P Australia (MEPAU) brand.

² No hydraulic fracture stimulation (i.e. no fracking) is proposed given the free-flowing nature of the Waitsia gas field.

Proposal Title	Waitsia Gas Project Stage 2 (The Proposal)
	<ul style="list-style-type: none"> • The drilling, completion and connection of up to an additional six wells³, • A gathering system comprising flowlines and hubs to convey the extracted gas to the WGP and the gas distribution network, and • Installing a flowline from the WGP to a water re-injection well to re-inject produced formation water into a disused petroleum formation, thus minimising the requirement for and size of evaporation ponds.

Figure 2-1: Regional Setting



2.1.1 Waitsia Gas Plant

Gas extracted from the wells will be conveyed to centrally located gas gathering stations, or hubs, then directed via two flowlines to the proposed WGP for processing prior to being exported from WGP to the nearby DBNGP.

The WGP will use the same standard components as those used for processing Waitsia Stage 1 gas from the existing XPF. The WGP comprises the following processing components, which are required to condition the gas to meet the DBNGP pipeline gas quality specifications:

- Slug catcher and inlet separation as the gas enters the WGP,
- Mercury removal equipment,

³ Another stage of Waitsia gas field development could include drilling of up to an additional eight (8) wells, resulting in an expected 17 wells in total over the life of the Waitsia gas field. Any additional wells are separate to this Proposal and will be subject to separate approvals.

- Gas refining to remove carbon dioxide (also known as ‘sweetening’),
- Hydrocarbon dew-point control,
- Water content control,
- Export compression,
- Sales gas metering,
- Condensate export system,
- Produced water treatment; and
- Support utilities.

The Plant will be operated 24 hours a day throughout the year, except for maintenance shutdowns.

2.1.2 Gathering System

The Gathering System comprises the flowlines that convey the gas from underground wells to the gas hubs and various items of above-ground infrastructure.

2.1.3 Wells

Currently, two existing wells (i.e. Waitsia-01 and Senecio-03) are operating as Waitsia Stage 1, with gas extracted from these wells transmitted to the existing XPF. The Waitsia Stage 1 Expansion will connect a third existing well (i.e. Waitsia-02) to XPF.

Two existing wells (i.e. Waitsia-03 and Waitsia-04) will be brought on stream as part of the Proposal, with the drilling of up to six additional wells⁴.

2.1.4 Supporting Utilities

The following supporting utilities will be required for the Proposal:

- Fuel gas system,
- Electrical Power generation facilities,
- Heating medium system,
- An instrument air system,
- Flare system,
- Fire water system,
- Utility water system, and
- Diesel system.

⁴ Another stage of Waitsia gas field development could include drilling of up to another eight (8) wells, resulting in an expected 17 wells in total over the life of the Waitsia gas field. Any additional wells are separate to this Proposal and will be subject to separate approvals.

2.1.5 Development Envelope

2.1.5.1 Avoidance and mitigation

Throughout the scoping phase of this Proposal, MEPAU conducted site selection analysis to, where possible, reduce the environmental footprint of the Proposal. Specifically, the location of the Waitsia Gas Plant and flowline alignments were selected to avoid vegetated areas and minimise the amount of vegetation and flora that was directly impacted by the proposal. As detailed in Table 2-2, ~91.5 % of the development envelope is located within existing agricultural or other cleared land and only ~1.5 % of the development envelope is situated in good quality native vegetation.

MEPAU has managed to balance the project needs, whilst locating the Development Envelope in a location that has reduced the direct vegetation and flora impacts to a level that is as low as practicable.

2.1.5.2 Development Envelope area

The total area of the development envelope for the Proposal area is ~345 ha (Figure 2-2).

Although the area of impact has been minimised to the lowest practicable extent by utilising existing cleared areas to locate infrastructure, the proposal will result in a direct loss of vegetation and flora through clearing to construct access roads and flowlines.

The areas where vegetation clearing is proposed is described Table 2-2. APPENDIX H of the Environmental Referral Supporting Report (MEPAU, 2019) provides figures detailing affected areas. The direct impacts of this Proposal are:

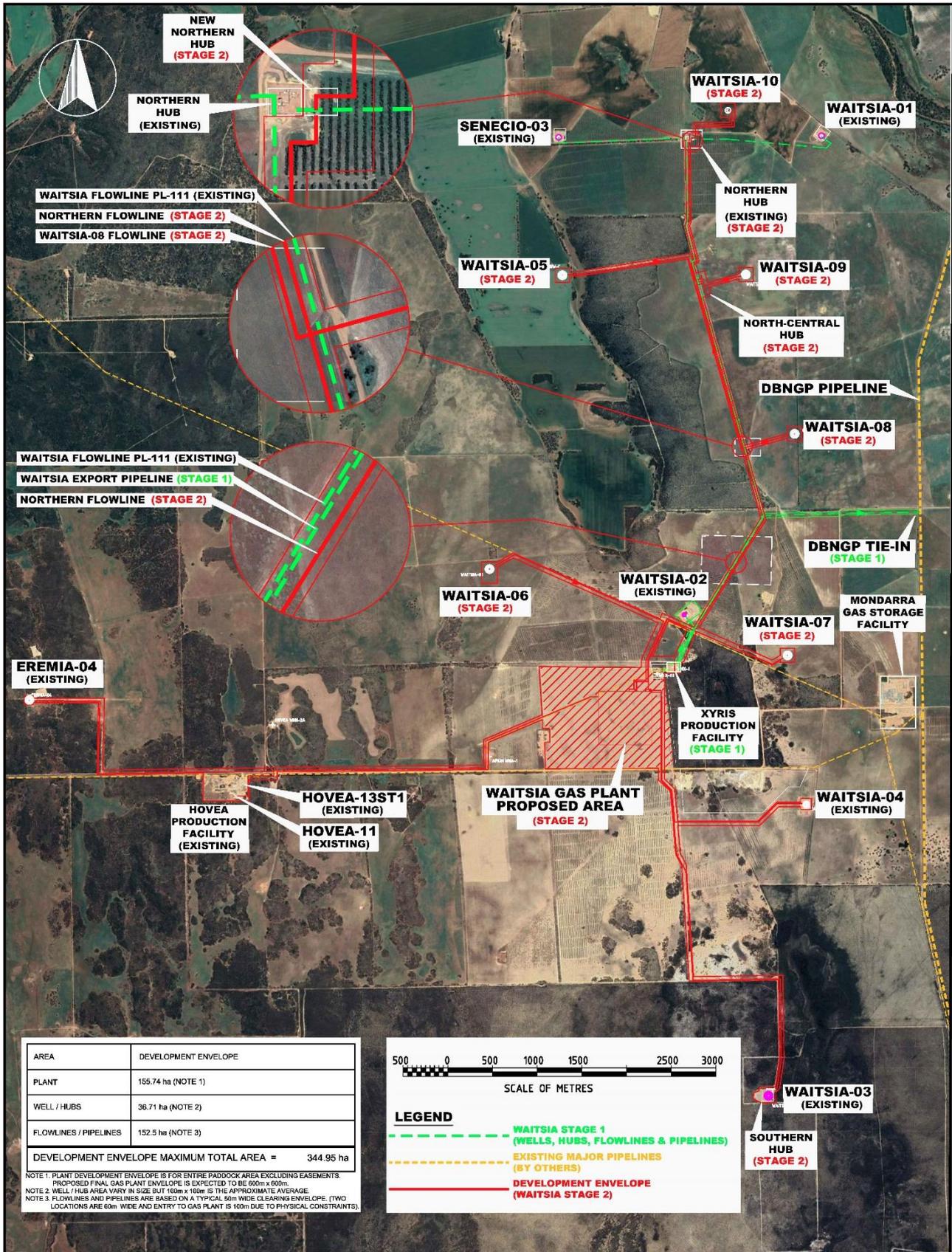
- The construction of access tracks and flowlines will result in clearing of approximately:
- ~3 ha (or 0.8% of the Development Envelope) of native vegetation in good condition (known as *Waitsia-03 Area Vegetation*);
- ~14 ha (or 4.1% of the Development Envelope) of native vegetation in poor condition that has been largely degraded over many decades by a mixture of partial clearing, burning and grazing (known as *General Vegetation Area*); and
- Direct loss of individual plants from 4 priority listed taxa⁵.

⁵ MEPAU, 2019 states that 5 priority species would be impacted by the Proposal. *Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176) was recorded by Woodman, 2018a. As detailed in Figure 2, APPENDIX 3 this species does not occur within the Clearing Envelope.

Table 2-2: Clearing of vegetation as a percentage of overall Development Envelope

Area of impact	Hectares	% of Development Envelope
Development Envelope Maximum Area	~345	100%
Waitsia-03 Area Vegetation		
Indicative Flowline Easement	~3	0.8
Clearing Envelope	~5	1.5
General Vegetation Area		
Indicative Flowline Easement	~14	4.1
Clearing Envelope	~24	7.0
Existing agricultural or other cleared land		
	~316	91.5

Figure 2-2: Waitsia Gas Project Stage 2 - Development Envelope



2.2 Key Environmental Factors

The preliminary key environmental factors that have been identified by the EPA includes: Air Quality, Flora and Vegetation, Inland Waters, and Social Surroundings. A summary of the Flora and Vegetation factor with a specific focus on the impacts on flora and vegetation by this Proposal are detailed in Table 2-3. The other preliminary key environmental factors and their management provisions are outlined in separate environmental management plans.

Impacts will be managed via the management measures detailed in Section 3.

Table 2-3: Summary of key environmental factor – Flora and Vegetation

Flora and Vegetation	
EPA Objective	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Policy and Guidance	<ul style="list-style-type: none"> • Environmental Factor Guideline – Flora and Vegetation 2016 • Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment 2016 • Part V of the Environmental Protection Act 1986 • Petroleum and Geothermal Energy Resources Act 1967 • Petroleum Pipelines (Environment) Regulations 2012
Project activities	Clearing of native vegetation for the purposes of flowline and pipeline construction.
Potential impacts – Direct impacts	<ul style="list-style-type: none"> • Direct loss of vegetation and flora • Accidental disturbance of areas outside of the final flowline envelope
Potential impacts – indirect impacts	<ul style="list-style-type: none"> • Introduction of new weeds and/or spread of existing weeds • Potential introduction of dieback

2.3 Condition Requirements

The Proposal is currently being assessed by the EPA (Assessment 2226) and a Ministerial Statement and associated proposal implementation conditions are yet to be issued.

Should this Proposal be approved for implementation, the conditions relating to Flora and Vegetation management will be included in this section.

2.4 Rationale and Approach

A number of key information sources and aspects inform the rationale and approach of the management provisions outlined in Section 3. The following sub-sections summarise:

- Vegetation and Flora assessments and desktop studies completed and findings (Section 2.4.1);
- Key assumptions and uncertainties (Section 2.4.2);
- The management approach (Section 2.4.3); and
- The rationale for choice of provisions (Section 2.4.4).

2.4.1 Vegetation and Flora Assessments and Desktop Studies Completed and Findings

Several vegetation and flora assessments and desktop studies have been undertaken within the Development Envelope and wider Proposal Area. Assessments that are relevant to the Project were identified and discussed in the *Waitsia Gas Project Stage 2 – Environmental Referral Supporting Report* (MEPAU 2019) and are detailed in APPENDIX 1.

The key findings of these assessments are:

- There are six Vegetation System Associations (VSAs) across the Waitsia area: Agricultural land, Kwongan to open banksia woodland on sand, Riparian shrub-thicket and woodland on dark peaty-sand (including wetlands such as Ejaro Spring), Eucalypt/banksia/acacia low forest on sand, York Gum Woodland on red sandy loam and Irwin River Red Gum Woodland. The six VSAs are relatively well represented with more than 45% of pre-European extent remaining (APPENDIX 2 Table 3-1).
- No riparian vegetation, declared rare flora (Threatened), or threatened ecological communities, as listed under the *Biodiversity Conservation Act* (BC Act) or threatened species or priority ecological communities as listed under the EPBC Act, have been recorded within the proposed development envelope or the abutting area.
- Four flora taxa listed as priority flora by the Department of Biodiversity, Conservation and Attractions (DBCA) are known to occur within the proposed clearing area. All four taxa are known to occur outside the clearing area across relatively large ranges.
- Key threatening processes to flora and vegetation include the direct impact of clearing, potential indirect impacts caused by weeds, potential spread of dieback and smothering of vegetation caused by dust.

2.4.2 Key Assumptions and Uncertainties

The key assumptions and uncertainties relating to the Flora and Vegetation assessments detailed in APPENDIX 1 are summarised in Table 2-4.

Table 2-4: Assumptions and Uncertainties

#	Assumptions and uncertainties	Comment
1	Level of surveys completed were adequate to assess flora and vegetation	Where targeted and/or detailed surveys were completed they were conducted over one field trip at varying times within the peak flowering season in the Geraldton Sandplains Bioregion. Replicated quadrats were established in each vegetation pattern identified in the Study Area. EPA (2016a) indicates that survey may be required to be undertaken in other seasons. It is considered that surveys in the peak flowering season only are adequate, as it is considered likely that most taxa that flower outside the peak flowering season could be identified during the survey period (Woodman, 2018a)
2	Competency and experience of consultant/s carrying out the survey was sufficient to ensure qualified results	Senior experienced and qualified personnel were involved with all desktop assessments and/or targeted and/or detailed flora surveys undertaken. They also had experience in conducting similar assessments in the bioregion.

#	Assumptions and uncertainties	Comment
3	Scope (Were the sampling of flora groups limited because of any constraints?)	All vascular groups that were present during the targeted and/ or detailed assessments were sampled. No constraints prevented appropriate sampling techniques (quadrat establishment, relevés, targeted searching and opportunistic recording) being undertaken.
4	A sufficient proportion of flora identified, recorded and /or collected	In most instances a high proportion of perennial vascular taxa were recorded based on the intensity and method of survey. A lower proportion of ephemeral and annual vascular taxa were recorded based on the below-average rainfall prior to and the later timing of the survey (Woodman, 2018a). Unknown vascular taxa were collected within quadrats, relevés and opportunistically, with specimens identified at the WA Herbarium
5	Sources of information on previous surveys was used.	Sources of information used during desktop assessments and/or targeted and/or detailed surveys included government databases (e.g. DBCA and DoEE) and previous reports and unpublished data from the vicinity of the broader proposal area.
6	The proportion of the task achieved and further work which might be needed	Where Targeted and/or Detailed Surveys were completed, the targeted survey included grid searching for significant flora taxa throughout the entire Study Area. No further surveys within the Study Area were considered necessary.
7	Timing/weather/season/cycle were factored into the surveys	Where Targeted and/or Detailed Surveys were completed the field survey was conducted in Spring, corresponding with the optimum flowering period for the Geraldton Sandplains Bioregion. Where below-average rainfall in the months prior to the survey and/or later timing of the survey limited the number of ephemeral and annual taxa recorded/identified this did not impact the outcomes of the survey or prevent identification of any potential significant taxa that may potentially occur in the Study Area.
8	Disturbances (e.g. fire, flood, accidental human intervention etc.), which affected results of survey	Where Targeted and/or Detailed Surveys were completed some disturbances such as historical clearing and weeds were apparent. These did not significantly impact the flora taxa present and are therefore not considered to have affected the results of the survey.
9	Intensity of survey	Where Targeted and/or Detailed Surveys were completed the survey intensity was considered adequate, with replication of quadrats in vegetation types and detailed foot searching (particularly for significant flora) undertaken throughout the Study Area
10	Completeness and mapping reliability	Where Targeted and/or Detailed Surveys were completed the survey of the Study Area is considered complete in terms of mapping of vegetation types. Specific grid searching for significant flora taxa was undertaken throughout the entire Study Area. Where appropriate foot and/or vehicle transects were employed to aid in mapping which increased the reliability

#	Assumptions and uncertainties	Comment
11	Remoteness and/or access problems	Where Targeted and/or Detailed Surveys were completed access to the Study Area was considered good, given the entire Study Area was accessible via tracks and firebreaks
12	Survey planning and implementation	All surveys have been planned and implemented in accordance with relevant in-force industry guidance (including the EPA's Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment guidance)

2.4.3 Management Approach

MEPAU plan to implement both outcome and management-based provisions under this Plan.

The reason for this approach is the nature of the risks associated with the implementation of the Proposal where some vegetation will be directly impacted (i.e. cleared under a Part V of the EP Act clearing permit) and where other potential indirect impacts are considered low risk.

APPENDIX 1 provides an assessment of:

- the direct impacts on vegetation and priority flora associated with the implementation of the Proposal, and
- the potential indirect impacts on vegetation and priority flora associated with the implementation of the Proposal.

The assessment identifies that limited vegetation to be cleared has conservation significance and no VSA will be cleared by more than 0.01%.

Although four priority listed taxa were identified, the potential impact to each of these species is considered small as:

- the number of plants impacted for each of these species comprise only a small proportion of the recorded population
- each of these species has a wide distribution outside the Development Envelope, including within formal reserves or beyond the Geraldton Sandplains IBRA.

Further details on the assessment of potential impacts associated with the implementation of the Proposal can be found in MEPAU, 2019.

2.4.4 Rationale for Choice of Provisions

The management provisions proposed are based on the following rationale:

- Nature of the impact - Throughout the scoping phase of this Proposal, MEPAU conducted site selection analysis to, where possible, reduce the direct impacts from environmental footprint of the Proposal. Specifically, the location of the WGP and flowline alignments were selected to avoid vegetated areas and minimise the amount of vegetation and flora that was directly impacted by the proposal. The area directly impacted from these activities will be minimised following construction to the smallest practicable extent to ensure infrastructure can be safely maintained. Table 2-2 details the percentage clearing vegetated areas compared to non-vegetated areas. Specifically, ~91.5 % of the

development envelope is located within existing agricultural or other cleared land and only ~1.5 % of the development envelope is situated in good quality native vegetation.

- Duration of impact – Given that the clearing of native vegetation and construction of flowlines are short in duration, indirect impacts will be minimised. Operational activities pose minimal indirect impacts that can be managed through adaptive management actions detailed in this Plan.
- Expected changes in flora and vegetation – as detailed in APPENDIX 2 the flora and vegetation to be cleared are well represented within the broader proposal area and areas outside of the proposal area.

3.0 FLORA AND VEGETATION MANAGEMENT

A series of environmental objectives have been developed to mitigate environmental impacts on flora and vegetation associated with the implementation of the Proposal. Table 3-1 details the environmental objectives for this plan.

For each objective, outcome and / or management-based provisions have been developed to ensure the impacts from the implementation of the Proposal are appropriately managed, targets achieved, and the appropriate monitoring and reporting are completed to support the implementation of the management actions.

Table 3-1: Environmental Objectives

Potential Impact	Environmental Objective
Direct loss of vegetation and flora	Minimise impacts to conservation significant flora
Accidental disturbance of areas outside of the final flowline envelope	Prevent clearing of vegetation and flora outside of final flowline easement
	Minimise disturbance of vegetation and flora outside of the final flowline envelope
Introduction of new weeds and/or spread of existing weeds	Prevent introduction of new weed species into adjacent areas of previously uncleared or unimpacted native vegetation.
	Prevent the spread of existing weed species within Waitsia-03 Vegetation Area.
Introduction of dieback	Prevent introduction of dieback into the Waitsia-03 Vegetation Area.

3.1 Flora and Vegetation Management Plan Provisions

Table 3-2 and Table 3-3 identify the legal outcome and management-based provisions (respectively) that MEPAU will implement to ensure that the environment outcomes are met during the implementation of the Proposal.

Table 3-2: Outcome Based Provisions for Flora and Vegetation

EPA Objective		To protect flora and vegetation so that biological diversity and ecological integrity are maintained.			
Impact	Management Objective	Environmental Criteria	Response Actions	Monitoring	Reporting
Introduction of new weeds and/or spread of existing weeds	Prevent introduction of new weed species	<p>Trigger Criteria Suspected introduction of a new weed species within the defined development envelope attributable to the Proposal.</p> <p>Threshold Criteria One or more confirmed new weed species introduced outside the defined development envelope attributable to the Proposal</p>	<p>Trigger Criteria</p> <ul style="list-style-type: none"> Implement weed and hygiene protocols to prevent spread outside of the development envelope Engage with a specialist to verify whether a new weed species has been introduced Determine if the introduction of a new weed species is attributable to the Proposal Review management strategies to determine key cause for suspected introduction of species Implement weed management measures (such as spot spraying or boom spraying) in accordance with specialist advice to eradicate species Implement increased frequency (e.g. Biannual) survey for weed presence Where the trigger criteria exceedance was not attributed to the Proposal, resume standard monitoring frequency. <p>Threshold Criteria</p> <ul style="list-style-type: none"> Notify DMIRS, EPA and DBCA if relevant to determine corrective actions Engage with key stakeholders including DBCA, and relevant specialists where required to determine key actions to determine corrective actions 	Table 3-5	<ul style="list-style-type: none"> PGER(E) R Annual Environmental Performance Report Ministerial Conditions Annual Environmental Report
	Prevent the spread of existing weed species within Waitsia-03 Vegetation Area.	<p>Trigger Criteria Statistically different increase of weed density from baseline within the Waitsia-03 Vegetation Area attributable to the Proposal.</p> <p>Threshold Criteria Statistically different increase of weed density from baseline over two consecutive monitoring events</p>	<p>Trigger Criteria</p> <ul style="list-style-type: none"> Implement weed and hygiene protocols to prevent further spread of weed species from baseline levels Review management strategies to determine key cause for suspected spread of weed species Implement increased survey frequency (e.g. Biannual) for weed presence Determine if the increase in spread of weed species is attributable to the Proposal Where the trigger criteria exceedance was not attributable to the proposal, resume standard monitoring frequency. <p>Threshold Criteria</p> <ul style="list-style-type: none"> Notify DMIRS, EPA and DBCA to determine corrective actions Engage with key stakeholders including DBCA, and relevant specialists where required to determine key actions to determine corrective actions such as implementing weed management measures 	Table 3-4 and Table 3-5	<ul style="list-style-type: none"> PGER(E) R Annual Environmental Performance Report Ministerial Conditions Annual Environmental Report
Potential introduction of dieback	Prevent introduction of dieback into the Waitsia-03 Vegetation Area	<p>Trigger Criteria Suspected introduction of dieback into the Waitsia-03 Vegetation Area attributable to the Proposal.</p> <p>Threshold Criteria Confirmed introduction of dieback into the Waitsia-03 Vegetation Area attributable to the Proposal.</p>	<p>Trigger Criteria</p> <ul style="list-style-type: none"> Implement hygiene protocols to prevent spread of soil vegetation material within and outside of the suspected dieback contaminated area Conduct a dieback survey with soil and tissue samples to verify if dieback has been introduced. Review management strategies to determine key cause for suspected introduction of dieback Implement increased frequency (e.g. Annual) Dieback presence monitoring survey for dieback presence Where the trigger criteria exceedance was not attributable to the proposal, resume standard monitoring frequency. <p>Threshold Criteria</p> <ul style="list-style-type: none"> Notify DMIRS, EPA and DBCA to determine corrective actions Engage with key stakeholders including DBCA, and relevant specialists where required to determine key actions to determine corrective actions 	Table 3-5	<ul style="list-style-type: none"> PGER(E) R Annual Environmental Performance Report Ministerial Conditions Annual Environmental Report

Table 3-3: Environmental Management Approach for Flora and Vegetation

EPA Objective		To protect flora and vegetation so that biological diversity and ecological integrity are maintained.				
Impact	Management Objective	Management Action	Proposal Stage	Management Targets	Monitoring	Reporting
Habitat loss, degradation and fragmentation						
Direct loss of vegetation and flora	Minimise impacts to conservation significant flora	<ul style="list-style-type: none"> MEPAU will finalise additional targeted flora surveys in <i>General Vegetation Area</i> and <i>Waitsia-03 Vegetation Area</i> to ensure no significant flora species will be significantly impacted by construction Gain approval to clear vegetation under Part V of the EP Act (NVCP). 	Construction	Compliance with commitment in the EPA referral which states no significant impacts to flora and vegetation.	<ul style="list-style-type: none"> None identified 	<ul style="list-style-type: none"> Part V NVCP annual compliance report
Accidental disturbance of areas outside of the final flowline envelope.	Prevent clearing of vegetation and flora outside of final flowline easement	<ul style="list-style-type: none"> Ensure final flowline easement is ≤ 30m width within development envelope. Vegetation clearing will be undertaken in accordance with a Land Clearing Procedure. The procedure will include the following requirements: An authorised internal clearing permit must be issued prior to undertaking any vegetation clearing. Clearing boundaries must be clearly marked and checked to confirm they are accurate prior to undertaking clearing. A survey of cleared areas will be undertaken post clearing to confirm boundaries have been adhered to. Make all construction personnel aware of the clearing area boundaries through the induction/ training process 	Construction	Compliance with pre-defined clearing limits and boundaries described within the NVCP.	<ul style="list-style-type: none"> Verification prior to clearing activities that clearing limits are clearly defined Verification following clearing activities that no clearing outside of this area has occurred Weekly inspections to visually check/review clearing boundaries and compliance Photographic reference points of clearing to enable comparison between pre and post clearing environments 	<ul style="list-style-type: none"> Any clearing undertaken outside of the clearing area will be reported as required by the EP Act Part V and PGER(E) R requirements in accordance with MEPAU's incident management procedure. Part V NVCP annual compliance report
	Minimise disturbance of vegetation and flora outside of the final flowline envelope	<ul style="list-style-type: none"> Stockpiling of all soil and vegetative materials from clearing will be within the final flowline envelope. Final flowline envelope boundaries in the vicinity of proposed stockpiling areas must be clearly marked and checked to confirm they are accurate prior to undertaking clearing. A survey of stockpiled areas will be undertaken post stockpiling to confirm boundaries have been adhered to. Make all construction personnel aware of the final flowline envelope area boundaries through the induction/ training process Vehicles shall be restricted to movement along designated tracks and cleared areas, unless undertaking clearing. Vehicle speeds will be restricted (~ 25 km/h) on unconsolidated surfaces in dry conditions. 	Construction	Minimal disturbance to vegetation and flora outside of final flowline envelope.	<ul style="list-style-type: none"> Weekly inspections to visually check/review: Stockpiling of all soil and vegetation materials are within final flowline envelope. Compliance with final flowline envelope and stockpiling area boundaries. Vegetation and flora outside of final flowline envelope has not been disturbed. 	<ul style="list-style-type: none"> PGER(E) R Annual Environmental Performance Report Ministerial Conditions Annual Environmental Report.

EPA Objective		To protect flora and vegetation so that biological diversity and ecological integrity are maintained.				
Impact	Management Objective	Management Action	Proposal Stage	Management Targets	Monitoring	Reporting
Invasive Species						
Introduction of new weeds and/or spread of existing weeds	Prevent introduction of new weed species into adjacent areas of previously uncleared or unimpacted native vegetation.	<p>MEPAU will:</p> <ul style="list-style-type: none"> Develop a weed and dieback hygiene protocol prior to commencement of construction. This protocol will: Describe the requirements and triggers for conducting a hygiene inspection and vehicle clean-down. Specifically, all vehicles/plant/ equipment prior to mobilizing to site will be inspected and cleaned down where they are known to have been working in, or travelling through areas with known or potential dieback presence, and all vehicles/plant/equipment is required to be inspected prior requirement to accessing sensitive areas such as the Yordanogo Nature Reserve Describe the process by which construction fill is evaluated to verify it comprises a low risk of containing weeds or pathogens Describe the requirement for monitoring: <ul style="list-style-type: none"> weed presence quarterly dieback presence annually 	Construction and Operations	No new declared weeds or dieback infestations introduced into or adjacent to the Proposal area attributable to the Proposal	<ul style="list-style-type: none"> Pre-clearing baseline flora and vegetation survey that identifies weed and dieback presence Quarterly observations for weed presence Verification that construction fill brought to site has low risk of containing weeds or pathogens Verification that vehicles/plant/equipment comply with weed and dieback hygiene protocol inspection and clean-down requirements. 	<ul style="list-style-type: none"> PGER(E) R Annual Environmental Performance Report Ministerial Conditions Annual Environmental Report.
Introduction of dieback	Prevent introduction of dieback into the Waitsia-03 Vegetation Area.	<ul style="list-style-type: none"> dieback biannually with a specialist survey (specific to the Waitsia-03 well site access track) Describe weed management methods (such as spot spraying, boom spraying and vegetation slashing) relevant to the activity Make all personnel aware of weed and dieback hygiene protocol and practices through the induction/ training processes Prohibit the importation of soil and vegetation materials to site unless approved for a specific purpose and is assessed to comprise a low risk of containing weeds or pathogens. Implement the weed and dieback hygiene protocol 	Construction and Operations		<ul style="list-style-type: none"> Bi-annual dieback assessment of access route to Waitsia-03 well site (flowline route adjoining Yordanogo Nature Reserve). 	<ul style="list-style-type: none"> PGER(E) R Annual Environmental Performance Report Ministerial Conditions Annual Environmental Report.

3.2 Monitoring

To clearly understand if the environmental criteria have been met or exceeded, MEPAU has (and will continue) to monitor vegetation adjacent to the development envelope. Specifically, the monitoring program is used to:

- Establish presence of existing weed species and dieback infestations
- Identify if the presence of weeds and dieback has been impacted by the Proposal

3.2.1 Establish Presence of Existing Weed Species and Dieback Infestations

In addition to the surveys completed specifically to support this Proposal, flora and vegetation composition for the Proposal area and surrounds, are well understood given the numerous surveys that have been conducted for previous oil and gas activities in the area

Based upon these surveys MEPAU has a clear understanding regarding weed and dieback presence within the Development Envelope. Specifically, two weed species known to be declared pests under the Biosecurity and Agriculture Management Act 2007 are known to be present within the Development envelope. These are

- *Echium plantagineum* (Patersons Curse)
- *Rumex hypogaeus* (doublegee)

No weed species of national significance are known to occur within the Development Envelope.

No dieback infestations are known to be present within the Development Envelope.

In addition to the studies that have been used to inform baseline levels (APPENDIX 1), MEPAU plan to complete supplementary studies to further define weed diversity/density to enable ongoing comparison as required. The details of these studies are provided in Table 3-4.

Table 3-4: Supplementary Baseline Monitoring Events

Monitoring event	Location	Phase	Frequency	Survey Methodology
Weed presence	Waitsia-03 Vegetation Area	Prior to construction	One-off	Conduct a baseline flora and vegetation survey to set up permanent sampling points to monitor potential changes in weed species presence, density / abundance and vegetation health. Quadrats sampling techniques are to be used to provide comparability between future survey datasets. The survey will also set up at least two permanent quadrats within the Yordanogo Nature Reserve to understand the abundance, density and diversity of weed species within the Nature Reserve.
Ejarno Spring floristic diversity and vegetation condition	Ejarno Spring	Prior to construction	One-off	Conduct a baseline vegetation condition survey that details vegetation quality and diversity prior to the proposal commencing. The survey will also record presence and condition of invasive weeds, having regard to weed density and category of weed

Monitoring event	Location	Phase	Frequency	Survey Methodology
				species (i.e. declared, national significance etc.)

3.2.2 Identify if the Presence of Weeds and Dieback has been Impacted by the Proposal

Prior to commencement of construction, MEPAU will develop a weed and hygiene protocol that will align with existing operational documentation. Specifically, the protocol will describe in greater detail the locations and method for monitoring weed and dieback presence. However, Table 3-5 provides the basis on which the monitoring program will be developed.

Table 3-5: Weed and Dieback Monitoring Events

Monitoring event	Location	Phase	Frequency	Survey Methodology
Dieback Presence	Waitsia-03 Vegetation Area	Construction	Quarterly	Observations will be undertaken by MEPAU personnel with a focus on vegetation health in the vegetation adjacent to the Waitsia-03 access track and wellsite. Specifically, observations will focus on the health of known dieback susceptible species including Banksia species.
		Operations	Annual	
Dieback Presence	Waitsia-03 Vegetation Area	Construction and Operations	Bi-annual	Biannual monitoring for dieback presence will be performed to standards and procedures defined in FEM047 – <i>The Phytophthora Dieback Interpreter's Manual for lands</i> . A linear assessment along the Waitsia-03 access track will be conducted using standards defined by FEM047 During the assessment, soil and tissue samples will be collected, if required, to support any field diagnosis. Sample points will be logged, and, when identified, infestations mapped.
Weed Presence	Waitsia-03 Vegetation Area and General Vegetation Area	Construction and operations	Quarterly	Observations will be undertaken by MEPAU personnel within the development envelope with the focus on verifying areas that comprise existing declared pests and opportunistically identifying additional introduced species
Weed presence	Waitsia-03 Vegetation Area	Construction (+1 year following commencement of operations)	Annually	An annual flora and vegetation survey with a focus on weed species presence, density / abundance and vegetation health / condition during spring between the months of August and October (subject to appropriate weather conditions). The survey will include assessment of at least two permanent

Monitoring event	Location	Phase	Frequency	Survey Methodology
				quadrats set up within the Yandanogo Nature Reserve during the initial baseline survey. The survey will record presence of invasive weeds and vegetation condition having regard to weed density and category of weed species (i.e. declared, national significance etc.)

3.3 Reporting

The environmental outcome will be reported against Trigger and Threshold criteria (Table 3-2) and management targets (Table 3-3) for each calendar year in the Annual Compliance Assessment Report (ACAR) for the Proposal.

The annual report will also include a summary of analysis of monitoring data to facilitate adaptive management.

In the event that Trigger and Threshold criteria are exceeded during the reporting period, the annual report will include a description of the effectiveness of any adaptive management actions that have been implemented to manage the impact.

4.0 ADAPTIVE MANAGEMENT

4.1 Monitoring and Corrective Actions

A monitoring program is required to measure the effectiveness of the management actions as defined in this Plan. The outcomes of the monitoring program will be reviewed with an adaptive management approach to ensure all environmental impacts and risks continue to be reduced for the duration of the proposal.

MEPAU will implement adaptive management to learn from the implementation of mitigation measures, monitoring and evaluation against trigger and threshold criteria, to more effectively meet the conditioned environmental outcome.

The following approaches will apply:

- Monitoring data will be systematically evaluated and compared to baseline
- The effectiveness and relevance of Trigger level and Threshold contingency actions will be evaluated on an annual basis to determine if any changes to management actions are required

Adaptive management practices that will be assessed as part of this approach may include:

- Evaluation of the monitoring program, data and comparison to baseline data and reference sites on an annual basis to verify whether responses to project activities are the same or similar to predictions
- Re-evaluation of the identified impacts and revision of risk-based priorities as a result of monitoring outcomes
- Review of data and information gathered over the review period that has increased understanding of site environment in the context of the regional ecosystem
- Assessment of changes which are outside the control of the project and the management measures identified (i.e. a new project within the area or region; regional change affecting management).

4.2 Management Plan Review

This Plan is intended to be dynamic and may be updated to reflect changes in management practices and the natural environment over time. This approach will allow flexibility to adopt new approaches/management measures.

Amendments to management actions will be completed on an “as needs” basis. This will include:

- amendment of management actions that are not achieving the desired outcomes,
- monitoring that identifies additional impacts requiring additional management actions or changes to existing management actions,
- changes to relevant legislation that may affect the implementation of management actions, and/or
- improvements to management practices to achieve a greater environmental outcome.

5.0 STAKEHOLDER CONSULTATION

Consistent with the EPA's expectations for this Plan to align with the principles of Environmental Impact Assessment, MEPAU consulted with stakeholders, including but not limited to the Department of Biodiversity, Conservation and Attractions and Department of Water and Environmental Regulation during the development of the EPA referral. MEPAU will continue to maintain effective communication with local and regional stakeholders throughout the delivery of the Proposal.

A summary of stakeholder consultation outcomes completed as of August 2019 is provided in Table 3.1 of the *Environmental Referral Supporting Report* (MEPAU, 2019).

Any additional consultation regarding this Plan will be captured in subsequent revisions.

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Woodman Environmental Consulting Pty Ltd (2018a) *Waitsia-03 – Flowline Corridor - Flora, Vegetation and Fauna Assessment*

Woodman Environmental Consulting Pty Ltd (2018b) *Xyris Lateral Flora and Vegetation Assessment*

Woodman Environmental Pty Ltd (2019) *Waitsia Gas Project Stage 2 – Xyris West Vegetation Desktop Review*

APPENDICES

APPENDIX 1: Baseline Studies – Flora and Vegetation

Year Survey Completed	Consultant	Survey Name⁶
2004a	Woodman Environmental	Proposed Xyris Pipeline Vegetation Assessment. Unpublished report prepared for ARC Energy, July 2004.
2004b	Woodman Environmental	Denison 3D Seismic Survey Flora and Vegetation Study. Unpublished report prepared for ARC Energy and Origin Energy, December 2004.
2004c	Woodman Environmental	Proposed Xyris Area Gas Gathering System (XAGGS) Vegetation Assessment. Unpublished report prepared for ARC Energy, December 2004.
2015	Maia Environmental Consultancy	AWE Perth Pty Ltd, Waitsia Gas Field: Flora and Vegetation Desktop Study, February 2015
2016	Maia Environmental Consultancy	Xyris Production Facility Area, Combined Level 1 Flora and Vegetation Reconnaissance and Targeted Flora Survey, January 2016.
2016	Maia Environmental Consultancy	Waitsia-04 Area Level 1 Flora and Vegetation Reconnaissance and Targeted Flora Survey ⁷ .
2018a	Woodman Environmental	Waitsia-03 – Flowline Corridor - Flora, Vegetation and Fauna Assessment (including a Level 2 Flora and Vegetation assessment along the proposed flowline route and wider area).
2018b	Woodman Environmental	Proposed Xyris Lateral – Flora and Vegetation Assessment
2019	Woodman Environmental	Waitsia Gas Project Stage 2 – Xyris West Vegetation Desktop Review.

⁶ Surveys were completed prior to IBSA requirement coming into effect

⁷ Note that the report title refers to initial well location name. Well location name was changed from Waitsia-04 to Waitsia-03 following the survey.

APPENDIX 2: WGP2 - Flora and Vegetation Impact Assessment

DOCUMENT NO APPENDIX 2	REVISION Rev 1	DATE OF REVISION 17/03/2020
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mitsui E&P
Australia

WGP2 – Flora and Vegetation Impact Assessment

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1.0 PURPOSE

This document has been written to provide an assessment of direct and potential indirect impacts on flora and vegetation associated with the implementation of the Proposal.

2.0 OBJECTIVES

The objectives of this document are to:

- Define and describe the Vegetation System Associations present in the proposal area (**refer Section 3.0**).
- Define the direct impacts to native Vegetation System Associations from clearing (**refer Section 4.0**).
- Define the location of priority flora that has been recorded in the areas where native vegetation will be cleared (**refer Section 4.2**).
- Provide an assessment of the priority flora that will be cleared and the degree of impact to their overall known representation in the broader region (**refer Section 4.3 to 4.6**).
- Describe the potential indirect impacts to flora and/or vegetation (**refer Section 5.0**)

3.0 VEGETATION SYSTEM ASSOCIATIONS

A number of Flora and Vegetation surveys and assessments have been undertaken to support the Proposal¹. Appendix 1 of the Plan details these surveys and assessments.

As stated in the Plan, vegetation of the general Proposal area has been largely historically cleared.

Using Beard (1976) and Shepherd et al. (2002), four Pre-European vegetation system associations have been determined to be present within the Proposal area (Table 3-1). These system associations are relatively well represented with even the smallest system associations Eridoon_433 estimated to comprise 69% of the pre-European extent remaining (Table 3-1).

Table 3-1: Extent of the Vegetation System Associations of the Project Area (Government of Western Australia, 2018)

Vegetation System	Description	Current Extent (ha)	IBRA Region Extent (ha)	Percentage of Pre-European Extent Remaining	Percentage of Current Extent Reserved for Conservation
Illyarrie_433	Mosaic: Shrublands; <i>Acacia rostellifera</i> & <i>Melaleuca cardiophylla</i> thicket / Sparse low woodland; illyarrie	14,746.34 ha	14,327.99 ha	45.43 %	10.87 %
Eridoon_378	Shrublands; scrub-heath with scattered <i>Banksia spp.</i> , <i>Eucalyptus todtiana</i> and <i>Xylomelum angustifolium</i> on deep sandy flats in the Geraldton Sandplain Region	60,826.7 ha	60,826.7 ha	65.0 %	21.9 %
Eridoon_392	Shrublands; <i>Melaleuca thyooides</i> thicket	429.8 ha	429.8 ha	97.9 %	3.3 %
Eridoon_433	Mosaic: Shrublands; <i>Acacia rostellifera</i> & <i>Melaleuca cardiophylla</i> thicket / Sparse low woodland; <i>illyarrie</i>	132.73 ha	132.73 ha	69.08 %	49.68 %

As detailed in the Proposal (MEPAU, 2019) vegetation that will be cleared within the Proposal area was split into two key areas:

¹ Woodman Environmental flora and vegetation survey reports (2018a, 2018b and 2019) are provided as Appendix C in MEPAU, 2019. These reports conclude that no riparian vegetation, declared rare flora, threatened ecological communities or priority ecological communities, as listed under the BC Act or EPBC Act, have been recorded within the proposed clearing area, or the abutting area.

- General Vegetation: areas that have been previously disturbed and/or cleared, and
- Waitsia-03 Area Vegetation: areas that comprise vegetation in good condition.

3.1 General Vegetation

The General Vegetation area has been largely historically cleared, fragmented and/or disturbed (Maia, 2015a). Vegetation within this area consist of Illyarrie_433, Eridoon_433 and Eridoon_378. MEPAU completed additional reconnaissance flora surveys and targeted searches in accordance with the EPA Guidance (EPA, 2016a) in late Spring 2019, to meet the requirements to obtain a Native Vegetation Clearing Permit (NVCP) under Part V of the *Environmental Protection Act 1986*. The results of these surveys are planned to be available in early 2020. The outcomes of these surveys will be used to further define the potential presence of conservation significant flora taxa, verify the impact assessment included in this report and to meet the requirements to obtain an NVCP.

This assessment will further verify the Vegetation System Associations in these areas and the potential presence of conservation significant flora taxa.

3.2 Waitsia-03 Area Vegetation

The Waitsia-03 Area Vegetation is the largest intact portion of native vegetation. It is located on the southern boundary of the Proposal area (as detailed in Appendix 1). A detailed flora survey and targeted searches were conducted from 6th – 10th November 2017 to assess the flora and vegetation of this area (Woodman, 2018a). The survey verified that although four Vegetation System Associations were present, these broadly matched to the two vegetation types Eridoon_378 and Eridoon_392, noting that the wetland thickets present within the survey area were mapped as Eridoon_392 but did not contain *Melaleuca thyoides* (Woodman, 2018a). The survey also noted that vegetation within the Waitsia-03 area represented 0.31 % of similar vegetation across Yandanogo Nature Reserve.

MEPAU completed additional detailed flora surveys and targeted searches in accordance with the EPA guidance (EPA, 2016a) of the proposed clearing area in late Spring 2019. The initial, verified, data from these surveys relating to conservation flora are included in Section 4.0. The remainder of the data associated with these surveys are planned to be available in early 2020. The outcomes of these surveys will be used, to further define the potential presence of conservation significant flora taxa, verify the impact assessment included in this report and to meet the requirements to obtain an NVCP.

4.0 IMPACT ASSESSMENT – DIRECT IMPACTS

Although the area of impact has been minimised to the lowest practicable extent by utilising existing cleared areas to locate infrastructure, the Proposal will result in a direct loss of vegetation and flora through clearing to construct access roads and flowlines. The areas where vegetation clearing is proposed is detailed in Table 4-1 (and shown in Appendix H (Figures 1 [A to H] and Figure 2) of MEPAU, 2019). Table 4-2 provides a breakdown of vegetation clearing areas by vegetation system.

The direct impacts of this Proposal are:

- The construction of access tracks and flowlines will result in clearing of approximately:
 - ~3 ha (or 0.8% of the Development Envelope) of Waitsia-03 Area Vegetation,
 - ~14 ha (or 4.1% of the Development Envelope) of General Vegetation; and
 - removal of a number of individuals that are identified as four different priority listed taxa².

Table 4-1: Clearing of Vegetation as a Percentage of Overall Development Envelope

Area of impact	Hectares	% of Development Envelope
Development Envelope Maximum Area	~345 ha (~316 + ~5 + ~24)	100%
Clearing Envelope Total Area	~29 ha (~5 + ~24)	8.5%
Indicative Flowline Easement Total Area	~17 ha (~3 + ~14)	4.9%
Waitsia-03 Area Vegetation		
Indicative Flowline Easement	~3 ha	0.8%
Clearing Envelope	~5 ha	1.5%
General Vegetation Area		
Indicative Flowline Easement	~14 ha	4.1%
Clearing Envelope	~24 ha	7.0%
Existing agricultural or other cleared land		
	~316 ha	91.5%

² MEPAU, 2019 states that 5 priority species would be impacted by the Proposal. *Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176) was recorded by Woodman, 2018a. As detailed in Appendix 1, this species does not occur within the Clearing Envelope.

Table 4-2: Summary of Vegetation System Disturbance

Vegetation System	Flowline Easement (Maximum area to be cleared) (ha)	Clearing Envelope (ha)	Current Extent (ha)	Percentage of Development Envelope Regarding Regional Current Extent (%)	Percentage of Clearing Envelope Regarding Regional Local (IBRA) Extent (%)
Illyarrie_433	8.1	12.5	14,746.34	0.0005	0.0005
Eridoon_378	6.1	11.6	60,826.7	0.0001	0.0001
Eridoon_392	0.9	2.0	429.8	0.002	0.002
Eridoon_433	1.60	2.87	132.73	0.01	0.01
TOTAL	~17 ha	~29 ha			

4.1 Regional and Local Significance

As described in Table 4-2, a total clearing area of ~17 ha is estimated for the Proposal. When broken down by vegetation associations, the direct impact of this proposal is limited to clearing no more than 0.01% of a single vegetation association. Having regard to the extent and distribution of these associations both locally and regionally, the removal of 0.01% of a vegetation association is not considered to be significant.

Of the ~29 ha clearing envelope, ~5 ha is considered to be in good condition, with the remaining vegetation comprised of remnant disturbed vegetation in poor condition. Vegetation that is in good condition is located within the proposed Waitsia-03 vegetation area which in turn is adjacent to the Yardanogo Nature Reserve which is comprised of similar vegetation. When considered in the context of the adjacent reserve, the vegetation associations within the Waitsia-03 area are well represented locally with the adjoining reserve comprising an area of approximately 7,000 ha. The small scale and low impact of the proposed flowline suggest that clearing within this area is not expected to impact the adjoining reserve, nor exacerbate existing habitat fragmentation. Therefore, the loss of vegetation within the Waitsia-03 area of the Proposal area is not considered to result in significant local or regional impacts.

Approximately 14 ha (or 4.1% of the Development Envelope) of General Vegetation, broadly considered as poor-quality native vegetation, will be cleared for access roads and flowline construction. Typical of remnants within an agricultural landscape this vegetation (see Table 4-6 of MEPAU, 2019) is considered to have negligible local and regional significance due to its fragmented and heavily impacted characteristics.

4.2 Conservation Significant Flora – Priority Flora

A total of 13 priority taxa have locations within the Proposal Area (Woodman, 2019). The location of these priority taxa are detailed in Figure 4-1. Four of these priority taxa (as detailed in Table 4-3 and Table 4-4), listed as priority flora by the DBCA (under the Biodiversity Conservation Act 2016), are known to occur within the proposed clearing envelope. The Priority taxa identified during detailed surveys that are known to occur within the clearing envelope are known to have a wider distribution outside of the Geraldton Sandplains IBRA region (DPaW, 2007). With the exception of *Comesperma girffinii*, all other conservation significant species directly impacted by the Proposal are known to occur within the adjacent Yardanogo Nature

Reserve indicating that priority taxa are well represented in the local area. Sections 4.3 to 4.6 provide an assessment of impacts to these priority taxa.

Figure 4-1 Significant Flora known from the Proposal Area (Woodman, 2019)

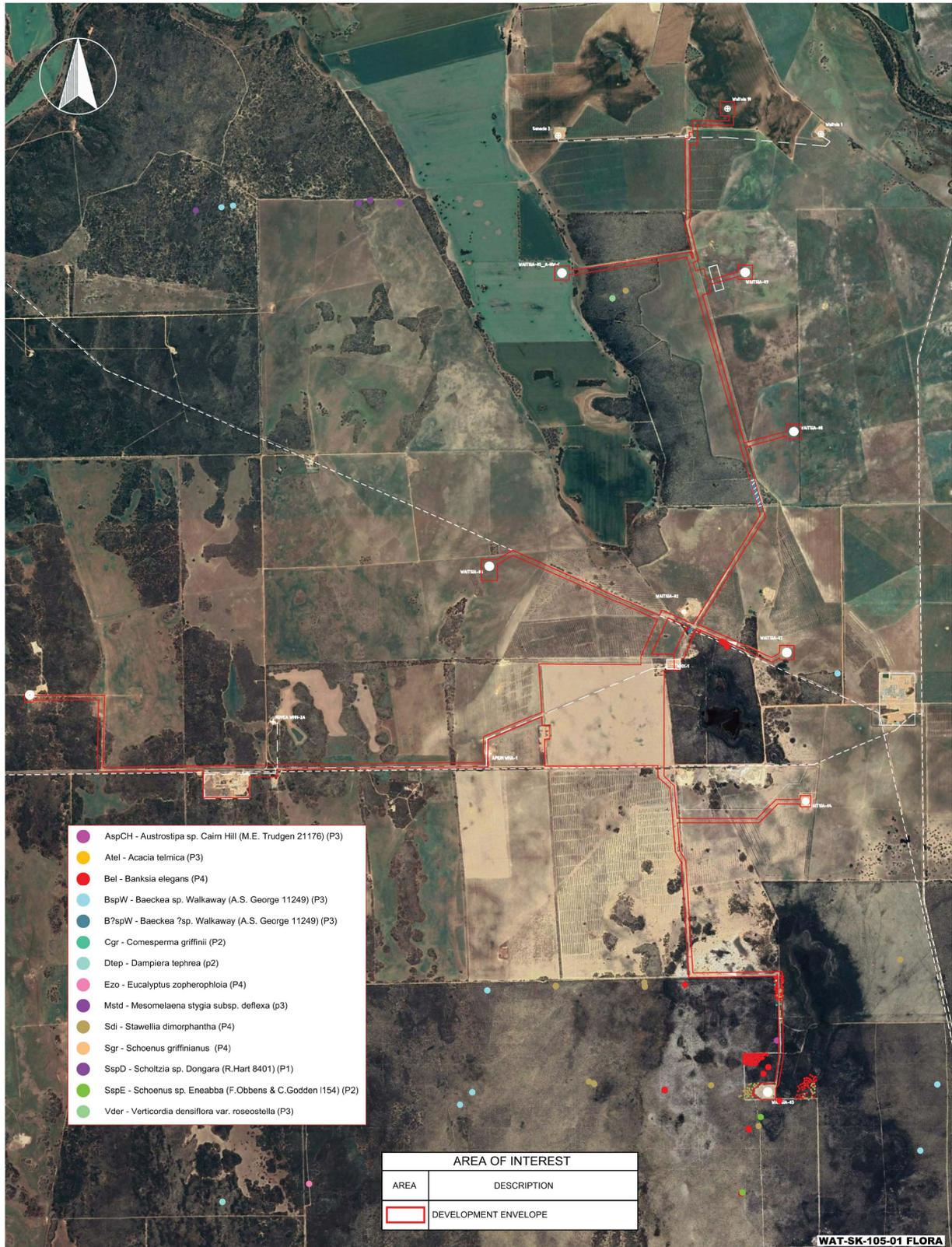


Table 4-3 WGP2 Vegetation System Association Clearing Summary and Recorded Priority Flora Within Clearing Envelope.

Location	Reference	Reference Figure (MEPAU, 2019)	Vegetation Quality	Vegetation System	Fragmented remnant	Indicative Flowline Easement - Maximum Area to be Cleared	Development Envelope excluding existing cleared areas	Priority Flora recorded as present in clearing envelope - reference
Waitsia-03 Area Vegetation								
Waitsia-03 Area - Flowline and access road easements	Appendix 1	1E	Good	Eridon_392	Partial	0.9 ha	2.0 ha	Woodman, 2019
				ERIDOON_378		1.5 ha	3.3 ha	<ul style="list-style-type: none"> • <i>Baeckea sp. Walkaway (A.S. George 11249)</i> • <i>Banksia elegans</i> • <i>Comesperma griffinii</i> • <i>Stawellia dimorphantha</i>
Sub-Total						~3 ha	~5 ha	
General Vegetation								
Waitsia-03 and 04 - Flowline and access road easements	Appendix 1	1D	Poor	ERIDOON_378	Yes	0.8 ha	1.4 ha	Woodman, 2019 None recorded
				ERIDOON_433	Yes	1.6 ha	2.9 ha	Woodman, 2019 None recorded
Xyris Production Facility North and Waitsia-07 - Pipeline and flowline easements		2	Poor (Fragmented)	ERIDOON_378	Yes	0.4 ha	0.8 ha	Woodman, 2019 <ul style="list-style-type: none"> • <i>Baeckea sp. Walkaway (A.S. George 11249)</i> • <i>Banksia elegans</i>
Waitsia 07 - Flowline and access road easements		1C	Poor	ERIDOON_378	Yes	1.1 ha	1.6 ha	Woodman, 2019 None recorded
Waitsia 05 - Flowline and access road easements		1B	Moderate	ERIDOON_378	Yes	2.1 ha	4.1 ha	Woodman, 2019 None recorded
PFW re-injection Line -Flowline and access road easements		1G	Poor	ILLYARRIE_433	Yes	3.4 ha	3.4 ha	Woodman, 2019 None recorded
PFW re-injection Line -Flowline and access road easements		1H	Poor	ERIDOON_378	Yes	0.20 ha	0.4 ha	Woodman, 2019 None recorded
Sub-Total						~14 ha	~24 ha	
TOTAL Clearing						~17 ha	~29 ha	

Table 4-4 Existing NVCP Permitted Areas to be Cleared³ as Part of the Proposal (Refer APPENDIX 1 for further details).

Location	Reference	Vegetation Quality	Priority Flora recorded as present in clearing envelope - reference
NVCP 6875 (Pipeline and flowline easements Existing flowline corridor north of XPF)	Appendix 1	Poor (Fragmented)	Maia, 2015b / Existing NVCP in place – no further clearing required.
NVCP 6875 (WPG1 - pipeline and flowline easements)		Poor (Fragmented)	Maia, 2015b / NVCP in place <ul style="list-style-type: none"> • <i>Baeckea sp. Walkaway (A.S. George 11249)</i> • <i>Banksia elegans</i>
NVCP 6938 (XPF area)			Maia, 2016 / None recorded

Table 4-1: Summary of Significant Flora Taxa Recorded within the Clearing Envelope of the Proposals Development Envelope

Name	Conservation Status	Species Distribution (Western Australian Herbarium, 1998)	Number of Records 4(DPaW, 2007-)	LOCATION - Waitsia-03 Area Vegetation - Flowline and access road easements FLORA SURVEY - Woodman, 2018a, Woodman, 2020				LOCATION - Xyris Production Facility North and Waitsia-07 (General Vegetation) - Pipeline and flowline easements FLORA SURVEY – Maia, 2015b			
				Figure Reference	Number of point locations recorded in survey area (survey area 47.6 ha)	Number of individuals recorded in survey area	Number of known point Locations individuals required to be cleared – Waitsia-03	Figure Reference	Number of point locations recorded in survey area (survey area 1.13 ha)	Number of individuals recorded in survey area	Number of known point Locations individuals required to be cleared – Xyris Production Facility North and Waitsia-07
<i>Baeckea sp. Walkaway (A.S. George 11249)</i>	P3	Recorded within the Avon Wheatbelt and Geraldton Sandplains IBRA regions	This species has been recorded 39 times	Appendix 1	1	5	0	Appendix 1	1	109	2
<i>Banksia elegans</i>	P4	Recorded within the Avon Wheatbelt and Geraldton Sandplains IBRA regions	This species has been recorded 46 times		340	3,175	333		1	5	4
<i>Comesperma griffinii</i>	P2	Recorded within the Avon Wheatbelt, Esperance Plains, Geraldton Sandplains, Mallee and Swan Coastal Plain IBRA regions	This species has been recorded 14 times		3	14	1		Not recorded	-	-
<i>Stawellia dimorphantha</i>	P4	Recorded within the Avon Wheatbelt, Esperance Plains, Geraldton Sandplains, Mallee and Swan Coastal Plain IBRA regions.	Presence of this species has been recorded 67 times		70	141	12		Not recorded	-	-

³ Area (ha) to be cleared factored into Table 4-1

⁴ A location can consist of 1 or more individual plants.

4.3 Assessment of impacts to Priority Taxon - *Baeckea* sp. Walkaway

Baeckea sp. Walkaway (A.S. George 11249) (P3) is a dense, multi-stemmed shrub growing up to 2 m high which occurs on undulating plains and hillslopes on yellow/brown or white sand in Kwongan or Banksia woodland/heath (WAHerb, 1998). It has a range of approximately 120 km in Western Australia (where it is endemic), from near Geraldton in the north-west, to south-east of Mullewa in the east and south-east of Dongara in the south. Outside of the Proposal area this taxon is known from 39 records⁵ (Refer Table 4-3) representing approximately 32 broad localities, five of which occur within conservation reserves including Burma Road Nature Reserve, Indarra Spring Nature Reserve and Yandanogo Nature Reserve (DPaW, 2007) outside of the Proposal area. Figure 4-1 details recorded distribution of *Baeckea* sp. within the Proposal area (DPaW 2007-, Maia 2016, Woodman Environmental 2004, 2009, 2012, 2018a).

4.3.1 *Baeckea* sp. Walkaway in Xyris Production Facility North and Waitsia-07 (General Vegetation) Area

Baeckea sp. Walkaway (A.S. George 11249) (P3) was recorded within the Xyris Production Facility North and Waitsia-07 (General Vegetation) area (Maia, 2015b) (Appendix 1), with 109 individuals recorded (Refer Table 4-3). There are a number of known locations of this taxon within the broader Proposal area (DPaW, 2007, Maia, 2016, Woodman Environmental; 2004, 2009, 2018a).

4.3.1.1 Impact Assessment

Based upon the information available for this species (Maia, 2016 and Woodman, 2018a), MEPAU understand that there are at least 114 known individuals that have been previously recorded and reported in the Proposal area. Based upon the clearing footprint of the Proposal, surveys undertaken by MEPAU indicate that approximately 2 individuals will be impacted by the Proposal. This equates to a disturbance of approximately 4% of the known records in this area.

This Proposal is not considered to result in a significant impact to the species as:

- The direct impact equates to a small portion (4%) of known individuals in the surveyed areas (Maia, 2016 and Woodman, 2018a),
- This taxon is also known from 39 records outside of the Proposal area representing approximately 32 broad localities, five of which occur within conservation reserves (DPaW, 2007); and
- The species has a large known distribution indicating that any localised impacts are not expected to affect the wider overall population distribution.

4.4 Assessment of Impacts to Priority Taxon - *Banksia elegans*

Banksia elegans (P4) is a shrub growing up to 4 m high which occurs on sandplains and low consolidated dunes on yellow, white or red sand (WAHerb 1998-). It has a range of approximately 175 km in Western Australia (where it is endemic), from north-west of Dongara in the north-west, to near Hill River in the south-east. Outside of the Proposal area this taxon

⁵ The abundance of plants at each known locality varies from four plants, 13 plants and 15 plants to 1,000+. There is likely at least 2,000 plants across all current populations when numbers are estimated from available data on FloraBase (Maia, 2015b).

is known from 46 records (Refer Table 4-3) representing approximately 19 broad localities, seven of which occur within conservation reserves including Beekeepers Nature Reserve, Lake Logue Nature Reserve, Lesueur National Park and Yardanogo Nature Reserve (DPaW 2007-). Figure 4-1 details recorded distribution of *Banksia elegans* within the Proposal area (DPaW 2007-, Maia 2016, Woodman Environmental 2004, 2009, 2012, 2018a).

4.4.1 *Banksia elegans* in Waitsia-03 Area Vegetation Area

Banksia elegans (P4) was common within the Waitsia-03 Area (Woodman, 2018a), with a total of 340 point locations recorded within the Study Area and 3,175 individuals recorded across these point locations (Woodman, 2018a) (Refer Table 4-3 and Appendix 1).

4.4.2 *Banksia elegans* in Xyris Production Facility North and Waitsia-07 (General Vegetation) Area

Five *Banksia elegans* (P4) plants were located in a moderately dense to open remnant in this small survey area⁶ (Maia, 2015b) (Refer Appendix 1). Woodman, 2018b recorded 99 individual plants, at 14 locations, within 1km of this location (Refer Table 4-3 and Appendix 1).

4.4.3 Impact Assessment

A total of 46 locations have been recorded previously via Naturemap (DPaW, 2007-). A large number of individual plants have been recorded at both the Waitsia-03 Area Vegetation and Xyris Production Facility North and Waitsia-07 (General Vegetation) area.

4.4.3.1 Waitsia-03 Area Vegetation

Based upon the information available for this species (Maia, 2016 and Woodman, 2018a), MEPAU understand that there are at least 3,175 known individuals that have been previously recorded in this area. Based upon the clearing footprint of the Proposal, surveys undertaken by MEPAU indicate that approximately 333 individuals will be directly impacted in the Waitsia-03 Area Vegetation by the Proposal. This equates to a disturbance of approximately 10% of the known records in this area.

4.4.3.2 Xyris Production Facility North and Waitsia-07 (General Vegetation) Area

Based upon the information available for this species (Maia, 2015b and Woodman, 2018a), MEPAU understand that there are at least 104 known individuals that have been previously recorded in this area. Based upon the clearing footprint of the Proposal, surveys undertaken by MEPAU indicate that approximately 4 individuals will be impacted in the Xyris Production Facility North and Waitsia-07 (General Vegetation) area by the Proposal. This equates to a disturbance of approximately 4% of the known records in this area.

4.4.3.3 Impact Assessment conclusion

This Proposal is not considered to result in a significant impact to the species as:

- The direct impact equates to a small portion (10% and 4% respectively) of known individuals in the surveyed areas (Woodman, 2018a and Maia, 2015b)
- This taxon is also known from 46 records outside of the Proposal area, representing approximately 19 broad localities, seven of which are locations within conservation reserves (DPaW, 2007); and

⁶ Survey undertaken to meet the requirements for NVCP 6875. Survey area, 1.13 ha, comprises the NVCP 6875-1 area.

- The species has a large known distribution indicating that any localised impacts are not expected to affect the wider overall population distribution.

4.5 Assessment of Impacts to Priority Taxon - *Comesperma griffinii*

Comesperma griffinii (P2) is an annual or perennial herb growing to 0.15 m high which occurs on plains on yellow or grey sand (WAHerb 1998-). It has a large range of approximately 830 km in Western Australia (where it is endemic), from east of Geraldton in the north-west, to near Esperance in the south-east. Outside of the Proposal area this taxon is known from 11 records representing approximately 10 broad localities, four of which occur within conservation reserves including Indarra Nature Reserve, Helms Forestry Reserve, Kenwick Wetland and South Eneabba Nature Reserve (DPaW 2007-). Figure 4-1 details recorded distribution of *Comesperma griffinii* within the Proposal area (DPaW 2007-, Maia, 2016 and Woodman Environmental, 2018a).

4.5.1 *Comesperma griffinii* in Waitsia-03 Area Vegetation Area

Comesperma griffinii (P2) was recorded at three point locations within the Waitsia-03 Study Area, with 14 individuals recorded across these point locations (Woodman, 2018a) (Refer Table 4-3 and Appendix 1). There is one known location of this taxon approximately 15 km south-east of the broader Proposal area. The next closest record is 60 km south of the Study Area (DPaW, 2007).

4.5.1.1 Impact Assessment

Based upon the information available for this species (Woodman, 2018a), MEPAU understand that there are 14 known individuals that have been previously recorded and reported in the Waitsia-03 Area, with other individuals existing outside of this area. Based upon the clearing footprint of the Proposal, surveys undertaken by MEPAU indicate that approximately 1 individual will be impacted by the Proposal. This equates to a disturbance of approximately 7% of the known records in this area.

This Proposal is not considered to result in a significant impact to the species as:

- the direct impact equates to a small portion (7%) of known individuals in the surveyed areas (Woodman, 2018a),
- This taxon is also known from 11 records outside of the Proposal area, representing 10 broad localities, four of which occur within conservation reserves; and
- The species has a large known range indicating that any localised impacts are not expected to affect the wider overall population distribution.

4.6 Assessment of Impacts to Priority Taxon - *Stawellia dimorphantha*

Stawellia dimorphantha (P4) is a stilt-rooted perennial herb growing up to 0.2 m high which occurs on white, grey and yellow sand (WAHerb 1998-). It has a range of approximately 89 km in Western Australia (where it is endemic), from north of Dongara in the north, to near Eneabba in the south. This taxon is known from 65 records representing approximately 20 broad localities, 6 of which occur within conservation reserves including Beekeepers Nature Reserve, Lake Logue and Yandanogo Nature Reserve (DPaW 2007-). Figure 4-1 details recorded distribution of *Stawellia dimorphantha* within the Proposal area (DPaW 2007-, Maia, 2016 and Woodman Environmental, 2018a).

4.6.1 *Stawellia dimorphantha* in Waitsia-03 Area Vegetation Area

Stawellia dimorphantha (P4) was recorded at 70 point locations within the Waitsia-03 Study Area, with 141 individuals recorded across these point locations (Woodman, 2018a). This taxon was relatively common within the Study Area (Woodman, 2018a). There are a number of known locations of this taxon within the broader Proposal area (Refer Table 4-3 and Appendix 1).

4.6.1.1 Impact Assessment

Based upon the information available for this species (Woodman, 2018a), MEPAU understand that there are 141 known individuals that have been previously recorded and reported in the Waitsia-03 Area, with other individuals existing outside of this area. Based upon the clearing footprint of the Proposal, surveys undertaken by MEPAU indicate that approximately 12 individuals will be impacted by the Proposal. This equates to a disturbance of approximately 8% of the known records in this area.

This Proposal is not considered to result in a significant impact to the species as:

- the direct impact equates to a small portion (8%) of known individuals in the surveyed area (Woodman, 2018a),
- This taxon is also known from 65 records outside of the Proposal area representing approximately 20 broad localities, six of which occur within conservation reserves (DPaW, 2007); and
- The species has a large known distribution indicating that any localised impacts are not expected to affect the wider overall population distribution.

5.0 IMPACT ASSESSMENT – INDIRECT IMPACTS

The area of potential indirect impacts has been minimised to the lowest practicable extent by utilising existing cleared areas to locate infrastructure. The potential for indirect impacts associated with the implementation of the Proposal exists.

5.1 Spread of Weeds

A search of the DoEE Species Profile and Threats Database (Woodman, 2019) identified four significant invasive flora taxa or habitat for such taxa, that may occur within the broader Proposal area. Woodman (2019) identified four introduced flora taxa via the DBCA *NatureMap* database search. None of these taxa are listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007*.

Vegetation in the majority of the Proposal area (General Vegetation Area) has been subject to weed incursion which can be attributed to the disturbance of the land from historical land clearing, fragmentation of remnants and agricultural practices. Given the disturbed nature of the flora and vegetation in this area and the potential threat of significant invasive weed incursion, standard weed management measures are required during the construction and operation phases of the Proposal (MEPAU, 2019).

The flora and vegetation assessment of the Waitsia-03 Vegetation Area undertaken by Woodman (2018a) stated that no declared weeds or weeds of national significance were recorded within the Study Area. Of the four priority flora that will be impacted by the Proposal only one species has a conservation advice (CwA, 2008)⁷. However, CwA, 2008 states that the known populations are relatively healthy and threatening processes (e.g. weed infestation) are unlikely to severely impact on the species.

Given this finding, the nature of the flora and vegetation in this area, and the immediate proximity of this area to the Yandanogo Nature Reserve, effective weed assessment, management and monitoring during construction and operation phases of the Proposal is required. This is further supported in Woodman, 2018a.

The risk of spreading weeds through the implementation of the Proposal is credible, as weed species are known to be present within the Development Envelope, but is not considered a significant risk given:

- the spread of weeds is not considered a key threat to identified priority taxon or vegetation systems.
- it is considered a standard construction risk manageable through the implementation of good industry practice and hygiene management actions.

5.2 Spread of *Phytophthora cinnamomi* (Dieback)

The Proposal area lies at the northern limit of the portion of Western Australia where significant plant disease caused by *Phytophthora cinnamomi* (Dieback) is known to occur. The environmental conditions of the area significantly affect the pathogens ability to survive or flourish and spread over time. All land with an annual average rainfall of more than 400 millimetres and suitable soil composition (e.g. warm and moist) are considered vulnerable to Dieback (Department of Parks and Wildlife, 2015).

⁷ No species currently have species recovery plans in place.

Given the condition of native vegetation in the General Vegetation Area, average rainfall⁸ of the Proposal area and the soil composition the threat posed by and impact to vegetation from Dieback is considered as minimal.

A specific dieback assessment was undertaken by subject matter experts (Glevan, 2018) relating to the area depicted in Waitsia-03 Vegetation Area prior to (in 2016) and post drilling of Waitsia-03 well (in 2018). Although the surveys were not able to conclusively verify that Dieback was not present in this area due to a lack of reliable indicator species, Glevan (2018) noted that there was no evidence to suggest that Dieback did occur in this area. Given the condition and species composition of vegetation in the Waitsia-03 Vegetation Area (Woodman, 2018a) and proximity of this area to the Yandanogo Nature Reserve, the potential threat of Dieback cannot be excluded as a potential indirect impact from the implementation of the Proposal in this area.

The risk of spreading dieback through the implementation of the Proposal is considered credible in certain areas of the Proposal area (i.e. Waitsia-03 Vegetation Area). Although the known environmental condition requirements for the potential presence of Dieback may be present within the Development Envelope, it is not considered a significant risk given:

- the spread of dieback is not considered a key threat to identified priority taxa. However, some species identified during flora surveys are known to be susceptible
- it is considered a standard construction risk manageable through the implementation of good industry practice and hygiene management actions.

5.3 Impacts from Dust

There is a general belief that dust accumulation on plant surfaces can cause negative impacts to plants. Matsuki et al, 2016 concluded that there was no evidence to support the perception that dust accumulation on plants causes negative impacts. Given the short duration of vegetation clearing and flowline installation works (MEPAU, 2019) impacts from dust on nearby vegetation is considered a low potential.

A long term monitoring program that investigated impacts of dust on vegetation for a significant development in the Pilbara over a 5 year period, where significantly higher volumes of vehicles (heavy and light) and earthworks were present, determined that no adverse impacts occurred to plant health or vegetation communities as a result of construction dust loads (Chevron Australia, 2015). Consequently, any potential impact is also not expected to be permanent. Therefore, no specific mitigation measures are proposed.

⁸ The average rainfall of the Proposal area is approximately 440 millimetres (BoM, 2020) and declining (DoW, 2015).

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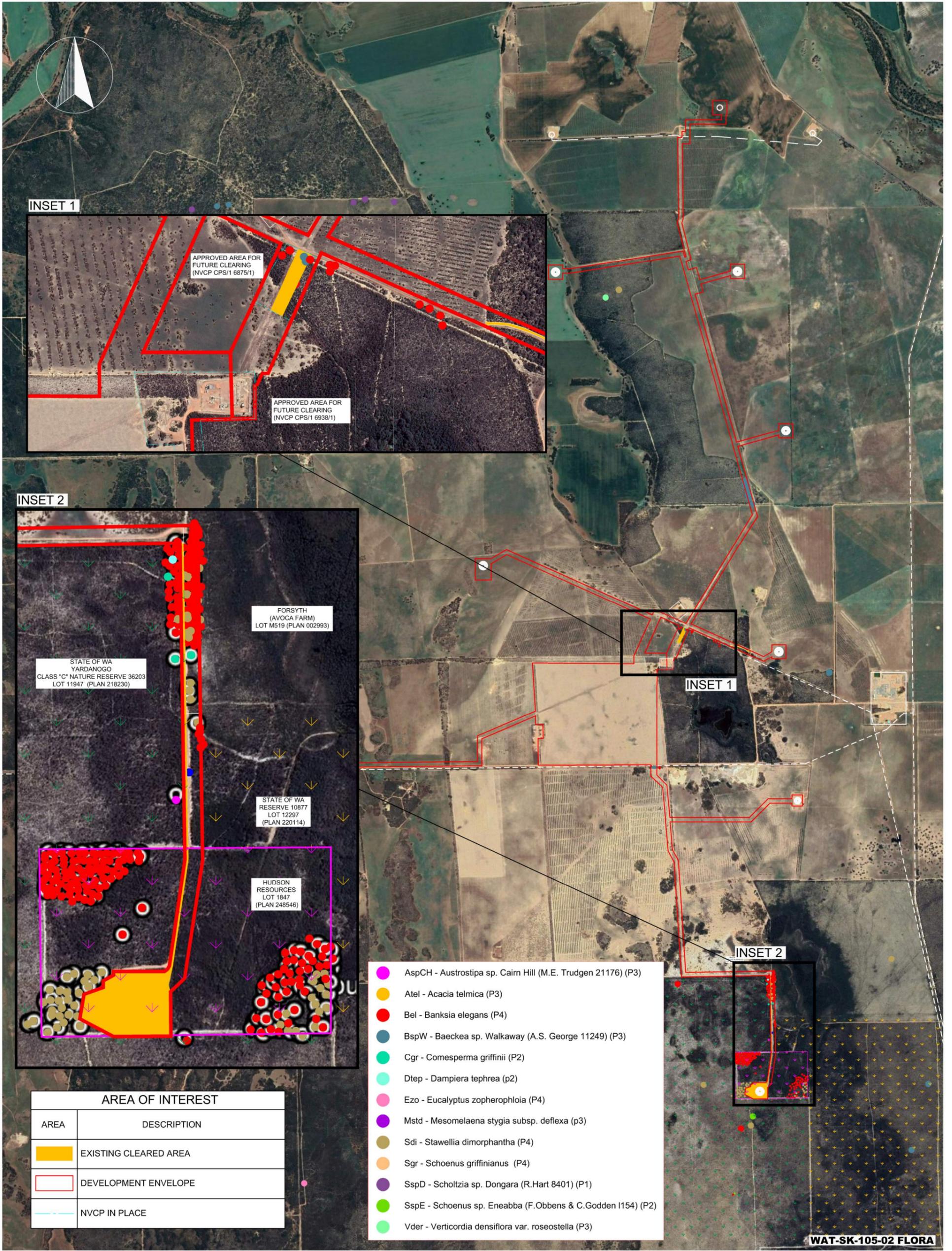
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APPENDICIES

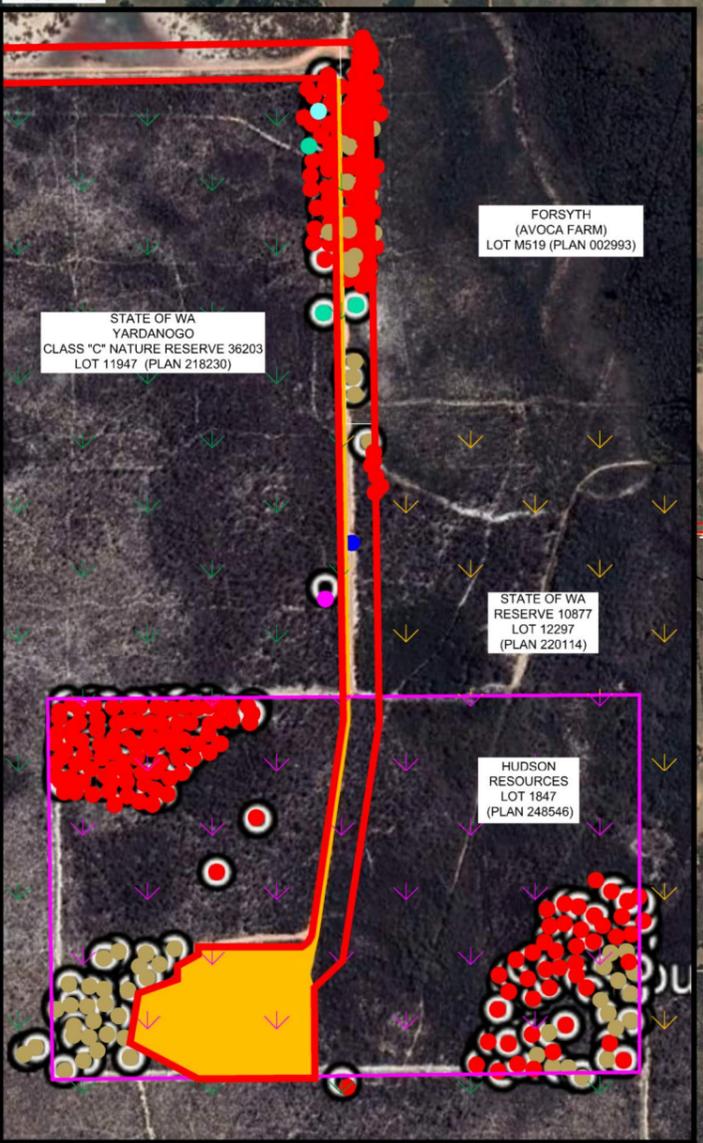
APPENDIX 1 - Waitsia-03 Area - Flowline and Access Road Easements



INSET 1



INSET 2



INSET 1

INSET 2

- AspCH - *Austrostipa* sp. Cairn Hill (M.E. Trudgen 21176) (P3)
- Atel - *Acacia telmica* (P3)
- Bel - *Banksia elegans* (P4)
- BspW - *Baeckea* sp. Walkaway (A.S. George 11249) (P3)
- Cgr - *Comesperma griffinii* (P2)
- Dtep - *Dampiera tephrea* (p2)
- Ezo - *Eucalyptus zopherophloia* (P4)
- Mstd - *Mesomelaena stygia* subsp. *deflexa* (p3)
- Sdi - *Stawellia dimorphantha* (P4)
- Sgr - *Schoenus griffinianus* (P4)
- SspD - *Scholtzia* sp. Dongara (R.Hart 8401) (P1)
- SspE - *Schoenus* sp. Eneabba (F.Obbens & C.Godden I154) (P2)
- Vder - *Verticordia densiflora* var. *roseostella* (P3)

AREA OF INTEREST	
AREA	DESCRIPTION
	EXISTING CLEARED AREA
	DEVELOPMENT ENVELOPE
	NVCP IN PLACE