16 Offsets

This section summarises the predicted significant residual environmental impacts associated with the Proposal and the offsets proposed.

The process of identifying significant residual impacts and determining appropriate offsets follows the framework provided by the WA Environmental Offsets Policy (GoWA 2011) and the WA Environmental Offsets Guidelines (GoWA 2014). While the Proposal is not undergoing an accredited assessment with the Commonwealth, the offsets proposed are appropriate and consistent with the EPBC Act Environmental Offsets Policy and have been developed to satisfy the offset requirements for both assessments.

16.1 Objective

Environmental offsets are actions that provide environmental benefits which counterbalance the significant residual environmental impacts or risks of a Proposal. Environmental offsets need only be applied where the residual impacts of a Proposal are determined to be significant, after avoidance, minimisation and rehabilitation have been pursued. Unlike mitigation actions, which occur on-site as part of the Proposal and reduce the direct impact of that Proposal, offsets are generally undertaken outside of the Development Envelope and counterbalance significant residual impacts.

To ensure consistency and transparency on whether offsets should be applied to a Proposal, the significance of residual impacts has been determined through the application of the residual impact significance model (RISM) provided in the Environmental Offsets guidelines. This model outlines how significance is determined and when an offset is likely to be required, or may be required, in relation to relevant EPA environmental factors and the relevant clearing principles in Schedule 5 of the EP Act (GoWA 2014). The mitigation hierarchy of 'avoid, minimise, rehabilitate and offset' has been considered in the assessment of this Proposal consistent with both State and Federal guidance and policy.

16.2 State Policy and Guidance

The rate, scale and nature of current and future development, combined with the impacts of other land uses and threatening processes, have raised the WA EPA's concerns about cumulative environmental impacts in the Pilbara region. In relation to the potential for significant residual impacts, the EPA (2014) identified concern regarding the regulation and management of cumulative impacts on native vegetation due to impacts from clearing, pastoralism, feral animals, weeds and climate change in the Pilbara, and the lack of reliable information on the extent and condition of native vegetation at a regional scale. The EPA has therefore determined that a proactive approach is required to compensate the clearing of native vegetation in the Pilbara and has established a strategic regional conservation initiative to consolidate and manage offset funds for the Pilbara, known as the Pilbara Environmental Offsets Fund (PEOF) (DWER 2021f).

The PEOF pools financial contributions for environmental offsets for Pilbara resource and infrastructure projects approved under the EP Act, which are conditioned in accordance with the WA Environmental Offsets Policy (GoWA 2011) and associated *WA Environmental Offsets Guidelines* (GoWA 2014). Financial contributions to the

PEOF will be used to implement conservation projects that counterbalance any significant residual impacts of those developments at a landscape level in the Pilbara.

Contributions to the PEOF to offset the significant residual impact from the clearing of native vegetation considered in 'Good to Excellent' condition has been used as the standard offset approach by the EPA and proponents in the Pilbara since 2012.

A draft Impact Reconciliation Procedure (IRP) (**Appendix 23**) has been prepared to support the assessment of the Proposal under both the EP Act and the EPBC Act. The purpose of the IRP is to outline the methodology that will be used to calculate the area of vegetation cleared. The IRP has been developed as per the *Instructions on how to prepare Environmental Protection Act 1986 Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports*.

16.2.1 Consistency with State Offset Principles

The EPA notes that in establishing and implementing the PEOF, the WA Government has committed to ensuring that the offsets implemented via the PEOF are underpinned by the principles set out in the WA Environmental Offsets Policy (GoWA 2011). An assessment of the proposed offsets against these principles is provided in **Table 16-1**.

Table 16-1: Consideration of State Offset Principles

Principle	Consideration
Environmental offsets will only be considered after avoidance and mitigation options have been pursued.	• The Proposal design adopts the hierarchy of risk management to avoid, reduce, and mitigate environmental impacts. Designating a Indicative Footprint provides flexibility in considering alternative designs and locations of supporting infrastructure within the Development Envelope to minimise impacts on the environment. The location of non-fixed assets will be optimised within the Development Envelope through applying the risk management hierarchy; including: • Locating non-process infrastructure in areas where no or a low-density of conservation significant species of flora and fauna have been recorded; and • Considering alternative options for locating the airport or using existing facilities at other sites to reduce the total Indicative Footprint. • The following additional mitigation measures have been adopted through ongoing mine design and planning: • Avoid direct impacts to areas of high-value habitat through establishment of the FHEZ and the FHEZ Corridor. • Reduction in the amount of native vegetation clearing. This is further discussed in **Section 2.3.3**. • Surplus water will no longer be discharged to the environment. All surplus water not required for the operation of the mine will now be managed through MAR. • Opportunities to backfill the pit voids to above surrounding groundwater level, will be pursued • HPPL now intend to utilise a solar farm as a supplementary renewable energy power source.

Principle	Consideration
	• Waste rock will initially be used to construct infrastructure (e.g. access roads and ramps, RoM and stockpile bases, drainage structures and safety bunds) with the remainder stored in above ground WRDs or used to backfill pits. Based on amendment to the original referred Proposal, the approximate volume of waste rock to be mined over the LoM has reduced from 1,755.5 Mt to approximately160 Mt. • The application of the mitigation hierarchy for the Proposal has ensured that all practical avoidance and minimisation measures have been considered and pursued where appropriate. Offsets have only been considered for those significant impacts that are not able to be avoided or minimised
Environmental offsets are not appropriate for all projects	The identified significant residual impacts are considered appropriate to be offset as they are not considered to be either minor (too minor to require an offset) or likely to be considered environmentally unacceptable regardless of offsets.
Environmental offsets will be cost effective, as well as relevant and proportionate to the significance of the environmental value being impacted.	HPPL commits to providing financial offsets that are cost effective, relevant and proportionate to counterbalance the significant residual impacts to the identified environmental values. The offset rates are expected to be appropriate to the Fortescue Valley and Chichester sub-regions of the Pilbara. They include a base rate which applies to vegetation clearing generally and a higher rate that accounts for specialised environmental values.
Environmental offsets will be based on sound environmental information and knowledge.	The Pilbara is predominantly Crown land so traditional land acquisition offsets are not possible and on-ground conservation actions are difficult for a single proponent to implement due to tenure constraints including pastoral leases and mineral tenements. Contribution to the PEOF is not a traditional offset where, for example a single conservation project would need to consider sound environmental information and knowledge about a particular species or community. However, the conservation and research projects to be implemented at a broad-scale through the PEOF are intended to address the cumulative impacts of mining in the Pilbara as identified by the EPA and provide a more detailed understanding of conservation values in the Pilbara region to improve decision making regarding conservation and management.
Environmental offsets will be applied within a framework of adaptive management.	HPPL understands an adaptive management framework should be applied in relation to environmental offsets to take account of the potential risks. One of the key risks associated with the PEOF as an environmental offset being applied for the majority of projects in the Pilbara is managing the time lag between establishing offsets and generating the anticipated benefits. This challenge and the adaptive management framework around conservation outcomes are being addressed in the development of the PEOF mechanisms including partnerships, scheduling, procurement, funding arrangements, performance measures and reporting requirements in consultation with stakeholders.
Environmental offsets will be focussed on longer term strategic outcomes.	The EPA recognises that the establishment of the PEOF is consistent with this principle in that strategic approaches, such as the use of the PEOF, will provide a mechanism to coordinate implementation of offsets across a range of land tenures (GoWA 2014). The PEOF provides a strategic, coordinated approach to the application of environmental offsets to achieve broad-scale biodiversity conservation outcomes for the Pilbara region. HPPL recognises the commitment of the EPA to this strategic approach and is contributing via being a participant in the working group for establishment of the PEOF.

16.3 Assessment of Significant Residual Impact

Environmental offsets will only be applied where the residual impacts of the Proposal are determined to be significant after avoidance, minimisation and rehabilitation have been pursued (GoWA 2014). These measures have been detailed in the relevant impact assessments for each environmental factor (**Sections 7** to **14** of this

ERD). **Section 16** outlines the significant residual impacts of the Proposal**.** In general, significant residual impacts include those that affect flora and fauna of conservation significance (such as declared rare flora and threatened species that are protected by statute), areas within the formal conservation reserve system, important environmental systems, species that are protected under international agreements (such as Ramsar listed wetlands) and areas that are already defined as being critically impacted in a cumulative context. Impacts may also be significant if, for example, they could cause plants or animals to become rare or endangered, or they affect vegetation which provides important ecological functions. Significant residual impacts to environmental values recognised under WA legislation and policy and were determined in accordance with the RISM provided in the WA Environmental Offsets Guidelines (GoWA 2014).

Table 16-2: Residual Impact Significance Model (RISM)

Part IV Environmental Factors	Flora and Vegetation			Terrestrial Fauna		Subterranean Fauna	
	Rare Flora	Threatened Ecological Communities	Remnant Vegetation	Wetlands and Waterways	Conservation Areas	High Biological Diversity	Habitat For Fauna
Residual impact that is environmentally unacceptable and cannot be offset	None identified.	None identified.	None identified.	None identified.	None identified.	None identified	None identified.
Significant residual impacts that will require an offset – All significant residual impacts to species and ecosystems are protected by statute or where the cumulative impact is already at critical level	None identified.	None identified.	Clearing of up to 4,339.16 ha of native vegetation of which 4,296.93 ha is in 'Good' to' Excellent' condition and includes a PEC, riparian and sheetflow dependent vegetation. The Proposal is located within the Fortescue Valley and Chichester IBRA subregions. Contribution to the PEOF will be made at a dollar rate per ha of vegetation in Good to Excellent condition that is cleared.	Clearing of up to 4.31 ha of riparian vegetation.	None identified.	None identified	Based on the Indicative Footprint, the Proposal will involve the clearing of approximately 1,406.03 ha of 'high value' habitat for listed fauna species.
Significant residual impacts that may require an offset – Any significant residual impact to potentially threatened species and ecosystems, areas of high environmental value or where the cumulative impact may reach critical levels if not managed	None identified.	None identified.	None identified	None identified	None identified.	None identified	None identified

Residual impacts that are not significant	No Threatened flora species will be impacted. Direct impacts to three Priority flora species: *Hibiscus* sp. Mulga Downs (S. Hitchcock SH 638); *Triodia veniciae*; and *Dolichocarpa sp. Hamersley Station* (A.A. Mitchell PRP 1479) (Priority 3).	No TECs are present in the Development Envelope.	The Proposal will not impact any vegetation types that are highly cleared. All vegetation types occur extensively outside of the Development Envelope. Unmanaged, there is a potential for 335 ha of native vegetation to be indirectly impacted through changes to surface water flows. These areas will be monitored with contingency actions implemented as required to ensure these impacts do not occure.	The Development Envelope is within the Chichester Range, on the northern flanks of the Fortescue Valley. The Fortescue Valley comprises a network of interconnected ephemeral swamps, claypans and floodplains (Goodiadarrie Swamp), and is an ESA. The ESA is located outside the Development Envelope. The residual impacts of the Proposal to Inland Waters are not considered significant. HPPL considers the Proposal can be managed to meet the EPA's objective to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	There are no formal conservation areas within the Development Envelope. Nearby conservation reserves (including Karijini National Park) will not be impacted by the Proposal.	The Pilbara region has very high biodiversity value, possessing high species richness and many endemic flora and fauna species. The Proposal is within the Fortescue and Chichester bioregions, which are not nationally or internationally recognised biodiversity hotspots.	Impacts to the remaining fauna habitat types are not considered significant. The lithological units which represent likely stygofauna and troglofauna habitats, and which have shown to have ahigh diversity and abundance, are extensive and continuous over a wide area within and surrounding the Development Envelope.

Table 16-3: Environmental Offsets Table

Existing Environment	Mitigation			Significant Residual Impact
	Avoid and Minimise	**Rehabilitation**	**Rehabilitation Success**	
Flora and Vegetation				
The Proposal will result in the following impacts to flora and vegetation values: Clearing of up to 4,339.16 ha of native vegetation of which 4,296.93 ha is in Good to Excellent condition. 2,973.51 ha of sheetflow vegetation will be directly impacted. Loss of up to 70.31 ha of Four Plant Assemblages of the Wona Land System Priority 1 PEC. Loss of up to 4.31 ha of riparian vegetation, No Threatened flora species will be impacted by the Proposal. Individuals of three Priority flora species will be impacted.	Minimise clearing as far as practicable. Where possible Proposal elements have been located to avoid impacts on environmental factors. Avoid unnecessary clearing and ground disturbance: Utilise areas of existing disturbance before clearing of new ground where possible. Where possible Proposal elements have been located to minimise impacts on environmental factors. Clearing has been minimised within restricted vegetation communities where possible. Clearing has been minimised within locally significant vegetation communities where possible. HPPL will ensure clearing only occurs in approved ground disturbance. No more than 30% of individuals of the three Priority flora species: *Hibiscus* sp. Mulga Downs (S. Hitchcock SH 638); *Triodia veniciae*; and *Dolichocarpa sp. Hamersley Station* (A.A. Mitchell PRP 1479) (Priority 3) will be impacted. Phase the works to enable progressive clearing and where possible progressive rehabilitation. Manage construction and operational works through an EMS. Implement programs for induction and education of the workforce with respect to flora and vegetation protection and management.	Site specific, progressive rehabilitation as per Preliminary Mine Closure Plan (**Appendix 3**). Rehabilitation of land as soon as possible after completion of activities. HPPL will ensure stockpiled topsoil is signposted to prevent accidental use or degradation of soil resources. Topsoil will be progressively re-spread over temporary construction areas or utilised for future rehabilitation.	**Can the environmental values be rehabilitated? Evidence? Operator experience in undertaking rehabilitation?** All rehabilitation is undertaken in accordance with HPPL's Rehabilitation Procedures. HPPL is experienced in mine site rehabilitation as demonstrated at its existing Pilbara operations. **What is the type of vegetation being rehabilitated?** Rehabilitation will enable the pre-mining vegetation types to re-establish in cleared areas. **Time scale** Progressive rehabilitation will continue to be undertaken throughout the life of the Proposal where practicable, however the majority of the rehabilitation will be undertaken at closure.	**Extent** Clearing up to 4,339.16 ha of native vegetation. Quality Up to 4,296.93 ha of native vegetation in Good to Excellent condition. **Land tenure** Not applicable. **Time scale** Temporary clearing areas will be progressively rehabilitated.
Terrestrial Fauna				
The Proposal will result in the following impacts to terrestrial fauna: Clearing of up to 4,339.16 ha of fauna habitat within two Pilbara IBRA bio-subregions. Loss of high value fauna habitat.	Where possible Proposal elements have been located to avoid impacts on environmental factors. Avoid unnecessary clearing and ground disturbance: Utilise areas of existing disturbance before clearing of new ground where possible. HPPL has redesigned the Development Envelope to avoid 1,320.82 ha habitat (the FHEZ) which is considered as priority for the Pilbara Olive Python, Northern Quoll, Pilbara Leaf-nosed and Ghost Bat. The habitat includes Drainage Lines / Floodplain habitat which allows for dispersal of ground dwelling species. An additional FHEZ Corridor has also been proposed with contains an additional 991.45 ha habitat. Minimal ancillary related activities with be permitted within the FHEZ Corridor. Disturbance within the FHEZ corridor	Site specific, progressive rehabilitation as per Preliminary Mine Closure Plan (**Appendix 3**). Rehabilitation of land as soon as possible after completion of activities. HPPL will ensure stockpiled topsoil is signposted to prevent accidental use or degradation of soil resources. Topsoil will be progressively re-spread over temporary construction areas or utilised for future rehabilitation. Rehabilitation is expected to return disturbed areas to a stable and vegetated state, providing some habitat value for fauna over time.	**Can the environmental values be rehabilitated? Evidence? Operator experience in undertaking rehabilitation?** All rehabilitation is undertaken in accordance with HPPL's Rehabilitation Procedures. HPPL is experienced in mine site rehabilitation as demonstrated at its existing Pilbara operations. **What is the type of vegetation being rehabilitated?** Rehabilitation will enable the pre-mining vegetation types to re-establish in cleared areas. **Time scale** Progressive rehabilitation will continue to be undertaken throughout the life of the Proposal where	**Extent** Clearing of up to 4,339.16 ha of fauna habitat, including approximately 1,462.51 ha of high value fauna habitat, based on the Indicative Footprint. **Quality** Fauna habitat of high value to fauna species. Land tenure Not applicable. **Time scale** Temporary clearing areas will be progressively rehabilitated.

Existing Environment	Mitigation			Significant Residual Impact
	Avoid and Minimise	**Rehabilitation**	**Rehabilitation Success**	
	will be limited to no more than 5 ha following approval of the Hub & Spur Proposal. Creek line crossings will be designed to maintain flow, appropriately engineering culverts or bridges will be installed to allow access of fauna. HPPL will ensure clearing only occurs in approved ground disturbance areas (in accordance with a GDP) Clearing will be managed as outlined in the CSFMP and as per the EMS. Directional lighting onto active construction areas to minimise the potential for light overspill in accordance with EMS; and Ensure staff and contractors are provided with appropriate training in regard to protection of significant fauna and associated habitats.		practicable, however the majority of the rehabilitation will be undertaken at closure.	

16.4 Proposed Offsets

To offset clearing of vegetation, HPPL proposes offsets in the form of financial contributions to the PEOF, as outlined in **Table 16-4** which can be used to fund programs that will mitigate impacts to:

- Native vegetation in 'Good to Excellent' condition within the Fortescue and Chichester IBRA subregions which contains;
  - High value fauna habitat (Rocky Hills, Stony Spinifex Plains and Hillslopes, Drainage Lines / Floodplains and Gibber Cracking Clay);
  - PEC (Four Plant Assemblages of the Wona Land System Priority 1 PEC);
  - Other important vegetation (potential sheetflow); and
  - Riparian vegetation.

HPPL will continue to liaise with DWER in relation to identifying programs which could be supported by the offset funding for this Proposal.

The PEOF has set a per hectare rate for four IBRA subregions in the Pilbara bioregion. The PEOF rates are based on the following considerations:

- The level of biodiversity protection in the region, and
- Cumulative impacts to environmental values, including high quality vegetation and the conservation of significant-species habitat.

Generally, the rates are divided into either a base rate or a higher rate. The rates are applied as follows:

- Base rate – impacts to native vegetation in good to excellent condition, which may include impacts to fauna habitat; and
- Higher rate – types of specialised environmental values, including but not limited to impacts on:
  - Riparian vegetation;
  - Threatened or Priority ecological communities;
  - Important vegetation types; and
  - Specialised fauna habitat.

Areas requiring offsets outlined below are conservative estimates based upon the most current mine planning information at the time of preparing this ERD. The actual quantum of impact and offsets required will be determined through an Impact Reconciliation Procedure (IRP; **Appendix 23**). The proposed offset rates and the estimated areas are provided in **Table 16-4**.

Table 16-4: PEOF Offset Values

Environmental Values	IBRA subregion	Offset Rate ($/ha)	Residual Impact Area (Ha)
Base rate			
Native vegetation in good to excellent condition	Fortescue	$1,972	0.00
Native vegetation in good to excellent condition	Chichester	$932	0.38
Higher rate			
Native vegetation in good to excellent condition, including:	Fortescue	$3,944	4,053.80
Riparian vegetation			4.31
Other important vegetation (sheet flow)			2,957.17
High Value fauna habitat			1,266.33
Native vegetation in good to excellent condition, including:	Chichester	$1,864	243.12
Four Plant Assemblages of the Wona Land System PEC (P1)			70.31
Other important vegetation (sheet flow)			16.34
High value fauna habitat			196.18

16.5 Impact Reconciliation

A draft IRP, that is consistent with the EPA's Instruction for preparing IRPs, has been prepared by HPPL and is provided in **Appendix 23**. The draft IRP has been prepared to support the assessment of the Proposal under both the EP Act and the EPBC Act.

Clearing required for the Proposal will be offset at the rates for the Chichester and Fortescue Plains sub-regions based on 2023/24 financial year rates and subject to annual indexation based on CPI (DWER 2021f).

HanRoy's Ground Disturbance Permit Procedure will apply to all ground disturbance undertaken for the Proposal. This ensures all clearing complies with relevant approval boundaries, limits and conditions. Following ground disturbing activities, HPPL will utilise on-site visual inspection and aerial imagery in combination with baseline mapping shapefiles and GIS technology to determine the extent of native vegetation and terrestrial fauna habitat cleared at the end of each financial year within the reporting period.

HPPL will prepare Impact Reconciliation Reports (IRRs) to document the actual clearing undertaken. The IRR(s) will be provided to DCCEEW and DWER to enable the contributions payable to be confirmed.

17 Cumulative Impact Assessment

In determining the significance of an impact, it is important to also consider the impacts at the regional scale. The cumulative impact assessment process considers both direct and indirect impacts that may combine over time and/or space, for example the potential for multiple mining projects to affect environmental values within a region. In isolation, a project may not be considered to have a significant impact, however, when considered along with other projects, activities and threats in the region, the cumulative impacts may be significant (EPA, 2014).

In consideration of the cumulative impacts of multiple projects in the Pilbara, the EPA prepared strategic advice under s16I of the EP Act, *Cumulative environmental impacts of development in the Pilbara region* (EPA, 2014). In this report, the EPA acknowledged that the Pilbara region is a national biodiversity hotspot. It is characterised as an area of very high biodiversity, with high species richness and many endemic flora and fauna species. The WA EPA also recognised that the Pilbara is an important area for the mining industry. The region is likely to remain the principal area for iron ore mining for the next 50 years, given the size of the iron ore reserves (DWER 2019, JBS&G 2022).

The EPA also recognised that the scale and nature of the clearing within the Pilbara has additional consequences. These include loss and fragmentation of fauna habitat, interruption of and changes in overland surface water flows, and reduced vegetation condition and fauna population resilience through mechanisms such as changes in fire regimes and increased feral pests and weeds (DPaW 2017b, JBS&G 2022).

The Development Envelope is situated in the upper section of the Fortescue River Valley and is located between the Chichester and Hamersley Ranges. The Fortescue Marsh is located approximately 60 km upstream of the Proposal. Therefore, as part of the assessment, the EPA Report 1484 (advice under s. 16(e)) – *Environmental and water assessments relating to mining and mining-related activities in the Fortescue Marsh management area* (EPA 2013), will also be considered. As outlined in the approved ESD for the Proposal, the CIA will consider the environmental effects of surrounding projects and activities within 100 km of the Proposal, with a total area of 3,141,588.47ha.

There is the potential for cumulative impacts on the environmental values for the following factors:

- Inland Waters;
- Flora and Vegetation;
- Terrestrial Fauna;
- Subterranean Fauna;
- Greenhouse Gas emissions;
- Terrestrial Environmental Quality;
- Air Quality; and
- Social Surroundings.

The following section presents the findings of the Cumulative Impact Assessment for the Proposal in context with the environmental effects of past and existing projects in the area, including reasonably foreseeable

projects which have not yet commenced. Projects considered in the cumulative impact assessment are presented in **Table 17-1** and shown in **Figure 17-1**.

The following assumptions apply to the cumulative impact assessment:

- The cumulative impact assessment has been undertaken using publicly available spatial data.
- Existing and proposed disturbances not associated with EP Act approvals could not be considered in a consistent and robust manner as no spatial data is publicly available. Cumulative impact calculations therefore do not take into consideration areas outside of those assessed under the EP Act;
- Given disturbance approved under the EP Act is within a Development Envelope or Purpose Permit boundary, cumulative impacts resulting from third-Party operations used in this assessment are conservative as the actual extent of clearing within those boundaries is likely to be significantly less.
- The Local Assessment Area for the purpose of the assessment is 100 km with a total area of 3,141,588.47ha, as required by the ESD, from the centroid of the Development Envelope. This assessment boundary has been applied to all relevant environmental factors, with the exception of Social Surrounds. The Regional Assessment Area is the Pilbara Bioregion with an area of 17,831,891.67ha. Refer to **Table 17-1** and **Figure 17-1.**
- The cumulative assessment for Social Surrounds has been undertaken within the Banjima Native Title Determination Area (refer to **Figure 17-10**).

Table 17-1: Projects within the Local Assessment Boundary

Existing Approved Proposal	Description
Roy Hill Infrastructure Mulga Downs Hub and Rail Spur (under assessment)	The Mulga Downs Hub and Rail Spur is located approximately 210 km south of Port Hedland and 180 km northwest of Newman in the Pilbara region of Western Australia. The Mulga Downs Hub and Rail Spur is for the development of a hub and rail spur to connect into the existing Roy Hill Railway for the transport of iron ore to Port Hedland. The Mulga Downs Hub and Rail Spur includes, and is not limited to, truck unloading and train loading facilities, product rehandling facilities, stockyards, a laboratory, a rail loop and rail service tracks, lateral access roads, rail associated infrastructure including a rail spur line, passing loops, sidings fibre optic cable, telecommunications towers, access tracks, borrow pits and laydown areas. Additionally, the Mulga Downs Hub and Rail Spur will contain bulk fuel storage and fuelling facility, energy supply infrastructure, ancillary buildings, wastewater treatment plant, accommodation village and an airstrip. Included are access roads for haul, construction, and light vehicles. Construction and operations water supply/bores and water storage will also be required. The Mulga Downs Hub and Rail Spur is located within a Development Envelope no greater than 17,714.01 ha and will require clearing of no more than 2,304.74 ha of native vegetation.
Mount Bruce Mining Pty Limited, Koodaideri Iron Ore Mine and Infrastructure Project (MS 0999)	An open cut iron ore mine and associated infrastructure for the extraction, processing and transport of iron ore. The Koodaideri Iron Ore Mine and Infrastructure Project is located approximately 110 km west-north-west of Newman in the Pilbara region of Western Australia and Includes a 167 km railway connecting the main network operated by Rio Tinto's Iron Ore business.
RHI Rail Mainline (MS 847)	RHIO operates a single heavy haulage rail line facility to Port Hedland. Referral documentation is no longer publicly available. The EPA report does not contain sufficient information to consider this project in the Cumulative Impact Assessment.

Existing Approved Proposal	Description
FMG Cloudbreak Iron Ore Mine and Life of Mine Expansion (MS 0899)	The Cloudbreak mine comprises an open pit mining operation, borefield, reinjection borefield and associated project infrastructure. It is located approximately 90 km to the east of the Proposal. Cloudbreak shares heavy haulage rail line facilities with Christmas Creek. The Proposal crosses the Cloudbreak/Christmas Creek rail line towards the northern boundary of the Development Envelope.
FMG Eliwana Railway Project (MS 1108)	The Eliwana 120 km heavy haulage rail line traverses the Chichester Ranges, Yule River catchment and Fortescue River Valley. The rail line may impact flora/vegetation and terrestrial fauna values of these areas and surface water flows to the north into the Yule River Valley.
FMG Solomon Iron Ore Project – Sustaining Production (MS 1062)	An iron ore mining and export operation based on iron ore resources located on the central Hamersley Ranges, approximately 60 km north of Tom Price, Western Australia. The FMG Solomon Mine involves the establishment and operation of the two mining areas (and associated infrastructure) and the construction and operation of a railway connecting the mining areas to Fortescue's existing Port Hedland to Cloudbreak rail line.
FMG Eliwana Mine (MS 1109)	The Lower Fortescue Borefield Development is located immediately to the south-west of E 47/1315 and the proposed groundwater supply borefield. Drawdown impacts related to the abstraction of groundwater may overlap those anticipated from the proposed E 47/1315 borefield.
BHP Pilbara Strategic Proposal	Strategic Proposal for future iron ore mining and associated activities and operations. New Operations include Caramulla, Coondiner, Gurinbiddy, Jinidi, Marillana, Mindy, Ministers North, Mudlark Munjina/Upper Marillana, Ophthalmia/Prairie Down, Rocklea, Roy Hill, Tandanya. Future expansions to new operations to these and existing mining operations at Jimblebar, Mining Area C, Newman and Yandi
HPPL Murray's Hill project	Refer to Section 2.2.5.1.
Brockman Mining Limited, Marillana Iron Ore Project (MS 855)	The Marillana iron ore project is a 700-750 Million tonne (Mt) iron ore mine, processing facility and associated infrastructure in the Pilbara Region of Western Australia. The project area is located approximately 100km north west of Newman in the Fortescue Valley, approximately 15 km south of the Fortescue Marsh. Note: The PER is not available on the EPA website. Therefore only information from the EPA Assessment Report (1376) is available.
FMG Pilbara Transmission Project (not assessed)	Pilbara Energy Company Pty Ltd (PEC), a wholly owned subsidiary of Fortescue Metals Group Limited (Fortescue), is proposing to develop the Pilbara Transmission Project (the Project), a high voltage transmission network in the Pilbara region of Western Australia. The Project comprises: • 220 kV overhead powerline infrastructure • terminal, substation and gantry infrastructure. The Project follows existing Fortescue rail corridors from Port Hedland to the Cloudbreak and Solomon mine sites and is approximately 375 km in length with pylons located approximately 300 m apart and at changes of direction/vertices.
Pilbara Energy Generation Project	Within cleared area of the Solomon Iron Ore Mine. Not considered further in this assessment.
Hamersley Iron Marandoo Iron Ore Project (MS 1020)	The Marandoo Mine Phase 1 is located in the central Pilbara region of Western Australia, approximately 37 km east of Tom Price and 77 km north-east of Paraburdoo. The mining component of the Project is confined to the existing Marandoo mine lease which was excised from Karijini National Park in 1991.

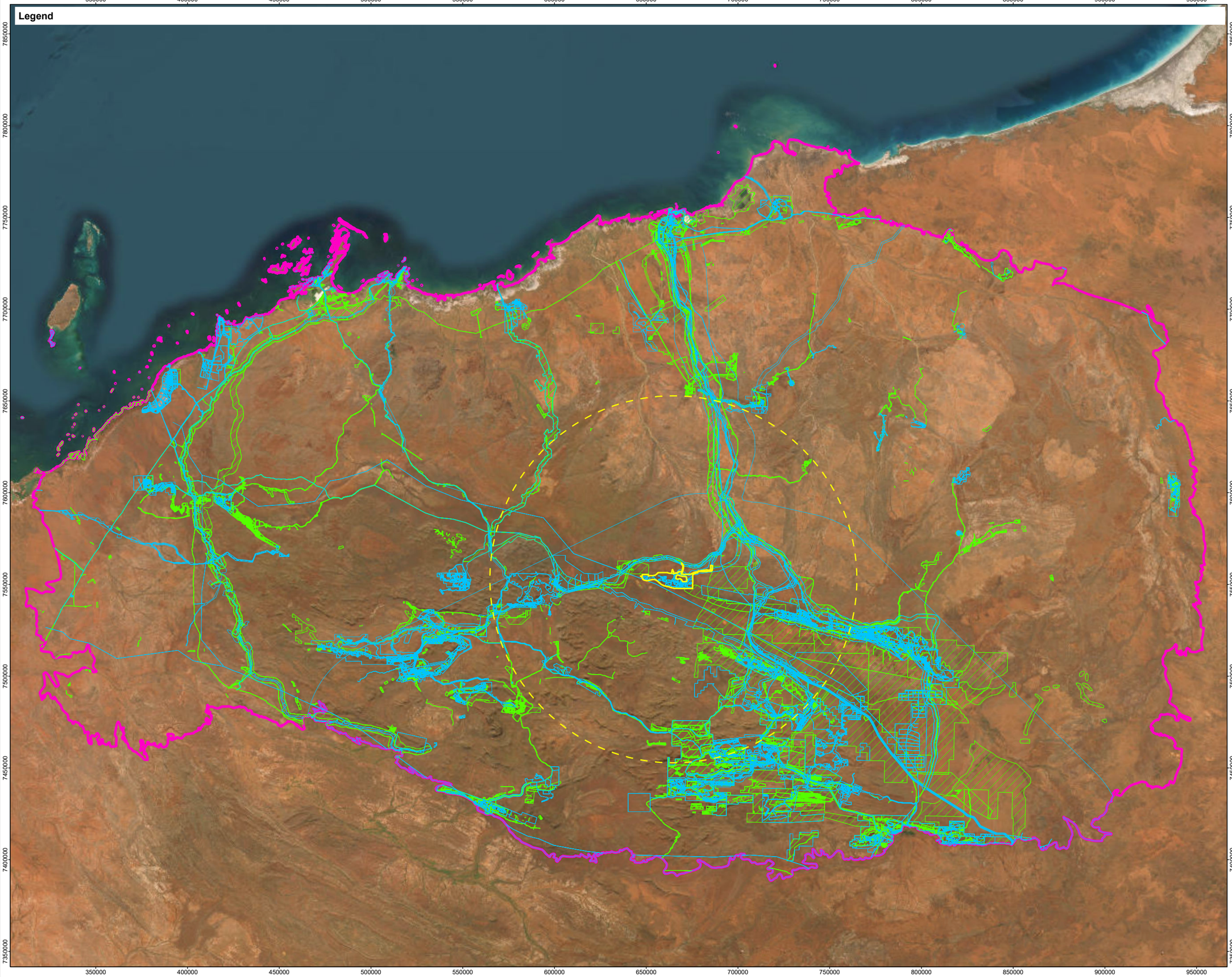
The total extent of disturbance within the Local Assessment Area for projects considered in the assessment and the additional disturbance proposed as a result of the Proposal is provided in **Table 17-2**. Approved projects represent 41.10% of the Local Assessment Area and the Proposal contributes an additional 0.14%.

Table 17-2: Cumulative Impacts within the Local Assessment Area

Description	Extent	
	Ha	% of Local Assessment Area
Extent of Local Assessment Area*	3,141,588.47	100
Extent of disturbance for approved projects	1,291,169.66	41.10
The Proposal (Proposed disturbance)	4,339.16	0.14

*Included the proposal development envelope

Figure 17-1: Projects in the Local and Regional Assessment Areas



Legend

- Development Envelope
- 100km buffer
- EPA Referred Significant Proposals (DWER-120)
- Clearing Instruments Proposals (Areas Applied to Clear) (DWER-075)
- Pilbara IBRA region (DCCEEW)

JBS&G

Job No: 67751	
Client: Hancock Prospecting Pty Ltd	
Version: A	Date: 30-Mar-2025
Drawn By: droberts	Checked By: MD

Scale 1:1,900,000 at A3

0 20 40
Kilometers

Coord. Sys. GDA2020 MGA Zone 50

Mulga Downs Iron Ore Mine
Central Pilbara, Western Australia

PROJECTS IN THE LOCAL AND REGIONAL ASSESSMENT AREAS

FIGURE 17.1

File Name: C:\Users\droberts\JBS&G Australia\JBS&G - DCS - Internal - Documents\Projects\Hancock Prospecting\01_Mine\EP Act\02_MapProjects\67751_MDIOM_EPAct_s43a_ERD_R01_Desktop.aprx
Image Reference: World Imagery: Earthstar Geographics

17.1 Inland Waters

The Proposal and other projects in the region may have a cumulative impact on inland waters at a regional scale through:

- Changes in surface hydrological regimes;
- Changes in groundwater levels through abstraction and/or reinjection.

17.1.1 Surface Water

As discussed in Section 6 the Development Envelope is located within the Chichester Ranges, on the northern flanks of the Lower Fortescue Valley which drains into Goodiadarrie Swamp which is fed by multiple surface water catchments (**Figure 7-1**). The Development Envelope intersects 16 delineated water catchment areas. East of the Development Envelope, the Goodiadarrie Hills form the western boundary of the Upper Fortescue River Catchment, disconnecting the Fortescue Valley in the vicinity of the Proposal from the Fortescue Marsh to the east (AQ2 2024b).

The Fortescue Valley (shown as the ESA) (**Figure 7-29**) and identified as DIWA066 is bound by the Chichester Range to the north and the Hamersley Range to the south. It comprises an extensive network of interconnected ephemeral claypans and broad floodplains which extend further to the west toward Mt Florance Station. Major surface water features, such as the Koodjeepindarranna and Gnalka Gnoona Claypans have developed at the interface of the alluvial fan margins and extensive shallow calcrete associated with the valley floor paleodrainage (AQ2, 2024a). Catchment inflows occur from the north and south, with the Development Envelope intersecting the northern flow path of the catchments of both wetlands (AQ2 2024).

The claypans are subject to frequent inundation associated with surface runoff from alluvial fans to the north and south of the Fortescue Valley following moderate to large rainfall events. Impacts from construction activities, clearing of native vegetation, and landforms and drainage channels on the alluvial fans may be subject to erosion and may lead to deposition of sediments within the claypans if not managed.

Cumulative impacts to the Fortescue Valley and the associated claypans are not considered significant from the Murray's Hill Project and diversion of surface water drainage has been assessed as part of the MDIOM Proposal's groundwater and surface water impact assessment in AQ2 (2024b). The mine development areas will cause a reduction in surface water flows to the environment on the downstream side of the Project, particularly around the Fridge Hill mining area, due to a reduction in contributing catchment areas. To reduce the impact of the mine development on the hydrological regime of the downstream and upstream environments, surface water diversions are proposed to divert water around mine development areas and reduce the likelihood of ponding.

The residual risks of the Project to the hydrological environment have been assessed taking into account the proposed mitigation measures and the results of the flood modelling and claypan water balance modelling. As discussed in Section 7, the residual risks were generally considered to be low.

A Water Management Plan (HanRoy 2024) has been prepared and provides additional information on the surface water management measures proposed.

The proposed surface water management measures (including culverts/bridge, stream training, grading of ground along the alignments to the culverts and erosion protection measures) of the Mulga Downs Hub and Rail project will minimise disruption to the surface water regime and reduce the potential effect of the rail alignments on environmental receptors such as the Fortescue Valley. Cumulative impacts are therefore considered to not be significant (Calibre 2022).

17.1.2 Groundwater

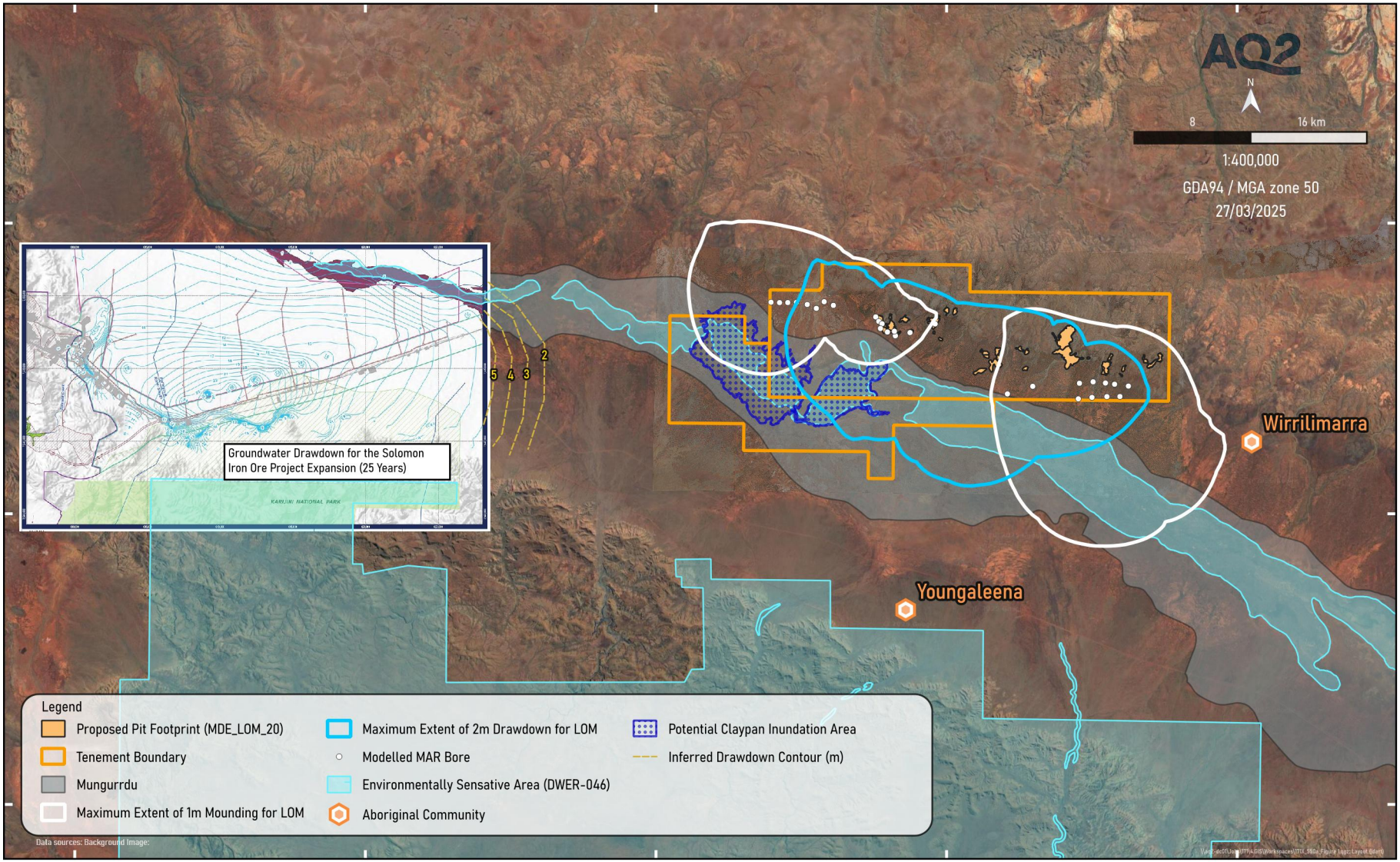
Other than Murray's Hill and Mulga Downs Hub and Rail Spur, the groundwater drawdown extent and surface water discharge extents from the Proposal do not overlap with impacts from other projects. Based on the available data for the proposed Solomon Iron Ore Expansion Project (Fortescue 2015), the predicted maximum extent of the 2m drawdown contour for the Proposal is ~16.5 km from the inferred 2m drawdown contours for the Solomon Iron Ore Expansion Project **(Figure 17-2)**.

Mining related to the Murray's Hill Proposal will not be below the groundwater table therefore eliminating the need for groundwater abstraction for dewatering. The average water demand for the Murray's Hill Proposal during both construction (6 months) and operation (5 years) is 3 ML/d (1.1 GL/yr), with the operation of the Murray's Hill Proposal anticipated to overlap with the commencement of the MDIOM Proposal. The water supply will be sourced from groundwater, within the mining / MAR areas for the MDIOM Proposal. Earlier groundwater abstraction in these areas will provide advanced dewatering and / or increased MAR capacity. As such, and as the water demands for the Murray's Hill Proposal are relatively small compared to the predicted dewatering for the mine (ie up to 11.4 GL/yr), the early groundwater abstraction for supply purposes are not anticipated to have a significant effect on the modelled drawdown / drawup with respect to impact assessment.

As the Mulga Downs Hub and Rail Spur will only commence once the MDIOM Proposal is in operation, the short-term water demands for the southern extent of the Hub and Spur intend to be sourced from the dewatering discharge at the mine. As such there will be no additional drawdown impacts from the Hub and Rail Spur in to the Fortescue Valley.

Groundwater abstraction at nearby communities and for pastoral activities are also considered minor in comparison to the potential impacts associated with the Proposal.

Figure 17-2: Maximum drawdown modelled (source AQ2)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27/03/2025
Groundwater Drawdown for the Solomon Iron Ore Project Expansion (25 Years)
KARIJINI NATIONAL PARK
5
4
3
2
Wirrilimarra
Youngaleena
Legend
Proposed Pit Footprint (MDE_LOM_20)
Tenement Boundary
Mungurrdu
Maximum Extent of 1m Mounding for LOM
Maximum Extent of 2m Drawdown for LOM
Modelled MAR Bore
Environmentally Sensative Area (DWER-046)
Aboriginal Community
Potential Claypan Inundation Area
Inferred Drawdown Contour (m)
Data sources: Background Image:

17.2 Vegetation and Flora

17.2.1 Land Systems

There are 48 land systems in the Local Assessment Area, of which 10 are inside the Development Envelope (Figure 17-3 and Figure 17-4). Potential cumulative impacts to these land systems are assessed in Table 17-3 for the Local and Regional Assessment Areas. One of these land systems, the Jamindie Land System, was identified as under 'Moderate threat in the EPA's report on the *cumulative environmental impacts of development in the Pilbara region* (EPA, 2014). The other nine land systems were not identified as being under threat.

Impacts to the Jamindie land System from approved projects in the Local and Regional Assessment Areas are 0.06% and 0.02% respectively, of which the Proposal contributes 3.40% and 1.31%.

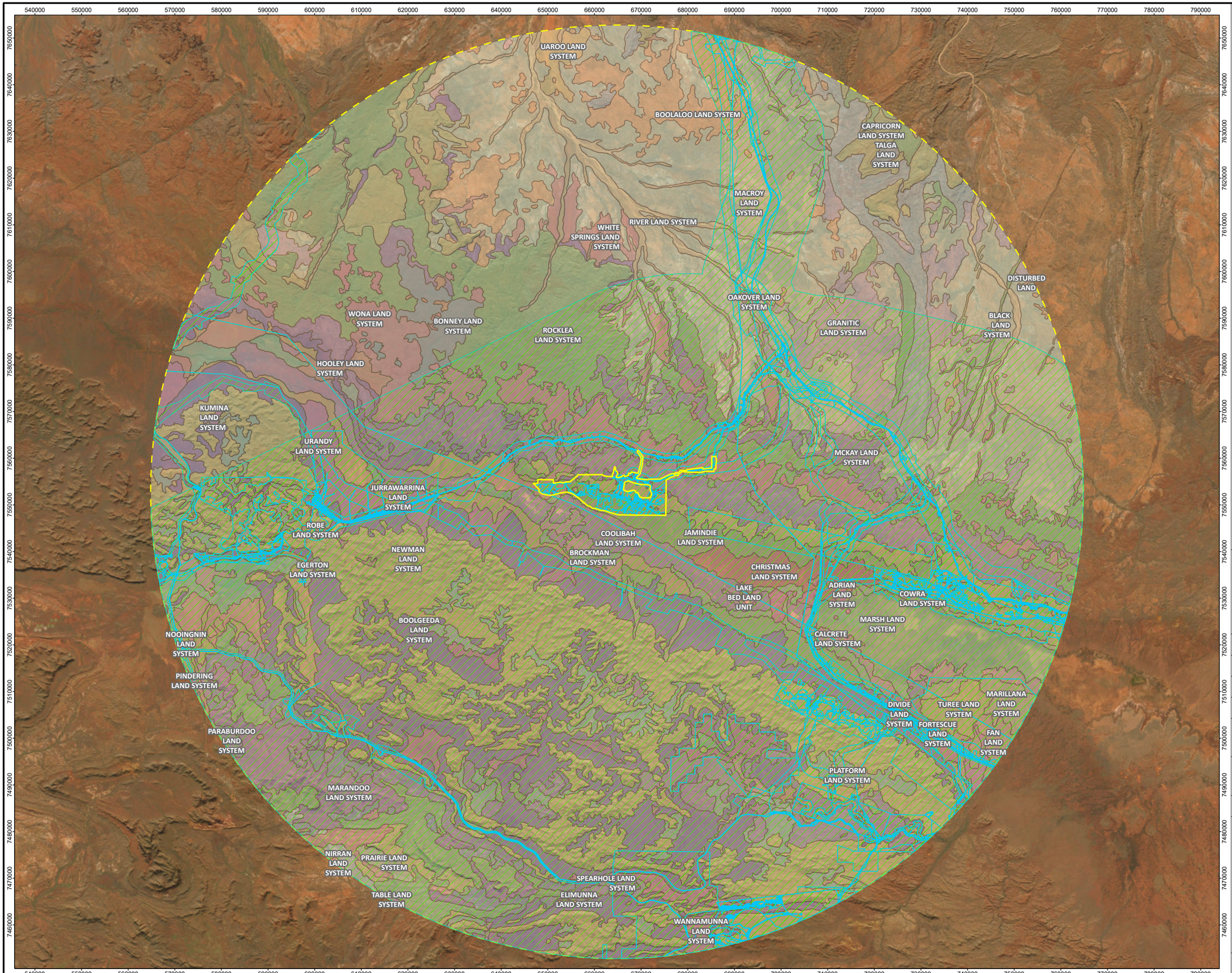
Based on the assessment, the Proposal does not significantly contribute to cumulative impacts to land systems within the Regional or Local Assessment Areas.

Table 17-3: Cumulative Impacts to Land Systems

Land System	Approved Impact Area (ha)	The Proposal Area of Impact (ha)	Local Impact			Regional Impact	
			Local Assessment Area Total (Ha)	Proposal Contribution (%)	Total Local Cumulative Impact (%)	Extent Regional Assessment Area (ha)	Proposal Contribution (%)
Bonney System	97.47	4.99	4762.31	0.10	2.15	74,940.55	0.01
Boolgeeda System	18,640.12	238.79	332,110.72	0.07	5.68	961,637.09	0.02
Brockman System	5872.12	16.11	11,845.19	0.14	49.71	74,108.02	0.02
Hooley System	705.61	488.56	7,116.41	6.87	16.78	59,081.14	0.83
Jamindie System	42.06	2,515.15	74,079.51	3.40	3.45	192,227.17	1.31
Jurrawarrina System	1,147.05	0	22,693.38	0.00	5.05	66,474.69	0.00
McKay System	6,731.17	87.67	177,414.74	0.05	3.84	426,144.89	0.02
Newman System	24,647.66	834.30	442,187.47	0.19	5.76	1,993,744.45	0.04

Land System	Approved Impact Area (ha)	The Proposal Area of Impact (ha)	Local Impact			Regional Impact	
			Local Assessment Area Total (Ha)	Proposal Contribution (%)	Total Local Cumulative Impact (%)	Extent Regional Assessment Area (ha)	Proposal Contribution (%)
Rocklea	1,659.80	66.02	99,993.46	0.07	1.73	2,881,635.56	0.00
Wona System	239.08	87.56	25,301.73	0.35	1.29	194,821.41	0.04

Figure 17-3: Cumulative Impact Assessment – Land Systems



Legend

- Development Envelope
- 100km buffer
- EPA Referred Significant Proposals (DWER-120)
- Clearing Instruments Proposals (Areas Applied to Clear) (DWER-075)

Soil Landscape Mapping - Rangelands (DPIRD-063)

- Adrian Land System
- Black Land System
- Bonney Land System
- Boolaloo Land System
- Boolgeeda Land System
- Brockman Land System
- Calcrete Land System
- Capricorn Land System
- Christmas Land System
- Coolibah Land System
- Cowra Land System
- Disturbed land
- Divide Land System
- Egerton Land System
- Elimunna Land System
- Fan Land System
- Fortescue Land System
- Granitic Land System
- Hooley Land System
- Jamindie Land System
- Jurrawarrina Land System
- Kumina Land System
- Lake bed land unit
- Macroy Land System
- Marandoo Land System
- Marillana Land System
- Marsh Land System
- McKay Land System
- Newman Land System
- Nirran Land System
- Nooingnin Land System
- Oakover Land System
- Paraburdoo Land System
- Pindering Land System
- Platform Land System
- Prairie Land System
- River Land System
- Robe Land System
- Rocklea Land System
- Spearhole Land System
- Table Land System
- Talga Land System
- Turee Land System
- Uaroo Land System
- Urandy Land System
- Wannamunna Land System
- White Springs Land System
- Wona Land System

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Scale 1:740,000 at A3

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Kilometers

Coord. Sys. GDA2020 MGA Zone 50

Mulga Downs Iron Ore Mine
Central Pilbara, Western Australia

CUMULATIVE IMPACT ASSESSMENT - LAND SYSTEMS

FIGURE 17.3

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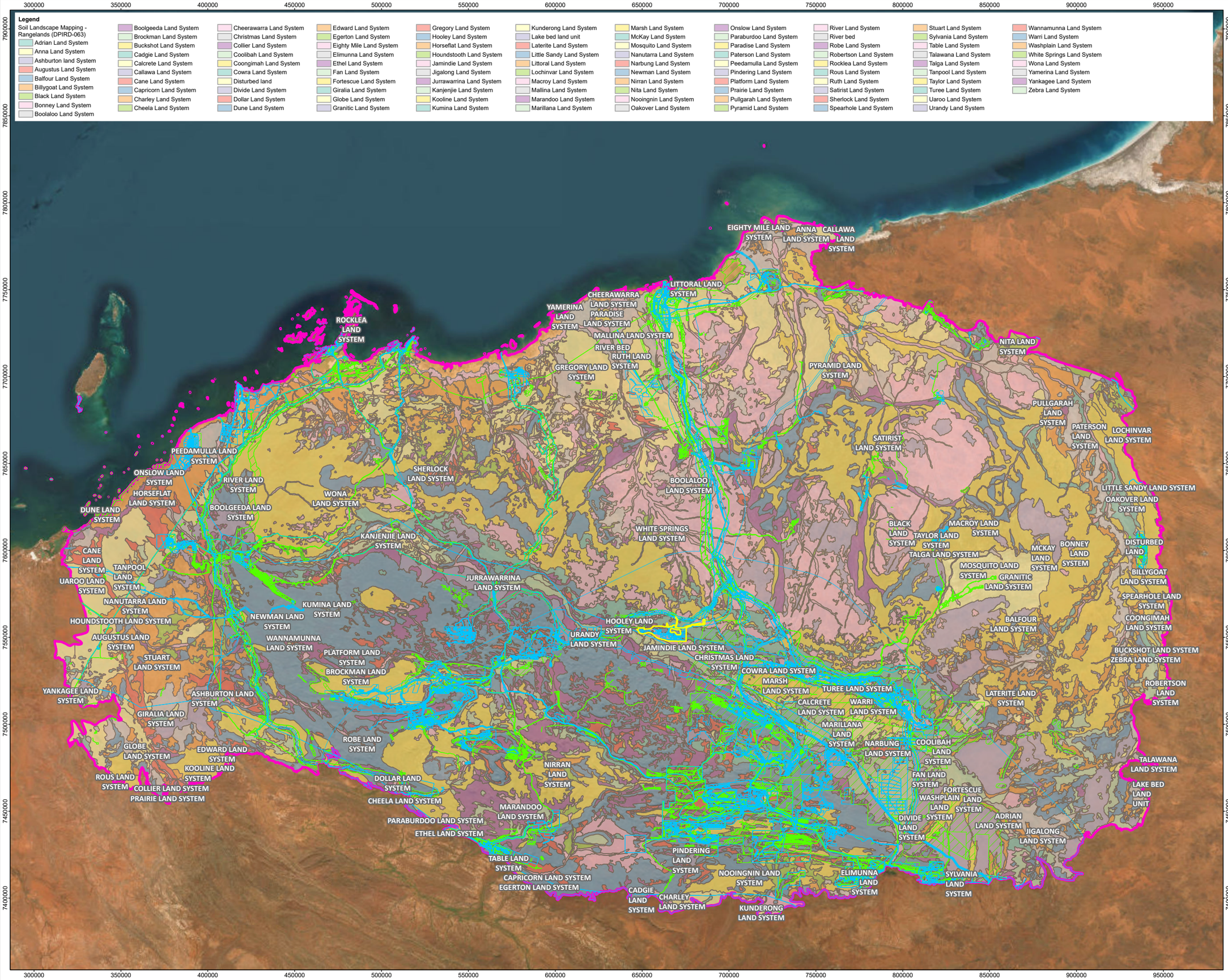
Image Reference: World Imagery: Earthstar Geographics

Figure 17-4: Cumulative Impact Assessment – Pilbara IBRA Land Systems



Legend

- Development Envelope
- EPA Referred Significant Proposals (DWER-120)
- Clearing Instruments Proposals (Areas Applied to Clear) (DWER-075)
- Pilbara IBRA region (DCCEEW)

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CUMULATIVE IMPACT ASSESSMENT – PILBARA IBRA LAND SYSTEMS

FIGURE 17.4

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17.2.2 Broad-scale mapping

Clearing for the Proposal will result in the loss of native vegetation from the Development Envelope. Detailed vegetation mapping has been completed for the Development Envelope; however, it is not available for the broader Pilbara region. Therefore, the assessment of potential cumulative impacts to vegetation require broader mapping available across the region. Broad-scale vegetation mapping has been used to assess the cumulative loss of vegetation and flora from existing and reasonably foreseeable future projects in the region.

There are 31 pre-European vegetation associations in the Local Assessment Area, four of which are inside the Development Envelope (**Figure 17-5** and **Figure 17-6**). Cumulative disturbance to these vegetation associations is assessed in **Table 17-4**.

The Proposal will result in the clearing of up to 4,339.16 ha of native vegetation in addition to the potential clearing of approximately 76,900.09 ha within the Local Assessment Area. The current extent of vegetation within the Pilbara region is 17,731,765 ha (GoWA 2019). Based on the predicted impacts, clearing for the Proposal will contribute a further 1.17% to vegetation clearing within the bioregion (Regional Assessment Area). The Proposal contributes 2.42% to the total clearing extent within the Local Assessment Area.

A total of 164.63 ha within the Development Envelope has been recorded as cleared/completely degraded as a result of previous activities including drill lines, access tracks, fence lines and existing infrastructure of which 42.23 ha occurs within the Indicative Footprint. There is a total of 122.40 ha of cleared/completely degraded areas within the Development Envelope which occurs outside of the Proposal Indicative Footprint resulting from previous exploration and pastoral activities. The majority of these existing disturbed areas are narrow and linear.

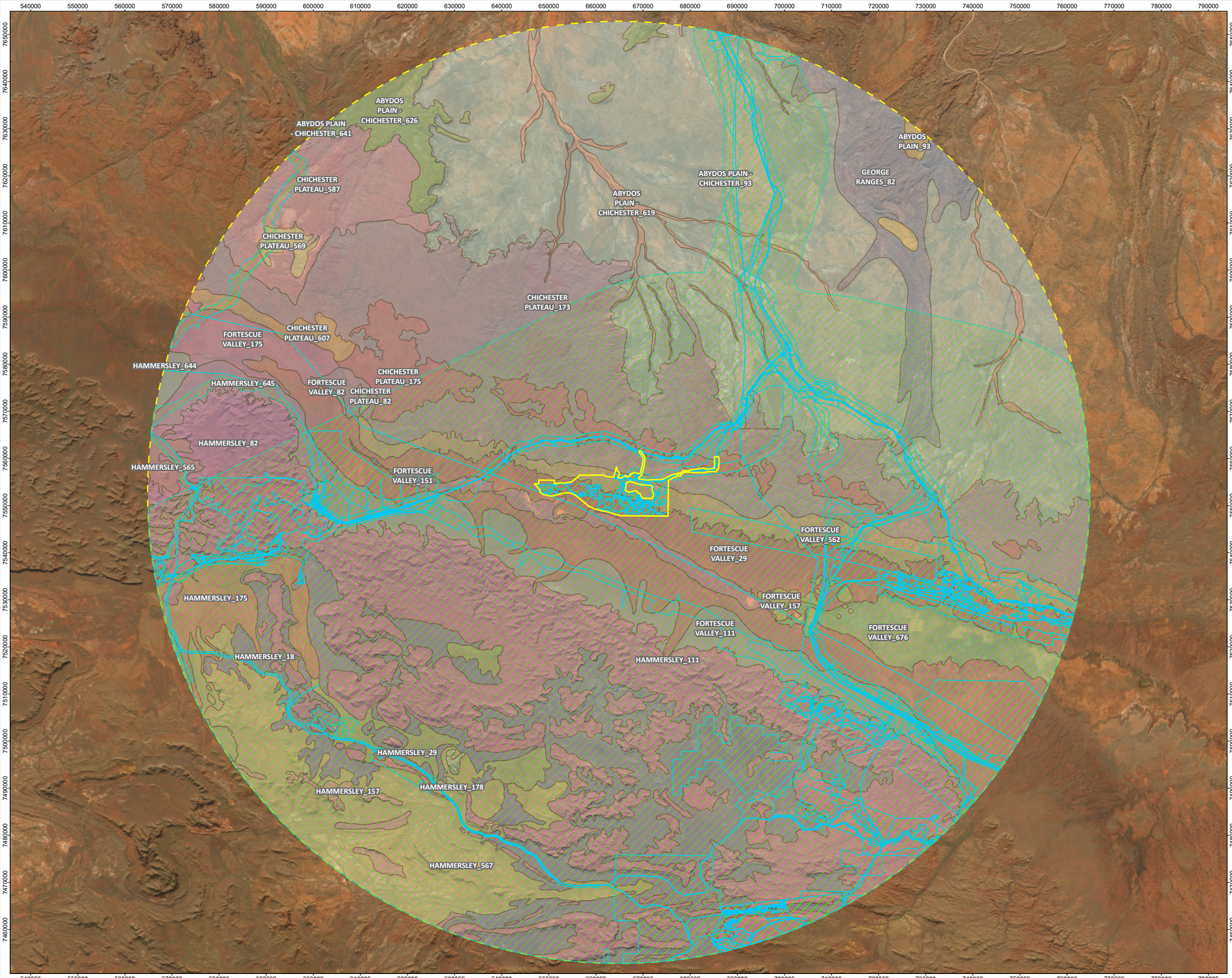
Based on the assessment, the Proposal does not significantly contribute to cumulative impacts to pre-European vegetation within the Regional or Local Assessment Areas.

Table 17-4: Cumulative Impacts Pre-European Vegetation

Vegetation Association	Approved Impact Area (ha)	The Proposal Area of Impact (ha)	Local Impact			Regional Impact	
			Total Area Mapped in Local Assessment Area (Ha)	Proposal Impact Contribution (%)	Total Cumulative Impact (%)	Area of Impact within Regional Assessment Area (ha)	Proposal Contribution (%)
29: Sparse Low Mulga Woodland, discontinuous in scattered groups.	13,844.78	3,195.44	297,806.08	1.07	5.72	1,109,382.90	0.29
173: Hummock grasslands, shrub steppe; Kanji over Soft Spinifex & Limestone Spinifex on basalt.	24788.69	183.15	395,210.04	0.05	6.32	1,753,520.20	0.01
175: Grassland short bunch-grass savanna.	37,884.62	57.77	107,244.38	0.05	35.38	389,121.33	0.01

562: Mosaic of low Mulga woodland in valleys, and open low Snappy gum tree steppe and Hummock grasslands of Limestone Spinifex.	382.00	902.80	72,669.71	1.24	1.77	103,662.41	0.87

Figure 17-5: Cumulative Impact Assessment – Pre-European Vegetation



Legend

- Development Envelope
- 100km buffer
- EPA Referred Significant Proposals (DWER-120)
- Clearing Instruments Proposals (Areas Applied to Clear) (DWER-075)

Pre-European Vegetation (DPIRD-006)
System Association

- ABYDOS PLAIN - CHICHESTER_619
- ABYDOS PLAIN - CHICHESTER_626
- ABYDOS PLAIN - CHICHESTER_641
- ABYDOS PLAIN - CHICHESTER_93
- ABYDOS PLAIN_93
- CHICHESTER PLATEAU_173
- CHICHESTER PLATEAU_175
- CHICHESTER PLATEAU_569
- CHICHESTER PLATEAU_587
- CHICHESTER PLATEAU_607
- CHICHESTER PLATEAU_82
- FORTESCUE VALLEY_111
- FORTESCUE VALLEY_151
- FORTESCUE VALLEY_157
- FORTESCUE VALLEY_175
- FORTESCUE VALLEY_29
- FORTESCUE VALLEY_562
- FORTESCUE VALLEY_676
- FORTESCUE VALLEY_82
- GEORGE RANGES_82
- HAMMERSLEY_111
- HAMMERSLEY_157
- HAMMERSLEY_175
- HAMMERSLEY_178
- HAMMERSLEY_18
- HAMMERSLEY_29
- HAMMERSLEY_565
- HAMMERSLEY_567
- HAMMERSLEY_644
- HAMMERSLEY_645
- HAMMERSLEY_82

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CUMULATIVE IMPACT ASSESSMENT - PRE-EUROPEAN VEGETATION

FIGURE 17.5

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