APPENDIX B: SOCIAL SURROUNDINGS

B.1: Traditional Owner Consultation Overview

a. Consultation Framework

b. Social Surroundings Consultation Process and Progress

a. Consultation Framework

B.1 a. Consultation Framework:

Under their respective Agreements, the Proponent and each Traditional Owner group have agreed heritage-specific engagement processes, including Heritage Protocols, which provide for archaeological and ethnographic surveys, associated consultation and meetings and Cultural Heritage Management Plans to be undertaken or developed.

Formal, informal and ad-hoc Traditional Owner meetings and forums include:

Six-monthly Local Implementation Committee (LIC) meetings: The LIC are existing Traditional Owner specific forums established through final Participation Agreements Rio Tinto has with Traditional Owner groups. The LIC forums facilitate the implementation of the regional standards contained in the Regional Framework Deed or the implementation plan in the Participation Agreements. These standards or plans are in respect of cultural heritage management, land access, environmental management, life of mine planning and cultural awareness training, employment and training, business development and contracting. At least once a year, the forum discusses and makes recommendations to Rio Tinto on matters regarding the standards or implementation plans. The forum is constituted by six Traditional Owner group representatives and three senior Rio Tinto representatives. The LIC forum is convened at least once every six months.

Heritage surveys: Rio Tinto is committed to undertaking heritage surveys at the earliest practicable stage of project development including baseline surveys. Heritage surveys may be either ethnographic or archaeological in nature. In-field heritage surveys are scheduled and completed via the Traditional Owner Registered Native Title Bodies Corporate (RNTBC) with Traditional Owner group representatives (including consultants) to identify sites of special significance and Aboriginal sites (including cultural values) of immediate concern to ensure these sites are considered in the long-term development decisions by Rio Tinto. Rio Tinto is committed to avoiding all identified heritage sites where possible however instances where this is not practical, prior to impact to any site, Rio Tinto consults Traditional Owners about how heritage values of Aboriginal sites may be preserved, recorded or impact mitigated.

Heritage specific consultation forums: Heritage specific consultations often are carried out through special function heritage subcommittees of the LIC. Both Ngarlawangga and Yinhawangka have these subcommittees. Unless otherwise determined by a special resolution of the LIC, the Heritage Sub Committee (HSC - Ngarlawangga) and Heritage Environment Committee (HEC – Yinhawangka) do not exceed four members (with at least one Rio Tinto and Traditional Owner member), they meet regularly, and they report directly to the LIC. The HSCs collaboratively manage and oversee the conduct of heritage surveys, consultations and other cultural heritage management procedures on the country of each Traditional Owner group.

Life of Mine Planning (LoMP) meetings: The Life of Mine Plan Forum is an avenue established through the Regional Framework Deed to allow Rio Tinto and Traditional Owners to work collaboratively on land and water related aspects of mine planning and development of infrastructure. The forum meets at least twice a year and provides opportunity for Rio Tinto and Traditional Owner groups to discuss among others what mining is happening or what projects are planned on Traditional Owner's Country in the Pilbara. Through LoMP engagements, Traditional Owners provide Rio Tinto timely information, feedback including concerns and ideas in relation to Rio Tinto's projects (across the different development stages) and key approval applications. LoMP forums constituted by four Rio Tinto representatives (at least one with senior managerial responsibility) and the LIC

members of the Traditional Owner group. To date (September 2022) LoMP forums have been established with Ngarlawangga; but are yet to be established with Yinhawangka as standalone forums. LoMP updates are currently provided to Yinhawangka via their HEC or LIC meetings in place of an additional consultation forum.

Approvals specific consultation and engagement and other meetings as required: Additional specific consultations and engagements are undertaken with Yinhawangka or Ngarlawangga as required. These meetings are generally requested to consult on topics that may dominate agendas and discussions of other engagements and provide all parties with a separate opportunity to consider and discuss in depth. Additionally, subject matter experts or external consultants may be requested by Traditional Owners to specifically discuss topics and themes in more detail.

Social Surroundings consultation: Further to the significant consultation already undertaken (Table A- 1), Rio Tinto and each Traditional Owner group have established and are continuing to develop and undertake dedicated Social Surroundings consultation forums, including both in-field consultation as well as meetings and workshops to support their mutually agreed approach for codesigned development of approvals documents, including ERDs and SCHMPs. Each Traditional Owner group is represented by individuals from the group, including elders with cultural authority and others who are community-recognised spokespeople, along with officers from the relevant RNTBC and supporting personnel engaged by the RNTBC, such as anthropologists or environmental approval specialists as appropriate for any particular session. These supporting personnel may also be engaged by the RNTBC to assist in the development, revision and drafting of approvals documents. The Proponent can be represented by a range of personnel suited to the topics under discussion, but other senior personnel may also be present, such as study leads and managers, and various discipline representatives such as cultural heritage advisors.

Ethnobotanical/Land Management or Traditional Ecological Knowledge consultation: The primary purpose of TEK surveys is to develop a written record of existing knowledge and known language names of flora and fauna as provided by the Traditional Owners, for use within their community, cultural knowledge base and ranger programs. TEK surveys also record an understanding of plants that are traditionally and culturally important to the past and current lives of the Traditional Owners, to inform impact assessment with respect to both singular and cumulative mining developments.

Through this framework, the Proponent and the Traditional Owner groups work together to share information to support the management of the social, cultural, heritage and environmental values of the areas in which the Proponent operates on their Country.

Traditional Owner Agreements

The Proponent has also committed to not enforcing any Agreements clauses that restrict Traditional Owners from raising concerns about cultural heritage matters with anyone or applying for statutory protection of any cultural heritage sites.

The Proponent is working hard to rebuild trust with Traditional Owners and make changes to its business to strengthen its approach to cultural heritage and improve the way it engages to ensure incidents like Juukan Gorge never happen again. To improve its practices, Rio Tinto is moving to a co-management of Country approach which will enhance protection of heritage and better outcomes for Traditional Owners in the Pilbara. A key component of this is ongoing modernisation of Rio Tinto's Agreements with Traditional Owners which will introduce mechanisms into the Agreements to respond better to new information that may emerge about cultural heritage sites, cease enforcement of clauses such as those that

restrict Traditional Owners from raising concerns about cultural heritage matters to anyone or applying for a statutory protection of any cultural heritage site. In addition, Rio Tinto has established the Australian Advisory Group (AAG). The AAG brings together a broader, eminent group of independent advisers to provide guidance on current and emerging concerns, and better manage policies and positions that are important to both Australian communities and Rio Tinto's broader business.

Traditional Owner Social Surroundings Consultation Principles, Approach and Objectives

The Proponent is committed to the principles of authentic, meaningful, transparent and integrated consultation with each Traditional Owner group, and recognises it is important to understand the cultural context and norms of each Traditional Owner group and to integrate this into a jointly developed consultation process.

The consultation process developed by the Proponent with the Ngarlawangga and Yinhawangka Traditional Owners aims to take into account that each Traditional Owner group has its own governance structure and internal decision-making processes.

As with any group, the interests and views amongst the Elders/knowledge holders, other Traditional Owner individuals and their RNTBC, may differ from each other. Under relevant Agreements, the Proponent is required to engage with, and seek input/decisions from, each RNTBC. However, as part of its Social Surroundings consultation, the Proponent has sought to engage with a broader representative group of Traditional Owners who have authority to speak for the land, the subject of the Development Envelope. These individuals are selected through the RNTBC's governance processes to take part in both in-field and workshop style consultation.

As there are two Traditional Owner groups involved in the Proposal, the Proponent recognises that there are cultural protocols around which areas and concerns each group is able to advise and be consulted on. This has meant consultation includes qualitative and quantitative approaches following local protocols involving a variety of methods as appropriate to and as informed by each group and families within those groups, and the persons being consulted – examples of approaches used to date include one-on-one interviews with elders (recognising gender-specific knowledge holders), on-country Social Surroundings consultation with 10-20 Traditional Owners, as well as workshop-style meetings, archaeological and ethnographic heritage surveys and other heritage specific consultation, story-telling, filming and sound recordings, as well as ensuring supporting personnel have attended as required during these approaches, at the direction of the RNTBC s.

Traditional Owners and their support staff reside in widespread locations, mostly in Pilbara towns and communities (for example, Newman, Tom Price, Paraburdoo, Port Hedland and smaller Aboriginal communities) but also beyond (for example, Perth) so arrangements for in-person meetings and field trips are contingent on the Proponent being adaptable and flexible to ensure all key people are involved as needed.

Free, Prior and Informed Consent

The Proponent is committed to striving to achieve the free, prior and informed consent of the Traditional Owner groups affected by the Proposal with respect to:

- Achieving each group's endorsement of, and participation in, the mutually agreed upon consultation process and approvals document development

- Obtaining information from Traditional Owners regarding the tangible and intangible social surroundings values inherent in their Country
- Working with each group to understand potential impacts from the project, listening and responding to ensure impacts are minimised and managed on their key values.
- However, the Proponent acknowledges that it is not culturally appropriate to request the outright and absolute support and consent of some or all Traditional Owners for all elements of the Proposal. In such circumstances the Proponent aims to obtain the non-opposition of the relevant RNTBC to the Proposal.

Consultation Objectives

The objectives for Traditional Owner consultation and engagement in respect of the Proposal are to:

- Keep Traditional Owners informed at all stages of the study and approvals process (and continuing throughout the life of the Proposal)
- Seek input and feedback to understand how the Proposal impacts social, cultural and heritage values and use this information to develop options to avoid, reduce and manage these impacts for consultation with Traditional Owners and seek their input on these options to inform decision making
- Obtain Traditional Owner non-opposition for the Proposal to be referred to the EPA and, ultimately, for the Proposal itself
- Identify, acknowledge and incorporate social, cultural and heritage values in Proposal design to, where possible, avoid negative impacts or where this is not possible to mitigate or manage negative impacts
- Co-design SCHMPs with Traditional Owners that:
- Address the EP Act objective for Social Surroundings
- Identify and minimise impacts of the Proposal on Traditional Owner social surroundings
- Provide an agreed framework for Traditional Owner involvement in Proposal decision-making, activities and oversight processes relevant to social surroundings
- Co-establish, implement and review minimization, mitigation and management activities, and oversight processes relevant to social surroundings through the life of the Proposal
- Meet Native Title Agreement (NTA) commitments
- Contribute to building and maintaining good, respectful relationships with Traditional Owners and other stakeholders
- Demonstrate, and continue to develop, good practice engagement.

b. Social Surroundings Consultation Process and Progress

Social Surroundings Consultation Process and Progress

Provide background and context to the Proposal

Identify key values or issues/concerns

Identify design/planning/management options to address key issues/concerns, taking into account the mitigation hierarchy, being

- Avoid significant impacts to social surroundings where possible
- Otherwise minimise impacts, through the open discussion of design options and operation limits
- Discuss rehabilitation strategies specific to individual areas

Consultation in respect of options, seek input into key design decisions

Communicate decisions and agree outcomes including ongoing planning and management, if required

Provide the draft Social Surroundings chapter and draft ERD to Traditional Owner groups for review and feedback prior to lodgement with the EPA

Cooperation and development of SCHMPs with each Traditional Owner group to address specific issues/concerns and agreed management actions and framework for ongoing consultation.

Consultation will continue throughout the environmental approvals process, including during the development of SCHMPs, and throughout the life of the Proposal.

Table A- 1 Social Surroundings Consultation Program

Consultation Stage	Purpose	Details of Consultation			
		Ngarlawangga	Date	Yinhawangka	Date
Initial / Pre-Referral Meeting	Introduce and establish a baseline understanding of the Proposal and work to investigate its potential development.	Local Implementation Committee (LIC) Meeting - Detailed Overview and introduction of WAN B2020 and Part IV	Sept 2019	LIC Meeting - Detailed Overview and introduction of WAN B2020 and Part IV .	Oct 2019
		West Angelas B2020 and Part IV Social Surroundings Meeting.	Oct 2020	West Angelas WAN B2020 and Part IV Social Surroundings Video Conference	July 2020
				Heritage and Environment Committee (HEC) Meeting – WAN B2020 and Part IV update	September 2020
Community Meeting / Pre-Field Work Consultation	To discuss the Proposal and to scope Social Surroundings fieldwork.	RTIO West Angelas, Mt Ella & Hope Down 2 Expansion Project Proposal and Introduction to Social Surroundings meetings and planning.	9–10 December 2020	N/A	N/A
		Social Surroundings Traditional Ecological Knowledge TEK Flora Project Proposal	August 2022		
In-Field Site Visits and Consultation	On-Country assessments to explain the proposal and development options to Traditional Owners, provide clarity where they may	West Angelas, Mt Ella and Hope Downs 2 Phase 1 Scoping Field trip	9–13 April 2021	West Angelas Social Surroundings Field Trip 1	22–27 March 2021

Consultation Stage	Purpose	Details of Consultation			
		Ngarlawangga	Date	Yinhawangka	Date
(several as needed)	intersect values, seek to understand concerns or potential impacts to values, and to provide feedback on previously raised concerns, identify known and 'new' sites or areas of significance. Being on Country is generally the preferred setting for Traditional Owners to understand the Proposal and the development options, and to explain, clarify, confirm or provide further information on social and cultural heritage values or concerns. The site visits also include areas of direct and potential indirect impacts (including examples from nearby operating mines), with on-ground discussion of how Country may be affected, and the potential significance of this for people. Relevant data and information is recorded for input into project planning, impact assessment and mitigation and management strategies.	West Angelas Social Surrounding Fieldtrip 2	21–23 September 2021	West Angelas Social Surroundings Field Trip 2	(25–28 May 2021
		Mt Ella Ngarlawangga & Yinhawangka Mt Ella In-field Consultation 1	10– 13 November 2021	West Angelas Social Surroundings Field Trip 3	10–14 November 2021
		Mt Ella Ngarlawangga, Yinhawangka and Martu Mt Ella In-field Consultation 2	28 February–2 March 2022	West Angelas Social Surroundings Field Trip 4	1 March 2022
		Ngarlawangga Traditional Ecological Knowledge Flora Fieldtrip	19–24 August 2021 (ongoing)		
Post Site Visit Meetings (several as needed)	To review and discuss the outcomes of in-field consultation and to plan additional in-field consultation. Additional meetings will continue to be convened as required and Traditional Owner capacity permits.	NAC RTIO West Angelas, Mt Ella and Hope Downs 2 Phase 1 Scoping Fieldtrip debrief	29 July 2021	HEC Meeting – Study and WAN RP Overview and Values discussion: May 2021	
		Life of Mine Planning – High Level study update	September 2021	HEC Meeting – High level study update and Social Surroundings discussions	October 2021
		Social Surroundings Meeting - Yinhawangka and Ngarlawangga shared values	21 October 2021	Social Surroundings Meeting - Yinhawangka and Ngarlawangga shared values	21 October 2021

Consultation Stage	Purpose	Details of Consultation			
		Ngarlawangga	Date	Yinhawangka	Date
		Ngarlawangga Aboriginal Corporation WAN Social Surroundings Consolidation Workshop	10–11 May 2022	HEC Meeting – High level study and Social Surroundings update	March 2022
				Consolidation Workshop: Preliminary Advice	21 June 2022:
				YAC Board Meeting – WAN RP and Study Amendments:	Aug 2022
Document review and SCHMP development meetings/ workshops	Consultation workshops to review Social Surroundings recommendations, project development, mine planning and amendments, Subject Matter Expert updates, commitments and Environmental Review Document, Social Surroundings Chapter, and Social Cultural Heritage Management Plan development	Life of Mine Planning – Social Surroundings Recommendations discussion, Chapter and SCHMP introduction	June 2022 28 February 2023	Social, Cultural and Heritage Management Plan Workshop (SCHMPW): SCHMP	22 June 2022
		Social Surroundings Chapter, SCHMP Workshops 1-3	13–14 Sept 2022 (Dampier) 13–14 Oct 2022 (West Angelas – On Country)	Social Surroundings Chapter, SCHMP Workshops 1-3	6–7 Sept 2022 (Karratha) 4–5 Oct 2022 (Paraburdoo – On Country) 15–16 Nov 2022 (West Angelas – On Country)

Consultation Stage	Purpose	Details of Consultation			
		Ngarlawangga	Date	Yinhawangka	Date
		Social Surroundings Chapter, SCHMP & ERD workshops 4-5	27-28 April 2023 (West Angelas – On Country) September 2023 (Dates to be confirmed)	Social Surroundings Chapter, SCHMP & ERD workshops 4-5	4-5 April 2023 (West Angelas – On Country. EPA Attendance September 2023 (Dates to be confirmed)

B.2: Commercial-In-Confidence - Ngarlawangga Social Surroundings

a. CONFIDENTIAL Final Report of Ngarlawangga Aboriginal Corporation WAN Social Surroundings Consultations (Herrmann and Millett 2022)

b. CONFIDENTIAL Ngarlawangga – Rio Tinto Iron Ore Social Surroundings Consultations Regarding the West Angelas Proposal. Summary Report No. 2 (Stevens 2023b)

c. CONFIDENTIAL Ngarlawangga Traditional Ecological Knowledge (TEK) – Ethnobotanical Survey 1 August 2021 – Interim Report (Long & Associates 2021)

d. CONFIDENTIAL Ngarlawangga People Social Cultural Heritage Management Plan (SCHMP)

e. CONFIDENTIAL Ngarlawangga Aboriginal Corporation Board letter of acknowledgment

f. CONFIDENTIAL Ngarlawangga Social Surroundings Assessment Recommendations

B.3: Yinhawangka Social Surroundings

a. Final Report of a Social Surroundings Assessment for West Angelas Revised Proposal (Yinhawangka CLH and Archae-aus 2022)

b. Yinhawangka Social Cultural Heritage Management Plan – SCHMP

c. Yinhawangka Aboriginal Corporation Board Letter of Acknowledgement

d. Yinhawangka Social Surroundings Assessment Recommendations

a. Final Report of a Social Surroundings Assessment for West Angelas Revised Proposal (Yinhawangka CLH and Archae-aus 2022)


YINHAWANGKA
ABORIGINAL CORPORATION
Social Surroundings Assessment
Yinhawangka AC | for Rio Tinto
REPORT

Report

Report of a Social Surroundings Assessment for West Angelas Revised Proposal, Western Australia

For Yinhawangka Aboriginal Corporation
on behalf of
Rio Tinto Iron Ore Pty Ltd
by Yinhawangka Common Law Holders and Archae-aus Pty Ltd
October 2022

PROJECT REFERENCE

Rio Tinto Iron Ore: West Angelas Revised Proposal Social Surroundings Assessment
Archae-aus Pty Ltd: YC21WS1a_Q001

There are images in this document. Aboriginal and Torres Strait Islander People are advised that it may contain names or images of people who have passed.

ABOUT THIS SOCIAL SURROUNDINGS ASSESSMENT

This Social Surroundings Assessment was conducted in consultation with Yinhawangka Common Law Holders, to consider Yinhawangka values, practices, interests, knowledge, stories and aspirations for their Country in relation to Rio Tinto Iron Ore's West Angelas Revised Proposal.

The assessment comprised desktop research, four fieldtrips and two workshops, reported as follows:

- Section 1: Introduction
- Section 2: Context
- Section 3: Results
- Section 4: Discussion
- Section 5: Recommendations

This report will inform further workshops and a Social, Cultural and Heritage Management Plan, which RTIO must submit to the Environmental Protection Authority for assessment under the Environmental Protection Act 1986 (WA). Together, these components comprise the Social Surroundings Assessment for the West Angelas Revised Proposal.

AUTHORSHIP & REVIEW

This report was prepared by Dirima Cuthbert (MEnvDes [UWA]; BDes [USyd]; BSc Hons Anthropology [UWA]) with assistance from Dr Myles Mitchell (PhD Anthropology [ANU]; BA Communication Studies [UWA]). Maps 1, 3, 4 and 5 were prepared by Paul Connolly (BSc Environmental Management [ECU]. Maps 3-5 use base layers supplied by Rio Tinto Iron Ore. Map 2 was supplied by Rio Tinto Iron Ore.

Film clips and drone footage recorded on the SSA were prepared by Michael Bonner (BArchaeology [Flinders University]; MArts Screen, Documentary [Film, Television and Radio School]. These are to be reviewed by Yinhawangka Common Law Holders. Permission will be obtained from those who feature in the footage and from any other relevant parties before a decision is made to incorporate the footage in this Social Surroundings Assessment.

Paul Connolly reviewed this report for compliance with the Environmental Protection Act 1986 (WA), and Dr Anna Fagan reviewed it for Yinhawangka Aboriginal Corporation. Expert adviser Professor David Trigger reviewed a previous Social Surroundings Assessment report (Yinhawangka Common Law Holders and Archae-aus 2021) which was prepared by Archae-aus for Rio Tinto Iron Ore's Greater Paraburdoo Operations. Reviewers' queries and concerns have been addressed in this report to the satisfaction of Yinhawangka Aboriginal Corporation.

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The recommendations contained in this report have been endorsed by Yinhawangka Common Law Holders who participated in this Social Surroundings Assessment, Yinhawangka Aboriginal Corporation and Rio Tinto Iron Ore.

ACKNOWLEDGMENTS

Archae-aus Pty Ltd would like to acknowledge and thank Yinhawangka Common Law Holders. We would also like to thank Yinhawangka Aboriginal Corporation for coordinating and overseeing this Social Surroundings Assessment and Rio Tinto Iron Ore for supporting it with funds, logistical assistance and advice on the West Angelas Revised Proposal.

RESEARCH ETHICS FRAMEWORK

This Social Surroundings Assessment was led by YInhawangka Common Law Holders and informed by:

- United Nations Declaration on the Rights of Indigenous People – Article 32 (United Nations 2007);
- Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS) Code of Ethics for Aboriginal and Torres Strait Islander Research (AIATSIS 2020);
- Terri Janke and Maiko Sentina, Indigenous Knowledge: Issues for Protection and Management, IP Australia (Commonwealth of Australia 2018);
- A Way Forward; Final report into the destruction of Indigenous heritage sites at Juukan Gorge (Commonwealth of Australia 2021);
- Australian Anthropological Sociey Code of Ethics.

DISCLAIMER

This report was prepared from information available at the time of research and writing. Archae-aus Pty Ltd is not responsible for any omissions of information that may subsequently become available, or inconsistencies with such information.

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REPORT REFERENCE

Yinhawangka Common Law Holders and Archae-aus 2022 Report of a Social Surroundings Assessment for West Angelas Revised Proposal. Prepared for Yinhawangka Aboriginal Corporation & Rio Tinto Iron Ore by Yinhawangka Common Law Holders and Archae-aus Pty Ltd, August 2022.

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Final report submitted by Yinhawangka Aboriginal Corporation to Rio Tinto Iron Ore	14 October 2022	A. Fagan

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TERMS USED IN THIS REPORT

ACHA	Aboriginal Cultural Heritage Act 2021 (WA)
AHA	Aboriginal Heritage Act 1972
AIATSIS	Australian Institute of Aboriginal and Torres Strait Islander Studies
Archae-aus	Archae-aus Pty Ltd
CLH	Common Law Holders
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act (1986)
GPO	Greater Paraburdoo Operations
HCP	Healthy Country Plan
HEC	Heritage and Environment Committee
RTIO	Rio Tinto Pty Ltd
SCHMP	Social, Cultural and Heritage Management Plan
SSA	Social Surroundings Assessment
The Proposal	West Angelas Revised Proposal
T & W	Thurantajinha and Wilga
UNDIP	United Nations Declaration on the Rights of Indigenous Peoples
WAN	West Angelas
YAC	Yinhawangka Aboriginal Corporation

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" We are still using the culture in this Country "

DAVID COX (BARNDU)

This report was commissioned by Yinhawangka Aboriginal Corporation (YAC) for Rio Tinto Iron Ore (RTIO) on behalf of Robe River Mining Company Pty Ltd. It reports the results of a Social Surroundings Assessment (SSA) of the West Angelas (WAN) Revised Proposal (the Proposal). The SSA comprised desktop research, four fieldtrips, a Consolidation Workshop and a Social, Cultural and Heritage Management Plan Workshop in 2021 and 2022. The results will be used by RTIO to address the Social Surroundings Environmental Factor under s. 38 (Part IV) of the Environmental Protection Act 1986 (WA) (EP Act). Results which fall outside the remit of the EP Act will support Yinhawangka Common Law Holders (CLH), YAC and RTIO in managing Yinhawangka Country. [1]

A Scope of Work (SoW) for this SSA was co-developed by YAC and RTIO. It would allow for the identification and discussion of tangible and intangible Yinhawangka values and discussion of the cumulative impacts on them from the Proposal across space and through time, including any advice that Yinhawangka CLH may have to avoid, minimise or mitigate those impacts. Archae-aus Pty Ltd (Archae-aus) was commissioned to conduct the SSA on 8 March 2021. RTIO referred the Proposal to the Environmental Protection Authority (EPA) with the public comment period commencing on 1 April 2021. On 27 April 2021, the EPA published its decision to assess the Proposal and set the level of assessment as Public Environmental Review.

It was the objective of this SSA to:

- Inspect the Development Envelope and its surroundings and record places and values significant to Yinhawangka CLH using a range of media (fieldnotes, film, drone footage and photography). This process was facilitated by the provision of male and female anthropologists, an environmental adviser, filmmaker and drone operator;
- Hear about the Proposal from RTIO personnel;
- Consider places and values significant to Yinhawangka CLH in light of the Proposal, and existing and proposed activities at Deposits G and A West;
- Develop recommendations for avoiding, mitigating or managing impacts to places and values in relation to the Proposal;
- Test the methodology developed for the SSA;
- Develop preliminary Terms of Reference for conducting future SSAs on Yinhawangka Country.

The Proposal is located approximately 100 kilometres northwest of Newman in the Pilbara region of Western Australia (Map 1). It will involve developing new above and below water table iron ore mine pits and associated infrastructure to sustain existing WAN operations (Map 2). The overall WAN Development Envelope will increase by 17,555 hectares (ha) as a result of the Proposal, to a combined total area of 35,157 ha.

The Development Envelope is intersected by two Native Title Determination areas: Yinhawangka and Ngarlawangga (Map 1). RTIO has commissioned a separate SSA with the Ngarlawangga People to identify their values and to understand how the Proposal may impact them.

During the SSA, RTIO personnel described the Proposal to Yinhawangka CLH using a range of communication tools, including:

- Maps
- Power Point presentations
- On-Country inspections and discussion within and adjacent to the Development Envelope
- 3D visualisations

This SSA was a collaborative process between Yinhawangka CLH, YAC, RTIO and Archae-aus. Yinhawangka CLH heard about the proposal and RTIO representatives heard Yinhawangka CLH's advice on the Proposal on fieldtrips and in workshops. Yinhawangka CLH who participated in the SSA indicated that the information RTIO provided was sufficient to make an informed decision about the Proposal. The adopted approach allowed for the identification and discussion of tangible and intangible values and assessment of the impacts (direct and indirect, immediate and cumulative) on those values across space and through time.

Desktop research of published ethnohistorical information, published and unpublished Aboriginal Heritage survey reports, water studies and ethnobotanical research, as well as Native Title research, articulates rich and enduring deep-time relationships between Yinhawangka People, Culture and Country. To capture these relationships, the SSA adopted an approach known as 'more than human' (sometimes called 'multispecies') ethnography.

'Common Law Holders' is the term preferred by the Yinhawangka representatives who participated in this SSA. It acknowledges that Yinhawangka have been successful in attaining Native Title Determination over their Country.

This type of ethnographic analysis acknowledges the mutually dependent relationships between people, plants, animals, waterholes, weather, rocks and other elements that comprise the social and cultural landscape. This relational perspective supports a nuanced and holistic understanding of the connections between people, places and their 'more than human' elements across time and space.

It reveals process and outputs, methods and theory and subject and object to be entangled in complex ways. This SSA is an attempt to bring these complex entanglements to meet the legislation, while acknowledging the need for consensus between all parties to manage Country in light of the Proposal.

To this end, the SSA consisted of:

- Desktop research
- 4 x fieldtrips with Yinhawangka CLH, RTIO and Archae-aus representatives. It was on these fieldtrips that the recommendations contained in this report were recorded. Trip Reports were submitted after each Field Trip.
- A Consolidation Workshop with Yinhawangka CLH who participated in the fieldtrips, YAC, Archae-aus and RTIO representatives. At this workshop the recommendations recorded on the fieldtrips were reviewed and refined. Preliminary Advice (PA) was submitted after the workshop. The recommendations contained in the PA are reproduced in this report.
- A Social, Cultural and Heritage Management Plan (SCHMP) Workshop with Yinhawangka CLH Advisers who participated in the fieldtrips, (or who represented one of the three Yinhawangka Apical families), YAC and Archae-aus. The SCHMP Workshop will inform a SCHMP to be co-developed by YAC, RTIO, Archae-aus and other consultants engaged by YAC and RTIO. The SCHMP will be submitted to the EPA to support the Proposal's referral within the Environmental Review Document (ERD).
- 4 x ERD Workshops with Yinhawangka CLH who participated in the fieldtrips, YAC, Archae-aus and RTIO representatives for the purpose of co-developing the SCHMP.

The SSA generated 47 recommendations. In so doing, it identified three principles to protect social surroundings from significant harm. They may be of assistance in conducting future SSAs on Yinhawangka Country:

1. Values cannot simply be preserved by not impacting them - they are dynamic connections between People, Culture and Country which must be continually regenerated.
2. Through the act of doing SSAs, we are creating, developing, shaping and reproducing social surroundings.
3. A given point in time is just a 'snapshot' of a place's social surroundings. A meaningful assessment will take a long-term perspective, from the deep past to the present and multiple possible futures.



"It's not just a landscape, for us it's a family tree"

NANCY TOMMY

Recommendations

As a result of the SSA, the following 47 recommendations have been endorsed by Yinhawangka CLH, YAC and RTIO. Some of these recommendations will be used by RTIO to address the Environmental Protection Authority's (EPA's) Social Surroundings Environmental Factor under s.38 (Part IV) of the EP Act. Other recommendations which fall outside the remit of the EP Act will support Yinhawangka CLH, YAC and RTIO in managing Yinhawangka Country through other agreements and programs. To assist with their implementation, the recommendations are grouped in themes which emerged during the SSA, although it is acknowledged that a recommendation may relate to more than one theme.

Yinhawangka Common Law Holders conditionally support the Proposal.

Recommendations #1 - #8 identify the parts of the Proposal that may proceed, and the parts that may not.

It is recommended that:

1 The range immediately to the south of the existing WAN operations (the Range) is a critically important site. The site is to be registered under the AHA and entered into YAC and RTIO's databases for its protection (dashed yellow outline, Map 3). The site extends beyond Yinhawangka Country into Ngarlawangga Country. Further discussion between Yinhawangka and Ngarlawangga CLH will be required to manage this site.

2 Due to the site at Recommendation #1, Yinhawangka CLH do not support the Proposal at Deposit J (Map 2). Ground disturbance is not supported in the Range. However, maintenance (but not expansion) of existing infrastructure e.g. tracks, may be permitted. Within these parameters, the specific activities which may be supported in the Range should be determined through further discussion with Yinhawangka and Ngarlawangga CLH.

3 The Proposal at Mount Ella East (Map 2) within the proposed disturbance footprint may proceed. Yinhawangka CLH do not support direct impacts to the Range outside this footprint. Pits at Mount Ella East shall be backfilled to the original ground surface, using the waste material from the proposed pits and existing waste dumps. Where possible, waste from the proposed pits should be dumped on top of existing waste dumps, to limit the overall number and footprint of waste dumps;

Protection of Country

Recommendations #9 - #19 advise RTIO how to protect Country in and around the Development Envelope, before, during and after the Proposal. While the Proposal's impacts on dust was considered during the SSA, Yinhawangka CLH assume that RTIO will continue to monitor dust quality and quantity and minimise its impacts at WAN as standard practice. Consequently, Yinhawangka CLH had no specific recommendations on this matter.

It is recommended that:

4 The Proposal at Western Hill (Map 2) may proceed, provided the previously recorded Western Hill Site Complex (WAN20-009, WAN20-014, WAN20-012, TBR-18-20, WAN20-007, WARE14-87-SS, WAN20-002, TBR-18-19, WAN20-11, WA-18-05-RS, WAN20-008, WAN20-010, WAN20-013, WAN20-006, WA-16-23-AS, WAN20-005, WAN20-004, WAN20-003, WA-18-02-ST, WA-18-04-RS) (Map 3) is protected;

5 The Proposal at Deposit H (Map 2) may proceed;

6 The Proposal at Deposit F North (Map 2) may proceed;

7 There are no recommendations specific to Deposit G (Map 2);

8 There are no recommendations specific to Deposit A West (Map 2).

Protection of Country

Recommendations #9 - #19 advise RTIO how to protect Country in and around the Development Envelope, before, during and after the Proposal. While the Proposal's impacts on dust was considered during the SSA, Yinhawangka CLH assume that RTIO will continue to monitor dust quality and quantity and minimise its impacts at WAN as standard practice. Consequently, Yinhawangka CLH had no specific recommendations on this matter.

It is recommended that:

9 All mine pits associated with the Proposal are to be backfilled at the cessation of mining;

10 Independent experts should monitor the impacts of RTIO's blasting activities on rockshelters and share the results with Yinhawangka CLH via an appropriate forum as determined through consultation with YAC;

11 Yinhawangka CLH support RTIO's plans to monitor water quality and quantity at a sinkhole (the Sinkhole) (Rio Tinto Database: Yinta) (located 5.5 km south-west of the Development Envelope; Map 3) to create a baseline for future water monitoring and management. Real time data should be shared with CLH and YAC through an appropriate forum to be determined by YAC;

12 A Rights Reserved Area (RRA) around the Sinkhole (Map 3) should be negotiated between RTIO and YAC and the place should be registered as a site under the AHA;

13 RTIO should expand the existing RRA at Illingurra (Mt Governor) (Rio Tinto Database HOPEETH3-01), to encompass the mountain in its entirety. The mountain lies in Yinhawangka and Banjima Country and the RRA currently covers only the portion in Banjima Country. The extent of the RRA in Yinhawangka Country will need to be determined by RTIO and YAC;

14 Guided by their Elders, Yinhawangka CLH should be engaged for the following work in and around the Development Envelope:

a Monitoring landscape condition, water quality and water quantity at the Sinkhole (Map 3). This should include removing animal bones and other debris when the water dries up;

b Implementing cultural burning to control weeds at locations to be determined;

c Monitoring the impacts of mining activities on rockshelters;

15 An ethnographic survey should be conducted to support possible registration of the site known as Dinner Camp, (Rio Tinto Database WAETH06-2) (Map 3) under the AHA;

16 RTIO and Yinhawangka CLH should work together to map and protect pebble mouse mounds where practicable. This may be considered within RTIO's environmental survey program;

17 RTIO should manage topsoil to maintain and improve its vitality, so that it provides a viable seed bank when used during mine closure rehabilitation activities. Done well, there may not be a need to seed at all. If seed is required, stock should be provenanced from Yinhawangka Country where practical, as close to WAN as possible. Yinhawangka CLH will advise RTIO on a culturally appropriate species for inclusion in the rehabilitation seed mix;

18 Yinhawangka CLH should be supported by RTIO and YAC to regenerate native bee populations and encouraged to harvest the resulting honey for their personal consumption;

19 Yinhawangka CLH wish to explore the potential for compensation from the Western Australian Government for the irreplaceable loss of and damage to places from mining under the Racial Discrimination Act 1984. Yinhawangka CLH do not see Mining Benefits Payments as sufficient compensation.



Connection to Country

Recommendations #20 - #27 identify the places to which Yinhawangka CLH require access in and around the Development Envelope, and how knowledge of places is to be managed and shared between Yinhawangka CLH and others.

It is recommended that:

20 RTIO should facilitate Yinhawangka CLH access to the following places in line with the West Angelas Land Access Protocol (Map 3):

- a The Range to the south of existing WAN mining activities
- b Western Hill Site Complex
- c Archaeological Site (RTIO database: WA-16-61SS [No DPLH Place ID])
- d Mt Ella Site Complex
- e Rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444])
- f Engraving WA-16-51-ENG
- g Rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID])
- h The Sinkhole (RTIO database: Yinta)

RTIO and Yinhawangka CLH should maintain ongoing communication to ensure that access to the abovementioned places is properly managed throughout the life of the Proposal. There should be regular RTIO and YAC review of the Land Access Protocol. Due consideration should also be given to any additional places for Yinhawangka CLH access in the future, such as significant places identified during archaeological survey;

21 Opportunities to re-vitalise women's connections to significant places are to be sought by YAC under the leadership and guidance of Yinhawangka women. This should include a program of activities on-Country, supported by RTIO through provision of funding and logistics;

22 Yinhawangka CLH will identify gender restricted places in and around the Development Envelope. The results should be shared with appropriate parties to ensure consistency around access and culturally appropriate management of places;

23 Yinhawangka CLH will work with RTIO to produce a cultural protocols 'Code of Conduct' brochure in digital and hard copy formats to educate mining personnel and the general public in appropriate behaviour on Yinhawangka Country. This may be produced in conjunction with other Traditional Owner Groups. Hard copies should be made available at airports, hotels and mining camps in the region;

24 Yinhawangka CLH will work with RTIO to host an annual 'Yinhawangka Community Day' at WAN. Yinhawangka CLH and others will be supported to visit and observe the activities taking place there. This would be an additional commitment over and above any other similar events;

25 The office, services and facilities at WAN should offer a welcoming experience for Yinhawangka CLH and others through:

26 Yinhawangka CLH will work with RTIO to develop a communications strategy for sharing language and imagery throughout WAN;

27 The Aboriginal Place Names Project is to be completed through YAC. It should include cultural mapping in and around the Development Envelope, re-assessing names already applied to places and recording names for places which have not yet been identified on maps, databases etc. Once these names have been endorsed, they should be shared with RTIO to use at WAN.

> " On Yinhawangka Country, when you make a hole, you gotta fill it in otherwise you Coolbargu make trouble for yourself "
>
> **MARLON COOKE**

[3] Yinta is the RTIO Database reference for the Sinkhole, which was recorded during a previous ethnographic survey (Williams 2011).

a More signage, murals and displays (in language where possible) celebrating Yinhawangka Culture and Country;

b Cultural awareness training for all employees, including office, catering, grounds and other service staff and contractors;

c Cultural immersion camps aimed at giving WAN staff an extended cultural experience (overnight or longer) co-designed and implemented by Yinhawangka and Ngarlawangga CLH;

d Special treatment of Yinhawangka Elders including the provision of rooms with easy access to the dry mess and vehicle drop off and pick up points;

26 Yinhawangka CLH will work with RTIO to develop a communications strategy for sharing language and imagery throughout WAN;

27 The Aboriginal Place Names Project is to be completed through YAC. It should include cultural mapping in and around the Development Envelope, re-assessing names already applied to places and recording names for places which have not yet been identified on maps, databases etc. Once these names have been endorsed, they should be shared with RTIO to use at WAN.

Caring for Country

Recommendations #28 - #40 set out processes for managing Yinhawangka Country in and around the Development Envelope now.

It is recommended that:

28 Yinhawangka CLH are supported to manage important cultural places by all land users and managers, including mining companies, Government Departments etc.;

29 Yinhawangka CLH participation in heritage surveys and SSAs is supported by YAC through an induction program. The program should include:

a Mentoring;

b Appropriate gender and apical representation;

c Cultural safety;

30 YAC should employ a Yinhawangka man and woman to manage CLH participation in heritage surveys and SSAs;

31 RTIO and YAC should develop support mechanisms to encourage Yinhawangka CLH into the RTIO workforce.;

31 RTIO and YAC should develop support mechanisms to encourage Yinhawangka CLH into the RTIO workforce.;

32 A Yinhawangka Water Committee led by nominated Yinhawangka CLH should be established for the purpose of making water-related decisions on Yinhawangka Country;

33 Archaeological survey areas should not be considered 'assessed' in circumstances where ground surface visibility is deemed too low (eg. <20%). Alternative approaches should be sought in low visibility areas, such as cultural burning in advance of the survey. The area should be inspected by Yinhawangka CLH and other experts as required beforehand, to identify any scarred trees or other features to be protected during the burn;



" Trees, rocks, they are all very significant to us "

RHONDA PARKER

34 RTIO is to involve Yinhawangka CLH in mine planning for all Proposals on Yinhawangka Country from the Conceptual Phase through to mine closure and rehabilitation. Involvement should include (but not be limited to):

a The location and scale of a proposal, including new mines and extensions to existing mines;

b The routes RTIO anticipates using during exploration, mine construction, operations and closure;

c Yinhawangka CLH access to places within the Development Envelope;

d The extent to which pits will be backfilled at the cessation of mining;

35 Plants, animals and other natural features in and around the Development Envelope should be recorded in a two-way knowledge exchange between people trained in Western and Yinhawangka science;

36 YAC should facilitate Yinhawangka-led studies, especially in areas which are subject to RTIO proposals. Studies may include (but not be limited to) flora, fauna and water assessments;

37 RTIO should adopt standard formatting for reporting the results of studies undertaken on Yinhawangka Country. There should be real-time sharing of data;

38 RTIO should invite Yinhawangka CLH to visit mines which have been or soon will be closed such as Argyle Mine, Hunter Valley Coal Mine, Ranger Mine etc., to hear the experience of those involved and apply any lessons learnt to WAN;

39 RTIO and YAC should agree on the eligibility and processes for RTIO's funding of Yinhawangka CLH-managed programs and businesses. There should be transparency around these requirements so that Yinhawangka CLH can tailor applications for success. This process may be facilitated by the YAC Implementation Officer;



40 RTIO should facilitate regular workshops for CLH to review RTIO's activities on Yinhawangka Country.

Sustainable Futures

Recommendation #41 is a holistic vision for the future of Yinhawangka Country.

It is recommended that:

41 Yinhawangka CLH develop a 100-year plan which considers the long-term benefits and impacts of mining alongside other possible futures for Yinhawangka Country;

Partnership and Agreement

Recommendations #42 - #47 define the way forward for Yinhawangka CLH and RTIO.

It is recommended that:

42 Yinhawangka CLH and RTIO explore the pros and cons associated with a partnership model as an alternative to existing Agreements;

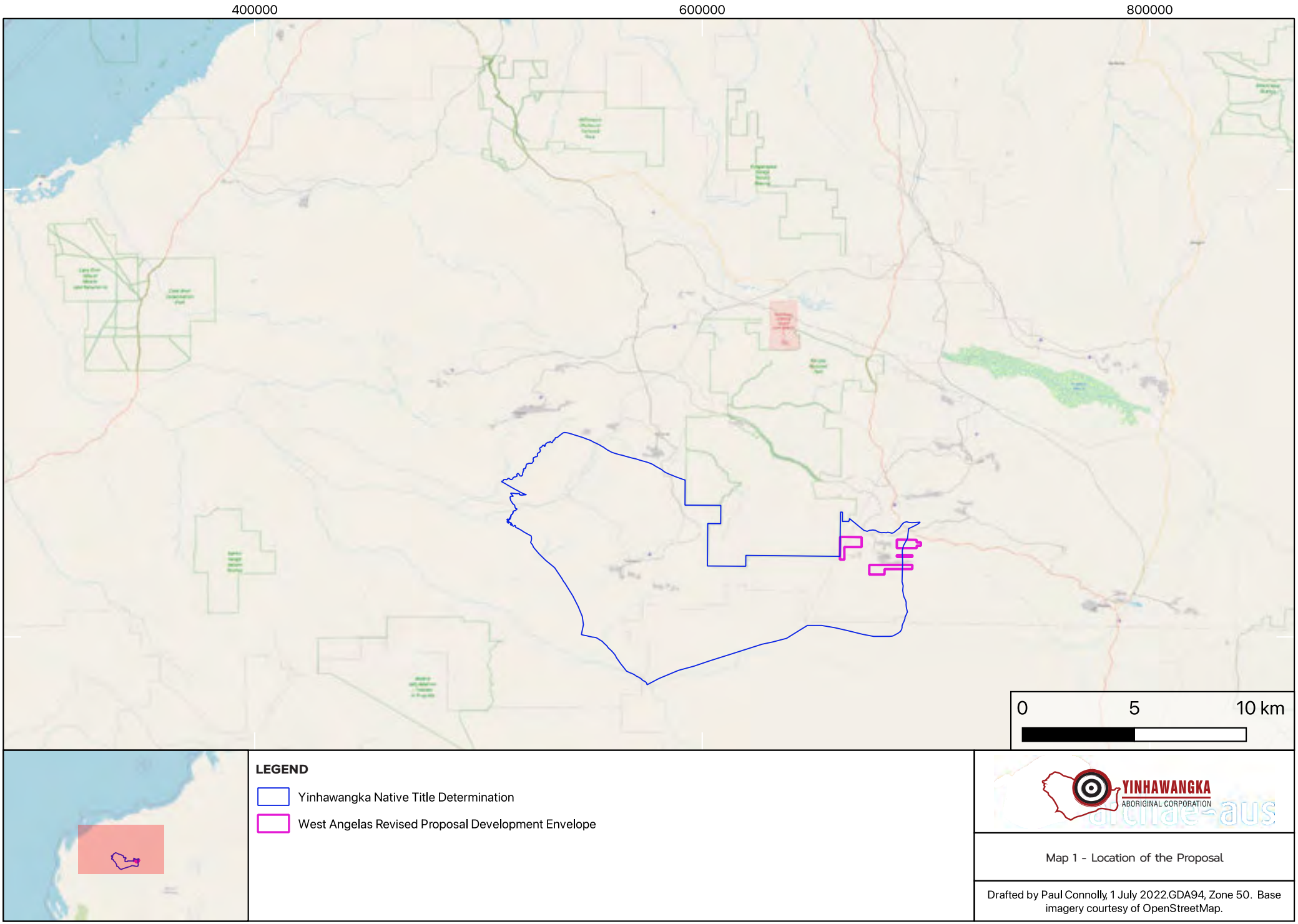
43 Yinhawangka CLH develop standards for RTIO and other proponents and land managers working on Yinhawangka Country. These standards will take into account Regional Standards developed by other Pilbara Traditional Owner groups;

44 Yinhawangka CLH should work with RTIO and other Pilbara Traditional Owner groups to develop joint ventures with existing and future contractors for the purpose of recycling waste products including, but not limited to, copper, steel, batteries, aerosol cans and especially rubber tyres;

45 RTIO should host a workshop to communicate the recommendations from Commonwealth of Australia (2021) A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge to Yinhawangka CLH and how any changes have affected or will affect Yinhawangka People, Culture and Country;

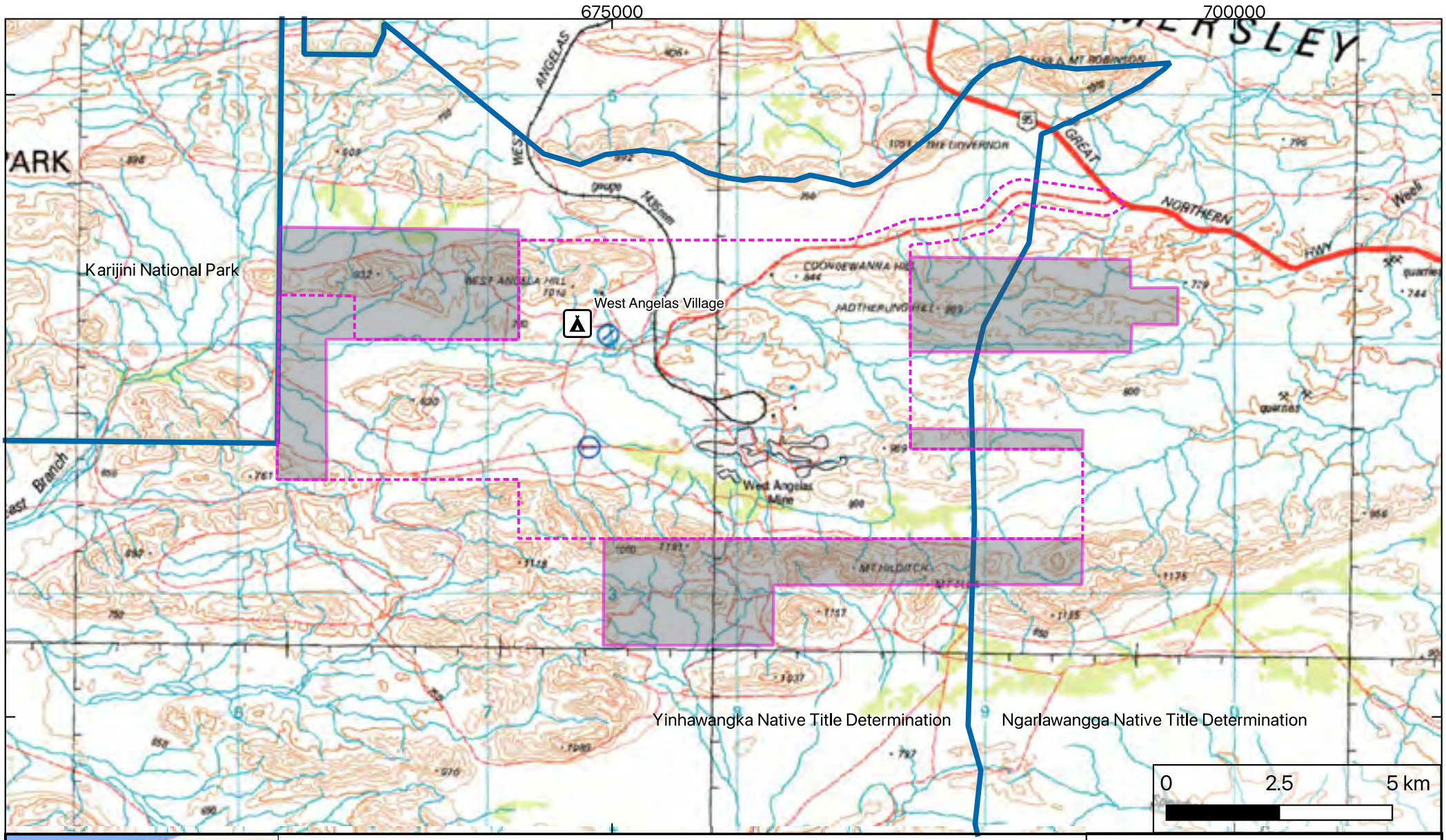
46 The YAC-RTIO CWPA Modernised Agreement is to result in Yinhawangka CLH being given fair compensation for all mining on Yinhawangka Country;

47 Where appropriate, the recommendations and commitments from this SSA should be enshrined in the YAC-RTIO CWPA Modernised Agreement.



Map 1 - Location of the Proposal

Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of OpenStreetMap.





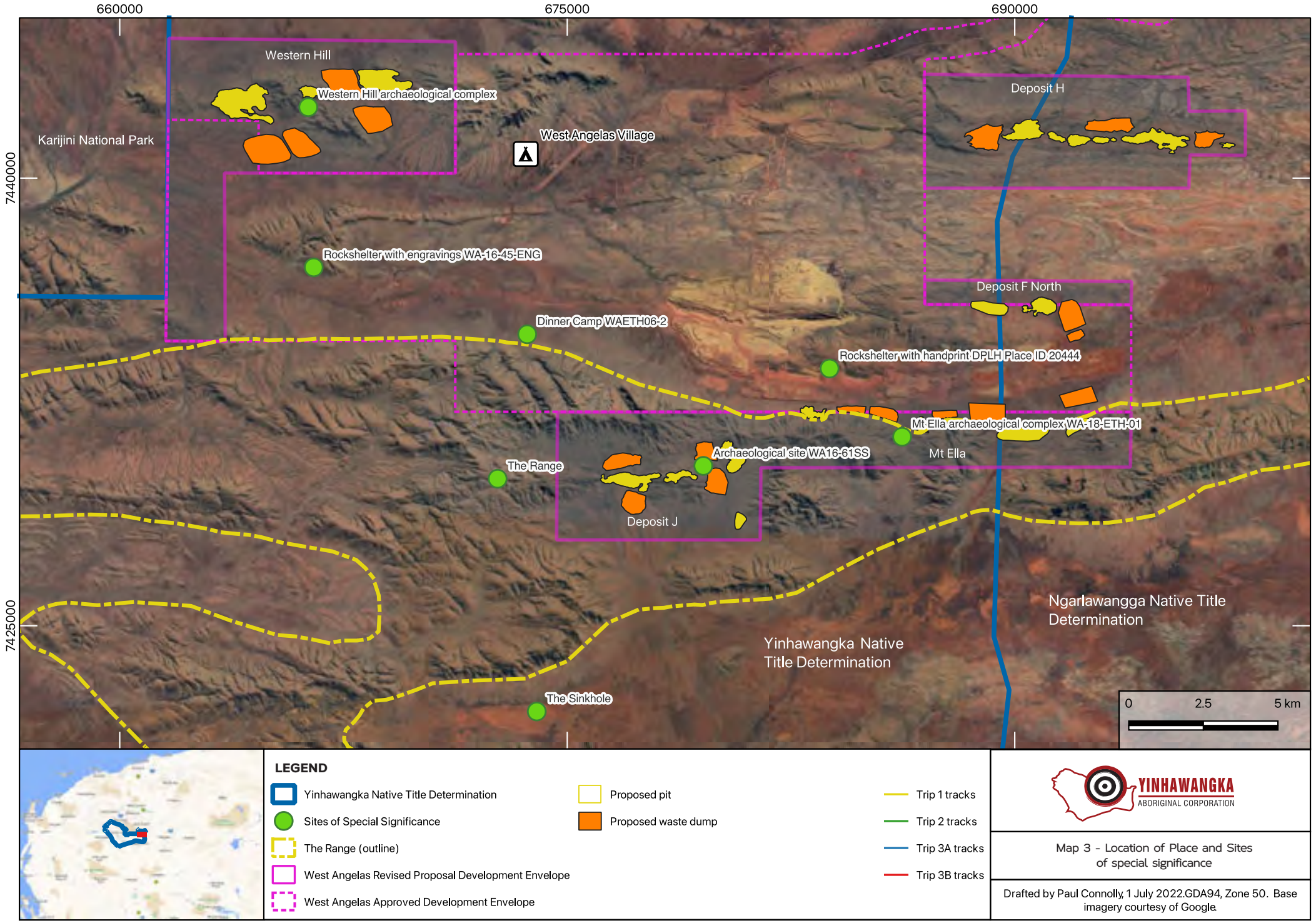
LEGEND

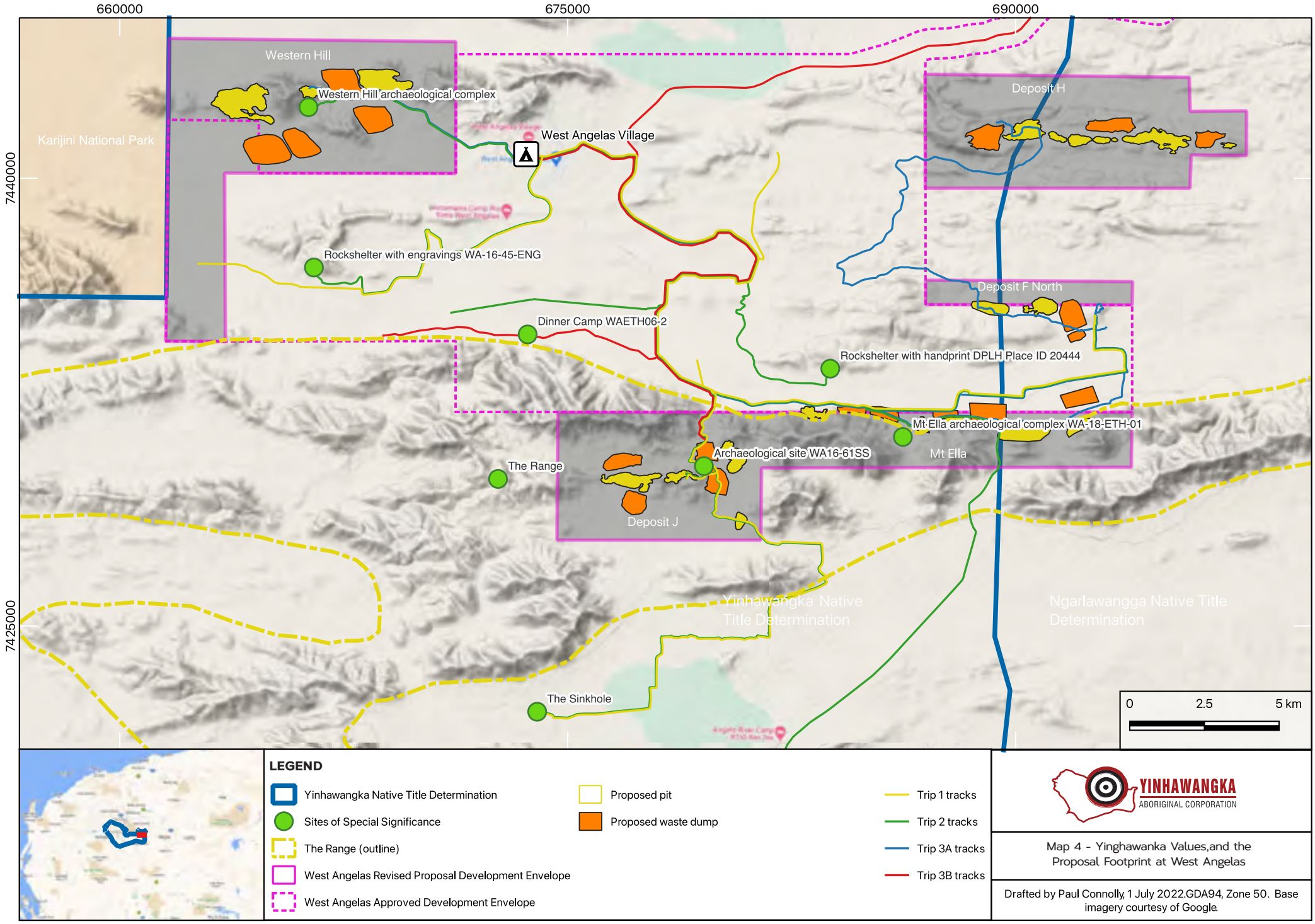
- Yinhawangka Native Title Determination Area
- Development Envelope (Not yet approved) - subject of this Social Surroundings Assessment
- Development Envelope (Approved)

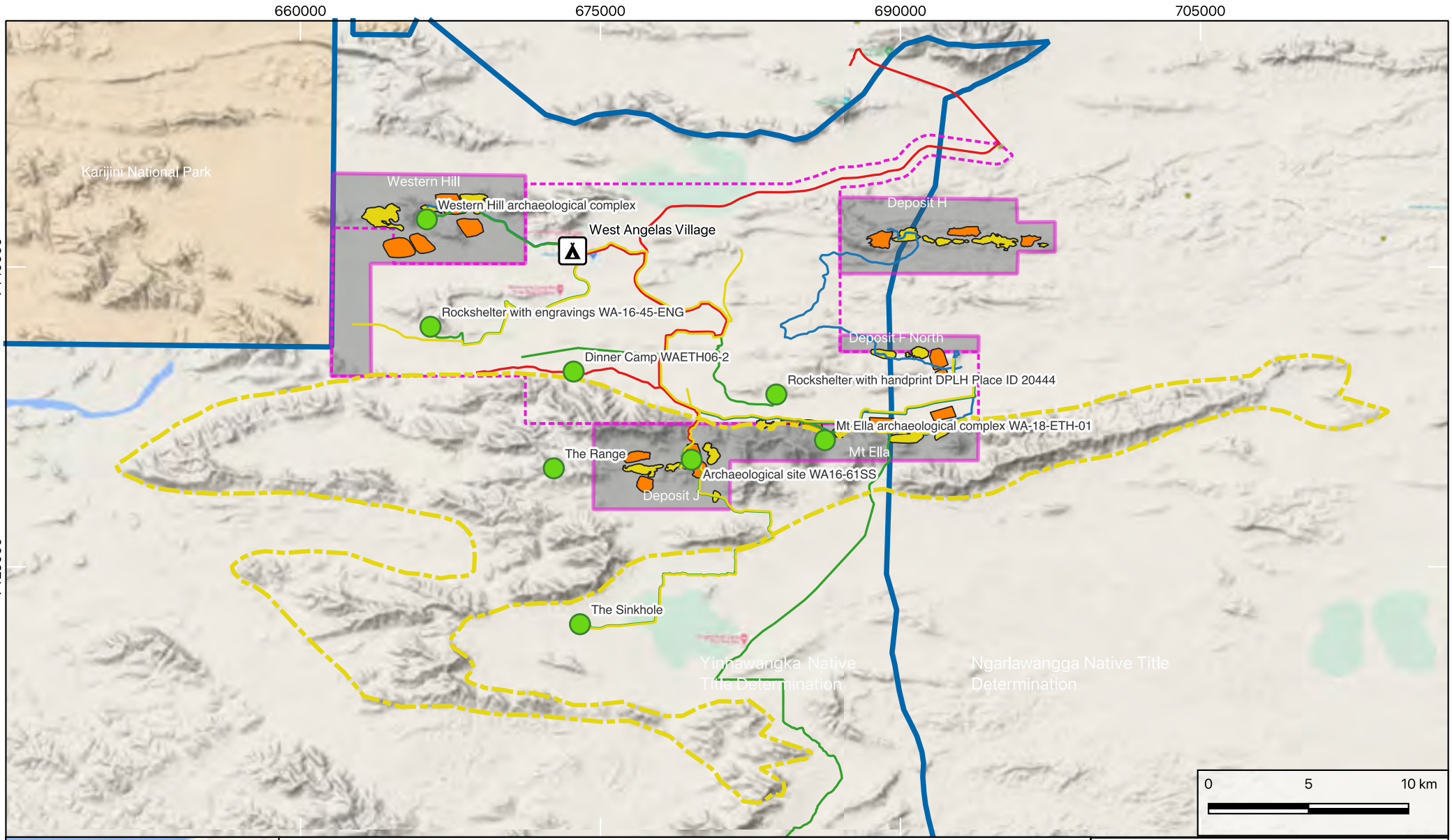
YINHAWANGKA ABORIGINAL CORPORATION

Map 2 - The Development Envelope

Drafted by Paul Connolly, 29 June 2022
GDA94, Zone 50
Base imagery courtesy of AUSLIG


660000
675000
690000
7440000
7425000
Western Hill
Western Hill archaeological complex
Karijini National Park
West Angelas Village
Deposit H
Rockshelter with engravings WA-16-45-ENG
Deposit F North
Dinner Camp WAETH06-2
Rockshelter with handprint DPLH Place ID 20444
Mt Ella archaeological complex WA-18-ETH-01
Mt Ella
Archaeological site WA16-61SS
The Range
Deposit J
Ngarlawangga Native Title Determination
Yinhawangka Native Title Determination
The Sinkhole
0
2.5
5 km
LEGEND
Yinhawangka Native Title Determination
Sites of Special Significance
The Range (outline)
West Angelas Revised Proposal Development Envelope
West Angelas Approved Development Envelope
Proposed pit
Proposed waste dump
Trip 1 tracks
Trip 2 tracks
Trip 3A tracks
Trip 3B tracks
YINHAWANGKA
ABORIGINAL CORPORATION
Map 3 - Location of Place and Sites of special significance
Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of Google.


660000
675000
690000
7440000
7425000
Western Hill
Western Hill archaeological complex
Karijini National Park
West Angelas Village
Deposit H
Rockshelter with engravings WA-16-45-ENG
Deposit F North
Dinner Camp WAETH06-2
Rockshelter with handprint DPLH Place ID 20444
Mt Ella archaeological complex WA-18-ETH-01
Archaeological site WA16-61SS
Mt Ella
The Range
Deposit J
Yinhawangka Native Title Determination
Ngarlawangga Native Title Determination
The Sinkhole
0
2.5
5 km
LEGEND
Yinhawangka Native Title Determination
Sites of Special Significance
The Range (outline)
West Angelas Revised Proposal Development Envelope
West Angelas Approved Development Envelope
Proposed pit
Proposed waste dump
Trip 1 tracks
Trip 2 tracks
Trip 3A tracks
Trip 3B tracks
YINHAWANGKA
ABORIGINAL CORPORATION
Map 4 - Yinghawanka Values,and the Proposal Footprint at West Angelas
Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of Google.


660000
675000
690000
705000
7440000
7425000
Karijini National Park
Western Hill
Western Hill archaeological complex
West Angelas Village
Deposit H
Rockshelter with engravings WA-16-45-ENG
Deposit F North
Dinner Camp WAETH06-2
Rockshelter with handprint DPLH Place ID 20444
Mt Ella archaeological complex WA-18-ETH-01
The Range
Mt Ella
Archaeological site WA16-61SS
Deposit J
The Sinkhole
Yinhawangka Native Title Determination
Ngarlawangga Native Title Determination
0
5
10 km
LEGEND
Yinhawangka Native Title Determination
Sites of Special Significance
The Range (outline)
West Angelas Revised Proposal Development Envelope
West Angelas Approved Development Envelope
Proposed pit
Proposed waste dump
Trip 1 tracks
Trip 2 tracks
Trip 3A tracks
Trip 3B tracks
YINHAWANGKA
ABORIGINAL CORPORATION
Map 5 - Yinghawanka Values, including the full extent of the Range & the Proposal Footprint at West Angelas
Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of Google.

SECTION 2 sets out the parameters of the Social Surroundings Assessment (SSA), as defined by the West Angelas (WAN) Revised Proposal (the Proposal) and stipulated by the Scope of Work (SoW). Within this framework, a theoretical and methodological approach was adopted to map the 'more than human' connections which comprise the cultural landscape.

After anthropologist Marilyn Strathern (2018:23), a distinction is introduced between ethnography as subject and ethnography as object (i.e. the circumstances and mechanisms inherent in how knowledge, stories, views and perspectives are reproduced (subject) as distinct from their content (object)). The section goes on to consider the ethical and legal parameters within which the SSA operates. Between the *Native Title Act 1993* (Cth) (NTA) and the Aboriginal Heritage Act 1972 (WA) (AHA), and with the imminent rollout of the *Aboriginal Cultural Heritage Act 2021* (WA) (ACHA), there is an opportunity for SSAs to occupy their own distinct niche. However, this will depend on the active revitalization of social surroundings.

Values are dynamic – they are created and reinforced by the act of reproducing them. It is incumbent upon SSA practitioners to question which values are reproduced, which values are not and why. To do this, we must remain vigilant to any 'baked-in' pre-conceptions inherent within current practices.



The Proposal

This report was commissioned by Yinhawangka Aboriginal Corporation (YAC) for Rio Tinto Iron Ore (RTIO), on behalf of Robe River Mining Company Pty Ltd. The information contained within it will be used by RTIO to address the Social Surroundings Environmental Factor under s. 38 (Part IV) of the Environmental Protection Act 1986 (WA) (EP Act). RTIO are required to undertake the SSA for the Proposal.

Anticipating this requirement, YAC and RTIO co-developed a Scope of Work (SoW) for this SSA in 2020. Archae-aus Pty Ltd (Archae-aus) was subsequently commissioned to conduct the SSA on 8th March 2021. RTIO referred the Proposal to the Environmental Protection Authority (EPA) on 1 April 2021. On 27 April 2021, the EPA published its decision to assess the Proposal and set the level of assessment as Public Environmental Review.

The Proposal is located approximately 100 kilometres northwest of Newman in the Pilbara region of Western Australia (Map 1). It will involve developing new above and below water table iron ore mine pits and associated infrastructure to sustain existing WAN operations (Map 2). The overall WAN Development Envelope will increase by 13,162 hectares (ha) as a result of the Proposal, to a combined total area of 39,862 ha.

Key components of the Proposal include, but are not limited to, the following:

- Development of new above and below water table mine pits at:
  - Western Hill
  - Deposit H
  - Deposit F-North
  - Mt Ella East
  - Deposit J
- Dewatering and surplus dewater management, including use in ore processing, onsite use including storage / discharge to disused mine pits, and discharge to creeklines;
- Mineral waste management;
- Construction of mine infrastructure.

Deposits G and A West are also included in this SSA. They already have Part IV approval under the EP Act in place, hence they are not considered to be part of the Proposal. Nonetheless, they were included at RTIO's request to ensure that any Yinhawangka values not previously identified within or related to these deposits may be effectively managed.

Scope of Work

Minimally, there are three parts to SSAs:

- Recording values;
- Assessing the likely impact of a Proposal on those values;
- Identifying ways to avoid, minimise or mitigate those likely impacts.

As such, it was the objective of this SSA to:

- Inspect the Development Envelope and its surroundings, recording places and values significant to Yinhawangka CLH using a range of media fieldnotes, film, drone footage and photography). This process was facilitated by the provision of male and female anthropologists, an environmental adviser, filmmaker and drone operator;
- Hear about the Proposal from RTIO personnel;
- Consider places and values significant to Yinhawangka CLH in light of the Proposal, and existing and proposed activities at Deposits G and A West;
- Develop recommendations for avoiding, mitigating or managing impacts to places and values in relation to the Proposal;
- Test the methodology developed for the SSA;



YAC would nominate nine Yinhawangka CLH representing the three Yinhawangka Apical Families (Jardunha, Minatungunha and Thurantajinha and Wilga) to participate in the fieldtrips and workshops which comprised the consultation component of the SSA.

Phil Shiner would lead the SSA for RTIO and Dr Anna Fagan would oversee the SSA for YAC. RTIO would provide information and expertise for the fieldtrips and workshops to explain the Proposal. On fieldtrips and in workshops, Archae-aus anthropologists Dirima Cuthbert and Dr Myles Mitchell would record Yinhawangka values, the anticipated impacts of the Proposal on them and any advice to avoid, minimise or mitigate those impacts in fieldnotes, photographs and other instruments (e.g. Global Positioning System).

Archae-aus environmental adviser Paul Connolly would attend the fieldtrips and workshops to provide Yinhawangka CLH with independent advice on the likely environmental impacts of the Proposal and work with Yinhawangka CLH, YAC and RTIO to co-develop the Social, Cultural and Heritage Management Plan (SCHMP). Documentary film maker and drone pilot Michael Bonner would record the fieldtrips using cameras and drones.

Tracey Foster would provide logistical support for Yinhawangka CLH in getting to and from the fieldtrips and workshops, and RTIO would provide logistical support for all parties while participating. YAC CEO Kupa Teao would be kept informed of the SSA's progress and moderate workshops.

The SoW specified desktop research and three fieldtrips. The third fieldtrip at the suggestion of Yinhawangka men was a combined consultation between Yinhawangka and Ngarlawangga, in order to consult with Ngarlawangga men on critical aspects of the Proposal and its impact on their respective and shared values on-Country.

A fourth fieldtrip was added at the suggestion of Yinhawangka and Ngarlawangga men, in order to consult with Martu Men to discuss shared cultural knowledge that was relevant to critical aspects of the Proposal and its impact on their respective and shared values on-Country. Several workshops (a Consolidation Workshop, SCHMP Workshop and four Environmental Review Document (ERD) Workshops) were also added to the program in order to review and refine the SSA recommendations and co-develop the SCHMP within the ERD. Preliminary Advice (PA) containing 47 recommendations was reviewed in turn by Yinhawangka representatives who participated in the SSA, as well as YAC and RTIO. Yinhawangka CLH and YAC did not suggest any changes to the recommendations. RTIO had minor clarifying suggestions to support their efforts to implement the recommendations. No recommendations were substantively altered as a result of these reviews.

We met the abovementioned objectives of the SSA by:

- Mapping significant places in and around the Development Envelope, and the relationships between them.
- Ascertaining the places to which Yinhawangka CLH require access before, during and after the Proposal.
- Discussing the impacts of noise, dust and vibrations on values and places within and adjacent to the Development Envelope, including at significant places.
- Evaluating how the Proposal could affect water quality, volume and flow within and beyond the Development Envelope, and at specific water holes, aquifers and creeks.
- Recording how the Proposal may impact hunting and harvesting, and any implications of this for Yinhawangka CLH health and wellbeing.
- Evaluating how knowledge and stories inscribed in the landscape would be impacted by the Proposal. Yinhawangka oral traditions are complex and dynamic and there was not sufficient time on fieldtrips to record these in detail. However, Yinhawangka CLH revealed which impacts were most detrimental to maintaining their knowledge, cultural responsibilities, and stories.
- Recording management and monitoring actions which Yinhawangka CLH have developed to guide RTIO in respecting, protecting and, in some cases re-activating, Yinhawangka values into the future.

We also created a Table of Actions for recommendations which will not be included in the SCHMP (because they fall outside the EPA's remit) (to be submitted to YAC separately).

" We live from the Dreamtime story.
What our old people told to us.
It is real. Not just a story "

BARNDU



Methodological and Theoretical Framework

A review of published ethnohistory, unpublished Native Title and archaeological and ethnographic heritage survey reports in and around the Proposal's Development Envelope describes rich and enduring deep-time relationships between Yinhawangka People, Culture and Country (e.g. Scambary 2013; Sharp and Thieberger 1992; Stevens et al. 2019, Wilson 1961).

To capture these relationships, the SSA adopted an approach known as 'more than human' (sometimes called 'multispecies') ethnography, which maps and reiterates relationships between 'people, plants, animals, waterholes, weather, rocks and other elements of Country.

The approach supports Deborah Bird Rose's (2011:11) notion of "becoming human," which asserts that we only become who we are in the company of those 'others' (more than humans) with whom we share the cultural landscape.

Ethno = people and graphy = writing, hence ethnography is writing about people. Yet it is more than just descriptive. In recording knowledge, stories, views and perspectives, we are also recording the mechanisms and circumstances through which these knowledge, stories, views and perspectives are shared and reproduced.

Which places are inspected, whose values are recorded and how those values are communicated to meet the legislation are all heuristic tools for the type of social surroundings that are reproduced. It follows, then, that ethnography can be considered both subject and object at the same time (Strathern 2018:23). The concept is supported by Laura Nader's (2011, p. 211) positioning of ethnography as a "theory of description".

These entanglements between process and outputs, methods and theory and subject and object are complex and the challenges in bringing a body of information to meet the legislation with honesty and integrity cannot be understated.

Dust exemplifies such an entanglement. Although it is a well-known mining impact which has implications for health and other factors, there are no recommendations in this SSA to manage dust. Yinhawangka representatives on Trip 1 pointed out that suppressing dust associated with the Proposal would mean using more water – a management action which they were not prepared to recommend. They would prefer to be kept informed of dust levels through RTIO's dust monitoring regime, speculating that new practices to address excessive dust other than through water suppression may become known in the future.

In this way, dust and water are entangled. Dust management is important to Yinhawangka CLH, but this value is 'hidden' by its connection to water. Even while it is acknowledged that new connections may emerge between dust and 'others' in the future. In bringing knowledge, stories, views and perspectives to meet the legislation, it is as important to acknowledge absence as it is to acknowledge presence.

This is achievable using the more than human approach because it privileges a relational perspective over the dominant Western perspective – the latter typically placing process and outputs, methods and theory and subject and object (not to mention nature and culture, human and nonhuman etc) into binary relationships (Redfield 1953, Narvaez, 2016; Te Ahukaramu, 2002).

Legal and Ethical Frameworks

Social Surroundings Environmental Factor

The Social Surroundings Environmental Factor under s.38 (Part IV) of the Environmental Protection Act 1986 (WA) (EP Act) defines Environment as:

"... living things, their physical, biological and social surroundings, and interactions between all of these ..."

[4]Yinhawangka representatives on Trip 1 identified dust management among several datasets that RTIO commonly shared with Yinhawangka CLH through the HEC, alongside blasting activities, water quality and quantity etc. They anticipated that RTIO would continue to share this and any other heritage and environmental monitoring information relevant to management of Yinhawangka Country.

The EP Act further defines social surroundings:

"In the case of humans, the reference to social surroundings in the definition of environment in subsection (1), is a reference to aesthetic, cultural, economic and other social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings."

The EPA's (2016) Environmental Factor Guideline: Social Surroundings, states that the environmental objective for the factor Social Surroundings is:

"To protect social surroundings from significant harm."

SSAs are relatively new to Yinhawangka People and Yinhawangka Country. This SSA was undertaken in tandem with another SSA on Yinhawangka Country for RTIO's Greater Paraburdoo Operations (GPO) and followed similar processes with similar outputs (Trip Reports, PA, Full Report, SCHMP). With plans for future mines and major mine expansions, there are likely to be many more SSAs conducted on Yinhawangka Country. SSAs are also being undertaken by neighbouring Traditional Owner groups working with other heritage consultants and proponents on their Countries.

It is anticipated that CLH/Traditional Owners, consultants, proponents, Aboriginal Corporations/Prescribed Body Corporates, the EPA and the relevant professional societies (the Anthropological Society of Western Australia and the Australian Association of Consulting Archaeologists Inc), will apply the learnings from this first round of SSAs to future SSAs in the Pilbara, noting that the context and circumstances of each SSA will vary.

Native Title Act 1993 (NTA)

The Commonwealth Native Title Act 1993 (NTA) recognises Aboriginal and Torres Strait Islander peoples' traditional rights and interests in land and waters. Under the NTA, native title claimants may apply to the Federal Court to have their native title recognised by Australian law.

The NTA was extensively amended in 1998, with further amendments occurring in 2007, and again in 2009. Under the Future Act provision, native title holders and registered native title claimants are entitled to certain procedural rights, including a right to be notified of, object to, comment or be consulted on or negotiate with i.e. the same rights as an ordinary title holder (freeholder). The Yinhawangka Native Title Claim was determined in 2017 (WAD216/2010, WAD340/2010),

Free, Prior and Informed Consent (FPIC)

YAC, RTIO and Archae-aus provided Yinhawangka CLH with accessible, relevant and timely information about the Proposal wherever possible, to facilitate informed decision-making in line with the principles of free prior and informed consent (FPIC) as expressed in the –United Nations Declaration on the Rights of Indigenous People Article 32[5].

Aboriginal Heritage Act 1972 (AHA) and Aboriginal Cultural Heritage Act 2021 (ACHA)

In 2021, the Aboriginal Cultural Heritage Act 2021 (ACHA) was passed by Parliament. It will come into effect mid-2023. This will see negotiation and agreement-making placed firmly in the hands of Yinhawangka CLH. Yet there have been persistent concerns from those working in heritage and land management, including Traditional Owners, Aboriginal Corporations/Prescribed Body Corporates, archaeologists and anthropologists that there will not be sufficient resourcing to adequately manage this negotiation and agreement-making imperative.

Negotiation and agreement-making that satisfies the requirements of FPIC takes time. Yet resource industry timelines, which tend to be set by business or legislative timelines, are tight. For Traditional Owners, cultural obligations and responsibilities must be met before or alongside other business – a challenge within these tight timelines that sits uneasily with FPIC.

While the matter of resourcing remains unknown, the ACHA may, in principal, fit effectively with SSAs. The ability to negotiate with proponents and come to agreement on the management of heritage may improve protection for cultural landscapes and intangible heritage.

The current requirement for a proponent to apply to the Minister for Aboriginal Affairs under s18 of the AHA to 'use' (usually destroy) a site is often not practical for managing values and places which do not have discrete boundaries.

Such sites are often not protected under the AHA. Important values and places identified as a result of SSAs may benefit from the development of Cultural Heritage Management Plans (CHMPs) under the ACHA.

[5]UNDRIP Article 32:
1. Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources.

2. States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources (emphasis added).

3. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact.
[6]Aboriginal Cultural Heritage Act co-design submissions: https://consultation.dplh.wa.gov.au/heritage/acha-co-design-submissions-form/consultation/published_select_respondent accessed 10/8/2022.

Best practice principles

In addition to the above frameworks, Archae-aus also follow best practice principles for working with Aboriginal People, informed by:

- The Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Code of Ethics for Aboriginal and Torres Strait Islander Research (AIATSIS 2020);
- Terri Janke and Maiko Sentina, Indigenous Knowledge: Issues for Protection and Management, IP Australia (Commonwealth of Australia 2018);
- A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge (Commonwealth of Australia 2021) and;
- The Australian Anthropological Society.



SECTION 3 provides context for the SSA through published and unpublished historical accounts (e.g. Radcliffe Brown 1913; Stanner 1987), and research conducted under the NTA and AHA (e.g. Stevens 2011; Williams 2011). In recent years, Yinhawangka CLH have also commissioned their own research to guide management of Yinhawangka Country (e.g. Yinhawangka Aboriginal Corporation 2016, 2017).

These sources describe deep time, historical and future connections, responsibilities and aspirations for Yinhawangka People, Culture and Country. Country is the connection to the past through the Ancestors, and to the future through the young people who are yet to learn the stories and meaning associated with it.

It is up to practitioners to find a way for SSAs to hold a meaningful place within this context. The only way to find this niche is by doing them. By knowing the past, present and possible future contexts in which this 'doing' takes place, we can begin to consider what it is that SSAs may offer and how they can be used effectively to protect social surroundings from significant harm.

Ethnohistory

Yinhawangka Country is centred around the Ashburton River system encompassing Angelo River, Ashburton River, Hardey River, Kunderong Range, Mount Vernon Station, Rocklea Station and Turee Creek (Scambary 2013; Sharp and Thieberger 1992; Thieberger 1993; Wilson 1980). They share boundaries and close cultural, linguistic and familial ties with neighbouring Banjima, Nyiyaparli, Ngarlawangga, and Eastern Guruma Peoples (Scambary 2013). For Yinhawangka People, as for all Traditional Owners throughout Australia, connection to Country is fundamental to culture, health, and identity.

Stevens (2019: 7) notes that the elements of Country, from trees to rocks to water to weather to Yinhawangka CLH themselves (and all of the relationships between them enacted across space and through time) were – and still are - created by ontological beings. These beings are generally conceived as Ancestors who remain extant and active in Country today. In this way, Country is in a constant process of re-creation. As Stanner (1987: 225) observed: "One cannot 'fix' The Dreaming in time: it was, and is, everywhen".

The Ancestors continue to bring all things into existence and to bestow Country, with all of its interconnected elements, upon people and upon all those others (living and non-living) who share in it.

Early ethnographic research in the Pilbara affirms the importance of waterways. The earliest work was conducted with the Yindjibarndi People whose Country is situated on the Tablelands around Millstream and the Harding River (Withnell 1901) and the Kariyarra people around the Port Hedland area (Radcliffe Brown 1913). Between 1904 and 1912, Bates (1985) undertook a survey of Western Australian Indigenous people, which included work with the Inyawonga.

Bates (nd Series 12, Section II, 1: 36) recorded named places and pools, including "...Kurunbida, Jindibirila, Mambulula and Jardungunna near Angelo River."

From the 1960s, linguists began conducting research with Pilbara Aboriginal groups, including von Brandenstein (1967, 1982); O'Grady (1960); Dench (1980, 1995). Simultaneously, the anthropologist Robert Tonkinson (1966, 1974) was conducting extensive research with Martu and Nyiyaparli people at Jigalong.

Further anthropological research was conducted by Kingsley Palmer (1975, 1977, 1983) and John Wilson (1961, 1980). More recently, a collection of oral history material specific to the Central Pilbara titled Karijini Mirli Mirli (Olive 1997) was produced by the Karijini Aboriginal Corporation. Radcliffe-Brown's (1913: 146) research with the Kariyarra found that Pilbara language groups were divided into exogamous patrilineal local clans with territorial and totemic associations.

Descent may be patrilineal and/or matrilineal but there may be considerable flexibility (now and in the past) as to exactly which genetic line an individual chooses to identify with (e.g. the father's line; the mother's line; or both). The extended family group has always been important. Wilson (1961:10) observes:

"Rarely, if ever, did the tribes, individually or collectively, act as a corporate unit even though the members acknowledged a cultural affinity".

Identity within a language group is based on genealogy, now formalised through Native Title Determination. The Yinhawangka Native Title claim is based on genealogical descent from three apical ancestors Minatangunha, Jarndunha, and Thurantajinha and Wilga (T & W).

Native Title Determination

The Yinhawangka Native Title determination was finalised in the Federal Court on 18 July 2017, granting the Yinhawangka People Native Title over the 10,150 square kilometre determination area (WAD 340 of 2010 and WAD 216 of 2010 in the Federal Court; National Native Title Tribunal 2021). Yinhawangka Aboriginal Corporation (YAC) is the Registered Native Title Prescribed Body Corporate representing the interests of the Yinhawangka Native Title holders.

Much of the information recorded to support claims is not available in the public domain, and it is possible that some information that might inform this SSA cannot be accessed. However, a history of the native title claim itself illustrates Yinhawangka People's connection to, and knowledge of, Country (Jones v Western Australia 2017). The Yinhawangka Native Title holders' Connection Material included a Connection Report (Sackett 2010), genealogies for the descendants of Jardunha, Minatangunha and Thurantajinha (Sackett and Norris 2011); and a Yinhawangka Connection DVD (C. McDonald 2011).

In 2016, Yinhawangka elders made numerous witness statements to the Federal Court. The various Connection Material, submissions and statements were deemed by the Court "to evidence the Yinhawangka People's maintenance of connection according to traditional laws and customs in the Determination Area" (Jones v Western Australia 2017). Yinhawangka People affirmed their belief that ancestral beings created the features of the landscape and laid down the laws and customs when the world was soft. These laws and customs connect Yinhawangka People to their Country today.

According to the Federal Court, the joint submissions identified the continuity of Yinhawangka traditional laws and customs, the recognition of the traditional Country of the Yinhawangka People, and the descent of contemporary Yinhawangka People from recognised Yinhawangka Ancestors.



"Water is the life blood of Yinhawangka Country. The main artery is Turee Creek. All veins that flow into Turee Creek define Yinhawangka Country"

BRENDON COOK

Membership under Native Title requires descent from a Yinhawangka Ancestor, self-identification as a Yinhawangka person, and acceptance of that identity by other members of the Yinhawangka People in accordance with their traditional laws and customs. It follows that Yinhawangka People consulted for the present SSA are the appropriate people to speak for the Development Envelope, and in fact many of the older Yinhawangka people who were consulted for the present SSA were those who provided Witness Statements as cultural experts to the Federal Court in support of the Yinhawangka Determination (Jones v Western Australia, 2017). The determination also noted that traditional decision-making is consensual, although not necessarily unanimous.

The Proposal also covers the Ngarlawangga Native Title Determination Area. RTIO has commissioned a separate SSA with Ngarlawangga Traditional Owners to identify their values and to understand how the Proposal may impact them.

Fieldtrip three had a component where Yinhawangka and Ngarlawangga men came together to discuss aspects of the Proposal which have implications for both Native Title Determination Areas.

"Put the *%$# back in the hole"

GAIL COX

There was also an Yinhawangka only component of field trip three with men and women.

Fieldtrip four brought Yinhawangka, Ngarlawangga and Martu men together to discuss shared cultural knowledge that was relevant to critical aspects of the Proposal and its impact on their respective and shared values on-Country.

There will be a requirement for further discussion between the groups to agree on the management of any shared values.

Heritage Surveys

Heritage surveys, while usually directed at prescribed questions about the use of specific land areas, provide some insights into Yinhawangka values and aspirations for the Development Envelope, particularly as they have consistently involved the Yinhawangka People, resulting in confirmation of some of these values and aspirations on many occasions.

The main legislation governing heritage assessment in Western Australia is the AHA, which emphasises the identification and protection of sites, or places, rather than cultural landscapes. Hence, it does not fully reflect the perspective of Country held by Yinhawangka representatives who participated in the SSA.

Nevertheless, it does provide for the recognition of tangible values, such as objects and archaeological features, and intangible values, such as traditions, practices, and beliefs associated with certain places or objects.

Most surveys at WAN have been archaeological surveys, which have led to the identification of hundreds of artefact scatters, as well as rockshelters; quarries; and modified (scarred) trees (Jackson and Ibbitson 2008; Gavin Jackson 2013; Stevens 2011). Some scatters may indicate former habitation or "public" areas, while others may have been associated with sacred or private activities. Ethnographic surveys at WAN have confirmed the importance of intangible values and places.

Common themes on ethnographic surveys include management of archaeological sites in the path of mining proposals, traditional ecological plant knowledge for food and medicines and significant spiritual places (Williams 2022; Stevens 2011; Venz and Grove 2003). Stevens et al's (2019) ethnobotanical survey report reveals an extensive plant knowledge held by Yinhawangka women. Yinhawangka men have recently identified sites associated with men's business (Trip 4, closed report (2022)).

Yinhawangka Vision for the Future

Some of the most important Yinhawangka visions for the future are documented in YAC's Healthy Country Plan (HCP; Yinhawangka Aboriginal Corporation, 2016), and to some extent more recent heritage reports. These documents largely address aspirations for Country. The plan, developed with Yinhawangka CLH and YAC, identifies six main management targets for healthy Country:

- Yinda (Important places: water)
- Plants
- Animals
- Cultural sites
- Culture, Lore, Customs
- People on Country



The Plan states that all six targets are largely achieved in land that is already in a protection regime, for example Karijini National Park (Yinhawangka Aboriginal Corporation, 2016). The targets are partly met on unallocated Crown land and, less so, on some pastoral stations.

They are not met, or require serious remediation, on mine-sites and on Rocklea Station. These statements indicate mining and some forms of pastoralism to be serious and on-going threats to Yinhawangka Country as a whole. The specific threats to the targets are multiple and overlapping.

They include lack of effective governance; lack of management capacity; people living away from Country; climate change; roads and railways cutting through Country; overgrazing; inappropriate recreation activities in some places; unresolved Native Title; restricted access; loss of cultural knowledge; mine dewatering and bore fields; invasive plants, herbivores, and carnivores; wrong fire regimes; various social issues; and mining as a whole.

Conversations with YAC staff and recent heritage reports reveal many of these issues continue to be seen as problems by Yinhawangka People.



However, the HCP (Yinhawangka Aboriginal Corporation, 2016) also demonstrates Yinhawangka are keenly aware of local solutions to these threats even if the threats are largely the result of external historical and on-going economic and political forces. Six strategies for solving these problems are identified, as follows:

- Developing capacity in governance and native title
- Managing relationships and partnerships through Indigenous Land Use Agreements (ILUAs) and joint management agreements
- Developing capacity in land management through a Ranger program
- A cultural heritage program engaging Yinhawangka youth
- Managing invasive species
- A burning program to achieve less harmful fires and improve natural and cultural values.The plan acknowledges that these strategies would require developing and extending the capacities of YAC and Yinhawangka CLH into environmental and heritage protection through a culturally appropriate management structure. This work is on-going.





[6]Yinhawangka CLH advised during the SSA that Yinda means "important place". It may or may not be associated with water. Hence, we have not used the term Yinda in association with water throughout this report, except when it is stated in previous documents or when CLH have identified a Yinda, not just water.

The Yinhawangka Strategic Plan (Yinhawangka Aboriginal Corporation, 2017) also indicates priorities for YAC in the areas of education, land, culture, health, economic development, and governance. These priorities align with the HCP and confirm overarching Yinhawangka aspirations to manage their Country.

" The reality is that once you start active mining in this area, we can't exercise our Native Title rights. We can't come in and enjoy this area "

DARREN INJIE

SECTION 4 sets out the results of the SSA, as recorded on fieldtrips and refined at the Consolidation and SCHMP Workshops. These results are reflected in Yinhawangka representatives' responses to the Proposal and five themes which emerged during consultations.

Nested within these are Yinhawangka values, the anticipated impacts to them and the management actions to protect them in light of the Proposal.

Consultations

Fieldtrips

1. 22nd – 27th March 2021: Trip Report 1;
2. 25th – 28th May 2021: Trip Report 2;
3. 10th – 14th November 2021: Trip Report 3;
4. 1st March 2022: Trip Report 4.

Workshops

- Consolidation Workshop (CW) 21st June 2022: Preliminary Advice;
- Social, Cultural and Heritage Management Plan Workshop (SCHMPW): 22nd June 2022;
- ERD Workshops 1 – 4: September, October and November 2022 and April 2023.

Response to Proposal

Yinhawangka CLH conditionally support the Proposal. The SSA identified the parts of the Proposal that may proceed and the parts that may not (SECTION 5, Recommendations #1 - #8). The range immediately to the south of the existing WAN operations is critically important to Yinhawangka CLH for its spiritual values.

As a result, Yinhawangka CLH do not support the Proposal at Deposit J (Map 2). The Proposal may proceed (with conditions) at other locations.

Themes

The remaining recommendations (#9 - #47) are ordered through the following five themes:

- Protection of Country
- Connection to Country
- Caring for Country
- Sustainable futures
- Partnership and agreement

Protection of Country

This theme recommends a range of on-ground and high level actions to guide RTIO in protecting Country in and around the Development Envelope, before, during and after the Proposal. These recommendations (#9 - #19) are specific to the Proposal.

Even those which do not appear to be directly related to the Proposal e.g. restoring native bee populations (Recommendation #18) were shared by Yinhawangka CLH as a mitigation measure to offset the impacts of the Proposal.

Connection to Country

Recommendations #20 - #27 identify the places to which Yinhawangka CLH require access in and around the Development Envelope, and how knowledge of places is to be managed and shared between Yinhawangka CLH and others. The following places have been identified for access (Maps 3, 4, 5):

a. The Range to the south of existing WAN mining activities
b. Western Hill Site Complex
c. Archaeological Site (RTIO database: WA-16-61SS [No DPLH Place ID])
d. Mt Ella Site Complex
e. Rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444])
f. Rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID])
g. The Sinkhole (RTIO database: Yinta)

Access to these places will be managed under the West Angelas Land Access Protocol. This protocol will determine the conditions of access.

Yinhawangka representatives who participated in the SSA did not identify any other places for access within the Development Envelope.

However, given the dominance of archaeological surveys in reproducing knowledge at WAN, there should be ongoing conversation between RTIO and YAC regarding any as yet unidentified places to which CLH may require access in the future.

Caring for Country

Recommendations #28 - #40 set out processes for managing Yinhawangka Country in and around the Development Envelope. Business, education and capacity building projects associated with and beyond the Proposal have been grouped within this theme. These recommendations are not necessarily associated with the Proposal and may be implemented separately. Some may be appropriate for implementation at other RTIO operations and proposals.

Sustainable futures

Recommendation #41 is a holistic vision for the future of Yinhawangka Country. This would see development of a 100-year plan to consider the long-term benefits and impacts of mining alongside other possible futures for Yinhawangka Country.

Partnership and agreement

Recommendations #42 - #47 define the way forward for Yinhawangka CLH and RTIO. A genuine partnership approach to mine planning, management, and closure was a priority for Yinhawangka CLH.



SECTION 5 combines the results of desktop research, fieldtrips and workshops to consider the SSA's effectiveness in protecting social surroundings from significant harm in relation to the Proposal. The section considers the concept of value, specifically the relationship between present and absent values. There is now a precedent for compensating loss of value through the 2016 Griffiths Case (Timber Creek). The section goes on to consider the challenges in reflecting diversity within the SSA processes and outputs. A possible way forward is revealed in the form of a regenerative approach.

Towards the end of the section are some high level principles to protect social surroundings from significant harm. The section ends by arguing for the retention of complexity in bringing Yinhawangka CLH knowledge, stories, views and perspectives to bear on the Proposal.

Values

Values are at the centre of SSAs. A sophisticated anthropological analysis will qualitatively assess them, not just in terms of their presence (or absence), but in relation to each other. The more than human approach attempts this by mapping connections between values. In this SSA, connections between certain archaeological sites, songlines and stories, plant foods, plant medicines and traditional ecological knowledge were all recorded. Of particular note were the numerous archaeological surveys conducted at WAN which have, over decades, brought Yinhawangka CLH to the area for the purpose of identifying and assessing heritage sites.

Many of the Yinhawangka representatives on the SSA had participated in such surveys, and others followed the results through meetings, reports and word-of-mouth. While not the focus of SSAs, archaeology is important to Yinhawangka CLH and this SSA revealed archaeological surveys to be a dominant form of knowledge production in the Development Envelope and its surroundings.

Archaeological survey teams on Yinhawangka Country usually consist of archaeologists guided by and working together with Yinhawangka CLH. While archaeologists may be male or female, Yinhawangka representatives on the surveys are male. Due to the often strenuous nature of archaeological fieldwork, the teams are skewed to a younger demographic, although there may be one or more Senior Elders present.

The holder of knowledge tends to be the archaeologist. While knowledge has been shared with Traditional Owners across the Pilbara over decades, the technology for identifying and recording artefacts and sites, innovations in the discipline, site records etc. are all held by archaeologists, not Traditional Owners (although it is acknowledged that there are many Aboriginal archaeologists in Australia). All of these circumstances reproduce certain values which manifest in SSAs.

For example, on fieldtrip two, there was a preference from one Yinhawangka representative to visit archaeological sites (while women waited at the vehicles). This served to reproduce the value of archaeology and reduced the window of opportunity to consider other values which may have otherwise been considered during that fieldtrip.

All values are important - archaeological values among them. However, limited Yinhawangka engagement with the Development Envelope and its surroundings for reasons other than archaeological surveys has created the conditions for these values to dominate in certain circumstances.

One important consideration for SSAs is how to address and respond to diverse views and perspectives among Yinhawangka CLH on fieldtrips and in workshops. Yinhawangka CLH are a community of individuals, who share a common cultural heritage, and common ancestral heritage. While this shared heritage generally creates strong cohesion in terms of values and what constitutes an impact and the appropriate way to mitigate or avoid it, there are differing views between individuals on some issues.

By their very nature, SSAs attempt to reach a certain degree of consensus in managing Country. We need to ensure that diversity is not flattened in the process of meeting the legislation. The Yinhawangka Determination (Jones v Western Australia, 2017) suggests that traditional decision-making is consensual, although not necessarily unanimous.

Anthropologists working on SSAs may learn more about addressing and responding to diverse views and perspectives from the experience of those working in Native Title.

Absent in and around the Development Envelope were connections to places of birth and death of known individuals, ceremonial and social gathering places, and places supporting day-to-day activities such as hunting. With the exception of a 'dinner camp' (which requires further assessment and will not be impacted by the Proposal) there were no values or places reported from 'living memory' i.e. the memory of those Yinhawangka representatives who participated in the fieldtrips.

Information shared tended to be from the deep past (reproduced from archaeological surveys) or reflected knowledge of or aspirations for Country of a general nature found at, or suggested for, other places on Yinhawangka Country.

A Yinhawangka representative on Trip 2 explained that the absence of living memory values was due to the deep water table in and around the Development Envelope. In the C.19th, pastoral stations were established at locations where the water table was close to the ground surface so that the station could be serviced by a water supply which could be accessed by the technology of the time. Yinhawangka CLH lived and worked at the stations and many of the representatives who participated in the SSA grew up at or spent considerable time in their youth at such stations. However, with no stations established in or around the Development Envelope, certain values (which were common at GPO) were absent at WAN.

An absence of values may point to a loss. The impact of loss is acknowledged by the Griffiths (Timber Creek) Case, which ordered compensation be paid to Ngaliwurru and Nungali peoples by the Northern Territory and Commonwealth of Australia for the extinguishment of native title rights and interests under the Native Title Act 1993 (Cth). In August 2016, the Federal Court awarded approximately $3.3 million compensation to the Ngaliwurru and Nungali peoples, including spiritual loss ($1.3 million), economic loss (calculated at eighty per cent of the freehold value of the affected land) and simple interest on the sum awarded for economic loss.

The case was the first time that loss of Traditional Owner values had been allocated a dollar value (Australian Institute of Aboriginal and Torres Strait Islander Studies: https://aiatsis.gov.au/explore/timber-creek-compensation-case.

Values across Yinhawangka Country are not static: they have always been in varying states of reproduction, with the relationships between them subject to re-definition. Yinhawangka CLH have used this SSA to protect what is of value to them now as much as they possibly can in advance of the Proposal.

We did not investigate the responsibility of SSAs in protecting certain social surroundings from the past. For example, we do not know when Yinhawangka CLH's ancestors stopped hunting in the Development Envelope and its surroundings, though we have to assume from the prevalence of human occupation sites in the area that hunting took place there.

If there is no living memory of hunting, is it a loss to social surroundings when that value no longer exists? What of the possible need to protect future values which have not yet emerged? Given the right circumstances, hunting may re-emerge as a value at the place. To what extent are social surroundings shaped by the act of doing SSAs? Such questions underscore the need to support Yinhawangka CLH to re-connect with Country.

When we strengthen connections lying latent in the cultural landscape, we strengthen social surroundings. If we want social surroundings to thrive, we cannot simply protect them from harm – we must regenerate them.

A Regenerative Approach

Rose (2011: 62) asserts that, "Whether planned or accidental, extinctions result from actions that refuse to recognize connectivity, mutuality, and the flourishing of beings and relationships." By this logic, any efforts to actively reproduce values (and the connections between them) will be beneficial to People, Culture and Country.

This aligns with a regenerative approach, which seeks to create the optimum conditions for life to thrive, by focusing on improving the connections between elements and the systems of which they are a part.

The approach is commonly adopted in agriculture, but an emerging body of research is also coalescing around regenerative thinking across all sectors and industries, including business, design and social policy (e.g. Mang and Reed 2012; Camrass 2020; Hahn and Tampe 2021).

" Everyone needs to know what we are losing "

JARED GRABENHOFER



The recently-published Victorian Traditional Owner Cultural Landscapes Strategy (Federation of Victorian Traditional Owner Corporations, Parks Victoria and Department of Environment, Land, Water and Planning with Traditional Owners 2021), which aims to embed Traditional Owner management of Country at a state level, is taking a regenerative approach with the ultimate objective of 'Restoring the Knowledge System'.

This should avoid or reduce 'silo-ing' of programs and departments as Traditional knowledge is shared and adopted to manage Country. While the Strategy is applied in a different context to this SSA (culturally, geographically, economically and politically), it will be important to follow developments. Yinhawangka CLH are determined to "get on the front foot" in managing Country, as reflected in recommendations for genuine partnerships between Yinhawangka CLH and RTIO, other proponents and land managers.

As for the Victorian situation, work must continue to restore the knowledge system and the mechanisms through which knowledge is reproduced for such partnerships to be fully effective.

Terms of Reference

This SSA was guided by Yinhawangka CLH and informed by the frameworks outlined in SECTION 2, the context in SECTION 3 and the processes and outputs of fieldtrips and workshops in SECTION 4. The approach was necessarily iterative and dynamic. As such, we would not advocate for a prescribed way to conduct SSAs. However, three principles, revealed through this SSA, will protect social surroundings from significant harm. These preliminary Terms of Reference may be of assistance in conducting future SSAs on Yinhawangka Country:

1. Values cannot simply be preserved by not impacting them - they are dynamic connections between People, Culture and Country which must be continually regenerated.
2. Through the act of doing SSAs, we are creating, developing, shaping and reproducing social surroundings.
3. A given point in time is just a 'snapshot' of a place's social surroundings. A meaningful assessment will take a long-term perspective, from the deep past to the present and multiple possible futures.

> "In the case of humans, the reference to social surroundings in the definition of environment in subsection (1), is a reference to aesthetic, cultural, economic and other social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings." EP Act 1986 (WA).

Social surroundings are values entangled in complex, dynamic ways. New connections are constantly forming, just as old ones are re-forming and others are forgotten. It is incumbent on SSA practitioners to find ways to regenerate these values. There can be no real end to a given SSA because what is recorded is a moment in time and circumstance. Social surroundings will have changed (perhaps not markedly, but changed nonetheless) by the next SSA at WAN, as they should.

Hence SSAs must be considered 'working documents' that grow and adapt over time. As process and outputs, methods and theory and subject and object, they should strive to record and extend the opportunities for complexity, diversity and nuance, while seeking consensus in bringing Yinhawangka CLH knowledge, stories, views and perspectives to bear on a Proposal. In so doing, SSAs will reproduce social surroundings in their own way, taking their place as an important framework within the cultural landscape.



As a result of the SSA, the following 47 recommendations have been endorsed by Yinhawangka CLH, YAC and RTIO. Some of these recommendations will be used by RTIO to address the Environmental Protection Authority's (EPA's) Social Surroundings Environmental Factor under s.38 (Part IV) of the EP Act. Other recommendations which fall outside the remit of the EP Act will support Yinhawangka CLH, YAC and RTIO in managing Yinhawangka Country through other agreements and programs. To assist with their implementation, the recommendations are grouped in themes which emerged during the SSA, although it is acknowledged that a recommendation may relate to more than one theme.

Yinhawangka Common Law Holders conditionally support the Proposal.

Recommendations #1 - #8 identify the parts of the Proposal that may proceed, and the parts that may not.

It is recommended that:

1 The range immediately to the south of the existing WAN operations (the Range) is a critically important site. The site is to be registered under the AHA and entered into YAC and RTIO's databases for its protection (dashed yellow outline, Map 3). The site extends beyond Yinhawangka Country into Ngarlawangga Country. Further discussion between Yinhawangka and Ngarlawangga CLH will be required to manage this site.

2 Due to the site at Recommendation #1, Yinhawangka CLH do not support the Proposal at Deposit J (Map 2). Ground disturbance is not supported in the Range. However, maintenance (but not expansion) of existing infrastructure e.g. tracks, may be permitted. Within these parameters, the specific activities which may be supported in the Range should be determined through further discussion with Yinhawangka and Ngarlawangga CLH.

3 The Proposal at Mount Ella East (Map 2) within the proposed disturbance footprint may proceed. Yinhawangka CLH do not support direct impacts to the Range outside this footprint. Pits at Mount Ella East shall be backfilled to the original ground surface, using the waste material from the proposed pits and existing waste dumps. Where possible, waste from the proposed pits should be dumped on top of existing waste dumps, to limit the overall number and footprint of waste dumps;

4 The Proposal at Western Hill (Map 2) may proceed, provided the previously recorded Western Hill Site Complex (WAN20-009, WAN20-014, WAN20-012, TBR-18-20, WAN20-007, WARE14-87-SS, WAN20-002, TBR-18-19, WAN20-11, WA-18-05-RS, WAN20-008, WAN20-010, WAN20-013, WAN20-006, WA-16-23-AS, WAN20-005, WAN20-004, WAN20-003, WA-18-02-ST, WA-18-04-RS) (Map 3) is protected;

5 The Proposal at Deposit H (Map 2) may proceed;

6 The Proposal at Deposit F North (Map 2) may proceed;

7 There are no recommendations specific to Deposit G (Map 2);

8 There are no recommendations specific to Deposit A West (Map 2).

Protection of Country

Recommendations #9 - #19 advise RTIO how to protect Country in and around the Development Envelope, before, during and after the Proposal. While the Proposal's impacts on dust was considered during the SSA, Yinhawangka CLH assume that RTIO will continue to monitor dust quality and quantity and minimise its impacts at WAN as standard practice. Consequently, Yinhawangka CLH had no specific recommendations on this matter.

It is recommended that:

9 All mine pits associated with the Proposal are to be backfilled at the cessation of mining;

10 Independent experts should monitor the impacts of RTIO's blasting activities on rockshelters and share the results with Yinhawangka CLH via an appropriate forum as determined through consultation with YAC;

11 Yinhawangka CLH support RTIO's plans to monitor water quality and quantity at a sinkhole (the Sinkhole) (Rio Tinto Database: Yinta) (located 5.5 km south-west of the Development Envelope; Map 3) to create a baseline for future water monitoring and management. Real time data should be shared with CLH and YAC through an appropriate forum to be determined by YAC;

[7]Yinta is the RTIO Database reference for the Sinkhole, which was recorded during a previous ethnographic survey (Williams 2011).

12 A Rights Reserved Area (RRA) around the Sinkhole (Map 3) should be negotiated between RTIO and YAC and the place should be registered as a site under the AHA;

13 RTIO should expand the existing RRA at Illingurra (Mt Governor) (Rio Tinto Database HOPEETH3-01), to encompass the mountain in its entirety. The mountain lies in Yinhawangka and Banjima Country and the RRA currently covers only the portion in Banjima Country. The extent of the RRA in Yinhawangka Country will need to be determined by RTIO and YAC;

14 Guided by their Elders, Yinhawangka CLH should be engaged for the following work in and around the Development Envelope:

a Monitoring landscape condition, water quality and water quantity at the Sinkhole (Map 3). This should include removing animal bones and other debris when the water dries up;

b Implementing cultural burning to control weeds at locations to be determined;

c Monitoring the impacts of mining activities on rockshelters;

15 An ethnographic survey should be conducted to support possible registration of the site known as Dinner Camp, (Rio Tinto Database WAETH06-2) (Map 3) under the AHA;

16 RTIO and Yinhawangka CLH should work together to map and protect pebble mouse mounds where practicable. This may be considered within RTIO's environmental survey program;

17 RTIO should manage topsoil to maintain and improve its vitality, so that it provides a viable seed bank when used during mine closure rehabilitation activities. Done well, there may not be a need to seed at all. If seed is required, stock should be provenanced from Yinhawangka Country where practical, as close to WAN as possible. Yinhawangka CLH will advise RTIO on a culturally appropriate species for inclusion in the rehabilitation seed mix;

18 Yinhawangka CLH should be supported by RTIO and YAC to regenerate native bee populations and encouraged to harvest the resulting honey for their personal consumption;

19 Yinhawangka CLH wish to explore the potential for compensation from the Western Australian Government for the irreplaceable loss of and damage to places from mining under the Racial Discrimination Act 1984. Yinhawangka CLH do not see Mining Benefits Payments as sufficient compensation.

Connection to Country

Recommendations #20 - #27 identify the places to which Yinhawangka CLH require access in and around the Development Envelope, and how knowledge of places is to be managed and shared between Yinhawangka CLH and others.

It is recommended that:

20 RTIO should facilitate Yinhawangka CLH access to the following places in line with the West Angelas Land Access Protocol (Map 3):

a The Range to the south of existing WAN mining activities

b Western Hill Site Complex

c Archaeological Site (RTIO database: WA-16-61SS [No DPLH Place ID])

d Mt Ella Site Complex

e Rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444])

f Engraving WA-16-51-ENG

g Rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID])

h The Sinkhole (RTIO database: Yinta)

RTIO and Yinhawangka CLH should maintain ongoing communication to ensure that access to the abovementioned places is properly managed throughout the life of the Proposal. There should be regular RTIO and YAC review of the Land Access Protocol. Due consideration should also be given to any additional places for Yinhawangka CLH access in the future, such as significant places identified during archaeological survey;

21 Opportunities to re-vitalise women's connections to significant places are to be sought by YAC under the leadership and guidance of Yinhawangka women. This should include a program of activities on-Country, supported by RTIO through provision of funding and logistics;

" It's not just us as Yinhawangka, it is us as Australians. Yinhawangka are the main actors but it's about all of us "

BRENDAN COOK



22 Yinhawangka CLH will identify gender restricted places in and around the Development Envelope. The results should be shared with appropriate parties to ensure consistency around access and culturally appropriate management of places;

23 Yinhawangka CLH will work with RTIO to produce a cultural protocols 'Code of Conduct' brochure in digital and hard copy formats to educate mining personnel and the general public in appropriate behaviour on Yinhawangka Country. This may be produced in conjunction with other Traditional Owner Groups. Hard copies should be made available at airports, hotels and mining camps in the region;

24 Yinhawangka CLH will work with RTIO to host an annual 'Yinhawangka Community Day' at WAN. Yinhawangka CLH and others will be supported to visit and observe the activities taking place there. This would be an additional commitment over and above any other similar events;

25 The office, services and facilities at WAN should offer a welcoming experience for Yinhawangka CLH and others through:

a More signage, murals and displays (in language where possible) celebrating Yinhawangka Culture and Country;

b Cultural awareness training for all employees, including office, catering, grounds and other service staff and contractors;

c Cultural immersion camps aimed at giving WAN staff an extended cultural experience (overnight or longer) co-designed and implemented by Yinhawangka and Ngarlawangga CLH;

d Special treatment of Yinhawangka Elders including the provision of rooms with easy access to the dry mess and vehicle drop off and pick up points;

26 Yinhawangka CLH will work with RTIO to develop a communications strategy for sharing language and imagery throughout WAN;

27 The Aboriginal Place Names Project is to be completed through YAC. It should include cultural mapping in and around the Development Envelope, re-assessing names already applied to places and recording names for places which have not yet been identified on maps, databases etc. Once these names have been endorsed, they should be shared with RTIO to use at WAN.

Caring for Country

Recommendations #28 - #40 set out processes for managing Yinhawangka Country in and around the Development Envelope now.

It is recommended that:

28 Yinhawangka CLH are supported to manage important cultural places by all land users and managers, including mining companies, Government Departments etc.;

29 Yinhawangka CLH participation in heritage surveys and SSAs is supported by YAC through an induction program. The program should include:

a Mentoring;

b Appropriate gender and apical representation;

c Cultural safety;

30 YAC should employ a Yinhawangka man and woman to manage CLH participation in heritage surveys and SSAs;

31 RTIO and YAC should develop support mechanisms to encourage Yinhawangka CLH into the RTIO workforce;

32 A Yinhawangka Water Committee led by nominated Yinhawangka CLH should be established for the purpose of making water-related decisions on Yinhawangka Country;

33 Archaeological survey areas should not be considered 'assessed' in circumstances where ground surface visibility is deemed too low (eg. <20%). Alternative approaches should be sought in low visibility areas, such as cultural burning in advance of the survey. The area should be inspected by Yinhawangka CLH and other experts as required beforehand, to identify any scarred trees or other features to be protected during the burn;

34 RTIO is to involve Yinhawangka CLH in mine planning for all Proposals on Yinhawangka Country from the Conceptual Phase through to mine closure and rehabilitation. Involvement should include (but not be limited to):

a The location and scale of a proposal, including new mines and extensions to existing mines;

b The routes RTIO anticipates using during exploration, mine construction, operations and closure;

c Yinhawangka CLH access to places within the Development Envelope;

d The extent to which pits will be backfilled at the cessation of mining;

Where appropriate, plans should be evaluated by an independent expert (mining engineer or similar) engaged by YAC;

35 Plants, animals and other natural features in and around the Development Envelope should be recorded in a two-way knowledge exchange between people trained in Western and Yinhawangka science;

36 YAC should facilitate Yinhawangka-led studies, especially in areas which are subject to RTIO proposals. Studies may include (but not be limited to) flora, fauna and water assessments;

37 RTIO should adopt standard formatting for reporting the results of studies undertaken on Yinhawangka Country. There should be real-time sharing of data;

38 RTIO should invite Yinhawangka CLH to visit mines which have been or soon will be closed such as Argyle Mine, Hunter Valley Coal Mine, Ranger Mine etc., to hear the experience of those involved and apply any lessons learnt to WAN;

39 RTIO and YAC should agree on the eligibility and processes for RTIO's funding of Yinhawangka CLH-managed programs and businesses. There should be transparency around these requirements so that Yinhawangka CLH can tailor applications for success;

40 RTIO and YAC should facilitate regular workshops for CLH to review RTIO's activities on Yinhawangka Country.



Sustainable Futures

Recommendation #41 is a holistic vision for the future of Yinhawangka Country.

It is recommended that:

41 Yinhawangka CLH develop a 100-year plan which considers the long-term benefits and impacts of mining alongside other possible futures for Yinhawangka Country;

Partnership and Agreement

Recommendations #42 - #47 define the way forward for Yinhawangka CLH and RTIO.

It is recommended that:

42 Yinhawangka CLH and RTIO explore the pros and cons associated with a partnership model as an alternative to existing Agreements;

43 Yinhawangka CLH develop standards for RTIO and other proponents and land managers working on Yinhawangka Country. These standards will take into account Regional Standards developed by other Pilbara Traditional Owner groups;

44 Yinhawangka CLH should work with RTIO and other Pilbara Traditional Owner groups to develop joint ventures with existing and future contractors for the purpose of recycling waste products including, but not limited to, copper, steel, batteries, aerosol cans and especially rubber tyres;

45 RTIO should host a workshop to communicate the recommendations from Commonwealth of Australia (2021) A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge to Yinhawangka CLH and how any changes have affected or will affect Yinhawangka People, Culture and Country;

46 The YAC-RTIO CWPA Modernised Agreement is to result in Yinhawangka CLH being given fair compensation for all mining on Yinhawangka Country;

47 Where appropriate, the recommendations and commitments from this SSA should be enshrined in the YAC-RTIO CWPA Modernised Agreement.

"Leave only footprints, not rubbish. Take only photos, not rocks"

JUANITA LYNDON

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" What we value is our culture, our land and our people. And if we lose one of those things, we are nothing "

SCOTT JAMES



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b. Yinhawangka Social Cultural Heritage Management Plan – SCHMP

West Angelas Revised Proposal on Yinhawangka Country

Social, Cultural and Heritage Management Plan

RTIO-1030687

PREAMBLE

It is **Yinhawangka** People's birthright to look after Country, to ensure the continuation of life, culture, and health for future generations. Rio Tinto Iron Ore (**Rio Tinto**) (on behalf of Robe River Mining Co. Pty Ltd) (**the Proponent**), understands and accepts that **Yinhawangka** expects to participate in this responsibility through the obligations and management actions committed to in this Social, Cultural and Heritage Management Plan (**SCHMP**). This fundamental human Right to Care for Country has been recognised by the United Nations Declaration on the Rights of Indigenous Peoples adopted by the General Assembly on 13 September 2007 (United Nations 2007).

The Proponent acknowledges the Common Law and Native Title holders – the **Yinhawangka** People – as the Traditional Owners and rightful custodians of the **Yinhawangka** land on which it intends to develop the West Angelas Revised **Proposal**. **The Proponent** acknowledges that the West Angelas Revised Proposal extends within the lands of both the **Yinhawangka** and **Ngarlawangga** Peoples as recognised by their respective Native Title Determination areas. This West Angelas Revised **Proposal SCHMP** is specifically established for the **Yinhawangka** People and **the Proponent.** A separate **SCHMP** will be developed for the **Ngarlawangga** People and **the Proponent**.

The Proponent recognises that the **Yinhawangka** Aboriginal Corporation **RNTBC** ICN 7837 is the peak body representing the **Yinhawangka** People and has a responsibility to communicate and consult with the members of the **Yinhawangka** People at large.

The Proponent also acknowledges it has additional hubs and exploration activity across **Yinhawangka** Country and plans for future mine hub proposals. It is noted that this **Proposal** may not consider or anticipate the cumulative impacts to Country beyond the boundaries of the West Angelas Revised **Proposal**.

The Proponent acknowledges that water is central to life and its continuity and, as such, is intrinsic to the cultural, social, spiritual, aesthetic, ecological, and economic values of the **Yinhawangka** People. **The Proponent** acknowledges that the **Yinhawangka** People cannot and do not sanction impacts to their waters (and Country generally) but understand that it is currently an unavoidable consequence of mining.

The Proponent respects that this Country forms an integral part of **Yinhawangka** People's culture, history and future, and any impact to the land, waters and their respective life forms may impact the mental, physical, and spiritual well-being of the **Yinhawangka** People. The social, cultural and heritage values of the **Yinhawangka** People and their ancestors come from inseparable deep-time connections to and interrelationships with Country. This **SCHMP** recognises parts of this connection identified in the consultations between **Yinhawangka Common Law Holder**s (**CLHs**) and **the Proponent** in preparation of this document and where **Yinhawangka** connection to Country may be affected or impacted by **the Proponent**.

EXECUTIVE SUMMARY

This Social, Cultural and Heritage Management Plan (**SCHMP**) was jointly prepared for the West Angelas Revised **Proposal** (**EPA** Assessment No. 2290) (the **Proposal**) by Rio Tinto Iron Ore (**Rio Tinto**) (on behalf of Robe River Mining Co. Pty Ltd) (**the Proponent**), **Yinhawangka** Country **Common Law Holder**s (**CLHs**) and the **Yinhawangka** Aboriginal Corporation (**YAC**). This **SCHMP** has been developed to meet the Western Australian (**WA**) Environmental Protection Authority's (**EPA**) environmental objective for the social surroundings environmental factor.

The **EPA**'s environmental objective for the social surroundings environmental factor is:

> *To protect social surroundings from significant harm* (**EPA** 2016).

The *Environmental Protection Act 1996* (**WA**) (**EP Act**) defines "social surroundings" as follows:

> *"In the case of humans, the reference to social surroundings in the definition of* environment *in subsection (1), is a reference to aesthetic, cultural, economic and other social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings."* EP Act 1986 (WA).

The **Proposal** is for the development of new above and below-water table deposits and associated activities to extend the life of the existing West Angelas iron ore operation located approximately 100 kilometres northwest of the town of Newman, in the Pilbara region of Western Australia. Most of the western section of the **Proposal** is situated within **Yinhawangka** Native Title Determination Claim Areas: Part A (WAD340/2010) and Part B (WAD216/2010). Parts of the eastern section are situated within the Ngarlawangga Native Title Determination Area (WCD2016/007). This **SCHMP** only covers those parts of the **Proposal** situated within the **Yinhawangka** Native Title Determination Area: Part A (WAD340/2010) and Part B (WAD216/2010).

The **Proposal** includes the following key components:

- Clearing of up to 5,350 ha within a Revised Development Envelope of 8,457 ha
- Construction and operation of new above and below water table mine pits at:
    - Western Hill
    - Deposit H
    - Deposit F North
    - Mount Ella East
- Development and operation of infrastructure associated with:
    - mineral waste management, including but not limited to in-pit storage of waste fines;
    - dewatering and surplus dewater management, including use in ore processing, on-site use and surface discharge; and
        - Other associated mine infrastructure, support facilities and activities.

Significant places within and immediately surrounding the Revised Development Envelope (Figure 3-1) are associated with a range of cultural, social, spiritual, aesthetic, ecological, and economic values. Specific significant places were identified by the **Yinhawangka CLHs** via a number of on-Country consultations and other meetings with **the Proponent** in relation to the **Proposal**. The significant places and sites identified by **CLHs** within or near the Proposal are:

- **The Range** to the south of existing West Angelas mining operations (RTIO database: the Range [no **DPLH** Place ID])
- **Western Hill site complex**
- Archaeological site WA-16-61-SS (No **DPLH** Place ID)
- **Mt Ella East site complex** (RTIO database: WA-18-ETH-01 [No **DPLH** Place ID])
- Rockshelter with handprint (RTIO database: YINHARR-39 [**DPLH** Place ID 20444])
- Rockshelter with engravings (RTIO database: WA-16-45-ENG [No **DPLH** Place ID])

Other values in the vicinity of **the Proposal** relevant to **Yinhawangka's** social surroundings include:

- groundwater and surface water sources;
- native flora, fauna and natural habitats as biological values;
- archaeological and ethnographic sites as cultural heritage values; and
- lore, kinship, songlines, hunting, seed collection, bush medicine and food plants as cultural practices based on social values.

Yinhawangka CLHs identified potential impacts on **Yinhawangka** cultural objects and cultural landscape values (tangible and intangible) attributable to the **Proposal**. These potential impacts include:

- restricted access to Country, including **Places and Sites of Special Significance**;
- disruption of **CLHs**' connection to Country; and
- significant disturbance, alteration and damage to:
    - natural landscapes, including culturally significant features including, but not limited to, artefact scatters, rock shelters, and **water resources**[1]**,** which may cause direct and indirect impacts on cultural and spiritual values
    - traditional bush foods and medicines through the clearing of native vegetation
    - native animals, through disturbance and fragmentation of the landscape
    - water values, through the diversion of ephemeral **watercourses**, blocking of natural gully flows, abstraction of groundwater and artificial movement of water from one location to another.

Proposed operational activities will result in significant direct and indirect impacts on tangible and intangible **Yinhawangka** cultural objects and cultural, social, spiritual, aesthetic, ecological, and economic values of importance to **CLHs**.

Through a number of joint meetings, **the Proponent**, **CLHs** and **YAC** worked together to develop plans to avoid and, if unavoidable, mitigate impacts. On 03 November 2023, the Directors of **YAC** informed **the Proponent** that it had passed a resolution acknowledging the **Proposal**, which had been developed based on the input and feedback of the **YAC** Board and **Yinhawangka CLHs**. On the 29th November 2023, the YAC Board have also provided a letter of conditional endorsement (Appendix 13) and acknowledgement of Rio Tinto Iron Ore's submission to the Environmental Protection Authority. An excerpt of this resolution is below:

*'This letter is to confirm YAC's acknowledgement of Rio Tinto Iron Ore's (**RTIO**) submission to the Environmental Protection Authority (**EPA**), for the Social Surrounds Chapter and Social Cultural Heritage Management Plan (**SCHMP**) components of the final draft Environmental Review Document (**ERD**) for the West Angelas Revised Proposal Assessment No. 2290 (**Proposal**).'*

Following consultation with **YAC** and **Yinhawangka CLHs**, the **Proposal** has been amended, including:

- avoidance and minimisation of direct impact to six **Places and Sites of Special Significance**
- the removal of Deposit J from the Conceptual Footprint and modification of Revised Development Envelope to avoid impacts to **the Range** and minimise restrictions that may affect **CLH** access to **the Range**
- Significant amendment to the Conceptual Footprint and Revised Development Envelope at Mt Ella East to avoid the Range to the south, and **Mt Ella Site Complex**, and minimise restrictions that may affect **CLH** access to **the Range**

[1] Water in and of itself is a significant value for Yinhawangka. The Proposal will have impacts to surface regime and flow and groundwater extraction. However, there are no known waterholes or specific water heritage sites at risk of impact as a result of this Proposal.

- Amendment to the Conceptual Footprint at Western Hill to avoid direct impact to **Western Hill Site Complex**
- Commitment that mutually agreed closure outcomes with **YAC** are required prior to mining the Mount Ella East pits. This does not place any obligation on **YAC** and **Yinhawangka CLHs** to agree to the mining of the Mount Ella East pits at any time.

CLHs and **YAC** acknowledge that it is **the Proponent's** position that it is currently not economically viable to backfill pits at mine closure and waste dumps will remain in the landscape as per the **Mine Design**. **The Proponent** acknowledges that it is **CLH's** and **YAC's** preference that permanent waste dump landforms are minimised, and pits are backfilled, wherever practicable. **YAC** and **the Proponent** intend to continue discussing where outcomes that better meet **CLH** expectations and aspirations can be applied to the backfilling of pits and restoration of Country.

"On Yinhawangka Country, when you make a hole, you gotta fill it in otherwise you gurrbalgu *– make trouble for yourself."* Yinhawangka Elder 2022.

Mining development on Country when done well, can bring significant socio-economic benefits and opportunities to Traditional Owners. Proponent collaboration with Traditional Owners can promote the construction and operation of mines in ways that seek to minimise impacts, preserve and promote Traditional Culture, significant sites and values and Traditional Owners' connections thereto. **The Proponent's** implementation of the **Proposal** and this **SCHMP** also considers these processes and outcomes.

Proposal name	West Angelas Revised Proposal
Proponent name	Robe River Mining Co Pty Ltd (in its capacity as agent for and on behalf of the participants in the Robe Rive Joint Venture)
Ministerial Statement number	MSXXXX
Purpose of the SCHMP	To outline **the Proponent's** approach to social, cultural and heritage protection and management as it relates to **Yinhawangka** People, Culture and Country, and the **EPA's** *Environmental Factor Guideline: Social Surroundings* (**EPA** 2016).
Key environmental factor/s, outcome/s, and objective/s	**EPA** Environmental Factor: social surroundings **EPA** Social Surroundings objective: to protect social surroundings from significant **harm** (**EPA** 2016).
Key provisions in the SCHMP	Outline of management actions that aim to achieve outcomes that are acceptable to **CLHs** relating to: • Connection to Country • Protection of Country • Caring for Country • Water • Strong Culture • Strengthening of Cultural Heritage knowledge • Sustainable futures • Partnership and agreements

Document Control			
Rev	Date	Proponent reviewers	Approved for issue to
			Environmental Protection Authority

Disclaimer and Limitation

This **SCHMP** has been prepared by **Rio Tinto**, on behalf of Robe River Mining Co Pty Ltd (**the Proponent**) with **YAC** on behalf of the **Yinhawangka CLHs**. This **SCHMP** has been prepared specifically for the West Angelas Revised **Proposal**. Neither the report nor its contents may be referred to without the express approval of **the Proponent** and **YAC**.

Corporate Endorsement

I hereby certify that to the best of my knowledge, the provisions within the West Angelas Revised Proposal Social, Cultural and Heritage Management Plan are true and correct.

Name:	**Signed:**
James Davison	
Designation:	**Date:**
General Manager, Traditional Owner Partnerships Rio Tinto Iron Ore	
Name:	**Signed:**
Sean O'Hanlon	
Designation:	**Date:**
General Manager, West Angelas Region Rio Tinto Iron Ore	

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1 CONTEXT, SCOPE AND RATIONALE

1.1 Purpose

This Social, Cultural and Heritage Management Plan (**SCHMP**) was developed jointly by Rio Tinto Iron Ore (**Rio Tinto**) on behalf of Robe River Mining Co Pty Ltd (**the Proponent**), **Yinhawangka Common Law Holders** (**CLHs**) and **Yinhawangka Aboriginal Corporation** (**YAC**) as the peak body representing the **CLHs**. The **SCHMP** applies to the West Angelas Revised Proposal (**EPA** Assessment No. 2290) (**Proposal**) and has been prepared to ensure **the Proponent**:

- achieves the objective for the social surroundings environmental factor under Part IV of the *Environmental Protection Act 1986* (**EP Act**), which is to protect social surroundings from significant environmental **harm**;
- identifies and minimises impacts of the **Proposal** on **Yinhawangka CLHs**, their culture and their Country; and
- maintains and implements its commitments to **Yinhawangka CLHs**, as set out in Section 6 of this plan.

This **SCHMP** outlines how **the Proponent** will manage the **Proposal** and its potential direct and indirect impacts on social surroundings collaboratively with **CLHs** through **YAC**. The **SCHMP** is guided and informed by **Yinhawangka CLH's** knowledge and insights, who have, in cooperation with **the Proponent** produced a framework for management and guardianship of social surroundings for the **Proposal**.

Consultation completed to date is summarised in Section 3.2 specific consideration of social surroundings relevant to the **Proposal** has been recorded in the *Report of a Social Surroundings Assessment for West Angelas Revised Proposal* (**Yinhawangka** Common Law Holders and Archae-aus 2022) (**Social Surroundings Assessment**). Together, these consultations have enabled the development of a framework for management and guardianship with accompanying rights, responsibilities, obligations, and commitments. It has identified cultural, social, spiritual, aesthetic, ecological, and economic values and matters of importance to **CLHs** which will be or have the potential to be significantly impacted, directly or indirectly, by mining and ancillary activities being carried out by **the Proponent** for the **Proposal**. This plan outlines commitments and obligations to avoid, minimise and mitigate significant impacts on these social surroundings values. Where consultation has identified impacts and concerns that are not directly linked to the physical or biological surroundings as mandated under the **EP Act**, they have been retained and presented in Appendix 1. These matters are expected by **Yinhawangka CLHs** to be addressed in other agreements between **the Proponent** and **YAC** and under appropriate legislation as applicable.

1.2 Scope

This **SCHMP** applies to the West Angelas Revised **Proposal** (**EPA** Assessment No. 2290). It identifies outcomes and management and monitoring measures for potentially significant impacts on the social surroundings of **Yinhawangka CLHs**. It applies to the construction, operation, rehabilitation and closure of the **Proposal**.

This **SCHMP** will be implemented in **conjunction** with **the Yinhawangka** Cultural Heritage Management Plan (CHMP) for **Proponent** operations **within the West Angelas Revised Proposal Development Envelope** on **Yinhawangka** Country.

Additional information detailing scope and context is provided in Appendix 7.

1.3 Proposal Description

The Proponent proposes to extend the existing West Angelas Iron Ore Mine in the Pilbara region of Western Australia.

The Proposal includes a proposed consolidation and modernisation of the Ministerial Statements (MS) for the existing operations: MS 1113. Mining by **the Proponent** commenced around 1998, and this Proposal intends to utilise existing infrastructure within the Approved Proposal.

The Proposal has been referred for assessment under the (WA) *Environmental Protection Act 1986* (**EP Act**) through the Environmental Protection Authority (**EPA**), and the (**Cth**) *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) through the Department of Climate Change, Energy, the Environment and Water (**DCCEEW**).

A general description of the Proposal is provided in Table 1-1. Proposal deposits within Native Title Boundary locations is provided in Table 1-2. Proposal location, and Revised Development Envelope and Conceptual Footprint, in relation to regional location and the existing West Angelas Operations footprint are shown in Figure 1-1and Figure 1-2, respectively.

Table 1-1 General Proposal Content Description

Items	Details
Proposal Title	West Angelas Revised Proposal
Proponent Name	Robe River Mining Co Pty Limited

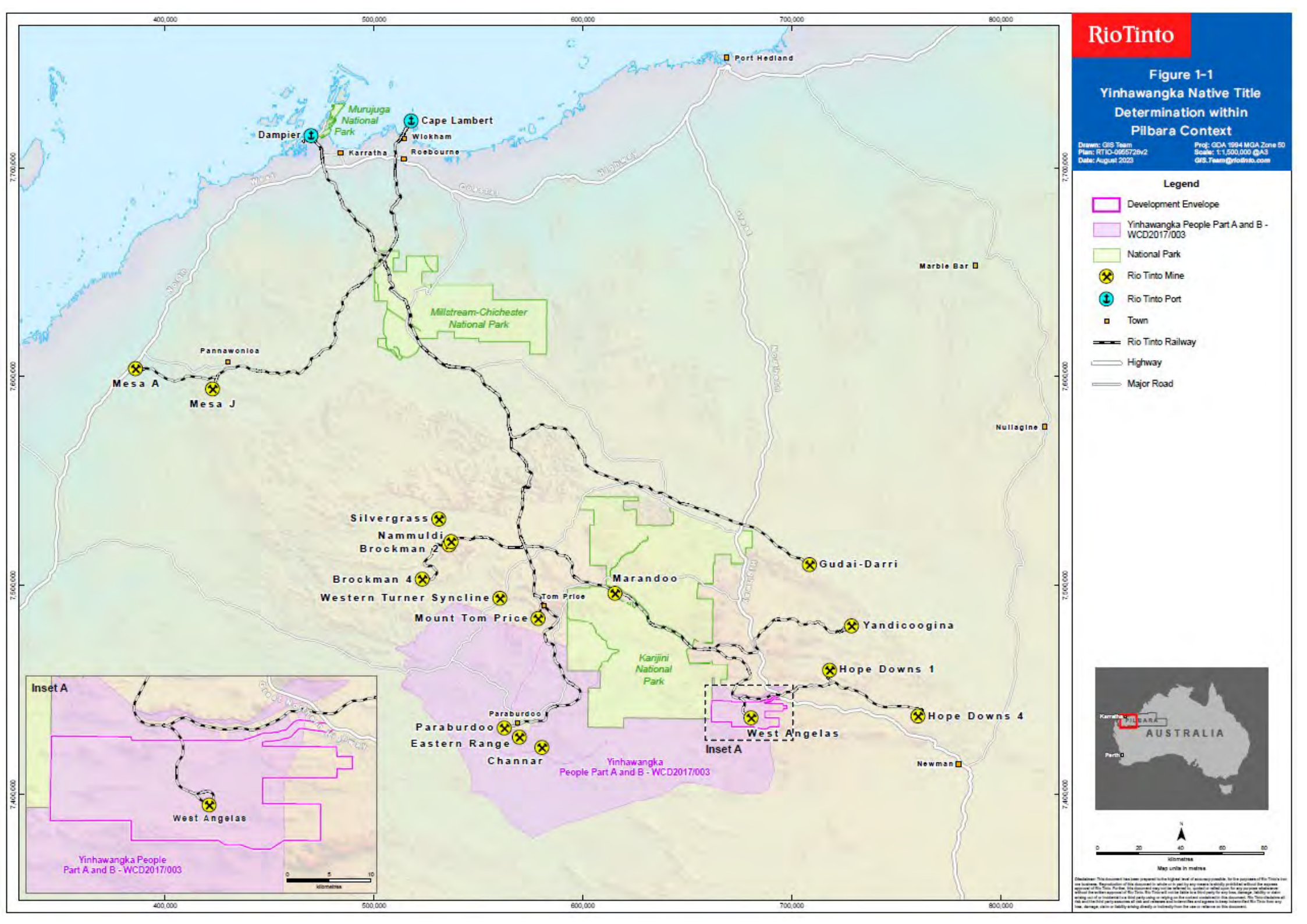
Short Description	The Proposal is located approximately 100 km northwest of Newman in the East Pilbara region of Western Australia. The Proposal is located within **Yinhawangka** and Ngarlawangga Peoples Native Title Determination Areas. The Proposal includes the development of **AWT** and **BWT** iron ore deposits and associated infrastructure including:
	• Development of above and below water table mine pits at:
	  • Western Hill
	  • Deposit H
	  • Deposit F North
	  • Mt Ella East
	• Associated activities which may include as relevant, but are not limited to, the following:
	• Mineral waste management: including waste rock landforms (WRL), land bridges, low grade ore dumps, topsoil and sub-soil stockpiles, in-pit WRL and storage of waste fines
	• Ore processing (including crushing) infrastructure

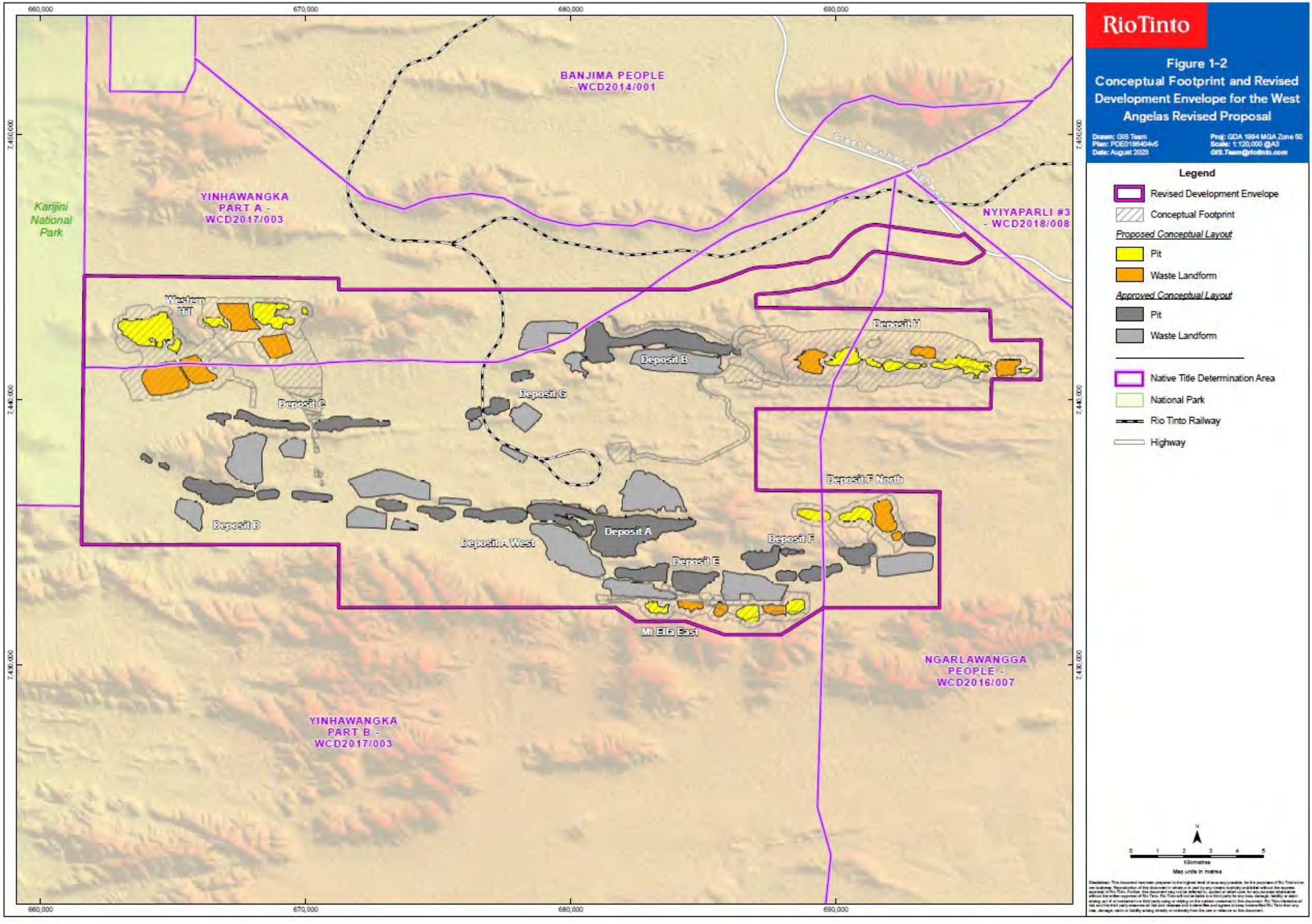
Items	Details
	• Other facilities including workshops, hydrocarbon and Ammonium Nitrate Fuel Oil (ANFO) storage and laydown areas • Linear infrastructure including heavy and light vehicle access roads, rail and associated infrastructure, conveyors, utilities corridors, pipelines and power (including sub-stations) and communications distribution networks • Infrastructure for surface water management including crossings, diversion drains, levees and culverts • Groundwater abstraction and utilisation, and associated infrastructure • Dewatering to enable below water table mining and associated infrastructure (including bores and pipelines) • Infrastructure for management and use of water from dewatering • Offices and accommodation villages • Renewable energy including renewable energy generation (solar), energy storage and associated ancillary infrastructure[2]

Table 1-2 Proposal Deposits within Native Title Boundary Locations

Deposit	Native Title Boundary Locations
Western Hill	**Yinhawangka** Country
Deposit H	**Yinhawangka**, and Ngarlawangga Country
Deposit F North	**Yinhawangka**, and Ngarlawangga Country
Mt Ella East	**Yinhawangka** Country

[2] Consultation with Yinhawangka CLHs on renewable energy and associated infrastructure has not yet occurred. Rio Tinto commits to undertaking consultation with Yinhawangka CLHs in the event that Rio Tinto decides to pursue renewable energy options on Yinhawangka Country and recognises that Yinhawangka CLHs reserve the right to object to any such proposals.


RioTinto
Figure 1-1
Yinhawangka Native Title Determination within Pilbara Context
Drawn: GIS Team
Plan: RTIO-0955729v2
Date: August 2023
Proj: GDA 1994 MGA Zone 50
Scale: 1:1,500,000 @A3
GIS.Team@riotinto.com
Legend
Development Envelope
Yinhawangka People Part A and B - WCD2017/003
National Park
Rio Tinto Mine
Rio Tinto Port
Town
Rio Tinto Railway
Highway
Major Road
Port Hedland
Murujuga National Park
Dampier
Cape Lambert
Wickham
Karratha
Roebourne
Millstream-Chichester National Park
Pannawonica
Mesa A
Mesa J
Marble Bar
Nullagine
Silvergrass
Nammuldi
Brockman 2
Brockman 4
Western Turner Syncline
Tom Price
Mount Tom Price
Marandoo
Gudai-Darri
Yandicoogina
Karijini National Park
Hope Downs 1
Hope Downs 4
West Angelas
Inset A
Paraburdoo
Paraburdoo
Eastern Range
Channar
Yinhawangka People Part A and B - WCD2017/003
Newman
Inset A
West Angelas
Yinhawangka People Part A and B - WCD2017/003
AUSTRALIA
Karratha
Perth
Kilometres
Map units in metres



RioTinto

Figure 1-2
Conceptual Footprint and Revised Development Envelope for the West Angelas Revised Proposal

Drawn: GIS Team
Plan: PDE0188404v5
Date: August 2023

Proj: GDA 1994 MGA Zone 50
Scale: 1:120,000 @A3
GIS.Team@riotinto.com

Legend

- Revised Development Envelope
- Conceptual Footprint

Proposed Conceptual Layout

- Pit
- Waste Landform

Approved Conceptual Layout

- Pit
- Waste Landform

- Native Title Determination Area
- National Park
- Rio Tinto Railway
- Highway

N

0 1 2 3 4 5
Kilometres
Map units in metres

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1.4 Exclusions

The **Proposal** excludes activities that are part of or required for the continuation of the existing mining operations at West Angelas. For the avoidance of doubt, this includes, but is not limited to, the following:

- Low impact activities[3], required to inform the Part IV assessment, including drilling and associated activities for the purposes of resource evaluation, geotechnical assessment and hydrogeological investigation. These activities will be subject to relevant provisions under Part V of the **EP Act** (**WA**), and the *Rights in Water and Irrigation Action 1914* (**RiWI Act**) (**WA**).
- Accommodation camp and associated activities; and
- Activities that are part, of or required for continuation of, the existing mining operations at West Angelas, as approved under MS 1113 and EPBC 2018/8299.

Current operational activities are authorised via statutory environmental approvals under Part IV and V of the **EP Act** and the **RiWI Act** and EPBC 2018/8299. **The Proponent** notes that, whilst the **Proposal** is under assessment, additional approvals or amendments to existing approvals may be required to support the continuation of the existing West Angelas operations that do not relate to the **Proposal** under assessment. Therefore, the above exclusions are not limited to only those activities already approved but also to activities authorised by existing approvals as they may be amended (including under s45C of the **EP Act**).

1.5 Key Assumptions

The social, cultural, and heritage information that forms the basis for and is included in this **SCHMP** remains the property of the **CLHs** at all times. Consultation for social surroundings is summarised in **Yinhawangka** Common Law Holders and Archae-aus (2022), provided in Appendix 3 (the **social surroundings assessment**).

The social, cultural and heritage information in this **SCHMP** is representative of consultations undertaken with **Yinhawangka CLHs** at a point in time to agree on management actions needed for the **Proposal** to proceed. The consultation and identified social, cultural and heritage information recorded are relevant to the **Proposal** information provided by **the Proponent** and the point in time they were undertaken. It should be acknowledged that culture and knowledge do not remain static. **Yinhawangka** is a living culture informed by its past, present and future; it should not be assumed that these records of social values will remain a complete, all-encompassing record of **Yinhawangka** knowledge, customs, places, beliefs and Law/Lore and may, over time, require adaptive management strategies to ensure the cultural needs of the **Yinhawangka** People are respected and met.

The social, cultural and heritage information presented in this **SCHMP** was collected specifically for the purpose of assessing the potential and predicted direct and indirect impact on social surroundings at a particular point in time to inform the **Proposa**l, mine planning and the design process. The mine design is anticipated to evolve over the life of the Proposal as driven by market influences and other factors. Changes to the **Proposal** will be developed against the commitments of this **SCHMP** and ongoing Life of Mine and mine planning consultation with **YAC** and **Yinhawangka CLHs**.

The information upon which this **SCHMP** is based is the result of consultation with **Yinhawangka CLH** via a number of forums. While attempts were made to consult widely, not every **CLH** was consulted, and therefore it is possible that other important information held by these **CLHs** was not taken into consideration during the development of this **SCHMP** and, therefore, not reflected in the agreed management actions.

It should be noted that their non-inclusion does not confer non-relevance to the social surroundings of the **Proposal** and that as/if identified, their inclusion may be actioned through a review of this plan or adaptive management process. In recognition of this, Section 11 outlines the agreed way **the**

[3] The specified activities described as “low impact activities” are not considered as low impact activities by Yinhawangka CLHs. The use of “low impact activities” to describe these activities is common in a regulatory sense, but does not reflect the views and experience of Yinhawangka CLHs.

Proponent and **CLHs** will respond to new or changed information regarding this **Proposal** and the **SCHMP**.

Traditional Owners have a cultural responsibility to care for their Country. This care is adaptive to the needs of Country. Through consultation, **Yinhawangka** and **the Proponent** have sought to agree on the ways in which Country will be cared for throughout this **Proposal**. **The Proponent**, **CLHs** and **YAC** also agree that effective management has a focus on continuous improvement and leading practice.

While consultations were undertaken with the best knowledge of all parties as to the potential impacts of the **Proposal** to reach an agreed position on what conditions it could proceed on, this should not be taken to imply unconditional consent from *all* **CLHs** to the implementation of the **Proposal**. **CLHs** reserve their rights with respect to the implementation of this **Proposal**. This prior informed consent will not arbitrarily be withdrawn. In the first instance, an attempt to resolve an issue through the review process outlined in this document will be undertaken.

All actions should be reviewed and updated as specified in this **SCHMP**.

2 YINHAWANGKA NATIVE TITLE AND AGREEMENTS

2.1 Yinhawangka Native Title

Yinhawangka have two Native Title Claim Areas:

- **Yinhawangka** Part A (WC2010/016) (4,699.83 km^2)
- **Yinhawangka** Part B (WC2010/011) (5,413.66 km^2).

Approximately 1,820 km^2 is within Karijini National Park, which, while not part of the Native Title Claim Areas, is also recognised as a part of **Yinhawangka** Country.

The **Yinhawangka** Native Title Determination was finalised in the Federal Court on 18 July 2017, granting the **Yinhawangka** People Native Title over the 10,150 square kilometre determination area (National Native Title Tribunal - online resource) (**Yinhawangka** People Part A and B [WCD2017/003]).

Figure 1-1 shows the **Proposal** within the **Yinhawangka** Native Title Determination area.

YAC is the Registered Native Title Body Corporate (**RNTBC**). **YAC** represents the interests of the **Yinhawangka** Native Title holders and has been active in the development of this **SCHMP**. **YAC** acts as the agent for **Yinhawangka** People in respect of their rights and obligations under various land use agreements.

2.2 Agreements

The Proponent's operations and approach to engagement with **CLHs** respect the **Yinhawangka** People's connection to Country, their rights under the *Native Title Act 1993* (**Cth**) and their cultural landscape values in a way that recognises **Yinhawangka** People as the **CLHs** of the land and Country on which this **Proposal** will be implemented.

Rio Tinto currently has three key agreements with the **Yinhawangka** People:

- Indigenous Land Use Agreement (**ILUA**)
- **Yinhawangka** Claim Wide Participation Agreement (**CWPA**)
- Regional Framework Deed (**RFD**).

As the RNTBC for the Yinhawangka People, YAC manages and protects **Yinhawangka** Native Title rights and interests on behalf of **Yinhawangka** People under these agreements.

Aligned with the obligations of an **RNTBC**, **YAC** creates a conduit for **CLHs** to deal with the non-Indigenous legal system. The **YAC** Board of Directors has responsibility for negotiating and implementing agreements with proponents who seek to undertake activities on their Native Title lands and making decisions on behalf of the **Yinhawangka** People as relevant.

YAC has ensured that **Proposal** consultations undertaken to date have been in accordance with **YAC** governance processes and the **Yinhawangka** and **Rio Tinto** Claim Wide Participation Agreement. The **YAC** Board has relied upon both the formally established committees and direct engagement with a number of **CLHs** to inform resolutions they have made to recommend changes to or accept the impacts and management strategies for this **Proposal**.

YAC will also continue to monitor the **Proposal** and the implementation of this **SCHMP** on behalf of the **CLHs** to ensure it meets the expectations of the **Yinhawangka** People and provide advice on how it may be adapted as required.

3 YINHAWANGKA SOCIAL, CULTURAL AND HERITAGE VALUES

3.1 Context: Yinhawangka Country, Culture and Heritage

Yinhawangka Country comprises 11,920 square kilometres of land in the central Pilbara region of Western Australia, centred on the Ashburton River system, which encompasses the Ashburton, Angelo and Hardey Rivers, Kunderong Range, Mount Vernon Station, Rocklea Station and Turee Creek.

Yinhawangka shares tribal boundaries and close cultural, linguistic and familial ties with Banjima, Nyiyaparli, Ngarlawangga, and Eastern Guruma Peoples. Despite experiencing significant upheavals since European colonisation, particularly through forced removals and relocation to reservations on the coast and the establishment of the pastoral and mining industries, many **Yinhawangka** connections to People, Country, and Culture remain intact. These connections are maintained through complex and active Laws/Lores, customs, caring for Country, and intergenerational knowledge transfer. Ceremonies to enact and reproduce this system are vitally important to maintaining Aboriginal cultural practice and identity throughout the Pilbara, enabling cultural resilience despite the socio-political upheavals experienced over the past 150 years.

On 18 July 2017, the Federal Court of Australia granted the **Yinhawangka** People Native Title over a 10,150 square kilometre determination area (WAD 340 of 2010 and WAD 216 of 2010 in the Federal Court; National Native Title Tribunal 2021). Much of the information recorded to support the determinations is not publicly available. However, many of the older **Yinhawangka** People who were consulted during the **social surroundings assessment**, which informs this **SCHMP** provided witness statements as cultural experts to the Federal Court in support of the **Yinhawangka** Determination (Jones v Western Australia, 2017).

Yinhawangka People have been participating in heritage surveys under the **AH Act** in and around the Revised Development Envelope from the mid-1980s onwards. These ethnographic and archaeological assessments were all commissioned by Robe River Mining Co Pty Ltd, either directly or through its parent company **Rio Tinto**, to support decisions about mining and ancillary infrastructure. While this body of work is an important repository of **Yinhawangka** knowledge and research, the AHA emphasises the identification and protection of sites, or places, rather than landscapes, meaning that many connections between People, Culture and Country have not been recorded (or, furthermore, protected) over the years. Most surveys at West Angelas have been archaeological surveys. As for other parts of **Yinhawangka** Country, they have identified hundreds of artefact scatters, rockshelters, quarries, and modified (scarred) trees (Jackson and Ibbitson 2008; Gavin Jackson 2013; Stevens 2011). Some scatters may indicate former habitation or "public" areas, while others may have been associated with sacred or private activities. Ethnographic surveys at West Angelas have confirmed the importance of intangible values and places. Common themes in ethnographic surveys include management of archaeological sites in the path of mining proposals, traditional ecological plant knowledge for food and medicines and significant spiritual places (Williams 2022; Stevens 2011; Venz and Grove 2003). Stevens *et al's* (2019) ethnobotanical survey report reveals extensive plant knowledge held by **Yinhawangka** women. **Yinhawangka** men have recently identified sites associated with men's business (Trip 4, closed report (2022)).

Yinhawangka CLHs also have aspirations for the future, documented in **YAC's** Healthy Country Plan (**HCP**; **YAC** 2017), some recent heritage reports, and the **social surroundings assessment**. The **HCP**, which was co-developed by **Yinhawangka CLH** and **YAC**, identifies six key management targets for healthy Country:

- *Yinda* (Important places: water)[4]
- Plants
- Animals
- Cultural sites
- Culture, Lore, Customs
- People on Country

Mining and some aspects of pastoralism are identified in the Plan as having serious and ongoing threats to **Yinhawangka** Country, arising from lack of effective governance; lack of management capacity; people living away from Country; climate change; roads and railways cutting through Country;

[4] Yinhawangka CLH advised during the social surroundings assessment that *Yinda* means "important place". It may or may not be associated with water. Hence, we have not used the term Yinda in association with water throughout this report, except when it is stated in previous documents or when CLH have identified a Yinda, not just water.

overgrazing; inappropriate recreation activities in some places; unresolved Native Title in some areas; restricted access; loss of cultural knowledge; mine dewatering and bore fields; invasive plants, herbivores, and carnivores; wrong fire regimes; various social issues; and mining as a whole.

The **HCP** recommends the following to achieve these six key management targets:

1. Developing capacity in governance and Native Title
2. Managing relationships and partnerships through **ILUAs** and joint management agreements
3. Developing capacity in land management through a Ranger program
4. A cultural heritage program engaging **Yinhawangka** youth
5. Managing invasive species
6. A burning program to achieve less harmful fires and improve natural and cultural values.

While some of these have commenced, the work needed to meet **Yinhawangka** expectations for their People, Culture and Country is considerable.

The **Yinhawangka** Strategic Plan (YSP) (**YAC** 2017) also indicates **Yinhawangka CLHs**' priorities in the areas of land management, education, culture, health, economic development, and governance. The HCP and YSP confirm **Yinhawangka**'s aspirations to achieve self-governance, determine their own future, and manage Country themselves.

3.2 Project Consultation

Understanding of **Yinhawangka** cultural heritage and values relevant to the **Proposal** has been informed by **Local Implementation Committee (LIC)** Meetings, **Heritage Environment Committee (HEC)** Meetings, feedback from **CLHs**, meetings with the **YAC** Board, the social surroundings assessment, and archaeological and ethnographic surveys conducted with **Yinhawangka** People. Collectively these consultations have shaped the design of the **Proposal** and the mutually agreed management actions for the **Proposal**.[5] **The Proponent** has been guided by **YAC** throughout the project to ensure that the appropriate **Yinhawangka** decision making processes and forums have been followed and consulted.

Consultation with **Yinhawangka CLHs** on the **Proposal** has been ongoing since 2019. A summary of the Social Surroundings Rationale, Approach, and Social Surroundings Assessment Methodology are provided in Appendix 11 and Appendix 12, respectively. A summary of the consultation undertaken with **Yinhawangka CLHs** in relation to the **Proposal** additional to those scoped as part of the **social surroundings assessment** is provided in Appendix 4 and is summarised as follows:

- In preparing for the **Proposal EIA**, consultation addressed various specific aspects of the **Proposal**. The consultations also included discussions of both broader issues and detailed cultural heritage considerations. The primary concerns raised during these consultations were in relation to the long-term alteration to the cultural landscape of the area and the regional hydrological regime. **Yinhawangka CLHs** and **YAC** representatives have been presented with pre- and post-mining visualisations of the site and the **Proposal** footprint.
- **The Proponent** has continued to work with **Yinhawangka** to address specific concerns, namely impacts on sites of cultural heritage significance, land access, and mine closure.
- In August 2022, **the Proponent** attended a **YAC** Board meeting and presented the proposed **Mine Design** depicting the changes made from the consultations to date (removal of Deposit J from the Proposal) and requested a resolution of endorsement by the **YAC** Directors.
- Throughout 2020 - 2022, three **HEC** Meetings have been held where consultation on cultural heritage sites and design interactions have occurred. These are complemented by archaeological and ethnographic in-field assessments and consultations and have resulted in mine pit and infrastructure layout and design modifications and removals.

[5] Heritage Environment Committee (HEC) forums are currently undergoing internal YAC restructure and will be known as **Cultural Heritage and Language Committee (CHLC)** moving forward. Roles and responsibilities of the CHLC in comparison to those of the HEC are currently being reviewed.

3.3 Social Surroundings Assessment Findings

The field trips and workshops conducted within the **social surroundings assessment** highlighted several interconnected themes that **Yinhawangka CLHs** see as critical, not just to **Yinhawangka** People and Culture but to all those who work on and travel through **Yinhawangka** Country.

Yinhawangka CLHs have their own interpretation of what constitutes impact as described in the **social surroundings assessment**. At the Consolidation Workshop and Social, Cultural and Heritage Management Plan Workshop, themes arising from the **social surroundings assessment** were endorsed by **Yinhawangka CLHs**. These themes (shown in Table 3-1) align with the values used as the framework to present the Management and Monitoring Actions in Section 6. They are also the basis for the 47 recommendations documented in the report arising from the **social surroundings assessment**. These recommendations form the basis for many of the outcomes and objectives identified in this **SCHMP**.

Table 3-1 Yinhawangka Themes/Values and Objectives

Code	Theme/Value	Objective
The objective of this **SCHMP**		To ensure that significant **harm** is not caused to social surroundings.
Management Action (MA) 1	Connection to Country	Objective MA1: Support and maintain access to **Yinhawangka** Country by **CLHs**.
MA2	Protection of Country	Objective MA2: Protect **Yinhawangka** Country and Cultural Heritage from significant **harm**
MA3	Caring for Country	Objective MA3: Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
MA4	Water	Objective MA4: Acknowledge the importance of water to **Yinhawangka** Country and Culture and protect water values from significant environmental **harm**
MA5	Strong Culture	Objective MA5: Build cultural awareness of **Rio Tinto** and contractor employees
MA6	Partnership and Agreement	Objective MA6: Develop and maintain improved relationships with **Yinhawangka CLHs** through a genuine approach to partnerships, transparency, and information exchange.

3.4 Heritage Findings

The Revised Development Envelope hosts a rich and diverse assemblage of heritage sites, including artefact scatters, quarries, modified (scarred) trees and rockshelters (Figure 3-1). As further required heritage survey works are completed to support the Proposal it is anticipated that additional sites will be identified. Some scatters may indicate former habitation or "public" areas, while others may have been associated with sacred or private activities. Ethnographic surveys at West Angelas have confirmed the importance of intangible values and places. Common themes on ethnographic surveys include management of archaeological sites in the path of mining proposals, traditional ecological plant knowledge for food and medicines and significant spiritual places (Williams 2022; Stevens 2011; Venz and Grove 2003). Stevens et al.'s (2019) ethnobotanical survey report reveals extensive plant knowledge held by **Yinhawangka** women. **Yinhawangka** men have recently identified sites associated with men's business (Trip 4, closed report (2022)). Water (Baba) systems are of high cultural significance to the **Yinhawangka** People due in part to a long history of interaction and its sustaining life properties for people and landscape. The **Yinhawangka CLHs** are deeply concerned about any negative impacts on ecosystems, springs and surface water flows.

There are approximately 52 **Yinhawangka** cultural heritage sites located within the Conceptual Footprint and therefore potentially at risk of being impacted by the **Proposal**. These potential impacts will need to be managed in accordance with the requirements of applicable Aboriginal Cultural Heritage legislation and in accordance with processes agreed by **Yinhawangka CLHs** and **the Proponent**. This number is anticipated to increase as further heritage survey works are completed to support the **Proposal**, notwithstanding ongoing design reviews and amendments to avoid impacts.

3.5 Places and Sites of Special Significance

Cultural heritage surveys to date have recorded archaeological and ethnographic sites in the region, including artefact scatters, quarries, rockshelters, scarred trees, rock art and other significant cultural values. As heritage work under the **AH Act** is still ongoing, further sites and their significance may remain to be determined by future archaeological excavation and analysis.

The **Yinhawangka CLHs** have specifically identified **six Places and Sites of Special Significance** that intersect with or are close enough to the Proposal to potentially be impacted indirectly by dust, noise and vibration. **The Proponent** recognises the significance of these areas to the **CLHs**. The places and sites are:

- **The Range** to the south of existing West Angelas mining operations (RTIO database: the Range [no **DPLH** Place ID])
- **Western Hill site complex** (RTIO database: WESTERNHILLCPLX [No **DPLH** Place ID])
- Archaeological site (RTIO database: WA-16-61-SS [No **DPLH** Place ID])
- **Mt Ella East site complex** (RTIO database: WA-18-ETH-01 [No **DPLH** Place ID])
- Rockshelter with handprint (RTIO database: YINHARR-39 [**DPLH** Place ID 20444])
- Rockshelter with engravings (RTIO database: WA-16-45-ENG [No **DPLH** Place ID])

It should be noted that this list is never final and that places and sites may be added or removed by **Yinhawangka CLHs** throughout the life of **the Proposal**.

4 PREDICTED IMPACT AND RISK

Yinhawangka CLHs have their own interpretation of what constitutes impact (**Yinhawangka** Common Law Holders and Archae-aus, 2021 and 2022). **Yinhawangka CLHs** identified that mining has a direct and indirect impact to Country and Culture through:

- Restricted access to Country by **CLHs**, including **Places and Sites of Special Significance**.
- Disruption of **CLH** connection to **Yinhawangka** Country.
- Significant disturbance, alteration and damage to:
    - natural landscapes, including culturally significant features including, but not limited to, artefact scatters, rockshelters, and water resources which may in turn cause permanent direct and indirect impacts on cultural and spiritual values;
    - traditional bush foods and medicines through the disturbance or clearing of native vegetation;
    - native animals through disturbance and fragmentation of the landscape; and
    - water, through blocking of natural gully flows, abstraction of groundwater and artificial movement of water from one location to another.

These impacts result in direct and indirect impacts to tangible and intangible **CLH** cultural objects and cultural, spiritual and aesthetic values of importance to **CLHs**.

The **Proposal** will impact a range of values held by **Yinhawangka CLHs**. These values broadly align with the themes identified in the **social surroundings assessment**. Some values will be impacted irrevocably; others temporarily. The nature and extent of these impacts are described by **Yinhawangka CLH** below.

4.1 Connection to Country

Yinhawangka Country is centred around the Ashburton River system encompassing Angelo River, Ashburton River, Hardey River, Kunderong Range, Mount Vernon Station, Rocklea Station and Turee Creek (Scambary 2013; Sharp and Thieberger 1992; Thieberger 1993; Wilson 1980). For **Yinhawangka** People, as for all Traditional Owners throughout Australia, connection to Country is fundamental to culture, health, and identity. Stevens (2019: 7) notes that the elements of Country, from trees to rocks to water to weather to **Yinhawangka CLH** themselves (and all of the relationships between them enacted across space and through time) were – and still are - created by ontological beings. These beings are generally conceived as Ancestors who remain extant and active in Country

today. In this way, Country is in a constant process of re-creation. As Stanner (1987: 225) observed: "One cannot 'fix' The Dreaming in time: it was, and is, everywhen". The Ancestors continue to bring all things into existence and bestow Country, with all its interconnected elements, upon people and upon all those others (living and non-living) who share in it.

Maintaining all the connections necessary to sustain Country has become increasingly difficult for **Yinhawangka CLH** over the past 150 years. While the pastoral industry and forced removal and relocation to reservations on the coast disrupted connections, mining at West Angelas has presented some particular challenges. Some of these challenges are irrevocable (a, below). Some others may *appear* temporary, but they have profound impacts nonetheless (b, below):

a) The profile of the landscape has been and will continue to be changed by mining at West Angelas. Ranges, hills and plains will continue to be dug out, and waste dumps and pits will remain post-mining.[6] All of this has an impact on the stories and knowledge inscribed in the landscape. The ranges associated with the **Proposal** are part of a Dreaming Story, which connects to other ranges in the wider cultural landscape. As noted above, **Yinhawangka** Culture anticipates dynamism from the Ancestors. However, there was no evidence recorded during the **social surroundings assessment** to suggest that Dreaming Stories can be adapted to fit with human modifications to Country except for those modifications which are embedded within cultural practise and hence endorsed by the Ancestors e.g., cultural burning. If a Story cannot be adapted to absorb modifications to Country, it will cease to exist – both through the loss of its tangible connection to the Country and future intergenerational knowledge transfer. The place that was maintained by the Story will lose its value and meaning to the **Yinhawangka** People, Culture and Country.

b) Separate from the **Proposal**, places of particular significance to **Yinhawangka CLHs**, *Nyirrimpa* (Mud Springs) and *Gathangurra*, have dried up following historic groundwater abstraction for water supply associated with **the Proponent's** Channar Mine (approximately 100 km to the west-south-west of the Proposal). Hydrological modelling indicates that it may take up to 50 years for *Nyirrimpa* spring to recharge naturally. **Yinhawangka CLHs** are dismayed that their connection to this place has been impacted in their lifetime, despite their identifying dewatering from mining as the reason for the declining water level some 20 years ago. The Dreaming Stories, activities, and presence of the Ancestral water serpent (*Warlu*) associated with *Nyirrimpa* are already lost to a generation of **Yinhawangka CLHs**, who must experience it through the memory of their Elders.

While this impact may seem temporary, it will be very difficult for **Yinhawangka CLHs** to revitalise and re-activate the stories and the presence of Ancestral water serpent associated with *Nyirrimpa* once the water has recharged since the lack of water has meant they could not be taught the stories in the first place. This is now a place of death – for the Ancestral Being, for the continuity and communication of Culture, and for the health of Country. Acknowledging that there are no **Yinhawangka** groundwater dependent places of significance at risk from the Proposal, **Yinhawangka CLH** are nonetheless concerned about similar 'temporary' impacts as a result of the **Proposal**.

While we may consider irrevocable impacts to the *physical* landscape to be deeper and more lasting than temporary ones, this is not necessarily the case with the *cultural* landscape. Once stories are lost, they are lost forever, irrespective of whether a connection to Country seems to be disrupted irrevocably or temporarily. For example, if **the Range** were to be impacted, important stories could be lost forever.

4.2 Access to Country

Yinhawangka Country is not just land. It is both system and entity, both a collective and proper noun, a living being that manifest from symbiotic and social interrelationships of people, animals, plants, Dreamings, Laws/Lores, ancestors, earth, soils, spirits, minerals, waters, surface waters, and air. It is

[6] Even though Yinhawangka CLHs would prefer that the pits be backfilled after mining ceases, through mine closure consultation they accept that it is not economically viable for the Proposal and as outlined in the mine closure plan only a small amount of backfill will occur. Nevertheless, the Proponent commits to looking for opportunities to backfill pits that may not be apparent now, throughout the life of **the Proposal**.

through the lawful practices and processes of taking care of and visiting Country that the continuity of life is assured.

Given that Country is who **Yinhawangka CLH** *are* and how they sustain themselves and the continuity of their world, it follows that loss of or restricted access to Country will have profound impacts on matters of self, health, identity, and relationality.

The **Proposal** will facilitate conditional access to a number of places that are significant to **Yinhawangka CLHs**. 'Conditional access' means that **Yinhawangka CLHs** will be required to give 48 hours notice of their intention to visit the place so that safety measures can be put in place. While this is acceptable to some **Yinhawangka CLHs**, it will significantly impact who, when, how and why they connect to Country. In many cases, it will not be possible for **CLHs** to make spontaneous visits to other places while on Country. Whether late-night or early morning visits or camping out under the stars will be allowed is still subject to discussion, **the Proponent** is committed to achieving such access wherever it is safe to do so.

4.3 Impact Assessment Healthy People, Country and Culture

Yinhawangka CLHs identified the following potential direct and indirect impacts to **Yinhawangka CLHs**, Country and Culture from the following activities:

- Clearing of up to 5,350 ha of native vegetation within a Revised Development Envelope of 8,457 ha.
    - Affected vegetation will include plants traditionally used for food and medicine.
    - Resident fauna with low mobility traditionally used for food will be destroyed or locally displaced.
    - Resident fauna traditionally hunted by **CLHs** for food will be displaced (or destroyed) and forced from their home ranges. **CLHs** report that fauna traditionally hunted as food are becoming more difficult to find, with longer distances being covered to find kangaroos and emus.
- Creation of mine pits/voids and waste dumps
    - Irreversible significant alteration of the ancient landscapes of **Yinhawangka** Country
    - Irreversible change to the natural horizons of **Yinhawangka** Country
    - Impacts to visual amenity.
- Dust emissions specific to cultural values
    - Impacts to flora and fauna health due to dust deposition in the atmosphere and on plants, including dews.
    - Exacerbation of light pollution impacts at night due to atmospheric dust.
    - Impacts to human health.
    - Aesthetic and experiential impacts to Country.
- Light emissions specific to cultural values.
    - Impacts to fauna which rely on darkness to navigate and hunt.
    - Impacts to fauna that are attracted to light at night.
    - Impacts to the visibility of and access to the night sky and human and non-human navigation.
    - Aesthetic impacts to Country.
- Noise and vibration emissions specific to cultural values.
    - Impacts to fauna.
    - Impacts to rockshelters.
    - Impacts to human health.
    - Aesthetic impacts to Country.

Impacts to Country, and to plants and animals used as bush foods and medicines are already believed to be causing impacts to physical health in terms of impacts to diet; to mental health and wellbeing. The loss of connection to the Ancestors also leads to emotional impacts of seeing Country damaged and destroyed; and Culture, including **CLHs** inability to take responsibility for the condition of Country in certain places and the cultural consequences which follow. Further details are provided in the **social surroundings assessment** (Appendix 3).

However, through this **SCHMP**, **Yinhawangka CLHs** have proposed safeguards for implementation to minimise the impacts wherever possible.

4.4 Water

Water is central to life and, as such, it has immense cultural, social, spiritual, aesthetic, ecological, and economic value to **Yinhawangka CLHs**. This is evinced by the loss of water and life at *Nyirrimpa* and *Gathangurra* near **the Proponent**'s Channar Mine, approximately 100 km to the west-south-west of the Proposal, which have had (and will continue to have) a profound impact on **Yinhawangka CLH** and Country. **CLHs** do not sanction impacts on water but understand that it is an unavoidable consequence of mine development at West Angelas. Management actions and design controls have been co-developed to minimise these impacts where possible.

As identified by **the Proponent**, implementation of the **Proposal** has the potential to cause direct impacts on water:

- alteration to groundwater aquifers due to groundwater abstraction;
- alteration to groundwater aquifers from temporary storage of surplus water in disused mine pits for operational purposes; and
- alteration to existing surface water catchments, surface water flow paths and sheet flows.

Potential indirect impacts identified by **the Proponent** include the reduction of water quality of groundwater and surface water as a result of:

- surface water discharge;
- mineral waste dumps;
- post closure formation of ephemeral pit lakes;
- increased sediments from infrastructure and drainage; and
- storage and handling of hazardous materials and waste.

CLHs identified concerns around similar impacts, which include:

- interference with **water resources**;
    - obstruction/blockages of **watercourses**;
    - abstraction of groundwater;
        - impacts to aquifers from abstraction;
        - artificial movement of water from one location to another;
        - water wastage and inappropriate use of water (e.g., dust suppression)
- potential pollution of **water resources** due to spills (hydrocarbons, wastewater treatment plants, blasting explosives (ammonium nitrate fuel oil), wet fines storage facility and other chemicals);

4.5 Cultural Heritage

The **Proposal** will cause direct and indirect impacts on tangible and intangible cultural heritage via the following:

- Ground disturbance, resulting in the destruction and disturbance of heritage sites;
- General disturbance to **Places and Sites of Special Significance** from dust, noise and vibration impacting the overall amenity of these sites and Country generally;
- Disturbance to Dreaming Stories from modifications to Country including to the profile of the landscape and loss of water. This issue was specifically raised by CLH during the **social surroundings assessment** in relation to the Range;
- Disruptions to intangible heritage through loss or reduction in cultural practices such as hunting kangaroos and emus, collecting bush food/medicine, and enjoying 'dinner out' (a meal enjoyed with family on Country) at certain places.

Cultural heritage will be impacted by the **Proposal** in many ways. Direct impacts on heritage are covered under the *Aboriginal Heritage Act 1972* [AH Act]. **The Proponent** will comply as required with the relevant State Aboriginal heritage legislation in consultation with **YAC**. To date, up to 24 sites may require impact under the relevant State Aboriginal heritage legislation, which will be progressed by **the**

Proponent in consultation with **CLHs** through **YAC**. Through this **SCHMP**, **CLHs** have proposed safeguards for implementation to minimise the impacts wherever possible via the Management Provisions.

5 MANAGEMENT APPROACH

This **SCHMP** was prepared in accordance with the "Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans" published by the **EPA** (**EPA** 2021) to meet the objective for the environmental factor of social surroundings.

In agreement with **Yinhawangka**, this **SCHMP** utilises two types of management actions:

Common Actions: These are common actions across all Rio Tinto Proposals subject to an **SCHMP** on **Yinhawangka** Country and, as such, may be included in each **Yinhawangka SCHMP**; and

Asset-Specific Actions: These actions are applicable to this **SCHMP** only.

The management approach applied in this **SCHMP** is based on the mitigation hierarchy, including:

- Avoidance: measures used to avoid or prevent impacts from the **Proposal**;
- Minimisation: measures taken to reduce the duration, intensity and/or extent of impact from the **Proposal**; and
- Rehabilitate: rehabilitate disturbed areas or mitigate by other agreed means to reduce residual impacts from the **Proposal**.

In response to feedback from **Yinhawangka CLHs** on cultural values, **the Proponent** has made various changes to mine design to avoid and minimise impacts on cultural values.

The Proponent and **YAC** have collaborated on the management actions to develop an agreed set of management and monitoring actions to achieve the objectives of this **SCHMP**. These management and monitoring actions are set out in Section 6 COMPONENTS OF SCHMP.

The management actions include the formation of a Water Management Committee (**WMC**), Mine Closure Working Group (**MCWG**) and Life of Mine Planning forum (**LOMP**). **The Proponent** acknowledges and agrees that the **WMC, MCWG**, and **LOMP** will require jointly agreed terms of reference to be developed by **the Proponent** and **YAC** to enable the management actions. Where an existing **WMC, MCWG** or **LOMP** forum have already been established between **YAC** and the **Proponent**, West Angelas **WMC, MCWG** or **LOMP** related matters will be directed to the appropriate existing forum[7]. Where the **WMC, MCWG** and **LOMP** may not yet have been established or terms of reference not yet been developed, all references to the **WMC, MCWG** and **LOMP** in the **SCHMP** management actions will mean **YAC**. In consultation with **YAC**, these forums may be housed as agenda items within Cultural Heritage and Language Committee (**CHLC**) meetings or other existing consultation forums as appropriate and agreed between **YAC** and **the Proponent**.

5.1 Design Changes to Avoid and Reduce Impacts

In response to feedback from **Yinhawangka CLHs** on cultural values, **the Proponent** has made various changes to the mine design to avoid and reduce impacts on social and cultural heritage values.

- Avoidance and minimisation of direct impact to six **Places and Sites of Special Significance**;
- Removal of Deposit J from the Conceptual Footprint and modification of Revised Development Envelope to avoid impacts to **the Range** and minimise restrictions that may affect **CLH** access to **the Range**;
- A significant amendment to the Conceptual Footprint and Revised Development Envelope at Mt Ella East to avoid **the Range** to the south and **Mt Ella Site Complex** and minimise restrictions that may affect **CLH** access to the Range; and

[7] These forums will consider an Yinhawangka country wide remit to their focus topic rather than the establishment of duplicate YAC and Proponent forums.

- Amendment to the Conceptual Footprint at Western Hill to avoid direct impact on the **Western Hill Site Complex**.

Appendix 4 provides a summary of engagements, and Appendix 6 identifies the changes made to the **Mine Design** and Conceptual Footprint by **the Proponent** as a direct result of consultation with **Yinhawangka CLHs**.

The **Proposal** Conceptual Footprint and Revised Development Envelope was acknowledged by the **YAC** Board on behalf of the **Yinhawangka** People at its Board Meeting on 03 November 2023. The **Mine Design** is provided in Appendix 5.

6 COMPONENTS OF SCHMP

This section of the **SCHMP** identifies the management actions, targets and monitoring that **the Proponent** will implement to ensure that the defined outcomes and objectives are met during the construction, implementation, closure and rehabilitation of the **Proposal**. The provisions for each social surroundings theme are detailed in Rationale of Component 6.1.1 to 6.1.6.

6.1 Rationale for Components

The Proponent's management approach for meeting the **EPA's** environmental objective focuses on avoidance in the first instance, followed by minimisation and management. The management targets and actions and monitoring actions to achieve each objective have also been developed while being mindful of this approach, and are informed by:

- results from the surveys and consultation undertaken with **Yinhawangka CLHs** including, but not limited to, the **social surroundings assessment**; and
- draft actions, targets and monitoring (as well as other sections of the **SCHMP**) prepared by **YAC** and **Yinhawangka CLHs**.

6.1.1 Yinhawangka value 1: Connection to Country

Objective MA1: Support and maintain access to **Yinhawangka** Country by **CLHs**

Key values: Yinhawangka identified **Places and Sites of Special Significance**: **the Range** to the south of existing West Angelas mining activities; **Western Hill site complex**; archaeological site WA-16-61-SS (No **DPLH** Place ID); **Mount Ella East site complex** (RTIO database: WA-18-ETH-01 [No **DPLH** Place ID]); rockshelter with handprint (RTIO database: YINHARR-39 [**DPLH** Place ID 20444]); rockshelter with engravings (RTIO database: WA-16-45-ENG [No **DPLH** Place ID])

Yinhawangka Value	Connection to Country
Theme	Support and maintain access to **Yinhawangka** Country by **CLHs**
Objective	1A

Objective 1A Management Action and Monitoring Table

Management targets	Limitations / Conditions	Management actions	Monitoring	Timing/ frequency
Maximise safe, unfettered access for CLHs and YAC.	• Access is in accordance with the *Mines Safety & Inspection Act 1994* • For safety reasons, access may be temporarily restricted for blasting events. • The principle of access being "no worse off" than before the approval of the Proposal shall apply.	**The Proponent will:**	**The Proponent will:**	
		Consult with **CLHs** and **YAC** to identify and document: • locations where access is required during the life of the West Angelas mine • when access may be required (how often; for how long; which months; before, during and after mining) • preferred access routes • safety requirements for each location (is an escort required? Is PPE required?) • areas where escorts and standard mine site PPE are not required.	• Maintain the Consultation and Engagement Register in the **Yinhawangka**/**Rio Tinto** SharePoint.	• Prior to ground disturbance • As required and ongoing
		• Ensure any known access restrictions for the upcoming 12-month period are identified and	• Meeting minutes	• At the next scheduled meeting following

Management targets	Limitations / Conditions	Management actions	Monitoring	Timing/ frequency
		communicated at **CHLC** meetings or another appropriate consultation forum.		the identification of the need for the access restriction.
		• Ensure any unexpected access changes or restrictions are communicated out of cycle at **CHLC** meetings or another appropriate consultation forum.	• Meeting minutes	• At the next scheduled meeting following the identification of the need for the access restriction.
		• Ensure minutes are accessible via **Yinhawangka**/**Rio Tinto** SharePoint	• Meeting minutes are accessible.	• As required and ongoing, and prior to the next meeting.
		Prepare the following records/documents: • Traditional Owner Access and Inspection Register to record where access has been requested, provided, or restricted, and details of any restrictions (including reasons for restriction).	• Maintain Traditional Owner Access and Inspection Register in **Yinhawangka/Rio Tinto** SharePoint	• Ongoing
		• In the instance of access being restricted or in breach of access requirements, **GM** Traditional Owner Partnerships, Yinhawangka Traditional Owner Engagement Lead or **GM** West Angelas are to notify **YAC** of the issue, including explanation for the non-facilitation of access, and specify a date and time when the facilitation of access will be restored.	• Notify **YAC.**	• As required
		• Consult with **YAC** to understand why access was restricted and agree resolution.	• Consult with **YAC.**	• As required
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided to the **Yinhawangka/Rio Tinto** SharePoint.	• As required and ongoing

Management targets	Limitations / Conditions	Management actions	Monitoring	Timing/ frequency
		Yinhawangka / YAC will:	**Yinhawangka / YAC will:**	
		Work with **The Proponent** to: • Identify and document locations where access is required during the life of the West Angelas mine.	• Review Register in **Yinhawangka/Rio Tinto** SharePoint.	• As required
		• Identify, document and provide to **the Proponent** when access may be required (how often; for how long; which months; before, during and after mining).		• As required
		• Identify, document and provide to **the Proponent** preferred access routes.		• As required
		• Consult with **Rio Tinto** if access restrictions may be in breach of notification or access requirements.		• As required

6.1.2 Yinhawangka value 2: Protection of Country

Objective MA2: Protect **Yinhawangka** Country and Cultural Heritage from significant **harm**

Key values: Yinhawangka identified six **Places and Sites of Special Significance**: **the Range** to the south of existing West Angelas mining activities; **Western Hill site complex**; archaeological site WA-16-61-SS (No **DPLH** Place ID); **Mount Ella East site complex** (RTIO database: WA-18-ETH-01 [No **DPLH** Place ID]); rockshelter with handprint (RTIO database: YINHARR-39 [**DPLH** Place ID 20444]); rockshelter with engravings (RTIO database: WA-16-45-ENG [No **DPLH** Place ID])

Yinhawangka Value	Protection of Country
Theme	Protect **Yinhawangka** Country and Cultural Heritage from significant **harm**
Objective	2A

Objective 2A Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
Protect Cultural Heritage from significant **harm**.	• Specifically applies to **Yinhawangka** Cultural Heritage	**The Proponent will:**	**The Proponent will:**	
		• Collaborate with **CLHs** through **YAC** to develop and implement a Cultural Heritage Management System (**CHMS**). • **CHMS** refers to a number of integrated documents with a shared purpose to minimise significant **harm** to Cultural Heritage.	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes). • System is implemented.	• Ongoing
		Prioritise and drive the development of a **CHMP** as agreed required for the management and protection of cultural heritage sites and places of special significance to **Yinhawangka**, ensuring: • Sufficient provisions and resources are made available to progress timely	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location,	• CHMP development progress update provided at CHLC forum in Q2 and Q4 2024

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
		development of the **CHMP** for the West Angelas Revised Proposal • Planning and scheduling of engagements with **Yinhawangka CLH**'s and **YAC** for collaboration and co-design of the CHMP. • Collaborate with **CLH**'s through **YAC** to develop and implement an agreed **Yinhawangka Cultural Heritage Management Plan (CHMP)** for **Proponent** operations on **Yinhawangka Country**	participants, and a summary of discussions/outcomes). • Prioritise the development and completion of an agreed **Yinhawangka CHMP**, in support of and alignment with broader **CHMS** and ensure the system is effectively implemented.	and prior to implementation. • CHMP completed and implemented prior to commencement of any ground disturbing activities on Country.
		• Provide annual summary (or as agreed) on Heritage Management, such as: What has occurred and what is forecast (number of surveys, sites identified etc.).	• Provide summary	• Annual or as agreed
		• Collaborate with **YAC** to identify **CHMS** focus areas and include regular updates, deep dives and implement improvement initiatives such as burning to facilitate improved ground surface visibility prior to archaeological survey assessment.	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes).	• At least annually and as required
		Prepare and maintain the following records/documents: • Environmental Survey and Monitoring Register • West Angelas **SCHMP** Incident Register • Traditional Owner Access Register	• Maintain registers in the **Yinhawangka/Rio Tinto** SharePoint.	• Ongoing
		• Record details of breaches of the **CHMS** and **CHMP** and cultural heritage and environment incidents that resulted in direct or indirect impacts to cultural heritage and environment in the West Angelas **SCHMP** Incident Register.	• Maintain registers in the **Yinhawangka/Rio Tinto** SharePoint.	• Within 48 hours of an incident/impact being detected.
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided to **Yinhawangka/Rio Tinto** SharePoint.	• Ongoing
		• Ensure registers are up to date prior to **CHLC** meetings.		

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
		• Ensure minutes are accessible in the **Yinhawangka/Rio Tinto** SharePoint.		
		Comply with the relevant requirements and commitments outlined in: • Cultural Heritage Management Plan (**CHMP**) • Co-designed **CHMS**.	• As per **CHMP** and **CHMS** • Collaborate with **CLH's** through **YAC** to review and continually improve **CHMS**	• As required
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	
		• Collaborate with **the Proponent** to implement a **CHMS**.	• Collaborate with **the Proponent.**	• Ongoing
		• Collaborate with **the Proponent** to develop and implement an agreed **CHMP** for **Proponent** operations **within the West Angelas Revised Proposal Development Envelope** on **Yinhawangka** Country.	• Collaborate with **the Proponent to ensure timely completion of CHMP, and in support of ongoing management, maintenance, and implementation of the CHMP.**	• Ongoing
		• Abide by and support the achievement of the commitments outlined in the CHMP and CHMS	• As per CHMP and CHMS • Collaborate with the Proponent to review and continually improve CHMS	• Ongoing
		• Collaborate with **the Proponent** to identify **Yinhawangka CHMS** focus areas for regular updates, deep dives and implement improvement initiatives.	• Collaborate with **the Proponent.**	• As required

Yinhawangka Value	Protection of Country
Theme	Protect **Yinhawangka** Country and Cultural Heritage from significant **harm**
Objective	2B

Objective 2B Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
Enable CLHs through YAC to undertake inspections and audits of Yinhawangka Sites and Places as determined by CLHs	Specifically applies to **Yinhawangka** sites and places	**The Proponent will:**	**The Proponent will:**	
		• Work collaboratively with **YAC** to develop and agree a process and schedule to facilitate **CLH** and **YAC** inspections and audits of sites and places as determined by **CLHs**.	• Annual audit and inspection plan co-developed and shared.	• Prior to construction and at least annually
		• Work collaboratively with **YAC** to implement the agreed audit process and schedule.	• Meeting minutes. emails, registers.	• Ongoing
		• Facilitate access, provide support, and supply required information as reasonably required for audits.	• Meeting minutes. emails, registers.	• As required
		• Ensure details of audits are recorded in West Angelas Traditional Owner Access and Inspection Register.	• Maintain (update) West Angelas Traditional Owner Access and Inspection Register.	• Ongoing
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided to **Yinhawangka/Rio Tinto** SharePoint.	• Ongoing
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	
		• Work collaboratively with **the Proponent** to develop and agree a process and schedule to facilitate **CLH** and **YAC** inspections and audits of sites and places as determined by **CLHs**.	• Annual audit and inspection plan co-developed and shared.	• Prior to construction and at least annually
		• Work collaboratively with **the Proponent** to implement the agreed audit process and schedule for **Places and Sites of Special Significance** and other locations as agreed.	• Meeting minutes. emails, registers.	• Ongoing

6.1.3 Yinhawangka value 3: Caring for Country

Objective MA3: Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.

Yinhawangka Value	Caring for Country
Theme	Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
Objective	3A

Objective 3A Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
CLHs through YAC are consulted, and their feedback is considered in mine planning and mine closure planning.	Specifically relates to: • Mine planning • Mine closure planning • Minimising above ground disposal of waste rock • Closure completion criteria, • Rehabilitation (including seed mixes) • Waste rock dump design, • Volumes of material, and • Pit backfill • Opportunities to minimise	**The Proponent will:**	**The Proponent will:**	
		• In collaboration with **YAC**, convene a Mine Closure Working Group (**MCWG**) with representatives from **the Proponent** and **YAC**, who will discuss mine closure related matters and provide advice	• **MCWG** is convened.	• Annually, or as agreed
		• Hold annual **MCWG** meetings with the **MCWG**, **CLHs**, and **YAC**'s independent technical advisor/s.	• Annual (or as agreed) **MCWG** meeting minutes.	• Ongoing
		Ensure **MCWG** meetings include (where relevant, but not limited to): • field trip to inspect rehabilitation progress • 5-year rehabilitation plan • post closure access • relinquishment • post closure risk (from **Yinhawangka** perspective) • Closure completion criteria.	Record activities in the: • Consultation and Engagement Register (meetings); and • Traditional Owner Access and Inspection Register (fieldtrips) maintained in **Yinhawangka/Rio Tinto** SharePoint	• As required

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
	permanent waste rock landforms • **NAF/PAF** closure management	• In collaboration with **YAC**, at agreed consultation forums, provide annual (or as agreed) updates on Life of Mine Planning such as: o Mine design (pit, waste rock landform locations and shapes) o Infrastructure design and locations o Works within current annual mine plan (active pits and waste rock landforms) o Backfilling opportunities o Rehabilitation activities.	• Meeting minutes	• Annually, or as agreed
		• Ensure minutes are accessible in the **Yinhawangka/Rio Tinto** SharePoint.	• Minutes are accessible on **Yinhawangka/Rio Tinto** SharePoint.	• Within 28 days of meeting being held
		• Provide the draft Mine Closure Plan (MCP) to CLHs through YAC for written comment 8 weeks prior to submission to the regulator	• **MCP** is accessible on **Yinhawangka/Rio Tinto** SharePoint 8 weeks prior to submission to regulator	• Within 12 months of Ministerial Statement and every 5 years thereafter • 8 weeks prior to submission
		MCP appendix to include: • Evidence of consultation undertaken with YAC and CLHs • CLH feedback as presented to Rio Tinto, including commentary on the sufficiency of consultation provided • Rio Tinto response to issues raised by CLHs	• All submitted MCPs will include the stated appendix • Record consultation activities in the Yinhawangka Consultation and Engagement Register maintained in Yinhawangka/Rio Tinto SharePoint	• As Required
		• Ensure **MCP** is accessible in **Yinhawangka/Rio Tinto** SharePoint site.	• **MCP** is accessible on **Yinhawangka/Rio Tinto** SharePoint.	• Annually
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided to **Yinhawangka/Rio Tinto** SharePoint.	• Ongoing
		Provide updates to CLH through **YAC** on any significant changes proposed to: • site closure strategy • post closure risk (from **Yinhawangka CLH** perspective)	• Updates are provided.	• Annually (or as agreed) • Specific **MCP** document revision milestones

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
		• closure completion criteria • Life of Mine Planning • mine design • operations • closure / rehabilitation planning and implementation.		
		• Ensure updates are shared in **Yinhawangka/Rio Tinto** SharePoint.	• Documents are accessible in **Yinhawangka/Rio Tinto** SharePoint.	• As required
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided to **Yinhawangka/Rio Tinto** SharePoint.	• Ongoing
		• Where agreed between **the Proponent** and **YAC**; **the Proponent** to cover costs for **CLH**, **YAC** and **YAC** technical advisors to attend workshops and to review documentation.	• Costs are covered.	• As required
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	
		• In collaboration with **the Proponent**, convene a **MCWG** with representatives from **the Proponent** and **YAC** who will discuss mine closure related matters and provide advice.	• Review minutes provide input and feedback.	• Within 14 days of meeting being held
		• Work with **the Proponent** to agree dates for **MCWG** workshops.	• Agree dates with **the Proponent**.	• As agreed
		• Ensure appropriate representative(s) attends scheduled **MCWG** meetings.	• Appropriate representative(s) attend scheduled **MCWG** meetings.	• As required
		• Review the draft Mine Closure Plan (MCP) and provide in writing, commentary on the sufficiency of consultation provided and issues of concern		• Within 6 weeks of receiving MCP

Yinhawangka Value	Caring for Country
Theme	Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
Objective	3B

Objective 3B Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
CLHs through **YAC** are consulted, and their feedback is considered in mine closure planning.		• Implement Spontaneous Combustion and Acid Rock Drainage (**SCARD**) Management Plan if and when required	• **SCARD** Management Plan is implemented	• If and when required

Yinhawangka Value	Caring for Country
Theme	Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
Objective	3C

Objective 3C Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
CLHs through YAC are consulted, and their feedback is considered in mine planning and mine closure planning.	Specifically relates Mount Ella East pits	**The Proponent will:**	**The Proponent will:**	
		• Not cause any direct impact to **the Range**.	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes)	• Ongoing
		• Require mutually agreed closure outcomes with **YAC** prior to mining the Mount Ella East pits, noting that there is no obligation on **CLHs** or **YAC** to agree to mining these pits whatsoever.		• Ongoing
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	
		• Ensure appropriate representative(s) attend workshops or review documentation as agreed.	• Appropriate representative(s) attend workshops or review documentation.	• As agreed
		• Provide written confirmation of mutually agreed closure outcomes and agreement to mining regarding Mount Ella East pits should this be agreed upon with **the Proponent.**	• Written confirmation is provided if mutually agreed closure outcomes and agreement to mining is agreed to.	• As agreed

Yinhawangka Value	Caring for Country
Theme	Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
Objective	3D

Objective 3D Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
The Proponent to collaborate with CLHs and YAC	Specifically relates to environmental management as outlined in the **EMP** and **MCP**, such as: • weed management· • feral animal and problem fauna control • monitoring of caves/rock shelters • dust management· • groundwater and surface water quality monitoring· • waste management and initiatives • rehabilitation (including identification and inclusion of	**The Proponent will:**	**The Proponent will:**	
		During **CHLC** meetings or another agreed appropriate consultation forum include an update on environment operations as a standing agenda item.	• **CHLC** or agreed consultation forum agenda includes update as standing item.	• As per **CHLC** or agreed appropriate consultation forum schedule
		Include in the update items such as: • waste management • information relating to volumes and location of burying of Type 2 Inert Waste, Type 1, and Type 2 special waste, (including but not limited to asbestos, tyres/conveyor, and general waste)	• Provide information in **SCHMP** reporting.	• Annually or as agreed
		• Collaborate with **YAC** to provide updates on **Yinhawangka** requested focus areas.	• Provide updates on requested focus areas.	• As agreed
		• Develop and/or support training opportunities for **CLHs** and **YAC** to enable delivery of the Annual Environmental Scope of Work (including on-ground initiatives on Country).	• Develop and/or support training opportunities for **CLHs** and **YAC** to enable delivery of the Annual Environmental Scope of Work.	• As agreed
		• Ensure minutes are accessible in **Yinhawangka/Rio Tinto** SharePoint	• Meeting minutes are accessible	• Within 28 days of meeting being held
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided	• Ongoing
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
	culturally relevant plant species in rehabilitation seed mixes) • topsoil storage and management (optimisation) • blast monitoring	• Ensure appropriate representative(s) attends scheduled **CHLC** meetings or other agreed appropriate consultation forum.	• Appropriate representative(s) attend **CHLC** meetings or other agreed appropriate consultation forum.	• As per **CHLC** meetings or other appropriate consultation forum schedule
		• Identify and request specific environment operation focus topics to be discussed in detail at appropriate consultation forums.	• Specific environment operation focus topics are identified and requested.	• As required

Yinhawangka Value	Caring for Country
Theme	Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
Objective	3E

Objective 3E Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
Manage potential impacts caused by noise, dust and vibration attributable to the Proposal	Specifically applies to **Places and Sites of Special Significance** being: • **The Range** to the south of existing West Angelas mining operations (RTIO Database: the Range) • **Western Hill site complex** (RTIO Database: WESTERNHILL CPLX) • Archaeological site (RTIO Database: WA-16-61-SS) • **Mount Ella East site complex** (RTIO Database: WA-18-ETH-01) • Rockshelter with handprint (RTIO Database: YINHARR-39)	**The Proponent will:**	**The Proponent will:**	
		Comply with the requirements and commitments outlined in: • **CHMS/CHMP** • Environmental Management Plan (**EMP**)	• As outlined in **CHMS**.	• As outlined in **CHMS**
		During regular agreed consultation forums report the monitoring results annually and consider feedback and input.	• Meeting minutes	• As per agreed meeting schedule
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided.	• Ongoing
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	
		• Ensure appropriate representative(s) attends scheduled meetings.	• Appropriate representative(s) attend scheduled meetings.	• Ongoing

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
	• Rockshelter with engravings (RTIO Database: WA-16-45-ENG) Places and sites may be added to or removed from this list on agreement. Where this occurs, this **SCHMP** will be updated accordingly.			

Yinhawangka Value	Caring for Country
Theme	Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
Objective	3F

Objective 3F Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
CLHs and YAC are invited to participate in environmental surveys and monitoring.	Specifically relates to environmental surveys and monitoring required under the **EMP** including but not limited to: • weed monitoring and management • vegetation surveys and monitoring • fauna surveys and monitoring • water monitoring (**water resources**, **watercourses**) • rockshelter monitoring • closure and rehabilitation activities.	**The Proponent will:**	**The Proponent will:**	
		• Identify and communicate the environmental activities required under the **EMP** to **YAC** with an invitation to participate (based on **YAC** advising which activities they would like to attend).	• Communications saved in **Yinhawangka/Rio Tinto** SharePoint. • Participation in activities recorded in Environmental Survey and Monitoring Register and maintained in **Yinhawangka/Rio Tinto** SharePoint.	• As required
		• Provide an annual Scope of Work for environmental surveys and monitoring.	• Annual Scope of Work is provided.	• Annually
		• Develop and/or support training/capability building opportunities for **CLHs** and **YAC** to enable delivery of the Annual Environmental Scope of Work.	• Training/capability building opportunities for **CLHs** and **YAC** to enable delivery of the Annual Environmental Scope of Work are developed and/or supported.	• Annual review
		• Provide survey notification to **YAC** at least four weeks prior to the survey taking place.	• Notifications saved in **Yinhawangka/Rio Tinto** SharePoint	• Four weeks prior to survey
		• Provide access to **Yinhawangka/Rio Tinto** SharePoint.	• Access is provided to **Yinhawangka/Rio Tinto** SharePoint	• Ongoing
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	
		• Review the annual Scope of Work outlining the environmental surveys and monitoring required under the **EMP** and provide a proposal and quote to undertake the work	• Provide proposal and quote to undertake the work.	• Within 4 weeks of receiving the Scope of Work

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
		• Nominate those activities **CLHs**/**YAC** would like to participate in.	• **CLHs**/**YAC** participation confirmed in writing.	• Within 14 days of meeting being held

Yinhawangka Value	Caring for Country
Theme	Collaborate with **YAC** (including Rangers) and **CLHs** to implement on-ground actions which seek to heal and improve the health of Country.
Objective	3G

Objective 3G Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
CLHs are consulted through YAC on management and impacts to Western Pebble-mound Mouse	Where practicable, avoid or minimise impacts to the Western Pebble-mound Mouse. *"where practicable" in this context is acknowledged as relating to ancillary disturbance activities such as tracks and infrastructure. Noting that in some instances that this may still be unavoidable. Western Pebble-mound Mouse mounds located within major disturbance footprints may still be impacted as required (pits, dumps, stockpiles etc).	**The Proponent will;**	**The Proponent will;**	
		• Will offer provision for **YAC** to collaborate to identify and map mounds of the Western Pebble-mound Mouse throughout the **Proposal** area prior to disturbance activities where fauna survey is incomplete.	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes). Record activities in the: • Consultation and Engagement Register (meetings) and • Traditional Owner Access and Inspection Register (field trips) maintained in **Yinhawangka/Rio Tinto** SharePoint.	• Ongoing
		• Ensure Pebble Mouse mounds are captured and have provision of 10m buffer in **the Proponent**'s GIS platform restriction layer to avoid direct impacts to the Western Pebble-mound Mouse where practicable.		• Ongoing
		• Develop an annual (or as agreed with **YAC**) program for **YAC** to visit and inspect a selection of mounds to assess for disturbance and occupation.		• Annually
		• Provide annual update at **CHLC** meetings on numbers of mounds impacted, and forecasted mounds to be impacted in next annual planning cycle and variances between planned and actual. Include description of activities and requirement for impact.	• Meeting minutes	• Annually
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
		• Review the annual Scope of Work outlining the environmental surveys and monitoring required and provide a proposal and quote to undertake the work.	• Participate in nominated activities	• Annually
		• **YAC** will work with **the Proponent** to develop annual (or as agreed) program and will select sites to visit and inspect.	• **YAC** worked with **the Proponent** to develop annual (or as agreed) program and will select sites to visit and inspect.	• Annually, or as agreed

6.1.4 Yinhawangka value 4: Water

Objective MA4: Acknowledge the importance of water to **Yinhawangka** Country and Culture and protect water values from **harm.**

Yinhawangka Value	Water
Theme	Acknowledge the importance of water to **Yinhawangka** Country and Culture and protect water values from significant **harm**.
Objective	4A

Objective 4A Management Action and Monitoring Table

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
Ongoing consultation with CLH and YAC on water management in Yinhawangka Country.	Specifically includes: • Proposed obstruction of major **watercourses** • Potential mixing of waters from different groundwater aquifers • Proposed activities that may cause unauthorised impacts to **water resources** and **watercourses** • Cumulative impacts on **water resources** within catchments • Changes to mine design altering	**The Proponent will:**	**The Proponent will:**	
		• Work collaboratively with **YAC** to establish a **Yinhawangka** – **Rio Tinto** Water Management Committee (**WMC**) with equal **CLH** and Proponent representation	• **WMC** is established.	• Within 1 year of Ministerial Statement being released • Frequency as agreed
		• Facilitate collaboratively developed and agreed monitoring processes (including both Western science and Traditional Ecological Knowledge) for monitoring of culturally significant water features via the **WMC**. • The intent of the **WMC** is to optimise water management and identify impacts to water values associated with the Proposal.	• Monitoring processes are agreed.	• As required
		• Details of **WMC** Terms of Reference are to be developed by the WMC and should include the management targets and design for potential obstructions to watercourses.	• **WMC** Terms of Reference are developed.	• As required
		• Support reasonable **WMC** requests for **YAC** to participate in monitoring, inspections, investigations and initiatives into water, which may include an independent review.	• Reasonable requests are supported.	• No less than annually

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
	surface water flows • Groundwater or surface water from Ministerial Statement, associated management plans, and **RiWI Act** or **EP Act** Part V licences for the Proposal.	• Record details of site visits and inspections.	Details are recorded in the: • Environmental Survey and Monitoring Register • Traditional Owner Access and Inspection Register (as applicable)	• As required • Register system updated monthly
		Provide copies of the following information to **YAC:** **RiWI Act** licences • Groundwater Operating Strategy • Annual Aquifer Review • Triennial Aquifer Review **EP Act** Ministerial Statements and licences • Annual Environmental Report • Annual Compliance Assessment Report *Mining Act 1978* mining proposals • Annual Environmental Review *Contaminated Sites Act 1997* • Preliminary and Detailed Site Investigation Reports. • Or any equivalent reports required under the above-mentioned legislation, if produced with a different title.	• To be available and updated in **Yinhawangka/Rio Tinto** SharePoint.	• Within 14 days of submission to the regulator.
		• Report to **YAC** all non-compliances with the Ministerial Statement and associated management plans (**EMP**, **GWOS**), **RiWI Act** or **EP Act** Part V Licences for the **Proposal** and actions being taken in response, at the next **WMC** meeting following provision to regulator.	• Meeting minutes • To be available and updated in **Yinhawangka/Rio Tinto** SharePoint.	• At next **WMC** meeting
		• Provide **YAC** with any follow up communication to the relevant government agency regarding these non-compliances, at the next **WMC** meeting following provision to regulator	• Meeting minutes • To be available and updated in **Yinhawangka/Rio Tinto** SharePoint.	• At next **WMC** meeting

Objective	Limitations / Conditions	Management actions	Monitoring	Timing/frequency
		• Provide copies of **DWER** Annual Groundwater and Surface Water Monitoring Reports and licences to **YAC.**	• To be available and updated in **Yinhawangka/Rio Tinto** SharePoint.	• Annually
		• Provide agreed monitoring information and management reports	• To be available and updated in **Yinhawangka/Rio Tinto** SharePoint.	• As agreed
		• Provide an annual summary of water use (volumes), monitoring results in relation to Ministerial Statement allowable limits, and Proponent internal management levels (e.g. adopted water quality triggers).	• To be available and updated in **Yinhawangka/Rio Tinto** SharePoint.	• Annually
		• Provide other water-related information as agreed between the parties.	• Reports provided to **YAC.**	• As agreed
		Yinhawangka/YAC will:	**Yinhawangka/YAC will:**	
		• Work collaboratively with **the Proponent** to establish a **Yinhawangka** – **Rio Tinto WMC** with equal **CLH** and **Proponent** representation within 1 year of Ministerial Statement being released.	• Establish **WMC** and appropriate representative(s) attend scheduled meetings.	• Within 1 year of Ministerial Statement being released • Quarterly / Annually (as agreed)
		• Participate in monitoring, inspections, investigations and initiatives into water, which may include an independent review.	• As per Annual Environmental Scope of Work.	• As agreed

6.1.5 Yinhawangka value 5: Strong culture

Objective MA5: Build cultural awareness of **Proponent** and contractor employees

Yinhawangka Value	Strong Culture
Theme	Build cultural awareness of **Proponent** and contractor employees
Objective	5A

Objective 5A Management Action and Monitoring Table

Objective	Limitations / Conditions	Management Actions	Monitoring	Timing / Frequency
All Proponent West Angelas employees and contractors complete a Cultural Awareness online induction (CAT 101)	Specifically relates to: • All **Proponent** West Angelas employees working on-site • All contractors working on site • Participants must attend prior to commencing work on-site • Cultural Awareness Training is on-line	**The Proponent will:**	**The Proponent will:**	
		All Proponent West Angelas employees and contractors complete Cultural Awareness Training (CAT101) prior to mobilisation to site	• Maintain records • Provide reports to **YAC**/**CLHs** upon request.	• Ongoing • As requested
		• Record details of completion rates including the site-based leadership team		• Ongoing
		• Integrate the CAT101 into **the Proponent**'s mandatory pre-mobilisation induction process and implement. • Consult with Yinhawangka and Ngarlawangga CLHs to determine if a package that covers both groups and their Countries is appropriate.	• Content is integrated and implemented.	• Within 6 months of issue of Ministerial Statement
		• Review the content of Cultural Awareness Training.	• Content is reviewed	• Biennial review
		Yinhawangka / YAC will:	**Yinhawangka / YAC will:**	
		• In collaboration with **the Proponent**, review the content of the Cultural Awareness Training (CAT101).	• Content is reviewed	• Biennial review

Yinhawangka Value	Strong Culture
Theme	Build cultural awareness of Proponent and contractor employees
Objective	5B

Objective 5B Management Action and Monitoring Table

Objective	Limitations / Conditions	Management Actions	Monitoring	Timing / Frequency
Proponent West Angelas employees and Category 1 contractors receive Yinhawangka specific cultural awareness training (CAT) to support their understanding of and respect for Yinhawangka culture and heritage	Specifically relates to: • **Yinhawangka** culture • All **Proponent** West Angelas employees working on-site • Category 1 contractors working on-site • All **Proponent** employees and contractors whose roles interact with **Yinhawangka** People • Cultural Awareness Training CAT 102 • Cat 102 is face-to-face and facilitated by **CLHs** or a **Yinhawangka** representative • Where face-to-face facilitation is not available, **YAC** endorsed CAT 102 Virtual Reality Package (or **YAC** approved alternative) is to be	**The Proponent will:**	**The Proponent will:**	
		• In collaboration with **CLHs** and **YAC**, co-design Cultural Awareness Training (CAT102). Package to include information such as: • differences between Western and **Yinhawangka** worldview • **Yinhawangka** culture and heritage, including cultural safety protocols • **Yinhawangka** personal and professional relationships and customs	• Training content is co-designed. • Targets for completion of program are agreed with **CLHs** and **YAC.**	• Within 6 months of issue of Ministerial Statement, and subject to YAC readiness and availability to facilitate
		All **Proponent** West Angelas employees and Category 1 contractors working on-site to complete CAT102 within 6 months of commencement on site	• Maintain records and provide reports to **YAC**/**CLHs** upon request.	Ongoing, once CAT 102 is established
		All proponent employees and contractors whose roles interact with **Yinhawangka** People to complete CAT 102 prior to initial engagement with **Yinhawangka**	• Maintain records and provide reports to **YAC**/**CLHs** upon request	• Ongoing, once CAT 102 is established
		• Integrate the CAT102 into **Proponent** Induction process and implement	• Content is integrated and implemented	Within 6 months of issue of Ministerial Statement, and subject to YAC readiness and availability to facilitate
		• Record details of completion rates including the site-based leadership team	• Maintain records and provide reports to **YAC**/**CLHs** upon request	• Ongoing, once CAT 102 is established
		• Review the content of Cultural Awareness Training • Consult with Yinhawangka and Ngarlawangga CLHs to determine if a package that covers both groups and their Countries is appropriate.	• Content is reviewed	• Biennial review

Objective	Limitations / Conditions	Management Actions	Monitoring	Timing / Frequency
	utilised as a secondary option.	**Yinhawangka / YAC will:**	**Yinhawangka / YAC will:**	
		• In collaboration with **the Proponent**, co-design Cultural Awareness Training (CAT102)	• Training content is co-designed • Targets for completion of program are agreed with **the Proponent**	• Within 6 months of issue of Ministerial Statement, and subject to YAC readiness and availability to facilitate
		• Request annual summary of CAT 102 completion rates including site leadership	• Request completion reports	• Annually, or as requested
		• In collaboration with **the Proponent**, review the content of the Cultural Awareness Training (CAT2)	• Content is reviewed	• Biennial review

6.1.6 Yinhawangka value 6: Partnership and agreement

Objective MA6: Develop and maintain improved relationships with **Yinhawangka CLHs** through a genuine approach to partnerships, transparency, and information exchange.

Yinhawangka Value	Partnership and agreement
Theme	Develop and maintain improved relationships with **Yinhawangka CLHs** through a genuine approach to partnerships, transparency, and information exchange.
Objective	6A

Objective 6A Management Action and Monitoring Table

Objective	Limitations / Conditions	Management Actions	Monitoring	Timing / Frequency
Regular consultation and engagement with CLHs and YAC	Specifically relates to Life of Mine Planning, mine design, operations and closure / rehabilitation	**The Proponent will:**	**The Proponent will:**	
		Consult and engage at agreed consultation forums with **Yinhawangka CLH** and **YAC** and (as required) its independent technical advisor/s and provide them with annual updates (or as agreed) on Life of Mine Planning, mine design, operations and Closure / rehabilitation planning and implementation such as: • Mine design (pit, waste rock landform locations and shapes, stockpiles, surface water management infrastructure etc.) • Infrastructure design and locations • Works within current annual mine plan (active pits and waste rock landforms) • Backfilling opportunities • Rehabilitation activities.	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes) • Meeting minutes	• Agreed consultation forum(s) at least annually, from commencement or as agreed with **YAC**
		• Provide response to **YAC** feedback on Life of Mine Planning, mine design, operations and closure / rehabilitation planning	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location,	• Agreed consultation forum(s) at least annually, from commencement

Objective	Limitations / Conditions	Management Actions	Monitoring	Timing / Frequency
			participants, and a summary of discussions/outcomes) • Meeting minutes	or as agreed with **YAC**
		Yinhawangka / YAC will:	**Yinhawangka / YAC will:**	
		• Attend meetings/workshops as invited.	• Appropriate representative(s) attend scheduled meetings.	• As per agreed meeting schedules
		• Provide feedback in relation to Life of Mine Planning, mine design, operations and Closure / rehabilitation planning and request **the Proponent** respond as needed	• Meeting minutes	• As required

Yinhawangka Value	Partnership and agreement
Theme	Develop and maintain improved relationships with **Yinhawangka CLHs** through a genuine approach to partnerships, transparency, and information exchange
Objective	6B

Objective 6B Management Action and Monitoring Table

Objective	Limitations / Conditions	Management Actions	Monitoring	Timing / Frequency
Heritage and environmental data are shared between the Proponent, CLHs and YAC (including rangers).	• Specifically applies to Heritage and Environmental data collected during monitoring activities which involve **CLHs** and **YAC**. • Data sharing processes (including platforms) are developed within two years of release of Ministerial Statement. • Data is shared in a way that enables **CLHs** and **YAC** to review data independently and on-demand. • Complies with **the Proponent** confidentiality and information security policies.	**The Proponent will:**	**The Proponent will:**	
		• Collaborate with **YAC** to investigate options for data sharing, such as the development of a dashboard style interface that shows real-time or near real-time data for environmental monitoring suited to real-time data viewing (e.g. dust, noise, water (bore levels, quality and quantity).	• As required as per relevant Management Plans • Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes) • Meeting minutes	• Within two years of the issue of the Ministerial Statement
		• Collaborate with **CLHs** and **YAC** to identify Heritage and Environmental datasets to be requested.	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes) • Meeting minutes	• Within two years of the issue of the Ministerial Statement
		• Share requested Heritage and Environmental data with CLH and **YAC** (including Rangers).	• Relevant data is shared.	• Annually, or as otherwise agreed
		• Establish standardised report formats for the various environmental monitoring programs to allow data to be easily compared.	• As required for relevant EMPs.	• Within two years of the issue of the Ministerial Statement.

Objective	Limitations / Conditions	Management Actions	Monitoring	Timing / Frequency
	• Where possible, a standard format for reporting will be implemented to allow like-for-like data comparisons.	**Yinhawangka/YAC will:**	**Yinhawangka/YAC will:**	
		• Collaborate with **the Proponent** to investigate options for data sharing.	• Access and review data and advise **the Proponent** of issues with the system or data	• As required
		• Collaborate with **the Proponent** to identify Heritage and Environmental datasets to be requested.	• Record collaboration/engagement with **CLHs** and **YAC** in the Consultation and Engagement Register in **Yinhawangka/Rio Tinto** SharePoint (includes details of dates, location, participants, and a summary of discussions/outcomes) • Meeting minutes	• Within two years of the issue of the Ministerial Statement

7 ROLES AND RESPONSIBILITIES

All **Proponent** employees and contractors are required to comply with the requirements of this **SCHMP**.

During all project stages, the Operations General Manager will be accountable for ensuring the requirements of this **SCHMP** are met with support from relevant project, operation and HSEC teams.

Where responsibilities are delegated, this must be clearly recorded and communicated.

This **SCHMP** must be readily accessible to **Proponent** employees and contractors and will be published (excluding confidential components) on **the Proponent** website, where it can be accessed by **CLHs** and the general public for the life of the project.

8 PARTNERSHIP APPROACH AND FUTURE ENGAGEMENT

Consultation is a continuous process that will be conducted throughout the life of the **Proposal**. Regular forums are built into the existing Agreement framework and are held between **the Proponent** and **YAC**. These include:

- Cultural Heritage and Language Committee (**CHLC**)
- Local Implementation Committee (**LIC**).

Proposed forums to support the **SCHMP** commitments, in conjunction with other objectives, include:

- Cultural Heritage and Language Committee (**CHLC**)
- Life of Mine Planning Forums (**LOMP**)
- Water Management Committee (**WMC**)
- Mine Closure Working Group (**MCWG**).

There are existing communication and consultation mechanisms within the current **Yinhawangka** Claim Wide Participation Agreement; however, it has been agreed between **the Proponent** and **YAC** that an updated codeveloped protocol will be formalised between the parties.

This protocol will describe how **CLHs** and **the Proponent** will work together in relation to the development and management of Country in areas where the **CLHs** and **the Proponent** interact. It will also recognise **YAC** as the peak body representing **Yinhawangka** People.

This protocol is underpinned by informed engagement and consultation throughout the life cycle of mining and related developments and is a demonstration of **Yinhawangka** and **the Proponent** working together to achieve the certainty that all parties require.

The Proponent's operations and approach to engagement with **Yinhawangka** shall respect the **Yinhawangka** People's connection to Country, their rights under the Native Title Agreement and their social, cultural and heritage values in a way that recognises **Yinhawangka** People as the **CLHs** of the land and Country on which this **Proposal** will be implemented. These protocols shall foster an environment that encourages communication and consultation that:

- is respectful;
- is timely;
- is cognisant and considerate of the differences in cultural responsibilities and sensitivities;
- recognises and is accommodating of the resourcing constraints of **YAC** and **CLHs**;
- does not assume a preconceived outcome; and
- ensures that both parties are on an equal footing as far as is reasonably possible.

9 RESOLUTION OF MATTERS

In the event a matter is raised by either party in relation to this **SCHMP** and its contents (including the Management Actions detailed in Section 6, or any subsequent Annual Compliance Assessment Reports issued in relation to this **SCHMP**), that cannot be resolved to the satisfaction of the initial parties involved in a timely manner, the matter shall be escalated within **YAC** and **the Proponent** for resolution as outlined in Figure 9-1. This resolution process should align with the framework agreed upon between **YAC** and **the Proponent** in the **CWPA** (as in effect from time to time). If it does not align, the process agreed upon in the **CWPA** shall take precedence, noting that this does not replace any regulatory requirement or compliance process under the **EP Act**.

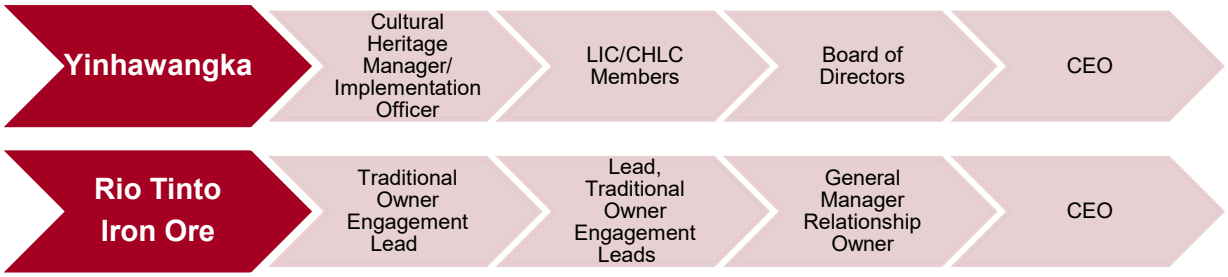


Figure 9-1: SCHMP resolution process

10 RECORD KEEPING AND REPORTING

10.1 Record Keeping

Actions implemented under this **SCHMP** will be documented as per the requirements set out in the Management and Monitoring Actions tables within Rational of Component 6.1.1 to 6.1.6. The requirements include the establishment and maintenance of a range of documents which will be shared via a Rio Tinto/**Yinhawangka** SharePoint site created by **the Proponent** and accessible by **the Proponent** and **CLHs** and **YAC**.

The following documents (or copies of) will be made available as appropriate via the SharePoint site**:**

- Social, Cultural Heritage Management Plan (**SCHMP**) (this document)
- Interim Progress Reports
- Annual Compliance Assessment Reports prepared to meet conditions of approvals issued under Part IV of the EP Act relevant to the Proposal
- RTIO-HSE-0311343 West Angelas Environmental Management Plan (EMP)
- Cultural Heritage Management Plan (CHMP)
- Rtio-0983209 West Angelas Mine Closure Plan (MCP). 10 March 2023 Version 1.0
- Ground Water Operating Strategies and annual and triennial aquifer reviews required under the Groundwater Operating Strategies
- Reports prepared to meet the conditions of licences and permits issued under Part V of the EP Act, including but not limited to Annual Environmental Reports, Annual Audit Compliance Reports, Native Vegetation Clearing Reports, and Annual Audit Reports.
- Annual Environmental Reports prepared to meet the conditions of mining leases granted under the *Mining Act 1979*.
- Minutes, registers and updates included within the management and monitoring action tables

Statements of intent by **Yinhawangka** with respect to management actions are included as agreed with **Yinhawangka** but are not binding under this document. **The Proponent** is not responsible for implementation of management actions to the extent they require action by **Yinhawangka** or other third parties.

10.2 Reporting

10.2.1 Regulatory Reporting

An Annual Compliance Assessment Report (**ACAR**) will be prepared in line with the reporting set out in the Management and Monitoring Actions tables within Rational of Component 6.1.1 to 6.1.6 and any Ministerial Statement. The **ACAR** will be submitted to the Western Australian Department of Water and Environmental Regulation (**DWER**) in accordance with conditions in any Ministerial Statement.

ACAR Report name:

- West Angelas Revised Proposal: Annual Compliance Assessment Report

ACAR Reporting Schedule:

- To be confirmed pending approval, issue of a Ministerial Statement, and any associated requirements for a Compliance Assessment Plan.

10.2.2 Reporting to YAC

In addition to the above, **the Proponent** will prepare and provide an annual report to **CLHs** via **YAC.**

YAC Report Name:

- West Angelas Revised Proposal: **Yinhawangka** Interim Progress Report
- **YAC** Reporting Schedule:
- 1 January – 31 December (due date 30 April, or first business day after in the following year)

In addition to reporting management actions identified in this plan as prescribed by Management and Monitoring Actions tables within Rational of Component 6.1.1 to 6.1.6, an annual report shall be produced containing a summary of major **Proposal** activities for the period, including:

  - Railed Ore as relevant to Yinhawangka Mining Benefit Payments
  - Area of land heritage surveyed
  - Area of native vegetation cleared
  - Volume of groundwater abstracted
  - Area of land rehabilitated
  - Number of **CLHs** employed directly by **the Proponent** at West Angelas.
- Summary of all environment and heritage incidents (including, but not limited to, unauthorised ground disturbance and clearing of native vegetation, fauna injury and death, impacts to Aboriginal heritage sites, spills to the environment, groundwater abstraction volume exceedances) and non-compliance with this plan that occurred during this period.
- Summary of all consultations undertaken with **CLHs** and **YAC** during the reporting period, which is not captured by a Management and Monitoring Action in this **SCHMP**, including information about what the consultation was for, what the outcomes of the consultation were, and how they will be satisfied or implemented.

The Proponent will provide the report and offer an annual briefing to the **YAC CHLC** and **CLHs** via **YAC** on the contents of each report. This briefing is to allow further information and context to be obtained through questioning by **CLHs** who would like additional information on matters presented in the report.

11 ADAPTIVE MANAGEMENT AND REVIEW OF THE SCHMP

This **SCHMP** should be reviewed as required in the context of an adaptive management approach. This may include, but is not limited to, where a definition, objective, action or target requires addition, deletion or refinement to ensure that the plan is effective and social surroundings are protected from significant **harm**, or where new knowledge or technology is discovered which may contribute to outcomes which better meet the objectives of this **SCHMP**.

As a minimum, the management actions in this **SCHMP** will be monitored, reviewed and evaluated by **the Proponent**, **CLHs** and **YAC** as necessary and updated, for submission to **DWER CEO** after 12 months of implementation. It shall be reviewed every second year thereafter unless an alternative is mutually agreed to by **CLHs**, **YAC** and **the Proponent**.

In addition, this **SCHMP** may be reviewed and updated in the following circumstances:

- Where comments are received from the **EPA** and other decision-making authorities during the Part IV assessment process;
- New information comes to light that may materially affect the current identified values, impacts and management actions within the **SCHMP**;
- **CLHs** request that a review is undertaken due to a relevant concern, such as the occurrence of an incident or the failure of a process set out in the plan to achieve the intended aim; and
- Where legislative changes affect Aboriginal Heritage management and protection.

Changes proposed by **the Proponent**, **YAC** or **CLHs** must be considered by all parties in accordance with the Communication and Consultation Protocol. This process is intended to ensure that all parties have the relevant information and time necessary to be able to make fully informed decisions on proposed changes prior to submission to the **EPA** for approval (where required) and implementation.

A summary of changes containing an explanation of the need for the change and any consequential effects of the change on other commitments must be fully explained and supported by examples. Changes are to be identified via the use of the track change function, clearly showing deletions and additions.

Where any changes to this **SCHMP** are considered significant in terms of the nature of the **Proposal** and the associated risks, this **SCHMP** will be re-submitted to the **EPA** for approval. Once approved, this updated version will be made publicly available and published on **the Proponent** website.

12 COMPLIANCE ASSURANCE

An independent audit of the implementation of this SCHMP shall be undertaken by **the Proponent** annually in the first two years and then biennially thereafter.

CLHs will be invited to participate in these **Proponen**t-led audits. Finalised audit reports will be shared with **CLHs** via **YAC**.

13 GLOSSARY

ACAR	Annual Compliance Assessment Report
AH Act	*Aboriginal Heritage Act 1972* (WA)
AWT	Above water table
BWT	Below water table
Caring for Country	Relates to aspirations and actions that Yinhawangka People hold and enact as part of Yinhawangka culture and cultural obligations to Country with respect to ensuring that Country is actively cared for and looked after. Actions related to this theme include all traditional and contemporary on-Country activities that are undertaken by Yinhawangka People to ensure that Country remains healthy, such as cultural burning, weeding, checking on important places, waterholes etc.
CEO	Chief Executive Officer
CHLC	Cultural Heritage and Language Committee
CLH	Common Law Holder
Connection to Country	Relates to Yinhawangka People's cultural and spiritual connection to Yinhawangka Country and the need to maintain that connection for cultural, spiritual and health reasons. Actions related to this theme include accessing Country to fulfil cultural obligations to People, Country and Culture, enjoyment of Country, and just being on Country.
CWPA	Claim Wide Participation Agreement
Common Law Holder	Registered Claimants of **Yinhawangka** Native Title Determination Claim Areas Part A (WAD340/2010) and Part B (WAD216/2010)
Cth	Commonwealth of Australia
DPLH	Department of Planning, Land and Heritage
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ERD	Environmental Review Document
ESD	Environmental Scoping Document
Exogamous	Custom enjoining marriage outside one's own group
GM	General Manager

GWL	Groundwater Licence
Harm	'Harm' as defined in the EP Act.
HCP	Healthy Country Plan
HEC	Heritage and Environment Committee
ILUA	Indigenous Land Use Agreement
Infrastructure	RTIO to provide a definition that excludes mine pits so as to define existing infrastructure that will require maintenance.
LAP	Land Access Protocol
LIC	Local Implementation Committee
LOMP	Life of Mine Planning Forums
MCP	Mine Closure Plan
MCWG	Mine Closure Working Group
Mine Design	Mine Design as acknowledged by **Yinhawangka** Aboriginal Corporation Board on 3rd November 2023
Mount Ella East site complex	This site complex is made up of the following site: WA-18-ETH-01
NAF	Non-Acid Forming
NEPM	National Environment Protection Measure
PAB	Pilbara Aboriginal Business
PAF	Potentially Aid Forming
Places and Sites of Special Significance	The Range; Western Hill archaeological site complex; Mount Ella East archaeological site complex; archaeological site WA-16-51-ENG (No DPLH Place ID); rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444]); rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID]); and the Sinkhole (RTIO database: Yinta)
Proposal	West Angelas Revised Proposal
Protection of Country	Relates to the implementation of non-Traditional measures aimed at preventing or minimising impacts to Yinhawangka values caused by the Proposal. Actions related to this theme include non-Traditional means such as the implementation of cultural heritage exclusion zones, and the conduct of audits and inspections of areas and values that are at risk from the Proposal.
Quarterly Report	Quarterly Social, Cultural and Heritage Management Plan Implementation Report
RFD	Regional Framework Deed
Rio Tinto	Rio Tinto Iron Ore
RiWI Act	*Rights in Water and Irrigation Act 1914* (WA)

RNTBC	Registered Native Title Body Corporate
SCARD	Spontaneous Combustion and Acid Rock Drainage
SCHMP	Social, Cultural and Heritage Management Plan
social surroundings assessment	**Yinhawangka** Common Law Holders and Archae-aus (2022). *Report of a Social Surroundings Assessment for West Angelas Revised Proposal, Western Australia*. Prepared for **Yinhawangka** Aboriginal Corporation and Rio Tinto Iron Ore Pty Ltd by Archae-aus Pty Ltd, August 2022.
The Range	The hill Range to the south of existing West Angelas mining operations. The Range is a heritage site and cultural landscape feature with a boundary provided from **Yinhawangka** to **the Proponent**.
WA	Western Australia/Western Australian
watercourse	Has meaning as per section 3 of the RiWI Act
water resources	Has meaning as per section 2 of the RiWI Act: Includes: watercourses and wetlands together with their beds and banks; and other surface waters; and aquifers and underground water.
Western Hill site complex	This site complex is made up of the following sites: WAN20-009, WAN20-014, WAN20-012, TBR-18-20, WAN20-007, TBR-16-07, WARE14-87-SS, WAN20-002, TBR-18-19, WAN20-11, WA-18-05-RS, WAN20-008, WAN20-010, WAN20-013, WAN20-006, WA-16-23-AS, WAN20-005, WA-16-24-RS, WAN20-004, WAN20-003, WA-18-02-ST, and WA-18-04-RS.
WMC	Water Management Committee
writing	Information conveyed in writing includes emails
YAC	**Yinhawangka** Aboriginal Corporation
Yinhawangka	Where cited, refers to **CLHs**, Country, Culture and Heritage collectively
YSP	**Yinhawangka** Strategic Plan

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15 APPENDICES

Appendix 2: Environmental Impact Assessment Process for West Angelas Revised Proposal

The Proponent referred the **Proposal** to the **EPA** under s. 38 of the **EP Act** on 25 March 2021. **The Proponent** subsequently prepared an Environmental Scoping Document (**ESD**; **EPA** YEAR), which set out the matters to be addressed in the Environmental Review Document [**ERD**] (**Rio Tinto** YEAR).

The **Proposal** was also referred to the Department of the Environment and Energy (DotEE, now Department of Climate Change, Energy, Environment and Water DoCCEEW) on 25 March 2021 under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), with the Commonwealth Minister for the Environment determining that the **Proposal** is a controlled action under s. 75 of the **EPBC Act**, requiring further assessment and approval. The relevant Matters of National Environmental Significance (MNES) with the potential to be significantly impacted by the **Proposal** were identified as:

- Northern Quoll
- Ghost Bat
- Pilbara Leaf-nosed Bat
- Pilbara Olive Python
- Grey Falcon
- Night Parrot
- Fork-tailed Swift

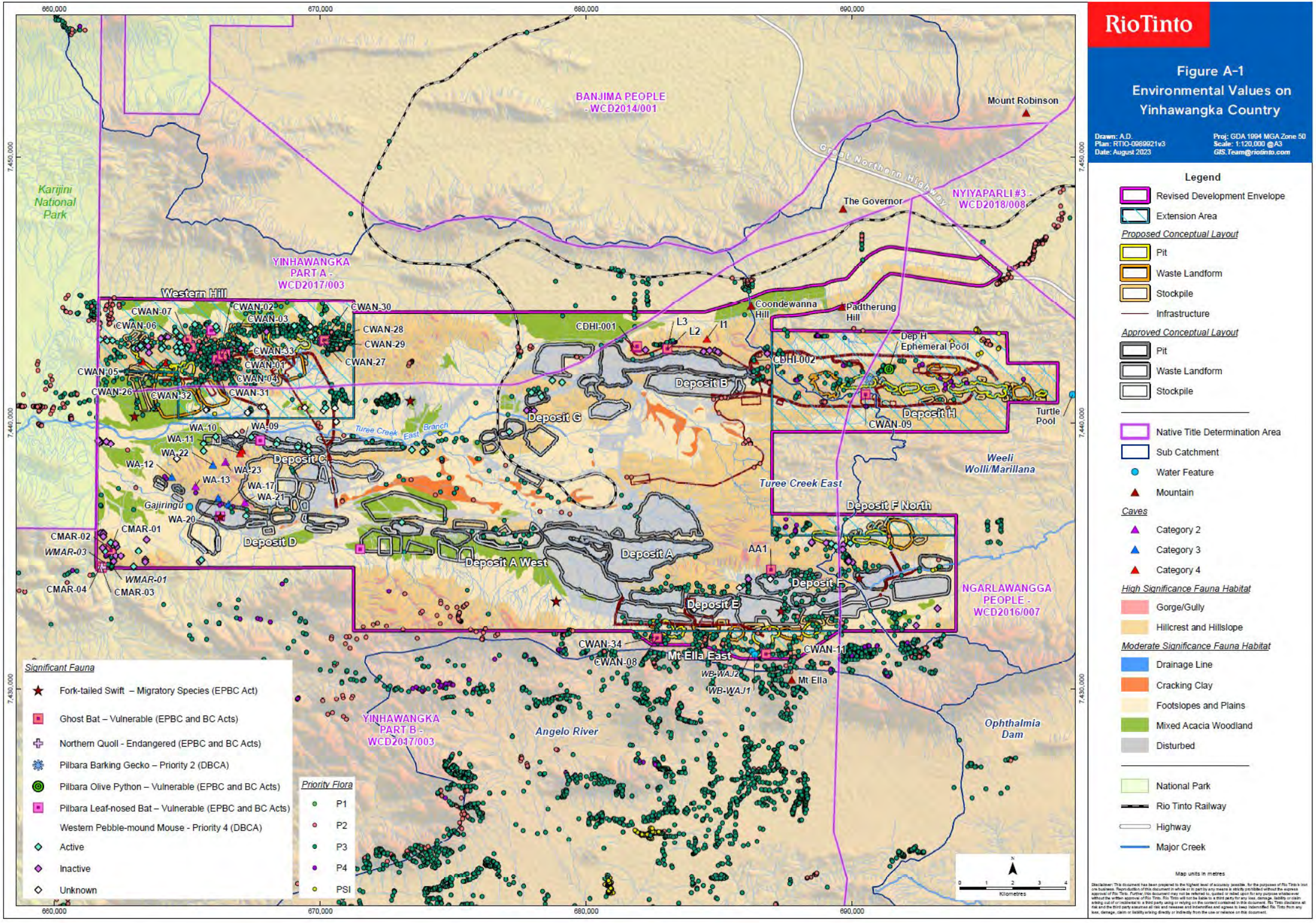
The **EPA** is assessing the **Proposal** as an accredited assessment on behalf of the Commonwealth under s. 87 of the EPBC Act.

Social surroundings was identified by the **EPA** as one of six key environmental factors considered for the **Proposal**, with the work required to assess the factor described in the **ESD** as follows.

- Provide evidence of consultation with relevant stakeholders, demonstrate how issues raised through consultation have been addressed, and specify how **the Proponent** will minimise impacts to social surroundings values within the Revised Development Envelope.
- Provide a detailed description and assessment of the potential impacts (direct, indirect and cumulative) to visitors to Karijini National Park.
- Conduct and undertake meaningful investigations, consultation and engagement with relevant Traditional Owner groups to identify tangible and intangible cultural heritage values within and outside the Revised Development Envelope that could be directly or indirectly impacted by the Proposal (to the extent that they are impacted upon by the physical or biological environment):
    - Provide evidence of meaningful investigations, engagement and consultation undertaken with Traditional Owner groups such as survey reports and documented consultation outcomes.
    - Provide details of the methodology used for the investigations and engagement, including (but not limited to) the timing, scope, activities undertaken and stakeholders involved, and a description of how the methodology adequately identifies tangible and intangible cultural heritage values for consideration in the assessment of impacts to social surroundings.
- Prepare a Social, Cultural and Heritage Management Plan for each Traditional Owner group, in consultation with each group, that describes the social, cultural and heritage values within the relevant country and specifies how **the Proponent** will avoid (where possible) and minimise impacts to social, cultural and heritage values within and directly adjacent to the Revised Development Envelope.
- Cumulative impacts: Provide a detailed description and assessment of the potential direct and indirect cumulative impacts to social surroundings as a result of changes to the environment from the Proposal with specific consideration given to Traditional Owners, pastoralists and visitors to Karijini National Park and their activities on the land including areas adjacent to and surrounding the Proposal which have the potential to be impacted.

The above work was addressed in the **ERD** and subsequent 'response to submissions' on that report. On DD MONTH YEAR the **ERD** was released for an eight-week public review period. On

DD MONTH YEAR **the Proponent** provided responses to the public submissions, including from **YAC** on behalf of **CLHs**. The **Proposal** is currently being assessed with approval pending, at which time a Ministerial Statement with conditions of approval will be issued. This **SCHMP** has been prepared consistent with the **EPA** 'Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans' (**EPA** 2020).



RioTinto

Figure A-1
Environmental Values on Yinhawangka Country

Drawn: A.D.
Plan: RTIO-0869921v3
Date: August 2023

Proj: GDA 1994 MGA Zone 50
Scale: 1:120,000 @A3
GIS.Team@riotinto.com

Legend

- Revised Development Envelope
- Extension Area

Proposed Conceptual Layout

- Pit
- Waste Landform
- Stockpile
- Infrastructure

Approved Conceptual Layout

- Pit
- Waste Landform
- Stockpile

- Native Title Determination Area
- Sub Catchment
- Water Feature
- Mountain

Caves

- Category 2
- Category 3
- Category 4

High Significance Fauna Habitat

- Gorge/Gully
- Hillcrest and Hillslope

Moderate Significance Fauna Habitat

- Drainage Line
- Cracking Clay
- Footslopes and Plains
- Mixed Acacia Woodland
- Disturbed

- National Park
- Rio Tinto Railway
- Highway
- Major Creek

Map units in metres

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Appendix 3: Yinhawangka Social Surroundings Assessment Report (Yinhawangka Common Law Holders and Archae-aus 2022)


YINHAWANGKA
ABORIGINAL CORPORATION
Social Surroundings Assessment
Yinhawangka AC | for Rio Tinto
REPORT

Report

Report of a Social Surroundings Assessment for West Angelas Revised Proposal, Western Australia

For Yinhawangka Aboriginal Corporation
on behalf of
Rio Tinto Iron Ore Pty Ltd
by Yinhawangka Common Law Holders and Archae-aus Pty Ltd
October 2022

PROJECT REFERENCE

Rio Tinto Iron Ore: West Angelas Revised Proposal Social Surroundings Assessment
Archae-aus Pty Ltd: YC21WS1a_Q001

There are images in this document. Aboriginal and Torres Strait Islander People are advised that it may contain names or images of people who have passed.

ABOUT THIS SOCIAL SURROUNDINGS ASSESSMENT

This Social Surroundings Assessment was conducted in consultation with Yinhawangka Common Law Holders, to consider Yinhawangka values, practices, interests, knowledge, stories and aspirations for their Country in relation to Rio Tinto Iron Ore's West Angelas Revised Proposal.

The assessment comprised desktop research, four fieldtrips and two workshops, reported as follows:

- Section 1: Introduction
- Section 2: Context
- Section 3: Results
- Section 4: Discussion
- Section 5: Recommendations

This report will inform further workshops and a Social, Cultural and Heritage Management Plan, which RTIO must submit to the Environmental Protection Authority for assessment under the Environmental Protection Act 1986 (WA). Together, these components comprise the Social Surroundings Assessment for the West Angelas Revised Proposal.

AUTHORSHIP & REVIEW

This report was prepared by Dirima Cuthbert (MEnvDes [UWA]; BDes [USyd]; BSc Hons Anthropology [UWA]) with assistance from Dr Myles Mitchell (PhD Anthropology [ANU]; BA Communication Studies [UWA]). Maps 1, 3, 4 and 5 were prepared by Paul Connolly (BSc Environmental Management [ECU]. Maps 3-5 use base layers supplied by Rio Tinto Iron Ore. Map 2 was supplied by Rio Tinto Iron Ore.

Film clips and drone footage recorded on the SSA were prepared by Michael Bonner (BArchaeology [Flinders University]; MArts Screen, Documentary [Film, Television and Radio School]. These are to be reviewed by Yinhawangka Common Law Holders. Permission will be obtained from those who feature in the footage and from any other relevant parties before a decision is made to incorporate the footage in this Social Surroundings Assessment.

Paul Connolly reviewed this report for compliance with the Environmental Protection Act 1986 (WA), and Dr Anna Fagan reviewed it for Yinhawangka Aboriginal Corporation. Expert adviser Professor David Trigger reviewed a previous Social Surroundings Assessment report (Yinhawangka Common Law Holders and Archae-aus 2021) which was prepared by Archae-aus for Rio Tinto Iron Ore's Greater Paraburdoo Operations. Reviewers' queries and concerns have been addressed in this report to the satisfaction of Yinhawangka Aboriginal Corporation.

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The recommendations contained in this report have been endorsed by Yinhawangka Common Law Holders who participated in this Social Surroundings Assessment, Yinhawangka Aboriginal Corporation and Rio Tinto Iron Ore.

ACKNOWLEDGMENTS

Archae-aus Pty Ltd would like to acknowledge and thank Yinhawangka Common Law Holders. We would also like to thank Yinhawangka Aboriginal Corporation for coordinating and overseeing this Social Surroundings Assessment and Rio Tinto Iron Ore for supporting it with funds, logistical assistance and advice on the West Angelas Revised Proposal.

RESEARCH ETHICS FRAMEWORK

This Social Surroundings Assessment was led by YInhawangka Common Law Holders and informed by:

- United Nations Declaration on the Rights of Indigenous People – Article 32 (United Nations 2007);
- Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS) Code of Ethics for Aboriginal and Torres Strait Islander Research (AIATSIS 2020);
- Terri Janke and Maiko Sentina, Indigenous Knowledge: Issues for Protection and Management, IP Australia (Commonwealth of Australia 2018);
- A Way Forward; Final report into the destruction of Indigenous heritage sites at Juukan Gorge (Commonwealth of Australia 2021);
- Australian Anthropological Sociey Code of Ethics.

DISCLAIMER

This report was prepared from information available at the time of research and writing. Archae-aus Pty Ltd is not responsible for any omissions of information that may subsequently become available, or inconsistencies with such information.

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REPORT REFERENCE

Yinhawangka Common Law Holders and Archae-aus 2022 Report of a Social Surroundings Assessment for West Angelas Revised Proposal. Prepared for Yinhawangka Aboriginal Corporation & Rio Tinto Iron Ore by Yinhawangka Common Law Holders and Archae-aus Pty Ltd, August 2022.

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Final report submitted by Yinhawangka Aboriginal Corporation to Rio Tinto Iron Ore	14 October 2022	A. Fagan

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TERMS USED IN THIS REPORT

ACHA	Aboriginal Cultural Heritage Act 2021 (WA)
AHA	Aboriginal Heritage Act 1972
AIATSIS	Australian Institute of Aboriginal and Torres Strait Islander Studies
Archae-aus	Archae-aus Pty Ltd
CLH	Common Law Holders
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act (1986)
GPO	Greater Paraburdoo Operations
HCP	Healthy Country Plan
HEC	Heritage and Environment Committee
RTIO	Rio Tinto Pty Ltd
SCHMP	Social, Cultural and Heritage Management Plan
SSA	Social Surroundings Assessment
The Proposal	West Angelas Revised Proposal
T & W	Thurantajinha and Wilga
UNDIP	United Nations Declaration on the Rights of Indigenous Peoples
WAN	West Angelas
YAC	Yinhawangka Aboriginal Corporation

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" We are still using the culture in this Country "

DAVID COX (BARNDU)

This report was commissioned by Yinhawangka Aboriginal Corporation (YAC) for Rio Tinto Iron Ore (RTIO) on behalf of Robe River Mining Company Pty Ltd. It reports the results of a Social Surroundings Assessment (SSA) of the West Angelas (WAN) Revised Proposal (the Proposal). The SSA comprised desktop research, four fieldtrips, a Consolidation Workshop and a Social, Cultural and Heritage Management Plan Workshop in 2021 and 2022. The results will be used by RTIO to address the Social Surroundings Environmental Factor under s. 38 (Part IV) of the Environmental Protection Act 1986 (WA) (EP Act). Results which fall outside the remit of the EP Act will support Yinhawangka Common Law Holders (CLH), YAC and RTIO in managing Yinhawangka Country. [1]

A Scope of Work (SoW) for this SSA was co-developed by YAC and RTIO. It would allow for the identification and discussion of tangible and intangible Yinhawangka values and discussion of the cumulative impacts on them from the Proposal across space and through time, including any advice that Yinhawangka CLH may have to avoid, minimise or mitigate those impacts. Archae-aus Pty Ltd (Archae-aus) was commissioned to conduct the SSA on 8 March 2021. RTIO referred the Proposal to the Environmental Protection Authority (EPA) with the public comment period commencing on 1 April 2021. On 27 April 2021, the EPA published its decision to assess the Proposal and set the level of assessment as Public Environmental Review.

It was the objective of this SSA to:

- Inspect the Development Envelope and its surroundings and record places and values significant to Yinhawangka CLH using a range of media (fieldnotes, film, drone footage and photography). This process was facilitated by the provision of male and female anthropologists, an environmental adviser, filmmaker and drone operator;
- Hear about the Proposal from RTIO personnel;
- Consider places and values significant to Yinhawangka CLH in light of the Proposal, and existing and proposed activities at Deposits G and A West;
- Develop recommendations for avoiding, mitigating or managing impacts to places and values in relation to the Proposal;
- Test the methodology developed for the SSA;
- Develop preliminary Terms of Reference for conducting future SSAs on Yinhawangka Country.

The Proposal is located approximately 100 kilometres northwest of Newman in the Pilbara region of Western Australia (Map 1). It will involve developing new above and below water table iron ore mine pits and associated infrastructure to sustain existing WAN operations (Map 2). The overall WAN Development Envelope will increase by 17,555 hectares (ha) as a result of the Proposal, to a combined total area of 35,157 ha.

The Development Envelope is intersected by two Native Title Determination areas: Yinhawangka and Ngarlawangga (Map 1). RTIO has commissioned a separate SSA with the Ngarlawangga People to identify their values and to understand how the Proposal may impact them.

During the SSA, RTIO personnel described the Proposal to Yinhawangka CLH using a range of communication tools, including:

- Maps
- Power Point presentations
- On-Country inspections and discussion within and adjacent to the Development Envelope
- 3D visualisations

This SSA was a collaborative process between Yinhawangka CLH, YAC, RTIO and Archae-aus. Yinhawangka CLH heard about the proposal and RTIO representatives heard Yinhawangka CLH's advice on the Proposal on fieldtrips and in workshops. Yinhawangka CLH who participated in the SSA indicated that the information RTIO provided was sufficient to make an informed decision about the Proposal. The adopted approach allowed for the identification and discussion of tangible and intangible values and assessment of the impacts (direct and indirect, immediate and cumulative) on those values across space and through time.

Desktop research of published ethnohistorical information, published and unpublished Aboriginal Heritage survey reports, water studies and ethnobotanical research, as well as Native Title research, articulates rich and enduring deep-time relationships between Yinhawangka People, Culture and Country. To capture these relationships, the SSA adopted an approach known as 'more than human' (sometimes called 'multispecies') ethnography.

'Common Law Holders' is the term preferred by the Yinhawangka representatives who participated in this SSA. It acknowledges that Yinhawangka have been successful in attaining Native Title Determination over their Country.

This type of ethnographic analysis acknowledges the mutually dependent relationships between people, plants, animals, waterholes, weather, rocks and other elements that comprise the social and cultural landscape. This relational perspective supports a nuanced and holistic understanding of the connections between people, places and their 'more than human' elements across time and space.

It reveals process and outputs, methods and theory and subject and object to be entangled in complex ways. This SSA is an attempt to bring these complex entanglements to meet the legislation, while acknowledging the need for consensus between all parties to manage Country in light of the Proposal.

To this end, the SSA consisted of:

- Desktop research
- 4 x fieldtrips with Yinhawangka CLH, RTIO and Archae-aus representatives. It was on these fieldtrips that the recommendations contained in this report were recorded. Trip Reports were submitted after each Field Trip.
- A Consolidation Workshop with Yinhawangka CLH who participated in the fieldtrips, YAC, Archae-aus and RTIO representatives. At this workshop the recommendations recorded on the fieldtrips were reviewed and refined. Preliminary Advice (PA) was submitted after the workshop. The recommendations contained in the PA are reproduced in this report.
- A Social, Cultural and Heritage Management Plan (SCHMP) Workshop with Yinhawangka CLH Advisers who participated in the fieldtrips, (or who represented one of the three Yinhawangka Apical families), YAC and Archae-aus. The SCHMP Workshop will inform a SCHMP to be co-developed by YAC, RTIO, Archae-aus and other consultants engaged by YAC and RTIO. The SCHMP will be submitted to the EPA to support the Proposal's referral within the Environmental Review Document (ERD).
- 4 x ERD Workshops with Yinhawangka CLH who participated in the fieldtrips, YAC, Archae-aus and RTIO representatives for the purpose of co-developing the SCHMP.

The SSA generated 47 recommendations. In so doing, it identified three principles to protect social surroundings from significant harm. They may be of assistance in conducting future SSAs on Yinhawangka Country:

1. Values cannot simply be preserved by not impacting them - they are dynamic connections between People, Culture and Country which must be continually regenerated.
2. Through the act of doing SSAs, we are creating, developing, shaping and reproducing social surroundings.
3. A given point in time is just a 'snapshot' of a place's social surroundings. A meaningful assessment will take a long-term perspective, from the deep past to the present and multiple possible futures.



"It's not just a landscape, for us it's a family tree"

NANCY TOMMY

Recommendations

As a result of the SSA, the following 47 recommendations have been endorsed by Yinhawangka CLH, YAC and RTIO. Some of these recommendations will be used by RTIO to address the Environmental Protection Authority's (EPA's) Social Surroundings Environmental Factor under s.38 (Part IV) of the EP Act. Other recommendations which fall outside the remit of the EP Act will support Yinhawangka CLH, YAC and RTIO in managing Yinhawangka Country through other agreements and programs. To assist with their implementation, the recommendations are grouped in themes which emerged during the SSA, although it is acknowledged that a recommendation may relate to more than one theme.

Yinhawangka Common Law Holders conditionally support the Proposal.

Recommendations #1 - #8 identify the parts of the Proposal that may proceed, and the parts that may not.

It is recommended that:

1 The range immediately to the south of the existing WAN operations (the Range) is a critically important site. The site is to be registered under the AHA and entered into YAC and RTIO's databases for its protection (dashed yellow outline, Map 3). The site extends beyond Yinhawangka Country into Ngarlawangga Country. Further discussion between Yinhawangka and Ngarlawangga CLH will be required to manage this site.

2 Due to the site at Recommendation #1, Yinhawangka CLH do not support the Proposal at Deposit J (Map 2). Ground disturbance is not supported in the Range. However, maintenance (but not expansion) of existing infrastructure e.g. tracks, may be permitted. Within these parameters, the specific activities which may be supported in the Range should be determined through further discussion with Yinhawangka and Ngarlawangga CLH.

3 The Proposal at Mount Ella East (Map 2) within the proposed disturbance footprint may proceed. Yinhawangka CLH do not support direct impacts to the Range outside this footprint. Pits at Mount Ella East shall be backfilled to the original ground surface, using the waste material from the proposed pits and existing waste dumps. Where possible, waste from the proposed pits should be dumped on top of existing waste dumps, to limit the overall number and footprint of waste dumps;

Protection of Country

Recommendations #9 - #19 advise RTIO how to protect Country in and around the Development Envelope, before, during and after the Proposal. While the Proposal's impacts on dust was considered during the SSA, Yinhawangka CLH assume that RTIO will continue to monitor dust quality and quantity and minimise its impacts at WAN as standard practice. Consequently, Yinhawangka CLH had no specific recommendations on this matter.

It is recommended that:

4 The Proposal at Western Hill (Map 2) may proceed, provided the previously recorded Western Hill Site Complex (WAN20-009, WAN20-014, WAN20-012, TBR-18-20, WAN20-007, WARE14-87-SS, WAN20-002, TBR-18-19, WAN20-11, WA-18-05-RS, WAN20-008, WAN20-010, WAN20-013, WAN20-006, WA-16-23-AS, WAN20-005, WAN20-004, WAN20-003, WA-18-02-ST, WA-18-04-RS) (Map 3) is protected;

5 The Proposal at Deposit H (Map 2) may proceed;

6 The Proposal at Deposit F North (Map 2) may proceed;

7 There are no recommendations specific to Deposit G (Map 2);

8 There are no recommendations specific to Deposit A West (Map 2).

Protection of Country

Recommendations #9 - #19 advise RTIO how to protect Country in and around the Development Envelope, before, during and after the Proposal. While the Proposal's impacts on dust was considered during the SSA, Yinhawangka CLH assume that RTIO will continue to monitor dust quality and quantity and minimise its impacts at WAN as standard practice. Consequently, Yinhawangka CLH had no specific recommendations on this matter.

It is recommended that:

9 All mine pits associated with the Proposal are to be backfilled at the cessation of mining;

10 Independent experts should monitor the impacts of RTIO's blasting activities on rockshelters and share the results with Yinhawangka CLH via an appropriate forum as determined through consultation with YAC;

11 Yinhawangka CLH support RTIO's plans to monitor water quality and quantity at a sinkhole (the Sinkhole) (Rio Tinto Database: Yinta) (located 5.5 km south-west of the Development Envelope; Map 3) to create a baseline for future water monitoring and management. Real time data should be shared with CLH and YAC through an appropriate forum to be determined by YAC;

12 A Rights Reserved Area (RRA) around the Sinkhole (Map 3) should be negotiated between RTIO and YAC and the place should be registered as a site under the AHA;

13 RTIO should expand the existing RRA at Illingurra (Mt Governor) (Rio Tinto Database HOPEETH3-01), to encompass the mountain in its entirety. The mountain lies in Yinhawangka and Banjima Country and the RRA currently covers only the portion in Banjima Country. The extent of the RRA in Yinhawangka Country will need to be determined by RTIO and YAC;

14 Guided by their Elders, Yinhawangka CLH should be engaged for the following work in and around the Development Envelope:

a Monitoring landscape condition, water quality and water quantity at the Sinkhole (Map 3). This should include removing animal bones and other debris when the water dries up;

b Implementing cultural burning to control weeds at locations to be determined;

c Monitoring the impacts of mining activities on rockshelters;

15 An ethnographic survey should be conducted to support possible registration of the site known as Dinner Camp, (Rio Tinto Database WAETH06-2) (Map 3) under the AHA;

16 RTIO and Yinhawangka CLH should work together to map and protect pebble mouse mounds where practicable. This may be considered within RTIO's environmental survey program;

17 RTIO should manage topsoil to maintain and improve its vitality, so that it provides a viable seed bank when used during mine closure rehabilitation activities. Done well, there may not be a need to seed at all. If seed is required, stock should be provenanced from Yinhawangka Country where practical, as close to WAN as possible. Yinhawangka CLH will advise RTIO on a culturally appropriate species for inclusion in the rehabilitation seed mix;

18 Yinhawangka CLH should be supported by RTIO and YAC to regenerate native bee populations and encouraged to harvest the resulting honey for their personal consumption;

19 Yinhawangka CLH wish to explore the potential for compensation from the Western Australian Government for the irreplaceable loss of and damage to places from mining under the Racial Discrimination Act 1984. Yinhawangka CLH do not see Mining Benefits Payments as sufficient compensation.



Connection to Country

Recommendations #20 - #27 identify the places to which Yinhawangka CLH require access in and around the Development Envelope, and how knowledge of places is to be managed and shared between Yinhawangka CLH and others.

It is recommended that:

20 RTIO should facilitate Yinhawangka CLH access to the following places in line with the West Angelas Land Access Protocol (Map 3):

- a The Range to the south of existing WAN mining activities
- b Western Hill Site Complex
- c Archaeological Site (RTIO database: WA-16-61SS [No DPLH Place ID])
- d Mt Ella Site Complex
- e Rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444])
- f Engraving WA-16-51-ENG
- g Rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID])
- h The Sinkhole (RTIO database: Yinta)

RTIO and Yinhawangka CLH should maintain ongoing communication to ensure that access to the abovementioned places is properly managed throughout the life of the Proposal. There should be regular RTIO and YAC review of the Land Access Protocol. Due consideration should also be given to any additional places for Yinhawangka CLH access in the future, such as significant places identified during archaeological survey;

21 Opportunities to re-vitalise women's connections to significant places are to be sought by YAC under the leadership and guidance of Yinhawangka women. This should include a program of activities on-Country, supported by RTIO through provision of funding and logistics;

22 Yinhawangka CLH will identify gender restricted places in and around the Development Envelope. The results should be shared with appropriate parties to ensure consistency around access and culturally appropriate management of places;

23 Yinhawangka CLH will work with RTIO to produce a cultural protocols 'Code of Conduct' brochure in digital and hard copy formats to educate mining personnel and the general public in appropriate behaviour on Yinhawangka Country. This may be produced in conjunction with other Traditional Owner Groups. Hard copies should be made available at airports, hotels and mining camps in the region;

24 Yinhawangka CLH will work with RTIO to host an annual 'Yinhawangka Community Day' at WAN. Yinhawangka CLH and others will be supported to visit and observe the activities taking place there. This would be an additional commitment over and above any other similar events;

25 The office, services and facilities at WAN should offer a welcoming experience for Yinhawangka CLH and others through:

26 Yinhawangka CLH will work with RTIO to develop a communications strategy for sharing language and imagery throughout WAN;

27 The Aboriginal Place Names Project is to be completed through YAC. It should include cultural mapping in and around the Development Envelope, re-assessing names already applied to places and recording names for places which have not yet been identified on maps, databases etc. Once these names have been endorsed, they should be shared with RTIO to use at WAN.

> " On Yinhawangka Country, when you make a hole, you gotta fill it in otherwise you Coolbargu make trouble for yourself "
>
> **MARLON COOKE**

[3] Yinta is the RTIO Database reference for the Sinkhole, which was recorded during a previous ethnographic survey (Williams 2011).

a More signage, murals and displays (in language where possible) celebrating Yinhawangka Culture and Country;

b Cultural awareness training for all employees, including office, catering, grounds and other service staff and contractors;

c Cultural immersion camps aimed at giving WAN staff an extended cultural experience (overnight or longer) co-designed and implemented by Yinhawangka and Ngarlawangga CLH;

d Special treatment of Yinhawangka Elders including the provision of rooms with easy access to the dry mess and vehicle drop off and pick up points;

26 Yinhawangka CLH will work with RTIO to develop a communications strategy for sharing language and imagery throughout WAN;

27 The Aboriginal Place Names Project is to be completed through YAC. It should include cultural mapping in and around the Development Envelope, re-assessing names already applied to places and recording names for places which have not yet been identified on maps, databases etc. Once these names have been endorsed, they should be shared with RTIO to use at WAN.

Caring for Country

Recommendations #28 - #40 set out processes for managing Yinhawangka Country in and around the Development Envelope now.

It is recommended that:

28 Yinhawangka CLH are supported to manage important cultural places by all land users and managers, including mining companies, Government Departments etc.;

29 Yinhawangka CLH participation in heritage surveys and SSAs is supported by YAC through an induction program. The program should include:

a Mentoring;

b Appropriate gender and apical representation;

c Cultural safety;

30 YAC should employ a Yinhawangka man and woman to manage CLH participation in heritage surveys and SSAs;

31 RTIO and YAC should develop support mechanisms to encourage Yinhawangka CLH into the RTIO workforce.;

31 RTIO and YAC should develop support mechanisms to encourage Yinhawangka CLH into the RTIO workforce.;

32 A Yinhawangka Water Committee led by nominated Yinhawangka CLH should be established for the purpose of making water-related decisions on Yinhawangka Country;

33 Archaeological survey areas should not be considered 'assessed' in circumstances where ground surface visibility is deemed too low (eg. <20%). Alternative approaches should be sought in low visibility areas, such as cultural burning in advance of the survey. The area should be inspected by Yinhawangka CLH and other experts as required beforehand, to identify any scarred trees or other features to be protected during the burn;



" Trees, rocks, they are all very significant to us "

RHONDA PARKER

34 RTIO is to involve Yinhawangka CLH in mine planning for all Proposals on Yinhawangka Country from the Conceptual Phase through to mine closure and rehabilitation. Involvement should include (but not be limited to):

a The location and scale of a proposal, including new mines and extensions to existing mines;

b The routes RTIO anticipates using during exploration, mine construction, operations and closure;

c Yinhawangka CLH access to places within the Development Envelope;

d The extent to which pits will be backfilled at the cessation of mining;

35 Plants, animals and other natural features in and around the Development Envelope should be recorded in a two-way knowledge exchange between people trained in Western and Yinhawangka science;

36 YAC should facilitate Yinhawangka-led studies, especially in areas which are subject to RTIO proposals. Studies may include (but not be limited to) flora, fauna and water assessments;

37 RTIO should adopt standard formatting for reporting the results of studies undertaken on Yinhawangka Country. There should be real-time sharing of data;

38 RTIO should invite Yinhawangka CLH to visit mines which have been or soon will be closed such as Argyle Mine, Hunter Valley Coal Mine, Ranger Mine etc., to hear the experience of those involved and apply any lessons learnt to WAN;

39 RTIO and YAC should agree on the eligibility and processes for RTIO's funding of Yinhawangka CLH-managed programs and businesses. There should be transparency around these requirements so that Yinhawangka CLH can tailor applications for success. This process may be facilitated by the YAC Implementation Officer;



40 RTIO should facilitate regular workshops for CLH to review RTIO's activities on Yinhawangka Country.

Sustainable Futures

Recommendation #41 is a holistic vision for the future of Yinhawangka Country.

It is recommended that:

41 Yinhawangka CLH develop a 100-year plan which considers the long-term benefits and impacts of mining alongside other possible futures for Yinhawangka Country;

Partnership and Agreement

Recommendations #42 - #47 define the way forward for Yinhawangka CLH and RTIO.

It is recommended that:

42 Yinhawangka CLH and RTIO explore the pros and cons associated with a partnership model as an alternative to existing Agreements;

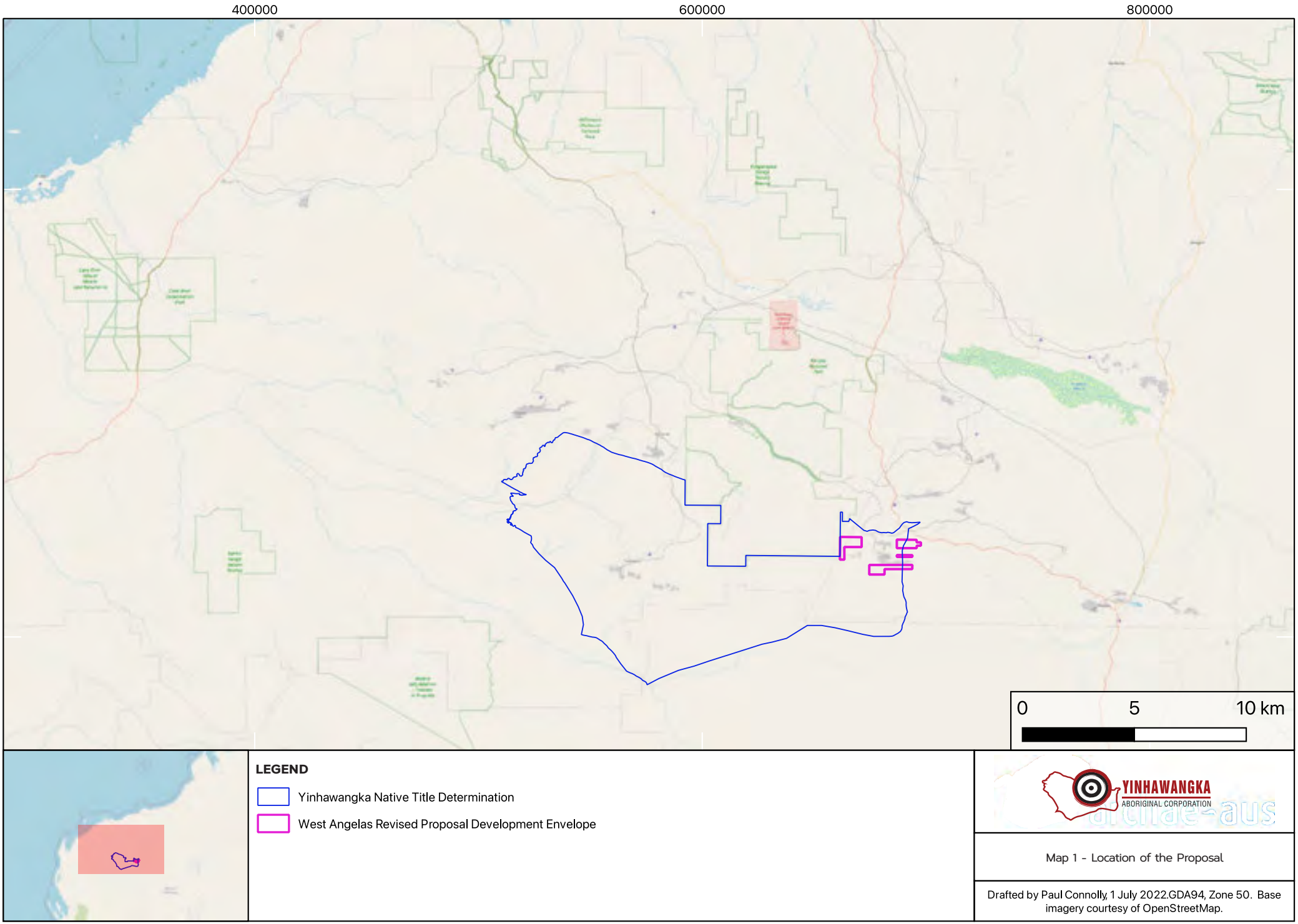
43 Yinhawangka CLH develop standards for RTIO and other proponents and land managers working on Yinhawangka Country. These standards will take into account Regional Standards developed by other Pilbara Traditional Owner groups;

44 Yinhawangka CLH should work with RTIO and other Pilbara Traditional Owner groups to develop joint ventures with existing and future contractors for the purpose of recycling waste products including, but not limited to, copper, steel, batteries, aerosol cans and especially rubber tyres;

45 RTIO should host a workshop to communicate the recommendations from Commonwealth of Australia (2021) A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge to Yinhawangka CLH and how any changes have affected or will affect Yinhawangka People, Culture and Country;

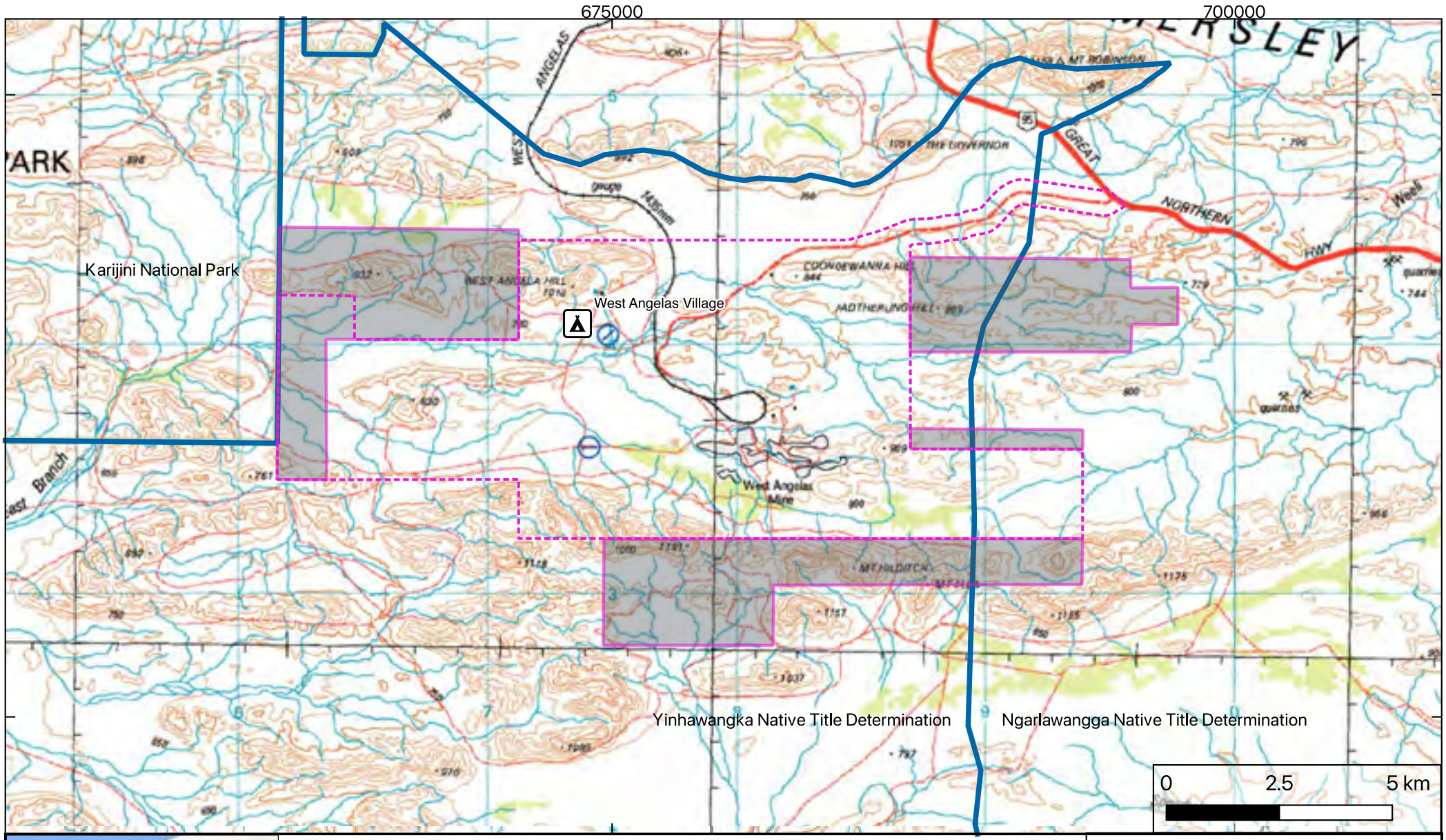
46 The YAC-RTIO CWPA Modernised Agreement is to result in Yinhawangka CLH being given fair compensation for all mining on Yinhawangka Country;

47 Where appropriate, the recommendations and commitments from this SSA should be enshrined in the YAC-RTIO CWPA Modernised Agreement.



Map 1 - Location of the Proposal

Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of OpenStreetMap.





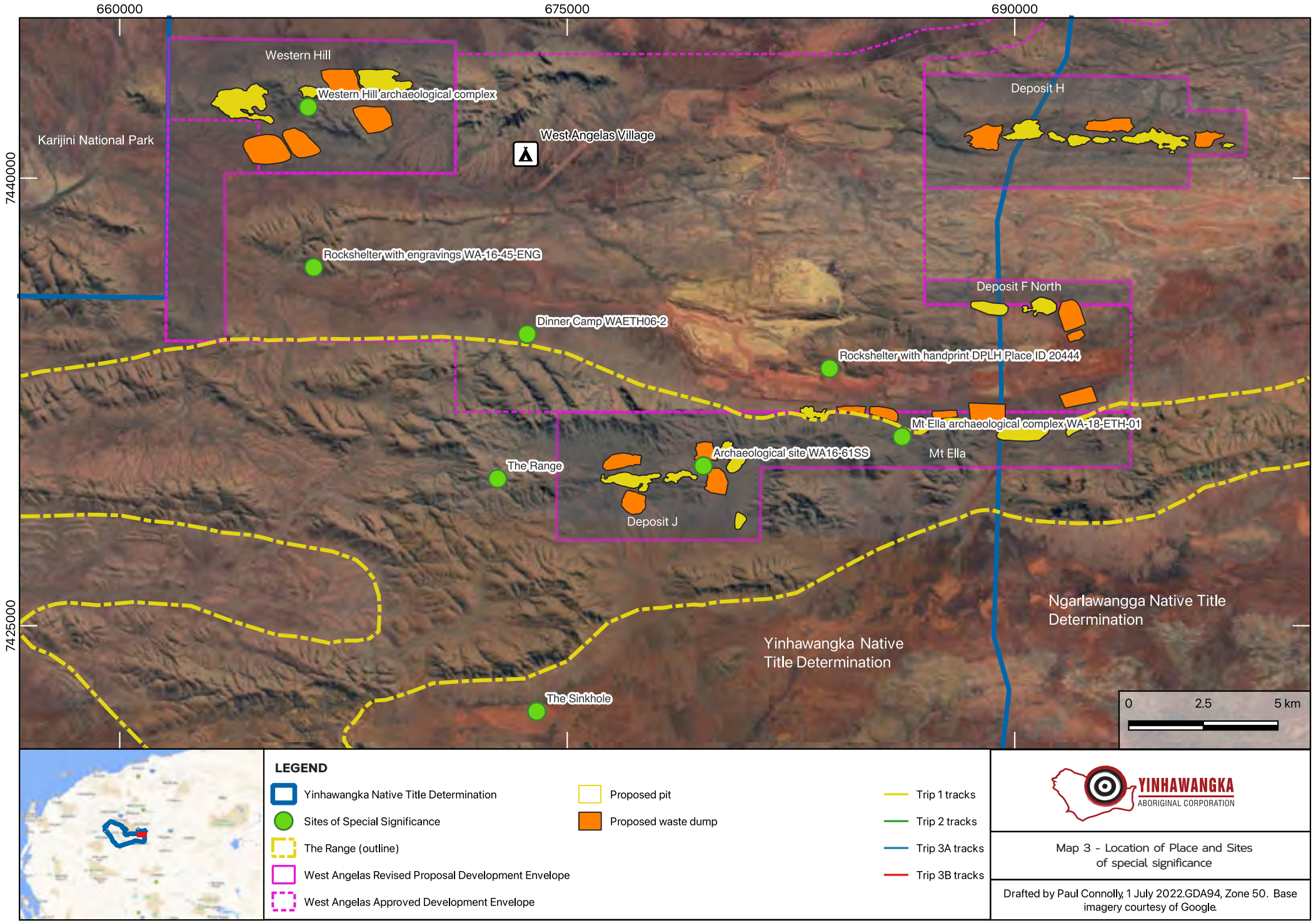
LEGEND

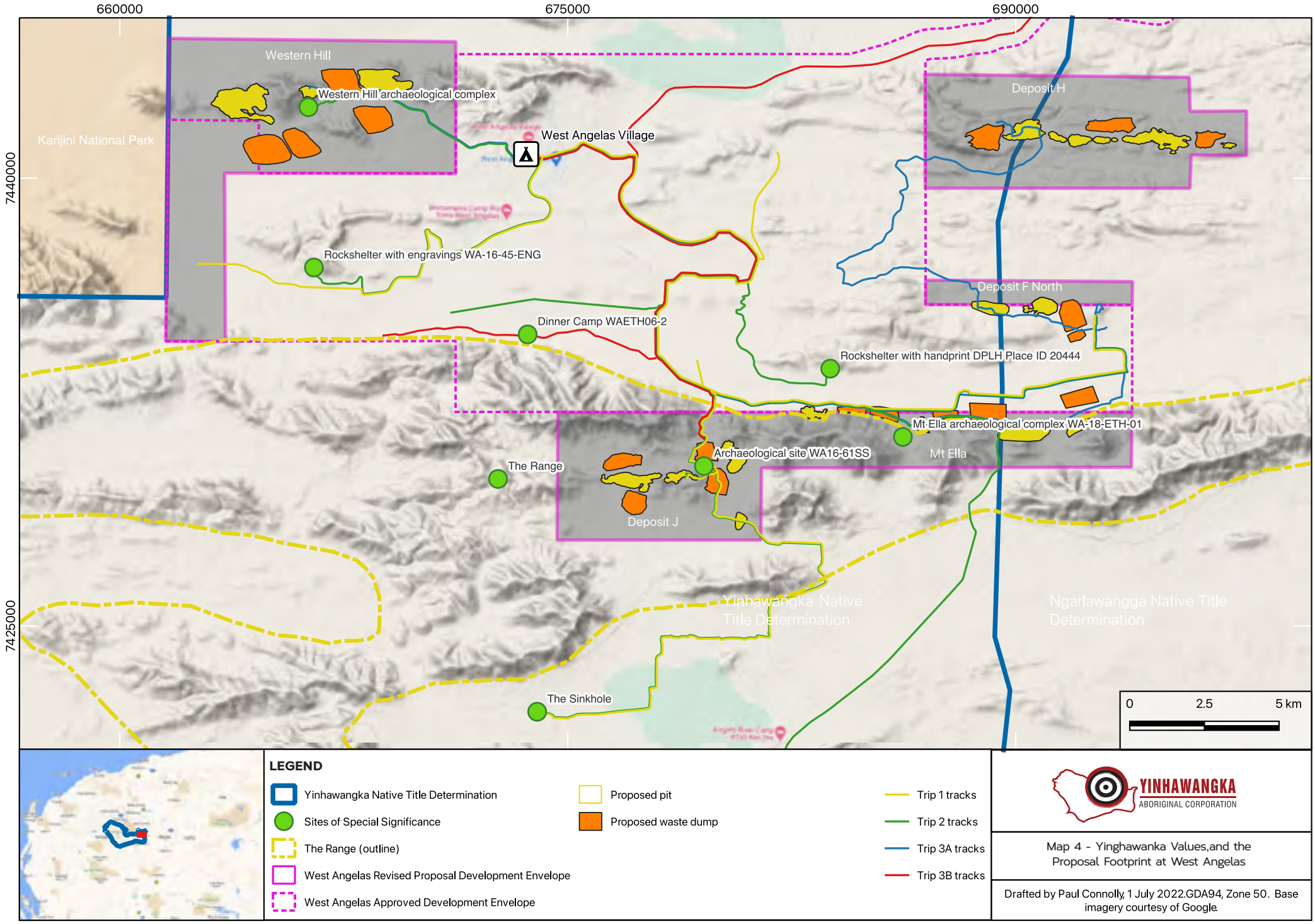
- Yinhawangka Native Title Determination Area
- Development Envelope (Not yet approved) - subject of this Social Surroundings Assessment
- Development Envelope (Approved)

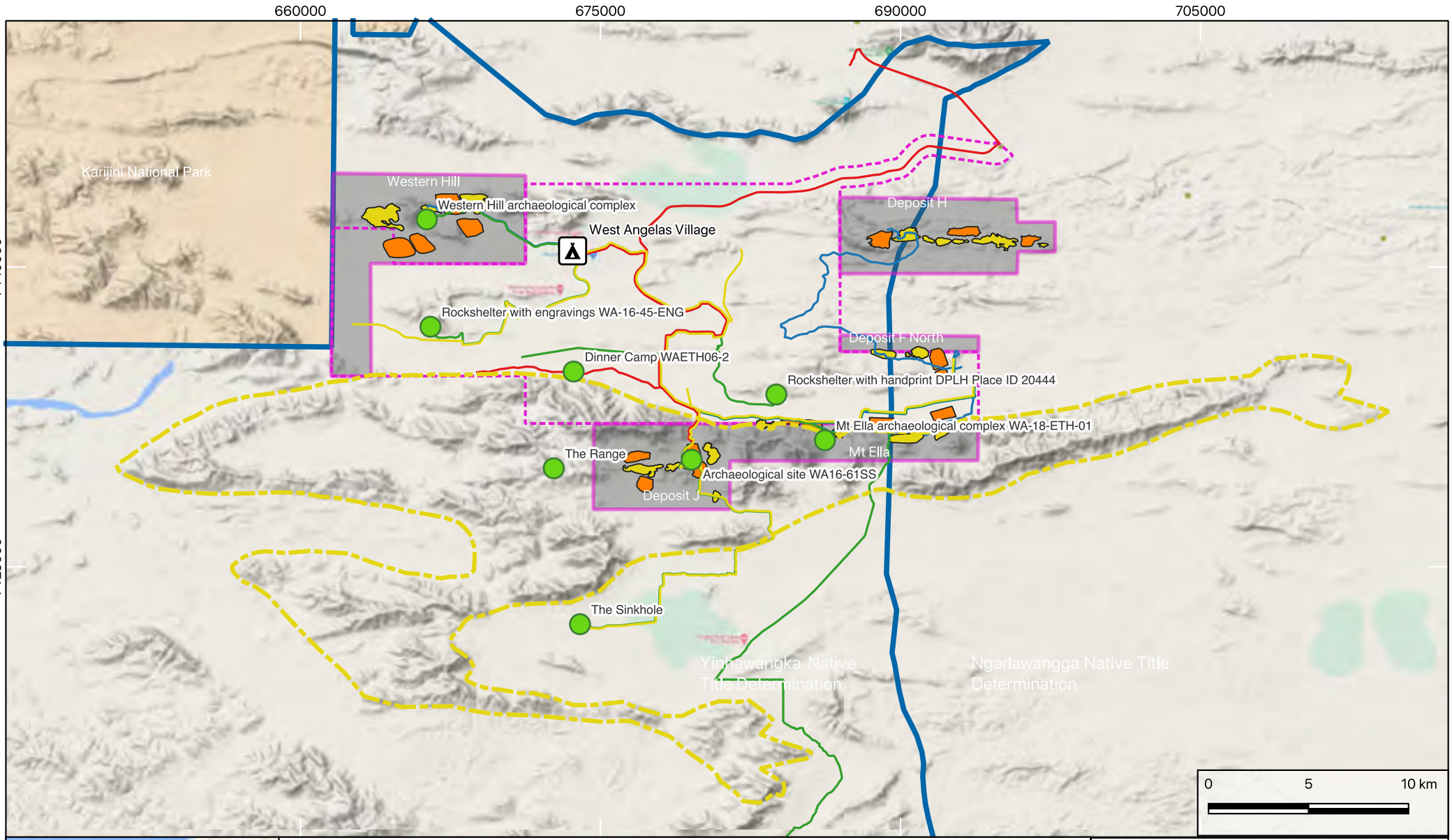
YINHAWANGKA ABORIGINAL CORPORATION

Map 2 - The Development Envelope

Drafted by Paul Connolly, 29 June 2022
GDA94, Zone 50
Base imagery courtesy of AUSLIG


660000
675000
690000
7440000
7425000
Western Hill
Western Hill archaeological complex
Karijini National Park
West Angelas Village
Deposit H
Rockshelter with engravings WA-16-45-ENG
Deposit F North
Dinner Camp WAETH06-2
Rockshelter with handprint DPLH Place ID 20444
Mt Ella archaeological complex WA-18-ETH-01
Mt Ella
Archaeological site WA16-61SS
The Range
Deposit J
Ngarlawangga Native Title Determination
Yinhawangka Native Title Determination
The Sinkhole
0
2.5
5 km
LEGEND
Yinhawangka Native Title Determination
Sites of Special Significance
The Range (outline)
West Angelas Revised Proposal Development Envelope
West Angelas Approved Development Envelope
Proposed pit
Proposed waste dump
Trip 1 tracks
Trip 2 tracks
Trip 3A tracks
Trip 3B tracks
YINHAWANGKA
ABORIGINAL CORPORATION
Map 3 - Location of Place and Sites of special significance
Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of Google.


660000
675000
690000
7440000
7425000
Western Hill
Western Hill archaeological complex
Karijini National Park
West Angelas Village
Deposit H
Rockshelter with engravings WA-16-45-ENG
Deposit F North
Dinner Camp WAETH06-2
Rockshelter with handprint DPLH Place ID 20444
Mt Ella archaeological complex WA-18-ETH-01
Archaeological site WA16-61SS
Mt Ella
The Range
Deposit J
Yinhawangka Native Title Determination
Ngarlawangga Native Title Determination
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0
2.5
5 km
LEGEND
Yinhawangka Native Title Determination
Sites of Special Significance
The Range (outline)
West Angelas Revised Proposal Development Envelope
West Angelas Approved Development Envelope
Proposed pit
Proposed waste dump
Trip 1 tracks
Trip 2 tracks
Trip 3A tracks
Trip 3B tracks
YINHAWANGKA
ABORIGINAL CORPORATION
Map 4 - Yinghawanka Values,and the Proposal Footprint at West Angelas
Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of Google.


660000
675000
690000
705000
7440000
7425000
Karijini National Park
Western Hill
Western Hill archaeological complex
West Angelas Village
Deposit H
Rockshelter with engravings WA-16-45-ENG
Deposit F North
Dinner Camp WAETH06-2
Rockshelter with handprint DPLH Place ID 20444
Mt Ella archaeological complex WA-18-ETH-01
The Range
Mt Ella
Archaeological site WA16-61SS
Deposit J
The Sinkhole
Yinhawangka Native Title Determination
Ngarlawangga Native Title Determination
0
5
10 km
LEGEND
Yinhawangka Native Title Determination
Sites of Special Significance
The Range (outline)
West Angelas Revised Proposal Development Envelope
West Angelas Approved Development Envelope
Proposed pit
Proposed waste dump
Trip 1 tracks
Trip 2 tracks
Trip 3A tracks
Trip 3B tracks
YINHAWANGKA
ABORIGINAL CORPORATION
Map 5 - Yinghawanka Values, including the full extent of the Range & the Proposal Footprint at West Angelas
Drafted by Paul Connolly, 1 July 2022.GDA94, Zone 50. Base imagery courtesy of Google.

SECTION 2 sets out the parameters of the Social Surroundings Assessment (SSA), as defined by the West Angelas (WAN) Revised Proposal (the Proposal) and stipulated by the Scope of Work (SoW). Within this framework, a theoretical and methodological approach was adopted to map the 'more than human' connections which comprise the cultural landscape.

After anthropologist Marilyn Strathern (2018:23), a distinction is introduced between ethnography as subject and ethnography as object (i.e. the circumstances and mechanisms inherent in how knowledge, stories, views and perspectives are reproduced (subject) as distinct from their content (object)). The section goes on to consider the ethical and legal parameters within which the SSA operates. Between the *Native Title Act 1993* (Cth) (NTA) and the Aboriginal Heritage Act 1972 (WA) (AHA), and with the imminent rollout of the *Aboriginal Cultural Heritage Act 2021* (WA) (ACHA), there is an opportunity for SSAs to occupy their own distinct niche. However, this will depend on the active revitalization of social surroundings.

Values are dynamic – they are created and reinforced by the act of reproducing them. It is incumbent upon SSA practitioners to question which values are reproduced, which values are not and why. To do this, we must remain vigilant to any 'baked-in' pre-conceptions inherent within current practices.



The Proposal

This report was commissioned by Yinhawangka Aboriginal Corporation (YAC) for Rio Tinto Iron Ore (RTIO), on behalf of Robe River Mining Company Pty Ltd. The information contained within it will be used by RTIO to address the Social Surroundings Environmental Factor under s. 38 (Part IV) of the Environmental Protection Act 1986 (WA) (EP Act). RTIO are required to undertake the SSA for the Proposal.

Anticipating this requirement, YAC and RTIO co-developed a Scope of Work (SoW) for this SSA in 2020. Archae-aus Pty Ltd (Archae-aus) was subsequently commissioned to conduct the SSA on 8th March 2021. RTIO referred the Proposal to the Environmental Protection Authority (EPA) on 1 April 2021. On 27 April 2021, the EPA published its decision to assess the Proposal and set the level of assessment as Public Environmental Review.

The Proposal is located approximately 100 kilometres northwest of Newman in the Pilbara region of Western Australia (Map 1). It will involve developing new above and below water table iron ore mine pits and associated infrastructure to sustain existing WAN operations (Map 2). The overall WAN Development Envelope will increase by 13,162 hectares (ha) as a result of the Proposal, to a combined total area of 39,862 ha.

Key components of the Proposal include, but are not limited to, the following:

- Development of new above and below water table mine pits at:
  - Western Hill
  - Deposit H
  - Deposit F-North
  - Mt Ella East
  - Deposit J
- Dewatering and surplus dewater management, including use in ore processing, onsite use including storage / discharge to disused mine pits, and discharge to creeklines;
- Mineral waste management;
- Construction of mine infrastructure.

Deposits G and A West are also included in this SSA. They already have Part IV approval under the EP Act in place, hence they are not considered to be part of the Proposal. Nonetheless, they were included at RTIO's request to ensure that any Yinhawangka values not previously identified within or related to these deposits may be effectively managed.

Scope of Work

Minimally, there are three parts to SSAs:

- Recording values;
- Assessing the likely impact of a Proposal on those values;
- Identifying ways to avoid, minimise or mitigate those likely impacts.

As such, it was the objective of this SSA to:

- Inspect the Development Envelope and its surroundings, recording places and values significant to Yinhawangka CLH using a range of media fieldnotes, film, drone footage and photography). This process was facilitated by the provision of male and female anthropologists, an environmental adviser, filmmaker and drone operator;
- Hear about the Proposal from RTIO personnel;
- Consider places and values significant to Yinhawangka CLH in light of the Proposal, and existing and proposed activities at Deposits G and A West;
- Develop recommendations for avoiding, mitigating or managing impacts to places and values in relation to the Proposal;
- Test the methodology developed for the SSA;



YAC would nominate nine Yinhawangka CLH representing the three Yinhawangka Apical Families (Jardunha, Minatungunha and Thurantajinha and Wilga) to participate in the fieldtrips and workshops which comprised the consultation component of the SSA.

Phil Shiner would lead the SSA for RTIO and Dr Anna Fagan would oversee the SSA for YAC. RTIO would provide information and expertise for the fieldtrips and workshops to explain the Proposal. On fieldtrips and in workshops, Archae-aus anthropologists Dirima Cuthbert and Dr Myles Mitchell would record Yinhawangka values, the anticipated impacts of the Proposal on them and any advice to avoid, minimise or mitigate those impacts in fieldnotes, photographs and other instruments (e.g. Global Positioning System).

Archae-aus environmental adviser Paul Connolly would attend the fieldtrips and workshops to provide Yinhawangka CLH with independent advice on the likely environmental impacts of the Proposal and work with Yinhawangka CLH, YAC and RTIO to co-develop the Social, Cultural and Heritage Management Plan (SCHMP). Documentary film maker and drone pilot Michael Bonner would record the fieldtrips using cameras and drones.

Tracey Foster would provide logistical support for Yinhawangka CLH in getting to and from the fieldtrips and workshops, and RTIO would provide logistical support for all parties while participating. YAC CEO Kupa Teao would be kept informed of the SSA's progress and moderate workshops.

The SoW specified desktop research and three fieldtrips. The third fieldtrip at the suggestion of Yinhawangka men was a combined consultation between Yinhawangka and Ngarlawangga, in order to consult with Ngarlawangga men on critical aspects of the Proposal and its impact on their respective and shared values on-Country.

A fourth fieldtrip was added at the suggestion of Yinhawangka and Ngarlawangga men, in order to consult with Martu Men to discuss shared cultural knowledge that was relevant to critical aspects of the Proposal and its impact on their respective and shared values on-Country. Several workshops (a Consolidation Workshop, SCHMP Workshop and four Environmental Review Document (ERD) Workshops) were also added to the program in order to review and refine the SSA recommendations and co-develop the SCHMP within the ERD. Preliminary Advice (PA) containing 47 recommendations was reviewed in turn by Yinhawangka representatives who participated in the SSA, as well as YAC and RTIO. Yinhawangka CLH and YAC did not suggest any changes to the recommendations. RTIO had minor clarifying suggestions to support their efforts to implement the recommendations. No recommendations were substantively altered as a result of these reviews.

We met the abovementioned objectives of the SSA by:

- Mapping significant places in and around the Development Envelope, and the relationships between them.
- Ascertaining the places to which Yinhawangka CLH require access before, during and after the Proposal.
- Discussing the impacts of noise, dust and vibrations on values and places within and adjacent to the Development Envelope, including at significant places.
- Evaluating how the Proposal could affect water quality, volume and flow within and beyond the Development Envelope, and at specific water holes, aquifers and creeks.
- Recording how the Proposal may impact hunting and harvesting, and any implications of this for Yinhawangka CLH health and wellbeing.
- Evaluating how knowledge and stories inscribed in the landscape would be impacted by the Proposal. Yinhawangka oral traditions are complex and dynamic and there was not sufficient time on fieldtrips to record these in detail. However, Yinhawangka CLH revealed which impacts were most detrimental to maintaining their knowledge, cultural responsibilities, and stories.
- Recording management and monitoring actions which Yinhawangka CLH have developed to guide RTIO in respecting, protecting and, in some cases re-activating, Yinhawangka values into the future.

We also created a Table of Actions for recommendations which will not be included in the SCHMP (because they fall outside the EPA's remit) (to be submitted to YAC separately).

" We live from the Dreamtime story.
What our old people told to us.
It is real. Not just a story "

BARNDU



Methodological and Theoretical Framework

A review of published ethnohistory, unpublished Native Title and archaeological and ethnographic heritage survey reports in and around the Proposal's Development Envelope describes rich and enduring deep-time relationships between Yinhawangka People, Culture and Country (e.g. Scambary 2013; Sharp and Thieberger 1992; Stevens et al. 2019, Wilson 1961).

To capture these relationships, the SSA adopted an approach known as 'more than human' (sometimes called 'multispecies') ethnography, which maps and reiterates relationships between 'people, plants, animals, waterholes, weather, rocks and other elements of Country.

The approach supports Deborah Bird Rose's (2011:11) notion of "becoming human," which asserts that we only become who we are in the company of those 'others' (more than humans) with whom we share the cultural landscape.

Ethno = people and graphy = writing, hence ethnography is writing about people. Yet it is more than just descriptive. In recording knowledge, stories, views and perspectives, we are also recording the mechanisms and circumstances through which these knowledge, stories, views and perspectives are shared and reproduced.

Which places are inspected, whose values are recorded and how those values are communicated to meet the legislation are all heuristic tools for the type of social surroundings that are reproduced. It follows, then, that ethnography can be considered both subject and object at the same time (Strathern 2018:23). The concept is supported by Laura Nader's (2011, p. 211) positioning of ethnography as a "theory of description".

These entanglements between process and outputs, methods and theory and subject and object are complex and the challenges in bringing a body of information to meet the legislation with honesty and integrity cannot be understated.

Dust exemplifies such an entanglement. Although it is a well-known mining impact which has implications for health and other factors, there are no recommendations in this SSA to manage dust. Yinhawangka representatives on Trip 1 pointed out that suppressing dust associated with the Proposal would mean using more water – a management action which they were not prepared to recommend. They would prefer to be kept informed of dust levels through RTIO's dust monitoring regime, speculating that new practices to address excessive dust other than through water suppression may become known in the future.

In this way, dust and water are entangled. Dust management is important to Yinhawangka CLH, but this value is 'hidden' by its connection to water. Even while it is acknowledged that new connections may emerge between dust and 'others' in the future. In bringing knowledge, stories, views and perspectives to meet the legislation, it is as important to acknowledge absence as it is to acknowledge presence.

This is achievable using the more than human approach because it privileges a relational perspective over the dominant Western perspective – the latter typically placing process and outputs, methods and theory and subject and object (not to mention nature and culture, human and nonhuman etc) into binary relationships (Redfield 1953, Narvaez, 2016; Te Ahukaramu, 2002).

Legal and Ethical Frameworks

Social Surroundings Environmental Factor

The Social Surroundings Environmental Factor under s.38 (Part IV) of the Environmental Protection Act 1986 (WA) (EP Act) defines Environment as:

"... living things, their physical, biological and social surroundings, and interactions between all of these ..."

[4]Yinhawangka representatives on Trip 1 identified dust management among several datasets that RTIO commonly shared with Yinhawangka CLH through the HEC, alongside blasting activities, water quality and quantity etc. They anticipated that RTIO would continue to share this and any other heritage and environmental monitoring information relevant to management of Yinhawangka Country.

The EP Act further defines social surroundings:

"In the case of humans, the reference to social surroundings in the definition of environment in subsection (1), is a reference to aesthetic, cultural, economic and other social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings."

The EPA's (2016) Environmental Factor Guideline: Social Surroundings, states that the environmental objective for the factor Social Surroundings is:

"To protect social surroundings from significant harm."

SSAs are relatively new to Yinhawangka People and Yinhawangka Country. This SSA was undertaken in tandem with another SSA on Yinhawangka Country for RTIO's Greater Paraburdoo Operations (GPO) and followed similar processes with similar outputs (Trip Reports, PA, Full Report, SCHMP). With plans for future mines and major mine expansions, there are likely to be many more SSAs conducted on Yinhawangka Country. SSAs are also being undertaken by neighbouring Traditional Owner groups working with other heritage consultants and proponents on their Countries.

It is anticipated that CLH/Traditional Owners, consultants, proponents, Aboriginal Corporations/Prescribed Body Corporates, the EPA and the relevant professional societies (the Anthropological Society of Western Australia and the Australian Association of Consulting Archaeologists Inc), will apply the learnings from this first round of SSAs to future SSAs in the Pilbara, noting that the context and circumstances of each SSA will vary.

Native Title Act 1993 (NTA)

The Commonwealth Native Title Act 1993 (NTA) recognises Aboriginal and Torres Strait Islander peoples' traditional rights and interests in land and waters. Under the NTA, native title claimants may apply to the Federal Court to have their native title recognised by Australian law.

The NTA was extensively amended in 1998, with further amendments occurring in 2007, and again in 2009. Under the Future Act provision, native title holders and registered native title claimants are entitled to certain procedural rights, including a right to be notified of, object to, comment or be consulted on or negotiate with i.e. the same rights as an ordinary title holder (freeholder). The Yinhawangka Native Title Claim was determined in 2017 (WAD216/2010, WAD340/2010),

Free, Prior and Informed Consent (FPIC)

YAC, RTIO and Archae-aus provided Yinhawangka CLH with accessible, relevant and timely information about the Proposal wherever possible, to facilitate informed decision-making in line with the principles of free prior and informed consent (FPIC) as expressed in the –United Nations Declaration on the Rights of Indigenous People Article 32[5].

Aboriginal Heritage Act 1972 (AHA) and Aboriginal Cultural Heritage Act 2021 (ACHA)

In 2021, the Aboriginal Cultural Heritage Act 2021 (ACHA) was passed by Parliament. It will come into effect mid-2023. This will see negotiation and agreement-making placed firmly in the hands of Yinhawangka CLH. Yet there have been persistent concerns from those working in heritage and land management, including Traditional Owners, Aboriginal Corporations/Prescribed Body Corporates, archaeologists and anthropologists that there will not be sufficient resourcing to adequately manage this negotiation and agreement-making imperative.

Negotiation and agreement-making that satisfies the requirements of FPIC takes time. Yet resource industry timelines, which tend to be set by business or legislative timelines, are tight. For Traditional Owners, cultural obligations and responsibilities must be met before or alongside other business – a challenge within these tight timelines that sits uneasily with FPIC.

While the matter of resourcing remains unknown, the ACHA may, in principal, fit effectively with SSAs. The ability to negotiate with proponents and come to agreement on the management of heritage may improve protection for cultural landscapes and intangible heritage.

The current requirement for a proponent to apply to the Minister for Aboriginal Affairs under s18 of the AHA to 'use' (usually destroy) a site is often not practical for managing values and places which do not have discrete boundaries.

Such sites are often not protected under the AHA. Important values and places identified as a result of SSAs may benefit from the development of Cultural Heritage Management Plans (CHMPs) under the ACHA.

[5]UNDRIP Article 32:
1. Indigenous peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources.

2. States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources (emphasis added).

3. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact.
[6]Aboriginal Cultural Heritage Act co-design submissions: https://consultation.dplh.wa.gov.au/heritage/acha-co-design-submissions-form/consultation/published_select_respondent accessed 10/8/2022.

Best practice principles

In addition to the above frameworks, Archae-aus also follow best practice principles for working with Aboriginal People, informed by:

- The Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Code of Ethics for Aboriginal and Torres Strait Islander Research (AIATSIS 2020);
- Terri Janke and Maiko Sentina, Indigenous Knowledge: Issues for Protection and Management, IP Australia (Commonwealth of Australia 2018);
- A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge (Commonwealth of Australia 2021) and;
- The Australian Anthropological Society.



SECTION 3 provides context for the SSA through published and unpublished historical accounts (e.g. Radcliffe Brown 1913; Stanner 1987), and research conducted under the NTA and AHA (e.g. Stevens 2011; Williams 2011). In recent years, Yinhawangka CLH have also commissioned their own research to guide management of Yinhawangka Country (e.g. Yinhawangka Aboriginal Corporation 2016, 2017).

These sources describe deep time, historical and future connections, responsibilities and aspirations for Yinhawangka People, Culture and Country. Country is the connection to the past through the Ancestors, and to the future through the young people who are yet to learn the stories and meaning associated with it.

It is up to practitioners to find a way for SSAs to hold a meaningful place within this context. The only way to find this niche is by doing them. By knowing the past, present and possible future contexts in which this 'doing' takes place, we can begin to consider what it is that SSAs may offer and how they can be used effectively to protect social surroundings from significant harm.

Ethnohistory

Yinhawangka Country is centred around the Ashburton River system encompassing Angelo River, Ashburton River, Hardey River, Kunderong Range, Mount Vernon Station, Rocklea Station and Turee Creek (Scambary 2013; Sharp and Thieberger 1992; Thieberger 1993; Wilson 1980). They share boundaries and close cultural, linguistic and familial ties with neighbouring Banjima, Nyiyaparli, Ngarlawangga, and Eastern Guruma Peoples (Scambary 2013). For Yinhawangka People, as for all Traditional Owners throughout Australia, connection to Country is fundamental to culture, health, and identity.

Stevens (2019: 7) notes that the elements of Country, from trees to rocks to water to weather to Yinhawangka CLH themselves (and all of the relationships between them enacted across space and through time) were – and still are - created by ontological beings. These beings are generally conceived as Ancestors who remain extant and active in Country today. In this way, Country is in a constant process of re-creation. As Stanner (1987: 225) observed: "One cannot 'fix' The Dreaming in time: it was, and is, everywhen".

The Ancestors continue to bring all things into existence and to bestow Country, with all of its interconnected elements, upon people and upon all those others (living and non-living) who share in it.

Early ethnographic research in the Pilbara affirms the importance of waterways. The earliest work was conducted with the Yindjibarndi People whose Country is situated on the Tablelands around Millstream and the Harding River (Withnell 1901) and the Kariyarra people around the Port Hedland area (Radcliffe Brown 1913). Between 1904 and 1912, Bates (1985) undertook a survey of Western Australian Indigenous people, which included work with the Inyawonga.

Bates (nd Series 12, Section II, 1: 36) recorded named places and pools, including "...Kurunbida, Jindibirila, Mambulula and Jardungunna near Angelo River."

From the 1960s, linguists began conducting research with Pilbara Aboriginal groups, including von Brandenstein (1967, 1982); O'Grady (1960); Dench (1980, 1995). Simultaneously, the anthropologist Robert Tonkinson (1966, 1974) was conducting extensive research with Martu and Nyiyaparli people at Jigalong.

Further anthropological research was conducted by Kingsley Palmer (1975, 1977, 1983) and John Wilson (1961, 1980). More recently, a collection of oral history material specific to the Central Pilbara titled Karijini Mirli Mirli (Olive 1997) was produced by the Karijini Aboriginal Corporation. Radcliffe-Brown's (1913: 146) research with the Kariyarra found that Pilbara language groups were divided into exogamous patrilineal local clans with territorial and totemic associations.

Descent may be patrilineal and/or matrilineal but there may be considerable flexibility (now and in the past) as to exactly which genetic line an individual chooses to identify with (e.g. the father's line; the mother's line; or both). The extended family group has always been important. Wilson (1961:10) observes:

"Rarely, if ever, did the tribes, individually or collectively, act as a corporate unit even though the members acknowledged a cultural affinity".

Identity within a language group is based on genealogy, now formalised through Native Title Determination. The Yinhawangka Native Title claim is based on genealogical descent from three apical ancestors Minatangunha, Jarndunha, and Thurantajinha and Wilga (T & W).

Native Title Determination

The Yinhawangka Native Title determination was finalised in the Federal Court on 18 July 2017, granting the Yinhawangka People Native Title over the 10,150 square kilometre determination area (WAD 340 of 2010 and WAD 216 of 2010 in the Federal Court; National Native Title Tribunal 2021). Yinhawangka Aboriginal Corporation (YAC) is the Registered Native Title Prescribed Body Corporate representing the interests of the Yinhawangka Native Title holders.

Much of the information recorded to support claims is not available in the public domain, and it is possible that some information that might inform this SSA cannot be accessed. However, a history of the native title claim itself illustrates Yinhawangka People's connection to, and knowledge of, Country (Jones v Western Australia 2017). The Yinhawangka Native Title holders' Connection Material included a Connection Report (Sackett 2010), genealogies for the descendants of Jardunha, Minatangunha and Thurantajinha (Sackett and Norris 2011); and a Yinhawangka Connection DVD (C. McDonald 2011).

In 2016, Yinhawangka elders made numerous witness statements to the Federal Court. The various Connection Material, submissions and statements were deemed by the Court "to evidence the Yinhawangka People's maintenance of connection according to traditional laws and customs in the Determination Area" (Jones v Western Australia 2017). Yinhawangka People affirmed their belief that ancestral beings created the features of the landscape and laid down the laws and customs when the world was soft. These laws and customs connect Yinhawangka People to their Country today.

According to the Federal Court, the joint submissions identified the continuity of Yinhawangka traditional laws and customs, the recognition of the traditional Country of the Yinhawangka People, and the descent of contemporary Yinhawangka People from recognised Yinhawangka Ancestors.



"Water is the life blood of Yinhawangka Country. The main artery is Turee Creek. All veins that flow into Turee Creek define Yinhawangka Country"

BRENDON COOK

Membership under Native Title requires descent from a Yinhawangka Ancestor, self-identification as a Yinhawangka person, and acceptance of that identity by other members of the Yinhawangka People in accordance with their traditional laws and customs. It follows that Yinhawangka People consulted for the present SSA are the appropriate people to speak for the Development Envelope, and in fact many of the older Yinhawangka people who were consulted for the present SSA were those who provided Witness Statements as cultural experts to the Federal Court in support of the Yinhawangka Determination (Jones v Western Australia, 2017). The determination also noted that traditional decision-making is consensual, although not necessarily unanimous.

The Proposal also covers the Ngarlawangga Native Title Determination Area. RTIO has commissioned a separate SSA with Ngarlawangga Traditional Owners to identify their values and to understand how the Proposal may impact them.

Fieldtrip three had a component where Yinhawangka and Ngarlawangga men came together to discuss aspects of the Proposal which have implications for both Native Title Determination Areas.

"Put the *%$# back in the hole"

GAIL COX

There was also an Yinhawangka only component of field trip three with men and women.

Fieldtrip four brought Yinhawangka, Ngarlawangga and Martu men together to discuss shared cultural knowledge that was relevant to critical aspects of the Proposal and its impact on their respective and shared values on-Country.

There will be a requirement for further discussion between the groups to agree on the management of any shared values.

Heritage Surveys

Heritage surveys, while usually directed at prescribed questions about the use of specific land areas, provide some insights into Yinhawangka values and aspirations for the Development Envelope, particularly as they have consistently involved the Yinhawangka People, resulting in confirmation of some of these values and aspirations on many occasions.

The main legislation governing heritage assessment in Western Australia is the AHA, which emphasises the identification and protection of sites, or places, rather than cultural landscapes. Hence, it does not fully reflect the perspective of Country held by Yinhawangka representatives who participated in the SSA.

Nevertheless, it does provide for the recognition of tangible values, such as objects and archaeological features, and intangible values, such as traditions, practices, and beliefs associated with certain places or objects.

Most surveys at WAN have been archaeological surveys, which have led to the identification of hundreds of artefact scatters, as well as rockshelters; quarries; and modified (scarred) trees (Jackson and Ibbitson 2008; Gavin Jackson 2013; Stevens 2011). Some scatters may indicate former habitation or "public" areas, while others may have been associated with sacred or private activities. Ethnographic surveys at WAN have confirmed the importance of intangible values and places.

Common themes on ethnographic surveys include management of archaeological sites in the path of mining proposals, traditional ecological plant knowledge for food and medicines and significant spiritual places (Williams 2022; Stevens 2011; Venz and Grove 2003). Stevens et al's (2019) ethnobotanical survey report reveals an extensive plant knowledge held by Yinhawangka women. Yinhawangka men have recently identified sites associated with men's business (Trip 4, closed report (2022)).

Yinhawangka Vision for the Future

Some of the most important Yinhawangka visions for the future are documented in YAC's Healthy Country Plan (HCP; Yinhawangka Aboriginal Corporation, 2016), and to some extent more recent heritage reports. These documents largely address aspirations for Country. The plan, developed with Yinhawangka CLH and YAC, identifies six main management targets for healthy Country:

- Yinda (Important places: water)
- Plants
- Animals
- Cultural sites
- Culture, Lore, Customs
- People on Country



The Plan states that all six targets are largely achieved in land that is already in a protection regime, for example Karijini National Park (Yinhawangka Aboriginal Corporation, 2016). The targets are partly met on unallocated Crown land and, less so, on some pastoral stations.

They are not met, or require serious remediation, on mine-sites and on Rocklea Station. These statements indicate mining and some forms of pastoralism to be serious and on-going threats to Yinhawangka Country as a whole. The specific threats to the targets are multiple and overlapping.

They include lack of effective governance; lack of management capacity; people living away from Country; climate change; roads and railways cutting through Country; overgrazing; inappropriate recreation activities in some places; unresolved Native Title; restricted access; loss of cultural knowledge; mine dewatering and bore fields; invasive plants, herbivores, and carnivores; wrong fire regimes; various social issues; and mining as a whole.

Conversations with YAC staff and recent heritage reports reveal many of these issues continue to be seen as problems by Yinhawangka People.



However, the HCP (Yinhawangka Aboriginal Corporation, 2016) also demonstrates Yinhawangka are keenly aware of local solutions to these threats even if the threats are largely the result of external historical and on-going economic and political forces. Six strategies for solving these problems are identified, as follows:

- Developing capacity in governance and native title
- Managing relationships and partnerships through Indigenous Land Use Agreements (ILUAs) and joint management agreements
- Developing capacity in land management through a Ranger program
- A cultural heritage program engaging Yinhawangka youth
- Managing invasive species
- A burning program to achieve less harmful fires and improve natural and cultural values.The plan acknowledges that these strategies would require developing and extending the capacities of YAC and Yinhawangka CLH into environmental and heritage protection through a culturally appropriate management structure. This work is on-going.





[6]Yinhawangka CLH advised during the SSA that Yinda means "important place". It may or may not be associated with water. Hence, we have not used the term Yinda in association with water throughout this report, except when it is stated in previous documents or when CLH have identified a Yinda, not just water.

The Yinhawangka Strategic Plan (Yinhawangka Aboriginal Corporation, 2017) also indicates priorities for YAC in the areas of education, land, culture, health, economic development, and governance. These priorities align with the HCP and confirm overarching Yinhawangka aspirations to manage their Country.

" The reality is that once you start active mining in this area, we can't exercise our Native Title rights. We can't come in and enjoy this area "

DARREN INJIE

SECTION 4 sets out the results of the SSA, as recorded on fieldtrips and refined at the Consolidation and SCHMP Workshops. These results are reflected in Yinhawangka representatives' responses to the Proposal and five themes which emerged during consultations.

Nested within these are Yinhawangka values, the anticipated impacts to them and the management actions to protect them in light of the Proposal.

Consultations

Fieldtrips

1. 22nd – 27th March 2021: Trip Report 1;
2. 25th – 28th May 2021: Trip Report 2;
3. 10th – 14th November 2021: Trip Report 3;
4. 1st March 2022: Trip Report 4.

Workshops

- Consolidation Workshop (CW) 21st June 2022: Preliminary Advice;
- Social, Cultural and Heritage Management Plan Workshop (SCHMPW): 22nd June 2022;
- ERD Workshops 1 – 4: September, October and November 2022 and April 2023.

Response to Proposal

Yinhawangka CLH conditionally support the Proposal. The SSA identified the parts of the Proposal that may proceed and the parts that may not (SECTION 5, Recommendations #1 - #8). The range immediately to the south of the existing WAN operations is critically important to Yinhawangka CLH for its spiritual values.

As a result, Yinhawangka CLH do not support the Proposal at Deposit J (Map 2). The Proposal may proceed (with conditions) at other locations.

Themes

The remaining recommendations (#9 - #47) are ordered through the following five themes:

- Protection of Country
- Connection to Country
- Caring for Country
- Sustainable futures
- Partnership and agreement

Protection of Country

This theme recommends a range of on-ground and high level actions to guide RTIO in protecting Country in and around the Development Envelope, before, during and after the Proposal. These recommendations (#9 - #19) are specific to the Proposal.

Even those which do not appear to be directly related to the Proposal e.g. restoring native bee populations (Recommendation #18) were shared by Yinhawangka CLH as a mitigation measure to offset the impacts of the Proposal.

Connection to Country

Recommendations #20 - #27 identify the places to which Yinhawangka CLH require access in and around the Development Envelope, and how knowledge of places is to be managed and shared between Yinhawangka CLH and others. The following places have been identified for access (Maps 3, 4, 5):

a. The Range to the south of existing WAN mining activities
b. Western Hill Site Complex
c. Archaeological Site (RTIO database: WA-16-61SS [No DPLH Place ID])
d. Mt Ella Site Complex
e. Rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444])
f. Rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID])
g. The Sinkhole (RTIO database: Yinta)

Access to these places will be managed under the West Angelas Land Access Protocol. This protocol will determine the conditions of access.

Yinhawangka representatives who participated in the SSA did not identify any other places for access within the Development Envelope.

However, given the dominance of archaeological surveys in reproducing knowledge at WAN, there should be ongoing conversation between RTIO and YAC regarding any as yet unidentified places to which CLH may require access in the future.

Caring for Country

Recommendations #28 - #40 set out processes for managing Yinhawangka Country in and around the Development Envelope. Business, education and capacity building projects associated with and beyond the Proposal have been grouped within this theme. These recommendations are not necessarily associated with the Proposal and may be implemented separately. Some may be appropriate for implementation at other RTIO operations and proposals.

Sustainable futures

Recommendation #41 is a holistic vision for the future of Yinhawangka Country. This would see development of a 100-year plan to consider the long-term benefits and impacts of mining alongside other possible futures for Yinhawangka Country.

Partnership and agreement

Recommendations #42 - #47 define the way forward for Yinhawangka CLH and RTIO. A genuine partnership approach to mine planning, management, and closure was a priority for Yinhawangka CLH.



SECTION 5 combines the results of desktop research, fieldtrips and workshops to consider the SSA's effectiveness in protecting social surroundings from significant harm in relation to the Proposal. The section considers the concept of value, specifically the relationship between present and absent values. There is now a precedent for compensating loss of value through the 2016 Griffiths Case (Timber Creek). The section goes on to consider the challenges in reflecting diversity within the SSA processes and outputs. A possible way forward is revealed in the form of a regenerative approach.

Towards the end of the section are some high level principles to protect social surroundings from significant harm. The section ends by arguing for the retention of complexity in bringing Yinhawangka CLH knowledge, stories, views and perspectives to bear on the Proposal.

Values

Values are at the centre of SSAs. A sophisticated anthropological analysis will qualitatively assess them, not just in terms of their presence (or absence), but in relation to each other. The more than human approach attempts this by mapping connections between values. In this SSA, connections between certain archaeological sites, songlines and stories, plant foods, plant medicines and traditional ecological knowledge were all recorded. Of particular note were the numerous archaeological surveys conducted at WAN which have, over decades, brought Yinhawangka CLH to the area for the purpose of identifying and assessing heritage sites.

Many of the Yinhawangka representatives on the SSA had participated in such surveys, and others followed the results through meetings, reports and word-of-mouth. While not the focus of SSAs, archaeology is important to Yinhawangka CLH and this SSA revealed archaeological surveys to be a dominant form of knowledge production in the Development Envelope and its surroundings.

Archaeological survey teams on Yinhawangka Country usually consist of archaeologists guided by and working together with Yinhawangka CLH. While archaeologists may be male or female, Yinhawangka representatives on the surveys are male. Due to the often strenuous nature of archaeological fieldwork, the teams are skewed to a younger demographic, although there may be one or more Senior Elders present.

The holder of knowledge tends to be the archaeologist. While knowledge has been shared with Traditional Owners across the Pilbara over decades, the technology for identifying and recording artefacts and sites, innovations in the discipline, site records etc. are all held by archaeologists, not Traditional Owners (although it is acknowledged that there are many Aboriginal archaeologists in Australia). All of these circumstances reproduce certain values which manifest in SSAs.

For example, on fieldtrip two, there was a preference from one Yinhawangka representative to visit archaeological sites (while women waited at the vehicles). This served to reproduce the value of archaeology and reduced the window of opportunity to consider other values which may have otherwise been considered during that fieldtrip.

All values are important - archaeological values among them. However, limited Yinhawangka engagement with the Development Envelope and its surroundings for reasons other than archaeological surveys has created the conditions for these values to dominate in certain circumstances.

One important consideration for SSAs is how to address and respond to diverse views and perspectives among Yinhawangka CLH on fieldtrips and in workshops. Yinhawangka CLH are a community of individuals, who share a common cultural heritage, and common ancestral heritage. While this shared heritage generally creates strong cohesion in terms of values and what constitutes an impact and the appropriate way to mitigate or avoid it, there are differing views between individuals on some issues.

By their very nature, SSAs attempt to reach a certain degree of consensus in managing Country. We need to ensure that diversity is not flattened in the process of meeting the legislation. The Yinhawangka Determination (Jones v Western Australia, 2017) suggests that traditional decision-making is consensual, although not necessarily unanimous.

Anthropologists working on SSAs may learn more about addressing and responding to diverse views and perspectives from the experience of those working in Native Title.

Absent in and around the Development Envelope were connections to places of birth and death of known individuals, ceremonial and social gathering places, and places supporting day-to-day activities such as hunting. With the exception of a 'dinner camp' (which requires further assessment and will not be impacted by the Proposal) there were no values or places reported from 'living memory' i.e. the memory of those Yinhawangka representatives who participated in the fieldtrips.

Information shared tended to be from the deep past (reproduced from archaeological surveys) or reflected knowledge of or aspirations for Country of a general nature found at, or suggested for, other places on Yinhawangka Country.

A Yinhawangka representative on Trip 2 explained that the absence of living memory values was due to the deep water table in and around the Development Envelope. In the C.19th, pastoral stations were established at locations where the water table was close to the ground surface so that the station could be serviced by a water supply which could be accessed by the technology of the time. Yinhawangka CLH lived and worked at the stations and many of the representatives who participated in the SSA grew up at or spent considerable time in their youth at such stations. However, with no stations established in or around the Development Envelope, certain values (which were common at GPO) were absent at WAN.

An absence of values may point to a loss. The impact of loss is acknowledged by the Griffiths (Timber Creek) Case, which ordered compensation be paid to Ngaliwurru and Nungali peoples by the Northern Territory and Commonwealth of Australia for the extinguishment of native title rights and interests under the Native Title Act 1993 (Cth). In August 2016, the Federal Court awarded approximately $3.3 million compensation to the Ngaliwurru and Nungali peoples, including spiritual loss ($1.3 million), economic loss (calculated at eighty per cent of the freehold value of the affected land) and simple interest on the sum awarded for economic loss.

The case was the first time that loss of Traditional Owner values had been allocated a dollar value (Australian Institute of Aboriginal and Torres Strait Islander Studies: https://aiatsis.gov.au/explore/timber-creek-compensation-case.

Values across Yinhawangka Country are not static: they have always been in varying states of reproduction, with the relationships between them subject to re-definition. Yinhawangka CLH have used this SSA to protect what is of value to them now as much as they possibly can in advance of the Proposal.

We did not investigate the responsibility of SSAs in protecting certain social surroundings from the past. For example, we do not know when Yinhawangka CLH's ancestors stopped hunting in the Development Envelope and its surroundings, though we have to assume from the prevalence of human occupation sites in the area that hunting took place there.

If there is no living memory of hunting, is it a loss to social surroundings when that value no longer exists? What of the possible need to protect future values which have not yet emerged? Given the right circumstances, hunting may re-emerge as a value at the place. To what extent are social surroundings shaped by the act of doing SSAs? Such questions underscore the need to support Yinhawangka CLH to re-connect with Country.

When we strengthen connections lying latent in the cultural landscape, we strengthen social surroundings. If we want social surroundings to thrive, we cannot simply protect them from harm – we must regenerate them.

A Regenerative Approach

Rose (2011: 62) asserts that, "Whether planned or accidental, extinctions result from actions that refuse to recognize connectivity, mutuality, and the flourishing of beings and relationships." By this logic, any efforts to actively reproduce values (and the connections between them) will be beneficial to People, Culture and Country.

This aligns with a regenerative approach, which seeks to create the optimum conditions for life to thrive, by focusing on improving the connections between elements and the systems of which they are a part.

The approach is commonly adopted in agriculture, but an emerging body of research is also coalescing around regenerative thinking across all sectors and industries, including business, design and social policy (e.g. Mang and Reed 2012; Camrass 2020; Hahn and Tampe 2021).

" Everyone needs to know what we are losing "

JARED GRABENHOFER



The recently-published Victorian Traditional Owner Cultural Landscapes Strategy (Federation of Victorian Traditional Owner Corporations, Parks Victoria and Department of Environment, Land, Water and Planning with Traditional Owners 2021), which aims to embed Traditional Owner management of Country at a state level, is taking a regenerative approach with the ultimate objective of 'Restoring the Knowledge System'.

This should avoid or reduce 'silo-ing' of programs and departments as Traditional knowledge is shared and adopted to manage Country. While the Strategy is applied in a different context to this SSA (culturally, geographically, economically and politically), it will be important to follow developments. Yinhawangka CLH are determined to "get on the front foot" in managing Country, as reflected in recommendations for genuine partnerships between Yinhawangka CLH and RTIO, other proponents and land managers.

As for the Victorian situation, work must continue to restore the knowledge system and the mechanisms through which knowledge is reproduced for such partnerships to be fully effective.

Terms of Reference

This SSA was guided by Yinhawangka CLH and informed by the frameworks outlined in SECTION 2, the context in SECTION 3 and the processes and outputs of fieldtrips and workshops in SECTION 4. The approach was necessarily iterative and dynamic. As such, we would not advocate for a prescribed way to conduct SSAs. However, three principles, revealed through this SSA, will protect social surroundings from significant harm. These preliminary Terms of Reference may be of assistance in conducting future SSAs on Yinhawangka Country:

1. Values cannot simply be preserved by not impacting them - they are dynamic connections between People, Culture and Country which must be continually regenerated.
2. Through the act of doing SSAs, we are creating, developing, shaping and reproducing social surroundings.
3. A given point in time is just a 'snapshot' of a place's social surroundings. A meaningful assessment will take a long-term perspective, from the deep past to the present and multiple possible futures.

> "In the case of humans, the reference to social surroundings in the definition of environment in subsection (1), is a reference to aesthetic, cultural, economic and other social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings." EP Act 1986 (WA).

Social surroundings are values entangled in complex, dynamic ways. New connections are constantly forming, just as old ones are re-forming and others are forgotten. It is incumbent on SSA practitioners to find ways to regenerate these values. There can be no real end to a given SSA because what is recorded is a moment in time and circumstance. Social surroundings will have changed (perhaps not markedly, but changed nonetheless) by the next SSA at WAN, as they should.

Hence SSAs must be considered 'working documents' that grow and adapt over time. As process and outputs, methods and theory and subject and object, they should strive to record and extend the opportunities for complexity, diversity and nuance, while seeking consensus in bringing Yinhawangka CLH knowledge, stories, views and perspectives to bear on a Proposal. In so doing, SSAs will reproduce social surroundings in their own way, taking their place as an important framework within the cultural landscape.



As a result of the SSA, the following 47 recommendations have been endorsed by Yinhawangka CLH, YAC and RTIO. Some of these recommendations will be used by RTIO to address the Environmental Protection Authority's (EPA's) Social Surroundings Environmental Factor under s.38 (Part IV) of the EP Act. Other recommendations which fall outside the remit of the EP Act will support Yinhawangka CLH, YAC and RTIO in managing Yinhawangka Country through other agreements and programs. To assist with their implementation, the recommendations are grouped in themes which emerged during the SSA, although it is acknowledged that a recommendation may relate to more than one theme.

Yinhawangka Common Law Holders conditionally support the Proposal.

Recommendations #1 - #8 identify the parts of the Proposal that may proceed, and the parts that may not.

It is recommended that:

1 The range immediately to the south of the existing WAN operations (the Range) is a critically important site. The site is to be registered under the AHA and entered into YAC and RTIO's databases for its protection (dashed yellow outline, Map 3). The site extends beyond Yinhawangka Country into Ngarlawangga Country. Further discussion between Yinhawangka and Ngarlawangga CLH will be required to manage this site.

2 Due to the site at Recommendation #1, Yinhawangka CLH do not support the Proposal at Deposit J (Map 2). Ground disturbance is not supported in the Range. However, maintenance (but not expansion) of existing infrastructure e.g. tracks, may be permitted. Within these parameters, the specific activities which may be supported in the Range should be determined through further discussion with Yinhawangka and Ngarlawangga CLH.

3 The Proposal at Mount Ella East (Map 2) within the proposed disturbance footprint may proceed. Yinhawangka CLH do not support direct impacts to the Range outside this footprint. Pits at Mount Ella East shall be backfilled to the original ground surface, using the waste material from the proposed pits and existing waste dumps. Where possible, waste from the proposed pits should be dumped on top of existing waste dumps, to limit the overall number and footprint of waste dumps;

4 The Proposal at Western Hill (Map 2) may proceed, provided the previously recorded Western Hill Site Complex (WAN20-009, WAN20-014, WAN20-012, TBR-18-20, WAN20-007, WARE14-87-SS, WAN20-002, TBR-18-19, WAN20-11, WA-18-05-RS, WAN20-008, WAN20-010, WAN20-013, WAN20-006, WA-16-23-AS, WAN20-005, WAN20-004, WAN20-003, WA-18-02-ST, WA-18-04-RS) (Map 3) is protected;

5 The Proposal at Deposit H (Map 2) may proceed;

6 The Proposal at Deposit F North (Map 2) may proceed;

7 There are no recommendations specific to Deposit G (Map 2);

8 There are no recommendations specific to Deposit A West (Map 2).

Protection of Country

Recommendations #9 - #19 advise RTIO how to protect Country in and around the Development Envelope, before, during and after the Proposal. While the Proposal's impacts on dust was considered during the SSA, Yinhawangka CLH assume that RTIO will continue to monitor dust quality and quantity and minimise its impacts at WAN as standard practice. Consequently, Yinhawangka CLH had no specific recommendations on this matter.

It is recommended that:

9 All mine pits associated with the Proposal are to be backfilled at the cessation of mining;

10 Independent experts should monitor the impacts of RTIO's blasting activities on rockshelters and share the results with Yinhawangka CLH via an appropriate forum as determined through consultation with YAC;

11 Yinhawangka CLH support RTIO's plans to monitor water quality and quantity at a sinkhole (the Sinkhole) (Rio Tinto Database: Yinta) (located 5.5 km south-west of the Development Envelope; Map 3) to create a baseline for future water monitoring and management. Real time data should be shared with CLH and YAC through an appropriate forum to be determined by YAC;

[7]Yinta is the RTIO Database reference for the Sinkhole, which was recorded during a previous ethnographic survey (Williams 2011).

12 A Rights Reserved Area (RRA) around the Sinkhole (Map 3) should be negotiated between RTIO and YAC and the place should be registered as a site under the AHA;

13 RTIO should expand the existing RRA at Illingurra (Mt Governor) (Rio Tinto Database HOPEETH3-01), to encompass the mountain in its entirety. The mountain lies in Yinhawangka and Banjima Country and the RRA currently covers only the portion in Banjima Country. The extent of the RRA in Yinhawangka Country will need to be determined by RTIO and YAC;

14 Guided by their Elders, Yinhawangka CLH should be engaged for the following work in and around the Development Envelope:

a Monitoring landscape condition, water quality and water quantity at the Sinkhole (Map 3). This should include removing animal bones and other debris when the water dries up;

b Implementing cultural burning to control weeds at locations to be determined;

c Monitoring the impacts of mining activities on rockshelters;

15 An ethnographic survey should be conducted to support possible registration of the site known as Dinner Camp, (Rio Tinto Database WAETH06-2) (Map 3) under the AHA;

16 RTIO and Yinhawangka CLH should work together to map and protect pebble mouse mounds where practicable. This may be considered within RTIO's environmental survey program;

17 RTIO should manage topsoil to maintain and improve its vitality, so that it provides a viable seed bank when used during mine closure rehabilitation activities. Done well, there may not be a need to seed at all. If seed is required, stock should be provenanced from Yinhawangka Country where practical, as close to WAN as possible. Yinhawangka CLH will advise RTIO on a culturally appropriate species for inclusion in the rehabilitation seed mix;

18 Yinhawangka CLH should be supported by RTIO and YAC to regenerate native bee populations and encouraged to harvest the resulting honey for their personal consumption;

19 Yinhawangka CLH wish to explore the potential for compensation from the Western Australian Government for the irreplaceable loss of and damage to places from mining under the Racial Discrimination Act 1984. Yinhawangka CLH do not see Mining Benefits Payments as sufficient compensation.

Connection to Country

Recommendations #20 - #27 identify the places to which Yinhawangka CLH require access in and around the Development Envelope, and how knowledge of places is to be managed and shared between Yinhawangka CLH and others.

It is recommended that:

20 RTIO should facilitate Yinhawangka CLH access to the following places in line with the West Angelas Land Access Protocol (Map 3):

a The Range to the south of existing WAN mining activities

b Western Hill Site Complex

c Archaeological Site (RTIO database: WA-16-61SS [No DPLH Place ID])

d Mt Ella Site Complex

e Rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444])

f Engraving WA-16-51-ENG

g Rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID])

h The Sinkhole (RTIO database: Yinta)

RTIO and Yinhawangka CLH should maintain ongoing communication to ensure that access to the abovementioned places is properly managed throughout the life of the Proposal. There should be regular RTIO and YAC review of the Land Access Protocol. Due consideration should also be given to any additional places for Yinhawangka CLH access in the future, such as significant places identified during archaeological survey;

21 Opportunities to re-vitalise women's connections to significant places are to be sought by YAC under the leadership and guidance of Yinhawangka women. This should include a program of activities on-Country, supported by RTIO through provision of funding and logistics;

" It's not just us as Yinhawangka, it is us as Australians. Yinhawangka are the main actors but it's about all of us "

BRENDAN COOK



22 Yinhawangka CLH will identify gender restricted places in and around the Development Envelope. The results should be shared with appropriate parties to ensure consistency around access and culturally appropriate management of places;

23 Yinhawangka CLH will work with RTIO to produce a cultural protocols 'Code of Conduct' brochure in digital and hard copy formats to educate mining personnel and the general public in appropriate behaviour on Yinhawangka Country. This may be produced in conjunction with other Traditional Owner Groups. Hard copies should be made available at airports, hotels and mining camps in the region;

24 Yinhawangka CLH will work with RTIO to host an annual 'Yinhawangka Community Day' at WAN. Yinhawangka CLH and others will be supported to visit and observe the activities taking place there. This would be an additional commitment over and above any other similar events;

25 The office, services and facilities at WAN should offer a welcoming experience for Yinhawangka CLH and others through:

a More signage, murals and displays (in language where possible) celebrating Yinhawangka Culture and Country;

b Cultural awareness training for all employees, including office, catering, grounds and other service staff and contractors;

c Cultural immersion camps aimed at giving WAN staff an extended cultural experience (overnight or longer) co-designed and implemented by Yinhawangka and Ngarlawangga CLH;

d Special treatment of Yinhawangka Elders including the provision of rooms with easy access to the dry mess and vehicle drop off and pick up points;

26 Yinhawangka CLH will work with RTIO to develop a communications strategy for sharing language and imagery throughout WAN;

27 The Aboriginal Place Names Project is to be completed through YAC. It should include cultural mapping in and around the Development Envelope, re-assessing names already applied to places and recording names for places which have not yet been identified on maps, databases etc. Once these names have been endorsed, they should be shared with RTIO to use at WAN.

Caring for Country

Recommendations #28 - #40 set out processes for managing Yinhawangka Country in and around the Development Envelope now.

It is recommended that:

28 Yinhawangka CLH are supported to manage important cultural places by all land users and managers, including mining companies, Government Departments etc.;

29 Yinhawangka CLH participation in heritage surveys and SSAs is supported by YAC through an induction program. The program should include:

a Mentoring;

b Appropriate gender and apical representation;

c Cultural safety;

30 YAC should employ a Yinhawangka man and woman to manage CLH participation in heritage surveys and SSAs;

31 RTIO and YAC should develop support mechanisms to encourage Yinhawangka CLH into the RTIO workforce;

32 A Yinhawangka Water Committee led by nominated Yinhawangka CLH should be established for the purpose of making water-related decisions on Yinhawangka Country;

33 Archaeological survey areas should not be considered 'assessed' in circumstances where ground surface visibility is deemed too low (eg. <20%). Alternative approaches should be sought in low visibility areas, such as cultural burning in advance of the survey. The area should be inspected by Yinhawangka CLH and other experts as required beforehand, to identify any scarred trees or other features to be protected during the burn;

34 RTIO is to involve Yinhawangka CLH in mine planning for all Proposals on Yinhawangka Country from the Conceptual Phase through to mine closure and rehabilitation. Involvement should include (but not be limited to):

a The location and scale of a proposal, including new mines and extensions to existing mines;

b The routes RTIO anticipates using during exploration, mine construction, operations and closure;

c Yinhawangka CLH access to places within the Development Envelope;

d The extent to which pits will be backfilled at the cessation of mining;

Where appropriate, plans should be evaluated by an independent expert (mining engineer or similar) engaged by YAC;

35 Plants, animals and other natural features in and around the Development Envelope should be recorded in a two-way knowledge exchange between people trained in Western and Yinhawangka science;

36 YAC should facilitate Yinhawangka-led studies, especially in areas which are subject to RTIO proposals. Studies may include (but not be limited to) flora, fauna and water assessments;

37 RTIO should adopt standard formatting for reporting the results of studies undertaken on Yinhawangka Country. There should be real-time sharing of data;

38 RTIO should invite Yinhawangka CLH to visit mines which have been or soon will be closed such as Argyle Mine, Hunter Valley Coal Mine, Ranger Mine etc., to hear the experience of those involved and apply any lessons learnt to WAN;

39 RTIO and YAC should agree on the eligibility and processes for RTIO's funding of Yinhawangka CLH-managed programs and businesses. There should be transparency around these requirements so that Yinhawangka CLH can tailor applications for success;

40 RTIO and YAC should facilitate regular workshops for CLH to review RTIO's activities on Yinhawangka Country.



Sustainable Futures

Recommendation #41 is a holistic vision for the future of Yinhawangka Country.

It is recommended that:

41 Yinhawangka CLH develop a 100-year plan which considers the long-term benefits and impacts of mining alongside other possible futures for Yinhawangka Country;

Partnership and Agreement

Recommendations #42 - #47 define the way forward for Yinhawangka CLH and RTIO.

It is recommended that:

42 Yinhawangka CLH and RTIO explore the pros and cons associated with a partnership model as an alternative to existing Agreements;

43 Yinhawangka CLH develop standards for RTIO and other proponents and land managers working on Yinhawangka Country. These standards will take into account Regional Standards developed by other Pilbara Traditional Owner groups;

44 Yinhawangka CLH should work with RTIO and other Pilbara Traditional Owner groups to develop joint ventures with existing and future contractors for the purpose of recycling waste products including, but not limited to, copper, steel, batteries, aerosol cans and especially rubber tyres;

45 RTIO should host a workshop to communicate the recommendations from Commonwealth of Australia (2021) A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge to Yinhawangka CLH and how any changes have affected or will affect Yinhawangka People, Culture and Country;

46 The YAC-RTIO CWPA Modernised Agreement is to result in Yinhawangka CLH being given fair compensation for all mining on Yinhawangka Country;

47 Where appropriate, the recommendations and commitments from this SSA should be enshrined in the YAC-RTIO CWPA Modernised Agreement.

"Leave only footprints, not rubbish. Take only photos, not rocks"

JUANITA LYNDON

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" What we value is our culture, our land and our people. And if we lose one of those things, we are nothing "

SCOTT JAMES



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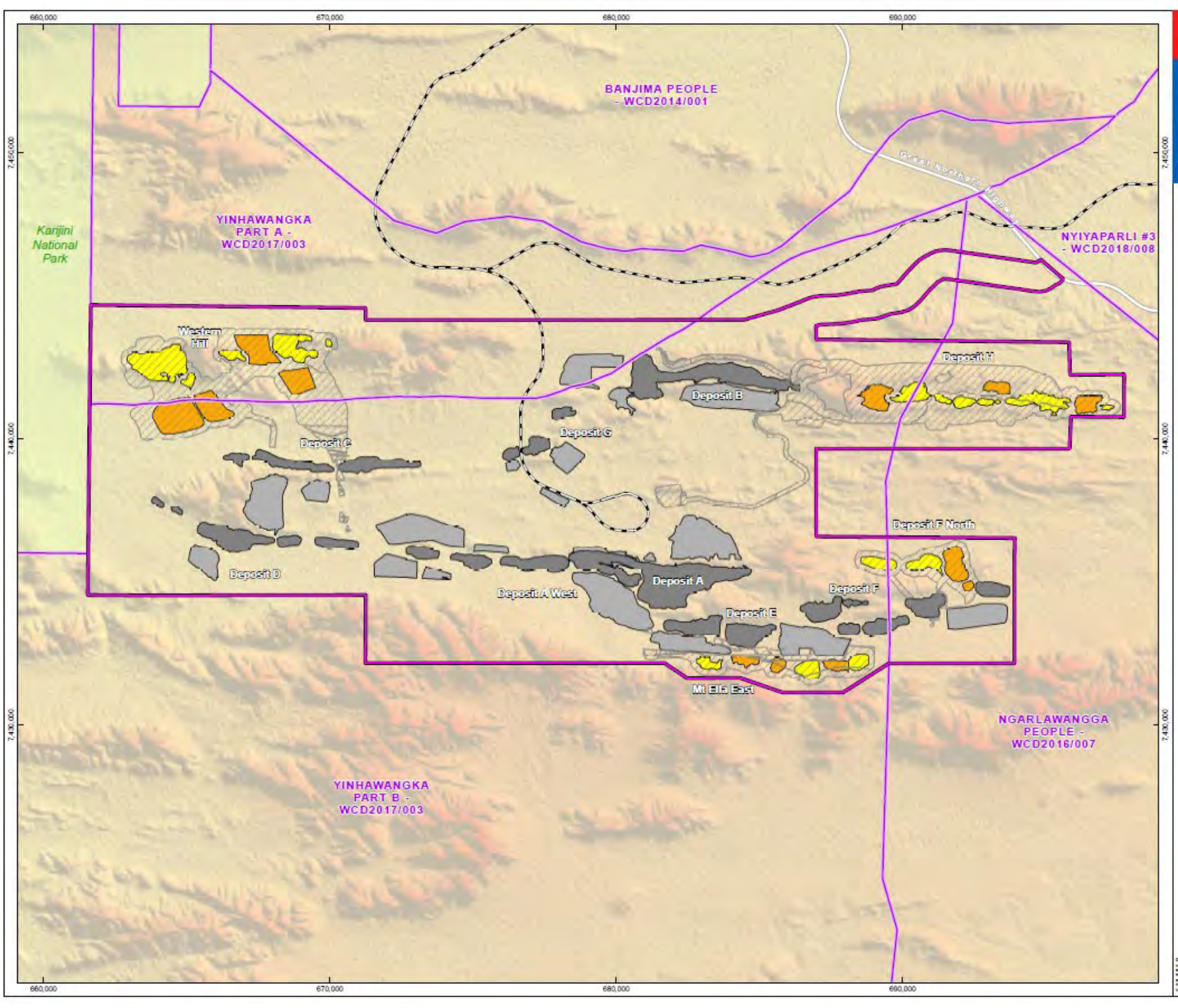
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Appendix 4: Consultation register with Yinhawangka Common Law Holders and YAC in relation to the West Angelas Revised Proposal

Consultation Stage	Purpose	Details of Consultation	Date
Initial / Pre-Referral Meeting	Introduce and establish a baseline understanding of the Proposal and work to investigate its potential development.	Local Implementation Committee (LIC) Meeting - Detailed Overview and introduction of WAN B2020 and Part IV	Oct 2019
		West Angelas B2020 and Part IV Social Surroundings Video Conference.	July 2020
		Heritage and Environment Committee (HEC) Meeting – WAN B2020 and Part IV update	September 2020
In-Field Site Visits and Consultation (several as needed)	On-Country assessments to explain the proposal and development options to Traditional Owners, provide clarity where they may intersect values, seek to understand concerns or potential impacts to values, and to provide feedback on previously raised concerns, identify known and 'new' sites or areas of significance. Being on Country is generally the preferred setting for Traditional Owners to understand the Proposal and the development options, and to explain, clarify, confirm or provide further information on social and cultural heritage values or concerns. The site visits also include areas of direct and potential indirect impacts (including examples from nearby operating mines), with on-ground discussion of how Country may be affected, and the potential significance of this for people. Relevant data and information is recorded for input into project planning, impact assessment and mitigation and management strategies.	West Angelas Social Surroundings Field Trip 1	22–27 March 2021
		West Angelas Social Surroundings Field Trip 2	25–28 May 2021
		West Angelas Social Surroundings Field Trip 3 - Mt Ella Ngarlawangga and **Yinhawangka** Mt Ella In-field Consultation 1	10–14 November 2021
		West Angelas Social Surroundings Field Trip 4 - Mt Ella Ngarlawangga, **Yinhawangka** and Martu Mt Ella In-field Consultation 2	28 February–2 March 2022
Post Site Visit Meetings (several as needed)	To review and discuss the outcomes of in-field consultation and to plan additional in-field consultation. Additional meetings will continue to be convened as required and Traditional Owner capacity permits.	HEC Meeting – Study and WAN RP Overview and Values discussion	May 2021
		HEC Meeting – High level study update and Social Surroundings discussions	October 2021
		Social Surroundings Meeting - **Yinhawangka** and Ngarlawangga shared values	21 October 2021
		HEC Meeting – High level study and Social Surroundings update	March 2022

Consultation Stage	Purpose	Details of Consultation	Date
		Consolidation Workshop: Preliminary Advice	21 June 2022
		YAC Board Meeting – WAN RP and Study Amendments:	Aug 2022
Document review and SCHMP development meetings/ workshops	Consultation workshops to review Social Surroundings recommendations, project development, mine planning and amendments, Subject Matter Expert updates, commitments and Environmental Review Document, Social Surroundings Chapter, and Social Cultural Heritage Management Plan development	Social, Cultural and Heritage Management Plan Workshop (SCHMPW): SCHMP	22 June 2022
		Social Surroundings Chapter, SCHMP Workshops 1-3	6–7 Sept 2022 (Karratha) 4–5 Oct 2022 (Paraburdoo – On Country) 15–16 Nov 2022 (West Angelas – On Country)
		Social Surroundings Chapter, SCHMP & ERD workshops 4-5	4-5 April 2023 (West Angelas – On Country. EPA Attendance 14-15 September 2023 (West Angelas – On Country)

Appendix 5: 'Mine Design' as acknowledged by Yinhawangka Aboriginal Corporation (YAC) Board on 3rd November 2023 (Mine Design)



RioTinto

Figure A-2
Conceptual Footprint and Revised Development Envelope for the West Angelas Revised Proposal

Drawn: GIS Team
Plan: PDE0186404v5
Date: August 2023

Proj: GDA 1994 MGA Zone 50
Scale: 1:120,000 @A3
GIS.Team@riotinto.com

Legend

- Revised Development Envelope
- Conceptual Footprint

Proposed Conceptual Layout

- Pit
- Waste Landform

Approved Conceptual Layout

- Pit
- Waste Landform

- Native Title Determination Area
- National Park
- Rio Tinto Railway
- Highway

N

0 1 2 3 4 5
Kilometres
Map units in metres

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Appendix 6: Changes in Mine Design to Avoid and Reduce Impacts

Native Title Area / Area	Design change
Ngarlawangga and **Yinhawangka**	The Revised Development Envelope has been changed to avoid impacts to important areas at Mt Ella East (**the Range**/part of the unnamed range to the south)
	Proposed eastern Mt Ella East Pits have been removed with the amendments to the Revised Development Envelope
	The Range has been protected from direct impacts through the establishment of a Provisional Heritage Site Boundary (HSB), and to minimise potential indirect impacts
Yinhawangka	Western Hill Pit 2 (Central Pit) was redesigned to avoid direct impacts to the Western Hill heritage site complex and to minimise potential indirect impacts
	Mt Ella East Pit 2 was redesigned to avoid direct impacts to the Mt Ella Site Complex and the surrounding unnamed range to the south of the existing West Angelas operations, and to minimise potential indirect impacts. Commitment to not extend Mt Ella pits, dumps, stockpiles and associated infrastructure into the boundary of the unnamed range (delineated site) to the south of the existing West Angelas operations
	Deposit J, including all associated pits, dumps, stockpiles and infrastructure, and the unnamed range to the south of the existing West Angelas operations, and encompassing the archaeological site WA-16-61SS, was included in the original referral, but has been removed from the Proposal and the Development Envelope has been amended to exclude these areas
	A total of 41 caves have been recorded within the Revised Development Envelope, 21 of which are located within the Proposal Area and 20 recorded within the Approved Development Envelope. Of the recorded caves, 40 are located on **Yinhawangka** Country. **MEZ**s and/or **MRZ**s have been established around 18 of the caves on **Yinhawangka** Country. The **MEZ**/**MRZ** areas also incorporate 3 heritage sites, further reducing impacts at these areas and protecting areas that are culturally important such as native fauna habitat (refer to Section 9 of the ERD).
Karijini National Park	Western Hill mining has been limited to **AWT** to avoid impacts to Karijini National Park

Appendix 7: Social Surroundings Scope and Context

In accordance with the **EP Act** and Environmental Protection Authority's (**EPA**) guidance documents, consideration of impacts on social surroundings is based on the following:

- **social surroundings assessment** completed;
- Identified significant impacts from the **Proposal** on **Yinhawangka CLHs**' social and cultural heritage that are linked to effects on physical or biological aspects of the environment.

This **SCHMP** principally aims to manage potential significant impacts within the Revised Development Envelope, however, any potential significant indirect impacts that may occur beyond the Revised Development Envelope attributable to the **Proposal** are also addressed where relevant.

This **SCHMP** is intended to complement separate documents which aim to manage compliance with heritage processes. These are beyond the scope of this **SCHMP** but are addressed as requirements under Aboriginal Cultural Heritage legislation, in particular:

- the Cultural Heritage Protocol agreed between **the Proponent** and the **Yinhawangka** People; and
- the Cultural Heritage Management Plan(s) prepared in respect of the **Proposal**.

This **SCHMP** will be implemented in **conjunction** with **the Yinhawangka** Cultural Heritage Management Plan (CHMP) for **Proponent** operations **within the West Angelas Revised Proposal Development Envelope** on **Yinhawangka** Country.

The **SCHMP** addresses social surroundings to meet the requirements of Part IV of the **EP Act**. Where relevant **Yinhawangka CLH** values, issues or concerns raised during the consultations that exist or occur beyond the scope of the **SCHMP**, they are recorded detailed in Appendix 1 (Confidential) and are provided to the **EPA** *in confidence*. These matters are expected by **CLHs** to be addressed in other agreements between **the Proponent** and **Yinhawangka**. **The Proponent** has agreed to work with **YAC** and the **CLHs** outside of the **SCHMP**, and Part IV of the **EP Act** processes on these items.

This **SCHMP** is expected to complement the following Environmental Management Plan(s) and Mine Closure Plans for the **Proposal** by identifying specific information to be provided to **Yinhawangka**, enabling **Yinhawangka** input into mine environmental management, rehabilitation and closure:

- Management and monitoring of potentially significant impacts to Flora and Vegetation, Terrestrial Fauna and Inland Waters addressed under the Environmental Management Plans (**EMP**: **Rio Tinto** 2018)
- Closure planning and activities under the mine closure plans (**MCP**s) prepared for the West Angelas (**Rio Tinto** 2018) and West Angelas Revised **Proposal** (**Rio Tinto** 20XX) sections of the Revised Development Envelope.

The **SCHMP** includes matters related to these plans where they are considered of relevance to social surroundings and best managed and reported on under the **SCHMP**.

Appendix 8: Social Surroundings Regulatory Framework

The **EP Act** definition of "environment" includes "social surroundings":

Environment, subject to subsection (2), means living things, their physical, biological and social surroundings, and interactions between all of these (Subsection 3(1)).

The **EP Act** further defines "social surroundings" as follows:

In the case of humans, the reference to social surroundings in the definition of environment in subsection (1) is a reference to aesthetic, cultural, economic and other social surroundings to the extent to which they directly affect or are affected by physical or biological surroundings.

The **EPA's** (2016) *Environmental Factor Guideline: Social Surroundings* states that the environmental objective for the factor social surroundings is:

To protect social surroundings from significant **harm**.

Impacts upon social surroundings may be managed (in a regulatory sense) under several different statutes and correlating guidance and policies. The following current legislation, environmental policy and guidance are relevant to the assessment of impacts to social surroundings environmental factor:

Table A- 2 Legislation and Guidelines relevant to the assessment of the social surroundings environmental factor

Document	Description
Environmental Protection Act 1986 (**WA**) (**EP Act**)	An Act to provide for an Environmental Protection Authority, for the prevention, control and abatement of pollution and environmental **harm**, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing.
Aboriginal Heritage Act 1972 (**WA**) (**AH Act**) to be reinstated pending repeal of the *Aboriginal Cultural Heritage Act 2021*, below	An Act to make provision for preservation on behalf of the community of places and objects customarily used by or traditional to the original inhabitants of Australia or their descendant.
Aboriginal Cultural Heritage Act 2021 (**WA**) (ACH Act) Temporarily replacing the AH Act; however, is to be repealed.	An Act: • about Aboriginal cultural heritage; and • to repeal the Aboriginal Heritage Act 1972 and the Aboriginal Heritage (Marandoo) Act 1992; and • to make consequential and other amendments to various Acts; and • for related purposes.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (**Cth**)	An Act to preserve and protect places, areas and objects of significance to Indigenous people, and for related purposes.
Native Title Act 1993 (**Cth**)	An Act for the advancement and protection of Aboriginal peoples and Torres Strait Islanders and is intended to further advance the process of reconciliation among all Australians.
EPA Guidance Statement Number 41: Assessment of Aboriginal Heritage	Considers Aboriginal Heritage in the environmental approvals process when heritage values are linked to the environment

Document	Description
EPA Environmental Factor Guideline Social Surroundings (**EPA** 2016)	Considers social surroundings in the environmental approvals process when social surroundings values are linked to the environment.
EPA Statement of environmental principles, factors objectives and aims of Environmental Impact Assessment (**EPA** 2021)	Communicates how, for the purposes of environmental impact assessment, the Environmental Protection Authority (**EPA**) considers various aspects of the **EP Act**.

The **Proposal** includes aspects that may be approved under subsidiary or other legislation including, but not limited to, Part V of the **EP Act**, *Environment Protection and Biodiversity Conservation Act 1999* (**Cth**) (**EPBC Act**), *Rights in Water and Irrigation Act 1914* (**RiWI Act**), *Land Administration Act 1997*, *Mining Act 1978*, *Aboriginal Heritage Act 1972*, and local government by-laws.

Appendix 9: Social Surroundings Relevant Guidance, Policies and Reports

- Statement of environmental principles, factors, objectives and aims of Environmental Impact Assessment (**EIA**) (**EPA** 2021)
- Aboriginal Heritage Due Diligence Guidelines, Version 3.0 (Department of Planning, Lands and Heritage and Department of Premier and Cabinet 2013).
- Engage early – guidance for proponents on best practice Indigenous engagement for environmental assessments under the **EPBC Act** (Commonwealth of Australia 2016)
- United Nations Declaration on the Rights of Indigenous Peoples (United Nations 2007)
- Australian Institute for Aboriginal and Torres Strait Islander Studies (AIATSIS) Code of Ethics for Aboriginal and Torres Strait Islander Research (AIATSIS 2020)
- Terri Janke and Maiko Sentina, Indigenous Knowledge: Issues for Protection and Management, IP Australia (Commonwealth of Australia 2018)
- A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge (Commonwealth of Australia 2021)

Appendix 10: Social Surroundings Condition Requirements

The **Proposal** is currently under assessment under Part IV of **EP Act**, with approval and associated Ministerial Statement and conditions yet to be issued. The **EIA** Process for the **Proposal** is described in Appendix 2.

It is expected that a condition will be imposed requiring implementation of this **SCHMP** in respect of the **Proposal**, which will be incorporated in future updates of this **SCHMP** following the issue of a Ministerial Statement. Failure to comply with an implementation condition is an offence under section 47(1) of the **EP Act**.

Section 6 of this **SCHMP** sets out the actions that will be taken by **the Proponent** to achieve the objectives of this **SCHMP** and, in doing so, comply with the relevant implementation conditions.

Appendix 11: Social Surroundings Rationale and Approach

The Scope of Works guiding the **Social Surroundings Assessment** was co-designed by **YAC**, **the Proponent** and consultants commissioned to undertake the work. As part of the **social surroundings assessment**, the social, cultural and heritage information in this **SCHMP** was recorded with **Yinhawangka CLHs** over several months in 2021 and 2022. The assessment comprised the following components:

- desktop research
- four field trips
    - 22 - 27 March 2021
    - 25 - 28 May 2021
    - 10 - 14 November 2021
    - 1 March 2022
- one-day Social Surroundings Consolidation Workshop (21 June 2022)
- one-day **SCHMP** Workshop (22 June 2022)
- **ERD** workshops
    - 6 - 7 Sept 2022
    - 4 - 5 Oct 2022
    - 15 - 16 Nov 2022
    - 4 - 5 April 2023
    - 14 - 15 September 2023.

Under the terms of this Scope of Works, **the Proponent** made financial provisions for **YAC** to access independent anthropological, environmental, logistical and documentary services contracted to **YAC** to record and assess the social, cultural and heritage values of the **Proposal** area. **The Proponent** also made available its own technical assessments and internal subject matter experts throughout the **social surroundings assessment**.

Male and female anthropologists undertook desktop research and documented gender-specific knowledge on field trips and in follow-up interviews. The independent environmental advisor provided evaluation and professional opinion on the likely impacts on environmental values at risk from **the Proponent's** mine plans on **Yinhawangka** Country, and a filmmaker and drone operator recorded all the above components.

The **social surroundings assessment** sought to:

- ensure that **CLHs** had all of the information that they required to make an informed set of decisions and recommendations about the proposed Scope of Works (under the principle of free prior and informed consent as defined in the United Nations Declaration on the Rights of Indigenous People – Article 32);
- identify social, cultural, spiritual, aesthetic, ecological and economic values within the immediate and surrounding landscapes to meet the requirements of the Environmental Protection Authority assessment process;
- consider the provisions of the **AH Act** in relation to cultural values and places identified during the fieldwork (while this **Proposal** is primarily focused on fulfilling the requirements of the **EP Act**, in some cases, the **AH Act** may also be relevant);
- identify potential impacts to **CLHs**' cultural values from the West Angelas Revised **Proposal** over time;
- identify solutions to mitigate potential impacts (management recommendations);
- facilitate negotiated outcomes that satisfy the needs of the Traditional Owners and **the Proponent**;
- solidify specific management commitments from **the Proponent**s via the **SCHMP**;
- fulfil the requirements of the **EPA**; and
- support the Part IV **EP Act** Assessment Process by recording tangible and intangible elements of the social, cultural, spiritual, aesthetic, ecological and economic landscapes and the relationships between them.

Appendix 12: Social Surroundings Assessment Methodology

A review of published ethnohistory, published and unpublished archaeological and ethnographic heritage survey and other reports in and around the **Proposal's** Revised Development Envelope describes rich and enduring deep-time relationships between **Yinhawangka** People, Culture and Country (e.g., Scambary 2013; Sharp and Thieberger 1992; Stevens *et al*. 2019, Wilson 1961). To capture these relationships, the S**ocial Surroundings Assessment** adopted an approach known as 'more than human' (sometimes called 'multispecies') ethnography, which maps relationships between people, plants, animals, waterholes, weather, rocks and other elements of Country. The approach supports Deborah Bird Rose's (2011:11) notion of "becoming human," which asserts that we only become who we are in the company of others. This interconnectedness between humans and more than human forms challenges the dominant Western perspective, which typically places nature and culture, human and nonhuman, subject and object into binary relationships. Popularized by anthropologist Robert Redfield (1953), the distinction between the two perspectives continues to be examined by scholars, especially those working in applied fields (e.g., Narvaez, 2016; Te Ahukaramu Charles Royal, 2002).

It is important to note that ethnography is not just descriptive. In recording knowledge, stories, views and perspectives, SSAs are also recording the mechanisms and circumstances through which these knowledge, stories, views and perspectives are shared and reproduced. It follows then that what is recorded and what is not, how it is recorded, how it is organized to meet the legislation etc., becomes a tool for the content that is reproduced. In this way, ethnography may be considered both subject and object at the same time (Strathern 2018:23). This is supported by Laura Nader's (2011: p. 211) positioning of ethnography as a "theory of description". These entanglements between subject and object, method and theory are complex and the challenges in bringing a body of information to meet the legislation with honesty and integrity cannot be understated.

One point for further examination is that the steps in this SSA (desktop research, fieldtrips and workshops and the outputs from them) are aimed at achieving consensus – identifying an agreed pathway for managing Country. However, it is the absence of agreement that is the strength of ethnography. Seeking out the overlooked, the nuanced and the unheard is at the heart of what anthropologists do. How diversity can be meaningfully acknowledged in SSA method and theory requires further consideration as SSAs roll out across the Pilbara.

Appendix 13: Yinhawangka Aboriginal Corporation Board letter of acknowledgement

YINHAWANGKA
ABORIGINAL CORPORATION

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www.yinhawangka.com.au

29 November 2023

Chairman
Environmental Protection Authority
Locked Bag 10
Joondalup DC WA 6919
Via Rio Tinto

RE: YINHAWANGKA ABORIGINAL CORPORATION RNTBC ICN 7837 (YAC) CONDITIONAL ENDORSEMENT – RTIO FINAL DRAFT ERD SUBMISSION FOR THE WEST ANGELAS REVISED PROPOSAL (EPA ASSESSMENT NO. 2290)

This letter is to confirm YAC's acknowledgement of Rio Tinto Iron Ore's (**RTIO**) submission to the Environmental Protection Authority (**EPA**), for the Social Surrounds Chapter and Social Cultural Heritage Management Plan (**SCHMP**) components of the final draft Environmental Review Document (**ERD**) for the West Angelas Revised Proposal Assessment No. 2290 (**Proposal**).

The SCHMP is endorsed by YAC to the extent that YAC's comments to RTIO via email of 29 November 2023 are adopted and, that a Yinhawangka Cultural Heritage Management Plan (**CHMP**), applicable to the construction, operation, rehabilitation and closure of the Proposal, be developed, completed and implemented prior to the commencement of any ground disturbing activities taking place on Yinhawangka Country (as captured under Management Objective 2A of the SCHMP).

It is important to note that within the current SCHMP, the controls in place to *'minimise potential impacts of direct disturbance of Country and cultural heritage'* are heavily weighted upon implementation of CHMPs (refer to SCHMP Table 6-18, 'Application of the Mitigation Hierarchy for Social Surroundings'). It is therefore imperative to ensuring the management and protection of Yinhawangka cultural heritage sites and places of special significance to Yinhawangka Common Law Holders (CLH) that the development of a CHMP for the West Angelas proposal is progressed by RTIO as a matter of high priority, alongside the development of a modernised co-management framework for our mutual engagements going forward and ensuring the best possible outcomes for our futures.

Yours sincerely,

Kupa Teao
CEO

Cc. YAC Directors

c. Yinhawangka Aboriginal Corporation Board Letter of Acknowledgement

`

YINHAWANGKA
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Yours sincerely,

Kupa Teao
CEO

Cc. YAC Directors

B.3 d Yinhawangka Social Surroundings Assessment Recommendations

No.	Title	Recommendation
1	**Yinhawangka Common Law Holders conditionally support the Proposal.** *Recommendations #1 - #8 identify the parts of the Proposal that may proceed, and the parts that may not.*	The range immediately to the south of the existing WAN operations (the Range) is a critically important site. The site is to be registered under the AHA and entered into YAC and RTIO's databases for its protection (dashed yellow outline, Map 3). The site extends beyond Yinhawangka Country into Ngarlawangga Country. Further discussion between Yinhawangka and Ngarlawangga CLH will be required to manage this site.
2		Due to the site at Recommendation #1, Yinhawangka CLH do not support the Proposal at Deposit J (Map 2). Ground disturbance is not supported in the Range. However, maintenance (but not expansion) of existing infrastructure e.g. tracks, may be permitted. Within these parameters, the specific activities which may be supported in the Range should be determined through further discussion with Yinhawangka and Ngarlawangga CLH.
3		The Proposal at Mount Ella East (Map 2) within the proposed disturbance footprint may proceed. Yinhawangka CLH do not support direct impacts to the Range outside this footprint. Pits at Mount Ella East shall be backfilled to the original ground surface, using the waste material from the proposed pits and existing waste dumps. Where possible, waste from the proposed pits should be dumped on top of existing waste dumps, to limit the overall number and footprint of waste dumps;
4		The Proposal at Western Hill (Map 2) may proceed, provided the previously recorded Western Hill Site Complex (WAN20-009, WAN20-014, WAN20-012, TBR-18-20, WAN20-007, WARE14-87-SS, WAN20-002, TBR-18-19, WAN20-11, WA-18-05-RS, WAN20-008, WAN20-010, WAN20-013, WAN20-006, WA-16-23-AS, WAN20-005, WAN20-004, WAN20-003, WA-18-02-ST, WA-18-04-RS) (Map 3) is protected;
5		The Proposal at Deposit H (Map 2) may proceed;
6		The Proposal at Deposit F North (Map 2) may proceed;
7		There are no recommendations specific to Deposit G (Map 2);
8		There are no recommendations specific to Deposit A West (Map 2).
9	**Protection of Country**	All mine pits associated with the Proposal are to be backfilled at the cessation of mining

No.	Title	Recommendation
10	*Recommendations #9 - #19 advise RTIO how to protect Country in and around the Development Envelope, before, during and after the Proposal. While the Proposal's impacts on dust was considered during the SSA, Yinhawangka CLH assume that RTIO will continue to monitor dust quality and quantity and minimise its impacts at WAN as standard practice. Consequently, Yinhawangka CLH had no specific recommendations on this matter*	Independent experts should monitor the impacts of RTIO's blasting activities on rockshelters and share the results with Yinhawangka CLH via an appropriate forum as determined through consultation with YAC;
11		Yinhawangka CLH support RTIO's plans to monitor water quality and quantity at a sinkhole (the Sinkhole) (Rio Tinto Database: Yinta [1]) (located 5.5 km south-west of the Development Envelope; Map 3) to create a baseline for future water monitoring and management. Real time data should be shared with CLH and YAC through an appropriate forum to be determined by YAC;
12		A Rights Reserved Area (RRA) around the Sinkhole (Map 3) should be negotiated between RTIO and YAC and the place should be registered as a site under the AHA;
13		RTIO should expand the existing RRA at Illingurra (Mt Governor) (Rio Tinto Database HOPEETH3-01), to encompass the mountain in its entirety. The mountain lies in Yinhawangka and Banjima Country and the RRA currently covers only the portion in Banjima Country. The extent of the RRA in Yinhawangka Country will need to be determined by RTIO and YAC;
14		Guided by their Elders, Yinhawangka CLH should be engaged for the following work in and around the Development Envelope:
		a. Monitoring landscape condition, water quality and water quantity at the Sinkhole (Map 3). This should include removing animal bones and other debris when the water dries up;
		b. Implementing cultural burning to control weeds at locations to be determined;
		c. Monitoring the impacts of mining activities on rockshelters;
15		An ethnographic survey should be conducted to support possible registration of the site known as Dinner Camp, (Rio Tinto Database WAETH06-2) (Map 3) under the AHA;

1. _____

[1] Yinta is the RTIO Database reference for the Sinkhole, which was recorded during a previous ethnographic survey (Williams 2011).

No.	Title	Recommendation
16		RTIO and Yinhawangka CLH should work together to map and protect pebble mouse mounds where practicable. This may be considered within RTIO's environmental survey program;
17		RTIO should manage topsoil to maintain and improve its vitality, so that it provides a viable seed bank when used during mine closure rehabilitation activities. Done well, there may not be a need to seed at all. If seed is required, stock should be provenanced from Yinhawangka Country where practical, as close to WAN as possible. Yinhawangka CLH will advise RTIO on a culturally appropriate species for inclusion in the rehabilitation seed mix;
18		Yinhawangka CLH should be supported by RTIO and YAC to regenerate native bee populations and encouraged to harvest the resulting honey for their personal consumption;
19		Yinhawangka CLH wish to explore the potential for compensation from the Western Australian Government for the irreplaceable loss of and damage to places from mining under the Racial Discrimination Act 1984. Yinhawangka CLH do not see Mining Benefits Payments as sufficient compensation.
20	**Connection to Country** *Recommendations #20 - #27 identify the places to which Yinhawangka CLH require access in and around the Development Envelope, and how knowledge of places is to be managed and shared between Yinhawangka CLH and others.*	RTIO should facilitate Yinhawangka CLH access to the following places in line with the West Angelas Land Access Protocol (Map 3):
		a. The Range to the south of existing WAN mining activities
		b. Western Hill Site Complex
		c. Archaeological Site (RTIO database: WA-16-61SS [No DPLH Place ID])
		d. Mt Ella Site Complex
		e. Rockshelter with handprint (RTIO database: YINHARR-39 [DPLH Place ID 20444])
		f. Engraving WA-16-51-ENG
		g. Rockshelter with engravings (RTIO database: WA-16-45-ENG [No DPLH Place ID])
		h. The Sinkhole (RTIO database: Yinta)
		RTIO and Yinhawangka CLH should maintain ongoing communication to ensure that access to the abovementioned places is properly managed throughout the life of the Proposal. There should be regular RTIO and YAC review of the Land Access Protocol. Due consideration should also be given to any additional places for Yinhawangka CLH access in the future, such as significant places identified during archaeological survey;

No.	Title	Recommendation
21		Opportunities to re-vitalise women's connections to significant places are to be sought by YAC under the leadership and guidance of Yinhawangka women. This should include a program of activities on-Country, supported by RTIO through provision of funding and logistics;
22		Yinhawangka CLH will identify gender restricted places in and around the Development Envelope. The results should be shared with appropriate parties to ensure consistency around access and culturally appropriate management of places;
23		Yinhawangka CLH will work with RTIO to produce a cultural protocols 'Code of Conduct' brochure in digital and hard copy formats to educate mining personnel and the general public in appropriate behaviour on Yinhawangka Country. This may be produced in conjunction with other Traditional Owner Groups. Hard copies should be made available at airports, hotels and mining camps in the region;
24		Yinhawangka CLH will work with RTIO to host an annual 'Yinhawangka Community Day' at WAN. Yinhawangka CLH and others will be supported to visit and observe the activities taking place there. This would be an additional commitment over and above any other similar events;
25		The office, services and facilities at WAN should offer a welcoming experience for Yinhawangka CLH and others through:
		a. More signage, murals and displays (in language where possible) celebrating Yinhawangka Culture and Country;
		b. Cultural awareness training for all employees, including office, catering, grounds and other service staff and contractors;
		c. Cultural immersion camps aimed at giving WAN staff an extended cultural experience (overnight or longer) co-designed and implemented by Yinhawangka and Ngarlawangga CLH;
		d. Special treatment of Yinhawangka Elders including the provision of rooms with easy access to the dry mess and vehicle drop off and pick up points;
26		Yinhawangka CLH will work with RTIO to develop a communications strategy for sharing language and imagery throughout WAN;
27		The *Aboriginal Place Names Project* is to be completed through YAC. It should include cultural mapping in and around the Development Envelope, re-assessing names already applied to places and recording names for places which have not yet been identified on maps, databases etc. Once these names have been endorsed, they should be shared with RTIO to use at WAN.

No.	Title	Recommendation
28	**Caring for Country** *Recommendations #28 - #40 set out processes for managing Yinhawangka Country in and around the Development Envelope now.*	Yinhawangka CLH are supported to manage important cultural places by all land users and managers, including mining companies, Government Departments etc.;
29		Yinhawangka CLH participation in heritage surveys and SSAs is supported by YAC through an induction program. The program should include:
		a. Mentoring;
		b. Appropriate gender and apical representation;
		c. Cultural safety;
30		YAC should employ a Yinhawangka man and woman to manage CLH participation in heritage surveys and SSAs;
31		RTIO and YAC should develop support mechanisms to encourage Yinhawangka CLH into the RTIO workforce;
32		A Yinhawangka Water Committee led by nominated Yinhawangka CLH should be established for the purpose of making water-related decisions on Yinhawangka Country;
33		Archaeological survey areas should not be considered 'assessed' in circumstances where ground surface visibility is deemed too low (eg. <20%). Alternative approaches should be sought in low visibility areas, such as cultural burning in advance of the survey. The area should be inspected by Yinhawangka CLH and other experts as required beforehand, to identify any scarred trees or other features to be protected during the burn;
34		RTIO is to involve Yinhawangka CLH in mine planning for all Proposals on Yinhawangka Country from the Conceptual Phase through to mine closure and rehabilitation. Involvement should include (but not be limited to):
		a. The location and scale of a proposal, including new mines and extensions to existing mines;
		b. The routes RTIO anticipates using during exploration, mine construction, operations and closure;
		c. Yinhawangka CLH access to places within the Development Envelope;
		d. The extent to which pits will be backfilled at the cessation of mining;

No.	Title	Recommendation
		Where appropriate, plans should be evaluated by an independent expert (mining engineer or similar) engaged by YAC;
35		Plants, animals and other natural features in and around the Development Envelope should be recorded in a two-way knowledge exchange between people trained in Western and Yinhawangka science;
36		YAC should facilitate Yinhawangka-led studies, especially in areas which are subject to RTIO proposals. Studies may include (but not be limited to) flora, fauna and water assessments;
37		RTIO should adopt standard formatting for reporting the results of studies undertaken on Yinhawangka Country. There should be real-time sharing of data;
38		RTIO should invite Yinhawangka CLH to visit mines which have been or soon will be closed such as Argyle Mine, Hunter Valley Coal Mine, Ranger Mine etc., to hear the experience of those involved and apply any lessons learnt to WAN;
39		RTIO and YAC should agree on the eligibility and processes for RTIO's funding of Yinhawangka CLH-managed programs and businesses. There should be transparency around these requirements so that Yinhawangka CLH can tailor applications for success;
40		RTIO and YAC should facilitate regular workshops for CLH to review RTIO's activities on Yinhawangka Country.
41	**Sustainable Futures** *Recommendation #41 is a holistic vision for the future of Yinhawangka Country.*	Yinhawangka CLH develop a 100-year plan which considers the long-term benefits and impacts of mining alongside other possible futures for Yinhawangka Country;
42	**Partnership and Agreement** *Recommendations #42 - #47 define the way forward for Yinhawangka*	Yinhawangka CLH and RTIO explore the pros and cons associated with a partnership model as an alternative to existing Agreements;
43		Yinhawangka CLH develop standards for RTIO and other proponents and land managers working on Yinhawangka Country. These standards will take into account Regional Standards developed by other Pilbara Traditional Owner groups;

No.	Title	Recommendation
44	*CLH and RTIO.*	Yinhawangka CLH should work with RTIO and other Pilbara Traditional Owner groups to develop joint ventures with existing and future contractors for the purpose of recycling waste products including, but not limited to, copper, steel, batteries, aerosol cans and especially rubber tyres;
45		RTIO should host a workshop to communicate the recommendations from Commonwealth of Australia (2021) A Way Forward: Final report into the destruction of Indigenous heritage sites at Juukan Gorge to Yinhawangka CLH and how any changes have affected or will affect Yinhawangka People, Culture and Country;
46		The YAC-RTIO CWPA Modernised Agreement is to result in Yinhawangka CLH being given fair compensation for all mining on Yinhawangka Country;
47		Where appropriate, the recommendations and commitments from this SSA should be enshrined in the YAC-RTIO CWPA Modernised Agreement.

1.

B.4: Commercial-in-Confidence: Cultural Heritage Survey Assessment Results

a. CONFIDENTIAL Ngarlawangga Cultural Heritage Survey Assessment Results

b. CONFIDENTIAL Yinhawangka Cultural Heritage Survey Assessment Results

B.5: West Angelas Beyond 2020 Proposal Visual Impact Assessment

RioTinto

West Angelas Beyond 2020 Proposal Visual Impact Assessment



	Name	Signature	Date
Prepared By:	Matt Jacob Analyst - GIS		October 2021
Checked By:	Thomas Linklater Specialist - GIS		October 2021
Approved By:	Elizabeth Mason Senior Advisor - Envrionmental Approvals		October 2021

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Appendix 34

Figure 32 - Infrastructure Height & Data Source

Summary

The Rio Tinto Iron Ore GIS Team conducted the Visual Impact Assessment (VIA) for the proposed West Angelas Beyond 2020 Proposal, located approximately 100km north west of Newman. Field work was undertaken in November of 2018 and the assessment was undertaken as part of the environmental impact assessment for the West Angelas Beyond 2020 Proposal.

The VIA was conducted in three phases:

- Desktop Assessment (Analysis)
- Field Assessment (Photo Locations)
- Visual Impact (Photo Montage)

Results show present, operational and closure photo montages to illustrate the indicative visual impact of the proposed operations at the West Angelas Beyond 2020 Proposal.

Introduction

This report outlines the West Angelas Beyond 2020 Proposal VIA scope, methodology and results. The GIS Team was engaged to prepare a VIA report, which was developed in conjunction with several other environmental studies and reports to provide an overview of the likely impacts.

1.1 Objective & Scope

The overall objective was to assess the visual impact of the West Angelas Beyond 2020 Proposal and illustrate these impacts through photo montages. The key objectives were to:

- Analyse landscape within the development area
- Identify points of interest where potential impact may occur
- Conduct field trip to identified points to photograph
- Illustrate potential visual amenity impacts of mining stages through photo montages

1.3 Study Area

The West Angelas Beyond 2020 Proposal is located approximately 100km north west of Newman and is adjacent to the West Angelas mine (refer Figure 1).

The Great Northern Highway runs to the north of the West Angelas Beyond 2020 Proposal, providing public access between the towns of Newman and Port Hedland and tourist access to Karijini National Park.

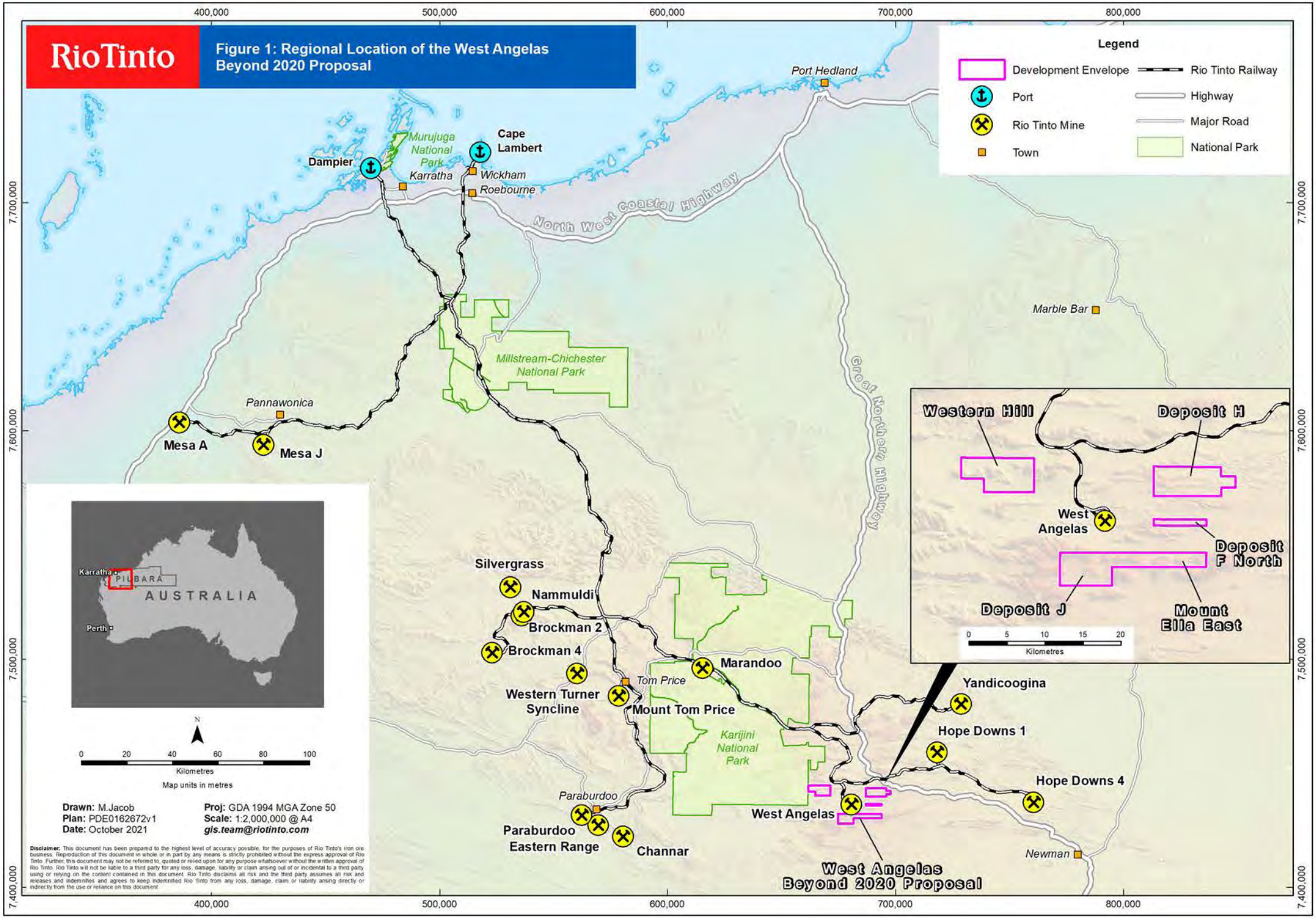
1.4 Regulatory Context

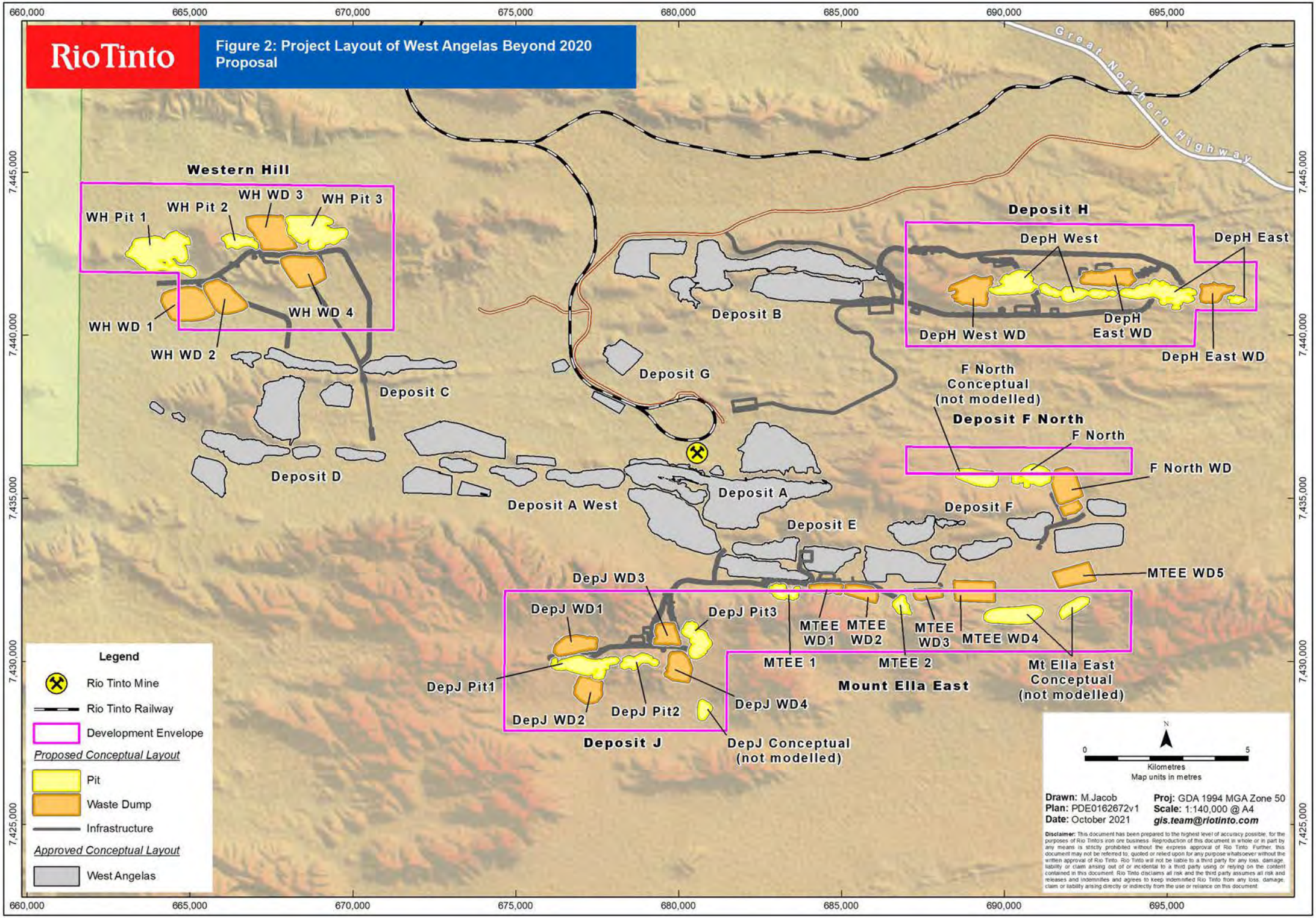
The following regulatory documents and relevant sections within them were consulted as part of this work to provide context and guidance on completing a Visual Impact Assessment.

Environmental Projection Authority (EPA) and the Environmental Protection Act 1986
Amenity: "To ensure that impacts to amenity are reduced as low as reasonably practicable".

The Western Australian Planning Commission's (WAPC) State Planning Policy No. 2:
Environment and Natural Resource Policy for Western Australia (WAPC 2003)
"consider the need for a landscape or visual impact assessment for development proposals that may impact upon sensitive landscapes".

The WAPC's Pilbara Planning and Infrastructure Framework (WAPC 2012)
"protect and manage the region's cultural heritage, arts including indigenous significant places, and landscapes of significance".


RioTinto
Figure 1: Regional Location of the West Angelas Beyond 2020 Proposal
Legend
Development Envelope
Rio Tinto Railway
Port
Highway
Rio Tinto Mine
Major Road
Town
National Park
400,000
500,000
600,000
700,000
800,000
7,700,000
7,600,000
7,500,000
7,400,000
Port Hedland
Dampier
Murujuga National Park
Karratha
Cape Lambert
Wickham
Roebourne
North West Coastal Highway
Marble Bar
Millstream-Chichester National Park
Great Northern Highway
Pannawonica
Mesa A
Mesa J
Western Hill
Deposit H
West Angelas
Deposit F North
Deposit J
Mount Ella East
0 5 10 15 20
Kilometres
Silvergrass
Nammuldi
Brockman 2
Brockman 4
Marandoo
Tom Price
Western Turner Syncline
Mount Tom Price
Yandicoogina
Hope Downs 1
Hope Downs 4
Karijini National Park
Paraburdoo
Paraburdoo Eastern Range
Channar
West Angelas
Newman
West Angelas Beyond 2020 Proposal
Karratha
PILBARA
AUSTRALIA
Perth
N
0 20 40 60 80 100
Kilometres
Map units in metres
Drawn: M.Jacob
Plan: PDE0162672v1
Date: October 2021
Proj: GDA 1994 MGA Zone 50
Scale: 1:2,000,000 @ A4
gis.team@riotinto.com
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RioTinto
Figure 2: Project Layout of West Angelas Beyond 2020 Proposal
660,000
665,000
670,000
675,000
680,000
685,000
690,000
695,000
7,445,000
7,440,000
7,435,000
7,430,000
7,425,000
Great Northern Highway
Western Hill
WH Pit 1
WH Pit 2
WH WD 3
WH Pit 3
WH WD 1
WH WD 2
WH WD 4
Deposit B
Deposit H
DepH West
DepH East
DepH West WD
DepH East WD
DepH East WD
Deposit G
Deposit C
F North Conceptual (not modelled)
Deposit F North
F North
F North WD
Deposit D
Deposit A West
Deposit A
Deposit F
Deposit E
MTEE WD5
DepJ WD3
DepJ WD1
DepJ Pit3
MTEE WD1
MTEE WD2
MTEE WD3
MTEE WD4
MTEE 1
MTEE 2
Mt Ella East Conceptual (not modelled)
Mount Ella East
DepJ Pit1
DepJ WD4
DepJ WD2
DepJ Pit2
Deposit J
DepJ Conceptual (not modelled)
Legend
Rio Tinto Mine
Rio Tinto Railway
Development Envelope
Proposed Conceptual Layout
Pit
Waste Dump
Infrastructure
Approved Conceptual Layout
West Angelas
N
0
5
Kilometres
Map units in metres
Drawn: M.Jacob
Plan: PDE0162672v1
Date: October 2021
Proj: GDA 1994 MGA Zone 50
Scale: 1:140,000 @ A4
gis.team@riotinto.com
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Methodology

The methodology used to assess the impact to the landscape and visual amenity was conducted in three phases. This process included the following:

2.1 Desktop Assessment

The aim the desktop assessment was to produce a terrain model of the study area with the proposed infrastructure overlaid. This model was then used to conduct a viewshed analysis using the proposed infrastructure to identify potential visual impacts across the model domain. The viewshed analysis output was then combined with existing spatial data such as heritage, environment and cadastral layers to guide the selection of locations for capture of images.

Viewshed Analysis

To perform the viewshed analysis, the ArcGIS Viewshed tool within ArcMap was used. This tool can be found under Spatial Analyst > Surface > Viewshed within the Arc Toolbox.

A viewshed analysis identifies cells within a raster image (ASCII terrain model) that can be seen from any number of observer points or lines (infrastructure polylines). The identified cells are given a value of 1 for visible or 0 for not visible. This project had more than one observer point so more than 20 values have been entered. The viewshed analysis provides the starting point for all further visual impact assessment work.

The study area terrain model was created from LiDAR data and the proposed infrastructure data in Global Mapper and loaded into ArcGIS in ASCII format.

Figure 03: Viewshed Analysis Control Factors

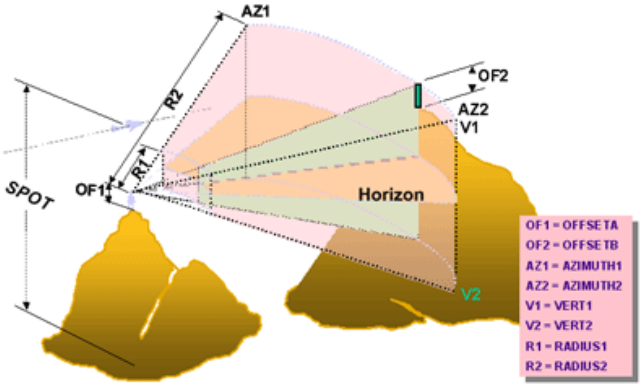
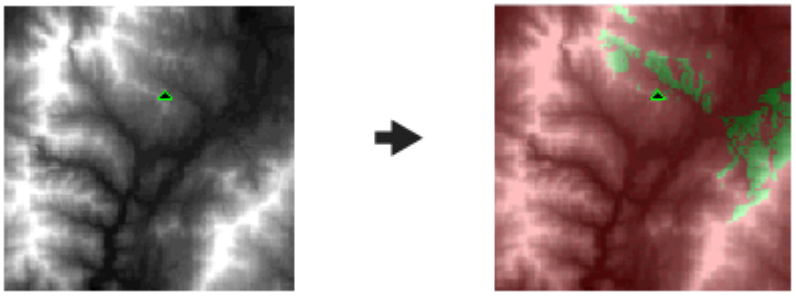


Figure 04: Viewshed Analysis Input vs Output



Input Surface with Observer Point

Output Viewshed

Output

The viewshed analysis output was then used to create a cartographic map for the study team to easily identify potential visual impacts and help determine the locations for capture of photographs.

Photo Location Selection

The study team consisted of Studies, Environment, Closure, Heritage and GIS. All teams worked together with GIS to identify and select locations for capture of images. Locations for the capture of images were selected based upon:

- proximity to significant heritage or environmental values
- line of sight to significant heritage or environmental values
- proximity to areas with public access

Traditional owner consultation was also undertaken to identify significant sites around the study area. Once all locations were selected, a field trip assessment was planned and undertaken over three days within the study area.

2.2 Field Assessment



A field assessment was conducted to capture data and photographs from selected locations around the study area, with the photographic views focusing on the proposed infrastructure such as dumps and stockpiles. Comprehensive data collection was undertaken at each location to allow for photo montages to be produced in the next phase.

Tools used in field work

Canon Digital Camera EOS 200 D
Accessories: Tripod, Stabiliser, Compass, Measuring Tape
ArcGIS Collector App (IOS Iphone)
Magellan GPS UnitPaperwork (manual field notes)

Field Trip

Field work was undertaken in November 2018.

At each photograph location, assessment was made on the ground for accessibility and view aspect, which resulted in minor changes to photograph locations to ones agreed upon in desktop assessment. Once location and direction of photo was agreed, 3 photos of the same view were taken to reduce the risk of poor photo clarity and recorded both manually and digitally.

Data Collection

The data shown in Table 1 were collected from each photograph location to assist in the next phase of the assessment.

Table 1 - Data collected at each photograph location

Site No. and Name	Identified in desktop assessment
Date/Time	Date and time of day
Photo Number	Unique photo number as multiple taken from each point
GPS Co-ordinates	Actual photo location for GPS unit
Bearing	Direction of the photo with the aid of compass
Camera Height	Height of the camera from ground level
Atmospheric Conditions	Weather and lighting
Description of View	Vegetation cover and infrastructure within the area
Comments	Additional detail

Field Photos Review

Once field work was complete, the study team reviewed the adjusted photograph locations and selected photos that would best illustrate the potential visual impact.

2.3 Visual Impact Assessment process

Photo montages were generated from the photographs selected to best illustrate the potential visual impact of the proposed development. Generation of the photo montages involved a multistep process of data creation, view setup, image rendering, output and final mock up. Software required for this process were; Global Mapper, Microstation V8i, ArcGIS Desktop, Adobe Photoshop and Adobe InDesign.

The following sections outline the process to create the final photo montage showing the current view, operational view and closure view along with any relevant supporting data.

Data

The terrain model created desktop assessment was used in the final phase to create surface features, for the purpose of lining up these features in the montage view.

The first feature captured was the bearing of the photo point (field data collection); then a 3D profile of the surface along the bearing alignment was created in 3D DXF line format (see Figure 05 & 06). Additionally, landmark topography in each photo was captured from the terrain model in 3D Mesh DXF format to assist in the final alignment. All photos required the bearing and at least two 3D Mesh DXF models to successfully line up the photo.

Figure 05: Global Mapper Model Bearing

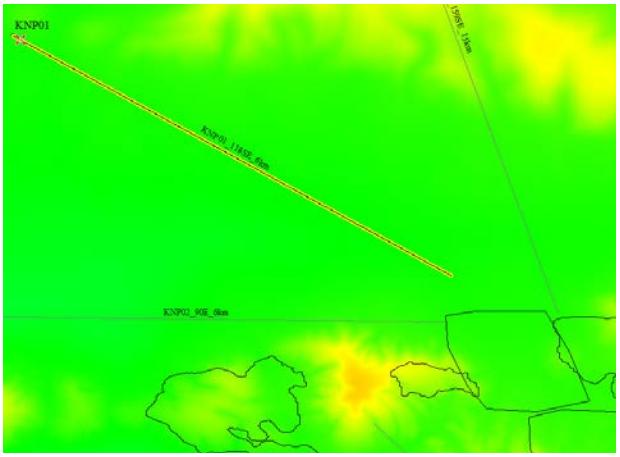
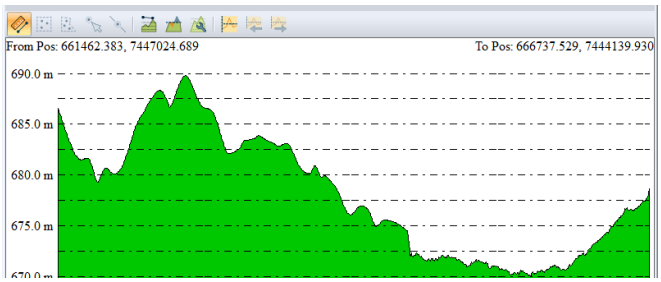


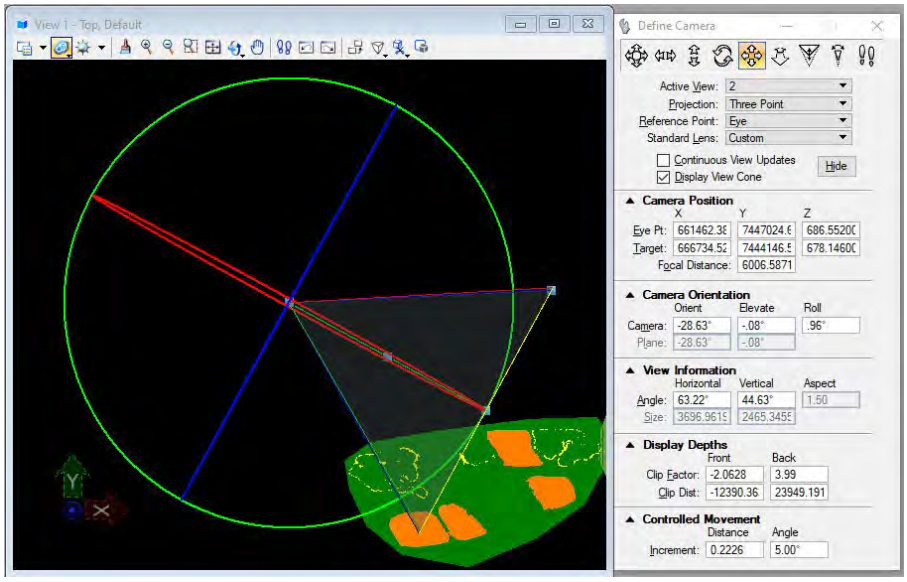
Figure 06: Global Mapper Model 3D Profile



Montage Setup

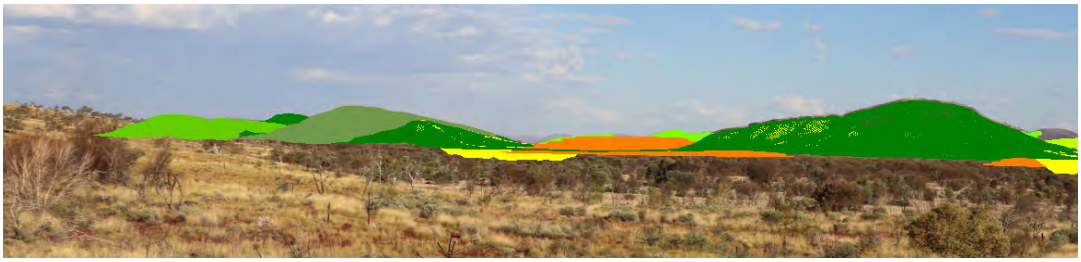
Once data were captured in Global Mapper, a montage was created in Microstation. The photo size was kept proportional to actual size, then a view was created in the image by using the Define Camera alignment tools in the construction view (see Figure 07).

Figure 07: Microstation Construction View and Camera Define Tools



The Define Camera alignment tools allowed the montage view to be altered by units distance and degrees in all directions which gave more control to exactly line up features in the image.

Figure 08: Montage View - after alignment completed



Montage Rendering

The next step was to add the proposed infrastructure to the montage view in Microstation, these data were provided from the Mine Planning Engineers and converted to 3D Mesh DXF. The rendering tool was then applied to convert the proposed infrastructure line strings to surface areas (see Figure 09). The image was then exported from Microstation to a JPG format.

Figure 09: Rendered View



Montage Output

To create the final image, the original photo was loaded into Adobe Photoshop and the rendered image from Microstation was overlaid to show the location of the proposed infrastructure. A realistic texture (of proposed infrastructure) was then placed under the original image and parts of the image were erased to expose texture in the proposed infrastructure location (See Figure 10). The final image was then exported from Adobe Photoshop to JPG format. A closure version was also created to show rehabilitated infrastructure.

Figure 10: Texture Exposed on Original Image in Adobe Photoshop



Final Mock Up

The Current View, Operations View, Closure View were then combined into the final mock up in Adobe InDesign with location map and photo location details as the final output for the Visual Impact Assessment.

Results

The results section outlines a description of the maps and figures produced during the Visual Impact Assessment. The final output produced 15 figures showing the potential visual impact of the West Angelas Beyond 2020 Proposal.

3.1 Desktop Assessment

The desktop assessment resulted in the output maps of the Planned Photo Locations and Viewshed Analysis. These assisted the team into the second phase of the Visual Impact Assessment.

Figure 11 - West Angelas Beyond 2020 Proposal Planned Photo Locations

Figure 12 - West Angelas Beyond 2020 Proposal Viewshed Analysis - Map shows the blue shaded area shows all locations where any component of the West Angelas Beyond 2020 Proposal may be visible based on the topography of the area and the dimensions of the proposed infrastructure.

3.2 Field Assessment

Sites with the greatest potential for visual impact and sites of interest were selected from the view shed analysis for field assessment. The field assessment resulted in a map of actual photo locations taken on the ground. These altered slightly from planned location in some cases due to access or view aspect. This data was used in the final phase of the Visual Impact Assessment.

Figure 13 - West Angelas Beyond 2020 Proposal Actual Photo Locations

3.3 Visual Impact

The final output from this assessment was to show the visual impact of the West Angelas Beyond 2020 hub, the following figures outline how each view will be impacted visually.

Figure 14 - Mount Meharry

Figure 15 - Mount Meharry

Figure 16 - Mount Robinson

Figure 17 - Mount Robinson

Figure 18 - Mount Robinson

Figure 19 - The Governor

Figure 20 - The Governor

Figure 21 - Great Northern Highway

Figure 22 - Great Northern Highway

Figure 23 - Deposit J

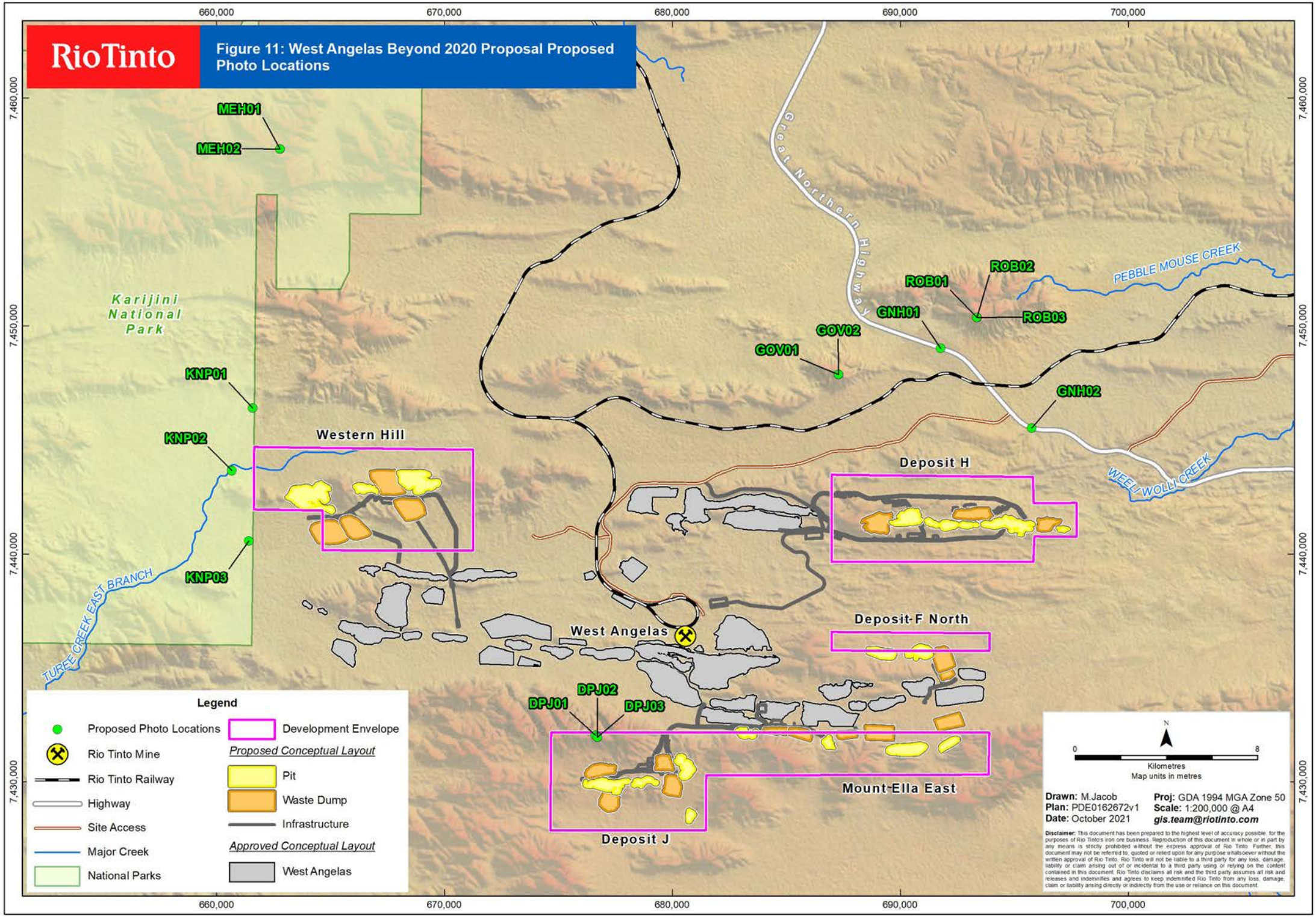
Figure 24 - Deposit J

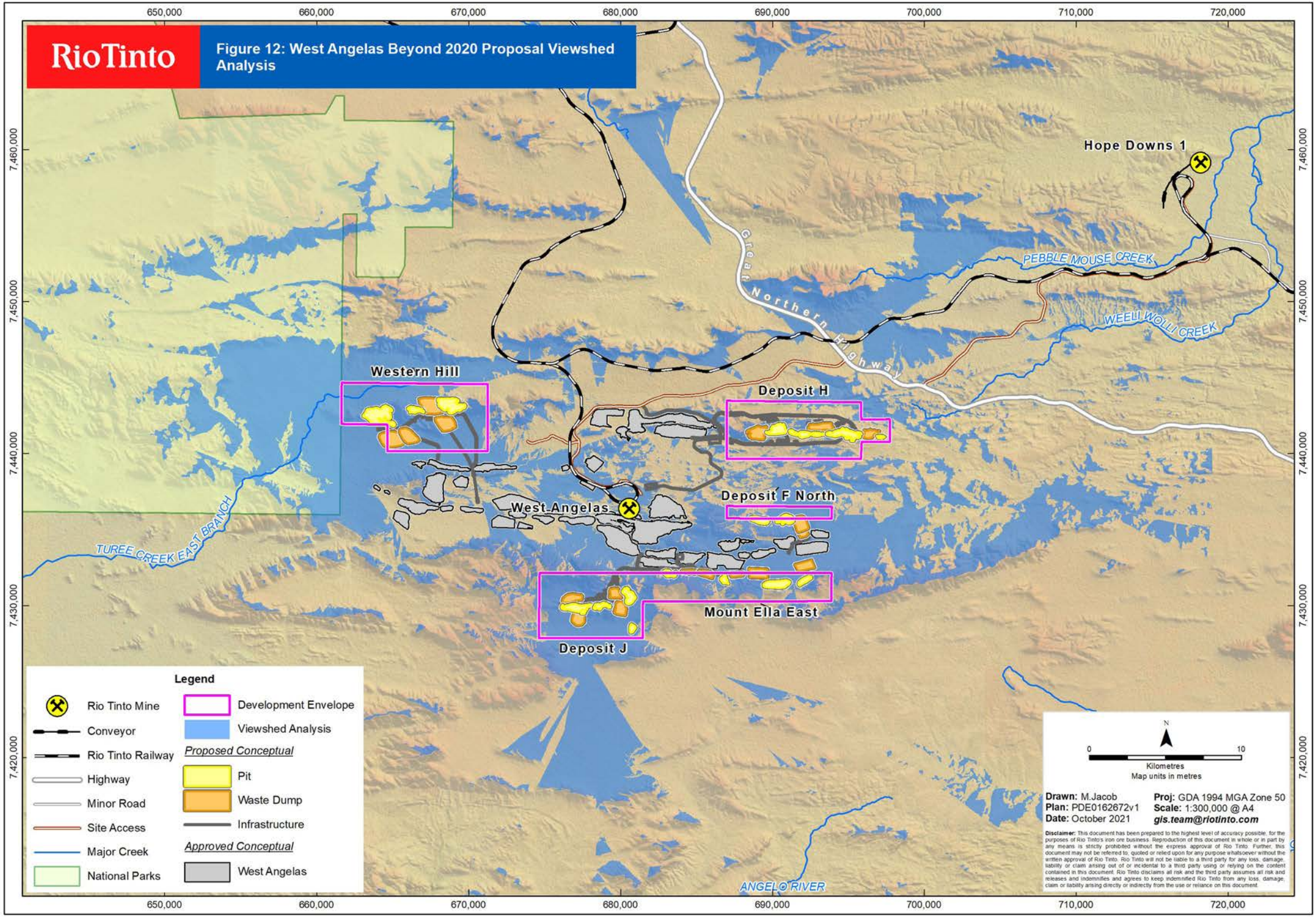
Figure 25 - Deposit J

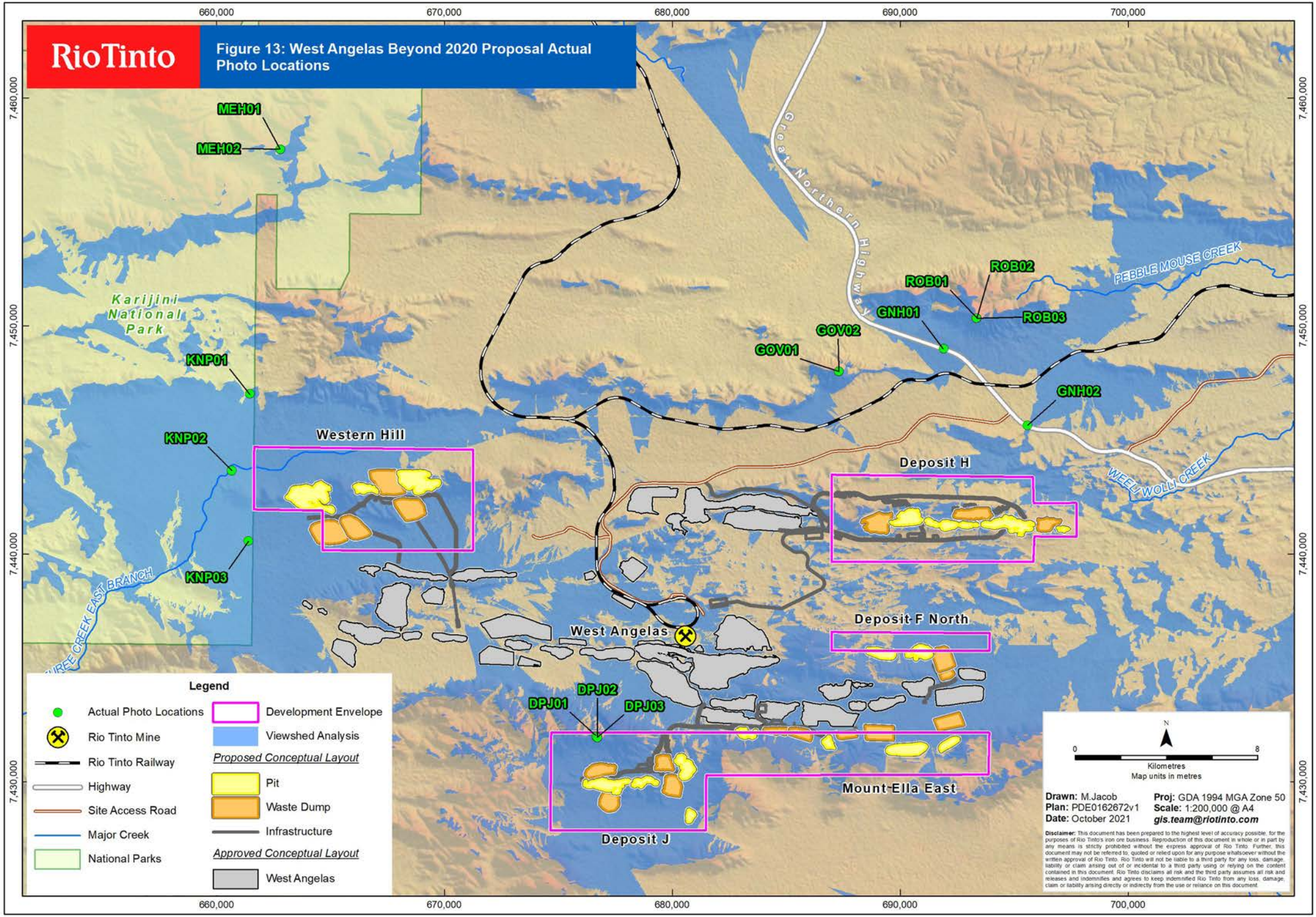
Figure 26 - Karijini National Park

Figure 27 - Karijini National Park

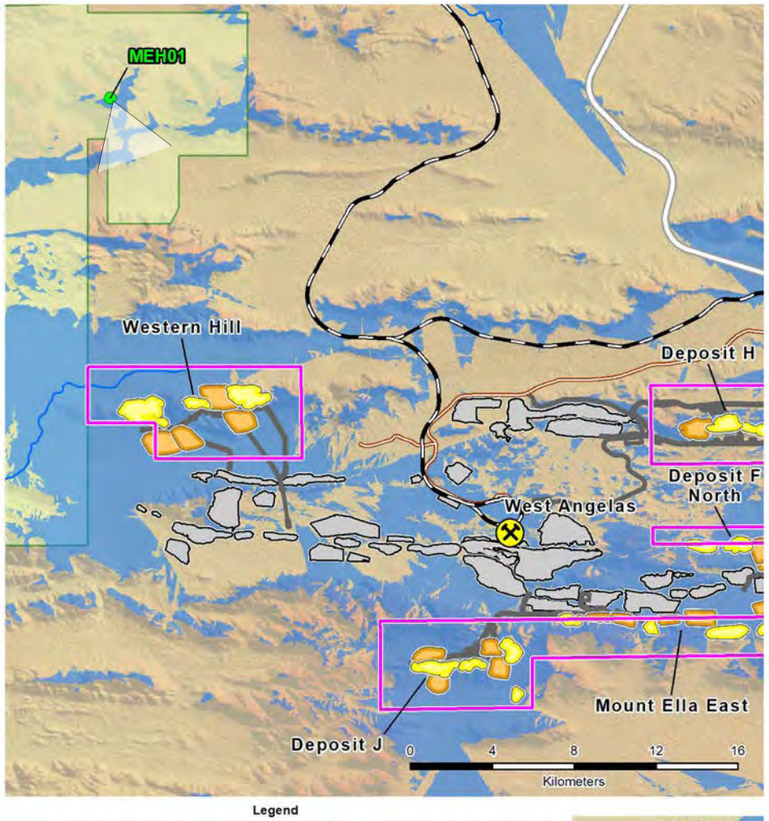
Figure 28 - Karijini National Park


RioTinto
Figure 11: West Angelas Beyond 2020 Proposal Proposed Photo Locations
660,000
670,000
680,000
690,000
700,000
7,460,000
7,450,000
7,440,000
7,430,000
MEH01
MEH02
Karijini National Park
KNP01
KNP02
KNP03
Western Hill
Great Northern Highway
PEBBLE MOUSE CREEK
ROB01
ROB02
ROB03
GNH01
GNH02
GOV01
GOV02
Deposit H
WEELI WOLLI CREEK
TUREE CREEK EAST BRANCH
West Angelas
Deposit F North
DPJ01
DPJ02
DPJ03
Mount Ella East
Deposit J
Legend
Proposed Photo Locations
Rio Tinto Mine
Rio Tinto Railway
Highway
Site Access
Major Creek
National Parks
Development Envelope
Proposed Conceptual Layout
Pit
Waste Dump
Infrastructure
Approved Conceptual Layout
West Angelas
N
0
8
Kilometres
Map units in metres
Drawn: M.Jacob
Plan: PDE0162672v1
Date: October 2021
Proj: GDA 1994 MGA Zone 50
Scale: 1:200,000 @ A4
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RioTinto
Figure 12: West Angelas Beyond 2020 Proposal Viewshed Analysis
650,000
660,000
670,000
680,000
690,000
700,000
710,000
720,000
7,460,000
7,450,000
7,440,000
7,430,000
7,420,000
Hope Downs 1
PEBBLE MOUSE CREEK
Great Northern Highway
WEELI WOLLI CREEK
Western Hill
Deposit H
West Angelas
Deposit F North
TUREE CREEK EAST BRANCH
Mount Ella East
Deposit J
ANGELO RIVER
Legend
Rio Tinto Mine
Conveyor
Rio Tinto Railway
Highway
Minor Road
Site Access
Major Creek
National Parks
Development Envelope
Viewshed Analysis
Proposed Conceptual
Pit
Waste Dump
Infrastructure
Approved Conceptual
West Angelas
N
0
10
Kilometres
Map units in metres
Drawn: M.Jacob
Plan: PDE0162672v1
Date: October 2021
Proj: GDA 1994 MGA Zone 50
Scale: 1:300,000 @ A4
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RioTinto
Figure 13: West Angelas Beyond 2020 Proposal Actual Photo Locations
660,000
670,000
680,000
690,000
700,000
7,460,000
7,450,000
7,440,000
7,430,000
MEH01
MEH02
Karijini National Park
KNP01
KNP02
KNP03
Western Hill
Great Northern Highway
PEBBLE MOUSE CREEK
ROB01
ROB02
ROB03
GNH01
GNH02
GOV01
GOV02
Deposit H
WEELI WOLLI CREEK
Deposit F North
West Angelas
DPJ01
DPJ02
DPJ03
Mount Ella East
Deposit J
Legend
Actual Photo Locations
Rio Tinto Mine
Rio Tinto Railway
Highway
Site Access Road
Major Creek
National Parks
Development Envelope
Viewshed Analysis
Proposed Conceptual Layout
Pit
Waste Dump
Infrastructure
Approved Conceptual Layout
West Angelas
N
0
8
Kilometres
Map units in metres
Drawn: M.Jacob
Plan: PDE0162672v1
Date: October 2021
Proj: GDA 1994 MGA Zone 50
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Location Map



View Aspect

Viewpoint Characteristics

Name	01 - MEH01 - Mount Meharry
Co-ordinates	662,796.60mE / 7,457,755.00mN
Direction	South East (Bearing 159°)
Description	Located on top of Mount Meharry with clear view towards West Angelas Beyond 2020 Proposal. Medium level vegetation with view well above tree line.
Site Significance	Located within Karijini National Park, this site is regularly visited by tourist as it is Western Australia's highest point.
Comments	Clear view to the proposed Western Hill operations. Very hot and windy.

Figure 14 - Mount Meharry

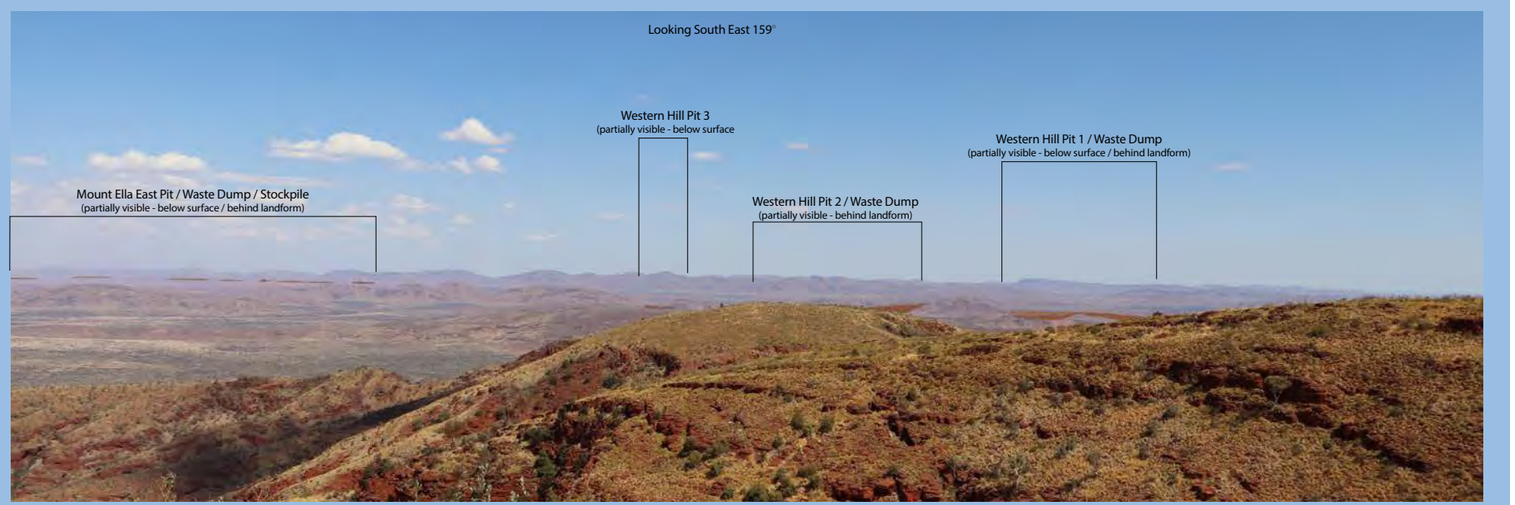
Current View



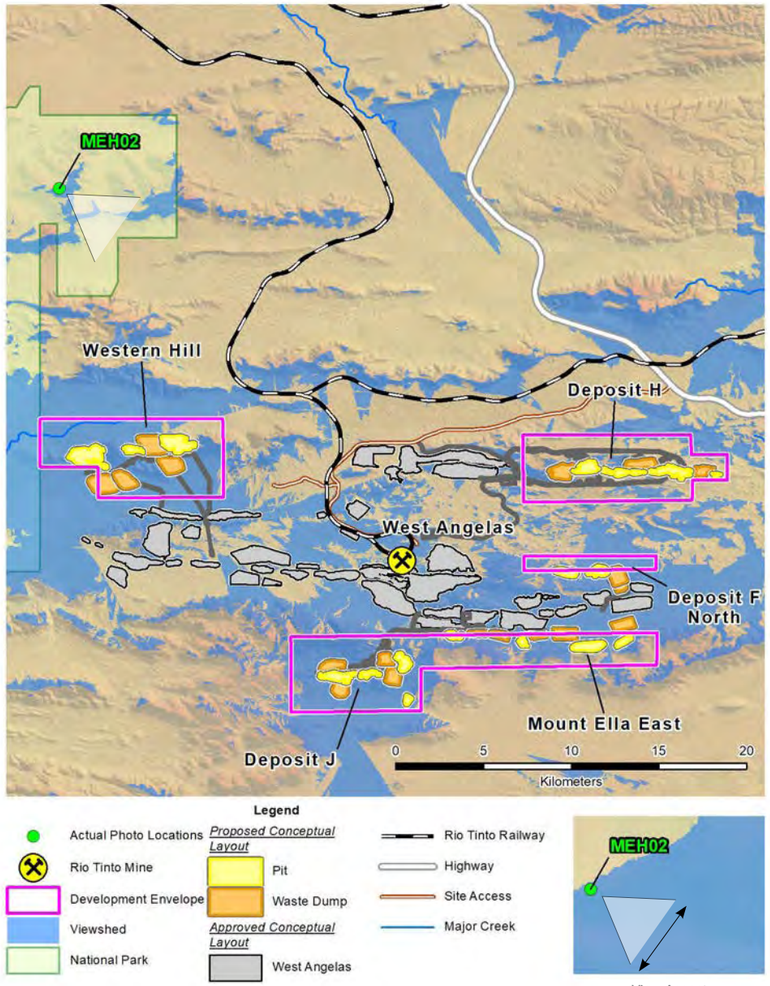
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

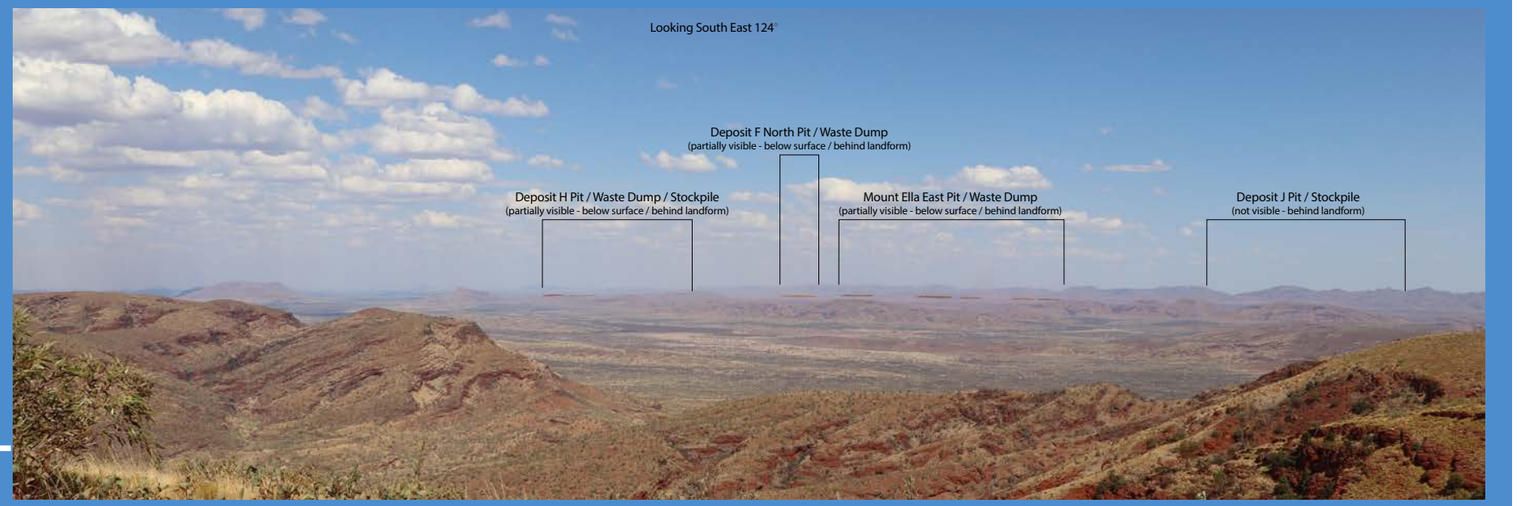
Name	02 - MEH02 - Mount Meharry
Co-ordinates	662,796.60mE / 7,457,755.00mN
Direction	South East (Bearing 124°)
Description	Located on top of Mount Meharry with clear view towards West Angelas Beyond 2020 Proposal. Medium level vegetation with view well above tree line.
Site Significance	Located within Karijini National Park, this site is regularly visited by tourist as it is Western Australia's highest point.
Comments	Clear view with Mount Robinson and Hope Downs 2 to the left. Very hot and windy.

Figure 15 - Mount Meharry

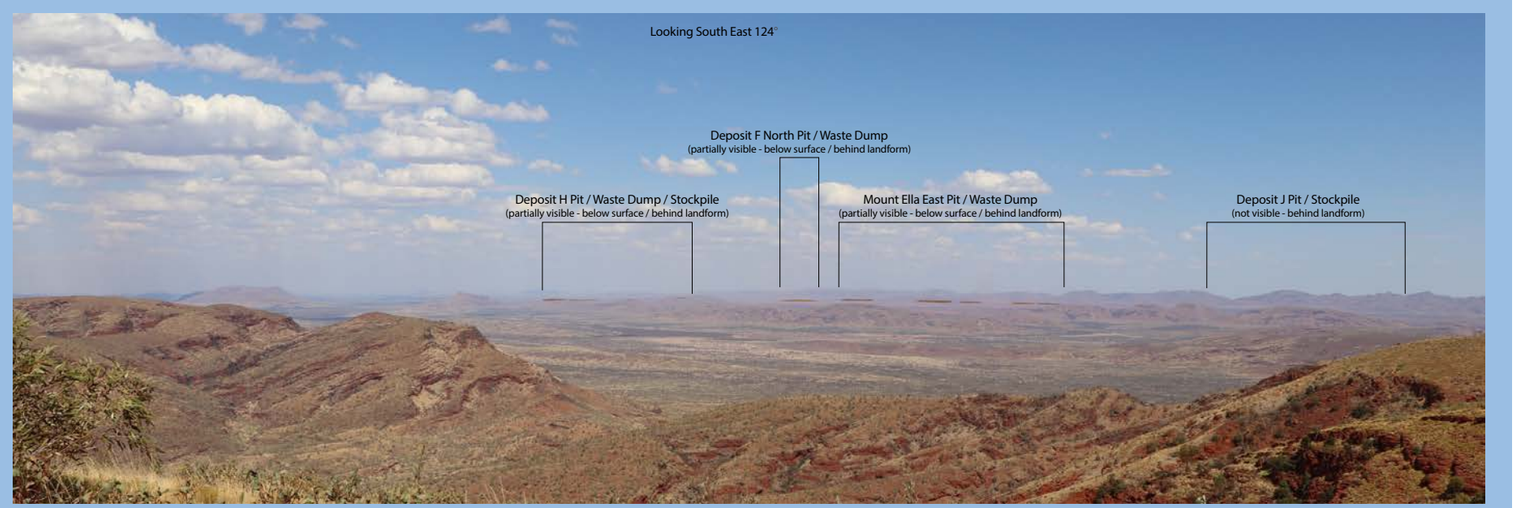
Current View



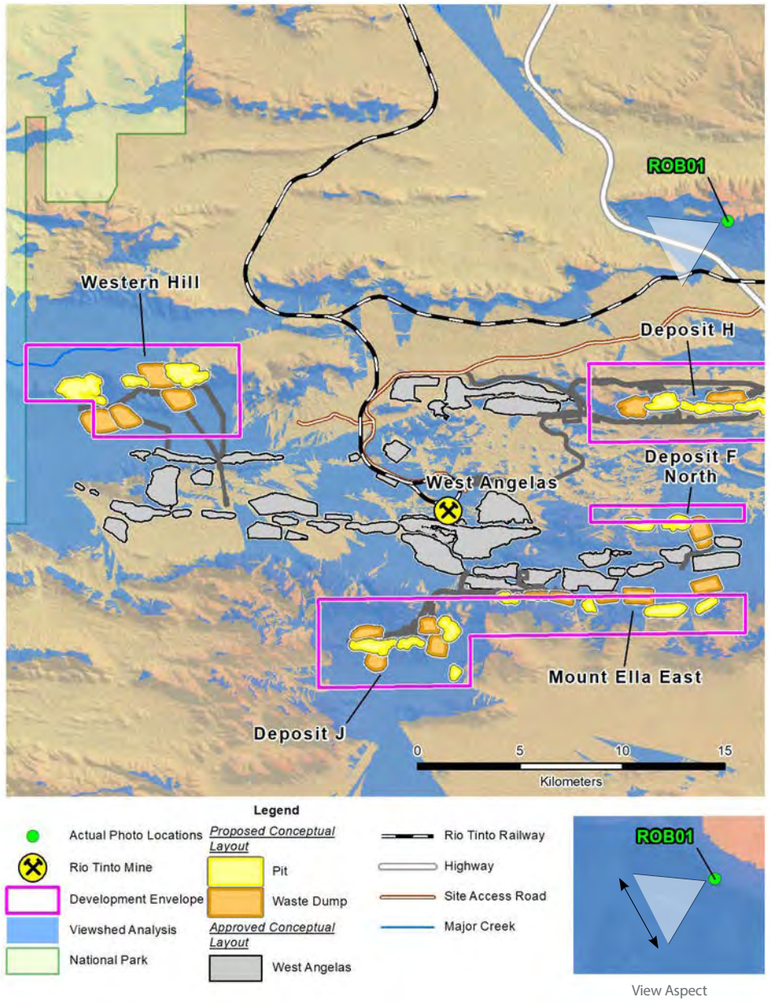
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

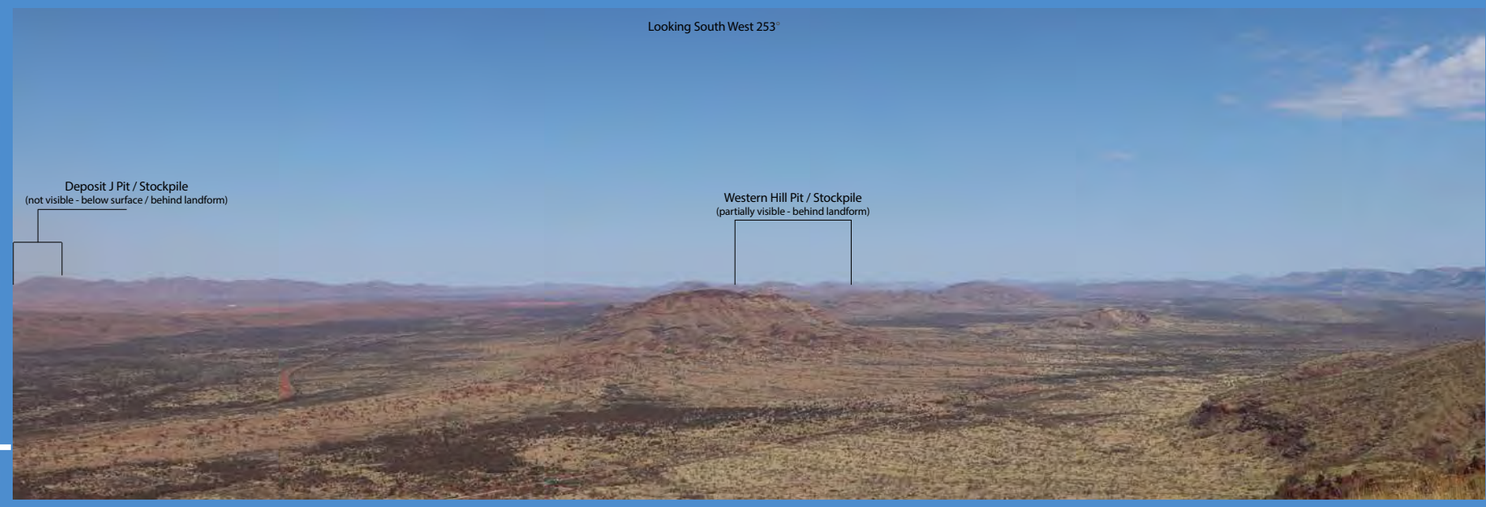
Name	03 - ROB01 - Mount Robinson
Co-ordinates	693,349.30mE / 7,450,333.00mN
Direction	South West (Bearing 253°)
Description	Located on top of Mount Robinson with clear view towards proposed Western Hill operations. Medium level vegetation with view above tree line.
Site Significance	Mount Robinson is a significant traditonal owner site the Yinhawangka People and Banjima People.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 16 - Mount Robinson

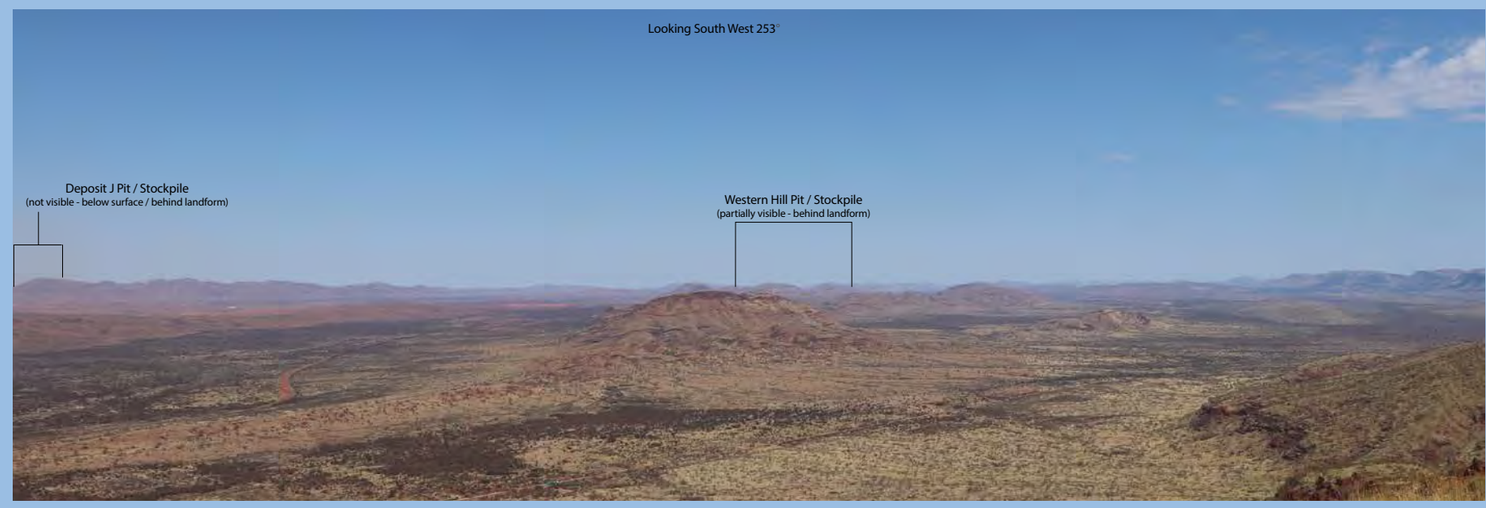
Current View



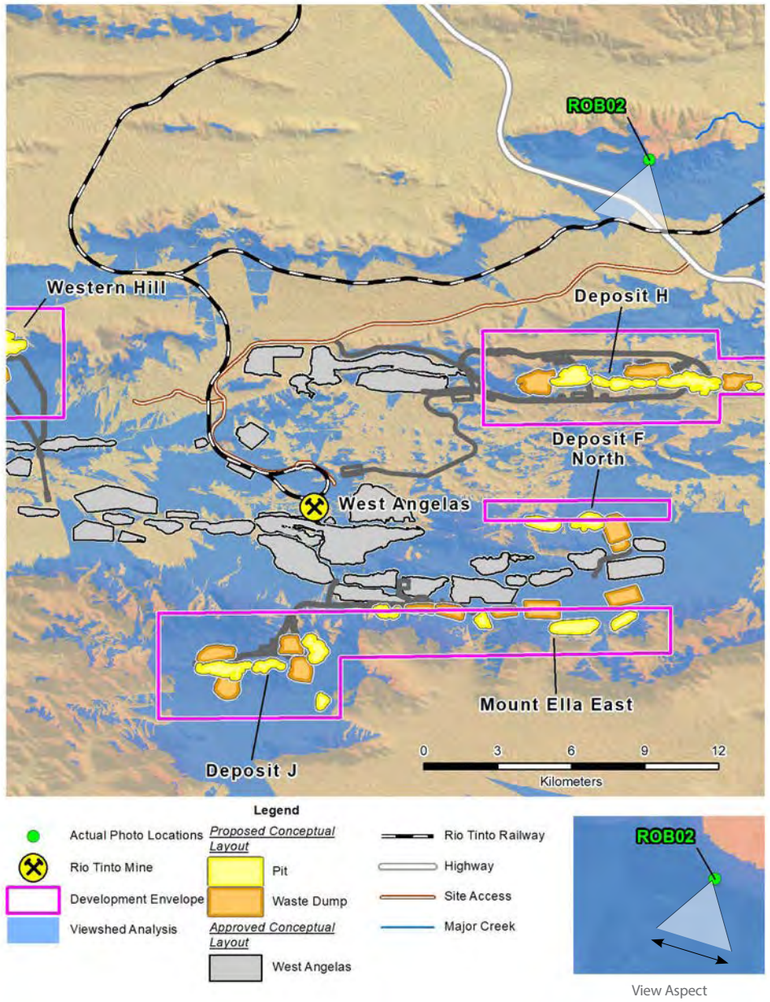
Operations View



Closure View



Location Map



Viewpoint Characteristics

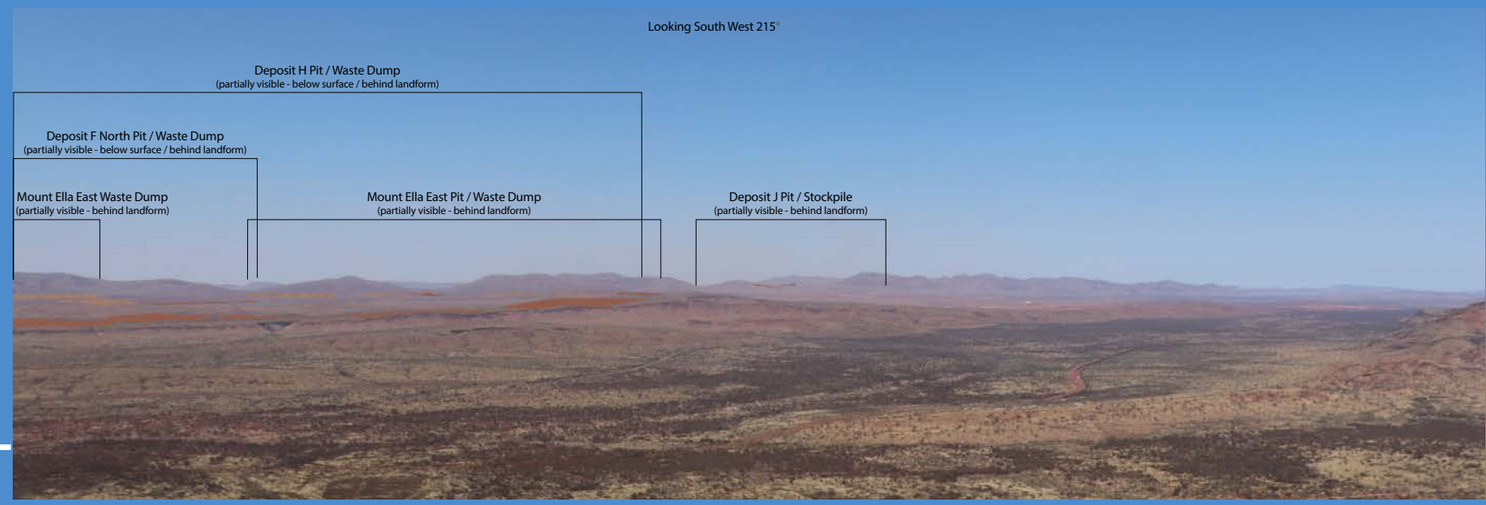
Name	05 - ROB02 - Mount Robinson
Co-ordinates	693,349.30mE / 7,450,333.00mN
Direction	South West (Bearing 215°)
Description	Located on top of Mount Robinson with clear view towards proposed Deposit J operations. Medium level vegetation with view above tree line.
Site Significance	Mount Robinson is a significant traditonal owner site the Yinhawangka People and Banjima People.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 17 - Mount Robinson

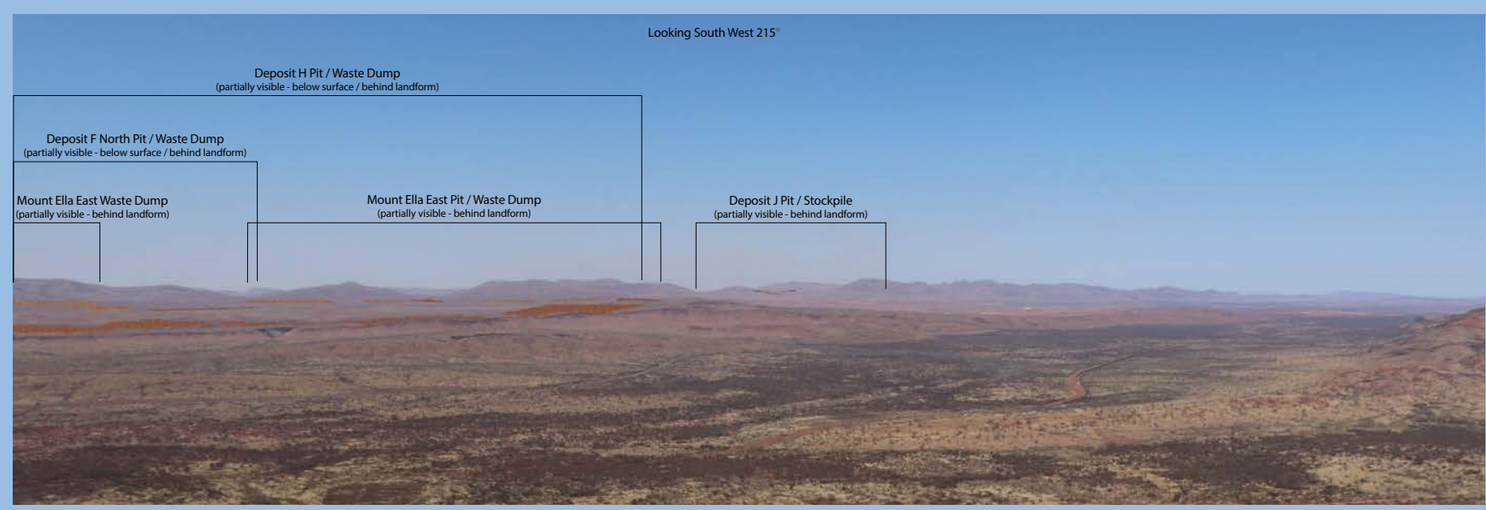
Current View



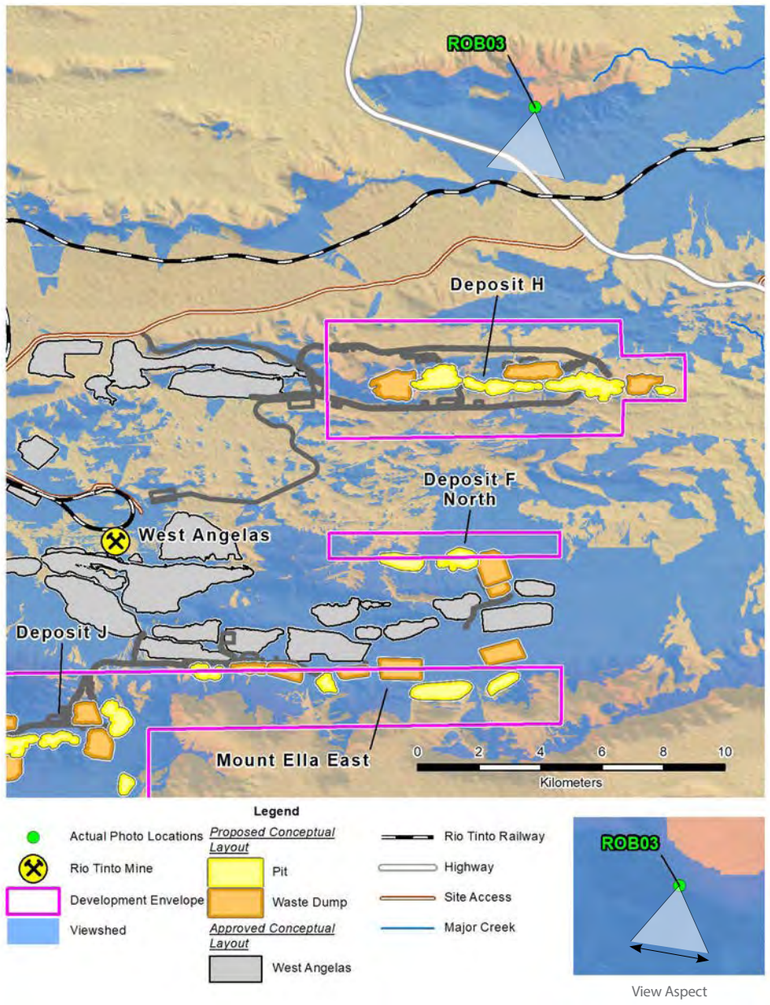
Operations View



Closure View



Location Map



Viewpoint Characteristics

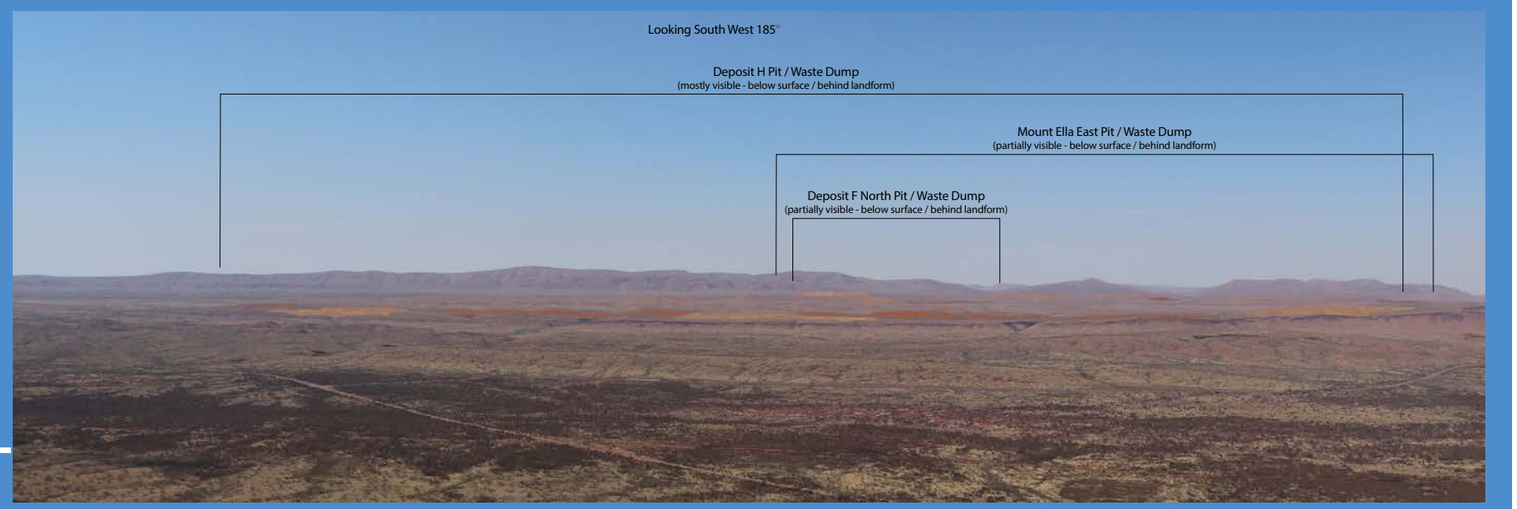
Name	05 - ROB03 - Mount Robinson
Co-ordinates	693,349.30mE / 7,450,333.00mN
Direction	South West (Bearing 185°)
Description	Located on top of Mount Robinson with clear view towards proposed Deposit H operations. Medium level vegetation with view above tree line.
Site Significance	Mount Robinson is a significant traditonal owner site the Yinhawangka People and Banjima People.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy

Figure 18 - Mount Robinson

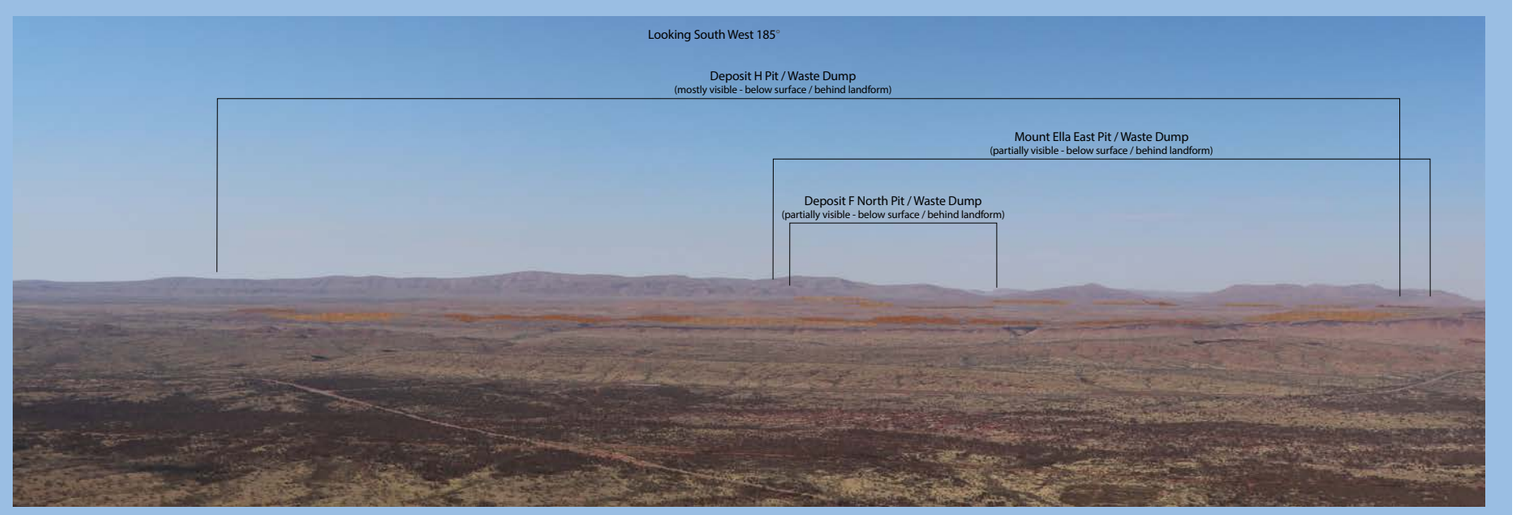
Current View



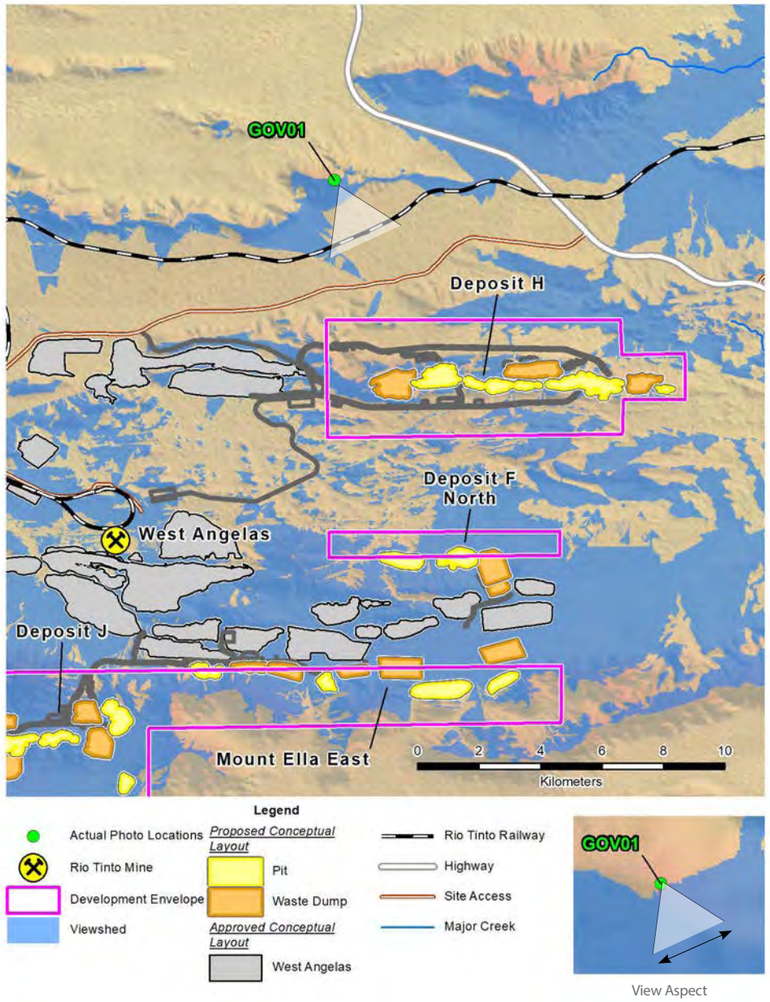
Operations View



Closure View



Location Map



Viewpoint Characteristics

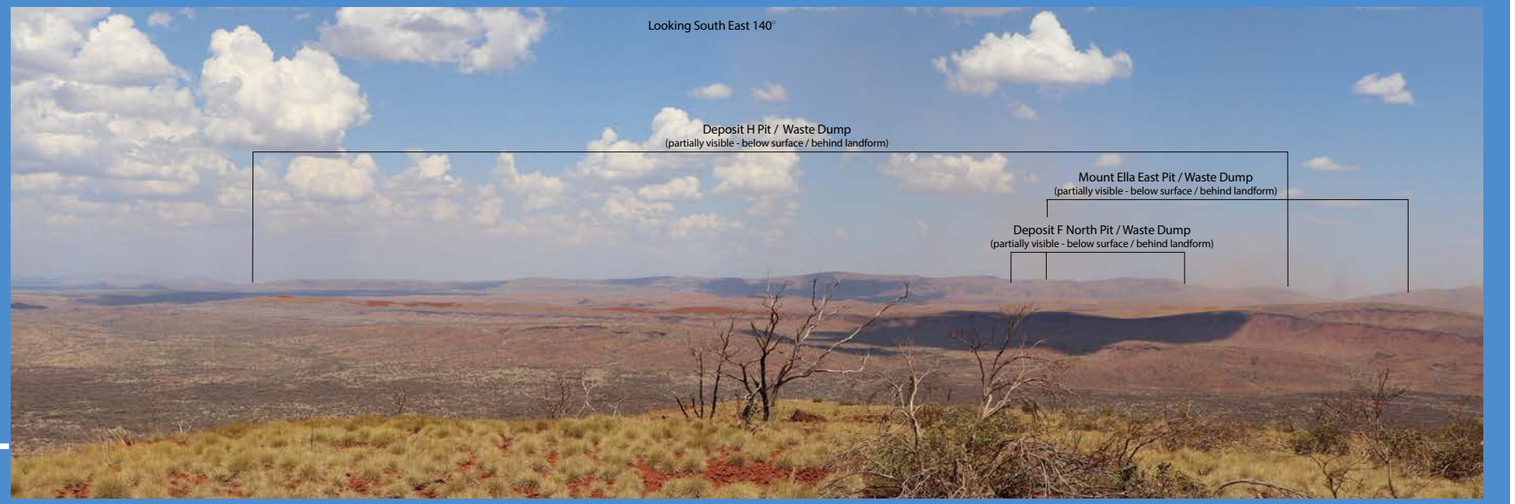
Name	06 - GOV01 - The Governor
Co-ordinates	687,295.40mE / 7,448,002.00mN
Direction	South East (Bearing 140°)
Description	Located on top of The Governor with clear views towards proposed Deposit J operations. Low level vegetation with view above tree line.
Site Significance	The Governor is a significant traditional owner site to the Yinhawangka People.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 19 - The Governor

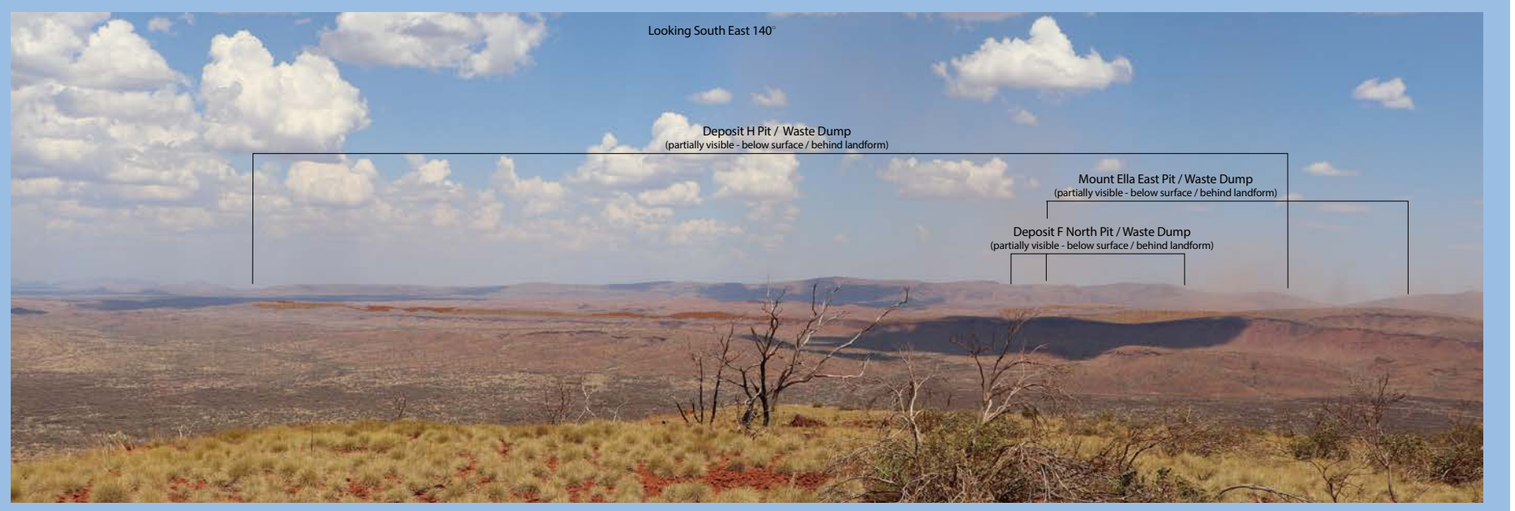
Current View



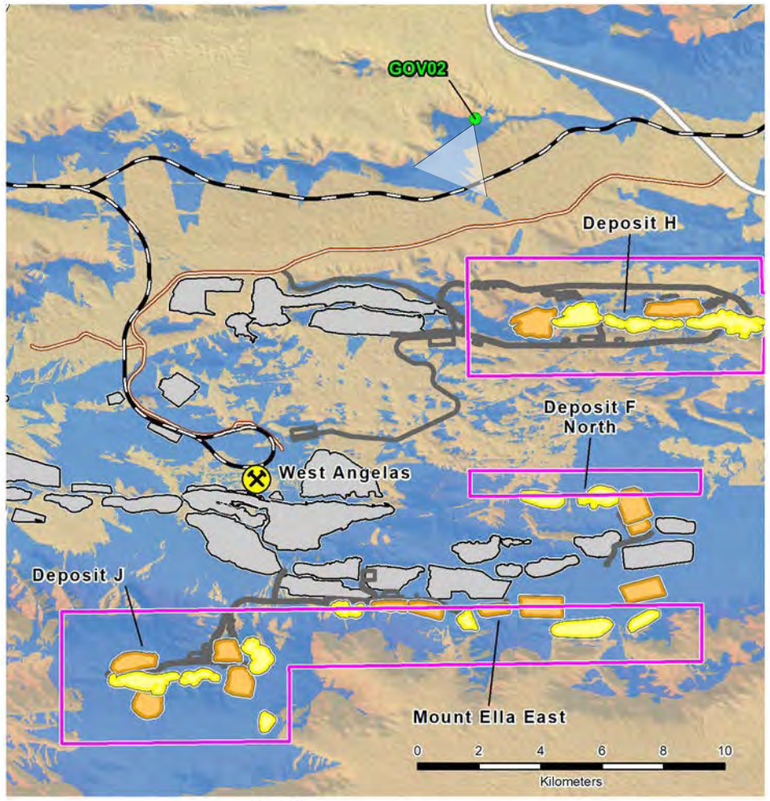
Operations View



Closure View



Location Map



Legend

- Actual Photo Locations
- Rio Tinto Mine
- Development Envelope
- Viewshed
- *Proposed Conceptual Layout*
  - Pit
  - Waste Dump
- *Approved Conceptual Layout*
  - West Angelas
- Rio Tinto Railway
- Highway
- Site Access
- Major Creek



View Aspect

Viewpoint Characteristics

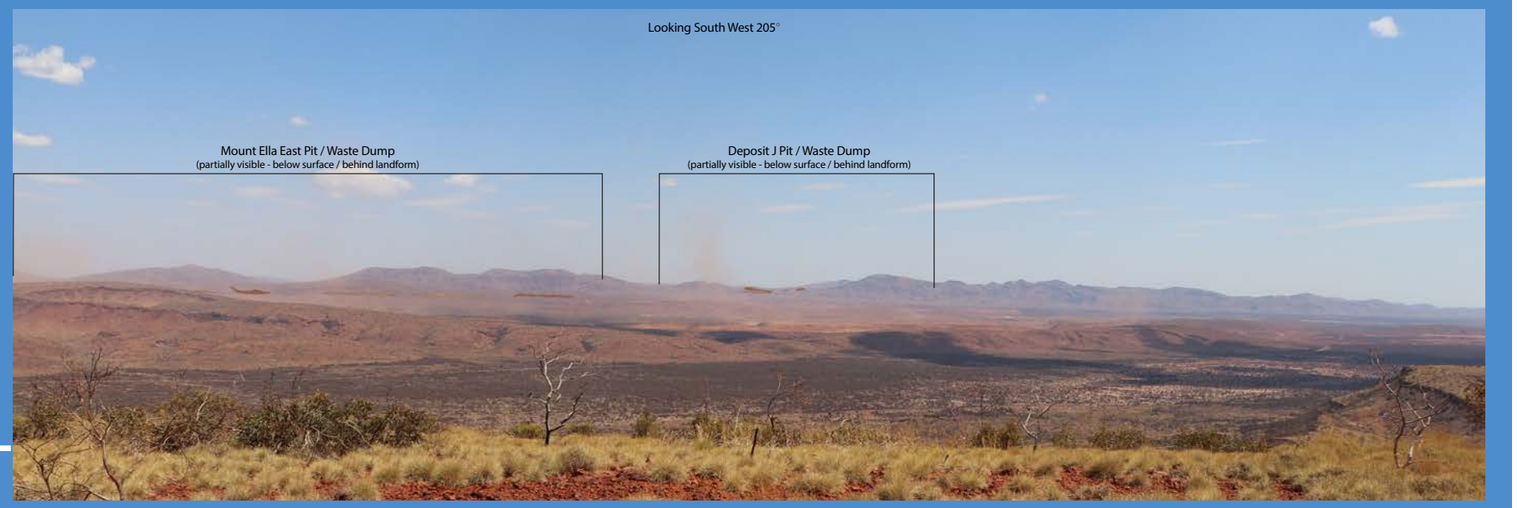
Name	07 - GOV02 - The Governor
Co-ordinates	687,295.50mE / 7,448,002.00mN
Direction	South West (Bearing 205°)
Description	Located on top of The Governor with clear views towards proposed Deposit H operations. Low level vegetation with view above tree line.
Site Significance	The Governor is a significant traditional owner site to the Yinhawangka People.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 20 - The Governor

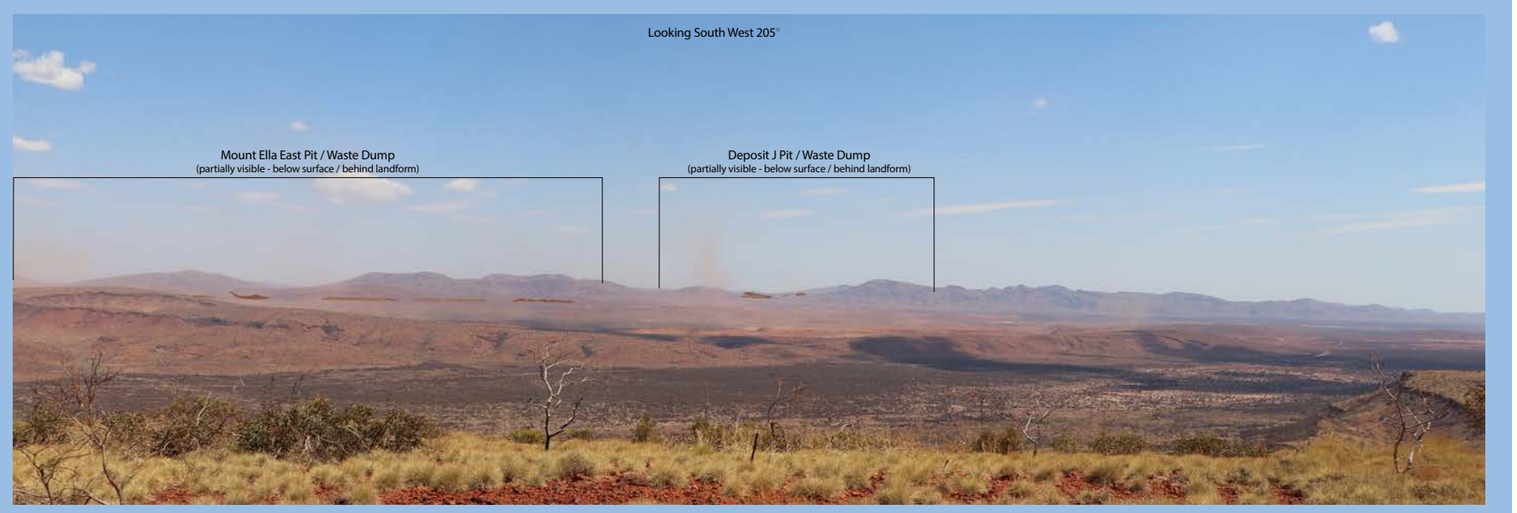
Current View



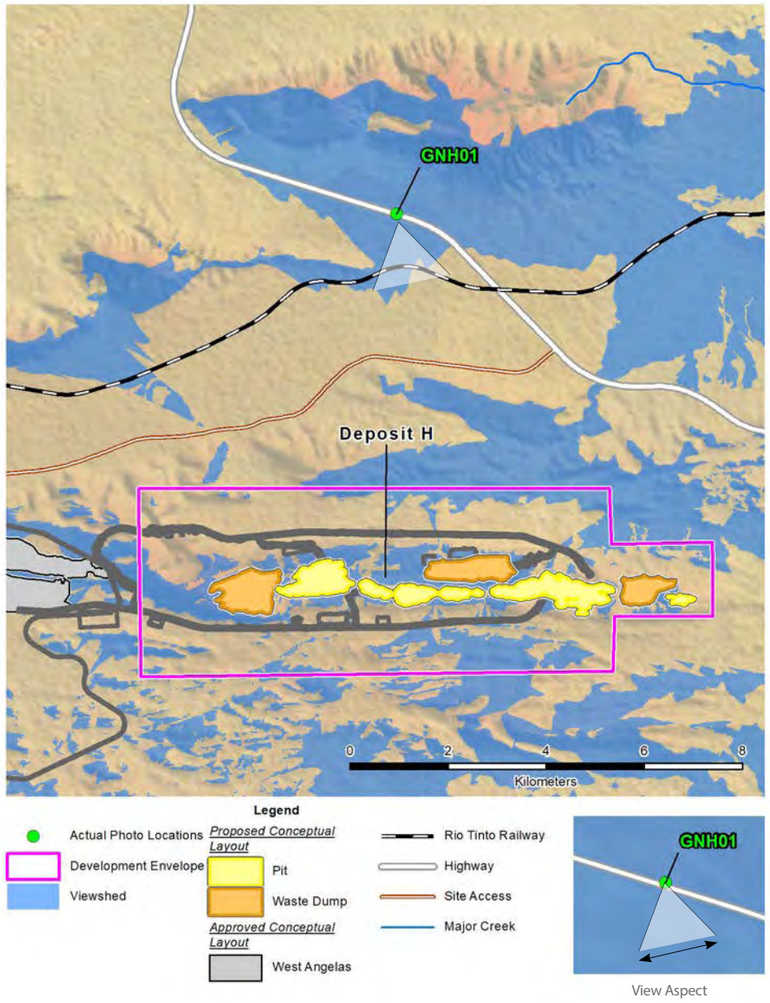
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

Name	08 - GNH01 - Great Northern Highway
Co-ordinates	691,902.20mE / 7,448,993.00mN
Direction	South East (Bearing 175°)
Description	Located on the northern side of the Great Northern Highway, looking towards proposed Deposit H operations. High level vegetation with limited view through tree line.
Site Significance	The Great Northern Highway provides public access between the towns of Port Hedland and Newman, it also provides tourist access to Karijni National Park.
Comments	Limited view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 21 - Great Northern Highway

Current View



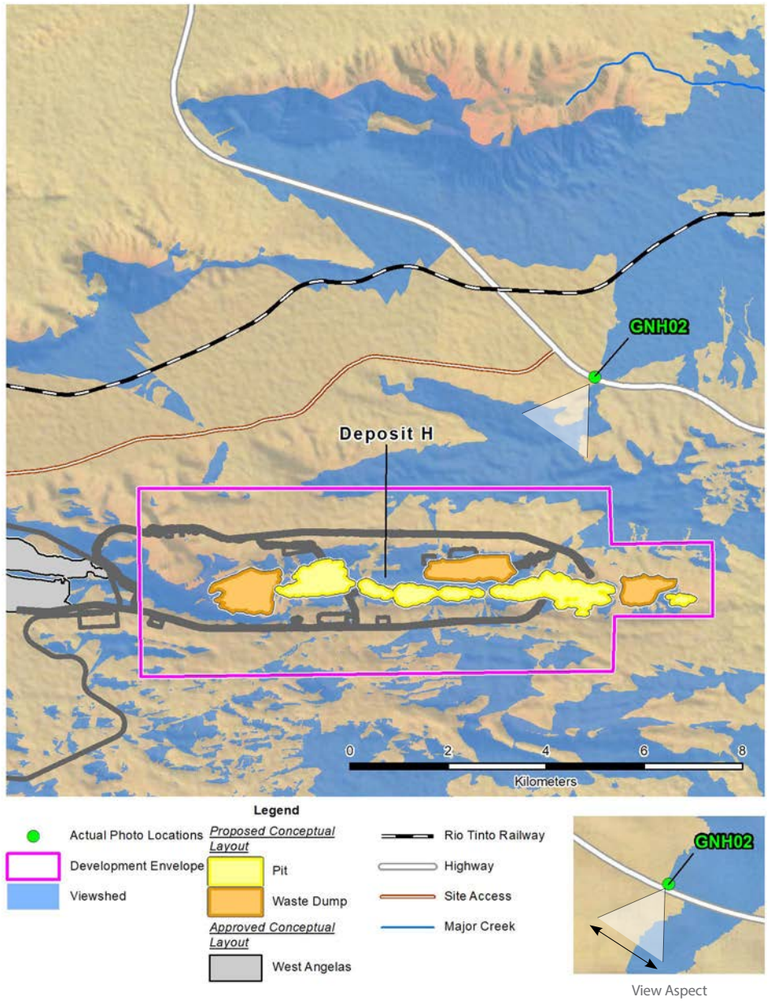
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

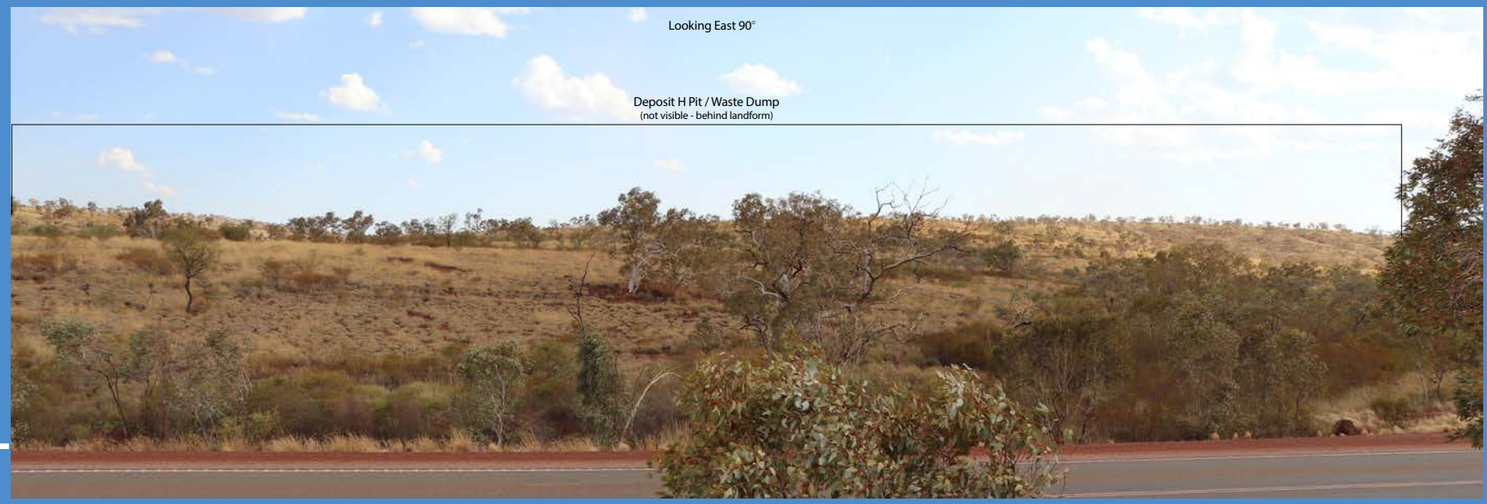
Name	09 - GNH02 - Great Northern Highway
Co-ordinates	695,576.90mE / 7,445,632.00mN
Direction	South West (Bearing 220°)
Description	Located on the northern side of the Great Northern Highway, looking towards proposed Deposit H operations. High level vegetation with limited view through tree line.
Site Significance	The Great Northern Highway provides public access between the towns of Port Hedland and Newman, it also provides tourist access to Karijni National Park.
Comments	Limited view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 22 - Great Northern Highway

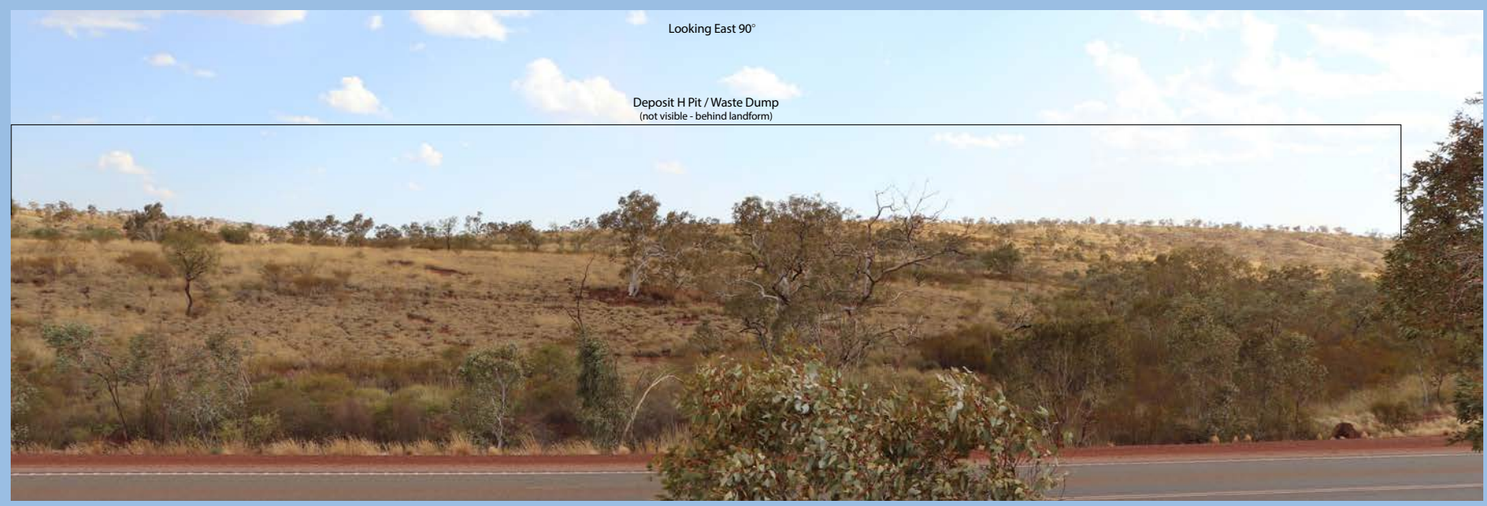
Current View



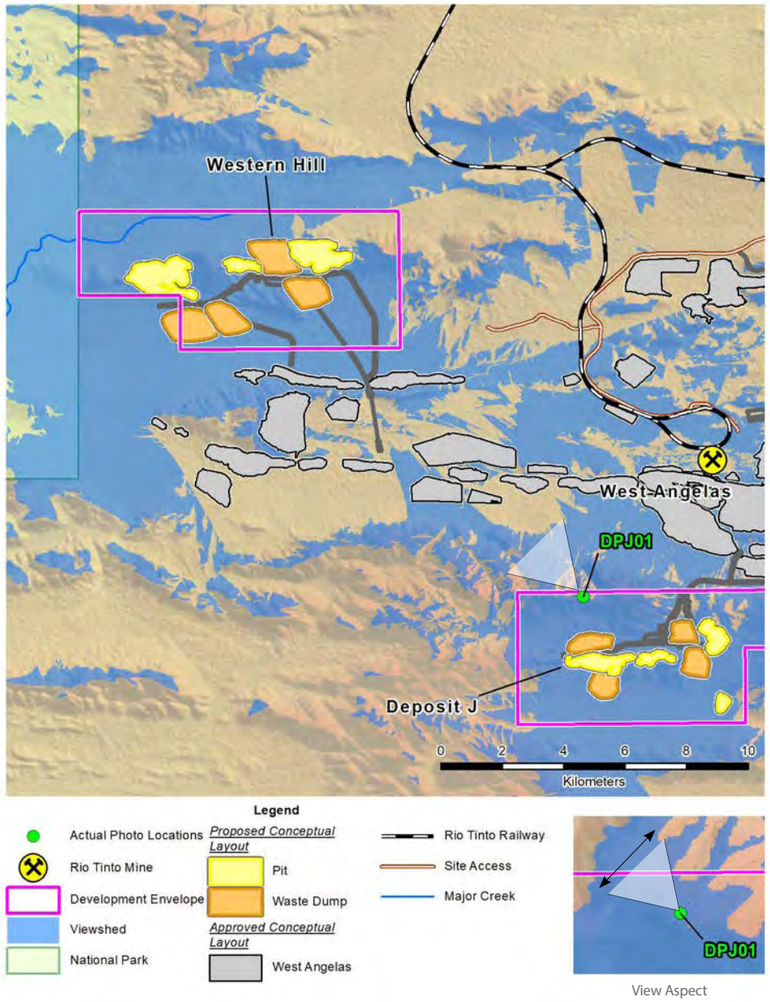
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

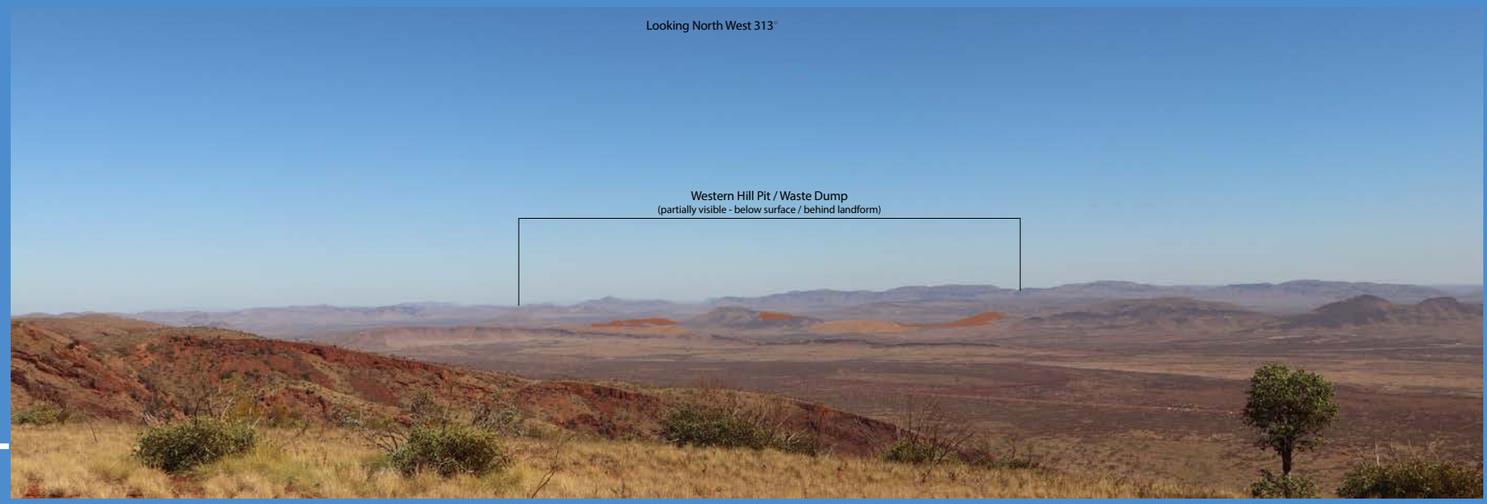
Name	10 - DPJ01 - Deposit J
Co-ordinates	676,658.60mE / 7,432,001.00mN
Direction	North West (Bearing 313°)
Description	Located north of the proposed Deposit J operations, looking towards Western Hill. Low level vegetation with clear view.
Site Significance	Located at a significant traditional owner site to the Yinhawangka People.
Comments	Clear view towards Western Hill within the West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 23 - Deposit J

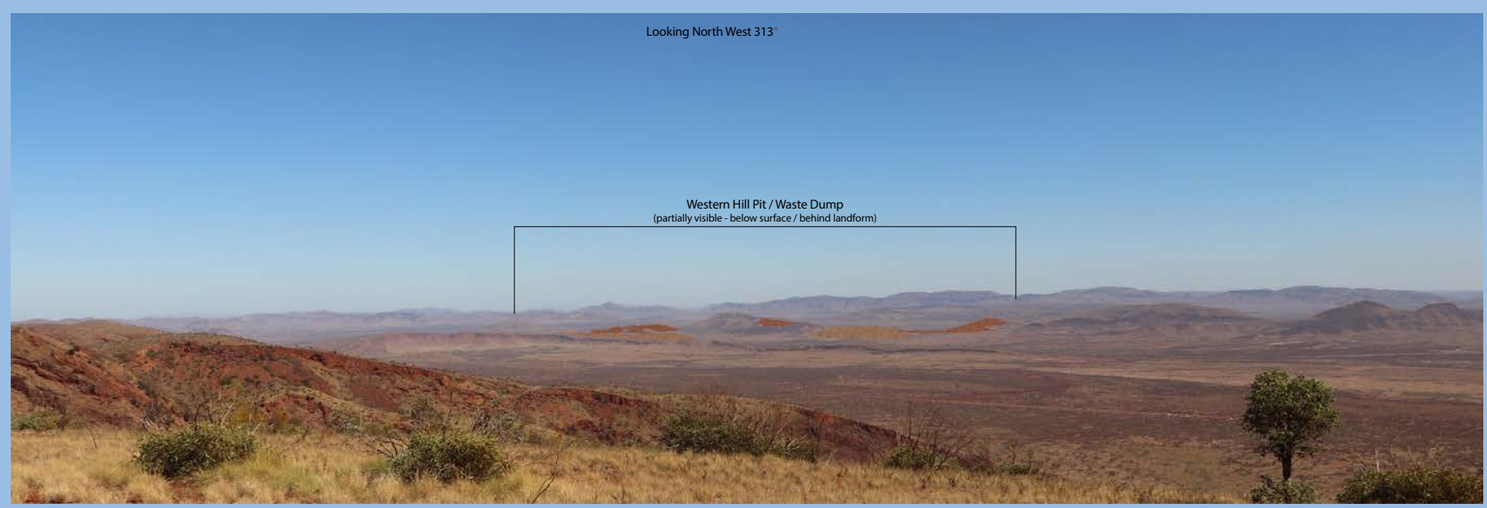
Current View



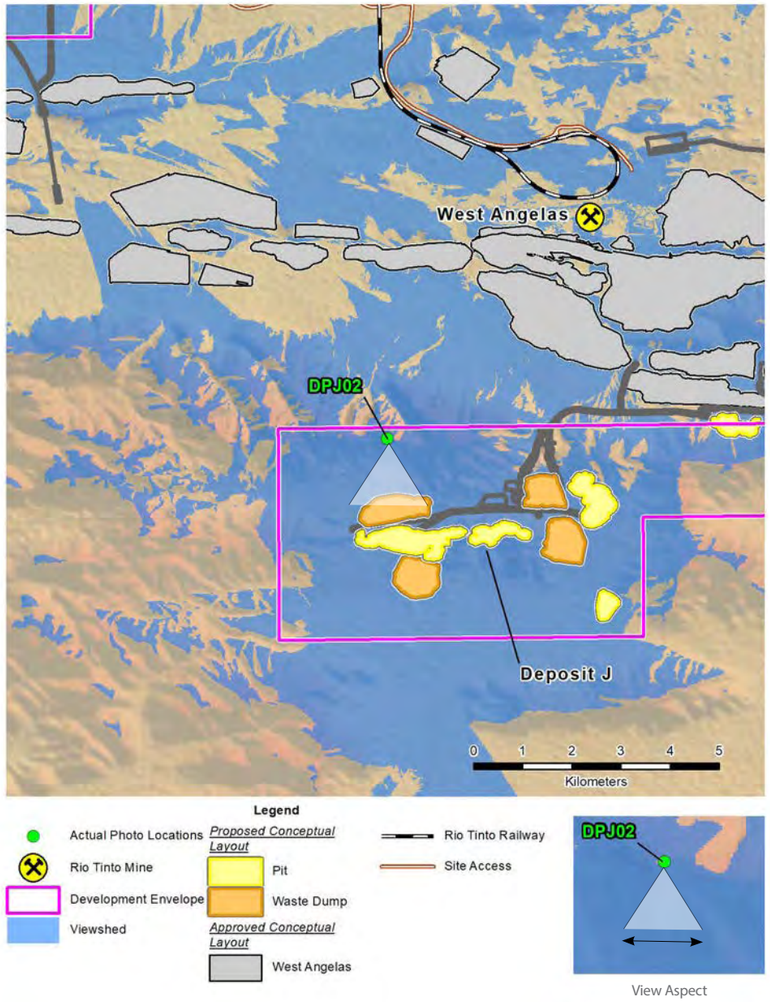
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

Name	11 - DPJ02 - Deposit J
Co-ordinates	676,715.40mE / 7,431,948.00mN
Direction	South (Bearing 180°)
Description	Located north of the proposed Deposit J operations, looking south to proposed Deposit J operations. Low level vegetation with clear view.
Site Significance	Located at a significant traditional owner site to the Yinhawangka People.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 24 - Deposit J

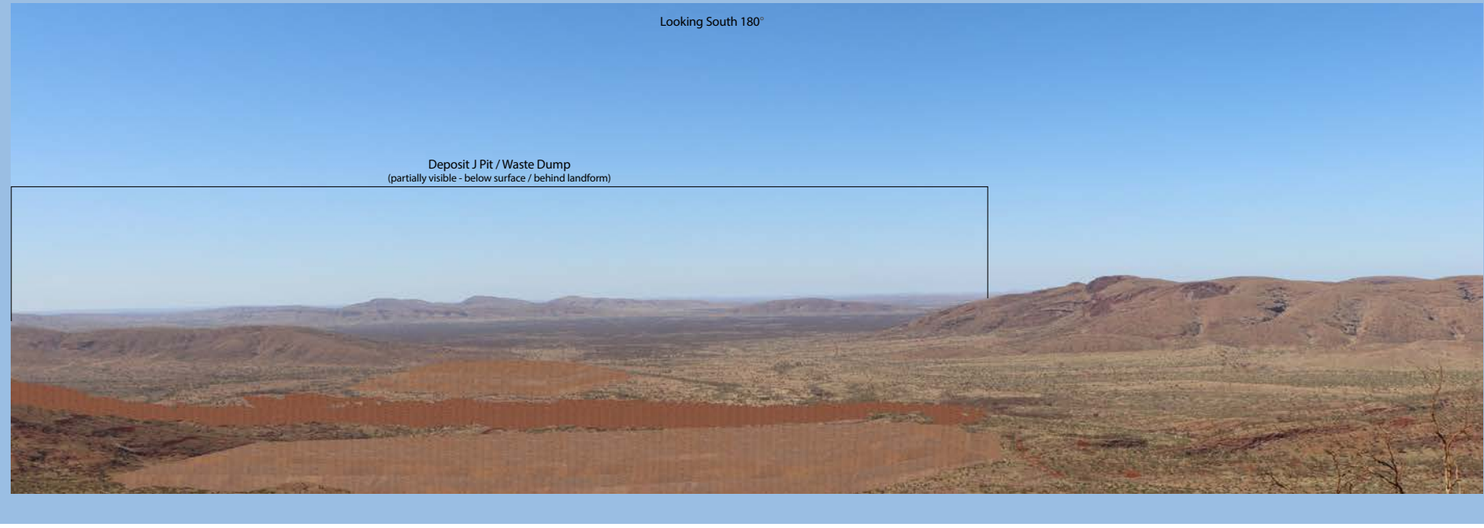
Current View



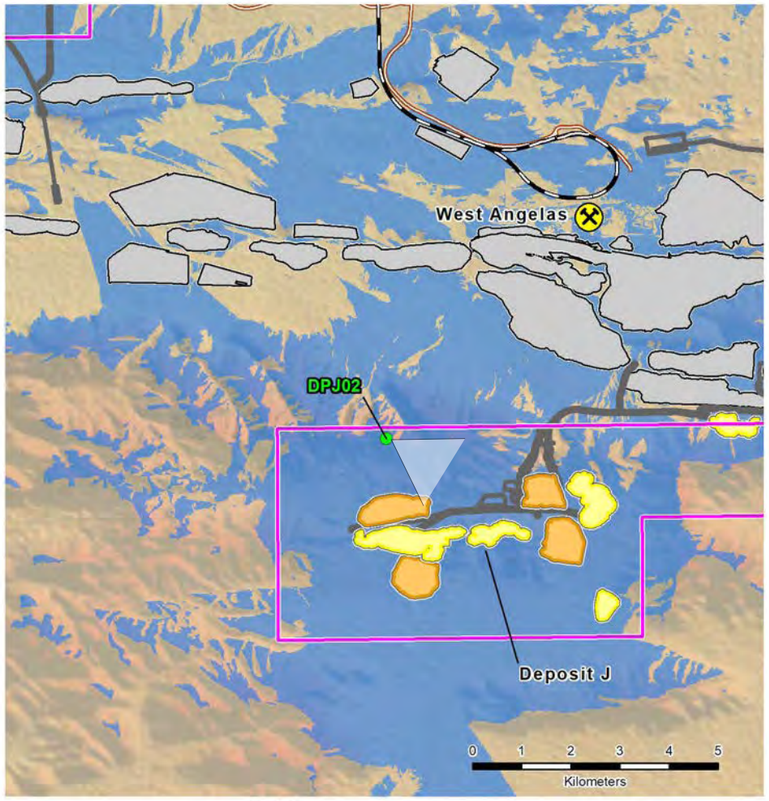
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

Name	12 - DPJ03 - Deposit J
Co-ordinates	676,715.40mE / 7,431,948.00mN
Direction	South East (Bearing 118°)
Description	Located north of the proposed Deposit J operations, looking towards proposed Deposit J operations. Low level vegetation with clear view.
Site Significance	Located at a significant traditional owner site to the Yinhawangka People.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 25 - Deposit J

Current View



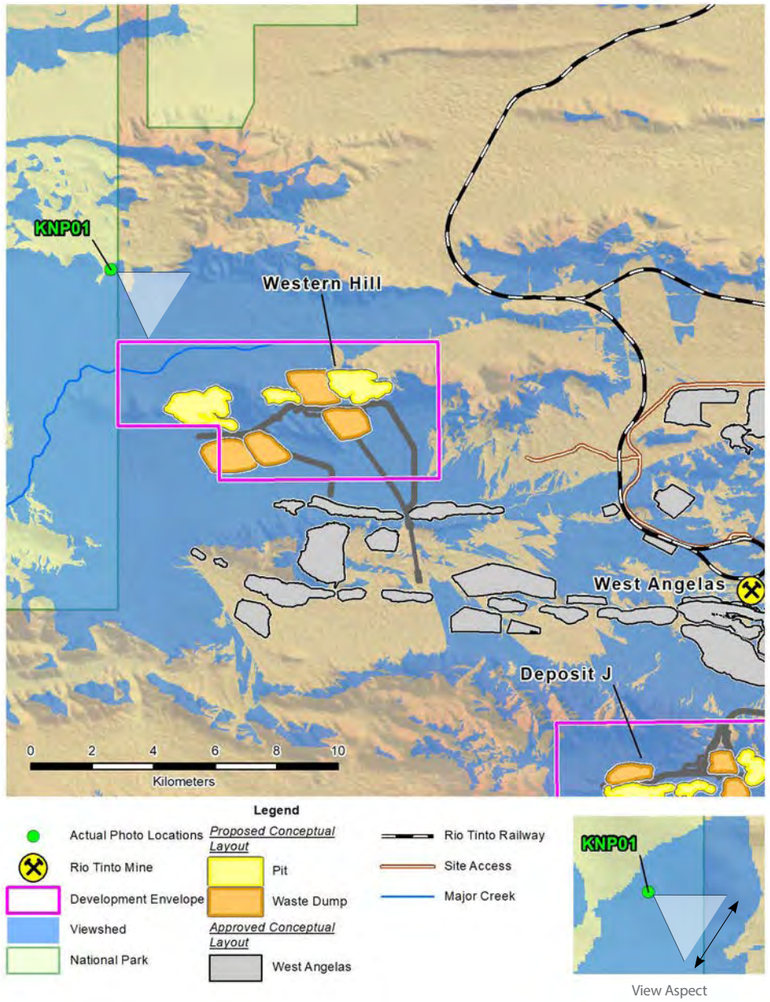
Operations View



Closure View



Location Map



Viewpoint Characteristics

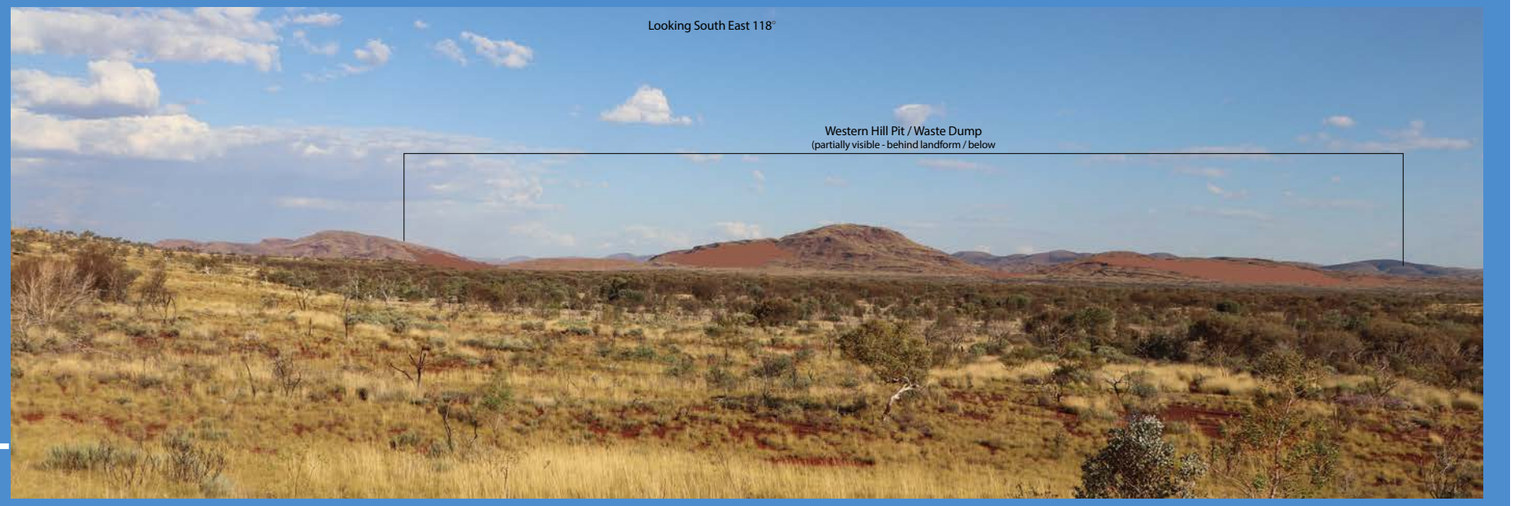
Name	13 - KNP01 - Karijini National Park
Co-ordinates	661,462.40mE / 7,447,025.00mN
Direction	South East (Bearing 118°)
Description	Located at the Western boundary of Karijini National Park, looking towards proposed Western Hill operarions. Medium level vegetation with clear view.
Site Significance	Located within Karijini National Park, this site is regularly visited by tourist as it is Western Australia's highest point.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 26 - Karijini National Park

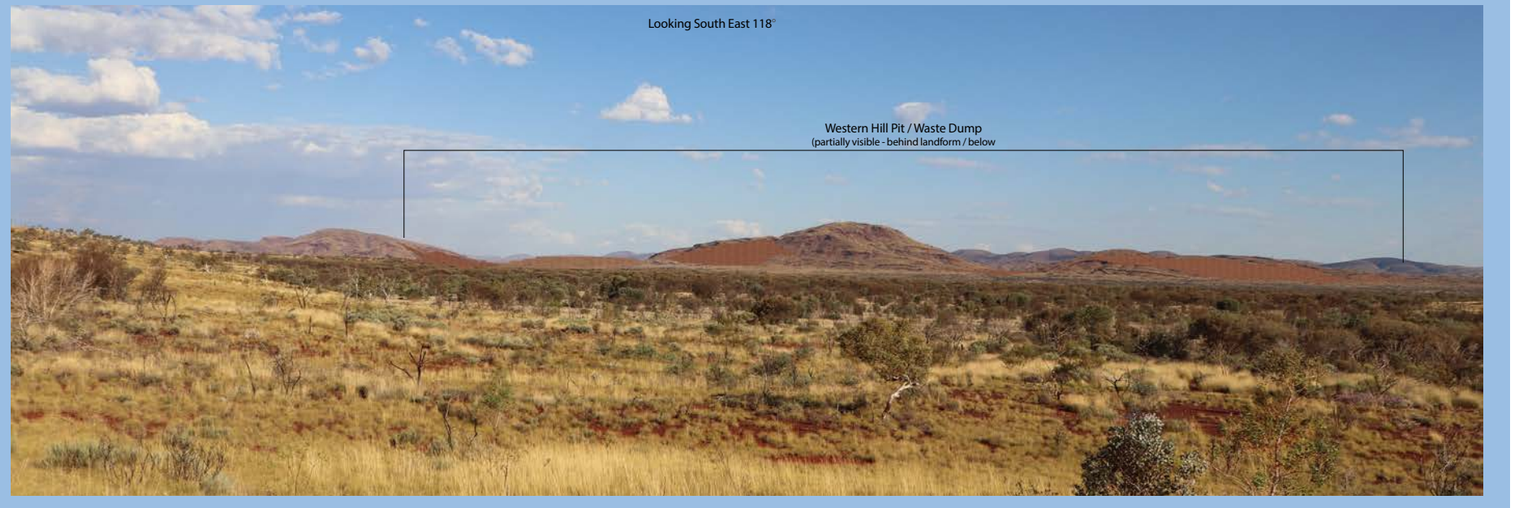
Current View



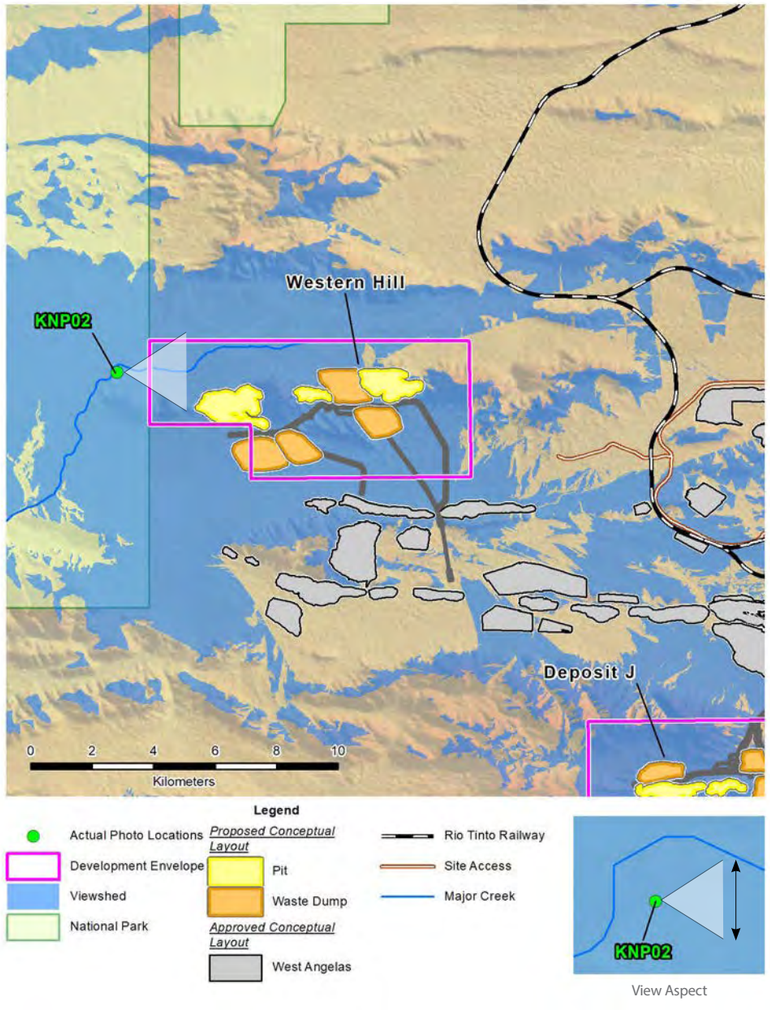
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

Name	14 - KNP02 - Karijini National Park
Co-ordinates	660,672.50mE / 7,443,651.00mN
Direction	East (Bearing 90°)
Description	Located at the Western boundary of Karijini National Park, looking towards proposed Western Hill operarions. Medium level vegetation with clear view.
Site Significance	Located within Karijini National Park, this site is regularly visited by tourist as it is Western Australia's highest point.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 27 - Karijini National Park

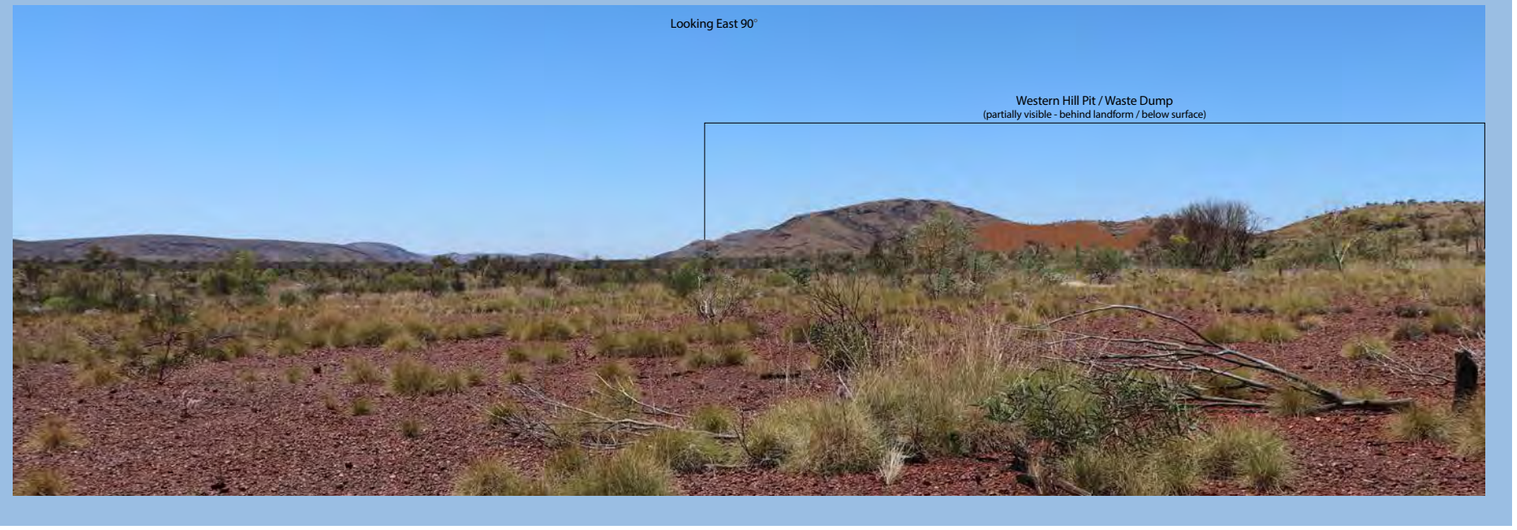
Current View



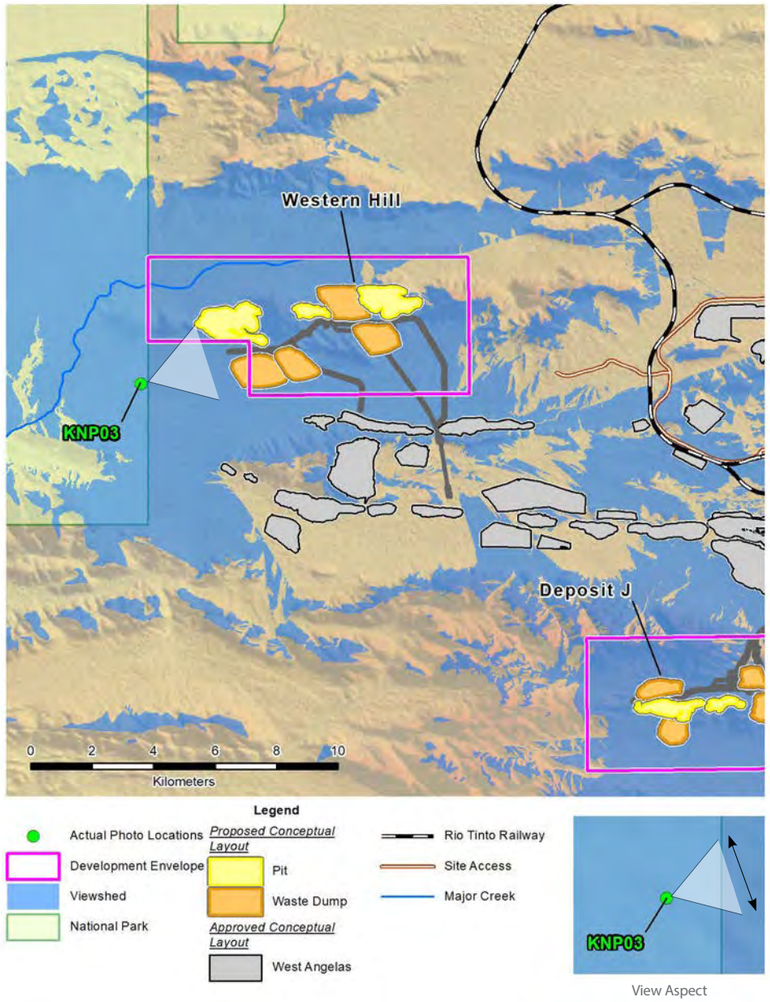
Operations View



Closure View



Location Map



View Aspect

Viewpoint Characteristics

Name	15 - KNP03 - Karijini National Park
Co-ordinates	661,394.40mE / 7,440,577.00mN
Direction	North East (Bearing 72°)
Description	Located at the Western boundary of Karijini National Park, looking towards proposed Western Hill operarions. Medium level vegetation with clear view.
Site Significance	Located within Karijini National Park, this site is regularly visited by tourist as it is Western Australia's highest point.
Comments	Clear view towards West Angelas Beyond 2020 Proposal. Very hot and windy.

Figure 28 - Karijini National Park

Current View

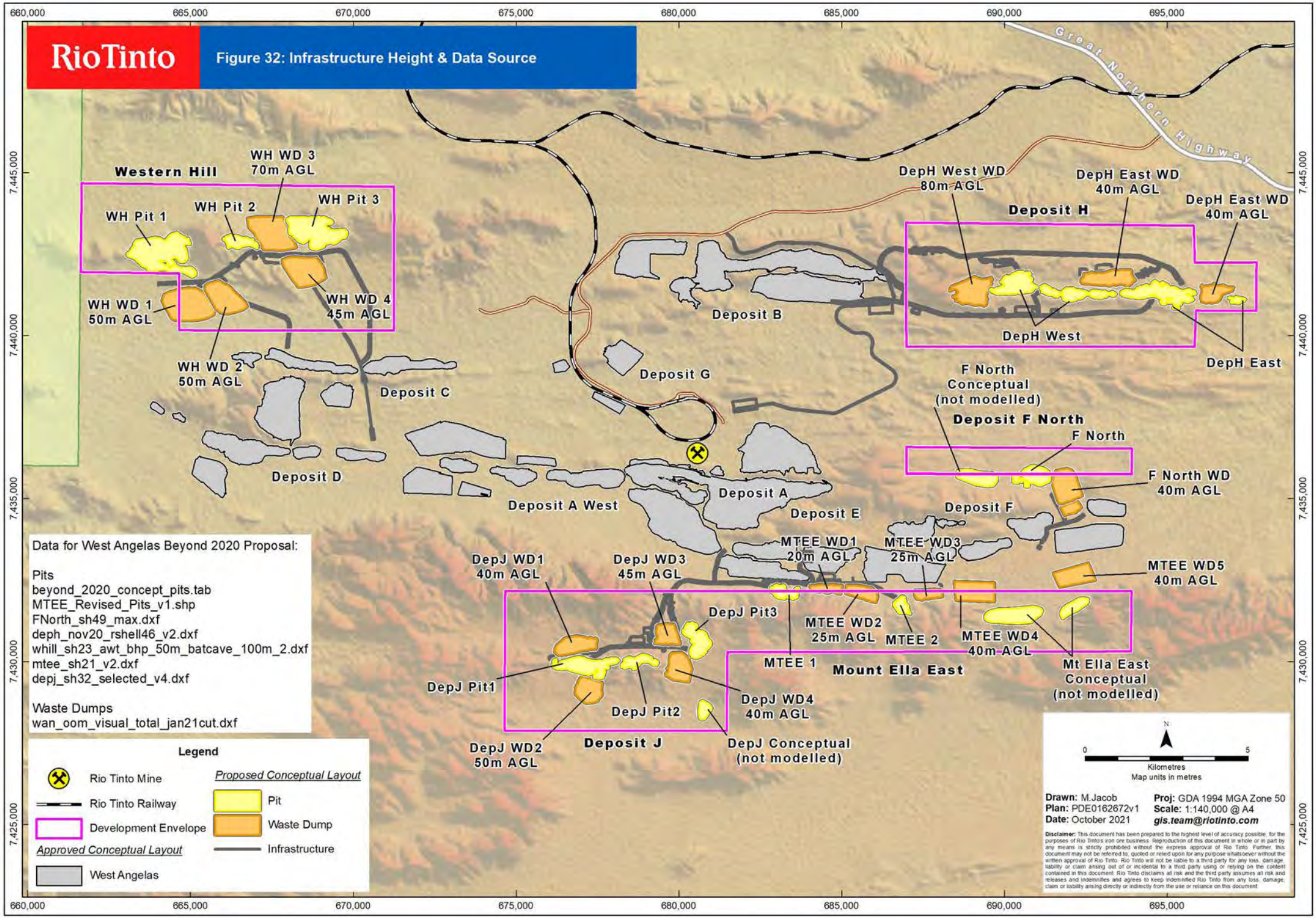


Operations View



Closure View




RioTinto
Figure 32: Infrastructure Height & Data Source
660,000
665,000
670,000
675,000
680,000
685,000
690,000
695,000
7,445,000
7,440,000
7,435,000
7,430,000
7,425,000
Great Northern Highway
Western Hill
WH WD 3
70m AGL
WH Pit 1
WH Pit 2
WH Pit 3
WH WD 1
50m AGL
WH WD 2
50m AGL
WH WD 4
45m AGL
Deposit B
Deposit C
Deposit D
Deposit G
DepH West WD
80m AGL
DepH East WD
40m AGL
DepH East WD
40m AGL
Deposit H
DepH West
DepH East
F North
Conceptual
(not modelled)
Deposit F North
F North
F North WD
40m AGL
Deposit A
Deposit A West
Deposit E
Deposit F
MTEE WD1
20m AGL
MTEE WD3
25m AGL
MTEE WD5
40m AGL
DepJ WD1
40m AGL
DepJ WD3
45m AGL
DepJ Pit3
MTEE WD2
25m AGL
MTEE 2
MTEE WD4
40m AGL
MTEE 1
Mount Ella East
Mt Ella East
Conceptual
(not modelled)
DepJ Pit1
DepJ Pit2
DepJ WD4
40m AGL
DepJ WD2
50m AGL
Deposit J
DepJ Conceptual
(not modelled)
Data for West Angelas Beyond 2020 Proposal:
Pits
beyond_2020_concept_pits.tab
MTEE_Revised_Pits_v1.shp
FNorth_sh49_max.dxf
deph_nov20_rshell46_v2.dxf
whill_sh23_awt_bhp_50m_batcave_100m_2.dxf
mtee_sh21_v2.dxf
depj_sh32_selected_v4.dxf
Waste Dumps
wan_oom_visual_total_jan21cut.dxf
Legend
Rio Tinto Mine
Rio Tinto Railway
Development Envelope
Approved Conceptual Layout
West Angelas
Proposed Conceptual Layout
Pit
Waste Dump
Infrastructure
N
0
5
Kilometres
Map units in metres
Drawn: M.Jacob
Plan: PDE0162672v1
Date: October 2021
Proj: GDA 1994 MGA Zone 50
Scale: 1:140,000 @ A4
gis.team@riotinto.com
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B.6: West Angelas Revised Proposal: Air Quality Assessment



West Angelas Revised Proposal

Air Quality Assessment

Final Report
Version 2

Prepared for Rio Tinto Iron Ore

March 2022

Project Number: 1297

West Angelas Revised Proposal

Final Report

DOCUMENT CONTROL

Version	Description	Date	Author	Reviewer
B	Preliminary Draft for client review	03.02.2021	ETA (JH)	ETA (DT)
1	Final	13.05.2021	ETA (JH)	ETA (DT)
2	Inclusion of additional receptors	25.02.2022	ETA (JH)	ETA (DT)

Approval for Release

Name	Position	File Reference
Jon Harper	Director /Principal Air Quality Specialist	1178 RTIO WestAngelas Revised Proposal Ver2.docx
Signature		

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Executive Summary

Rio Tinto Iron Ore (RTIO) operate the West Angelas mine located approximately 130 kilometres (km) north west of Newman in the Pilbara region of Western Australia (WA). RTIO is evaluating the potential development of additional iron ore deposits near the existing West Angelas operations. An air quality assessment was conducted to determine potential impacts from the future mine developments of five new deposits, being Western Hill, Deposit H, Deposit F North, Mount Ella East and Deposit J along with associated processing (crushing, screening, stacking, reclaiming and rail load out), collectively known as the West Angeles Revised Proposal.

Overview of assessment

An air quality assessment was conducted to determine potential air quality impacts of particulates as Total Suspended Particulates (TSP) and particulate matter below 10 microns (PM_{10}) and below 2.5 microns ($PM_{2.5}$) associated with the progressive development of the West Angelas mine. Emission rates were estimated using recognised and accepted methods of emissions estimation, which included published emission factors from the National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Mining (EA, 2012). Emissions were estimated for the mining years year 2 and year 10 based on the high forecast tonnages for these years, with year 2 representing consistent tonnage from the proposed operations with a focus on Deposit H which is the most easterly of the proposed operations, and year 10 representing both the maximum mining tonnage (ore and waste) and the highest tonnage from the proposed Western Hill operations which are the closest to Karijini National Park. Background concentrations were incorporated into the model results, from both Rio Tinto operations at Hope Downs and the BHP Mining Area C and South Flank operations.

Modelling impacts of TSP, PM_{10}, and $PM_{2.5}$ emissions, including dust deposition, was undertaken using the CALMET/CAPUFF modelling suite. In the absence of onsite meteorological measurements, the Weather Research and Forecast (WRF) model was used to simulate the meteorology over the region for a representative meteorological year (2010) and then as input to the CALMET model to generate fine-resolution three-dimensional meteorological fields. Fine resolution terrain elevation (Shuttle Radar Topography Mission (SRTM)) data with 90 m resolution was used in conjunction with ESACCI-LU land-use data to characterise the geophysical environment.

Ground-level particulates (as TSP, PM_{10}, and $PM_{2.5}$ concentrations) predicted at sensitive receptors and the surrounding environment were compared with the relevant air quality assessment criteria. Sensitive receptors considered in the assessment included:

- RTIO accommodation village and airport noting that these are project associated receptors and not third-party receptors
- wild-life habitat in particular the Ghost bat caves/roosts
- heritage areas including Karijini National Park.

For the purpose of the assessment, the selection of assessment criteria intended to protect human amenity and health values, are assumed to also be conservatively protective of the environmental values of the wild-life habitat (ecological) and heritage areas (including National Parks). Therefore a modelling result that is higher than the assessment criteria should not be interpreted as a predicted impact or loss of environmental value, but is an indication that results may need further consideration for the sensitive receptor at the specific location.

Predicted project contributions (to ground level concentrations) were presented:

- in isolation of non-project related emission sources to demonstrate the incremental change in air quality with the introduction of the Project
- with the inclusion of background concentrations (ie. existing non-project related sources) assessed to represent future cumulative impact conditions.

Key findings

The key findings of the assessment, in relation to potential impact on the environmental values to be protected are:

- For TSP, and the evaluation of potential impact on amenity -
    - For the year 2 operation year, modelled concentrations higher than the 24-hour assessment criteria (90 µg/m^3) is predicted to occur:
        - At the West Angelas Village on 1 occasion, with and without cumulative impact sources included.
        - At the RTIO airport on 1 occasion when cumulative impact sources are considered.
        - At some of the identified heritage receptor locations in isolation of other sources
        - With the inclusion of cumulative sources the model is predicting that there will be an increase in the number of heritage receptor locations impacted by the proposed operations.
    - For the year 10 operation year, modelled concentrations higher than the 24-hour assessment criteria (90 µg/m^3) is predicted to occur:
        - At the West Angelas Village on 15 occasions, with and without cumulative impact sources included.
        - At the RTIO airport on 3 occasions (4 when cumulative impact sources are included).
        - The model is predicting elevated TSP concentrations (with cumulative impact sources included) at all bat cave receptors.
        - At some of the identified heritage receptor locations, especially Receptor 46 (WA-16-45-ENG), Receptor 47 (WA-16-51-ENG), and Receptor 48 (WA-16-57-ENG), will be impacted by the proposed operations in isolation of other sources.
        - With the inclusion of cumulative sources the model is predicting that there will be an increase in the number of heritage receptor locations impacted by the proposed operations.
- For PM_{10} and the evaluation of potential impact on human health and ecological values -
    - For the year 2 operation year:
        - The model is not predicting annual average concentrations higher than the assessment criteria (25 µg/m^3) at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impact sources included.
        - The Taskforce criterion (70 µg/m^3) for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impact sources included.
        - The NEPM criterion for maximum 24-hour concentration (50 µg/m^3) is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impact sources included.
        - The model is predicting elevated concentrations at the Bat Cave receptors WA-04, WA-06 and WA-07 both with and without cumulative impact sources.
    - For the year 10 operation year:

        - The model is not predicting annual average concentrations higher than the assessment criteria (25 µg/m^3) at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impact sources.
        - The Taskforce criterion (70 µg/m^3) for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impact sources.
        - The NEPM criterion for maximum 24-hour concentration (50 µg/m^3) is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impact sources.
        - The model is predicting elevated concentrations at the Bat Cave receptors WA-04, WA-06 and WA-07 both with and without cumulative impact sources and at WA-23 and WA-24 with cumulative impact sources.
- For $PM_{2.5}$ and the evaluation of potential impact on human health -
    - For the year 2 operation year:
        - Modelled ground level concentrations are below the assessment criterion for annual average concentration (8 µg/m^3) at all nominated sensitive receptors (pertaining to human habitation), with and without cumulative impact sources.
        - The maximum 24-hour concentration modelled ground level concentrations is below the assessment criterion (25 µg/m^3) at all nominated sensitive receptors (pertaining to human habitation), with and without cumulative impact sources.
        - The model is predicting concentrations higher than the 24-hour assessment criteria (25 µg/m^3) at some bat cave locations, primarily WA-04 and WA-06, with and without cumulative impact sources.
    - For the year 10 operation year:
        - Modelled ground level concentrations are below the assessment criterion for annual average concentration (8 µg/m^3) at all nominated sensitive receptors (pertaining to human habitation), with and without cumulative impact sources.
        - The maximum 24-hour concentration modelled ground level concentrations is below the assessment criterion (25 µg/m^3) at all nominated sensitive receptors (pertaining to human habitation), with and without cumulative impact sources.
        - The model is predicting concentrations higher than the 24-hour assessment criteria (25 µg/m^3) at some bat cave receptors, primarily WA-04, WA-06 and WA-07, with and without cumulative impact sources.
- For Dust deposition, and the evaluation of potential change in impact on amenity, heritage and ecological values (vegetation) -
    - Modelled concentrations are lower than the assessment criteria for both human amenity impact (4 g/m^2/month) and ecological (vegetation/leaf) impact (7 g/m^2/month) beyond the mine operational areas.
    - Model concentrations are lower than the assessment criteria (4 g/m^2/month) within Karijini National Park.
    - The model is predicted that one identified heritage receptor location will have a maximum monthly deposition rate above the trigger level during mining year 2 (Receptor 28 - Bat cave CWAN-09) and another one during mining Year 10 (Receptor 49 - WAN20-012).

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1 Introduction

1.1 Background

Rio Tinto Iron Ore (RTIO) operate the West Angelas mine approximately 130 kilometres (km) northwest of Newman in the Pilbara region of Western Australia (WA) (Figure 1-1).

RTIO is evaluating the potential development of additional iron ore deposits near the existing West Angelas operations. This West Angelas Revised Proposal includes the potential development of five new deposits and associated infrastructure. Specifically, the Proposal comprises drill, blast, load and convey / haul from the following deposits: Western Hill, Deposit F north, Deposit H, Deposit J and Mount Ella East.

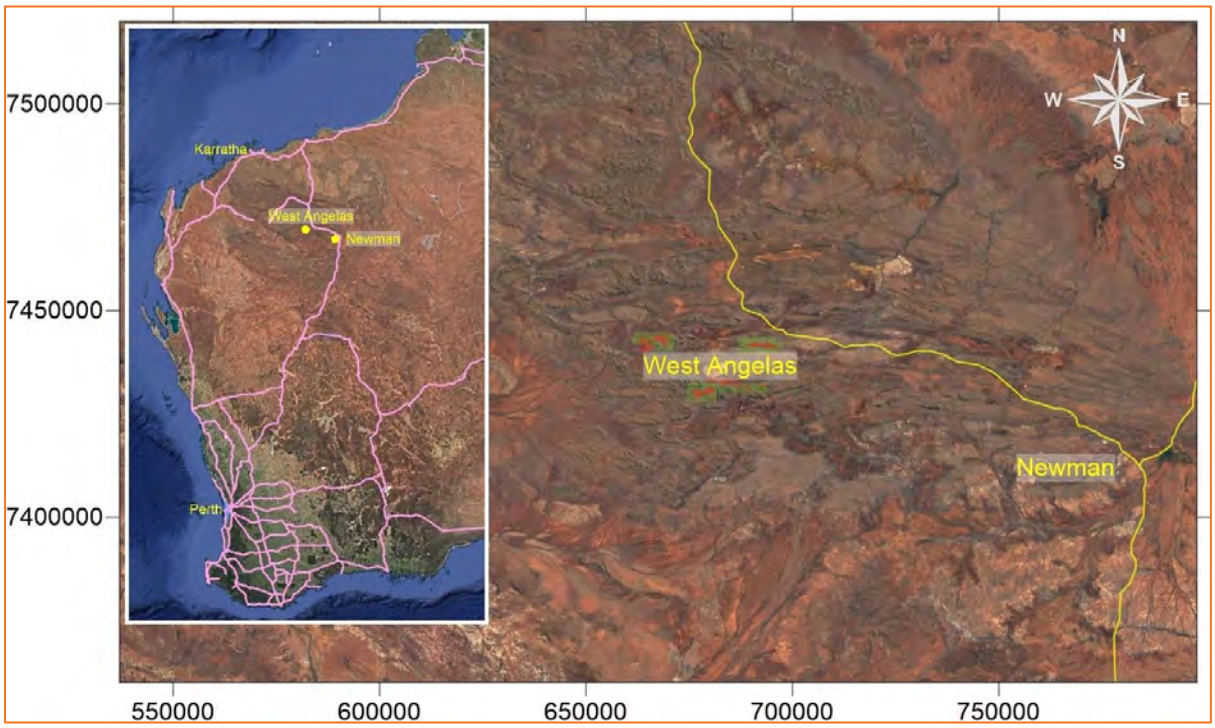


Figure 1-1: Project location and setting

1.2 Scope of work

This air quality impact assessment of the operational phase of the West Angeles Revised Proposal (the Project), has been undertaken to support an environmental approvals application under the provisions of Part IV of the *Environmental Protection Act 1986*. The modelling relates to future deposits Western Hill, Deposit H, Deposit F North, Mount Ella East and Deposit J. The location of these deposits is presented in Figure 1-2.

This report describes the methods and findings of an assessment of the potential impacts to the air environment arising from the Project. The assessment includes:

- The study approach and methodology in Section 2.
- Generation of site-specific meteorological data in Section 5.
- Atmospheric dispersion modelling of the emissions using the WRF-CALMET/CALPUFF model suite (Section 5).

- Project emission estimation and inventory in Section 6.
- An evaluation of the predicted ground-level concentrations of particulates and interpretation of the potential impact of the Project (Section 7).
- Conclusions of the assessment presented in Section 8.

The appendices contain supporting information.

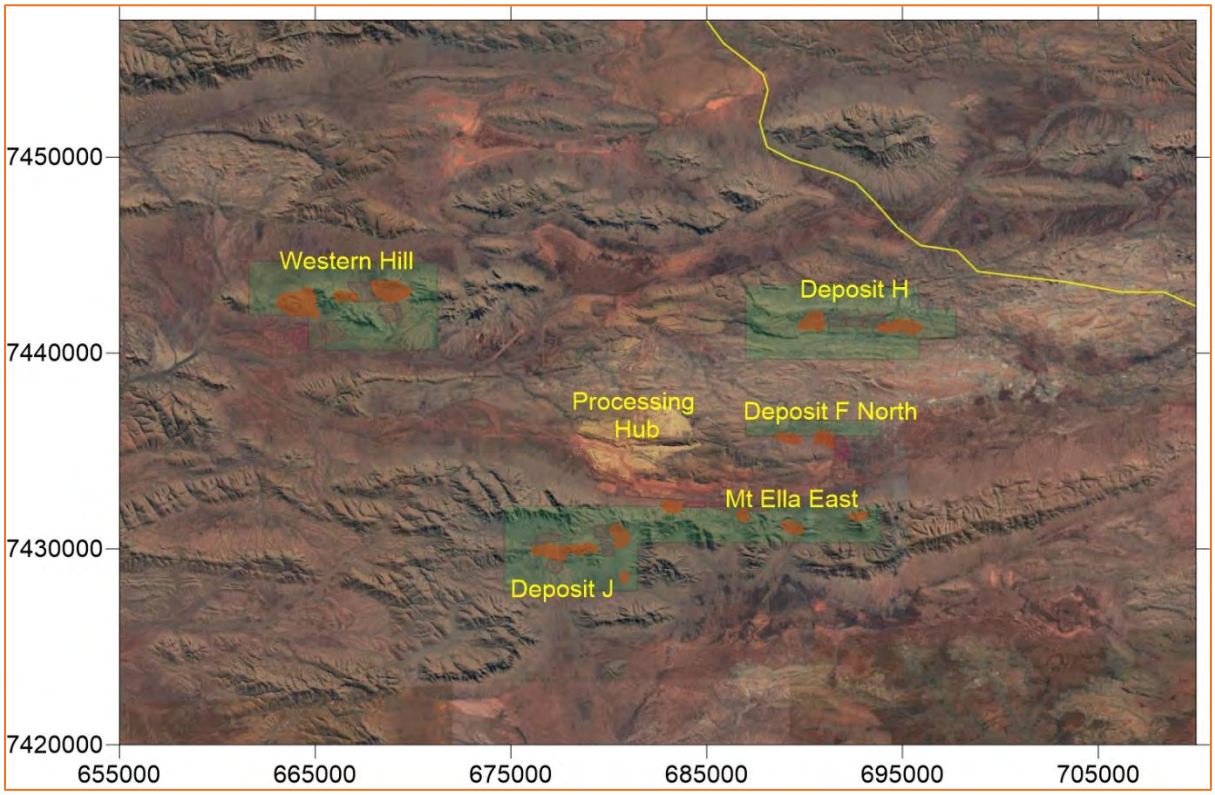


Figure 1-2: Locations of West Angelas Revised Proposal operations

2 Assessment methodology

This section outlines the air quality study and assessment approach. It includes the methodology applied to define the meteorological characteristics of the project area relevant to the assessment, the emission estimation, the dispersion, and the ambient assessment criteria selected for the purposes of determining the significance of the dispersion model results, and therefore the potential impact on the various types of sensitive receptors.

The study structure is shown in Figure 2-1.

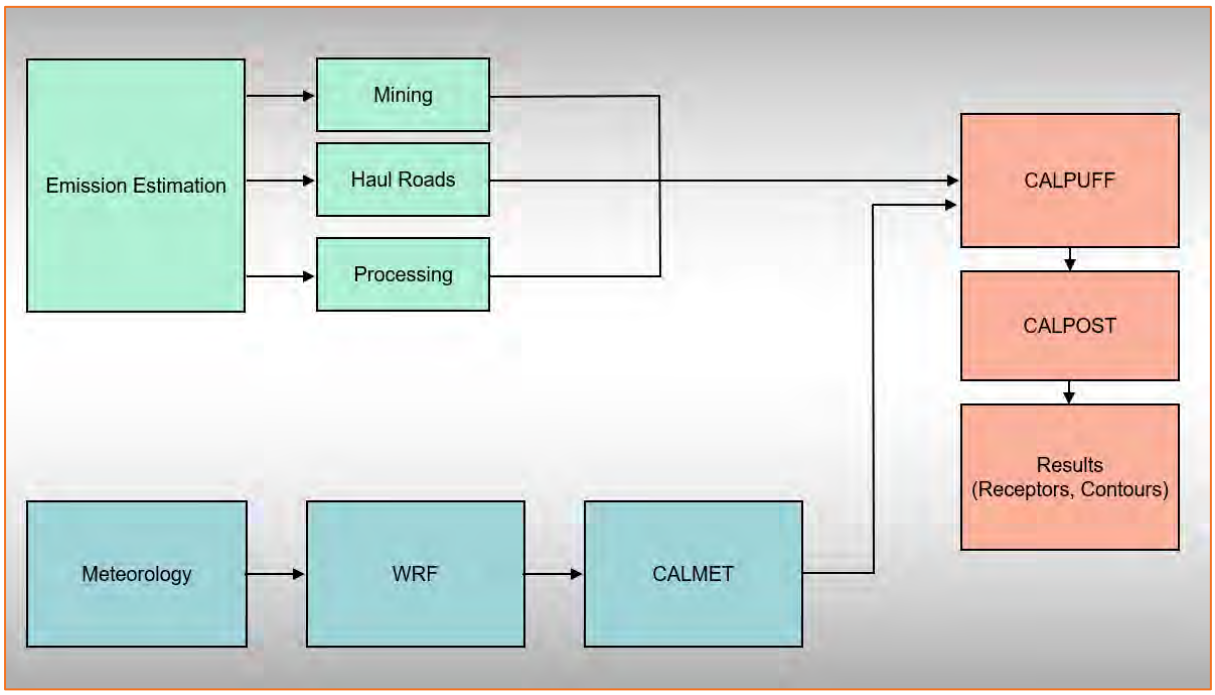


Figure 2-1: Air quality assessment – study approach

Comparison of the modelled results to the assessment criteria is intended to provide an objective evaluation of the potential impact of the operations at the nearest sensitive receptors. For this assessment, there are multiple environmental values and receptor locations relevant. The assessment criteria selected is intended to protect human amenity and health values, and are assumed to also be conservatively protective of the environmental values of the wild-life habitat (ecological) and heritage areas (including National Parks). A modelling result that is higher than the assessment criteria should not be interpreted as a predicted impact or loss of environmental value, but as an indication that results may need further consideration for the sensitive receptor at the specific location.

This comparison of modelled results to the assessment criteria is done for the Project only emissions, and the Project emissions in conjunction with background and other non-project related emission sources (cumulative scenario).

2.1 Meteorology

The meteorology component of a dispersion model is a key element for the effectiveness or representativeness of the dispersion model outputs. Both upper air and surface information are needed for modelling. In the absence of adequate onsite meteorological data, the Weather Research and Forecast (WRF V3.7) model (http://wrf-model.org/index.php) was used to generate hourly 3-dimensional data for the region. The 3-Dimensional meteorological data generated by WRF was input to CALMET for further processing to the finer resolution used in the dispersion modelling. This procedure will be referred to as the 'WRF-CALMET methodology'. The output from the CALMET meteorological model is then used to drive the pollution dispersion in the CALPUFF model.

2.2 Emissions estimation

Emission rates were estimated using recognised and accepted methods of emissions estimation, which included published emission factors from the NPI Emission Estimation Technique Manual for Mining (EA, 2012).

2.3 Modelling

Air dispersion modelling has been conducted using CALPUFF - the dispersion module of the CALMET/CALPUFF suite of models. The model has been used to predict ground level concentrations across the model domain and at identified sensitive receptor locations. The potential air quality impacts associated with the Project have been considered in both isolation and cumulatively. For the cumulative impacts emissions from RTIO Hope Downs mines as well as BHP's Mining Area C and South Flank mines were incorporated into the modelling.

2.4 Impact Assessment

Ground-level particulates (concentrations, and dust deposition) predicted at sensitive receptors and the surrounding environment were compared with the relevant air quality assessment criteria. This assessment has considered the potential impact attributable to the Project, as well as the cumulative (background) impact. The assessment has been made across the model domain, as well as at key sensitive receptor locations identified as being representative or important for assessment. Sensitive receptor types included in the model are:

- Ecological (ghost bat caves/potential habitat)
- Human habitation - RTIO West Angelas Village
- Amenity / safety – RTIO airport
- Ecological / Cultural / Amenity (dust deposition on native vegetation and national park areas) - Karijini National Park

The ambient air quality and potential impacts are assessed in terms of the following particulate sizes:

- Total Suspended Particulates (TSP)
- PM_{10} (particulate matter with an aerodynamic diameter of 10 microns in aerodynamic diameter (µm) or less)
- $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5 µm or less)

3 Existing Environment

The climate and meteorological characteristics of the region control the dispersion, transformation and removal (or deposition) of pollutants from the atmosphere. This section outlines the key climate and meteorological characteristics of the region important for the dispersion, transformation and removal (or deposition) of pollutants from the atmosphere, and therefore ambient air quality associated with the Project.

3.1 Climate

According to the Koppen-Geiger climate system the Newman region is classified as 'BWh' indicating a hot desert climate where evaporation exceeds rainfall (Kottek *et al*, 2006). The following sections outline the long-term meteorological statistics from the Bureau of Meteorology (BoM) automatic weather station (AWS) at Newman Airport, located approximately 9 km to the southeast of the Power Station. This AWS has been collecting meteorological data since 1998.

3.1.1 Local meteorology

The Pilbara region of Western Australia is characterised as semi-arid and has two primary seasons – wet and dry. The wet season, from October to April, is dominated by high temperatures and evaporation rates with isolated intense convective rainfall (thunderstorms) and cyclonic activity. The dry season, from May to September, is relatively dry with mild temperatures.

The long-term temperature statistics from the BoM AWS in Newman are presented in Figure 3-1. From this figure it is apparent that the wet season (summer) period has very warm to hot days and warm nights while the dry season (winter) has warm days with cool, and occasionally cold, nights.

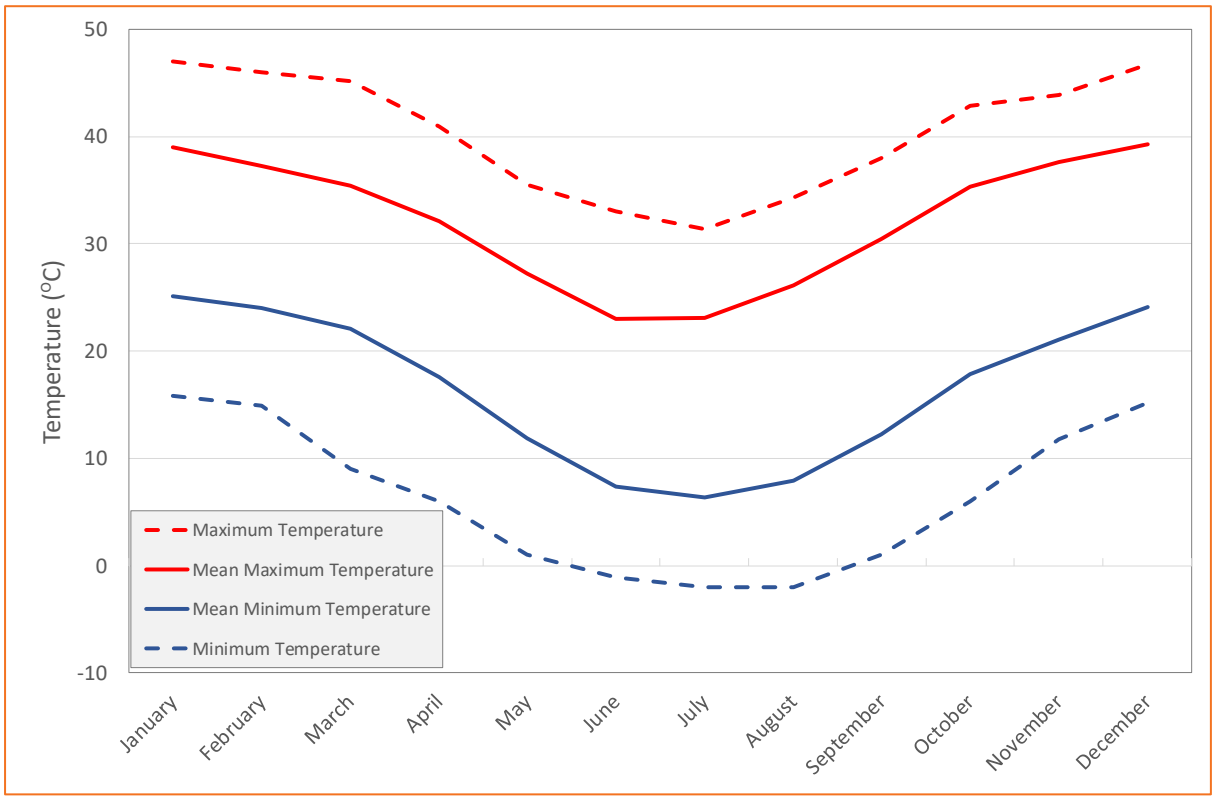


Figure 3-1: Long term temperature statistics (BoM, 2020)

The long term annual average rainfall at Newman is 330 millimetres (mm). While rainfall is mainly associated with the formation of the occasional afternoon thunderstorms, the impact of cyclonic rainfall is evident in Figure 3-2 where the maximum monthly rainfall is significantly greater than the mean rainfall, particularly during the cyclone period from December to March.

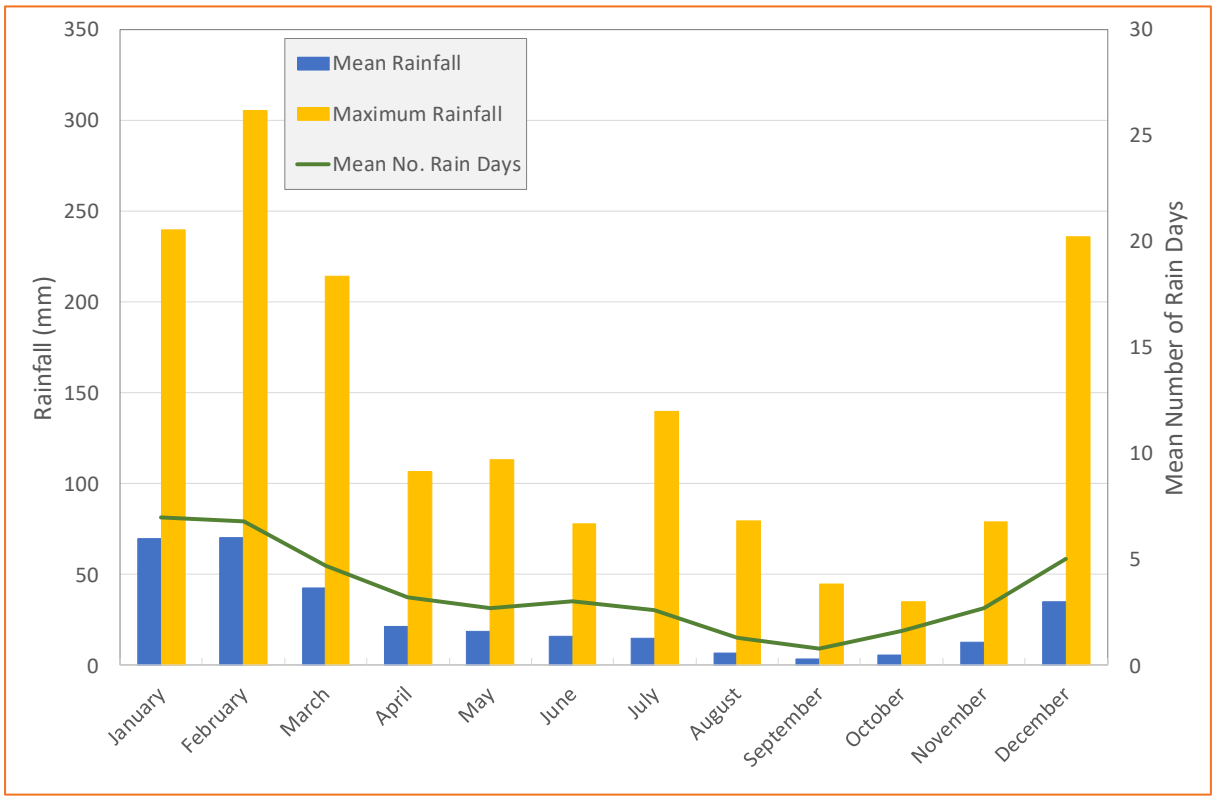


Figure 3-2 Long term rainfall statistics (BoM, 2020)

3.2 Local Air quality

The Pilbara region is a naturally dusty environment with wind-blown dust being a significant contributor to the particulate loading. Within the aggregated emission inventory for the Pilbara, undertaken by SKM in 2000 for the 1999/2000 financial year, it was calculated that approximately 170,000 tonnes of particulate material was emitted as a result of wind erosion. Wildfires also account for a significant amount of the emissions with approximately 195,000 tonnes of particulates emitted. Note that these are calculated values (i.e. not monitored data) and will vary on an annual basis depending on a range of factors including the extent of erodible areas, area burnt, rainfall and wind speed.

4 Air quality assessment criteria

4.1 Definitions

Suspended solids or liquids in air are referred to as Particulate Matter (PM). Concentrations of particles suspended in air can be classified by an aerodynamic diameter, which describes the behaviour of the particle in the air based on its size and shape:

- Total Suspended Particulate (TSP) – refers to the total amount of the PM suspended in air (regardless of size). These larger particles are primarily associated with amenity or visibility issues and are likely to be removed by gravitational settling within a short time of being emitted (i.e. they settle to the ground or other surfaces fairly quickly).
- PM_{10} – refers to the total of suspended particulate matter less than 10 µm in aerodynamic diameter. Particles in this size range can enter bronchial and pulmonary regions of the respiratory tract and can impact human health. Particles in this size range can remain suspended for many days in the atmosphere.
- $PM_{2.5}$ – refers to the total of suspended particulate matter less than 2.5 µm in aerodynamic diameter. Epidemiological studies have shown that particles in this size range are associated with greater health impacts on humans than other particle sizes due to their ability to enter further into the lungs and into the alveoli. Particles in this size tend to be derived from combustion sources such as combustion of fossil fuels and biomass burning (WHO, 2005). These particles can remain suspended for months to years. An example of the relative particle sizes is presented in Figure 4-1.

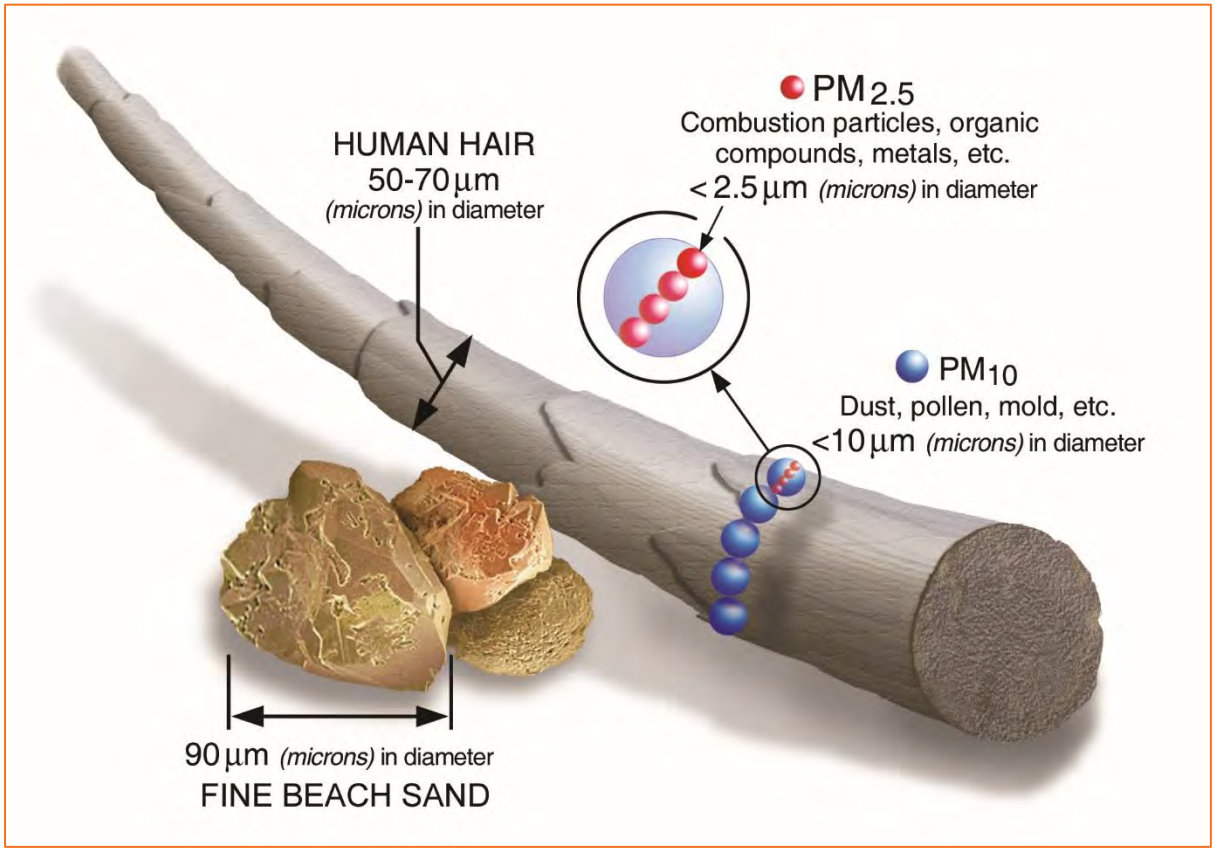


Figure 4-1: Example of particle sizes (USEPA, 2022)

4.2 Human Health Assessment and Amenity Criteria

Modelled ground level concentrations for particulates have been compared to ambient air quality assessment criteria to determine the potential changes in impact resulting from the Project.

The assessment criteria adopted for this study (for particulates) are primarily based on the DWER (2019; 2021) guidelines, which also reference the numerical values from the ambient air quality standards specified in the Ambient Air Quality NEPM (NEPC, 2021).

In their current draft form, the DWER (2019) guidelines for TSP/PM_{10}/$PM_{2.5}$ (defined as *criteria pollutants* in the guideline) require the criteria to generally be '…met at all existing and future offsite sensitive receptors in the modelling domain'. DWER (2021) draft guidelines address the settling or deposition of dust, noting that at time of this assessment the guideline is draft and subject to public consultation.

The relevant ambient air quality criteria for 'Inland Mining Operations' adopted in the Cleaner Air Management Plan (Rio Tinto, 2011) have also been applied to this assessment. The Cleaner Air Management Plan has been developed for Rio Tinto's Western Australian operations to provide a consistent approach for managing dust. These criteria are intended to apply at the nearest sensitive receptor to operations (e.g. camp, towns, nearest residence). It should be confirmed if there have been any revisions to the ambient air quality criteria for 'Inland Mining Operations' adopted in the Cleaner Air Management Plan (Rio Tinto, 2011).

The ambient air quality assessment criteria adopted for identifying potential human health and amenity impacts in this study are shown in Table 4-1.

4.3 Ecological Impact Assessment Criteria

With respect to fauna within the region there is limited published research available as to the ecological impact of dust on the Ghost Bat, and the dust (particulate) concentrations at which the bats may experience a noticeable or negative impact. The *Conservation Advice* (May 2016) of the Threatened Species Scientific Committee for the Ghost Bat references the impact of mining on the Ghost Bat but does not reference any specific impact associated with bat exposure to dust (TSSC, 2016). Wildcare Australia Inc (2014), report that microbats exposed to smoke and / or dust inhalation will exhibit shallow or difficulty in breathing and will have wings outstretched. Again the guidance does not extend to advise on the concentrations or exposure levels that may be of concern.

Reference to the presence of dust within bat roost (cave) locations was made by Biologic (2018) in the comparison of the 2015 and 2017 monitoring results for the West Angelas Iron Ore mine, stating that "*…dust was prominent at all caves visited, as well as generally across the mining area*." Mining activity was occurring at distances between 70 m and 535 m from the monitored caves. The report stated that "*…cave monitoring results do not appear to show any obvious impact of mining at the current time*."

In the absence of any documented criteria for assessing air quality impact on the Ghost Bat directly or indirectly (ie. roosting habitat), the ambient air quality assessment criteria intended to protect human amenity and health values, are assumed to be conservatively protective of the environmental values of wild-life habitat (ecological). A modelling result that is higher than the assessment criteria should not be interpreted as a predicted impact or loss of environmental value but is an indication that results may need further consideration for the sensitive receptor. The assessment criteria adopted for this comparative purpose are shown in Table 4-1.

4.4 Impact on vegetation

The Pilbara region is a naturally dusty environment with wind-blown dust being a significant contributor to the particulate loading. Within the aggregated emission inventory for the Pilbara, undertaken by SKM in 2000 for the 1999/2000 financial year, it was calculated that approximately 170,000 tonnes of particulate material was emitted as a result of wind erosion. Wildfires also account for a significant amount of the emissions with approximately 195,000 tonnes of particulates emitted. Note that these are calculated values (i.e. not monitored data) and will vary on an annual basis depending on a range of factors including the extent of erodible areas, area burnt, rainfall and wind speed. Given the high dust potential in the Pilbara region it is expected that native vegetation is reasonably tolerant to dust deposition.

With respect to vegetation health, research on the effects of dust deposition has been undertaken in Australia by Doley (2006). Doley concluded that "critical dust loads that result in significant alterations in the most sensitive plant functions vary with the particle size distribution and colour of the dust, from about 1 g/m^2 for carbon black with a median diameter of about 0.15 µm to about 8 g/m^2 for coarse road or limestone dusts with median diameters greater than about 50 µm. The critical loads vary with the plant function, and it is not possible to predict precisely the nature of one plant response from the knowledge of another". For mineral dust, Farmer (1993) showed that direct physical effects of mineral dusts on vegetation became apparent only at relatively high surface loads (e.g. > 7 g/m^2).

Internal studies undertaken for Rio Tinto (Butler, 2009) suggest that the potential for adverse dust deposition effects on plants is seasonally related. This is consistent with the results from other studies on the effects of air pollutants on vegetation, which indicate that adverse effects are usually related to the growing season. The Butler (2009) study failed to identify any significant loss of plant function for exposures of Pilbara species to deposited crustal dust loadings on plant leaves of up to a very high level of 7,500 g/m^2. This level should not strictly be compared to dust deposition predictions from modelling. Dust deposition predictions from modelling are effectively from vertical settling only. Plant leaves tend to trap dust irrespective of whether the dust is deposited from vertical settling or impacted horizontally from the wind. Therefore a plant leaf dust loading of 7,500 g/m^2 would correspond to a predicted deposition of somewhat less than this.

For this study, 7 g/m^2/month is used as an indicative criterion for potential effects on vegetation, however the Butler (2009) work shows that this is probably very conservative. A modelling result that is higher than the assessment criteria is interpreted an indication that results may need further consideration for the sensitive receptor, and is not necessarily a predicted impact or loss of environmental value.

4.5 Summary of Applied Assessment Criteria

A consolidated summary of the applicable assessment criteria and relevant receptor application is provided in Table 4-1.

Table 4-1: Summary of Adopted Assessment Criteria

Pollutant	Air quality assessment criteria					Reference
	Concentration [1]	Concentration [2]	Averaging Period	Allowable Exceedances	Environmental value protected	
PM_{10}	50 µg/m^3	46 µg/m^3	24-hour	exception event	Human health	DWER (2019) consistent with NEPM (NEPC, 2021)
	25 µg/m^3	23 µg/m^3	annual	none		
	70 µg/m^3	-	24-hour average	Not more than 10 days a year		Rio Tinto (2011) for nearest sensitive receptor to operations (includes onsite and offsite)
	70 µg/m^3	-	Annual average	None		
$PM_{2.5}$	25 µg/m^3	23 µg/m^3	24-hour	exception event		DWER (2019) consistent with NEPM (NEPC, 2021)
	8 µg/m^3	8 µg/m^3	annual	none		
TSP	90 µg/m^3	82 µg/m^3	24-hour	none	Human health and amenity Proxy for protection of ecological values	DWER (2019)
Dust deposition	2 g/m^2/30 days		30-days	Maximum increase above background	Amenity | Nuisance Proxy for protection of ecological values	DWER (2021) referencing NZ MfE (2016)
	4 g/m^2/30 days		30-days	Maximum		DWER (2021) referencing NSW EPA (2016)
	7 g/m^2/30 days		30-days	None	Ecological (vegetation/ leaf) impact	Doley (2006)

Notes:
1 Concentrations referenced to 0ºC (excluding reference to dust deposition)
2 Concentrations referenced to 25ºC (excluding reference to dust deposition)

5 Model Assessment

For this assessment, air dispersion modelling has been conducted using CALPUFF. The model has been used to predict ground level concentrations across the model domain and at identified sensitive receptor locations. The potential air quality impacts associated with the Project have been considered in isolation of other emission sources, as well as cumulatively with existing air quality of the region. The model was configured to predict the ground-level concentrations on a rectangular grid. The model domain was defined with the Southwest corner of the grid cell at 650.150 km Easting and 7420.150 km Northing (UTM Zone 50 S). Specifics for the modelling configuration are described further in this section.

5.1 Meteorological model

The meteorology component of a dispersion model is a key element for the effectiveness or representativeness of the dispersion model outputs. Both upper air and surface information are needed for modelling.

5.1.1 WRF Model

In the absence of adequate onsite meteorological data, the Weather Research and Forecast (WRF V3.7) model (http://wrf-model.org/index.php) was used to generate hourly 3-dimensional data for the region. WRF is the next-generation mesoscale numerical weather prediction system. The model was primarily designed to serve both operational forecasting and atmospheric research. WRF features multiple dynamical cores, a 3-dimensional variational data assimilation system and a software architecture allowing for computational parallelism and system extensibility. Further details on WRF are provided in Appendix A.

5.1.2 CALMET

The 3-Dimensional meteorological data generated by WRF was input to CALMET for further processing to the finer resolution used in the dispersion modelling. This procedure will be referred to as the 'WRF-CALMET methodology'. The output from the CALMET meteorological model is then used to drive the pollution dispersion in the CALPUFF model.

CALMET is a three-dimensional meteorological pre-processor that includes a wind field generator containing objective analysis and parameterised treatments of slope flows, terrain effects and terrain blocking effects. The pre-processor produces fields of wind components, air temperature, relative humidity, mixing height and other micro-meteorological variables to produce the three-dimensional, spatially and temporally varying meteorological fields that are utilised in the CALPUFF dispersion model.

CALMET requires several datasets to resolve the surface and upper air meteorology occurring for each hour of the year:

- surface observations and upper air observations or gridded prognostic meteorological model data.
- land use and topographical data.

CALMET was run for a 265 x 173 grid domain at a spatial resolution of 300 m. Vertically, the model consisted of 11 levels extending to 3,000 m. The southwest corner coordinates of the domain were 650.150 km Easting and 7420.150 km Northing (UTM Zone 50 S).

Shuttle Radar Topography Mission (SRTM) data with 90 m resolution was input into the CALMET model to indicate terrain heights within the model domain (Figure 5-1). CALMET also requires geophysical data including gridded fields of land use categories. The default US Geological Survey (USGS) land use classification system

(14 category system) was substituted with a more up to date, finer resolution data (300 m) obtained from the European Space Agency Climate Change Initiative Land cover (ESACCI-LC) dataset.

The CALMET results are provided in Appendix A.

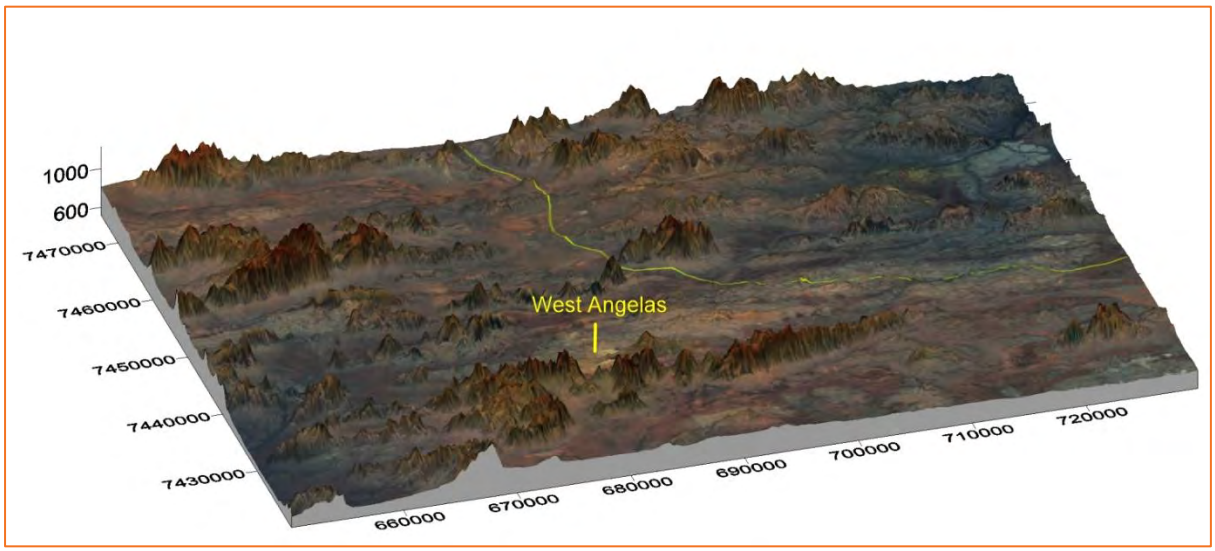


Figure 5-1: Image of SRTM terrain elevation used in CALMET (vertical height is exaggerated)

5.2 CALPUFF

CALPUFF is the dispersion module of the CALMET/CALPUFF suite of models. It is a multi-layer, multi species, non-steady-state puff dispersion model that can simulate the effects of time-varying and space-varying meteorological conditions on pollutant transport, transformation and removal. The model contains algorithms for near-source effects such as building downwash, partial plume penetration, sub-grid scale interactions as well as longer range effects such as pollutant removal, chemical transformation, vertical wind shear and coastal interaction effects. The model employs dispersion equations based on a Gaussian distribution of pollutants across released puffs and considers the complex arrangement of emissions from point, area, volume and line sources (Scire et al., 2000).

The CALPUFF model was set to calculate concentrations both on a set grid (gridded receptors) and at 21 specified locations (discrete receptors). The model domain was defined as 79.5 km in the east–west direction and 51.9 km in the north-south direction at a spacing of 300 m.

5.2.1 Emission sources – Rio Tinto

Each emission source for the Project was characterised as either area sources or volume sources in the dispersion model. Area sources were assigned to open areas while volume sources were assigned to mining activities in the pits and haul roads following the USEPA recommendations (USEPA, 2012). The locations of sources are presented in Appendix B as coordinates (GDA94, zone 50).

5.2.2 Emission sources – BHP

To account for additional sources in the immediate region for inclusion in the cumulative scenario the BHP Mining Area C (MAC) and South Flank mines were incorporated in the modelling. The emissions for these mines were sourced from the Central Pilbara Strategic Environmental Assessment – Cumulative Air Quality Assessment (BHP, 2014). This document outlines BHP's approach to determine the cumulative environmental impacts in the Pilbara, including air quality, to support their long term growth plans.

As part of this assessment (BHP, 2014) BHP determined the potential particulate emissions, for both TSP and PM_{10}, from their existing and proposed mines in the Pilbara based on a range of emission controls (none, standard and leading). For this assessment the calculated emissions for both MAC and South Flank were referenced with Standard Controls (BHP, 2014) which were 23,745 tonnes per year (t/yr) for TSP and 8,208 t/yr for PM_{10}. These emissions were converted to a grams per second (g/s) emission rate and then assigned to five large area sources per mine. This approach to source characterisation is likely to overpredict impacts in the vicinity of the mines.

5.2.3 Particle size distribution

CALPUFF was set up to model depletion of the dust plume concentration through deposition. Since dust is subject to gravitation settling as well as deposition, information on particle size is critical. A particle size distribution for TSP, PM_{10} and $PM_{2.5}$ was estimated using a composite from the USEPA AP-42 manuals for 'aggregated handling and storage piles', 'industrial wind erosion' and 'unpaved roads'. These are shown in Table 5.1.

Table 5.1: Particle size distribution (USEPA, 1999)

Size range (µm)	TSP Cumulative (%)	PM_{10} Cumulative (%)	$PM_{2.5}$ Cumulative (%)
<2.5	9	30	100
2.5-5.0	17	57	-
5.0-7.5	24	80	-
7.5-10.0	30	100	-
10.0-15.0	44	-	-
15.0-23.0	59	-	-
23.0-30.0	74	-	-
30.0-40.0	89	-	-
40.0-50.0	100	-	-

5.3 Sensitive Receptors

This modelling assessment considers the potential air quality impacts on a range of sensitive receptors, including:

- Ghost bat via impact to their habitat (ie roosting caves, that are either used, or with the potential to be used) – for potential ecological (habitat) impact.
- RTIO accommodation village – for potential human habitation impact noting this is a project associated receptor and not a third party receptor.

- RTIO Airport – for potential amenity (safety/visibility reduction) impact noting this is a project associated receptor and not a third party receptor.
- Karijini National Park and other heritage areas – for ecological and heritage impact.

It is noted that the current Department of Water and Environment Regulation (DWER) guidelines excludes the consideration of on-site Project related receptors as sensitive receptors, however the RTIO accommodation village has been included for information purposes.

The location of all the sensitive receptors in the region are presented in Figure 5-2 and contained in full in Appendix D.

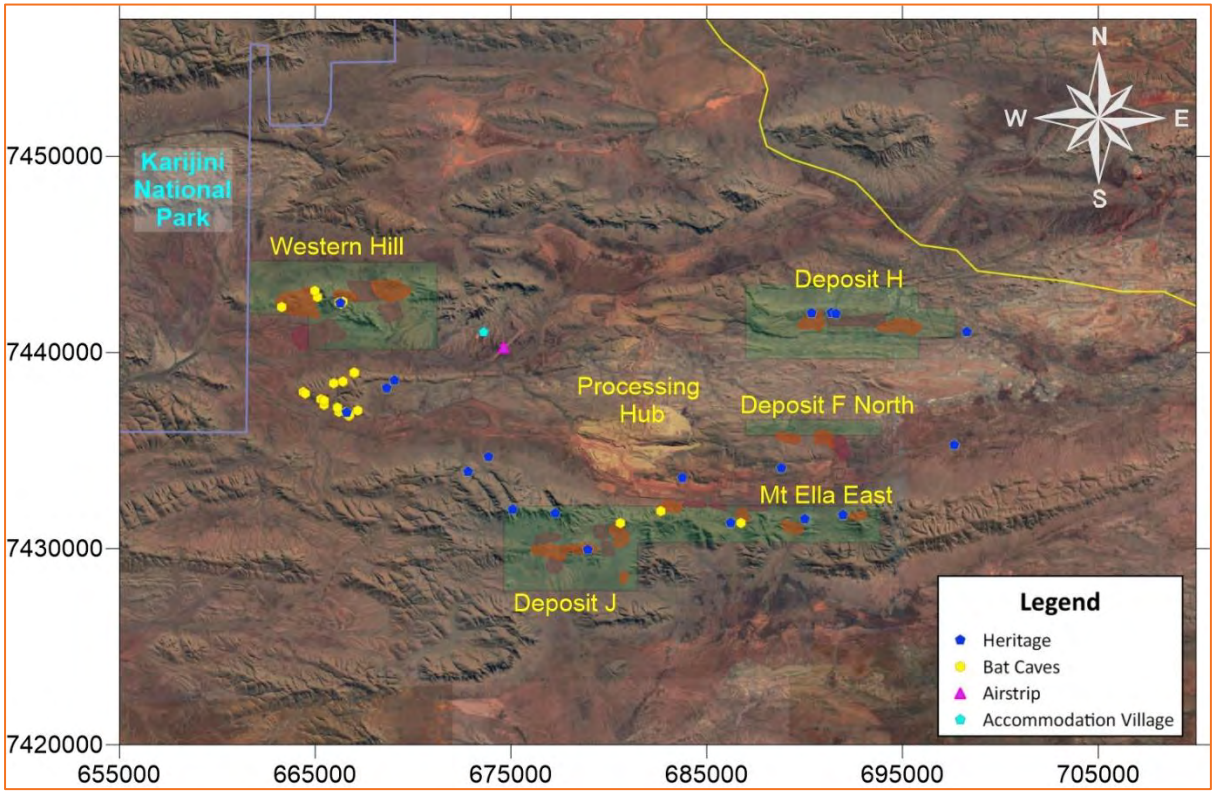


Figure 5-2: Discrete sensitive receptor locations

6 Emissions to air estimation

When determining the potential impact of a facility, either existing or proposed, one of the critical inputs is the source emission file. The following sections outline the process whereby potential sources are identified, and quantified, based on the forecast throughput tonnage of the facility.

6.1 Emission Source Inventory

The key emission sources for the operating phase of the Project are associated with:

- drilling and blasting
- material handling from loading and unloading activities involving
  - loading trucks
  - unloading trucks
  - bulldozing
  - crushing
- material transfer
  - by conveyors
  - transfer stations
- wheel generated dust from roads and haul roads
- wind erosion from stockpiles and open areas.

A summary of the estimated annual mining tonnages for the life of the mines within the Project (Rio Tinto, 2020) are presented in Table 6.1. For this assessment two separate mining years were chosen to determine the potential impact of mining operations:

- Year 2 – which represents consistent tonnage from the proposed operations, with a focus on Deposit H which is the most easterly of the proposed operations (Figure 1-2).
- Year 10 – this year represents both the maximum mining tonnage (ore and waste) and the highest tonnage from the proposed Western Hill operations which are the closest to Karijini National Park.

Table 6.1: Forecast mining tonnages (Mtpa)

Deposit	Type	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Mt Ella East	Total	-	2.00	11.49	4.33	-	-	-	-	1.45	2.53	7.14	-
	Ore	-	0.23	3.53	2.77	-	-	-	-	0.08	0.16	1.42	-
	Waste	-	1.77	7.96	1.56	-	-	-	-	1.38	2.37	5.71	-
Western Hill	Total	22.93	19.33	6.94	21.60	12.30	0.45	18.42	46.31	53.37	61.43	28.97	5.99
	Ore	6.23	7.24	1.81	6.02	6.34	0.45	5.98	14.52	11.83	20.00	18.05	5.70
	Waste	16.70	12.09	5.13	15.58	5.96	0.00	12.44	31.78	41.54	41.43	10.92	0.29
Deposit H	Total	33.30	22.15	10.25	2.17	-	-	-	-	-	-	-	-
	Ore	14.09	11.28	8.31	1.64	-	-	-	-	-	-	-	-
	Waste	19.21	10.88	1.94	0.52	-	-	-	-	-	-	-	-
Deposit J	Total	-	4.94	8.57	5.24	30.26	17.73	2.83	1.04	9.76	16.31	0.76	13.24
	Ore	-	0.41	2.36	1.25	2.14	7.56	1.81	0.00	1.35	2.93	0.34	4.25
	Waste	-	4.53	6.22	3.99	28.12	10.17	1.02	1.04	8.41	13.37	0.42	8.99
Deposit F North	Total	-	2.72	0.00	19.02	9.23	-	1.70	-	-	-	-	-
	Ore	-	0.01	0.00	0.81	4.14	-	1.26	-	-	-	-	-
	Waste	-	2.71	0.00	18.20	5.09	-	0.44	-	-	-	-	-
Total		**56.22**	**51.14**	**37.25**	**52.35**	**51.79**	**18.18**	**22.95**	**47.34**	**64.58**	**80.27**	**36.87**	**19.24**

6.2 Emission estimates

This section outlines the emission estimation process for the Project. Emission estimates are sourced from this inventory for inclusion in the dispersion model. It includes the emissions from mine operations, facilities and associated infrastructure including the road network. Emissions from all key sources have been identified according to accepted methods. The emphasis of the emission estimation and modelling is on the potential impact from the operating phase of the various operations within the Project. Emission estimation of construction activities is excluded from the assessment due to their intermittent nature over the life of the Project.

6.2.1 Drilling

Emissions for drilling have been calculated using the default emissions contained within the Emissions Estimation Technique Manual (EETM) for Mining (EA, 2012a). The default values are:

- TSP: 0.59 kg/hole
- PM_{10}: 0.31 kg/hole
- $PM_{2.5}$: 28% of PM_{10} emissions

The statistics of the annual emissions from drilling for PM_{10} are contained in Appendix C.

6.2.2 Blasting

Emissions for drilling have been calculated using Equation 19 outlined in Appendix A of the EETM for Mining. This is represented by Equation 1:

Equation 1: $$EF_{TSP\ (kg/blast)} = 0.00022 \times A^{1.5}$$

Where A = blast area (m^2)

The emission factor for PM_{10} is taken as 52% of the TSP emission and the $PM_{2.5}$ emissions are taken as 28% of the PM_{10} emissions. The statistics of the annual emissions for blasting for PM_{10} are contained in Appendix C.

6.2.3 Loading ore/waste

Emissions for loading ore and waste have been calculated using the default value for excavators and front end loaders on overburden of:

- TSP: 0.025 kg/t
- PM_{10}: 0.012 kg/t

The emission factor for $PM_{2.5}$ emissions is taken as 28% of the PM_{10} emissions. The statistics of the annual emissions for loading for PM_{10} are contained in Appendix C.

6.2.4 Unloading ore/waste

Emissions for unloading ore and waste have been calculated using the default values of:

- TSP: 0.012 kg/t
- PM_{10}: 0.0043 kg/t

The emission factor for $PM_{2.5}$ emissions is taken as 28% of the PM_{10} emissions. The statistics of the annual emissions for loading for PM_{10} are contained in Appendix C.

6.2.5 Bulldozing

Emissions for the operation of bulldozers on both ore and waste have been determined using Equation 16 and 17 outlined in Appendix A of the EETM for Mining (EA, 2012). The silt and moisture contents used were the defaults listed in the manual (10% moisture, 2% silt).

The emission factor for $PM_{2.5}$ emissions is taken as 30% of the PM_{10} emissions. The statistics of the annual PM_{10} emissions for bulldozing are contained in Appendix C.

6.2.6 Front end loaders

Emissions for the operation of front end loaders, at the Run of Mine (ROM) pad, used the default emission factor listed in Appendix A of the EETM for Mining (EA, 2012) for overburden. These factors are:

- TSP: 0.025 kg/tonne
- PM_{10}: 0.012 kg/tonne

The emission factor for $PM_{2.5}$ emissions is taken as 30% of the PM_{10} emissions. The statistics of the annual emissions for loading for PM_{10} are contained in Appendix C.

6.2.7 Primary Crusher

The emissions for the primary crusher were determined using the default emission factors for high moisture content ores from Table 3 of the EETM for Mining (EA, 2012).

The emission factor for $PM_{2.5}$ emissions is taken as 30% of the PM_{10} emissions. The statistics of the annual emissions for crushing for PM_{10} are contained in Appendix C.

6.2.8 Handling and transferring

The emissions for the handling and transferring, including stacking and reclaiming, were determined using the default emission factors for high moisture content ores from Table 3 of the EETM for Mining (EA, 2012).

The emission factor for $PM_{2.5}$ emissions is taken as 30% of the PM_{10} emissions. The statistics of the annual emissions for crushing for PM_{10} are contained in Appendix C.

6.2.9 Haul Roads

To determine emissions from wheel generated dust along the haul roads the default equation for 'unpaved roads from wheels' was utilised (Equation 2). The weight of the haul trucks was taken as 272 tonnes – being the average of an empty and fully laden CAT793E haul truck and the default silt content of 10% was utilised.

Equation 2: $$EF_{(kg/VKT)} = \frac{0.4536}{1.6093} \times k \times \left(\frac{s_{(\%)}}{12}\right)^{a} \times \left(\frac{W_{(t)}}{3}\right)^{b}$$

Where: k = constant (TSP = 4.9, PM_{10} = 1.5)
$s_{(\%)}$ = silt content (%)
$W_{(t)}$ = vehicle mass (t)
a = constant (TSP = 0.7, PM_{10} = 0.9)
b = constant (0.45)

6.2.10 Wind erosion

The default emission factor for wind erosion in the EETM for Mining (EA, 2012) is a constant emission of 0.2 kg/ha/hr which, while potentially suitable for the calculation of annual emissions, is not suitable for inclusion in atmospheric modelling. This assessment used the modified Shao equation outlined in SKM (2005) which is represented as Equation 3:

Equation 3: $$PM_{10_{(g/m^2/s)}} = k \times \left\{WS^3 \times \left(1 - \left(WS_0{}^2/WS^2\right)\right)\right\} \quad WS > WS_O$$

$$PM_{10_{(g/m^2/s)}} = 0 \quad WS < WS_O$$

Where: WS = wind speed (m/s)
WS_0 = threshold for particulate matter lift off (m/s)
K is a constant

Due to the large distances between the various mining operations this assessment extracted meteorological data from three separate points corresponding to Western Hill, Deposit H and Deposit J. For each location the wind speed threshold (WS_0) was set at 5.4 m/s and the k constants were set at:

- Western Hill: 1.95 x 10^{-7}
- Deposit H: 4.30 x 10^{-7}
- Deposit J: 2.10 x 10^{-7}

This results in an overall emission rate of 0.4 kg/ha/hr for PM_{10} from open areas, which is higher than the emission rate of 0.2 kg/ha/hr specified in the EETM for Mining (EA, 2012).

The emission factor for TSP is taken as twice that of the PM_{10} emissions while $PM_{2.5}$ emissions are taken as 30% of the PM_{10} emissions (Table 5.1).

6.3 Emission Controls

Emissions controls (for dust abatement) were included in the emissions estimation and these controls are summarised in Table 6.2, along with the percentage reduction applied to each source type.

Table 6.2: Dust abatement in place (included in model)

Source	Equipment	Dust abatement description	Emission reduction
Mining	Bulldozing	None	0%
	Loading ore and waste	In pit reduction	5% (PM_{10}) 50% (TSP)
	Unloading waste	None	0%
	Unloading ore at ROM pad	None	0%
	Drilling	In pit reduction	5% (PM_{10}) 50% (TSP)
	Blasting	In pit reduction	5% (PM_{10}) 50% (TSP)
	Wind erosion (OSA and ROM pad)	Watering	50%

Source	Equipment	Dust abatement description	Emission reduction
Haul road	Hauling	Level 1 watering	50%
Processing Facility	Unloading ore into primary crusher by front end loader	Watering	75%
	Primary crushing of ore	Underground	99%
	Secondary crusher	Enclosed with extraction	95%
	Screening	Enclosed with extraction	90%
	Transfer stations	Water	50%
	Stacking	Luffing / water	63%
	Reclaiming	Water	50%
	Rail load out	Enclosed	90%

6.4 Emission summary

A summary of the estimated annual emissions from the Project, for both year 2 and year 10, are shown in Table 6.3.

Table 6.3: Estimate of TSP, PM_{10} and $PM_{2.5}$ annual particulate emissions from the Project (kg/yr)

Source	Year 2			Year 10		
	TSP	PM_{10}	$PM_{2.5}$	TSP	PM_{10}	$PM_{2.5}$
Crushing	37,526	15,010	4,503	18,076	7,231	2,169
Screening	280,940	210,705	63,212	190,237	142,678	42,803
Transfer Stations	189,675	75,870	22,761	122,322	48,929	14,679
Stacking	65,921	26,368	7,910	44,638	17,855	5,357
Reclaiming	88,061	35,225	10,567	59,630	23,852	7,156
Rail load out	88,061	35,225	10,567	59,630	23,852	7,156
Front end loaders	205,676	98,725	29,617	47,605	22,851	6,855
Unloading	197,379	70,728	21,218	45,685	16,370	4,911
Drilling	19,768	19,735	5,920	29,186	29,137	8,741
Blasting	169,265	167,233	50,170	440,490	435,204	130,561
Loading	639,296	583,038	174,911	1,003,337	915,044	274,513
Unloading	383,633	137,468	41,241	686,047	245,833	73,750
Bulldozers	214,765	52,284	15,685	147,171	35,828	10,748
Wind Erosion	857,394	586,188	175,856	857,394	586,188	175,856
Haul Roads	4,842,896	1,429,434	428,830	8,690,545	2,565,110	769,533
Total	**8,280,257**	**3,543,236**	**1,062,971**	**12,441,994**	**5,115,962**	**1,534,789**

7 Predicted air quality impact

Comparison of the modelled results to the assessment criteria is intended to provide an objective evaluation of the potential impact of the operations at the nearest sensitive receptors.

The results of the modelling are presented in two formats:

- Isolation: modelled results for year 2 and year 10, representing the "project only" potential impact.
- Background (cumulative sources): the project emissions inclusive of the background concentrations (Section 5.2.1 and Section 5.2.2) which includes existing operations in the model domain (i.e. Hope Downs and BHP Mining Area C and South Flank), representing the potential cumulative impact.

7.1 Particulates as TSP

As outlined in Section 4.2 the criteria for TSP is primarily designed for the protection of human amenity, and therefore the assessment criteria is not applicable to receptors at West Angelas other than the accommodation village, and potentially the airport. For information purposes the predicted ground level concentrations of TSP at the heritage receptor locations is also presented.

The model results for TSP for year 2 and year 10 operational years[1] for the mine in isolation and for cumulative impacts with Hope Downs and the nearby BHP mines are shown as contour plots in Figure 7-1 to Figure 7-4 and the results are summarised in Table 7.1 and Table 7.2 for sensitive receptors[2]. Modelled results that are above the assessment criterion of 90 µg/m^3 (Section 4.2) are highlighted in orange. The concentration contours show:

- For the year 2 operation period;
  - With the mine in isolation, maximum concentrations greater than 1,000 µg/m^3 occur in the pits.
  - With inclusion of cumulative sources, primarily the BHP operations, the modelled results are higher than the amenity assessment criteria (90 µg/m^3) over a large part of the model domain.
- For the Year 10 operation period;
  - The area of impact of the mine shifts westward with concentrations above the amenity assessment criteria (90 µg/m^3) occurring over an area of approximately 110 km^2 .
- Plume depletion through deposition was not considered in the dispersion modelling.

The results indicate that at the nominated sensitive receptors:

- For the year 2 operation period;
  - The modelled results are higher than the amenity assessment criteria (90 µg/m^3) at the West Angelas Village on one occasion, with and without the cumulative sources included.
  - The modelled results are higher than the amenity / safety assessment criteria (90 µg/m^3) at the airport on one occasion when the cumulative sources are included.

[1] The assessment of year 2 represents consistent tonnage from the proposed operations with a focus on Deposit H - the most easterly of the proposed RTIO operations, and year 10 represents both the maximum mining tonnage (ore and waste) and the highest tonnage from the proposed Western Hill operations - the closest operations to Karijini National Park.

[2] These have been selected to represent the airport and the RTIO camp. The results have been presented for the Ghost bat caves for information purposes only.

- The model is predicting that some of the identified heritage receptor locations, especially Receptor 48 (WA-16-57-ENG) and Receptor 50 (YINHARR-39), will be impacted[3] by the proposed operations in isolation of other sources.
- With the inclusion of cumulative sources the model is predicting that there will be an increase in the number of heritage receptor locations impacted by the proposed operations.

- For the year 10 operation period:
  - The modelled results are higher than the amenity assessment criteria (90 µg/m^3) at the West Angelas Accommodation Village on 15 occasions, with and without the cumulative impacts sources included.
  - The modelled results are higher than the amenity/safety assessment criteria (90 µg/m^3) at the RTIO airport on three occasions (four when the cumulative sources are included).
  - The model is predicting that some of the identified heritage receptor locations, especially Receptor 46 (WA-16-45-ENG), Receptor 47 (WA-16-51-ENG), and Receptor 48 (WA-16-57-ENG), will be impacted by the proposed operations in isolation of other sources.
  - With the inclusion of cumulative sources the model is predicting that there will be an increase in the number of heritage receptor locations impacted by the proposed operations.

[3] Impact is determined by comparison to the adopted assessment criteria. An heritage receptor is considered to be "impacted" where the modelled ground level concentration is evaluated as elevated or above the adopted assessment criteria.

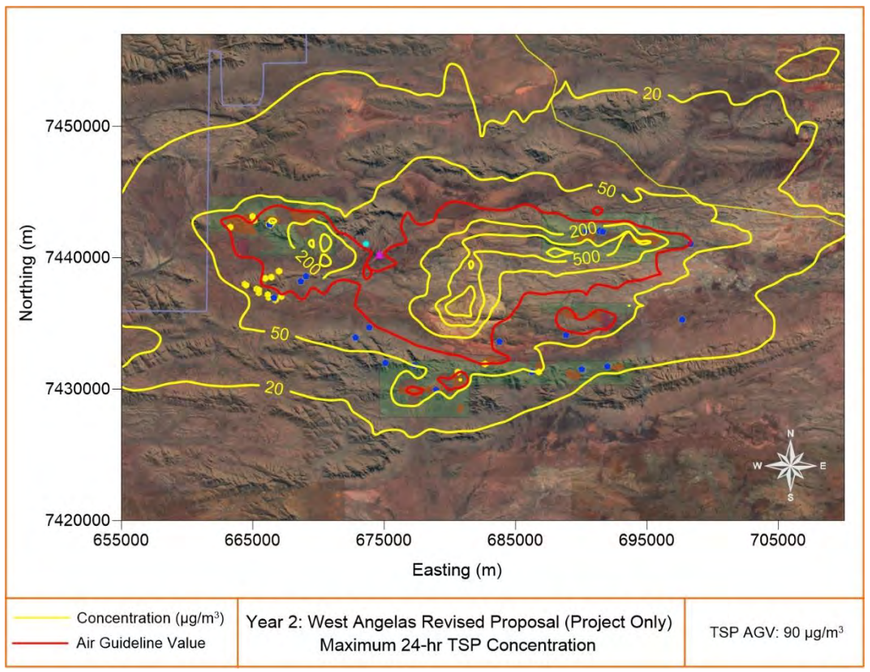


Figure 7-1: Predicted maximum 24-hour TSP concentrations, year 2 - excluding cumulative sources

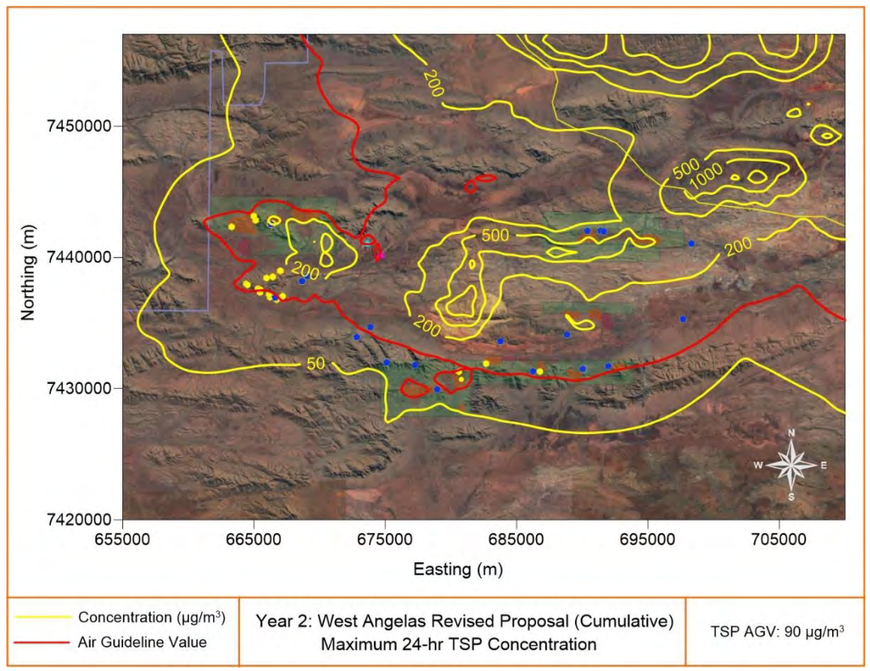


Figure 7-2: Predicted maximum 24-hour TSP concentrations, year 2 - including cumulative sources

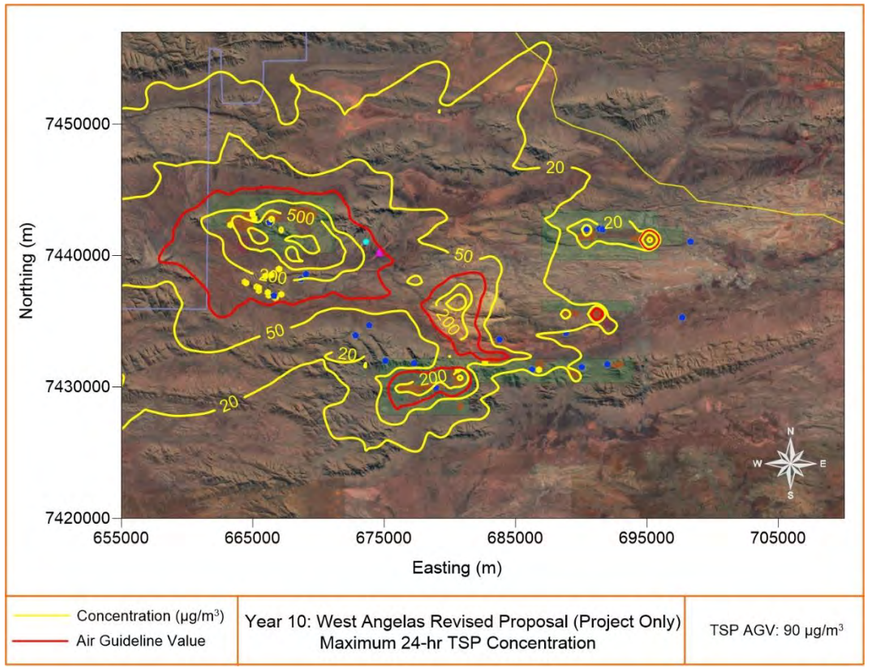


Figure 7-3: Predicted maximum 24-hour TSP concentrations, year 10 - excluding cumulative sources

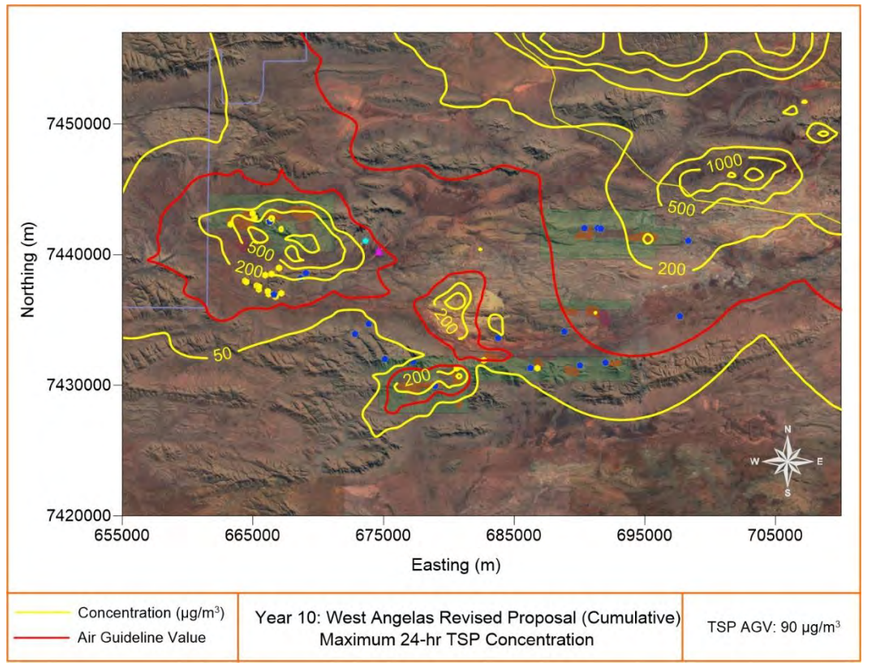


Figure 7-4: Predicted maximum 24-hour TSP concentrations, year 10 - including cumulative sources

Table 7.1: Statistics of 24-hour TSP concentration at sensitive receptors, year 2 – excluding cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
31	West Angelas Village	102	65	60	59	59	38	23	1
32	RTIO Airport	85	73	59	55	55	39	25	0
33	Deposit H	56	46	42	41	40	23	12	0
34	Turtle Pool	68	61	52	44	44	24	5	0
35	Pebble Mouse	58	47	42	39	39	22	12	0
36	Clay pan	80	63	43	38	37	19	4	0
37	Mt Ella East SE Con	88	80	62	57	56	31	13	0
38	Mt Ella East S Con	57	42	32	31	31	19	9	0
39	WARE14-16-RS	52	50	43	39	39	23	13	0
40	DF-SH1	81	73	53	49	49	32	15	0
41	WA-19-ETH-01	59	55	39	38	38	22	8	0
42	WA-16-61-SS	67	53	37	33	33	20	7	0
43	YINHARR-18	94	94	68	63	62	39	15	2
44	YINHARR-19	82	75	55	49	49	30	13	0
45	RR21	78	64	43	42	42	29	16	0
46	WA-16-45-ENG	70	54	50	48	48	33	21	0
47	WA-16-51-ENG	148	124	67	62	62	43	30	2
48	WA-16-57-ENG	192	166	116	110	110	79	60	21
49	WAN20-012	41	27	21	19	19	12	7	0
50	YINHARR-39	1365	1302	1172	1151	1127	455	229	216
51	WANETH06-2	84	76	53	50	50	36	20	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The criteria used for this assessment for TSP is from DWER (2019) and is based on the Kwinana EPP Area C criteria of 90 µg/m³ (Section 4.2). Results above the assessment criteria are highlighted in orange.

Table 7.2: Statistics of 24-hour TSP concentration at sensitive receptors, year 2 – including cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
31	West Angelas Village	102	80	68	64	64	45	31	1
32	RTIO Airport	91	84	71	68	67	47	34	1
33	Deposit H	131	101	85	82	82	53	33	4
34	Turtle Pool	539	479	421	403	395	207	77	98
35	Pebble Mouse	138	105	89	87	86	56	33	5
36	Clay pan	207	131	104	95	94	53	18	9
37	Mt Ella East SE Con	184	106	88	87	87	50	19	5
38	Mt Ella East S Con	135	73	65	61	61	39	15	1

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
39	WARE14-16-RS	114	94	76	71	71	49	32	4
40	DF-SH1	149	110	84	82	82	55	26	4
41	WA-19-ETH-01	108	79	58	57	57	37	16	1
42	WA-16-61-SS	86	70	59	57	57	35	11	0
43	YINHARR-18	113	112	92	86	86	54	20	6
44	YINHARR-19	96	93	79	72	71	45	19	2
45	RR21	90	82	63	60	60	43	24	1
46	WA-16-45-ENG	83	82	69	57	57	45	29	0
47	WA-16-51-ENG	162	151	75	71	70	52	38	2
48	WA-16-57-ENG	205	192	124	117	117	90	68	36
49	WAN20-012	68	49	34	32	32	23	14	0
50	YINHARR-39	1370	1313	1183	1177	1148	465	236	219
51	WANETH06-2	97	95	73	70	70	48	27	2

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The criteria used for this assessment for TSP is from DWER (2019) and is based on the Kwinana EPP Area C criteria of 90 µg/m^3 (Section 4.2). Results above the assessment criteria are highlighted in orange.

Table 7.3: Statistics of 24-hour TSP concentration at sensitive receptors, year 10 – excluding cumulative sources (µg/m^3)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
31	West Angelas Village	164	138	117	113	113	52	7	15
32	RTIO Airport	121	98	85	84	84	41	6	3
33	Deposit H	21	15	11	10	10	5	1	0
34	Turtle Pool	12	10	8	7	7	3	0	0
35	Pebble Mouse	20	15	11	10	10	5	1	0
36	Clay pan	11	11	7	7	7	3	0	0
37	Mt Ella East SE Con	20	20	12	10	10	4	1	0
38	Mt Ella East S Con	20	19	14	11	11	5	1	0
39	WARE14-16-RS	24	16	11	11	11	5	1	0
40	DF-SH1	23	22	15	14	14	6	2	0
41	WA-19-ETH-01	28	24	19	19	19	10	3	0
42	WA-16-61-SS	27	24	18	17	17	10	7	0
43	YINHARR-18	37	31	22	21	21	15	7	0
44	YINHARR-19	33	30	17	17	17	10	5	0
45	RR21	71	63	50	50	49	19	5	0
46	WA-16-45-ENG	343	200	174	161	160	104	58	45
47	WA-16-51-ENG	455	447	387	342	342	185	98	123
48	WA-16-57-ENG	1093	1045	802	786	783	541	389	353
49	WAN20-012	88	85	61	52	51	26	11	0

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
50	YINHARR-39	129	128	92	77	76	35	9	6
51	WANETH06-2	174	112	68	54	53	24	6	3

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The criteria used for this assessment for TSP is from DWER (2019) and is based on the Kwinana EPP Area C criteria of 90 µg/m^3 (Section 4.2). Results above the assessment criteria are highlighted in orange.

Table 7.4: Statistics of 24-hour TSP concentration at sensitive receptors, year 10 – including cumulative sources (µg/m^3)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
31	West Angelas Village	164	144	117	114	113	56	25	15
32	RTIO Airport	127	98	87	84	84	46	23	4
33	Deposit H	130	94	81	77	77	50	24	2
34	Turtle Pool	539	477	421	403	395	207	74	94
35	Pebble Mouse	137	99	86	81	81	52	25	2
36	Clay pan	185	107	84	79	78	44	11	4
37	Mt Ella East SE Con	96	53	47	44	44	24	8	1
38	Mt Ella East S Con	78	49	42	41	41	22	9	0
39	WARE14-16-RS	113	83	69	68	68	45	22	1
40	DF-SH1	76	55	47	46	46	26	11	0
41	WA-19-ETH-01	51	39	38	34	33	22	10	0
42	WA-16-61-SS	52	45	38	35	35	24	11	0
43	YINHARR-18	55	53	48	45	45	30	12	0
44	YINHARR-19	45	44	41	35	35	25	12	0
45	RR21	71	66	58	54	53	31	15	0
46	WA-16-45-ENG	343	212	187	185	182	115	66	62
47	WA-16-51-ENG	457	451	387	342	342	194	109	143
48	WA-16-57-ENG	1106	1045	812	796	791	547	399	353
49	WAN20-012	99	94	66	55	54	32	20	2
50	YINHARR-39	140	134	97	89	86	43	19	7
51	WANETH06-2	174	113	71	61	60	35	17	3

Notes:

c. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

a. The criteria used for this assessment for TSP is from DWER (2019) and is based on the Kwinana EPP Area C criteria of 90 µg/m^3 (Section 4.2). Results above the assessment criteria are highlighted in orange.

7.2 Particulates as PM_{10}

As outlined in Section 4.2, the 24-hour (50 µg/m^3) and annual criteria (25 µg/m^3) for PM_{10} are based on the protection of human health and the criterion used in this assessment it not applicable to receptors at West Angelas other than the RTIO accommodation village, and potentially the RTIO airport.

In the following section the predicted ground level concentrations of particles as PM_{10} are presented as contour plots and at the identified discrete receptor locations. The modelled concentrations are shown for the project in isolation and with non-project sources from surrounding operations to evaluate the potential cumulative impact.

The model results for PM_{10} for year 2 and year 10 operational years[4] are shown in Figure 7-5 to Figure 7-12 and summarised in Table 7.5 to Table 7.8 for sensitive receptors. Modelled results above of the 24-hour assessment criteria (based on the Taskforce criteria of 70 µg/m^3 (Section 4.1)) are highlighted in orange.

The concentration contours show:

- For the year 2 operation period;
  - With the mine emissions in isolation of non-project related sources, the modelled concentrations higher than the annual average assessment criterion (25 µg/m^3) are limited to the immediate vicinity of the pits and along the haul routes.
  - Inclusion of the other sources (ie. potential cumulative impact) does not significantly affect impacts in the immediate vicinity of West Angelas. Modelled results above the annual average assessment criterion (25 µg/m^3) do occur over the other mines in the model domain (ie. non-RTIO mines).
  - Maximum 24-hour concentrations above the Taskforce criterion (70 µg/m^3) are limited to the immediate vicinity of the pits and along the haul routes. Including emissions from nearby mines increases the area where concentrations are above the Taskforce criterion (70 µg/m^3), especially over the northeastern part of the model domain.
  - With the mine operations modelled in isolation of non-project sources, the modelled concentrations are higher than then 24-hour assessment criterion for human health impact (50 µg/m^3) only over the pits and along the haul routes.
  - With inclusion of the nearby mines, the area where concentrations are above the 24-hour assessment criterion (50 µg/m^3) increased over the northeastern part of the model domain.
- For the year 10 operation period:
  - With the mine operating in isolation, concentrations higher than the annual average assessment criterion (25 µg/m^3) is limited to the pits.
  - Inclusion of the other mines does not impact on annual average concentration in the immediate vicinity of West Angelas.
  - Concentrations higher than the Taskforce 24-hour assessment criterion (70 µg/m^3) is limited to the immediate vicinity of the pits.
  - Including emission sources from nearby mines (ie. cumulative sources) increases the area higher than the Taskforce criterion in the vicinity of West Angelas.

[4] The assessment of year 2 represents consistent tonnage from the proposed operations with a focus on Deposit H - the most easterly of the proposed RTIO operations, and year 10 represents both the maximum mining tonnage (ore and waste) and the highest tonnage from the proposed Western Hill operations - the closest operations to Karijini National Park.

- With the mine operating in isolation, concentrations higher than the 24-hour human health impact assessment criterion (50 µg/m^3) only occur over the pits.
- With inclusion of the nearby mines, the area where ground level concentrations are above the 24-hour assessment criterion in the vicinity of West Angelas is largely unchanged, although these areas are seen over the northeastern part of the model domain (over the nearby mines).

The results indicate that at the sensitive receptors where the primary impact of concern is the impact on human health (due to human habitation), for PM_{10}:

- For the year 2 operation period:
  - the model is predicting no annual average concentrations higher than the assessment criterion (25 µg/m^3) , with and without cumulative sources.
  - the model is predicting no maximum 24-hour concentrations higher than the Taskforce criterion (70 µg/m^3) for maximum 24-hour concentration, with and without cumulative sources included.
  - the NEPM criterion (50 µg/m^3) for maximum 24-hour concentration is not exceeded, with and without cumulative sources included.
- For the year 10 operation period:
  - the model is predicting no annual average concentrations higher than the assessment criterion (25 µg/m^3), with and without cumulative sources.
  - The Taskforce criterion (70 µg/m^3) for maximum 24-hour concentration is not exceeded, with and without cumulative sources.
  - the NEPM criterion (50 µg/m^3) for maximum 24-hour concentration is not exceeded, with and without cumulative sources.

The model results for PM_{10} have been presented for each of the listed ghost bat caves, noting that there is no known relevant assessment criteria for this receptor type. The human health criteria is therefore used as an indicative reference point for the purpose of the assessment, and is assumed to also be conservatively protective of the environmental values of the wild-life habitat (ecological). In this context a modelling result that is higher than the assessment criteria at a ghost bat receptor location should not be interpreted as a predicted impact or loss of environmental value, but is an indication that results may need further consideration for the sensitive receptor at the specific location.

The PM_{10} model results indicate that ghost bat caves in close proximity to the Project are predicted to experience elevated concentrations for both modelled years. As outlined in Section 4.2 RTIO has advised that Blast Management Plans, which cover monitoring, blast prediction and management of blasting impacts, are in place to control potential emissions.

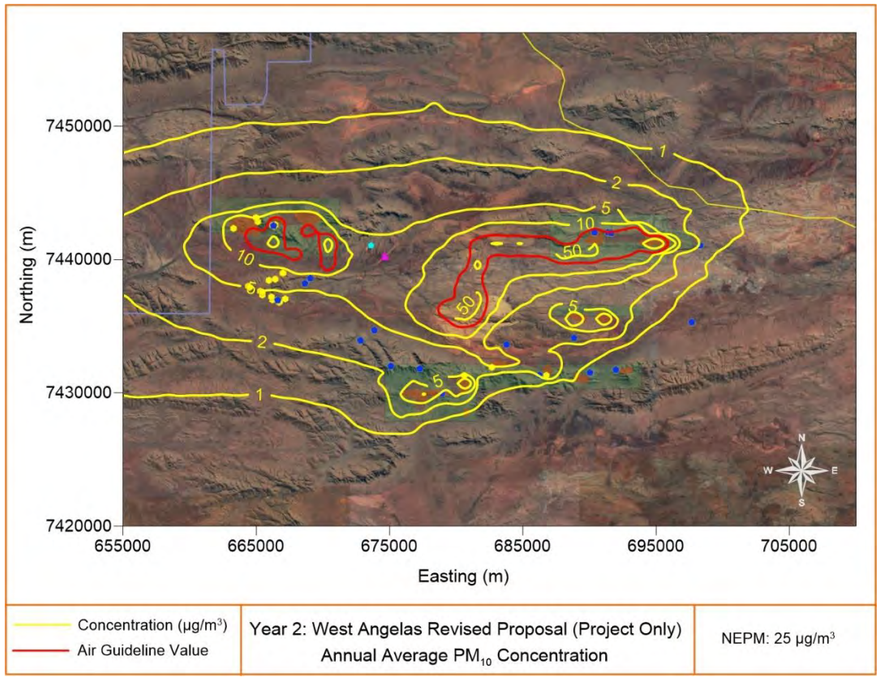


Figure 7-5: Predicted annual average PM_{10} concentrations, year 2 - excluding cumulative sources

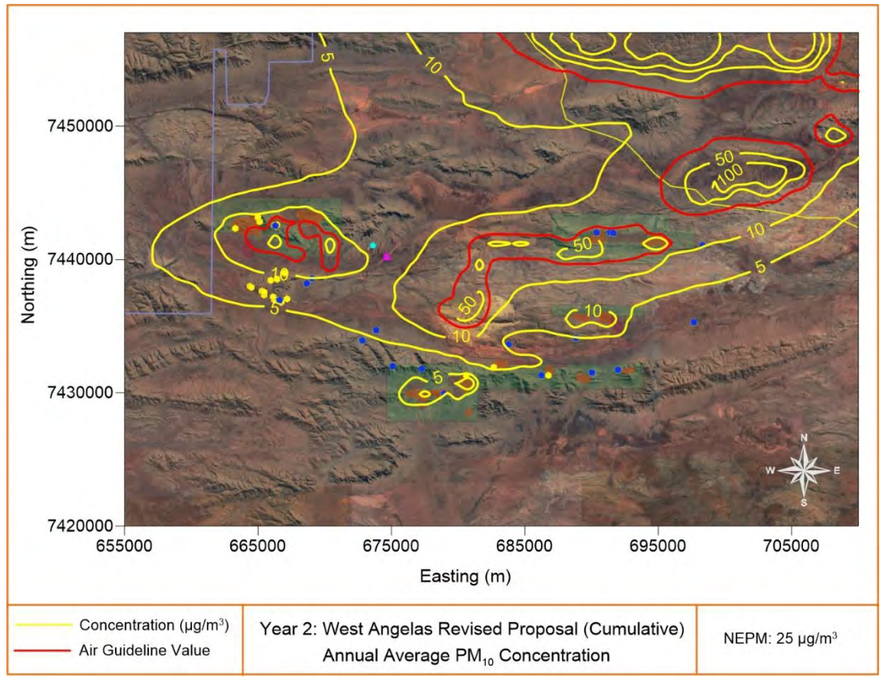


Figure 7-6: Predicted annual average PM_{10} concentrations, year 2 - including cumulative sources

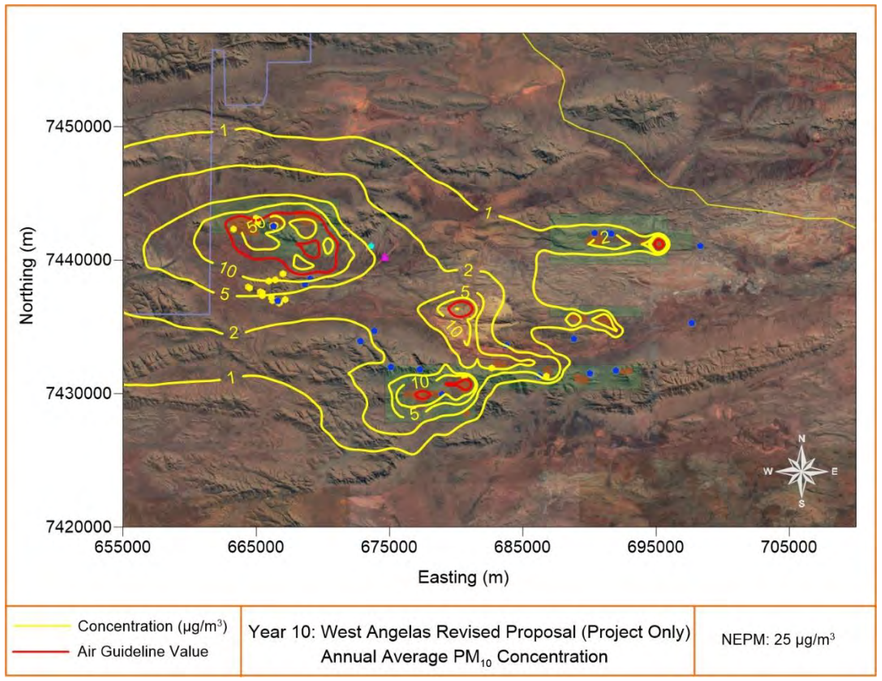


Figure 7-7: Predicted annual average PM_{10} concentrations, year 10 - excluding cumulative sources

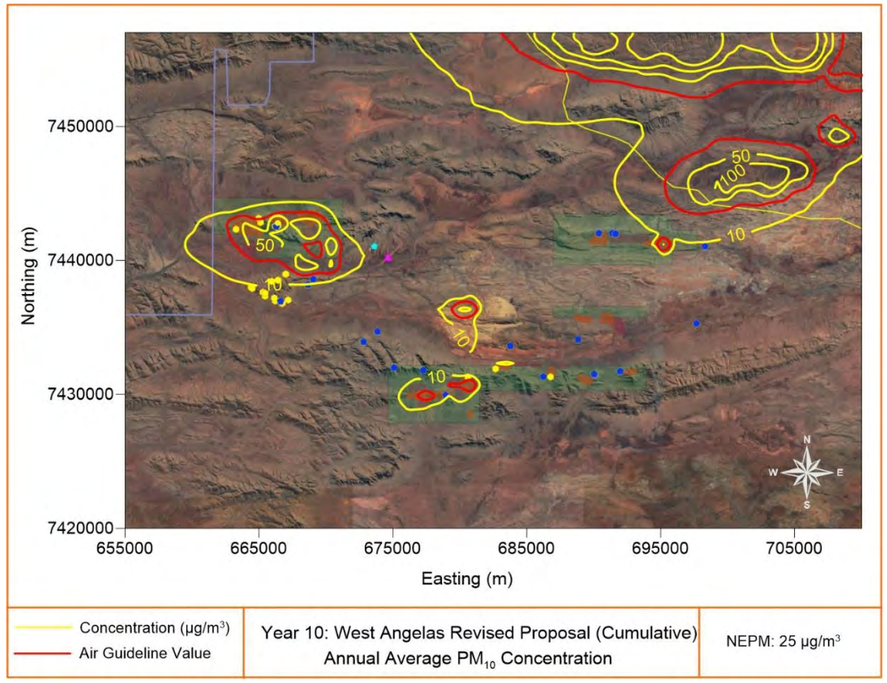


Figure 7-8: Predicted annual average PM_{10} concentrations, year 10 - including cumulative sources

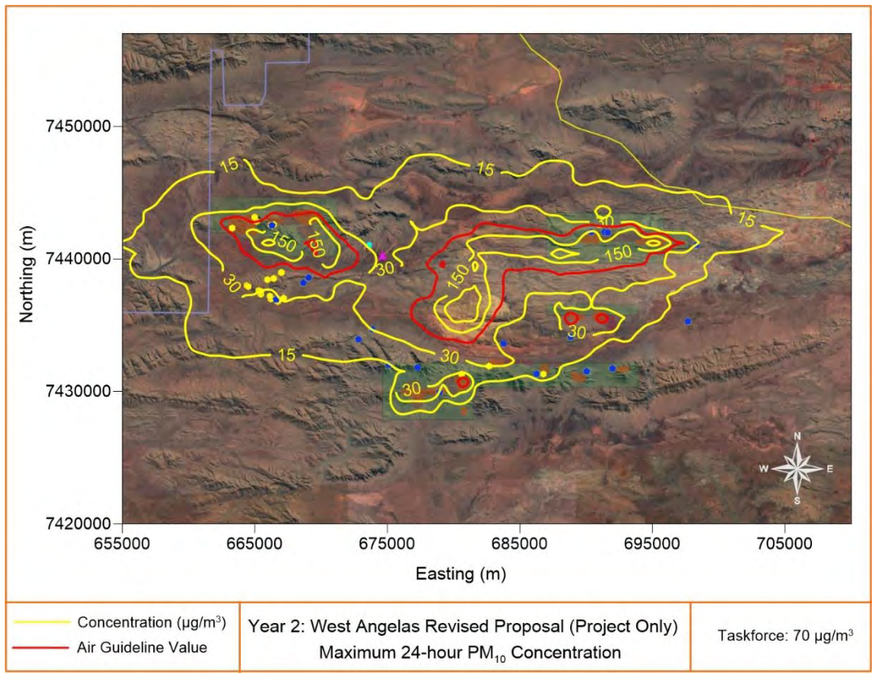


Figure 7-9: Predicted maximum 24-hour PM_{10} concentrations, year 2 - excluding cumulative sources

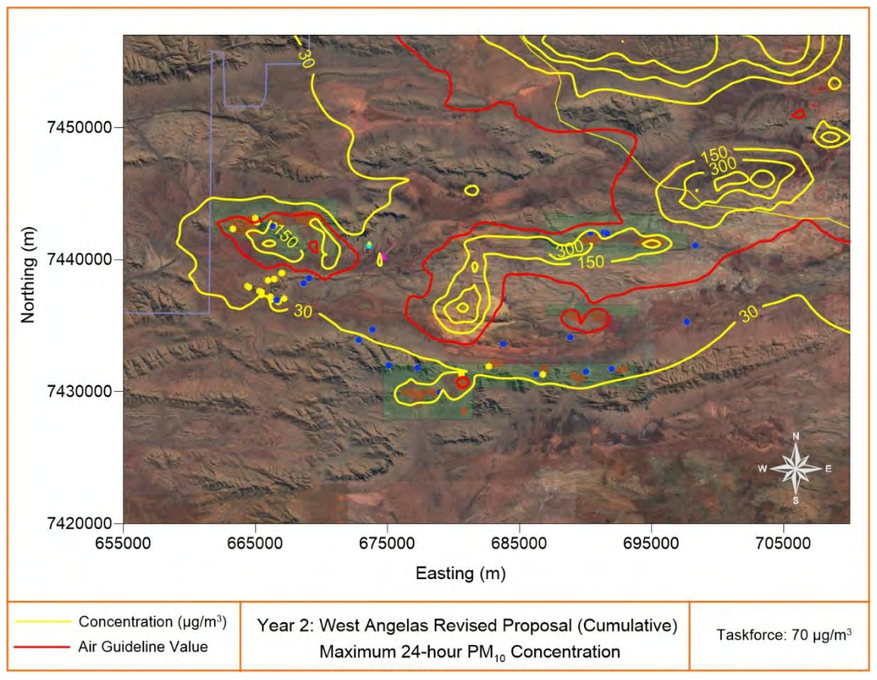


Figure 7-10: Predicted maximum 24-hour PM_{10} concentrations, year 2 - including cumulative sources

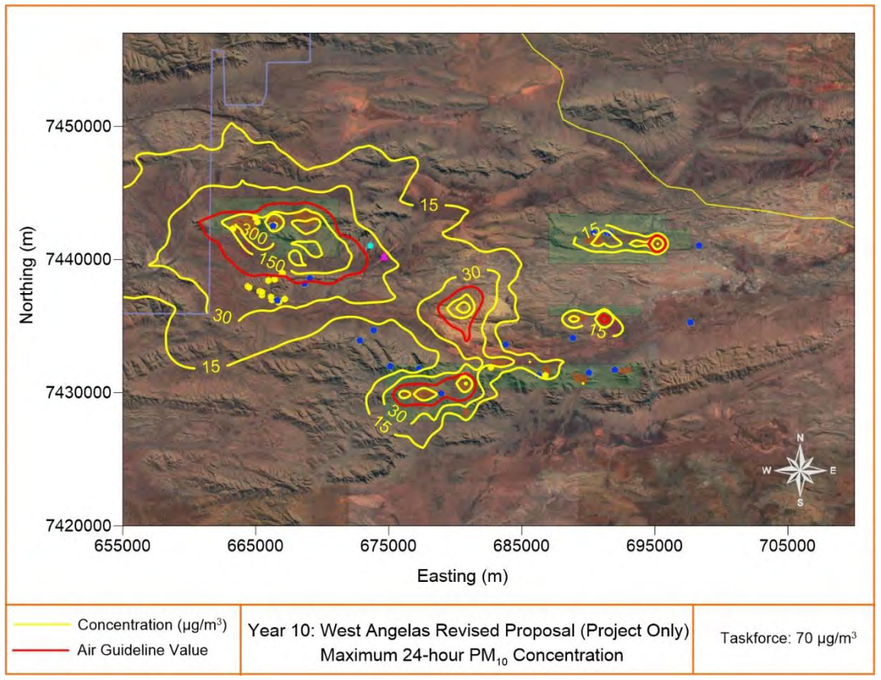


Figure 7-11: Predicted maximum 24-hour PM_{10} concentrations, year 10 - excluding cumulative sources

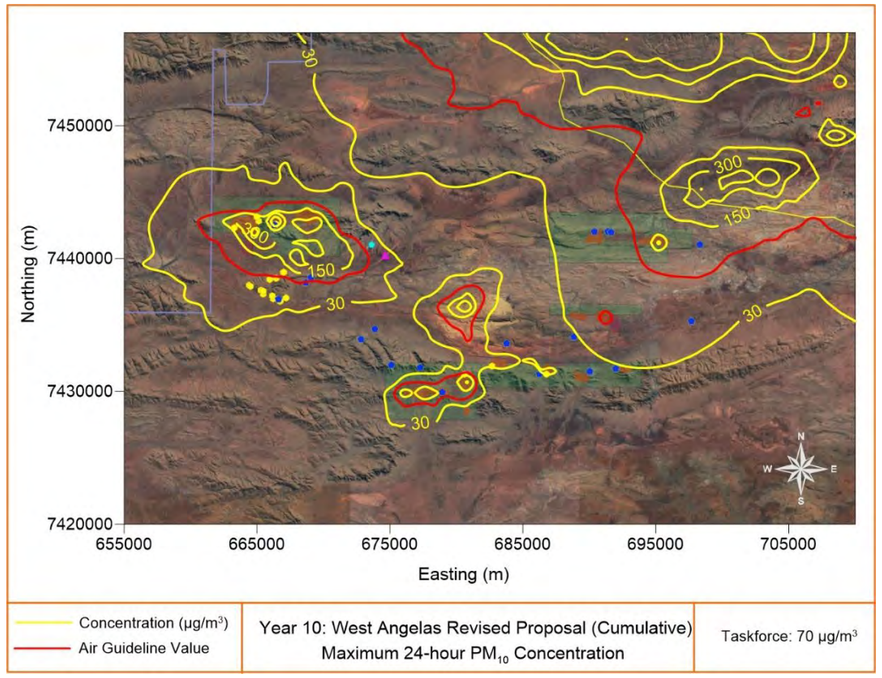


Figure 7-12: Predicted maximum 24-hour PM_{10} concentrations, year 10 - including cumulative sources

Table 7.5: Statistics of 24-hour PM_{10} concentration at sensitive receptors, year 2 – excluding cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Annual	Days >70 [b]
1	Bat Cave WA-10	39	27	21	20	20	14	9	6.8	0
2	Bat Cave WA-11	39	27	21	20	20	14	9	6.8	0
3	Bat Cave WA-12	33	27	17	16	16	10	6	4.4	0
4	Bat Cave WA-13	28	21	14	14	13	9	5	4.1	0
5	Bat Cave WA-14	25	19	12	12	12	8	5	3.7	0
6	Bat Cave WA-14	33	27	17	16	16	10	6	4.4	0
7	Bat Cave WA-15	25	19	12	12	12	8	5	3.7	0
8	Bat Cave WA-16	28	16	12	11	11	8	5	3.4	0
9	Bat Cave WA-17	27	16	12	11	11	8	4	3.4	0
10	Bat Cave WA-18	28	16	12	11	11	8	5	3.4	0
11	Bat Cave WA-19	27	18	12	12	12	8	5	3.6	0
12	Bat Cave WA-20	27	18	12	12	12	8	5	3.6	0
13	Bat Cave WA-21	31	21	14	12	12	9	5	3.9	0
14	Bat Cave WA-22	32	30	17	17	17	12	7	5.5	0
15	Bat Cave WA-23	34	28	18	18	18	13	8	6.0	0
16	Bat Cave WA-24	34	28	18	18	18	13	8	6.0	0
17	Bat Cave WA-04	141	114	88	83	82	54	35	30.4	47
18	Bat Cave WA-07	68	68	44	39	39	27	17	13.9	2
19	Bat Cave WA-06	92	81	54	49	48	32	18	16.4	7
20	Bat Cave CWAN-01	259	201	159	147	146	98	70	56.1	109
21	Bat Cave CWAN-02	88	82	73	65	65	41	27	22.6	7
22	Bat Cave CWAN-03	88	82	73	65	65	41	27	22.6	7
23	Bat Cave CWAN-04	238	154	102	99	99	46	31	27.5	20
24	Bat Cave CWAN-05	72	62	38	35	35	23	16	13.1	1
25	Bat Cave CWAN-06	67	56	40	36	35	23	16	13.2	0
26	Bat Cave CWAN-07	52	40	32	30	30	18	12	9.4	0
27	Bat Cave CWAN-08	22	21	12	11	11	6	3	2.4	0
28	Bat Cave CWAN-09	41	29	23	22	22	15	10	7.6	0
29	Bat Cave CWAN-10	33	22	18	17	17	11	7	5.5	0
30	Bat Cave CWAN-11	15	9	8	8	8	4	1	1.2	0
31	West Angelas Village	36	27	24	23	22	14	8	6.6	0
32	RTIO Airport	27	24	22	19	19	14	8	6.8	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The PM_{10} assessment criteria is 50 µg/m³ over a 24-hour period and 25 µg/m³ annual average (Section 4.2).

Table 7.6: Statistics of 24-hour PM_{10} concentration at sensitive receptors, year 2 – including cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	98th	95th	90th	70th	Annual	Days >50 [b]
1	Bat Cave WA-10	44	40	26	24	25	19	12	8.7	0
2	Bat Cave WA-11	44	40	26	24	25	19	12	8.7	0
3	Bat Cave WA-12	36	32	21	19	20	15	8	6.2	0
4	Bat Cave WA-13	31	29	19	18	19	14	8	5.8	0
5	Bat Cave WA-14	28	26	18	17	18	13	8	5.5	0
6	Bat Cave WA-14	36	32	21	19	20	15	8	6.2	0
7	Bat Cave WA-15	28	26	18	17	18	13	8	5.5	0
8	Bat Cave WA-16	31	23	18	16	17	12	7	5.1	0
9	Bat Cave WA-17	31	23	18	16	16	12	7	5.1	0
10	Bat Cave WA-18	31	23	18	16	17	12	7	5.1	0
11	Bat Cave WA-19	30	24	19	16	18	13	7	5.3	0
12	Bat Cave WA-20	30	24	19	16	18	13	7	5.3	0
13	Bat Cave WA-21	34	25	20	18	19	13	8	5.7	0
14	Bat Cave WA-22	36	35	24	21	21	17	10	7.3	0
15	Bat Cave WA-23	39	37	26	22	22	17	11	7.8	0
16	Bat Cave WA-24	39	37	26	22	22	17	11	7.8	0
17	Bat Cave WA-04	145	114	90	79	83	54	38	32.6	55
18	Bat Cave WA-07	70	68	47	39	41	27	18	16.0	4
19	Bat Cave WA-06	94	81	55	49	52	32	20	18.5	8
20	Bat Cave CWAN-01	264	201	159	142	147	100	72	58.3	117
21	Bat Cave CWAN-02	92	92	76	63	72	42	29	24.8	8
22	Bat Cave CWAN-03	92	92	76	63	72	42	29	24.8	8
23	Bat Cave CWAN-04	250	154	104	97	99	47	33	29.7	20
24	Bat Cave CWAN-05	81	62	42	35	36	25	19	15.1	1
25	Bat Cave CWAN-06	69	56	42	35	36	24	17	15.3	0
26	Bat Cave CWAN-07	54	42	35	30	31	20	14	11.6	0
27	Bat Cave CWAN-08	34	28	16	16	16	11	4	3.7	0
28	Bat Cave CWAN-09	46	41	29	26	27	19	13	9.5	0
29	Bat Cave CWAN-10	39	28	21	19	19	14	8	6.7	0
30	Bat Cave CWAN-11	33	18	14	13	13	8	3	2.6	0
31	West Angelas Village	36	29	25	24	25	17	11	9.1	0
32	RTIO Airport	30	29	25	22	23	16	12	9.2	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The PM_{10} assessment criteria is 50 µg/m³ over a 24-hour period and 25 µg/m³ annual average (Section 4.2).

Table 7.7: Statistics of 24-hour PM_{10} concentration at sensitive receptors, year 10 – excluding cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Annual	Days >50 [b]
1	Bat Cave WA-10	57	56	42	42	41	25	13	10.0	2
2	Bat Cave WA-11	57	56	42	42	41	25	13	10.0	2
3	Bat Cave WA-12	42	34	29	28	28	15	7	5.7	0
4	Bat Cave WA-13	34	27	22	20	20	13	6	4.7	0
5	Bat Cave WA-14	33	22	18	17	17	11	5	4.0	0
6	Bat Cave WA-14	42	34	29	28	28	15	7	5.7	0
7	Bat Cave WA-15	33	22	18	17	17	11	5	4.0	0
8	Bat Cave WA-16	31	19	16	14	14	8	3	2.9	0
9	Bat Cave WA-17	32	19	17	15	15	8	3	3.0	0
10	Bat Cave WA-18	31	19	16	14	14	8	3	2.9	0
11	Bat Cave WA-19	35	22	18	17	17	9	4	3.5	0
12	Bat Cave WA-20	35	22	18	17	17	9	4	3.5	0
13	Bat Cave WA-21	35	25	18	17	17	10	3	3.4	0
14	Bat Cave WA-22	46	43	31	30	30	19	9	7.0	0
15	Bat Cave WA-23	49	46	36	34	34	22	11	8.0	0
16	Bat Cave WA-24	49	46	36	34	34	22	11	8.0	0
17	Bat Cave WA-04	197	168	127	122	121	87	45	39.9	97
18	Bat Cave WA-07	361	201	106	101	101	67	38	32.1	85
19	Bat Cave WA-06	180	173	123	110	109	68	37	34.5	72
20	Bat Cave CWAN-01	160	156	122	112	111	71	41	35.4	38
21	Bat Cave CWAN-02	147	134	99	87	86	57	38	34.3	16
22	Bat Cave CWAN-03	147	134	99	87	86	57	38	34.3	16
23	Bat Cave CWAN-04	475	126	98	83	81	58	40	34.9	14
24	Bat Cave CWAN-05	126	125	90	83	82	52	34	30.0	13
25	Bat Cave CWAN-06	157	132	97	82	82	49	31	26.7	12
26	Bat Cave CWAN-07	165	162	69	62	62	41	24	19.8	4
27	Bat Cave CWAN-08	16	16	11	11	10	6	3	2.6	0
28	Bat Cave CWAN-09	75	63	53	51	51	31	17	12.9	1
29	Bat Cave CWAN-10	75	73	53	52	52	30	18	14.7	2
30	Bat Cave CWAN-11	8	7	5	5	5	3	1	0.9	0
31	West Angelas Village	55	48	39	38	38	18	3	5.3	1
32	RTIO Airport	41	33	28	28	28	14	3	4.2	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The PM_{10} assessment criteria is 50 µg/m³ over a 24-hour period and 25 µg/m³ annual average (Section 4.2).

Table 7.8: Statistics of 24-hour PM_{10} concentration at sensitive receptors, year 10 – including cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [c]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Annual	Days >50 [d]
1	Bat Cave WA-10	64	62	47	44	44	29	16	11.9	4
2	Bat Cave WA-11	64	62	47	44	44	29	16	11.9	4
3	Bat Cave WA-12	45	43	33	31	31	20	10	7.5	0
4	Bat Cave WA-13	37	34	26	26	26	18	9	6.5	0
5	Bat Cave WA-14	36	27	23	22	22	16	8	5.7	0
6	Bat Cave WA-14	45	43	33	31	31	20	10	7.5	0
7	Bat Cave WA-15	36	27	23	22	22	16	8	5.7	0
8	Bat Cave WA-16	35	24	19	18	18	12	6	4.6	0
9	Bat Cave WA-17	35	23	19	19	19	12	6	4.7	0
10	Bat Cave WA-18	35	24	19	18	18	12	6	4.6	0
11	Bat Cave WA-19	38	23	22	21	21	14	7	5.2	0
12	Bat Cave WA-20	38	23	22	21	21	14	7	5.2	0
13	Bat Cave WA-21	38	30	21	20	20	14	6	5.2	0
14	Bat Cave WA-22	50	48	36	35	35	23	12	8.8	0
15	Bat Cave WA-23	54	54	40	39	38	25	13	9.9	2
16	Bat Cave WA-24	54	54	40	39	38	25	13	9.9	2
17	Bat Cave WA-04	197	169	127	122	121	88	50	42.1	109
18	Bat Cave WA-07	361	201	106	103	102	68	39	34.2	87
19	Bat Cave WA-06	180	173	124	110	109	71	40	36.6	75
20	Bat Cave CWAN-01	161	156	123	112	111	72	43	37.6	41
21	Bat Cave CWAN-02	152	135	99	93	91	58	40	36.5	17
22	Bat Cave CWAN-03	152	135	99	93	91	58	40	36.5	17
23	Bat Cave CWAN-04	485	130	98	87	86	60	42	37.1	14
24	Bat Cave CWAN-05	135	126	93	88	86	56	37	32.0	14
25	Bat Cave CWAN-06	157	132	99	83	82	49	33	28.8	12
26	Bat Cave CWAN-07	165	162	69	66	65	41	25	22.0	5
27	Bat Cave CWAN-08	24	23	16	15	15	10	5	4.0	0
28	Bat Cave CWAN-09	79	74	57	54	54	34	21	14.9	2
29	Bat Cave CWAN-10	81	73	54	53	52	31	19	15.9	2
30	Bat Cave CWAN-11	23	15	12	11	11	7	3	2.3	0
31	West Angelas Village	55	50	39	38	38	20	9	7.8	1
32	RTIO Airport	44	33	29	28	28	16	8	6.6	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The PM_{10} assessment criteria for this assessment is 50 µg/m³ over a 24-hour period and 25 µg/m³ annual average (Section 4.2).

7.3 Particulates as $PM_{2.5}$

As outlined in Section 4.2 the 24-hour (25 µg/m^3) and annual criteria (8 µg/m^3) for $PM_{2.5}$ are based on the protection of human health and the criterion used in this assessment is not applicable to receptors at West Angelas other than the RTIO village, and potentially the airport.

In the following section the predicted ground level concentrations of particles as $PM_{2.5}$ are presented as contour plots and at the identified discrete receptor locations. The modelled concentrations are shown for the project in isolation and with cumulative background data to evaluate the potential cumulative impact. Figures demonstrating the ground level concentration contours for the modelled annual average and maximum 24-hour average ground level concentrations of $PM_{2.5}$ are presented.

The model results for $PM_{2.5}$ for year 2 and year 10 operational years[5] are shown in Figure 7-13 to Figure 7-20 and summarised in Table 7.9 to Table 7.12 for sensitive receptors. Modelled results above the 24-hour assessment criteria of 25 µg/m^3 (Section 4.1) have been highlighted in orange.

The concentration contours show:

- For the year 2 operation year:
  - With the mine emissions in isolation of non-project related sources, modelled concentrations higher than the annual average assessment criterion (8 µg/m^3) are limited to the immediate vicinity of the pits and along the haul routes.
  - Inclusion of the other mines (ie. sources for potential cumulative impact) does not significantly affect impacts in the immediate vicinity of West Angelas. Exceedance of the annual average assessment criterion does occur over the other mines.
  - With the mine emissions in isolation, the 24-hour assessment criterion (25 µg/m^3) is only exceeded over the pits and along the haul routes.
  - With inclusion of the nearby mines, the area higher than the 24-hour assessment criterion (25 µg/m^3) increases over the northeastern part of the model domain.
- For the year 10 operation year:
  - With the mine emissions in isolation, modelled concentrations higher than the annual average assessment criterion (8 µg/m^3) are limited to the area in the vicinity of the pits.
  - Inclusion of the other mines does not impact on annual average concentration in the immediate vicinity of West Angelas. Exceedance of the annual average assessment criterion again occurs over the nearby mines.
  - With the mine emissions in isolation, the 24-hour assessment criterion (25 µg/m^3) is only exceeded over the pits.
  - With inclusion of the nearby mines, the area higher than the 24-hour assessment criterion in the vicinity of West Angelas is largely unchanged, although areas of exceedance are seen over the northeastern part of the model domain (over the nearby mines).

[5] The assessment of year 2 represents consistent tonnage from the proposed operations with a focus on Deposit H - the most easterly of the proposed RTIO operations, and year 10 represents both the maximum mining tonnage (ore and waste) and the highest tonnage from the proposed Western Hill operations - the closest operations to Karijini National Park.

The results indicate that at the sensitive receptors (ie. RTIO accommodation village):

- For the year 2 operation year:
  - The assessment criterion for annual average concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
  - The assessment criterion for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
- For the year 10 operation year:
  - The assessment criterion for annual average concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
  - The assessment criterion for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.

The model results for $PM_{2.5}$ have been presented for each of the listed ghost bat caves, noting that there is no known relevant assessment criteria for this receptor type. The human health criteria is therefore used as an indicative reference point for the purpose of the assessment, and is assumed to also be conservatively protective of the environmental values of the wild-life habitat (ecological). In this context a modelling result that is higher than the assessment criteria at a ghost bat receptor location should not be interpreted as a predicted impact or loss of environmental value, but is an indication that results may need further consideration for the sensitive receptor at the specific location.

The $PM_{2.5}$ model results indicate that ghost bat caves in close proximity to the Project are predicted to experience elevated concentrations for both modelled years. As outlined in Section 4.2 RTIO has advised that Blast Management Plans, which cover monitoring, blast prediction and management of blasting impacts, are in place to control potential emissions.

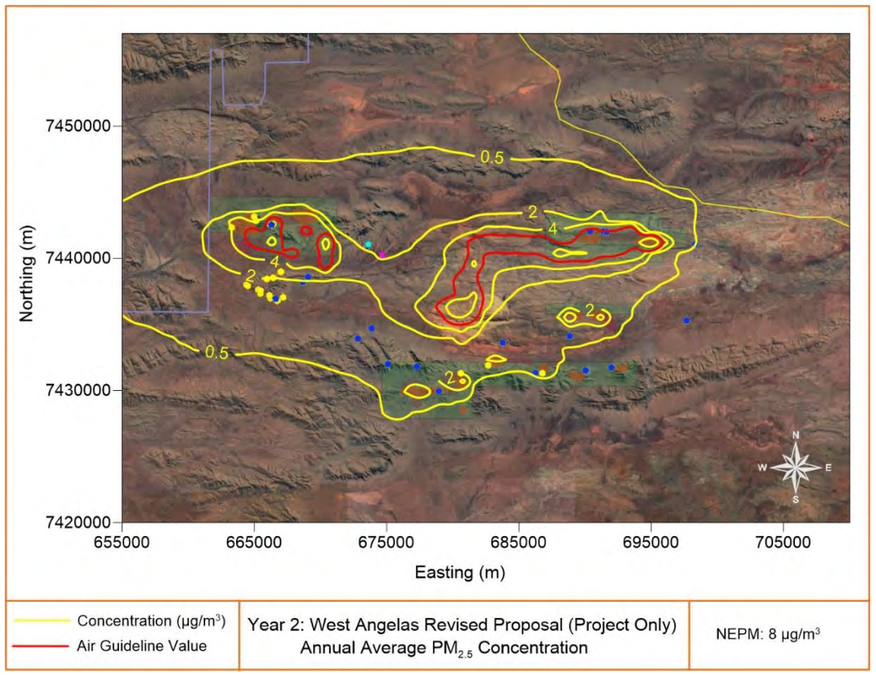


Figure 7-13: Predicted annual average $PM_{2.5}$ concentrations, year 2 - excluding cumulative sources

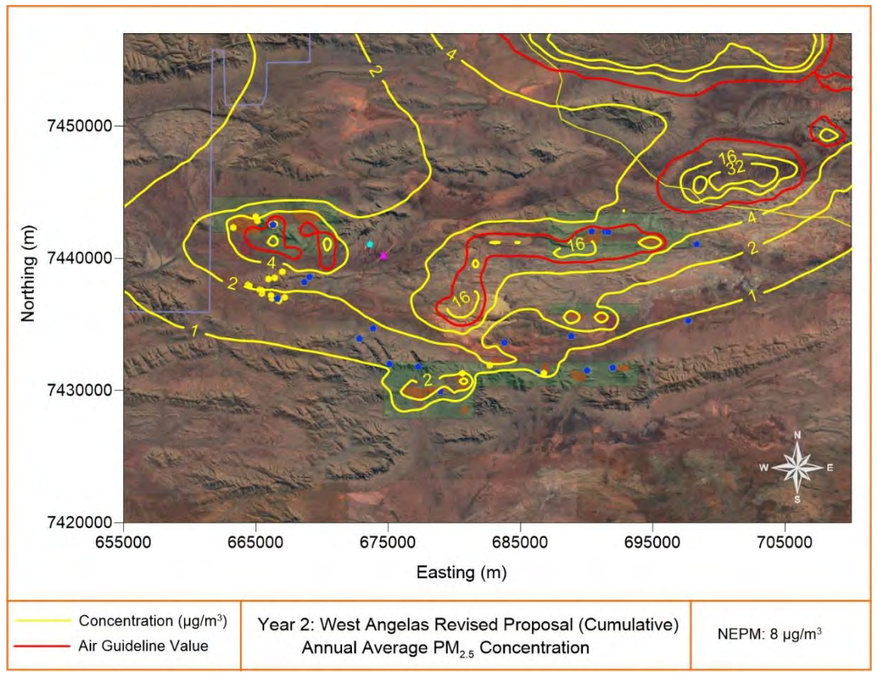


Figure 7-14: Predicted annual average $PM_{2.5}$ concentrations, year 2 - including cumulative sources

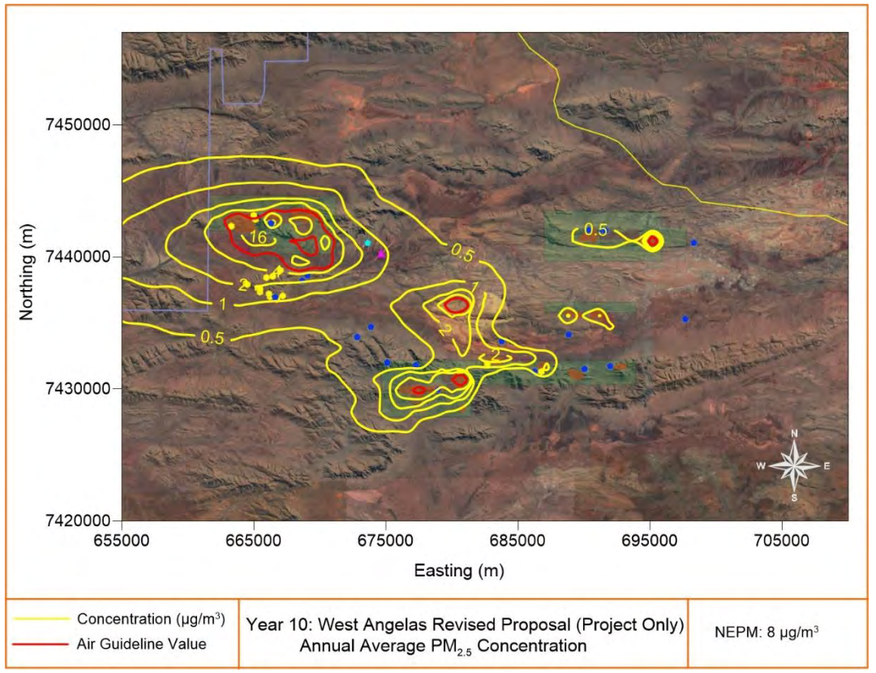


Figure 7-15: Predicted annual average $PM_{2.5}$ concentrations, year 10 - excluding cumulative sources

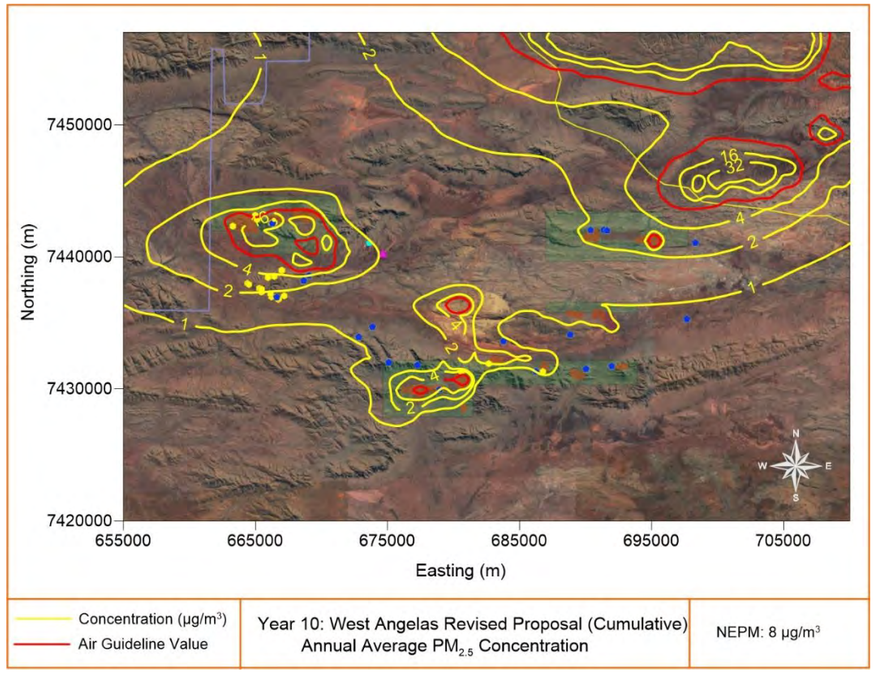


Figure 7-16: Predicted annual average $PM_{2.5}$ concentrations, year 10- including cumulative sources

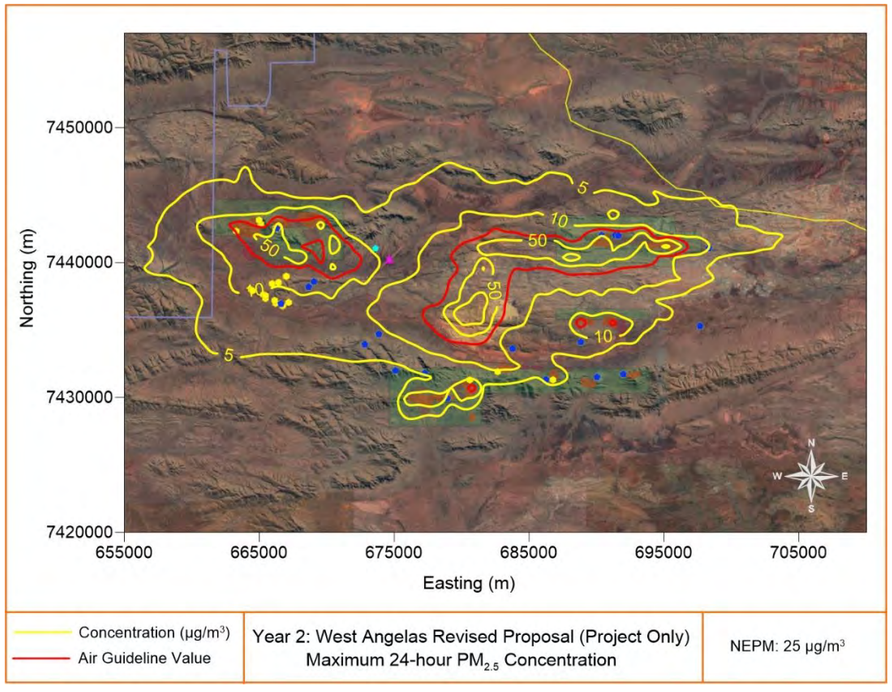


Figure 7-17: Predicted maximum 24-hour $PM_{2.5}$ concentrations, year 2 - excluding cumulative sources

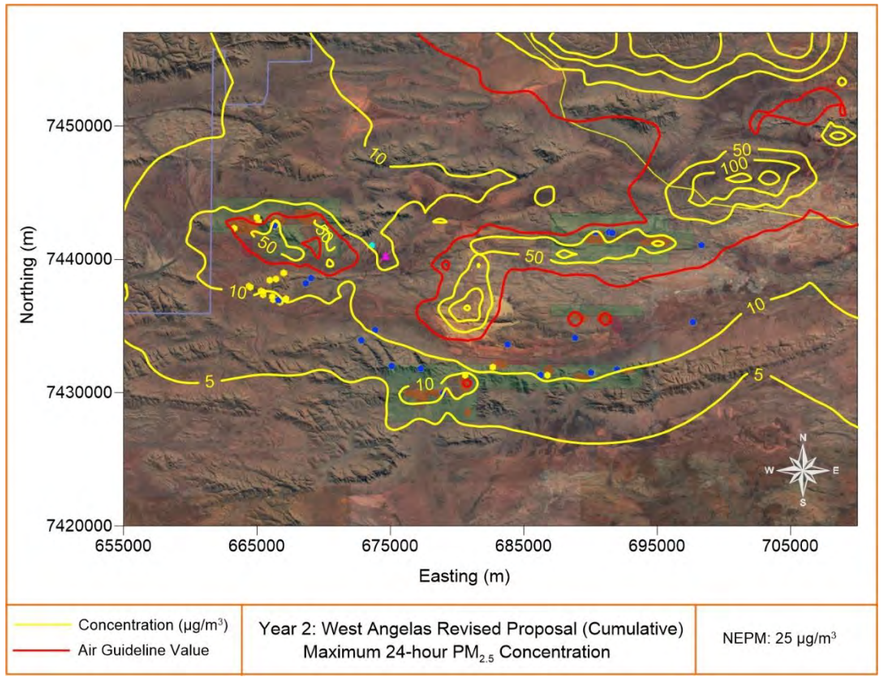


Figure 7-18: Predicted maximum 24-hour $PM_{2.5}$ concentrations, year 2 - including cumulative sources

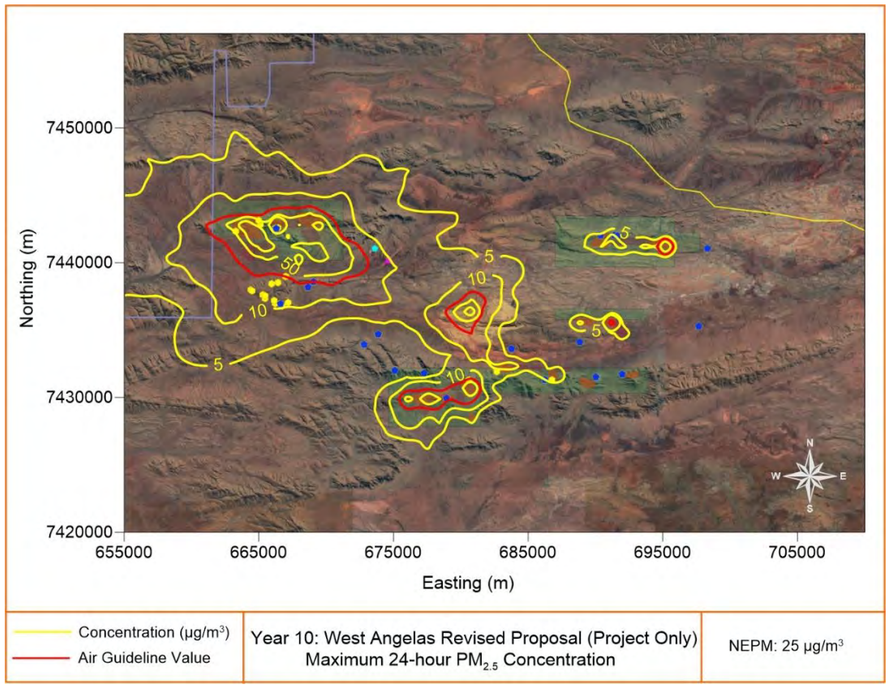


Figure 7-19: Predicted maximum 24-hour $PM_{2.5}$ concentrations, year 10 - excluding cumulative sources

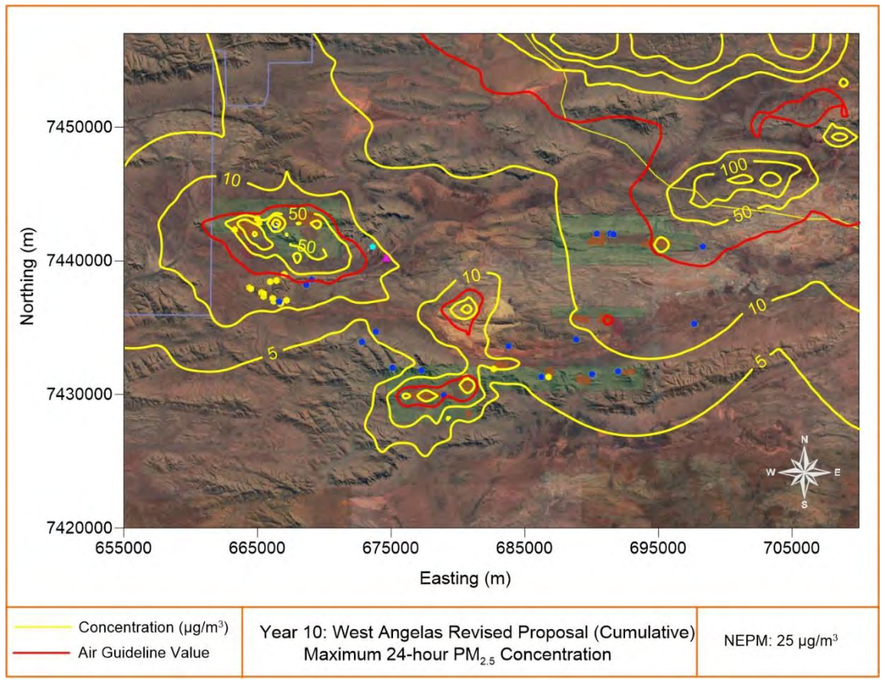


Figure 7-20: Predicted maximum 24-hour $PM_{2.5}$ concentrations, year 10 - including cumulative sources

Table 7.9: Statistics of 24-hour $PM_{2.5}$ concentration at sensitive receptors, year 2 – excluding cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Annual	Days >25 [b]
1	Bat Cave WA-10	12	8	6	6	6	4	3	2.0	0
2	Bat Cave WA-11	12	8	6	6	6	4	3	2.0	0
3	Bat Cave WA-12	10	8	5	5	5	3	2	1.3	0
4	Bat Cave WA-13	8	6	4	4	4	3	2	1.2	0
5	Bat Cave WA-14	8	6	4	4	4	3	2	1.1	0
6	Bat Cave WA-14	10	8	5	5	5	3	2	1.3	0
7	Bat Cave WA-15	8	6	4	4	4	3	2	1.1	0
8	Bat Cave WA-16	8	5	4	3	3	2	1	1.0	0
9	Bat Cave WA-17	8	5	4	3	3	2	1	1.0	0
10	Bat Cave WA-18	8	5	4	3	3	2	1	1.0	0
11	Bat Cave WA-19	8	6	4	4	4	2	1	1.1	0
12	Bat Cave WA-20	8	6	4	4	4	2	1	1.1	0
13	Bat Cave WA-21	9	6	4	4	4	3	2	1.2	0
14	Bat Cave WA-22	10	9	5	5	5	4	2	1.7	0
15	Bat Cave WA-23	10	8	5	5	5	4	2	1.8	0
16	Bat Cave WA-24	10	8	5	5	5	4	2	1.8	0
17	Bat Cave WA-04	42	34	27	25	25	16	11	9.1	7
18	Bat Cave WA-07	20	20	13	12	12	8	5	4.2	0
19	Bat Cave WA-06	28	24	16	15	15	10	5	4.9	1
20	Bat Cave CWAN-01	78	60	48	44	44	29	21	16.8	61
21	Bat Cave CWAN-02	26	25	22	20	19	12	8	6.8	1
22	Bat Cave CWAN-03	26	25	22	20	19	12	8	6.8	1
23	Bat Cave CWAN-04	71	46	31	30	30	14	9	8.2	14
24	Bat Cave CWAN-05	22	19	11	11	11	7	5	3.9	0
25	Bat Cave CWAN-06	20	17	12	11	10	7	5	4.0	0
26	Bat Cave CWAN-07	16	12	9	9	9	6	4	2.8	0
27	Bat Cave CWAN-08	6	6	4	3	3	2	1	0.7	0
28	Bat Cave CWAN-09	12	9	7	7	7	5	3	2.3	0
29	Bat Cave CWAN-10	10	7	6	5	5	3	2	1.6	0
30	Bat Cave CWAN-11	4	3	3	2	2	1	0	0.4	0
31	West Angelas Village	11	8	7	7	7	4	2	2.0	0
32	RTIO Airport	8	7	7	6	6	4	3	2.0	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, 8th highest and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The $PM_{2.5}$ assessment criteria is 25 µg/m³ over a 24-hour period (Section 4.2), and 8 µg/m³ annual average.

Table 7.10: Statistics of 24-hour $PM_{2.5}$ concentration at sensitive receptors, year 2 – including cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	98th	95th	90th	70th	Annual	Days >25 [b]
1	Bat Cave WA-10	13	12	8	7	7	6	4	2.6	0
2	Bat Cave WA-11	13	12	8	7	7	6	4	2.6	0
3	Bat Cave WA-12	11	10	6	6	6	5	3	1.9	0
4	Bat Cave WA-13	9	9	6	6	6	4	2	1.7	0
5	Bat Cave WA-14	9	8	6	5	5	4	2	1.7	0
6	Bat Cave WA-14	11	10	6	6	6	5	3	1.9	0
7	Bat Cave WA-15	9	8	6	5	5	4	2	1.7	0
8	Bat Cave WA-16	9	7	6	5	5	4	2	1.5	0
9	Bat Cave WA-17	9	7	6	5	5	4	2	1.5	0
10	Bat Cave WA-18	9	7	6	5	5	4	2	1.5	0
11	Bat Cave WA-19	9	7	6	5	5	4	2	1.6	0
12	Bat Cave WA-20	9	7	6	5	5	4	2	1.6	0
13	Bat Cave WA-21	10	8	6	6	6	4	2	1.7	0
14	Bat Cave WA-22	11	11	7	6	6	5	3	2.2	0
15	Bat Cave WA-23	12	11	8	7	7	5	3	2.3	0
16	Bat Cave WA-24	12	11	8	7	7	5	3	2.3	0
17	Bat Cave WA-04	44	34	27	25	24	16	11	9.8	7
18	Bat Cave WA-07	21	20	14	12	12	8	6	4.8	0
19	Bat Cave WA-06	28	24	16	15	16	10	6	5.6	1
20	Bat Cave CWAN-01	79	60	48	44	44	30	22	17.5	66
21	Bat Cave CWAN-02	28	28	23	22	21	13	9	7.4	2
22	Bat Cave CWAN-03	28	28	23	22	21	13	9	7.4	2
23	Bat Cave CWAN-04	75	46	31	30	30	14	10	8.9	15
24	Bat Cave CWAN-05	24	19	13	11	11	7	6	4.5	0
25	Bat Cave CWAN-06	21	17	13	11	11	7	5	4.6	0
26	Bat Cave CWAN-07	16	12	11	9	9	6	4	3.5	0
27	Bat Cave CWAN-08	10	9	5	5	5	3	1	1.1	0
28	Bat Cave CWAN-09	14	12	9	8	8	6	4	2.9	0
29	Bat Cave CWAN-10	12	8	6	6	6	4	2	2.0	0
30	Bat Cave CWAN-11	10	5	4	4	4	3	1	0.8	0
31	West Angelas Village	11	9	8	7	7	5	3	2.7	0
32	RTIO Airport	9	9	8	7	7	5	4	2.8	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, 8th highest and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The $PM_{2.5}$ assessment criteria is 25 µg/m³ over a 24-hour period (Section 4.2), and 8 µg/m³ annual average.

Table 7.11: Statistics of 24-hour $PM_{2.5}$ concentration at sensitive receptors, year 10 – excluding cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Annual	Days >25 [b]
1	Bat Cave WA-10	17	17	13	13	12	8	4	3.0	0
2	Bat Cave WA-11	17	17	13	13	12	8	4	3.0	0
3	Bat Cave WA-12	13	10	9	9	8	5	2	1.7	0
4	Bat Cave WA-13	10	8	7	6	6	4	2	1.4	0
5	Bat Cave WA-14	10	7	5	5	5	3	1	1.2	0
6	Bat Cave WA-14	13	10	9	9	8	5	2	1.7	0
7	Bat Cave WA-15	10	7	5	5	5	3	1	1.2	0
8	Bat Cave WA-16	9	6	5	4	4	3	1	0.9	0
9	Bat Cave WA-17	10	6	5	5	4	2	1	0.9	0
10	Bat Cave WA-18	9	6	5	4	4	3	1	0.9	0
11	Bat Cave WA-19	11	7	5	5	5	3	1	1.1	0
12	Bat Cave WA-20	11	7	5	5	5	3	1	1.1	0
13	Bat Cave WA-21	10	8	5	5	5	3	1	1.0	0
14	Bat Cave WA-22	14	13	9	9	9	6	3	2.1	0
15	Bat Cave WA-23	15	14	11	10	10	7	3	2.4	0
16	Bat Cave WA-24	15	14	11	10	10	7	3	2.4	0
17	Bat Cave WA-04	59	50	38	37	36	26	14	12.0	37
18	Bat Cave WA-07	108	60	32	30	30	20	11	9.6	27
19	Bat Cave WA-06	54	52	37	33	33	21	11	10.4	29
20	Bat Cave CWAN-01	48	47	37	34	33	21	12	10.6	26
21	Bat Cave CWAN-02	44	40	30	26	26	17	11	10.3	9
22	Bat Cave CWAN-03	44	40	30	26	26	17	11	10.3	9
23	Bat Cave CWAN-04	142	38	29	25	24	18	12	10.5	7
24	Bat Cave CWAN-05	38	38	27	25	25	16	10	9.0	7
25	Bat Cave CWAN-06	47	40	29	25	25	15	9	8.0	6
26	Bat Cave CWAN-07	50	49	21	19	19	12	7	5.9	3
27	Bat Cave CWAN-08	5	5	3	3	3	2	1	0.8	0
28	Bat Cave CWAN-09	22	19	16	15	15	9	5	3.9	0
29	Bat Cave CWAN-10	22	22	16	16	15	9	5	4.4	0
30	Bat Cave CWAN-11	2	2	2	2	1	1	0	0.3	0
31	West Angelas Village	17	14	12	11	11	5	1	1.6	0
32	RTIO Airport	12	10	9	8	8	4	1	1.3	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, 8th highest and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of an ongoing issue.

b. The $PM_{2.5}$ criteria for this assessment is 25 µg/m³ over a 24-hour period (Section 4.2), and 8 µg/m³ annual average.

Table 7.12: Statistics of 24-hour $PM_{2.5}$ concentration at sensitive receptors, year 10 – including cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [c]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Annual	Days >25 [d]
1	Bat Cave WA-10	19	19	14	13	13	9	5	3.6	0
2	Bat Cave WA-11	19	19	14	13	13	9	5	3.6	0
3	Bat Cave WA-12	13	13	10	9	9	6	3	2.3	0
4	Bat Cave WA-13	11	10	8	8	8	5	3	2.0	0
5	Bat Cave WA-14	11	8	7	7	7	5	2	1.7	0
6	Bat Cave WA-14	13	13	10	9	9	6	3	2.3	0
7	Bat Cave WA-15	11	8	7	7	7	5	2	1.7	0
8	Bat Cave WA-16	10	7	6	5	5	4	2	1.4	0
9	Bat Cave WA-17	11	7	6	6	6	4	2	1.4	0
10	Bat Cave WA-18	10	7	6	5	5	4	2	1.4	0
11	Bat Cave WA-19	12	7	7	6	6	4	2	1.6	0
12	Bat Cave WA-20	12	7	7	6	6	4	2	1.6	0
13	Bat Cave WA-21	11	9	6	6	6	4	2	1.6	0
14	Bat Cave WA-22	15	15	11	11	10	7	4	2.6	0
15	Bat Cave WA-23	16	16	12	12	12	8	4	3.0	0
16	Bat Cave WA-24	16	16	12	12	12	8	4	3.0	0
17	Bat Cave WA-04	59	51	38	37	36	26	15	12.6	37
18	Bat Cave WA-07	108	60	32	31	31	20	12	10.3	27
19	Bat Cave WA-06	54	52	37	33	33	21	12	11.0	29
20	Bat Cave CWAN-01	48	47	37	34	33	21	13	11.3	26
21	Bat Cave CWAN-02	45	40	30	28	27	17	12	10.9	10
22	Bat Cave CWAN-03	45	40	30	28	27	17	12	10.9	10
23	Bat Cave CWAN-04	145	39	29	26	26	18	13	11.1	9
24	Bat Cave CWAN-05	40	38	28	26	26	17	11	9.6	8
25	Bat Cave CWAN-06	47	40	30	25	25	15	10	8.7	7
26	Bat Cave CWAN-07	50	49	21	20	19	12	8	6.6	3
27	Bat Cave CWAN-08	7	7	5	5	4	3	2	1.2	0
28	Bat Cave CWAN-09	24	22	17	16	16	10	6	4.5	0
29	Bat Cave CWAN-10	24	22	16	16	16	9	6	4.8	0
30	Bat Cave CWAN-11	7	5	4	3	3	2	1	0.7	0
31	West Angelas Village	17	15	12	12	11	6	3	2.3	0
32	RTIO Airport	13	10	9	8	8	5	2	2.0	0

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, 8th highest and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The $PM_{2.5}$ assessment criteria is 25 µg/m³ over a 24-hour period (Section 4.2), and 8 µg/m³ annual average.

7.4 Deposition

The contour plot of the maximum monthly dust deposition rate across the modelled domain, is presented in Figure 7-21 and Figure 7-22 for year 2 and Figure 7-23 and Figure 7-24 for year 10[6]. As outlined in Table 4-1 the criterion of 4 g/m^2/month has been adopted as a trigger level for heritage receptors and 7 g/m^2/month was adopted to determine the potential impact on vegetation (Section 5.3). The maximum monthly deposition contours show that:

- For the year 2 operation year:
  - For West Angelas emissions in isolation, maximum monthly deposition rates greater than 4 g/m^2/month and 7 g/m^2/month are predicted to occur over the mines and operational areas such as waste dumps, haul roads and processing facility.
  - Dust deposition impacts are unchanged in the vicinity of West Angelas with the inclusion of the nearby mines in the cumulative sources modelling. Impacts are localised ie. over all mines.
  - Dust deposition is also predicted to be well below the 4 g/m^2/month assessment criteria within the heritage areas, with the single exception being at Receptor 28 (Bat cave CWAN-09), which is both a heritage and fauna receptor.
- For the year 10 operation year:
  - For West Angelas operating in isolation, maximum monthly deposition rates greater than 4 g/m^2/month and 7 g/m^2/month are predicted to occur over the mine operational areas only.
  - Dust deposition is unchanged in the vicinity of West Angelas with the inclusion of the nearby mines in the modelling (ie. cumulative sources). Impacts are localised over all mines.
  - Dust deposition is also predicted to be well below 4 g/m^2/month within the heritage areas, with the single exception being at Receptor 49 (WAN20-012).

[6] The assessment of year 2 represents consistent tonnage from the proposed operations with a focus on Deposit H - the most easterly of the proposed RTIO operations, and year 10 represents both the maximum mining tonnage (ore and waste) and the highest tonnage from the proposed Western Hill operations - the closest operations to Karijini National Park.

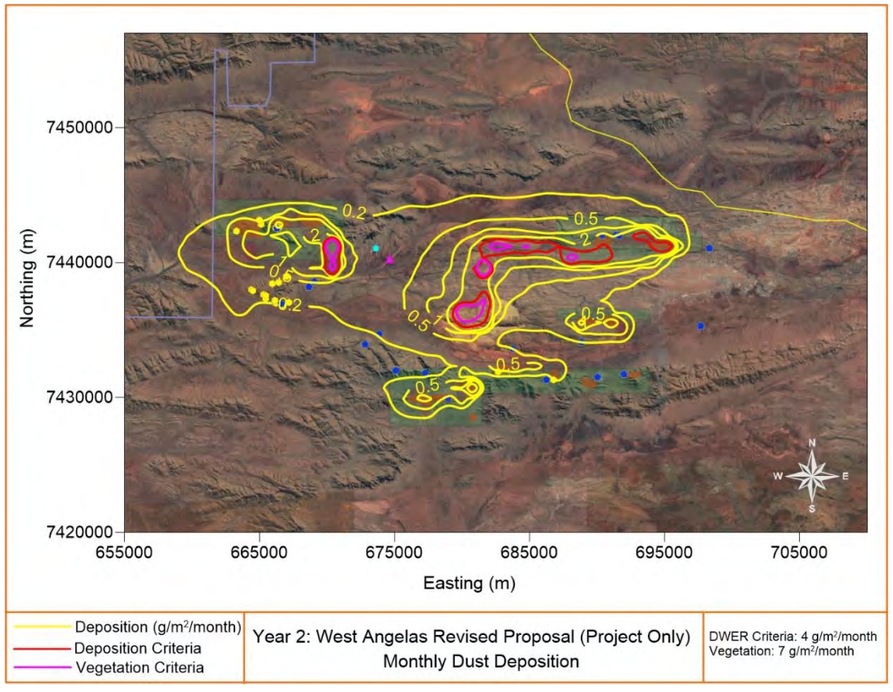


Figure 7-21: Predicted maximum monthly deposition, year 2 - excluding cumulative sources

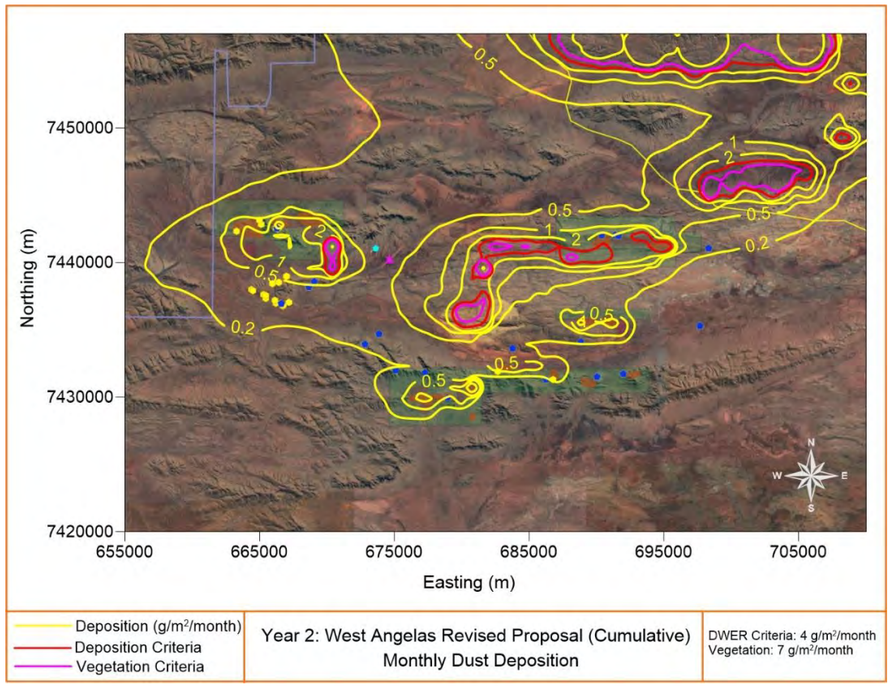


Figure 7-22: Predicted maximum monthly deposition, year 2 - including cumulative sources

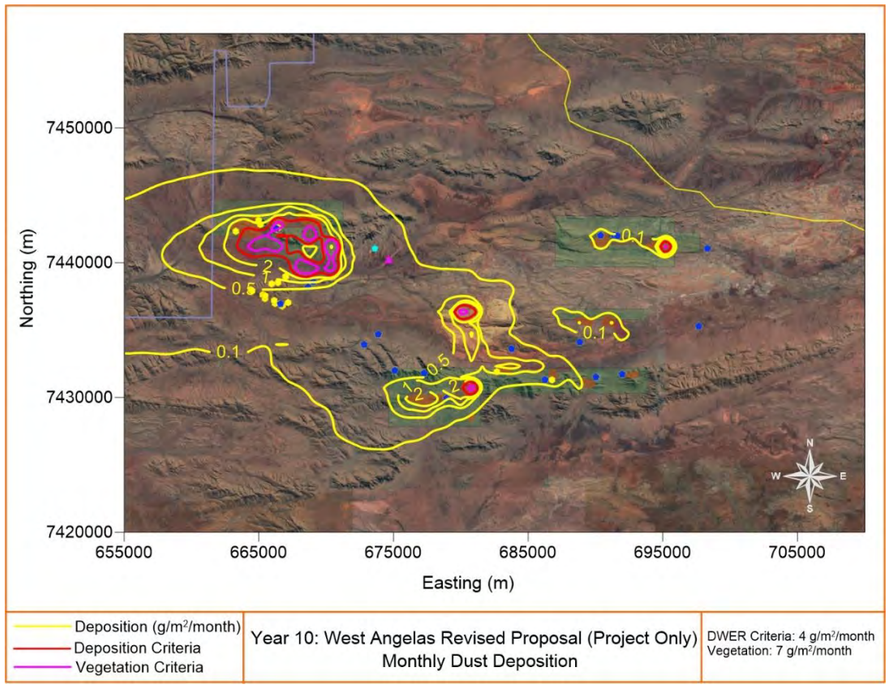


Figure 7-23: Predicted maximum monthly deposition, year 10 - excluding cumulative sources

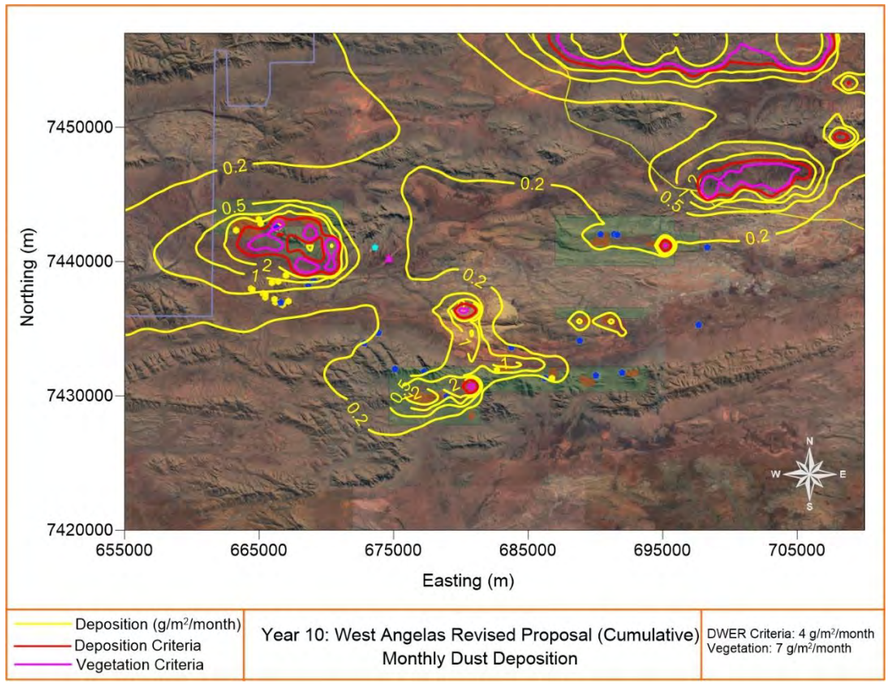


Figure 7-24: Predicted maximum monthly deposition, year 10 - including cumulative sources

Table 7.13: Maximum monthly deposition rate (mg/m²/month)

Receptor No.	Receptor Name	Year 2		Year 10	
		Standalone	Cumulative	Standalone	Cumulative
28	Bat Cave CWAN-09	4.5	4.6	0.1	0.2
33	Deposit H	2.1	2.3	0.1	0.3
34	Turtle Pool	0.1	0.2	0.0	0.2
35	Pebble Mouse	2.4	2.5	0.1	0.3
36	Clay pan	0.0	0.1	0.0	0.1
37	Mt Ella East SE Con	0.0	0.1	0.0	0.0
38	Mt Ella East S Con	0.0	0.1	0.0	0.1
39	WARE14-16-RS	2.5	2.6	0.2	0.3
40	DF-SH1	0.2	0.2	0.0	0.1
41	WA-19-ETH-01	0.1	0.2	0.2	0.2
42	WA-16-61-SS	0.4	0.4	1.0	1.0
43	YINHARR-18	0.2	0.2	0.5	0.5
44	YINHARR-19	0.2	0.2	0.3	0.4
45	RR21	0.2	0.2	0.2	0.2
46	WA-16-45-ENG	0.2	0.3	0.2	0.3
47	WA-16-51-ENG	0.5	0.6	0.9	1.0
48	WA-16-57-ENG	0.3	0.4	0.5	0.6
49	WAN20-012	1.7	1.8	6.8	6.9
50	YINHARR-39	0.2	0.2	0.2	0.2
51	WANETH06-2	0.2	0.3	0.2	0.2

Note:
Shading indicates a modelled result is predicted to be elevated n comparison to the relevant assessment criteria.

8 Conclusions

This modelling study has assessed the potential air quality impacts associated with mining, hauling and processing activities from the future mine developments at West Angelas, including Western Hill, Deposit H, Deposit F North, Mt Ella East and Deposit J along with associated ore processing (crushing, screening, stacking, reclaiming and rail load out). Modelled ground level concentrations for the key pollutants (particles as TSP, PM_{10}, and $PM_{2.5}$) have been compared to relevant ambient air quality assessment criteria to determine the potential impact on key sensitive receptors at nominated locations and over the general area. The sensitive receptors considered in the assessment include human habitation locations, heritage locations and ecological receptor locations.

Modelling impacts of TSP, PM_{10}, and $PM_{2.5}$ emissions, including dust deposition, was undertaken using the CALMET/CAPUFF modelling suite. In the absence of onsite meteorological measurements, the Weather Research and Forecast (WRF) model was used to simulate the meteorology over the region for a representative year (2010) and was then input to the CALMET model to generate fine-resolution three-dimensional meteorological fields. Fine resolution terrain elevation (SRTM) data with 90 m resolution was used in conjunction with ESACCI-LU land-use data to characterise the geophysical environment.

Emissions were estimated for mining year 2 as this year had consistent tonnage from the proposed operations, with a focus on Deposit H which is the most easterly of the proposed RTIO operations. A second year (year 10) was modelled as it represents both the maximum mining tonnage (ore and waste) and the highest tonnage from the proposed Western Hill operations which are the closest to Karijini National Park.

The emission estimation was calculated utilising emission factors from the EETM for Mining (EA, 2012) and input into the CALPUFF dispersion model as volume sources to simulate mining, haulage and processing, and area sources to simulate wind-blown dust. Background concentrations were also included to provide an indication of the potential cumulative impact from the existing operations.

The key findings of the assessment, in relation to the potential environmental impact, assessed by comparison to assessment criteria for human health and amenity, are:

- For TSP
  - For the year 2 operation year, modelled concentrations higher than the 24-hour assessment criteria (90 µg/m^3) is predicted to occur:
    - at the West Angelas Village on 1 occasion, with and without cumulative sources.
    - at the airport on 1 occasion when cumulative sources are included.
    - at some of the identified heritage receptor locations in isolation of other sources
    - with the inclusion of cumulative sources the model is predicting that there will be an increase in the number of heritage receptor locations impacted[7] by the proposed operations.
  - For the year 10 operation year, modelled concentrations higher than the 24-hour assessment criteria (90 µg/m^3) is predicted to occur:
    - at the West Angelas Village on 15 occasions, with and without cumulative sources.

[7] Impact is determined by comparison to the adopted assessment criteria. An heritage receptor is considered to be “impacted” where the modelled ground level concentration is evaluated as elevated or above the adopted assessment criteria.

- at the airport on 3 occasions (4 when cumulative sources are included).
- some of the identified heritage receptor locations, especially Receptor 46 (WA-16-45-ENG), Receptor 47 (WA-16-51-ENG), and Receptor 48 (WA-16-57-ENG), will be impacted by the proposed operations in isolation of other sources.
- with the inclusion of cumulative sources the model is predicting that there will be an increase in the number of heritage receptor locations impacted by the proposed operations.

- For PM_{10}
  - For the year 2 operation period:
    - The model is not predicting annual average concentrations higher than the assessment criterion at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impacts.
    - The Taskforce criterion (70 µg/m^3) for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
    - The assessment criterion for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
    - The model is predicting elevated concentrations at the Bat Cave receptors WA-04, WA-06 and WA-07 both with and without cumulative sources.
  - For the year 10 operation period:
    - The assessment criterion for annual average concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative impacts.
    - The Taskforce criterion (70 µg/m^3) for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
    - The assessment criterion for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
    - The model is predicting elevated concentrations at the Bat Cave receptors WA-04, WA-06 and WA-07 both with and without cumulative sources and at WA-23 and WA-24 with cumulative sources.
- For $PM_{2.5}$
  - For the year 2 operation period:
    - The assessment criterion for annual average concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
    - The assessment criterion for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
    - The model is predicting concentrations higher than the 24-hour assessment criteria at some of the bat cave receptors, primarily WA-04 and WA-06, with and without cumulative sources.
  - For the year 10 operation period:
    - The assessment criterion for annual average concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.

        - The assessment criterion for maximum 24-hour concentration is not exceeded at any of the sensitive receptors (pertaining to human habitation), with and without cumulative sources.
        - The model is predicting concentrations higher than the 24-hour assessment criteria at some of the bat cave receptors, primarily WA-04, WA-06 and WA-07, with and without cumulative sources.
- For Dust deposition
    - There are no predicted excursions of the monthly dust deposition criteria beyond the mine operational areas, including Karijini National Park.
    - The model is predicting that one identified heritage receptor location will have a maximum monthly deposition rate above the trigger level during mining year 2 (Receptor 28 - Bat cave CWAN-09) and another one during mining year 10 (Receptor 49 - WAN20-012).

The key findings of the assessment, in relation to the potential environmental impact, in relation to ghost bat habitat or roosting areas, are:

- Model results for both PM_{10} and $PM_{2.5}$ indicate that caves within close proximity to operations are predicted to experience elevated concentrations, noting that there is no known appropriate (numeric) criteria for this receptor type.
- RTIO will have in place Blast Management Plans to address management of potential blasting impacts on this receptor type.

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10 Acronyms and Glossary

Acronym	Description
BoM	Bureau of Meteorology
BWS	Belt wash station
C	Degrees Celsius (temperature)
CV	Conveyor
DWER	Department of Water and Environmental Regulation
EE	Emissions estimation
EET	Emissions Estimation Technique
EETM	Emissions Estimation Technique Manual
EF	Emission factor
EPAV	Environmental Protection Authority Victoria, Australia
ETA	Environmental Technologies& Analytics Pty Ltd
FEL	Front end loader
GLC	Ground Level Concentration
g/m^2/month	Grams per square metre per month
g/s	grams per second
h/yr	Hours per year
kg	kilogram
kg/t	kilogram per tonne
kg/yr	kilograms per year
kPa	kiloPascals
km	kilometre
m	metre
m/s	metres per second
mm	millimetre

Acronym	Description
Mt	Million tonnes
Mtpa	Million tonnes per annum
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
NPI	National Pollutant Inventory
NSW	New South Wales
PM	Particulate matter, small particles and liquid droplets that can remain suspended in air.
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of 10 µm or less.
PM_{10}	Particulate matter with an aerodynamic diameter of 2.5 µm or less.
t	Tonnes
t/h	Tonnes per hour
tpa	tonnes per annum
tph	tonnes per hour
TS	Transfer station
TSP	Total suspended particulates
µg/m^3	micro grams (one millionth of a gram) per cubic metre
µm	micrometre
USEPA	United States Environment Protection Agency

11 Appendices

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Appendix A – Meteorology

A.1: WRF

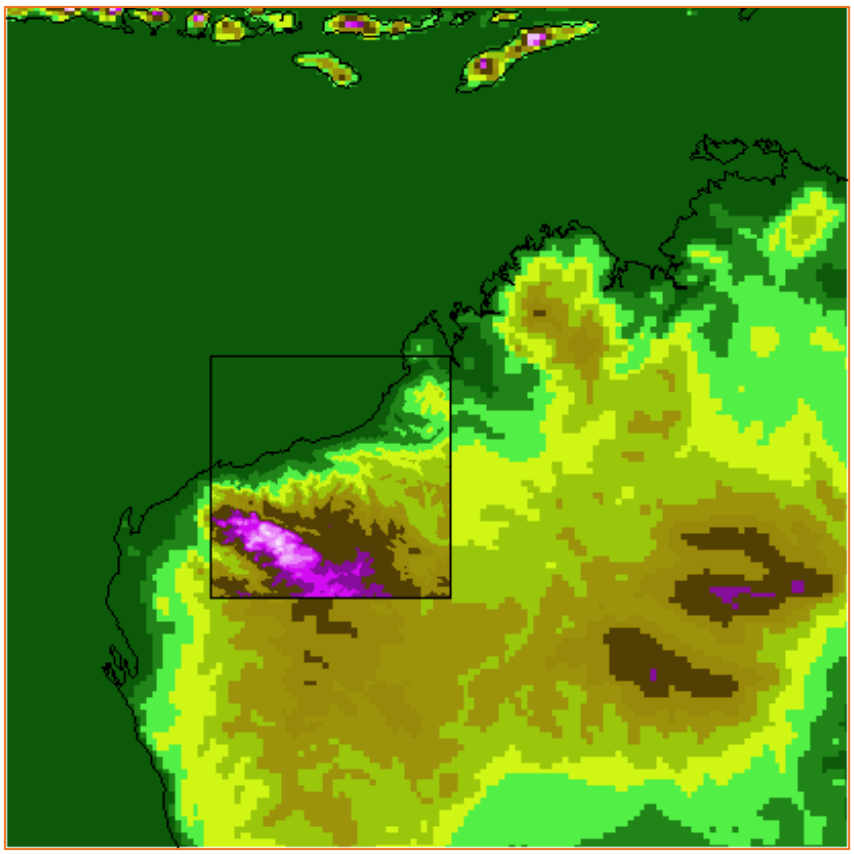
WRF was developed (and continues to be developed) in the United States by a collaborative partnership including the National Center for Atmospheric Research (NCAR), the National Oceanic and Atmospheric Administration (the National Center for Environmental Prediction (NCEP), the Forecast Systems Laboratory (FSL), the Air Force Weather Agency (AFWA), the Naval Research Laboratory, the University of Oklahoma, the Federal Aviation Administration (FAA) and others. (WRF, 2012).

WRF is a fully compressible, Eulerian, non-hydrostatic meso-scale numerical model developed by the National Center for Atmospheric Research (NCAR) and the National Oceanic and Atmospheric Administration (NOAA) in the United States. WRF is suitable for a broad spectrum of applications across scales ranging from metres to thousands of kilometres. The model utilises global reanalysis [8] data to produce fine-scale 3-dimensional meteorological fields that considers local terrain and land-use effects.

WRF was run with a two-nest structure (80 km and 6 km horizontal grid space resolution) centred on 23.055°S and 119.25°E. This is shown in Appendix Figure 1. The model vertical resolution consists of 34 eta levels [9].

[8] Global modelling using observed climate data for temperature, wind speed, and pressure. The observations are analysed; interpolated onto a system of grids and the model initialised with this data.

[9] Eta levels are terrain-following vertical coordinates.



Appendix Figure 1: WRF model domains showing terrain elevation

Physics options in WRF are to represent atmospheric radiation, surface and boundary layer as well as cloud and precipitation processes. The physics options selected for the modelling are summarised in Appendix Table 1.

Appendix Table 1: WRF Physics Options Selected for Model

	Domain 1	Domain 2	Explanatory Notes
mp_physics	3	3	WRF single moment 3-class scheme
ra_lw_physics	1	1	Rapid radiative transfer model scheme
ra_sw_physics	1	1	Dudhia scheme for cloud and clear sky absorption and scattering
Radt	30	15	Time step for radiation schemes
sf_sfclay_physics	1	1	MM5 based on MOST
sf_surface_physics	2	2	Noah land surface model with 6 soil layers
bl_pbl_physics	1	1	Non-local K-scheme with entrainment layer
bldt	0	0	Boundary layer time step (0=every time step)
cu_physics	1	1	Kain-Fritch scheme using mass flux approach for domain 1 only.
cudt	5	5	Cumulus physics time step (minutes)

Six-hourly global final analysis synoptic data (from http://nomads.ncdc.noaa.gov/data/gfsanl/) was used to initialise the model and provide boundary conditions.

Land-use and terrain data was sourced from the United State Geological Services (USGS) database. Inspection of the land-use indicates an acceptable resolution and category for the model area with shrub land being the dominant vegetation type. A review of the Vegparm.tbl [10] reveals that these are based on North American parameterisations, with marked seasonal differences to allow for winter snow cover. These are clearly inappropriate for the Pilbara region. A non-seasonally varying roughness length value of 0.4 m was assigned to the shrub land category based on a study by Peel *et al*. (2005) for Spinifex vegetation in the Pilbara. Albedo was also set to 0.2 based on values cited in Peel *et al*. (2005). Other parameters such as Bowen ratio were adjusted to allow for the drier climate of the Pilbara.

The selection of an appropriate Land Surface Model (LSM) is critically important to provide the boundary conditions at the land-atmosphere interface because:

- The Planetary Boundary Layer (PBL) schemes are sensitive to surface fluxes.
- The cloud/cumulus schemes are sensitive to the PBL structures.
- There is a need to capture mesoscale circulations forced by surface variability in albedo, soil moisture/temperature and land use.

The Noah Land-Surface Model was selected in this case to account for the sub-grid-scale fluxes. This sophisticated scheme provides 4 quantities to the parent atmospheric model (WRF), namely:

- surface sensible heat flux
- surface latent heat flux
- upward longwave radiation
- upward (reflected) shortwave radiation.

[10] A table consisting of land-use specific surface roughness, albedo and Bowen ratio.

A.2: CALMET

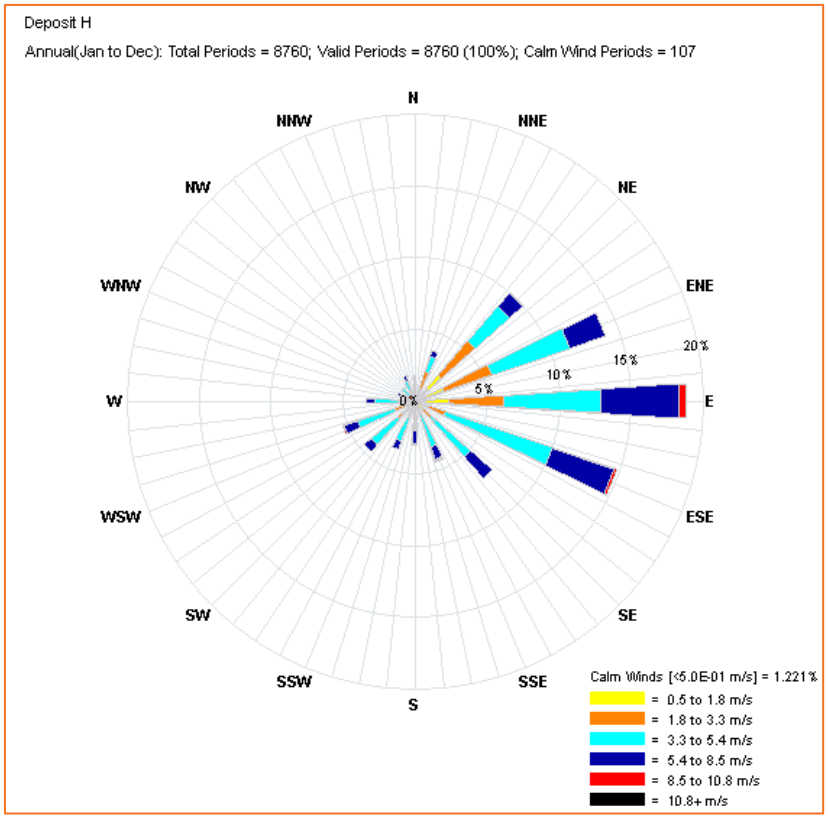
CALMET Results

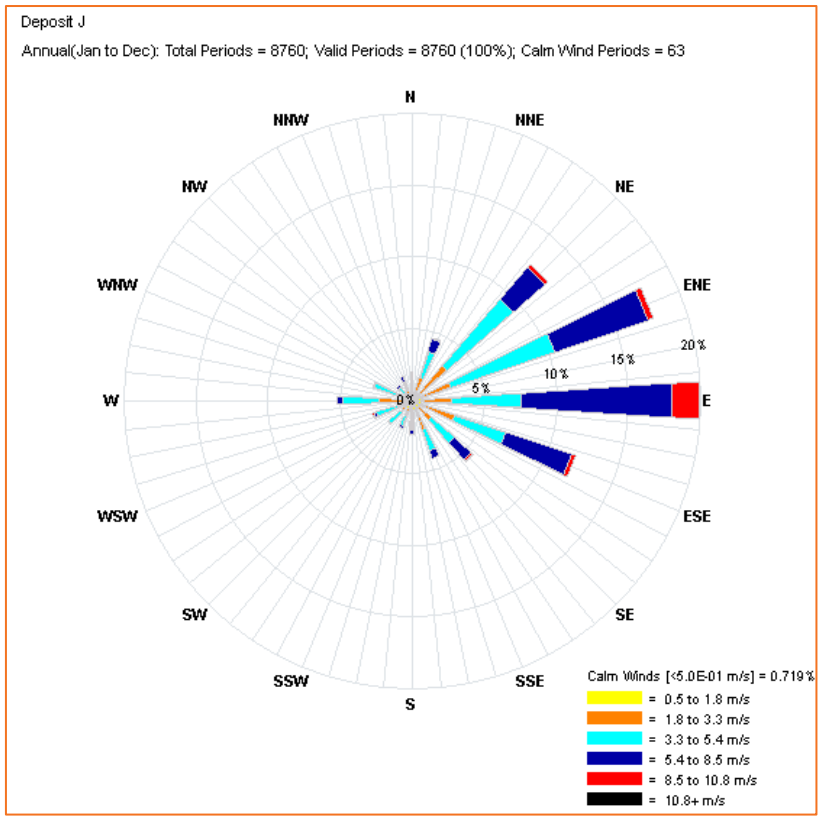
Wind

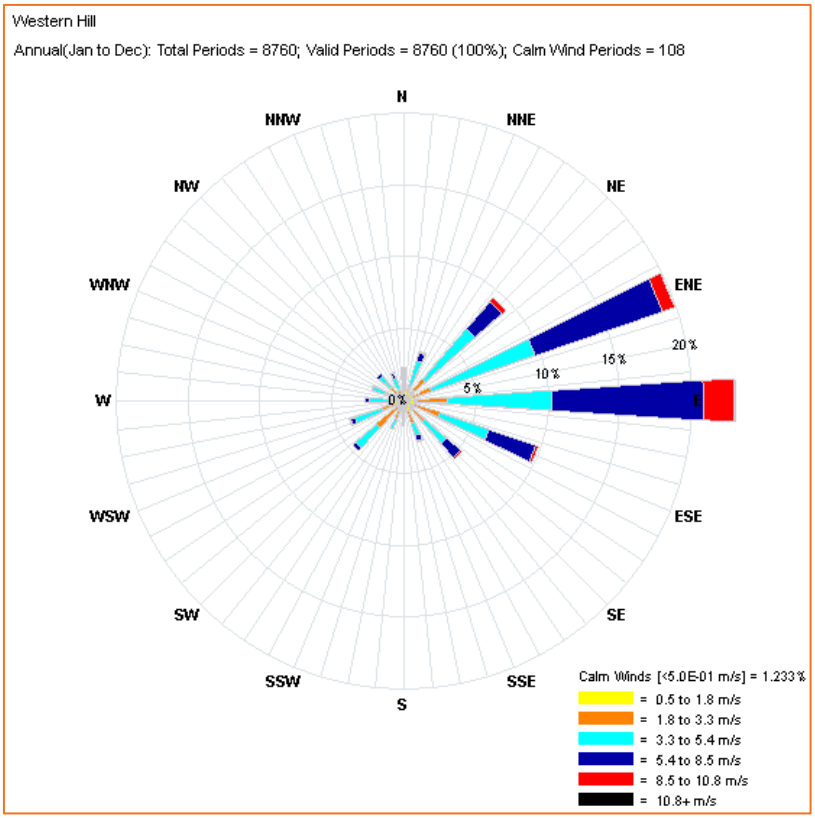
Selected meteorological variables were extracted from the gridded CALMET output for a point corresponding to West Angelas mine Deposit H, Deposit J and Western Hill. The diurnal characteristics of the 10 m winds are illustrated in the annual wind rose diagrams the 12-month period from January 2010 – December 2010. These are shown in Appendix Figure 1. The wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points – N, NNE, NE, etc. The bar at the top of each wind rose diagram represents winds blowing from the north (i.e., northerly winds), and so on. The length of the bar represents the frequency of occurrence of winds from that direction, and the widths of the bar sections correspond to wind speed categories, the narrowest representing the lightest winds.

The major features of the wind roses are as follows:

- Wind direction at the three locations is predominantly from east.
- The second most frequent wind direction is from the east-southeast at Deposit H and from the east-northeast at Deposit J and Western Hill.
- Strongest winds occur at Western Hill, while Deposit H has the highest frequency of light winds.
- Westerly winds are rare at the three sites.
- Calm conditions occur 1.2% of the year at Deposit H and Western Hill and 0.7% of the year at Deposit J.


Deposit H
Annual(Jan to Dec): Total Periods = 8760; Valid Periods = 8760 (100%); Calm Wind Periods = 107
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
0%
5%
10%
15%
20%
Calm Winds [<5.0E-01 m/s] = 1.221%
= 0.5 to 1.8 m/s
= 1.8 to 3.3 m/s
= 3.3 to 5.4 m/s
= 5.4 to 8.5 m/s
= 8.5 to 10.8 m/s
= 10.8+ m/s


Deposit J
Annual(Jan to Dec): Total Periods = 8760; Valid Periods = 8760 (100%); Calm Wind Periods = 63
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
0%
5%
10%
15%
20%
Calm Winds [<5.0E-01 m/s] = 0.719%
= 0.5 to 1.8 m/s
= 1.8 to 3.3 m/s
= 3.3 to 5.4 m/s
= 5.4 to 8.5 m/s
= 8.5 to 10.8 m/s
= 10.8+ m/s



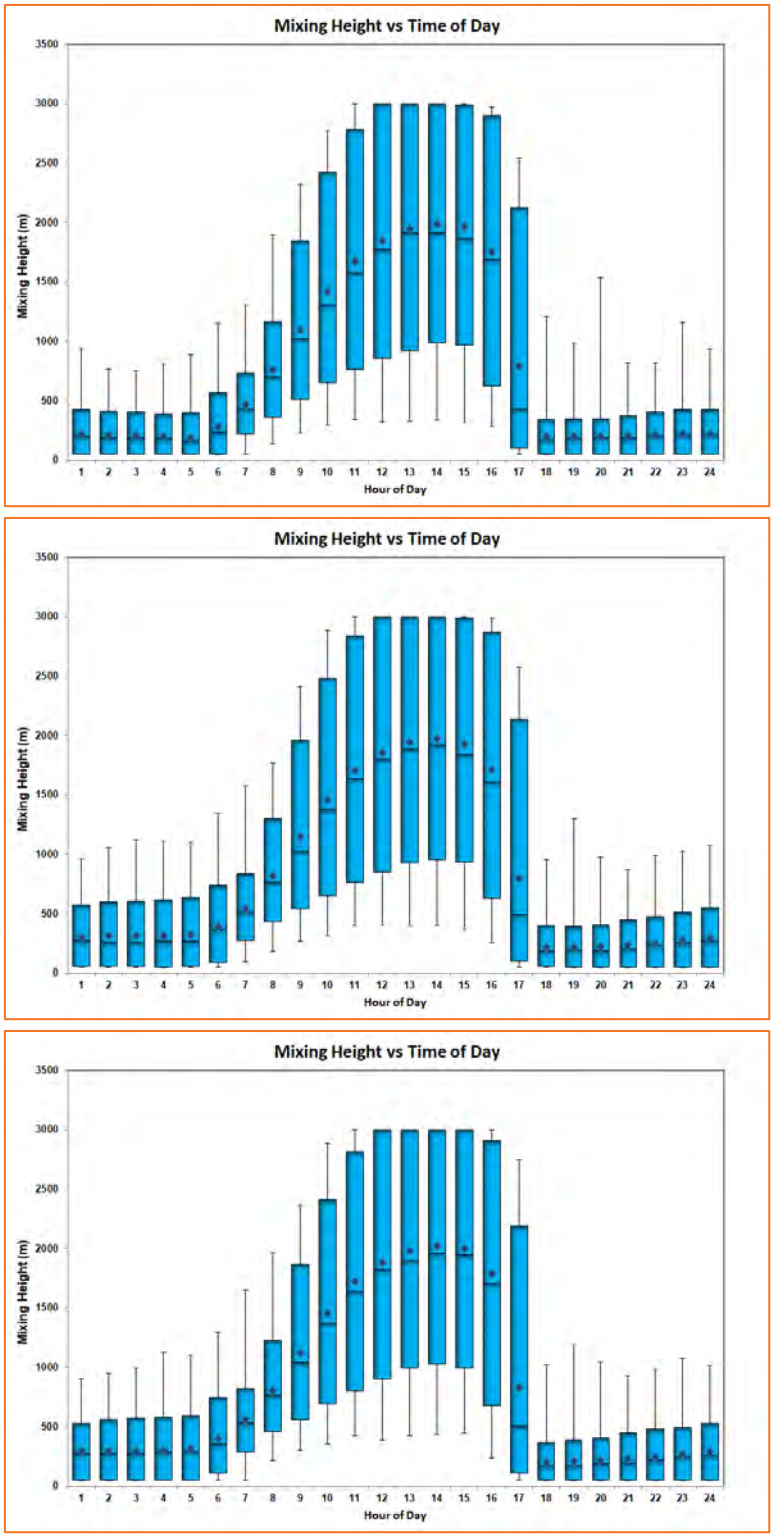
Appendix Figure 2: Annual Wind roses for a CALMET extract at West Angelas Deposit H (top), Deposit J (middle) and Western Hill (bottom)

Mixing Height

Mixing height is the depth of the atmospheric surface layer beneath an elevated temperature inversion. It is an important parameter within air pollution meteorology. Vertical diffusion or mixing of a plume is limited by the mixing height, as the air above this layer tends to be stable, with restricted vertical motion.

A series of internal algorithms within CALMET is used to calculate mixing heights for the subject site where it is assumed that mixing height is formed through mechanical means (wind speed) at night and through a mixture of mechanical and convective means (wind speed and solar radiation) during the day (Scire et al. 2008). During the night and early morning when the convective mixed layer is absent or small, the full depth of the planetary boundary layer (PBL) may be controlled by mechanical turbulence. During the day, the height of the PBL during convective conditions is then taken as the maximum of the estimated (or measured if available) convective boundary layer height and the estimated (or measured if available) mechanical mixing height. It is calculated from the early morning potential temperature sounding (prior to sunrise), and the time varying surface heat flux to calculate the time evolution of the convective boundary layer.

The hourly variation of mixing height at West Angelas Deposit H, Deposit J and Western Hill are summarised in Appendix Figure 3 with the diurnal cycle clearly evident at all three locations. At night, mixing height is normally low (lowest at Deposit H) and after sunrise it typically increases to between 1,000 m and 3,000 m in response to convective mixing generated by solar heating of the Earth's surface. A rapid reduction in mixing height commences around sunset, when convective mixing ceases and a mechanical mixing regime is re-established. The diurnal mixing height profile is clearly defined owing to the inland, sheltered location of the mines.



Appendix Figure 3: Simulated annual statistics[11] of hourly mixing heights, West Angelas Deposit H (top), Deposit J (middle) and Western Hill (bottom)

[11] The bars in the figure depicts 10th and 90th percentile values while the tringles show the average conditions. The whiskers indicate minimum and maximum values.

Stability

An important aspect of pollutant dispersion is the level of turbulence in the lowest 1 km or so of the atmosphere, known as the planetary boundary layer (PBL). Turbulence controls how effectively a plume is diffused into the surrounding air and hence diluted. It acts by increasing the cross-sectional area of the plume due to random motions. With stronger turbulence, the rate of plume diffusion increases. Weak turbulence limits diffusion and contributes to high plume concentrations downwind of a source.

Turbulence is generated by both thermal and mechanical effects to varying degrees. Thermally driven turbulence occurs when the surface is being heated, in turn transferring heat to the air above by convection. Mechanical turbulence is caused by the frictional effects of wind moving over the earth's surface and depends on the roughness of the surface as well as the flow characteristics.

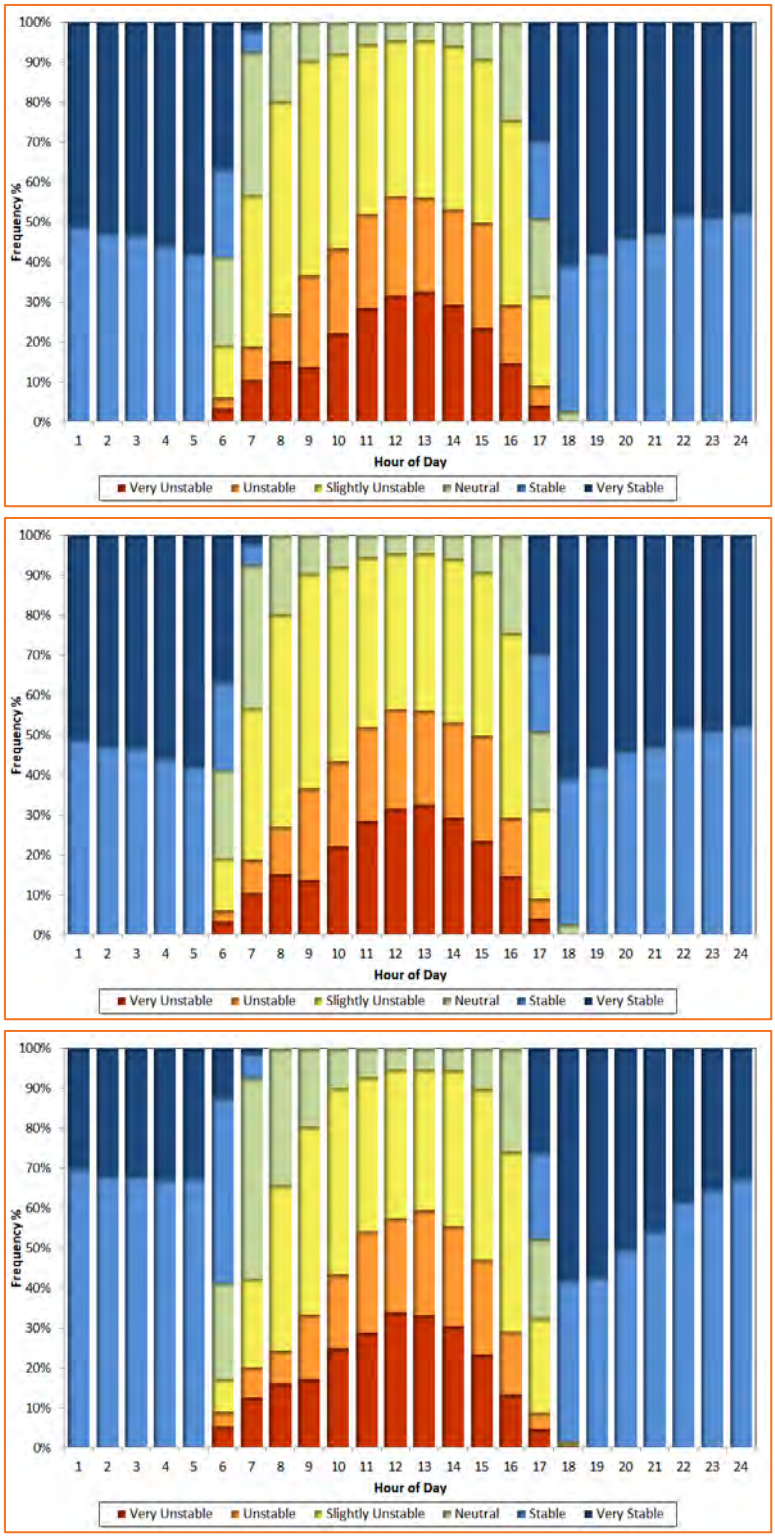
Turbulence in the boundary layer is influenced by the vertical temperature gradient, which is one of several indicators of stability. Plume models use indicators of atmospheric stability in conjunction with other meteorological data to estimate the dispersion conditions in the atmosphere.

Stability can be described across a spectrum ranging from highly unstable through neutral to highly stable. A highly unstable boundary layer is characterised by strong surface heating and relatively light winds, leading to intense convective turbulence and enhanced plume diffusion. At the other extreme, very stable conditions are often associated with strong temperature inversions and light winds, which commonly occur under clear skies at night and in the early morning. Under these conditions, plumes can remain relatively undiluted for considerable distances downwind. Neutral conditions are linked to windy and/or cloudy weather, and short periods around sunset and sunrise, when surface rates of heating or cooling are very low.

The stability of the atmosphere plays a significant role in determining the dispersion of a plume and it is important to have it correctly represented in the dispersion model. CALPUFF uses the Monin-Obukhov Similarity Theory (MOST) to characterise turbulence and other processes in the PBL. One of the measures of the PBL is the Monin-Obukhov length (L), which approximates the height at which turbulence is generated equally by thermal and mechanical effects (Seinfeld and Pandis 2006). It is a measure of the relative importance of mechanical and thermal forcing on atmospheric turbulence.

Because values of L diverge to + and - infinity as stability approaches neutral from the stable and unstable sides, respectively, it is often more convenient to use the inverse of L (i.e., 1/L) when describing stability.

The hourly averaged 1/L for Deposit H, Deposit J and Western Hill computed from all data in the CALMET surface file is presented in Appendix Figure 4. This plot indicates that the PBL is stable overnight and reaches maximum instability midday unstable as radiation from the sun heats the surface layer of the atmosphere and drives convection. While the stability profiles for the three sites are similar, Western Hill has slightly higher frequency of very unstable conditions at dawn, indicating the site receiving more early morning solar radiation than the other two sites.



Appendix Figure 4: Simulated annual statistics of hourly stability, West Angelas Deposit H (top), Deposit J (middle)

Appendix B – Emission Sources and Parameters

Appendix Table 1: West Angelas Processing (Year 2)

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
PC1	680615	7436157	2.0	3.8	0.93
PC2	680842	7436259	2.0	3.8	0.93
TS1	680607	7436220	4.0	2.0	1.86
Scalping	680577	7436397	10.0	7.1	4.65
TertCrush1	680590	7436201	3.0	3.8	1.40
TS2	680546	7436524	4.0	2.0	1.86
TS3	680527	7436638	4.0	2.0	1.86
Stck1	680247	7436485	8.0	50.0	3.72
Stck2	679875	7436538	8.0	50.0	3.72
Rec1	680098	7436512	8.0	50.0	3.72
TS4	680567	7436587	4.0	2.0	1.86
Rail	680525	7436794	4.0	2.0	1.86
FEL1	680007	7435815	3.0	15.0	1.40
FEL2	680461	7435732	3.0	15.0	1.40
FEL3	681183	7435860	3.0	15.0	1.40
Unload1	679857	7435825	3.0	50.0	1.40
Unload2	680218	7435717	3.0	50.0	1.40
Unload3	680456	7435647	3.0	50.0	1.40
Unload4	681265	7435878	3.0	50.0	1.40

Appendix Table 2: West Angelas Mining (Year 2)

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
DepFN-D1	688696	7435779	1.5	75	0.70
DepFN-B1	688829	7435751	20	26.1	9.30
DepFN-L1	688738	7435660	6	75	2.79
DepFN-D2	689417	7435688	1.5	75	0.70
DepFN-B2	689557	7435562	20	26.1	9.30
DepFN-L2	689326	7435527	6	75	2.79
DepFN-D3	690776	7435870	1.5	75	0.70
DepFN-B3	690664	7435716	20	26.1	9.30
DepFN-L3	690853	7435695	6	75	2.79
DepFN-D4	691197	7435744	1.5	75	0.70
DepFN-B4	691091	7435576	20	26.1	9.30
DepFN-L4	691288	7435583	6	75	2.79
DepFN-UW1	691820	7435442	2	75	0.93
DepFN-UW2	691925	7435085	2	75	0.93
DepFN-Bull1	691848	7435260	2	75	0.93
DH-D1	690000	7441462	1.5	75	0.70
DH-B1	690125	7441638	20	37.2	9.30
DH-L1	690198	7441491	6	75	2.79
DH-D2	690624	7441851	1.5	75	0.70
DH-B2	690528	7441689	20	37.2	9.30
DH-L2	690683	7441741	6	75	2.79
DH-D3	694183	7441366	1.5	75	0.70
DH-B3	694051	7441234	20	37.2	9.30
DH-L3	694286	7441197	6	75	2.79
DH-D4	694770	7441403	1.5	75	0.70
DH-B4	694682	7441278	20	37.2	9.30
DH-L4	694866	7441278	6	75	2.79
DH-D5	695431	7441454	1.5	75	0.70
DH-B5	695357	7441256	20	37.2	9.30
DH-L5	695592	7441242	6	75	2.79
DH-UW1	693735	7441660	2	75	0.93
DH-UW2	693251	7441601	2	75	0.93
DH-UW3	692759	7441594	2	75	0.93
DH-UW4	692297	7441586	2	75	0.93
DH-UW5	691901	7441586	2	75	0.93
DH-UW6	691497	7441630	2	75	0.93
DH-Bull1	693486	7441748	2	75	0.93
DH-Bull2	692569	7441542	2	75	0.93
DH-Bull3	691695	7441726	2	75	0.93
J-D1	676466	7429839	1.5	100	0.70
J-B1	676263	7429832	20	35.2	9.30
J-L1	676347	7429979	6	100	2.79
J-D2	677194	7429685	1.5	100	0.70
J-B2	677012	7429713	20	35.2	9.30
J-L2	677117	7429818	6	100	2.79
J-D3	677804	7430007	1.5	100	0.70
J-B3	677706	7429825	20	35.2	9.30
J-L3	677608	7429958	6	100	2.79
J-D4	678581	7430035	1.5	100	0.70
J-B4	678700	7429909	20	35.2	9.30
J-L4	678476	7429888	6	100	2.79
J-D5	680430	7431023	1.5	100	0.70
J-B5	680605	7430889	20	35.2	9.30
J-L5	680346	7430854	6	100	2.79

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
J-D6	680641	7430525	1.5	100	0.70
J-B6	680479	7430357	20	35.17	9.30
J-L6	680725	7430329	6	100	2.79
J-UW1	679618	7430868	2	100	0.93
J-UW2	679912	7430014	2	100	0.93
J-UW3	677236	7429166	2	100	0.93
J-UW4	676767	7430546	2	100	0.93
J-Bull1	679555	7430756	2	100	0.93
J-Bull2	679912	7430140	2	100	0.93
J-Bull3	677299	7429054	2	100	0.93
J-Bull4	676970	7430525	2	100	0.93
MTE-D1	683344	7432024	1.5	75	0.70
MTE-B1	683050	7432185	20	22.36	9.30
MTE-L1	683281	7432171	6	75	2.79
MTE-D2	686700	7431737	1.5	75	0.70
MTE-B2	686882	7431597	20	22.36	9.30
MTE-L3	686854	7431856	6	75	2.79
MTE-D3	689228	7431030	1.5	75	0.70
MTE-B3	689102	7431247	20	22.36	9.30
MTE-L3	686854	7431856	6	75	2.79
MTE-UW1	687841	7432052	2	75	0.93
MTE-UW2	687372	7432066	2	75	0.93
MTE-UW3	685831	7432101	2	75	0.93
MTE-UW4	685453	7432178	2	75	0.93
MTE-UW5	684703	7432227	2	75	0.93
MET-UW6	684164	7432241	2	75	0.93
MTE-Bull1	687631	7432017	2	75	0.93
MTE-Bull2	685649	7432129	2	75	0.93
MTE-Bull3	684388	7432227	2	75	0.93
WH-D1	663485	7442445	1.5	100	0.70
WH-B1	663595	7442643	20	37.24	9.30
WH-L1	663463	7442570	6	100	2.79
WH-D2	664564	7442951	1.5	100	0.70
WH-B2	664373	7442841	20	37.24	9.30
WH-L2	664549	7442775	6	100	2.79
WH-D3	664447	7442210	1.5	100	0.70
WH-B3	664630	7442078	20	37.24	9.30
WH-L3	664439	7442041	6	100	2.79
WH-D4	666325	7442959	1.5	100	0.70
WH-B4	666531	7442827	20	37.24	9.30
WH-L4	666325	7442819	6	100	2.79
WH-D5	668285	7443436	1.5	100	0.70
WH-B5	668468	7443362	20	37.24	9.30
WH-L5	668292	7443260	6	100	2.79
WH-D6	669209	7443113	1.5	100	0.70
WH-B6	669077	7442988	20	37.24	9.30
WH-L6	669246	7442937	6	100	2.79
WH-UW1	667213	7443480	2	100	0.93
WH-UW2	667433	7443128	2	100	0.93
WH-UW3	667654	7442827	2	100	0.93
WH-UW4	668600	7442166	2	100	0.93
WH-UW5	669019	7441946	2	100	0.93
WH-UW6	665775	7441425	2	100	0.93
WH-UW7	665922	7440963	2	100	0.93

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
WH-UW8	664931	7441175	2	100	0.93
WH-UW9	665129	7440662	2	100	0.93
WH-UW10	664447	7440442	2	100	0.93
WH-UW11	664182	7440933	2	100	0.93
WH-Bull1	667382	7443333	2	100	0.93
WH-Bull2	667639	7443010	2	100	0.93
WH-Bull3	668894	7442078	2	100	0.93
WH-Bull4	665790	7441153	2	100	0.93
WH-Bull5	665012	7440926	2	100	0.93
WH-Bull6	664439	7440765	2	100	0.93

Appendix Table 3: Hope Downs Processing

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
PC1	717938	7459507	2.0	3.8	0.93
TS1	717987	7459427	4.0	2.0	1.86
Screen	718187	7459167	10.0	7.1	4.65
SC1	718345	7459270	3.0	3.8	1.40
TS2	718051	7459045	4.0	2.0	1.86
TS3	718116	7458953	4.0	2.0	1.86
Stk1	717918	7458811	8.0	50.0	3.72
Stk2	717620	7458727	8.0	50.0	3.72
Rec	717769	7458762	8.0	50.0	3.72
Loadout	717111	7458266	4.0	2.0	1.86
FEL1	717047	7459033	3.0	15.0	1.40
FEL2	717354	7459257	3.0	15.0	1.40
PC2	715939	7455944	2.0	3.8	0.93
SC2	715934	7456116	3.0	3.8	1.40
TS4	715725	7456114	4.0	2.0	1.86
FEL3	716236	7455864	3.0	15.0	1.40
FEL4	716012	7455807	3.0	15.0	1.40
FEL5	716528	7455788	3.0	15.0	1.40

B.1: Haul Road Parameters

Appendix Table 4: Deposit F North

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR1	688844	7435625	8.5	16.7	7.9
HR2	689040	7435611	8.5	16.7	7.9
HR3	689236	7435534	8.5	16.7	7.9
HR4	689390	7435408	8.5	16.7	7.9
HR5	689600	7435387	8.5	16.7	7.9
HR6	689803	7435352	8.5	16.7	7.9
HR7	690021	7435359	8.5	16.7	7.9
HR8	690217	7435401	8.5	16.7	7.9
HR9	690427	7435394	8.5	16.7	7.9
HR10	690637	7435366	8.5	16.7	7.9
HR11	690833	7435345	8.5	16.7	7.9
HR12	691015	7435261	8.5	16.7	7.9
HR13	691211	7435177	8.5	16.7	7.9
HR14	691394	7435128	8.5	16.7	7.9
HR15	691541	7435009	8.5	16.7	7.9
HR16	691632	7434813	8.5	16.7	7.9
HR17	691723	7434638	8.5	16.7	7.9
HR18	691814	7434449	8.5	16.7	7.9
HR19	691863	7434281	8.5	16.7	7.9
HR20	691660	7434211	8.5	16.7	7.9
HR21	691450	7434169	8.5	16.7	7.9
HR22	691274	7434084	8.5	16.7	7.9
HR23	691260	7433874	8.5	16.7	7.9
HR24	691169	7433692	8.5	16.7	7.9
HR25	690980	7433538	8.5	16.7	7.9
HR26	690812	7433440	8.5	16.7	7.9
HR27	690630	7433363	8.5	16.7	7.9
HR28	690441	7433314	8.5	16.7	7.9
HR29	690231	7433307	8.5	16.7	7.9
HR30	690028	7433314	8.5	16.7	7.9
HR31	689817	7433272	8.5	16.7	7.9
HR32	689628	7433209	8.5	16.7	7.9
HR33	689425	7433104	8.5	16.7	7.9
HR34	689236	7433055	8.5	16.7	7.9
HR35	689047	7432992	8.5	16.7	7.9
HR36	688816	7433027	8.5	16.7	7.9
HR37	688627	7433062	8.5	16.7	7.9
HR38	688445	7433174	8.5	16.7	7.9
HR39	688255	7433293	8.5	16.7	7.9
HR40	688038	7433335	8.5	16.7	7.9
HR41	687821	7433349	8.5	16.7	7.9
HR42	687597	7433370	8.5	16.7	7.9
HR43	687387	7433391	8.5	16.7	7.9
HR44	687184	7433433	8.5	16.7	7.9
HR45	686974	7433447	8.5	16.7	7.9
HR46	686742	7433468	8.5	16.7	7.9
HR47	686546	7433503	8.5	16.7	7.9
HR48	686343	7433538	8.5	16.7	7.9
HR49	686154	7433566	8.5	16.7	7.9
HR50	685979	7433608	8.5	16.7	7.9

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR51	685727	7433587	8.5	16.7	7.9
HR52	685636	7433384	8.5	16.7	7.9
HR53	685566	7433202	8.5	16.7	7.9
HR54	685370	7433104	8.5	16.7	7.9
HR55	685152	7432971	8.5	16.7	7.9
HR56	684963	7432880	8.5	16.7	7.9
HR57	684746	7432880	8.5	16.7	7.9
HR58	684543	7432894	8.5	16.7	7.9
HR59	684333	7432915	8.5	16.7	7.9
HR60	684123	7432915	8.5	16.7	7.9
HR61	683892	7432943	8.5	16.7	7.9
HR62	683695	7432999	8.5	16.7	7.9

Appendix Table 5: Deposit H

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR1	694763	7441656	8.5	16.7	7.9
HR2	694560	7441713	8.5	16.7	7.9
HR3	694321	7441769	8.5	16.7	7.9
HR4	694111	7441776	8.5	16.7	7.9
HR5	693880	7441797	8.5	16.7	7.9
HR6	693677	7441839	8.5	16.7	7.9
HR7	693446	7441825	8.5	16.7	7.9
HR8	693222	7441846	8.5	16.7	7.9
HR9	693005	7441832	8.5	16.7	7.9
HR10	692794	7441860	8.5	16.7	7.9
HR11	692591	7441839	8.5	16.7	7.9
HR12	692402	7441867	8.5	16.7	7.9
HR13	690805	7441446	8.5	16.7	7.9
HR14	690896	7441264	8.5	16.7	7.9
HR15	690980	7441082	8.5	16.7	7.9
HR16	691029	7440858	8.5	16.7	7.9
HR17	691078	7441341	8.5	16.7	7.9
HR18	691309	7441411	8.5	16.7	7.9
HR19	694553	7441110	8.5	16.7	7.9
HR20	694441	7440970	8.5	16.7	7.9
HR21	694293	7440802	8.5	16.7	7.9
HR22	694083	7440718	8.5	16.7	7.9
HR23	693887	7440725	8.5	16.7	7.9
HR24	693663	7440725	8.5	16.7	7.9
HR25	693439	7440732	8.5	16.7	7.9
HR26	693236	7440711	8.5	16.7	7.9
HR27	692998	7440704	8.5	16.7	7.9
HR28	692780	7440683	8.5	16.7	7.9
HR29	692563	7440690	8.5	16.7	7.9
HR30	692353	7440648	8.5	16.7	7.9
HR31	692115	7440641	8.5	16.7	7.9
HR32	691884	7440620	8.5	16.7	7.9
HR33	691695	7440613	8.5	16.7	7.9
HR34	691464	7440599	8.5	16.7	7.9
HR35	691267	7440613	8.5	16.7	7.9

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR36	691036	7440613	8.5	16.7	7.9
HR37	690826	7440606	8.5	16.7	7.9
HR38	690637	7440606	8.5	16.7	7.9
HR39	690406	7440606	8.5	16.7	7.9
HR40	690224	7440620	8.5	16.7	7.9
HR41	690014	7440613	8.5	16.7	7.9
HR42	689789	7440634	8.5	16.7	7.9
HR43	689565	7440613	8.5	16.7	7.9
HR44	689362	7440620	8.5	16.7	7.9
HR45	689166	7440620	8.5	16.7	7.9
HR46	688970	7440613	8.5	16.7	7.9
HR47	688732	7440606	8.5	16.7	7.9
HR48	688515	7440620	8.5	16.7	7.9
HR49	688290	7440599	8.5	16.7	7.9
HR50	688087	7440655	8.5	16.7	7.9
HR51	687877	7440718	8.5	16.7	7.9
HR52	687681	7440795	8.5	16.7	7.9
HR53	687485	7440851	8.5	16.7	7.9
HR54	687254	7440914	8.5	16.7	7.9
HR55	687072	7440977	8.5	16.7	7.9
HR56	686855	7440998	8.5	16.7	7.9
HR57	686637	7441047	8.5	16.7	7.9
HR58	686413	7441110	8.5	16.7	7.9
HR59	686189	7441138	8.5	16.7	7.9
HR60	685979	7441103	8.5	16.7	7.9
HR61	685741	7441082	8.5	16.7	7.9
HR62	685503	7441033	8.5	16.7	7.9
HR63	685321	7440991	8.5	16.7	7.9
HR64	685089	7441012	8.5	16.7	7.9
HR65	684865	7441023	8.5	16.7	7.9
HR66	684666	7441047	8.5	16.7	7.9
HR67	684452	7441072	8.5	16.7	7.9
HR68	684231	7441089	8.5	16.7	7.9
HR69	684018	7441117	8.5	16.7	7.9
HR70	683811	7441135	8.5	16.7	7.9
HR71	683597	7441142	8.5	16.7	7.9
HR72	683366	7441138	8.5	16.7	7.9
HR73	683132	7441166	8.5	16.7	7.9
HR74	682914	7441233	8.5	16.7	7.9
HR75	682732	7441296	8.5	16.7	7.9
HR76	682540	7441373	8.5	16.7	7.9
HR77	682326	7441390	8.5	16.7	7.9
HR78	682095	7441408	8.5	16.7	7.9
HR79	681902	7441317	8.5	16.7	7.9
HR80	681934	7441114	8.5	16.7	7.9
HR81	682021	7440939	8.5	16.7	7.9
HR82	682105	7440732	8.5	16.7	7.9
HR83	682098	7440515	8.5	16.7	7.9
HR84	682042	7440294	8.5	16.7	7.9
HR85	681937	7440098	8.5	16.7	7.9
HR86	681818	7439923	8.5	16.7	7.9
HR87	681675	7439762	8.5	16.7	7.9
HR88	681527	7439555	8.5	16.7	7.9
HR89	681405	7439383	8.5	16.7	7.9
HR90	681321	7439191	8.5	16.7	7.9

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR91	681289	7438988	8.5	16.7	7.9
HR92	681265	7438785	8.5	16.7	7.9
HR93	681230	7438581	8.5	16.7	7.9
HR94	681223	7438354	8.5	16.7	7.9
HR95	681240	7438144	8.5	16.7	7.9
HR96	681317	7437951	8.5	16.7	7.9
HR97	681419	7437762	8.5	16.7	7.9
HR98	681513	7437555	8.5	16.7	7.9
HR99	681650	7437373	8.5	16.7	7.9
HR100	681776	7437223	8.5	16.7	7.9
HR101	681846	7436998	8.5	16.7	7.9
HR102	681846	7436767	8.5	16.7	7.9
HR103	681836	7436568	8.5	16.7	7.9
HR104	681811	7436347	8.5	16.7	7.9
HR105	681818	7436144	8.5	16.7	7.9
HR106	681766	7435941	8.5	16.7	7.9
HR107	681626	7435808	8.5	16.7	7.9
HR108	681408	7435769	8.5	16.7	7.9
HR109	681212	7435734	8.5	16.7	7.9
HR110	681023	7435755	8.5	16.7	7.9

Appendix Table 6: Deposit J

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR1	676179	7430162	8.5	16.7	7.9
HR2	676390	7430197	8.5	16.7	7.9
HR3	676593	7430232	8.5	16.7	7.9
HR4	676803	7430253	8.5	16.7	7.9
HR5	677013	7430281	8.5	16.7	7.9
HR6	677258	7430316	8.5	16.7	7.9
HR7	677447	7430309	8.5	16.7	7.9
HR8	677643	7430365	8.5	16.7	7.9
HR9	677861	7430435	8.5	16.7	7.9
HR10	678071	7430449	8.5	16.7	7.9
HR11	678288	7430456	8.5	16.7	7.9
HR12	678484	7430463	8.5	16.7	7.9
HR13	678687	7430470	8.5	16.7	7.9
HR14	678904	7430470	8.5	16.7	7.9
HR15	679114	7430470	8.5	16.7	7.9
HR16	679325	7430463	8.5	16.7	7.9
HR17	679556	7430491	8.5	16.7	7.9
HR18	679808	7430463	8.5	16.7	7.9
HR19	679990	7430449	8.5	16.7	7.9
HR20	680200	7430393	8.5	16.7	7.9
HR21	680403	7430358	8.5	16.7	7.9
HR22	679962	7430673	8.5	16.7	7.9
HR23	679941	7430869	8.5	16.7	7.9
HR24	679927	7431058	8.5	16.7	7.9
HR25	679836	7431269	8.5	16.7	7.9
HR26	679766	7431444	8.5	16.7	7.9

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR27	679731	7431661	8.5	16.7	7.9
HR28	679738	7431871	8.5	16.7	7.9
HR29	679745	7432088	8.5	16.7	7.9
HR30	679170	7430687	8.5	16.7	7.9
HR31	679177	7430876	8.5	16.7	7.9
HR32	679212	7431093	8.5	16.7	7.9
HR33	679275	7431276	8.5	16.7	7.9
HR34	679402	7431451	8.5	16.7	7.9
HR35	679486	7431661	8.5	16.7	7.9
HR36	679528	7431871	8.5	16.7	7.9
HR37	679654	7432025	8.5	16.7	7.9
HR38	679808	7432200	8.5	16.7	7.9
HR39	679941	7432375	8.5	16.7	7.9
HR40	680123	7432480	8.5	16.7	7.9
HR41	680347	7432494	8.5	16.7	7.9
HR42	680543	7432459	8.5	16.7	7.9
HR43	680753	7432445	8.5	16.7	7.9
HR44	680950	7432410	8.5	16.7	7.9
HR45	681083	7432585	8.5	16.7	7.9
HR46	681104	7432796	8.5	16.7	7.9
HR47	681167	7432971	8.5	16.7	7.9
HR48	681202	7433188	8.5	16.7	7.9
HR49	681335	7433349	8.5	16.7	7.9

Appendix Table 7: Mt Ella East

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR1	687149	7432116	8.5	16.7	7.9
HR2	686946	7432102	8.5	16.7	7.9
HR3	686756	7432053	8.5	16.7	7.9
HR4	686532	7432032	8.5	16.7	7.9
HR5	686329	7432144	8.5	16.7	7.9
HR6	686168	7432228	8.5	16.7	7.9
HR7	685979	7432298	8.5	16.7	7.9
HR8	685769	7432375	8.5	16.7	7.9
HR9	685545	7432375	8.5	16.7	7.9
HR10	685328	7432389	8.5	16.7	7.9
HR11	685131	7432389	8.5	16.7	7.9
HR12	684928	7432403	8.5	16.7	7.9
HR13	684718	7432375	8.5	16.7	7.9
HR14	684522	7432382	8.5	16.7	7.9
HR15	684326	7432389	8.5	16.7	7.9
HR16	684116	7432389	8.5	16.7	7.9
HR17	682743	7432333	8.5	16.7	7.9
HR18	682547	7432361	8.5	16.7	7.9
HR19	682708	7432494	8.5	16.7	7.9
HR20	682897	7432494	8.5	16.7	7.9
HR21	683079	7432466	8.5	16.7	7.9
HR22	683303	7432452	8.5	16.7	7.9
HR23	683499	7432431	8.5	16.7	7.9
HR24	683716	7432417	8.5	16.7	7.9
HR25	683913	7432403	8.5	16.7	7.9
HR26	684074	7432592	8.5	16.7	7.9
HR27	683892	7432726	8.5	16.7	7.9
HR28	683730	7432817	8.5	16.7	7.9
HR29	682309	7432410	8.5	16.7	7.9
HR30	682105	7432424	8.5	16.7	7.9
HR31	681881	7432403	8.5	16.7	7.9
HR32	681664	7432410	8.5	16.7	7.9
HR33	681489	7432403	8.5	16.7	7.9
HR34	681258	7432403	8.5	16.7	7.9

Appendix Table 8: Western Hills

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR1	664461	7441614	8.5	16.7	7.9
HR2	664706	7441600	8.5	16.7	7.9
HR3	664944	7441635	8.5	16.7	7.9
HR4	665175	7441656	8.5	16.7	7.9
HR5	665406	7441656	8.5	16.7	7.9
HR6	665616	7441727	8.5	16.7	7.9
HR7	665841	7441839	8.5	16.7	7.9
HR8	666016	7441706	8.5	16.7	7.9
HR9	666128	7441537	8.5	16.7	7.9
HR10	666261	7441369	8.5	16.7	7.9
HR11	666373	7441180	8.5	16.7	7.9
HR12	666541	7441033	8.5	16.7	7.9
HR13	666751	7440984	8.5	16.7	7.9
HR14	666982	7440893	8.5	16.7	7.9
HR15	667199	7440823	8.5	16.7	7.9
HR16	667417	7440732	8.5	16.7	7.9
HR17	667641	7440669	8.5	16.7	7.9
HR18	667830	7440606	8.5	16.7	7.9
HR19	667977	7440487	8.5	16.7	7.9
HR20	668012	7440277	8.5	16.7	7.9
HR21	668005	7440045	8.5	16.7	7.9
HR22	667991	7439835	8.5	16.7	7.9
HR23	667963	7439625	8.5	16.7	7.9
HR24	668173	7439520	8.5	16.7	7.9
HR25	668404	7439499	8.5	16.7	7.9
HR26	668607	7439520	8.5	16.7	7.9
HR27	668825	7439478	8.5	16.7	7.9
HR28	669042	7439464	8.5	16.7	7.9
HR29	669273	7439457	8.5	16.7	7.9
HR30	669462	7439443	8.5	16.7	7.9
HR31	669721	7439380	8.5	16.7	7.9
HR32	669924	7439310	8.5	16.7	7.9
HR33	670113	7439205	8.5	16.7	7.9
HR34	666016	7441972	8.5	16.7	7.9
HR35	666205	7442098	8.5	16.7	7.9
HR36	666380	7442196	8.5	16.7	7.9
HR37	666569	7442350	8.5	16.7	7.9
HR38	666695	7442483	8.5	16.7	7.9
HR39	666933	7442546	8.5	16.7	7.9
HR40	667185	7442560	8.5	16.7	7.9
HR41	667445	7442553	8.5	16.7	7.9
HR42	667697	7442532	8.5	16.7	7.9
HR43	667900	7442525	8.5	16.7	7.9
HR44	668117	7442504	8.5	16.7	7.9
HR45	668341	7442504	8.5	16.7	7.9
HR46	668523	7442497	8.5	16.7	7.9
HR47	668747	7442511	8.5	16.7	7.9
HR48	668972	7442567	8.5	16.7	7.9
HR49	669217	7442602	8.5	16.7	7.9
HR50	669483	7442616	8.5	16.7	7.9
HR51	669700	7442567	8.5	16.7	7.9
HR52	669819	7442427	8.5	16.7	7.9
HR53	669903	7442210	8.5	16.7	7.9

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR54	670001	7442042	8.5	16.7	7.9
HR55	670120	7441853	8.5	16.7	7.9
HR56	670211	7441678	8.5	16.7	7.9
HR57	670324	7441502	8.5	16.7	7.9
HR58	670429	7441285	8.5	16.7	7.9
HR59	670499	7441061	8.5	16.7	7.9
HR60	670499	7440830	8.5	16.7	7.9
HR61	670513	7440620	8.5	16.7	7.9
HR62	670513	7440389	8.5	16.7	7.9
HR63	670492	7440165	8.5	16.7	7.9
HR64	670499	7439940	8.5	16.7	7.9
HR65	670506	7439730	8.5	16.7	7.9
HR66	670499	7439520	8.5	16.7	7.9
HR67	670408	7439345	8.5	16.7	7.9

Appendix Table 9: Western Hills

Source Id	Easting	Northing	Effective Height (m)	Sigma Y	Sigma Z
HR1	683492	7433072	8.5	16.7	7.9
HR2	683272	7433090	8.5	16.7	7.9
HR3	683086	7433114	8.5	16.7	7.9
HR4	682869	7433104	8.5	16.7	7.9
HR5	682680	7433128	8.5	16.7	7.9
HR6	682473	7433128	8.5	16.7	7.9
HR7	682273	7433181	8.5	16.7	7.9
HR8	682084	7433247	8.5	16.7	7.9
HR9	681878	7433258	8.5	16.7	7.9
HR10	681671	7433286	8.5	16.7	7.9
HR11	681482	7433380	8.5	16.7	7.9
HR12	681317	7433496	8.5	16.7	7.9
HR13	681237	7433689	8.5	16.7	7.9
HR14	681170	7433881	8.5	16.7	7.9
HR15	681093	7434074	8.5	16.7	7.9
HR16	680929	7434172	8.5	16.7	7.9
HR17	680743	7434302	8.5	16.7	7.9
HR18	680662	7434491	8.5	16.7	7.9
HR19	680648	7434711	8.5	16.7	7.9
HR20	680746	7434883	8.5	16.7	7.9
HR21	680883	7435041	8.5	16.7	7.9
HR22	680862	7435247	8.5	16.7	7.9
HR23	680659	7435366	8.5	16.7	7.9
HR24	680550	7435524	8.5	16.7	7.9
HR25	680589	7435738	8.5	16.7	7.9
HR26	680431	7435853	8.5	16.7	7.9

Appendix C – Emission Rates

C.1: Mining Sources

Appendix Table 10: West Angelas Processing (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
PC1	0.17	0.17	0.17	0.17	0.17	0.14
PC2	0.10	0.10	0.10	0.10	0.10	0.07
TS1	0.25	0.25	0.25	0.25	0.25	0.17
Scalping	7.43	7.43	7.43	7.43	7.43	6.68
TertCrush1	0.30	0.30	0.30	0.30	0.30	0.27
TS2	0.62	0.62	0.62	0.62	0.62	0.56
TS3	0.62	0.62	0.62	0.62	0.62	0.56
Stck1	0.46	0.46	0.46	0.46	0.46	0.42
Stck2	0.46	0.46	0.46	0.46	0.46	0.42
Rec1	3.72	3.72	3.72	3.72	3.72	1.12
TS4	3.72	3.72	3.72	3.72	3.72	1.12
Rail	3.72	3.72	3.72	3.72	3.72	1.12
FEL1	1.49	1.49	1.49	1.49	1.49	1.04
FEL2	1.49	1.49	1.49	1.49	1.49	1.04
FEL3	1.49	1.49	1.49	1.49	1.49	1.04
Unload1	0.80	0.80	0.80	0.80	0.80	0.56
Unload2	0.80	0.80	0.80	0.80	0.80	0.56
Unload3	0.80	0.80	0.80	0.80	0.80	0.56
Unload4	0.80	0.80	0.80	0.80	0.80	0.56

Appendix Table 11: West Angelas Mining (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
DepFN-D1	0.08	0.08	0.08	0.08	0.00	0.01
DepFN-B1	34.40	0.00	0.00	0.00	0.00	0.06
DepFN-L1	0.25	0.25	0.25	0.25	0.25	0.25
DepFN-D2	0.08	0.08	0.08	0.08	0.00	0.01
DepFN-B2	34.40	0.00	0.00	0.00	0.00	0.05
DepFN-L2	0.25	0.25	0.25	0.25	0.25	0.25
DepFN-D3	0.08	0.08	0.08	0.08	0.00	0.01
DepFN-B3	34.40	0.00	0.00	0.00	0.00	0.05
DepFN-L3	0.25	0.25	0.25	0.25	0.25	0.25
DepFN-D4	0.08	0.08	0.08	0.08	0.00	0.01
DepFN-B4	34.40	0.00	0.00	0.00	0.00	0.18
DepFN-L4	0.25	0.25	0.25	0.25	0.25	0.25
DepFN-UW1	0.18	0.18	0.18	0.18	0.18	0.18
DepFN-UW2	0.18	0.18	0.18	0.18	0.18	0.18
DepFN-Bull1	1.13	1.13	1.13	1.13	0.00	0.12
DH-D1	0.14	0.14	0.14	0.14	0.14	0.05
DH-B1	99.77	0.00	0.00	0.00	0.00	0.52
DH-L1	1.60	1.60	1.60	1.60	1.60	1.60
DH-D2	0.14	0.14	0.14	0.14	0.14	0.05
DH-B2	99.77	0.00	0.00	0.00	0.00	0.52
DH-L2	1.60	1.60	1.60	1.60	1.60	1.60
DH-D3	0.14	0.14	0.14	0.14	0.14	0.05
DH-B3	99.77	0.00	0.00	0.00	0.00	0.52
DH-L3	1.60	1.60	1.60	1.60	1.60	1.60
DH-D4	0.14	0.14	0.14	0.14	0.14	0.05
DH-B4	99.77	0.00	0.00	0.00	0.00	0.51
DH-L4	1.60	1.60	1.60	1.60	1.60	1.60
DH-D5	0.14	0.14	0.14	0.14	0.14	0.05
DH-B5	99.77	0.00	0.00	0.00	0.00	0.52
DH-L5	1.60	1.60	1.60	1.60	1.60	1.60
DH-UW1	0.25	0.25	0.25	0.25	0.25	0.25
DH-UW2	0.25	0.25	0.25	0.25	0.25	0.25
DH-UW3	0.25	0.25	0.25	0.25	0.25	0.25
DH-UW4	0.25	0.25	0.25	0.25	0.25	0.25
DH-UW5	0.25	0.25	0.25	0.25	0.25	0.25
DH-UW6	0.25	0.25	0.25	0.25	0.25	0.25
DH-Bull1	1.13	1.13	1.13	1.13	0.00	0.13
DH-Bull2	1.13	1.13	1.13	1.13	0.00	0.14
DH-Bull3	1.13	1.13	1.13	1.13	0.00	0.14
J-D1	0.08	0.08	0.08	0.08	0.00	0.01
J-B1	84.03	0.00	0.00	0.00	0.00	0.10
J-L1	0.30	0.30	0.30	0.30	0.30	0.30
J-D2	0.08	0.08	0.08	0.08	0.00	0.01
J-B2	84.03	0.00	0.00	0.00	0.00	0.09
J-L2	0.30	0.30	0.30	0.30	0.30	0.30
J-D3	0.08	0.08	0.08	0.08	0.00	0.01
J-B3	84.03	0.00	0.00	0.00	0.00	0.09
J-L3	0.30	0.30	0.30	0.30	0.30	0.30
J-D4	0.08	0.08	0.08	0.08	0.00	0.01
J-B4	84.03	0.00	0.00	0.00	0.00	0.09
J-L4	0.30	0.30	0.30	0.30	0.30	0.30
J-D5	0.08	0.08	0.08	0.08	0.00	0.01
J-B5	84.03	0.00	0.00	0.00	0.00	0.09
J-L5	0.30	0.30	0.30	0.30	0.30	0.30

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
J-D6	0.08	0.08	0.08	0.08	0.00	0.01
J-B6	84.03	0.00	0.00	0.00	0.00	0.09
J-L6	0.30	0.30	0.30	0.30	0.30	0.30
J-UW1	0.15	0.15	0.15	0.15	0.15	0.15
J-UW2	0.15	0.15	0.15	0.15	0.15	0.15
J-UW3	0.15	0.15	0.15	0.15	0.15	0.15
J-UW4	0.15	0.15	0.15	0.15	0.15	0.15
J-Bull1	1.13	1.13	1.13	0.00	0.00	0.10
J-Bull2	1.13	1.13	1.13	0.00	0.00	0.09
J-Bull3	1.13	1.13	1.13	0.00	0.00	0.10
J-Bull4	1.13	1.13	1.13	0.00	0.00	0.10
MTE-D1	0.08	0.08	0.08	0.08	0.00	0.01
MTE-B1	21.60	0.00	0.00	0.00	0.00	0.04
MTE-L1	0.24	0.24	0.24	0.24	0.24	0.24
MTE-D2	0.08	0.08	0.08	0.08	0.00	0.01
MTE-B2	21.60	0.00	0.00	0.00	0.00	0.04
MTE-L3	0.24	0.24	0.24	0.24	0.24	0.24
MTE-D3	0.08	0.08	0.08	0.08	0.00	0.01
MTE-B3	21.60	0.00	0.00	0.00	0.00	0.04
MTE-L3	0.24	0.24	0.24	0.24	0.24	0.24
MTE-UW1	0.04	0.04	0.04	0.04	0.04	0.04
MTE-UW2	0.04	0.04	0.04	0.04	0.04	0.04
MTE-UW3	0.04	0.04	0.04	0.04	0.04	0.04
MTE-UW4	0.04	0.04	0.04	0.04	0.04	0.04
MTE-UW5	0.04	0.04	0.04	0.04	0.04	0.04
MET-UW6	0.04	0.04	0.04	0.04	0.04	0.04
MTE-Bull1	1.13	1.13	0.00	0.00	0.00	0.04
MTE-Bull2	1.13	1.13	0.00	0.00	0.00	0.05
MTE-Bull3	1.13	1.13	0.00	0.00	0.00	0.05
WH-D1	0.11	0.11	0.11	0.11	0.11	0.04
WH-B1	81.35	0.00	0.00	0.00	0.00	0.29
WH-L1	1.16	1.16	1.16	1.16	1.16	1.16
WH-D2	0.11	0.11	0.11	0.11	0.11	0.03
WH-B2	81.35	0.00	0.00	0.00	0.00	0.29
WH-L2	1.16	1.16	1.16	1.16	1.16	1.16
WH-D3	0.11	0.11	0.11	0.11	0.11	0.03
WH-B3	81.35	0.00	0.00	0.00	0.00	0.29
WH-L3	1.16	1.16	1.16	1.16	1.16	1.16
WH-D4	0.11	0.11	0.11	0.11	0.11	0.03
WH-B4	81.35	0.00	0.00	0.00	0.00	0.28
WH-L4	1.16	1.16	1.16	1.16	1.16	1.16
WH-D5	0.11	0.11	0.11	0.11	0.11	0.03
WH-B5	81.35	0.00	0.00	0.00	0.00	0.28
WH-L5	1.16	1.16	1.16	1.16	1.16	1.16
WH-D6	0.11	0.11	0.11	0.11	0.11	0.04
WH-B6	81.35	0.00	0.00	0.00	0.00	0.28
WH-L6	1.16	1.16	1.16	1.16	1.16	1.16
WH-UW1	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW2	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW3	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW4	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW5	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW6	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW7	0.15	0.15	0.15	0.15	0.15	0.15

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
WH-UW8	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW9	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW10	0.15	0.15	0.15	0.15	0.15	0.15
WH-UW11	0.15	0.15	0.15	0.15	0.15	0.15
WH-Bull1	1.13	1.13	1.13	0.00	0.00	0.10
WH-Bull2	1.13	1.13	1.13	0.00	0.00	0.10
WH-Bull3	1.13	1.13	1.13	0.00	0.00	0.11
WH-Bull4	1.13	1.13	1.13	0.00	0.00	0.10
WH-Bull5	1.13	1.13	1.13	0.00	0.00	0.10
WH-Bull6	1.13	1.13	1.13	0.00	0.00	0.10

Appendix Table 12: West Angelas Wind Erosion (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
WH_WE1	20.86	5.55	2.85	1.76	0.38	0.50
WH_WE2	20.86	5.55	2.85	1.76	0.38	0.50
WH_WE3	20.86	5.55	2.85	1.76	0.38	0.50
WH_WE4	20.86	5.55	2.85	1.76	0.38	0.50
WH_WE5	39.64	10.54	5.42	3.35	0.72	0.96
WH_WE6	39.64	10.54	5.42	3.35	0.72	0.96
DepH_WE1	55.44	7.15	3.06	1.46	0.00	0.50
DepH_WE2	55.44	7.15	3.06	1.46	0.00	0.50
DepH_WE3	55.44	7.15	3.06	1.46	0.00	0.50
DepH_WE4	105.34	13.58	5.81	2.77	0.00	0.95
DepH_WE5	32.83	9.94	5.39	3.44	0.87	0.96
DepF_WE1	32.83	9.94	5.39	3.44	0.87	0.96
DepF_WE2	32.83	9.94	5.39	3.44	0.87	0.96
DepF_WE3	17.28	5.23	2.84	1.81	0.46	0.51
MtE_WE1	17.28	5.23	2.84	1.81	0.46	0.51
MtE_WE2	17.28	5.23	2.84	1.81	0.46	0.51
MtE_WE3	17.28	5.23	2.84	1.81	0.46	0.51
MtE_WE4	32.83	9.94	5.39	3.44	0.87	0.96
MtE_WE5	32.83	9.94	5.39	3.44	0.87	0.96
DepJ_WE1	17.28	5.23	2.84	1.81	0.46	0.51
DepJ_WE2	17.28	5.23	2.84	1.81	0.46	0.51
DepJ_WE3	17.28	5.23	2.84	1.81	0.46	0.51
DepJ_WE4	17.28	5.23	2.84	1.81	0.46	0.51
DepJ_WE5	32.83	9.94	5.39	3.44	0.87	0.96
DepJ_WE6	32.83	9.94	5.39	3.44	0.87	0.96
DepJ_WE7	32.83	9.94	5.39	3.44	0.87	0.96
ROM1	4.32	1.31	0.71	0.45	0.11	0.13
ROM2	4.32	1.31	0.71	0.45	0.11	0.13
ROM3	4.32	1.31	0.71	0.45	0.11	0.13
Stk1	1.92	0.58	0.32	0.20	0.05	0.06
Stk2	1.92	0.58	0.32	0.20	0.05	0.06

C.2: Haul Road Emissions

Appendix Table 13: West Angelas Deposit F North (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR1	0.26	0.26	0.26	0.26	0.26	0.21
HR2	0.26	0.26	0.26	0.26	0.26	0.21
HR3	0.26	0.26	0.26	0.26	0.26	0.21
HR4	0.26	0.26	0.26	0.26	0.26	0.21
HR5	0.26	0.26	0.26	0.26	0.26	0.21
HR6	0.26	0.26	0.26	0.26	0.26	0.21
HR7	0.26	0.26	0.26	0.26	0.26	0.21
HR8	0.26	0.26	0.26	0.26	0.26	0.21
HR9	0.26	0.26	0.26	0.26	0.26	0.21
HR10	0.26	0.26	0.26	0.26	0.26	0.21
HR11	0.26	0.26	0.26	0.26	0.26	0.21
HR12	0.26	0.26	0.26	0.26	0.26	0.21
HR13	0.26	0.26	0.26	0.26	0.26	0.21
HR14	0.26	0.26	0.26	0.26	0.26	0.21
HR15	0.26	0.26	0.26	0.26	0.26	0.21
HR16	0.00	0.00	0.00	0.00	0.00	0.00
HR17	0.00	0.00	0.00	0.00	0.00	0.00
HR18	0.00	0.00	0.00	0.00	0.00	0.00
HR19	0.00	0.00	0.00	0.00	0.00	0.00
HR20	0.00	0.00	0.00	0.00	0.00	0.00
HR21	0.00	0.00	0.00	0.00	0.00	0.00
HR22	0.00	0.00	0.00	0.00	0.00	0.00
HR23	0.00	0.00	0.00	0.00	0.00	0.00
HR24	0.00	0.00	0.00	0.00	0.00	0.00
HR25	0.00	0.00	0.00	0.00	0.00	0.00
HR26	0.00	0.00	0.00	0.00	0.00	0.00
HR27	0.00	0.00	0.00	0.00	0.00	0.00
HR28	0.00	0.00	0.00	0.00	0.00	0.00
HR29	0.00	0.00	0.00	0.00	0.00	0.00
HR30	0.00	0.00	0.00	0.00	0.00	0.00
HR31	0.00	0.00	0.00	0.00	0.00	0.00
HR32	0.00	0.00	0.00	0.00	0.00	0.00
HR33	0.00	0.00	0.00	0.00	0.00	0.00
HR34	0.00	0.00	0.00	0.00	0.00	0.00
HR35	0.00	0.00	0.00	0.00	0.00	0.00
HR36	0.00	0.00	0.00	0.00	0.00	0.00
HR37	0.00	0.00	0.00	0.00	0.00	0.00
HR38	0.00	0.00	0.00	0.00	0.00	0.00
HR39	0.00	0.00	0.00	0.00	0.00	0.00
HR40	0.00	0.00	0.00	0.00	0.00	0.00
HR41	0.00	0.00	0.00	0.00	0.00	0.00
HR42	0.00	0.00	0.00	0.00	0.00	0.00
HR43	0.00	0.00	0.00	0.00	0.00	0.00
HR44	0.00	0.00	0.00	0.00	0.00	0.00
HR45	0.00	0.00	0.00	0.00	0.00	0.00
HR46	0.00	0.00	0.00	0.00	0.00	0.00
HR47	0.00	0.00	0.00	0.00	0.00	0.00
HR48	0.00	0.00	0.00	0.00	0.00	0.00
HR49	0.00	0.00	0.00	0.00	0.00	0.00
HR50	0.00	0.00	0.00	0.00	0.00	0.00

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR51	0.00	0.00	0.00	0.00	0.00	0.00
HR52	0.00	0.00	0.00	0.00	0.00	0.00
HR53	0.00	0.00	0.00	0.00	0.00	0.00
HR54	0.00	0.00	0.00	0.00	0.00	0.00
HR55	0.00	0.00	0.00	0.00	0.00	0.00
HR56	0.00	0.00	0.00	0.00	0.00	0.00
HR57	0.00	0.00	0.00	0.00	0.00	0.00
HR58	0.00	0.00	0.00	0.00	0.00	0.00
HR59	0.00	0.00	0.00	0.00	0.00	0.00
HR60	0.00	0.00	0.00	0.00	0.00	0.00
HR61	0.00	0.00	0.00	0.00	0.00	0.00
HR62	0.00	0.00	0.00	0.00	0.00	0.00

Appendix Table 14: West Angelas Deposit H (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR1	0.52	0.52	0.52	0.52	0.52	0.41
HR2	0.52	0.52	0.52	0.52	0.52	0.41
HR3	0.52	0.52	0.52	0.52	0.52	0.41
HR4	0.52	0.52	0.52	0.52	0.52	0.41
HR5	0.52	0.52	0.52	0.52	0.52	0.41
HR6	0.52	0.52	0.52	0.52	0.52	0.41
HR7	0.52	0.52	0.52	0.52	0.52	0.41
HR8	0.52	0.52	0.52	0.52	0.52	0.41
HR9	0.52	0.52	0.52	0.52	0.52	0.41
HR10	0.52	0.52	0.52	0.52	0.52	0.41
HR11	0.52	0.52	0.52	0.52	0.52	0.41
HR12	0.52	0.52	0.52	0.52	0.52	0.41
HR13	1.06	1.06	1.06	1.06	1.06	0.84
HR14	1.06	1.06	1.06	1.06	1.06	0.84
HR15	0.61	0.61	0.61	0.61	0.61	0.43
HR16	0.61	0.61	0.61	0.61	0.61	0.43
HR17	0.59	0.59	0.59	0.59	0.59	0.42
HR18	0.59	0.59	0.59	0.59	0.59	0.42
HR19	0.61	0.61	0.61	0.61	0.61	0.43
HR20	0.61	0.61	0.61	0.61	0.61	0.43
HR21	0.61	0.61	0.61	0.61	0.61	0.43
HR22	0.61	0.61	0.61	0.61	0.61	0.43
HR23	0.61	0.61	0.61	0.61	0.61	0.43
HR24	0.61	0.61	0.61	0.61	0.61	0.43
HR25	0.61	0.61	0.61	0.61	0.61	0.43
HR26	0.61	0.61	0.61	0.61	0.61	0.43
HR27	0.61	0.61	0.61	0.61	0.61	0.43
HR28	0.61	0.61	0.61	0.61	0.61	0.43
HR29	0.61	0.61	0.61	0.61	0.61	0.43
HR30	0.61	0.61	0.61	0.61	0.61	0.43
HR31	0.61	0.61	0.61	0.61	0.61	0.43
HR32	0.61	0.61	0.61	0.61	0.61	0.43
HR33	0.61	0.61	0.61	0.61	0.61	0.43
HR34	0.61	0.61	0.61	0.61	0.61	0.43
HR35	0.61	0.61	0.61	0.61	0.61	0.43
HR36	0.96	0.96	0.96	0.96	0.96	0.86
HR37	0.96	0.96	0.96	0.96	0.96	0.86
HR38	0.96	0.96	0.96	0.96	0.96	0.86
HR39	0.96	0.96	0.96	0.96	0.96	0.86
HR40	0.96	0.96	0.96	0.96	0.96	0.86
HR41	0.96	0.96	0.96	0.96	0.96	0.86
HR42	0.96	0.96	0.96	0.96	0.96	0.86
HR43	0.96	0.96	0.96	0.96	0.96	0.86
HR44	0.96	0.96	0.96	0.96	0.96	0.86
HR45	0.96	0.96	0.96	0.96	0.96	0.86
HR46	0.96	0.96	0.96	0.96	0.96	0.86
HR47	0.96	0.96	0.96	0.96	0.96	0.86
HR48	0.96	0.96	0.96	0.96	0.96	0.86
HR49	0.96	0.96	0.96	0.96	0.96	0.86
HR50	0.96	0.96	0.96	0.96	0.96	0.86
HR51	0.96	0.96	0.96	0.96	0.96	0.86
HR52	0.96	0.96	0.96	0.96	0.96	0.86

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR53	0.96	0.96	0.96	0.96	0.96	0.86
HR54	0.96	0.96	0.96	0.96	0.96	0.86
HR55	0.96	0.96	0.96	0.96	0.96	0.86
HR56	0.96	0.96	0.96	0.96	0.96	0.86
HR57	0.96	0.96	0.96	0.96	0.96	0.86
HR58	0.96	0.96	0.96	0.96	0.96	0.86
HR59	0.96	0.96	0.96	0.96	0.96	0.86
HR60	0.96	0.96	0.96	0.96	0.96	0.86
HR61	0.96	0.96	0.96	0.96	0.96	0.86
HR62	0.96	0.96	0.96	0.96	0.96	0.86
HR63	0.96	0.96	0.96	0.96	0.96	0.86
HR64	0.96	0.96	0.96	0.96	0.96	0.86
HR65	0.96	0.96	0.96	0.96	0.96	0.86
HR66	0.96	0.96	0.96	0.96	0.96	0.86
HR67	0.96	0.96	0.96	0.96	0.96	0.86
HR68	0.96	0.96	0.96	0.96	0.96	0.86
HR69	0.96	0.96	0.96	0.96	0.96	0.86
HR70	0.96	0.96	0.96	0.96	0.96	0.86
HR71	0.96	0.96	0.96	0.96	0.96	0.86
HR72	0.96	0.96	0.96	0.96	0.96	0.86
HR73	0.96	0.96	0.96	0.96	0.96	0.86
HR74	0.96	0.96	0.96	0.96	0.96	0.86
HR75	0.96	0.96	0.96	0.96	0.96	0.86
HR76	0.96	0.96	0.96	0.96	0.96	0.86
HR77	0.96	0.96	0.96	0.96	0.96	0.86
HR78	0.96	0.96	0.96	0.96	0.96	0.86
HR79	0.96	0.96	0.96	0.96	0.96	0.86
HR80	0.96	0.96	0.96	0.96	0.96	0.86
HR81	0.96	0.96	0.96	0.96	0.96	0.86
HR82	0.96	0.96	0.96	0.96	0.96	0.86
HR83	0.96	0.96	0.96	0.96	0.96	0.86
HR84	0.96	0.96	0.96	0.96	0.96	0.86
HR85	0.96	0.96	0.96	0.96	0.96	0.86
HR86	0.96	0.96	0.96	0.96	0.96	0.86
HR87	0.96	0.96	0.96	0.96	0.96	0.86
HR88	0.96	0.96	0.96	0.96	0.96	0.86
HR89	0.96	0.96	0.96	0.96	0.96	0.86
HR90	0.96	0.96	0.96	0.96	0.96	0.86
HR91	0.96	0.96	0.96	0.96	0.96	0.86
HR92	0.96	0.96	0.96	0.96	0.96	0.86
HR93	0.96	0.96	0.96	0.96	0.96	0.86
HR94	0.96	0.96	0.96	0.96	0.96	0.86
HR95	0.96	0.96	0.96	0.96	0.96	0.86
HR96	0.96	0.96	0.96	0.96	0.96	0.86
HR97	0.96	0.96	0.96	0.96	0.96	0.86
HR98	0.96	0.96	0.96	0.96	0.96	0.86
HR99	0.96	0.96	0.96	0.96	0.96	0.86
HR100	0.96	0.96	0.96	0.96	0.96	0.86
HR101	0.96	0.96	0.96	0.96	0.96	0.86
HR102	0.96	0.96	0.96	0.96	0.96	0.86
HR103	0.96	0.96	0.96	0.96	0.96	0.86
HR104	0.96	0.96	0.96	0.96	0.96	0.86

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR105	0.96	0.96	0.96	0.96	0.96	0.86
HR106	0.96	0.96	0.96	0.96	0.96	0.86
HR107	0.96	0.96	0.96	0.96	0.96	0.86
HR108	0.96	0.96	0.96	0.96	0.96	0.86
HR109	0.96	0.96	0.96	0.96	0.96	0.86
HR110	0.96	0.96	0.96	0.96	0.96	0.86

Appendix Table 15: West Angelas Deposit J (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR1	0.21	0.21	0.21	0.21	0.21	0.19
HR2	0.21	0.21	0.21	0.21	0.21	0.19
HR3	0.21	0.21	0.21	0.21	0.21	0.19
HR4	0.21	0.21	0.21	0.21	0.21	0.19
HR5	0.21	0.21	0.21	0.21	0.21	0.19
HR6	0.21	0.21	0.21	0.21	0.21	0.19
HR7	0.21	0.21	0.21	0.21	0.21	0.19
HR8	0.21	0.21	0.21	0.21	0.21	0.19
HR9	0.03	0.03	0.03	0.03	0.03	0.02
HR10	0.03	0.03	0.03	0.03	0.03	0.02
HR11	0.03	0.03	0.03	0.03	0.03	0.02
HR12	0.03	0.03	0.03	0.03	0.03	0.02
HR13	0.03	0.03	0.03	0.03	0.03	0.02
HR14	0.03	0.03	0.03	0.03	0.03	0.02
HR15	0.08	0.08	0.08	0.08	0.08	0.06
HR16	0.08	0.08	0.08	0.08	0.08	0.06
HR17	0.08	0.08	0.08	0.08	0.08	0.06
HR18	0.08	0.08	0.08	0.08	0.08	0.06
HR19	0.14	0.14	0.14	0.14	0.14	0.13
HR20	0.14	0.14	0.14	0.14	0.14	0.13
HR21	0.14	0.14	0.14	0.14	0.14	0.13
HR22	0.02	0.02	0.02	0.02	0.02	0.01
HR23	0.02	0.02	0.02	0.02	0.02	0.01
HR24	0.02	0.02	0.02	0.02	0.02	0.01
HR25	0.02	0.02	0.02	0.02	0.02	0.01
HR26	0.02	0.02	0.02	0.02	0.02	0.01
HR27	0.02	0.02	0.02	0.02	0.02	0.01
HR28	0.02	0.02	0.02	0.02	0.02	0.01
HR29	0.02	0.02	0.02	0.02	0.02	0.01
HR30	0.04	0.04	0.04	0.04	0.04	0.02
HR31	0.04	0.04	0.04	0.04	0.04	0.02
HR32	0.04	0.04	0.04	0.04	0.04	0.02
HR33	0.04	0.04	0.04	0.04	0.04	0.02
HR34	0.04	0.04	0.04	0.04	0.04	0.02
HR35	0.04	0.04	0.04	0.04	0.04	0.02
HR36	0.04	0.04	0.04	0.04	0.04	0.02
HR37	0.04	0.04	0.04	0.04	0.04	0.02
HR38	0.06	0.06	0.06	0.06	0.06	0.03
HR39	0.06	0.06	0.06	0.06	0.06	0.03
HR40	0.06	0.06	0.06	0.06	0.06	0.03

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR41	0.06	0.06	0.06	0.06	0.06	0.03
HR42	0.06	0.06	0.06	0.06	0.06	0.03
HR43	0.06	0.06	0.06	0.06	0.06	0.03
HR44	0.06	0.06	0.06	0.06	0.06	0.03
HR45	0.08	0.08	0.08	0.08	0.08	0.04
HR46	0.08	0.08	0.08	0.08	0.08	0.04
HR47	0.08	0.08	0.08	0.08	0.08	0.04
HR48	0.08	0.08	0.08	0.08	0.08	0.04
HR49	0.08	0.08	0.08	0.08	0.08	0.04

Appendix Table 16: West Angelas Mt Ella East (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR1	0.10	0.10	0.10	0.10	0.10	0.07
HR2	0.10	0.10	0.10	0.10	0.10	0.07
HR3	0.10	0.10	0.10	0.10	0.10	0.07
HR4	0.02	0.02	0.02	0.02	0.02	0.01
HR5	0.02	0.02	0.02	0.02	0.02	0.01
HR6	0.02	0.02	0.02	0.02	0.02	0.01
HR7	0.02	0.02	0.02	0.02	0.02	0.01
HR8	0.02	0.02	0.02	0.02	0.02	0.01
HR9	0.11	0.11	0.11	0.11	0.11	0.08
HR10	0.11	0.11	0.11	0.11	0.11	0.08
HR11	0.11	0.11	0.11	0.11	0.11	0.08
HR12	0.11	0.11	0.11	0.11	0.11	0.08
HR13	0.11	0.11	0.11	0.11	0.11	0.08
HR14	0.11	0.11	0.11	0.11	0.11	0.08
HR15	0.11	0.11	0.11	0.11	0.11	0.08
HR16	0.11	0.11	0.11	0.11	0.11	0.08
HR17	0.10	0.10	0.10	0.10	0.10	0.07
HR18	0.10	0.10	0.10	0.10	0.10	0.07
HR19	0.10	0.10	0.10	0.10	0.10	0.07
HR20	0.10	0.10	0.10	0.10	0.10	0.07
HR21	0.10	0.10	0.10	0.10	0.10	0.07
HR22	0.10	0.10	0.10	0.10	0.10	0.07
HR23	0.10	0.10	0.10	0.10	0.10	0.07
HR24	0.10	0.10	0.10	0.10	0.10	0.07
HR25	0.10	0.10	0.10	0.10	0.10	0.07
HR26	0.02	0.02	0.02	0.02	0.02	0.01
HR27	0.02	0.02	0.02	0.02	0.02	0.01
HR28	0.02	0.02	0.02	0.02	0.02	0.01
HR29	0.02	0.02	0.02	0.02	0.02	0.01
HR30	0.02	0.02	0.02	0.02	0.02	0.01
HR31	0.02	0.02	0.02	0.02	0.02	0.01
HR32	0.02	0.02	0.02	0.02	0.02	0.01
HR33	0.02	0.02	0.02	0.02	0.02	0.01
HR34	0.02	0.02	0.02	0.02	0.02	0.01

Appendix Table 17: West Angelas Western Hills (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR1	0.82	0.82	0.82	0.82	0.82	0.74
HR2	0.82	0.82	0.82	0.82	0.82	0.74
HR3	0.82	0.82	0.82	0.82	0.82	0.74
HR4	0.82	0.82	0.82	0.82	0.82	0.74
HR5	0.82	0.82	0.82	0.82	0.82	0.74
HR6	0.82	0.82	0.82	0.82	0.82	0.74
HR7	0.82	0.82	0.82	0.82	0.82	0.74
HR8	0.35	0.35	0.35	0.35	0.35	0.28
HR9	0.35	0.35	0.35	0.35	0.35	0.28
HR10	0.35	0.35	0.35	0.35	0.35	0.28
HR11	0.35	0.35	0.35	0.35	0.35	0.28
HR12	0.35	0.35	0.35	0.35	0.35	0.28
HR13	0.35	0.35	0.35	0.35	0.35	0.28
HR14	0.35	0.35	0.35	0.35	0.35	0.28
HR15	0.35	0.35	0.35	0.35	0.35	0.28
HR16	0.35	0.35	0.35	0.35	0.35	0.28
HR17	0.35	0.35	0.35	0.35	0.35	0.28
HR18	0.35	0.35	0.35	0.35	0.35	0.28
HR19	0.35	0.35	0.35	0.35	0.35	0.28
HR20	0.35	0.35	0.35	0.35	0.35	0.28
HR21	0.35	0.35	0.35	0.35	0.35	0.28
HR22	0.35	0.35	0.35	0.35	0.35	0.28
HR23	0.35	0.35	0.35	0.35	0.35	0.28
HR24	0.35	0.35	0.35	0.35	0.35	0.28
HR25	0.35	0.35	0.35	0.35	0.35	0.28
HR26	0.35	0.35	0.35	0.35	0.35	0.28
HR27	0.35	0.35	0.35	0.35	0.35	0.28
HR28	0.35	0.35	0.35	0.35	0.35	0.28
HR29	0.35	0.35	0.35	0.35	0.35	0.28
HR30	0.35	0.35	0.35	0.35	0.35	0.28
HR31	0.35	0.35	0.35	0.35	0.35	0.28
HR32	0.35	0.35	0.35	0.35	0.35	0.28
HR33	0.35	0.35	0.35	0.35	0.35	0.28
HR34	0.00	0.00	0.00	0.00	0.00	0.00
HR35	0.00	0.00	0.00	0.00	0.00	0.00
HR36	0.00	0.00	0.00	0.00	0.00	0.00
HR37	0.00	0.00	0.00	0.00	0.00	0.00
HR38	0.00	0.00	0.00	0.00	0.00	0.00
HR39	0.31	0.31	0.31	0.31	0.31	0.25
HR40	0.31	0.31	0.31	0.31	0.31	0.25
HR41	0.31	0.31	0.31	0.31	0.31	0.25
HR42	0.31	0.31	0.31	0.31	0.31	0.25
HR43	0.31	0.31	0.31	0.31	0.31	0.25
HR44	0.31	0.31	0.31	0.31	0.31	0.25
HR45	0.65	0.65	0.65	0.65	0.65	0.58
HR46	0.65	0.65	0.65	0.65	0.65	0.58
HR47	0.65	0.65	0.65	0.65	0.65	0.58
HR48	0.65	0.65	0.65	0.65	0.65	0.58
HR49	0.65	0.65	0.65	0.65	0.65	0.58
HR50	0.31	0.31	0.31	0.31	0.31	0.28
HR51	0.31	0.31	0.31	0.31	0.31	0.28
HR52	0.31	0.31	0.31	0.31	0.31	0.28
HR53	0.31	0.31	0.31	0.31	0.31	0.28

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR54	0.31	0.31	0.31	0.31	0.31	0.28
HR55	0.31	0.31	0.31	0.31	0.31	0.28
HR56	0.31	0.31	0.31	0.31	0.31	0.28
HR57	0.31	0.31	0.31	0.31	0.31	0.28
HR58	0.31	0.31	0.31	0.31	0.31	0.28
HR59	0.31	0.31	0.31	0.31	0.31	0.28
HR60	0.31	0.31	0.31	0.31	0.31	0.28
HR61	0.31	0.31	0.31	0.31	0.31	0.28
HR62	0.31	0.31	0.31	0.31	0.31	0.28
HR63	0.31	0.31	0.31	0.31	0.31	0.28
HR64	0.31	0.31	0.31	0.31	0.31	0.28
HR65	0.31	0.31	0.31	0.31	0.31	0.28
HR66	0.31	0.31	0.31	0.31	0.31	0.28
HR67	0.31	0.31	0.31	0.31	0.31	0.28

Appendix Table 18: West Angelas Additional (Year 2)

Source Id	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Average
HR1	0.02	0.02	0.02	0.02	0.02	0.01
HR2	0.02	0.02	0.02	0.02	0.02	0.01
HR3	0.02	0.02	0.02	0.02	0.02	0.01
HR4	0.02	0.02	0.02	0.02	0.02	0.01
HR5	0.02	0.02	0.02	0.02	0.02	0.01
HR6	0.02	0.02	0.02	0.02	0.02	0.01
HR7	0.02	0.02	0.02	0.02	0.02	0.01
HR8	0.02	0.02	0.02	0.02	0.02	0.01
HR9	0.02	0.02	0.02	0.02	0.02	0.01
HR10	0.02	0.02	0.02	0.02	0.02	0.01
HR11	0.02	0.02	0.02	0.02	0.02	0.01
HR12	0.10	0.10	0.10	0.10	0.10	0.05
HR13	0.10	0.10	0.10	0.10	0.10	0.05
HR14	0.10	0.10	0.10	0.10	0.10	0.05
HR15	0.10	0.10	0.10	0.10	0.10	0.05
HR16	0.10	0.10	0.10	0.10	0.10	0.05
HR17	0.10	0.10	0.10	0.10	0.10	0.05
HR18	0.10	0.10	0.10	0.10	0.10	0.05
HR19	0.10	0.10	0.10	0.10	0.10	0.05
HR20	0.10	0.10	0.10	0.10	0.10	0.05
HR21	0.10	0.10	0.10	0.10	0.10	0.05
HR22	0.10	0.10	0.10	0.10	0.10	0.05
HR23	0.10	0.10	0.10	0.10	0.10	0.05
HR24	0.10	0.10	0.10	0.10	0.10	0.05
HR25	0.10	0.10	0.10	0.10	0.10	0.05
HR26	0.10	0.10	0.10	0.10	0.10	0.05

Appendix D – Receptor Locations and Description

Appendix Table 19: Receptors

Number	East	North	Comment
1	667.039	7438.954	Bat Cave WA-10
2	666.980	7438.952	Bat Cave WA-11
3	664.405	7437.977	Bat Cave WA-12
4	665.302	7437.607	Bat Cave WA-13
5	665.468	7437.328	Bat Cave WA-14
6	664.512	7437.903	Bat Cave WA-14
7	665.472	7437.544	Bat Cave WA-15
8	666.739	7436.767	Bat Cave WA-16
9	666.536	7436.942	Bat Cave WA-17
10	666.777	7436.846	Bat Cave WA-18
11	666.220	7436.967	Bat Cave WA-19
12	666.150	7437.184	Bat Cave WA-20
13	667.181	7437.031	Bat Cave WA-21
14	665.954	7438.424	Bat Cave WA-22
15	666.434	7438.531	Bat Cave WA-23
16	666.429	7438.509	Bat Cave WA-24
17	666.328	7442.474	Bat Cave WA-04
18	664.994	7443.129	Bat Cave WA-07
19	665.127	7442.818	Bat Cave WA-06
20	666.433	7442.580	Bat Cave CWAN-01
21	666.230	7442.542	Bat Cave CWAN-02
22	666.302	7442.525	Bat Cave CWAN-03
23	666.327	7442.473	Bat Cave CWAN-04
24	663.302	7442.311	Bat Cave CWAN-05
25	665.126	7442.817	Bat Cave CWAN-06
26	664.994	7443.128	Bat Cave CWAN-07
27	682.668	7431.908	Bat Cave CWAN-08
28	667.007	7438.972	Bat Cave CWAN-09
29	680.598	7431.300	Bat Cave CWAN-10
30	686.759	7431.305	Bat Cave CWAN-11
31	673.616	7441.030	West Angelas Village
32	674.641	7440.250	RTIO Airport
33	691.374	7442.017	Deposit H Waterhole
34	698.292	7441.040	Turtle Pool
35	691.613	7441.967	Pebble Mouse Mounds
36	697.651	7435.280	Clay pan
37	691.967	7431.719	Mt Ella East SE Con Pit
38	690.017	7431.506	Mt Ella East S Con Pit
39	690.365	7442006	WARE14-16-RS
40	688.821	7434102	DF-SH1
41	686.234	7431313	WA-19-ETH-01
42	678.939	7429943	WA-16-61-SS
43	677.269	7431796	YINHARR-18
44	675.098	7431989	YINHARR-19
45	672.820	7433919	RR21
46	666.618	7436939	WA-16-45-ENG
47	669.060	7438572	WA-16-51-ENG

Number	East	North	Comment
48	668.661	7438183	WA-16-57-ENG
49	666.299	7442513	WAN20-012
50	683.764	7433607	YINHARR-39
51	673.862	7434684	WANETH06-2

Appendix E– Model Results

Appendix Table 20: Statistics of 24-hour TSP concentration at sensitive receptors, year 2 – excluding cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
1	Bat Cave WA-10	123	74	65	59	59	41	23	1
2	Bat Cave WA-11	123	74	65	59	59	41	23	1
3	Bat Cave WA-12	50	44	34	33	33	22	14	0
4	Bat Cave WA-13	56	45	37	32	32	23	14	0
5	Bat Cave WA-14	53	51	32	30	29	22	13	0
6	Bat Cave WA-14	50	44	34	33	33	22	14	0
7	Bat Cave WA-15	53	51	32	30	29	22	13	0
8	Bat Cave WA-16	72	48	34	30	30	22	12	0
9	Bat Cave WA-17	69	48	32	30	30	21	12	0
10	Bat Cave WA-18	72	48	34	30	30	22	12	0
11	Bat Cave WA-19	65	55	33	30	30	22	13	0
12	Bat Cave WA-20	65	55	33	30	30	22	13	0
13	Bat Cave WA-21	82	63	39	37	36	25	13	0
14	Bat Cave WA-22	90	57	51	46	46	32	18	0
15	Bat Cave WA-23	102	64	57	50	50	36	20	1
16	Bat Cave WA-24	102	64	57	50	50	36	20	1
17	Bat Cave WA-04	123	94	63	59	58	40	29	2
18	Bat Cave WA-07	76	71	46	42	42	32	24	0
19	Bat Cave WA-06	83	76	49	44	44	34	25	0
20	Bat Cave CWAN-01	110	103	55	55	55	40	29	2
21	Bat Cave CWAN-02	115	104	55	51	51	38	27	2
22	Bat Cave CWAN-03	115	104	55	51	51	38	27	2
23	Bat Cave CWAN-04	118	97	59	53	53	38	28	2
24	Bat Cave CWAN-05	87	64	48	39	38	30	22	0
25	Bat Cave CWAN-06	77	63	43	40	40	29	22	0
26	Bat Cave CWAN-07	67	54	40	36	36	25	18	0
27	Bat Cave CWAN-08	60	52	33	30	29	14	6	0
28	Bat Cave CWAN-09	132	77	70	67	67	42	26	1
29	Bat Cave CWAN-10	67	47	38	36	36	19	11	0
30	Bat Cave CWAN-11	39	25	21	19	19	9	2	0
31	West Angelas Village	102	65	60	59	59	38	23	1
32	RTIO Airport	85	73	59	55	55	39	25	0

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]

Notes:

b. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

c. The criteria used for this assessment for TSP is the Kwinana EPP Area C criteria of 90 µg/m³ (Section 4.2). Results above the assessment criteria are highlighted in orange.

Appendix Table 21: Statistics of 24-hour TSP concentration at sensitive receptors, year 2 – including cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
1	Bat Cave WA-10	136	126	80	78	78	56	32	4
2	Bat Cave WA-11	136	126	80	78	78	56	32	4
3	Bat Cave WA-12	94	63	52	50	50	38	21	1
4	Bat Cave WA-13	86	68	58	53	53	38	21	0
5	Bat Cave WA-14	74	65	56	54	53	35	20	0
6	Bat Cave WA-14	94	63	52	50	50	38	21	1
7	Bat Cave WA-15	74	65	56	54	53	35	20	0
8	Bat Cave WA-16	81	68	51	49	48	35	20	0
9	Bat Cave WA-17	78	67	51	49	49	35	20	0
10	Bat Cave WA-18	81	68	51	49	48	35	20	0
11	Bat Cave WA-19	74	68	53	51	50	35	20	0
12	Bat Cave WA-20	74	68	53	51	50	35	20	0
13	Bat Cave WA-21	92	76	59	54	54	38	21	1
14	Bat Cave WA-22	108	102	69	63	63	48	26	2
15	Bat Cave WA-23	116	115	73	69	69	51	29	2
16	Bat Cave WA-24	116	115	73	69	69	51	29	2
17	Bat Cave WA-04	135	122	77	69	67	47	35	2
18	Bat Cave WA-07	103	73	56	48	48	36	28	1
19	Bat Cave WA-06	111	82	62	55	53	40	30	1
20	Bat Cave CWAN-01	131	122	66	63	62	46	36	3
21	Bat Cave CWAN-02	132	127	65	62	61	45	35	2
22	Bat Cave CWAN-03	132	127	65	62	61	45	35	2
23	Bat Cave CWAN-04	130	125	70	65	64	46	35	2
24	Bat Cave CWAN-05	113	78	57	49	49	38	29	1
25	Bat Cave CWAN-06	104	74	58	49	48	36	27	1
26	Bat Cave CWAN-07	95	64	44	42	42	33	24	1
27	Bat Cave CWAN-08	95	72	46	44	44	29	11	1
28	Bat Cave CWAN-09	146	130	84	83	83	58	34	4
29	Bat Cave CWAN-10	85	74	44	43	43	31	16	0
30	Bat Cave CWAN-11	92	53	40	37	37	23	7	1
31	West Angelas Village	102	80	68	64	64	45	31	1
32	RTIO Airport	91	84	71	68	67	47	34	1

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The criteria used for this assessment for TSP is the Kwinana EPP Area C criteria of 90 µg/m³ (Section 4.2). Results above the assessment criteria are highlighted in orange.

Appendix Table 22: Statistics of 24-hour TSP concentration at sensitive receptors, year 10 – excluding cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
1	Bat Cave WA-10	184	173	135	132	131	81	40	24
2	Bat Cave WA-11	184	173	135	132	131	81	40	24
3	Bat Cave WA-12	113	104	90	87	86	45	22	5
4	Bat Cave WA-13	94	86	67	63	63	42	18	1
5	Bat Cave WA-14	94	69	55	53	53	34	14	1
6	Bat Cave WA-14	113	104	90	87	86	45	22	5
7	Bat Cave WA-15	94	69	55	53	53	34	14	1
8	Bat Cave WA-16	94	61	49	44	44	25	7	1
9	Bat Cave WA-17	96	60	50	45	45	24	8	1
10	Bat Cave WA-18	94	61	49	44	44	25	7	1
11	Bat Cave WA-19	104	68	56	49	49	28	11	1
12	Bat Cave WA-20	104	68	56	49	49	28	11	1
13	Bat Cave WA-21	105	80	57	54	53	29	9	1
14	Bat Cave WA-22	144	125	98	95	95	59	27	9
15	Bat Cave WA-23	158	140	113	109	108	67	31	13
16	Bat Cave WA-24	158	140	113	109	108	67	31	13
17	Bat Cave WA-04	605	434	366	340	339	223	121	159
18	Bat Cave WA-07	420	368	214	206	200	127	71	70
19	Bat Cave WA-06	430	323	246	235	233	157	81	92
20	Bat Cave CWAN-01	501	467	377	348	346	202	119	160
21	Bat Cave CWAN-02	411	403	263	237	236	165	110	147
22	Bat Cave CWAN-03	411	403	263	237	236	165	110	147
23	Bat Cave CWAN-04	520	366	261	237	237	176	119	181
24	Bat Cave CWAN-05	358	328	221	213	209	119	72	61
25	Bat Cave CWAN-06	357	263	206	180	177	123	72	74
26	Bat Cave CWAN-07	282	203	146	139	138	89	53	36
27	Bat Cave CWAN-08	30	29	22	21	21	13	7	0
28	Bat Cave CWAN-09	243	200	174	163	162	97	53	43
29	Bat Cave CWAN-10	128	122	102	88	86	54	30	7
30	Bat Cave CWAN-11	16	15	11	10	10	5	2	0
31	West Angelas Village	164	138	117	113	113	52	7	15

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
32	RTIO Airport	121	98	85	84	84	41	6	3

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The criteria used for this assessment for TSP is the Kwinana EPP Area C criteria of 90 µg/m³ (Section 4.2). Results above the assessment criteria are highlighted in orange.

Appendix Table 23: Statistics of 24-hour TSP concentration at sensitive receptors, year 10 – including cumulative sources (µg/m³)

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
1	Bat Cave WA-10	205	198	147	142	142	91	49	39
2	Bat Cave WA-11	205	198	147	142	142	91	49	39
3	Bat Cave WA-12	132	121	100	94	94	60	30	9
4	Bat Cave WA-13	104	103	82	79	79	53	25	4
5	Bat Cave WA-14	103	81	71	67	67	47	22	1
6	Bat Cave WA-14	132	121	100	94	94	60	30	9
7	Bat Cave WA-15	103	81	71	67	67	47	22	1
8	Bat Cave WA-16	103	74	56	55	54	37	17	1
9	Bat Cave WA-17	105	69	58	57	56	36	17	1
10	Bat Cave WA-18	103	74	56	55	54	37	17	1
11	Bat Cave WA-19	113	72	68	63	63	41	19	1
12	Bat Cave WA-20	113	72	68	63	63	41	19	1
13	Bat Cave WA-21	114	93	65	62	61	41	18	2
14	Bat Cave WA-22	156	152	115	105	105	69	35	16
15	Bat Cave WA-23	173	171	126	119	119	78	40	27
16	Bat Cave WA-24	173	171	126	119	119	78	40	27
17	Bat Cave WA-04	605	438	366	342	342	223	126	176
18	Bat Cave WA-07	420	368	215	209	203	128	76	76
19	Bat Cave WA-06	430	323	246	236	236	158	86	98
20	Bat Cave CWAN-01	501	471	379	348	346	205	123	177
21	Bat Cave CWAN-02	423	403	288	237	236	169	112	168
22	Bat Cave CWAN-03	424	403	288	237	236	169	112	168
23	Bat Cave CWAN-04	539	375	264	242	241	183	122	197
24	Bat Cave CWAN-05	358	355	224	220	215	124	78	82
25	Bat Cave CWAN-06	357	273	206	180	178	125	78	82
26	Bat Cave CWAN-07	282	205	147	139	139	90	56	37
27	Bat Cave CWAN-08	58	51	41	39	39	26	15	0
28	Bat Cave CWAN-09	261	222	186	172	170	104	61	53
29	Bat Cave CWAN-10	133	132	102	89	87	56	35	7
30	Bat Cave CWAN-11	16	15	11	10	10	5	2	0
31	West Angelas Village	164	144	117	114	113	56	25	15

Receptor No.	Receptor Name	Max [a]	2nd	6th	8th	95th %ile	90th %ile	70th %ile	Days >90 [b]
32	RTIO Airport	127	98	87	84	84	46	23	4

Notes:

a. Model results are presented as maximum, 2nd highest, 6th highest, and lower percentiles to provide an indication of the range of predicted ground level concentrations at each receptor. This provides an indication of whether predicted excursions are isolated events or are indicative of a potential ongoing issue.

b. The criteria used for this assessment for TSP is the Kwinana EPP Area C criteria of 90 µg/m^3 (Section 4.2). Results above the assessment criteria are highlighted in orange.

B.7: West Angelas Revised Proposal Noise and Vibration Impact Assessment

WEST ANGELAS REVISED PROPOSAL NOISE AND VIBRATION IMPACT ASSESSMENT

RIO TINTO

Rpt01-1403950-Rev2-16 June 2022

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Item	Page	Section	Comments
1	3	1.1.1	Cultural value receivers added to Table 1-1.
2	11	2.3	Noise threshold added cultural value receivers.
3	20	4.1	Table 4-3: *Modelled noise levels at cultural social receivers* added.
4	21	4.3	Table 4 4: *Distances at which vibration levels fall below assessment thresholds* and discussion added.

** Use after Rev. 0*

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EXECUTIVE SUMMARY

Rio Tinto is evaluating the potential development of ore deposits near the existing West Angelas operations, in the Pilbara region of Western Australia. This West Angelas Revised Proposal (the Revised Proposal) includes the potential development of five new deposits and associated infrastructure. Wood has been engaged by Rio Tinto to conduct a noise and vibration assessment of the construction and operation phases of the Proposal, in support of an environmental approvals application under Part IV of the *Environmental Protection Act 1986* (EP Act).

The noise and vibration sensitive receivers near the potential deposits and infrastructure include bat caves, camp sites in the Karijini National Park, cultural value locations (heritage sites and other identified places of value), and the West Angelas Village. Conservative modelling approaches were used to predict the noise, vibration and airblast levels generated at the receivers due to activities associated with the Proposal and other approved developments in the West Angelas area.

Maximum mining scenarios were modelled for years 2025, 2027, 2029 and 2034. Predicted noise levels and measured data from other studies were used to assess the potential for cumulative noise impacts due to concurrent activities in areas adjacent to the Proposal. The modelled noise levels:

- Fall below the conservative noise threshold (70 dB(A)) at all identified bat cave locations during all mining years assessed;
- Fall below the assessment thresholds at the West Angelas Village (65 dB(A)) and camping areas in Karijini National Park (35 dB(A)); and
- Are predicted to contribute to increased noise levels at the West Angelas Village, with the contribution of noise from the Revised Proposal being less significant than the contribution from other approved developments, and cumulative noise levels falling well below the most stringent noise limit applicable at the camp (65 dB(A)).

The modelled air blast levels:

- Fall below the most stringent threshold (115 dB(A) L_{Zpeak}) for a range of around 7000m from production blasts (for the expected maximum instantaneous charge of 430 kg); and
- Fall below the assessment threshold at the cultural value locations, the Mine Camp and camping areas in the Karijini National Park.

The modelled blast vibration levels:

- Fall below the threshold for cave structural integrity (25 mm/s peak particle velocity (PPV)) at a range of 620 m;
- Fall below the threshold for bat disturbance and residential dwellings (10 mm/s (PPV)) at a range of 1100 m;

- Fall below the threshold for cultural value locations (3 mm/s PPV) at a range of 2300 m; and
- Fall below the assessment thresholds at the Mine Camp and camping areas in the Karijini National Park.

Implementation of noise, airblast and blast vibration management would result in levels falling below the assessment thresholds.

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1 INTRODUCTION

1.1 Proposal Description

Rio Tinto Iron Ore is evaluating the potential development of additional iron ore deposits near the existing West Angelas operations, in the Pilbara region of Western Australia. The West Angelas Revised Proposal includes the potential development of five new deposits and associated infrastructure.

The proposal comprises drilling, blasting and conveying/hauling from the following deposits:

- Western Hill;
- Deposit F North;
- Deposit H;
- Deposit J; and
- Mount Ella East.

Activities associated with the development could result in noise and vibration impacts on sensitive land uses, structures and habitats. Operation of heavy mobile equipment and fixed plant (e.g. crushers, conveyors, screens) could result in elevated noise at sensitive receivers. Additionally, drilling and blasting activities could result in elevated noise and vibration.

The location of the proposed developments is shown in Figure 1-1 overleaf.

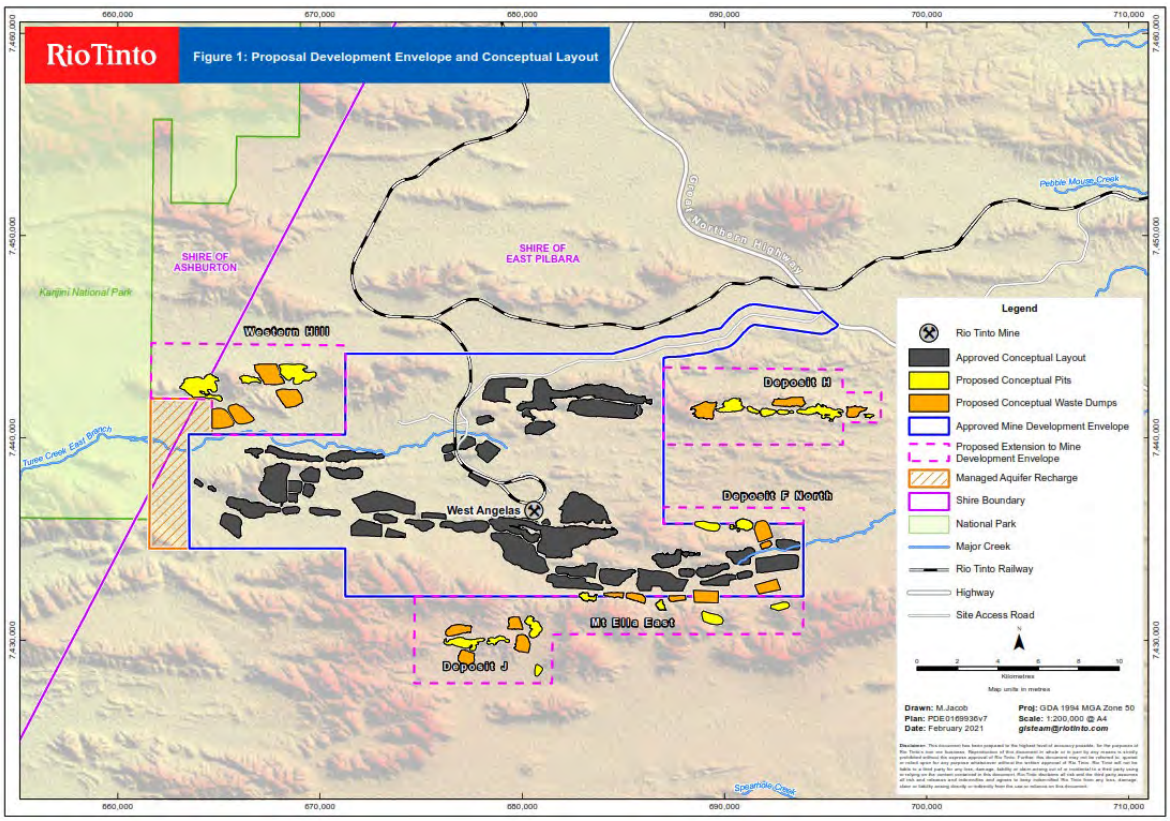


Figure 1-1 Location of proposed mining operations

1.1.1 Sensitive Receivers

The locations of identified noise or vibration sensitive receivers are shown in Table 1-1 overleaf. The receivers labelled CWAN-01 to -34 are cave systems.

The noise and vibration sensitive premises near the potential deposits and infrastructure include camp sites in the Karijini National Park and the West Angelas Village.

Additionally, it has been identified by Rio Tinto's ecology surveys that the area under consideration plays host to cave systems that could be habitats for bat species. Potential impacts caused by noise range from interruptions in feeding and resting behaviour, to complete abandonment of an area (Newport et al. 2014[1]). Constant levels of noise may also interfere with species communication, via acoustic interference (Parris and Scheider 2009[2]). Species that may

[1] Jenny Newport, David J. Shorthouse, Adrian D. Manning (2014) *The effects of light and noise from urban development on biodiversity: Implications for protected areas in Australia*, Ecological Management and Restoration

[2] Kirsten M. Parris and Angela Schneider (2009) *Impacts of Traffic Noise and Traffic Volume on Birds of Roadside Habitats* Ecology and Society

be especially at risk of disturbed communication are those that use calls to communicate or navigate.

Cultural value receivers have also been confirmed near the potential deposits and infrastructure.

Table 1-1 Locations of noise or vibration sensitive receivers

	Name	Easting	Northing
Sensitive Premises	West Angelas Mine Village	673893	7440922
	Dales Campground	659553	7514058
	Karijini Eco Retreat	630019	7523767
Sensitive Habitat	CWAN-34	682582	7431935
	CWAN-31	666114	7442306
	CWAN-29	670138	7443091
	CWAN-33	666714	7442807
	CWAN-32	666094	7442383
	CWAN-30	670357	7443399
	CWAN-28	670149	7443102
	CWAN-27	670077	7443081
	CWAN-26	664188	7442294
	CWAN_01	666434	7442502
	CWAN_02	666229	7442548
	CWAN_03	666301	7442536
	CWAN_04	666321	7442481
	CWAN_05	663297	7442315
	CWAN_06	665126	7442826
	CWAN_07	664986	7443138
	CWAN_08	682663	7431912
	CWAN_09	690499	7441062
	CWAN_10	680598	7431306
	CWAN_11	686761	7431307
	Pebble Mouse Mounds	691613	7441967

	Name	Easting	Northing
Cultural Value Locations	Deposit H Waterhole (waterhole)	691374	7442017
	Turtle Pool (waterhole)	698292	7441040
	Clay pan (landscape feature)	697651	7435280
	Mt Ella East SE Con Pit (landscape feature)	691967	7431719
	Mt Ella East S Con Pit (landscape feature)	690017	7431506
	Deposit H Waterhole (waterhole)	691374	7442017
	WARE14-16-RS (archaeological)	690365	7442006
	DF-SH1 (archaeological/ethnological)	688821	7434102
	WA-19-ETH-01 (archaeological)	686234	7431313
	WA-16-61-SS (archaeological)	678939	7429943
	YINHARR-18 (ethnological)	677269	7431796
	YINHARR-19 (ethnological)	675098	7431989
	RR21 (archaeological)	672820	7433919
	WA-16-45-ENG (archaeological)	666618	7436939
	WA-16-51-ENG (archaeological)	669060	7438572
	WA-16-57-ENG (archaeological)	668661	7438183
	WAN20-012 (archaeological)	666299	7442513
	YINHARR-39 (archaeological)	683764	7433607
	WANETH06-2 (ethnological)	673862	7434684

1.2 Approved Developments Adjacent to the Proposal

There are other approved Rio Tinto developments in the West Angelas area that will be operating at the same time as the developments included in the Proposal. The adjacent developments are:

- Deposit A;
- Deposit B;
- Deposit E;
- Deposit F;
- Deposit A-West;
- Deposit C;

- Deposit D; and
- Deposit G.

1.3 Potential Future Developments Adjacent to the Proposal

Rio Tinto is progressing a separate proposal to develop the Managed Aquifer Recharge (MAR) project to the west of the Proposal development envelope. Several diesel-driven pumping stations would operate occasionally and are the only significant noise sources associated with the MAR proposal.

1.4 Applicable Documents and Regulations

The following documents are applicable for this assessment:

- *WA Environmental Protection Act 1986*
- *WA Environmental Protection (Noise) Regulations 1997*
- *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance, Australian Government Department of Agriculture, Water and the Environment 2009*
- *Draft Guideline: Assessment of environmental noise emissions* WA Department of Water and Environmental Regulation, 2021
- Deutsches Institut fur Normung E.V. (DIN) 4150-3, 2016 Edition, December 2016 - *Vibrations in buildings - Part 3: Effects on structures*

1.5 Terms and Abbreviations

Term	Meaning
1/3 Octave bands	A 'constant percentage bandwidth' where each of the octave bands (defined below) is divided into 3 bands (i.e. each band is approximately 1/3 the 'width' of the octave bands), providing a more discreet analysis of the noises' frequency content.
dB	Decibel, a relative unit of measure for noise levels, using the threshold of human hearing as the reference point (for airborne sound pressure this is 20μPa). This scale is used to compress noise values into a numeric range that is more easily comprehensible.
dB(A)	The linear dB scale is usually modified by the A-weighting 'filter' to simulate the non-linear response of human hearing. The application of this filter is denoted by appending an 'A'; to the dB units. The unit may be presented as dB(A) or dBA.
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EPA	Environment Protection Authority

Term	Meaning
Hz	Hertz, the SI unit of frequency, meaning cycles per second.
L_{10}	The noise level that is exceeded for ten percent (10%) of the time. It is most commonly encountered in the assessment of environmental noise, as research has demonstrated that it can be proportionately linked to the level of annoyance (due to the noise) in the community
L_{A10}	The A-weighted L_{10}
L_{90}	The noise level that is exceeded for ninety percent (90%) of the time. The L_{90} is often used to define a 'background level' which is considered 'repeatable', and is used in many jurisdictions as the basis for setting environmental noise compliance limits
L_{A90}	The A-weighted L_{90}
L_{AF}	Sound pressure level with 'A-weighting', measured using the Fast response on the SLM.
L_{AS}	Sound pressure level with 'A-weighting', measured using the Slow response on the SLM.
$L_{eq,T}$	Equivalent Level - is the continuous sound level containing the same quantity of energy as the actual varying level over the same period. The 'T' component identifies the time averaging period (eg. $L_{eq,1h}$). Where the time averaging period is omitted, it is implied that the L_{eq} is representative of the long-term average of the noise source being discussed.
$L_{Z,PEAK}$	The peak sound level in decibels measured without using any frequency weighting.
MIC	Maximum Instantaneous Charge within an 8ms delay, TNT equivalent in kilograms.
Octave Band	A 'constant percentage bandwidth' where each successive band centre frequency is double the previous one. International standards define nominal centre frequencies of 16 Hz, 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz, and 16kHz. Each octave band has a bandwidth which is proportional to the frequency so that there are no gaps or overlaps between bands. A separate noise level can be measured for each band, allowing definition of the frequency content of the noise.
Pa	Pascal, the SI unit for pressure.
Plant	Industrial processing infrastructure used to mine, transport, crush and load iron ore.
PPV	Peak Particle Velocity in millimetres per second. A measure of the magnitude of ground vibration.
SLM	Sound Level Meter
Sound Power	Describes the rate of sound energy output of a source. Under fixed operating conditions the sound power of a source is fixed, and it is independent of the environment in which it is operating. Sound power is often used to describe the noise emission of a machine and allows comparison of the 'source strength' of machines. Sound Power Levels can be calculated from measured sound pressure or

Term	Meaning
	sound intensity values. Sound power levels are usually denoted by L_W and the reference value for Sound Power Level in dB is 10^{-12} Watts.
SWL	Refer Sound Power
Tonality	A qualitative term used to identify when a noticeable tone or series of tones are detectable. In environmental noise this can be used to can be used describe noise that may be more annoying (due to its frequency content), than other noise of a similar overall level – when it is so used, the appropriate authority will usually define a quantitative means for determining when a noise demonstrates 'tonality'.
'Worst case' weather conditions	Refers to the "default meteorological conditions" as suggested by the *Draft Guideline on Environmental Noise for Prescribed Premises, Department of Environment Regulation, May 2016*, and incorporating worst-case (source to receiver) wind directions.

2 ASSESSMENT THRESHOLDS

The regulatory noise limits referred to as the 'Assigned Levels', that apply to the proposal are shown in Table 2-1 and are based on the *Environmental Protection (Noise) Regulations 1997*.

Additional noise thresholds for sensitive receiving locations that are not covered by the Regulations are shown in Table 2-3 and Table 2-2. The additional criteria are drawn from published literature on the impacts of noise and vibration on bat species.

The vibration thresholds adopted for this study in terms of peak particle velocity (PPV) are shown in Table 2-4. The thresholds are drawn from published literature on the impacts on ground vibration on bat species and from Australian and German standards.

Table 2-1 Assigned Levels

Location/Area	Assigned Levels	Reference
Outdoor Noise at Residential Receivers	L_{AS10} 35 dB	Environmental Protection (Noise) Regulations 1997
Noise sensitive premises: any area other than highly sensitive area	L_{AS10} 60 dB	Environmental Protection (Noise) Regulations 1997
Outdoor noise at camps and villages that form part of an industrial premises	L_{AS10} 65 dB	Environmental Protection (Noise) Regulations 1997

Table 2-2 Air Blast Levels

Location/Area	Air Blast Level	Reference
Outdoor Noise at Sensitive Premises	$L_{Z,PEAK}$ 115 dB (Blasting Only)	Department of Environmental Regulation Regulation 11 – Blasting Operations limits

Table 2-3 Additional Noise Thresholds

Location/Area	Noise Limit	Reference
Noise at sensitive habitat (e.g. at the entrance of a cave system / adit)	L_{Aeq} 70 dB	DEWHA (2009) Matters of National Environmental Significance Significant Impact Guidelines. Bullen and Creese (2014)[3].

Table 2-4 Vibration Limits

Nature of Structure	Vibration Limit, PPV (mm/s)
Non-Residential	30
Residential	10
Sensitive habitat (e.g. at the entrance of a cave system containing significant habitat)	10
Fragile	3

2.1 Sensitive Premises

The 65 dB(A) Assigned Level derived from the Noise Regulations applies to residences (camps or villages) that form part of an industrial premises, during all hours of the day, for noise levels that occur for more than 10% of the time.

The following noise sources are excluded from the Noise Regulations:

- rail noise;
- noise from traffic on public roads;
- aircraft noise; and
- noise from safety warning devices fitted to earth moving equipment.

The ground vibration limits used in this assessment for sensitive premises were derived from German Standard DIN 4150-3.

DIN 4150-3 specifies vibration limits as frequency-dependent Peak Particle Velocity (PPV) limit curves, that become progressively less stringent as frequency increases. The non-residential limit

[3] Bullen, R.D. and Creese, S. 2014 A *Note on the Impact on Pilbara Leaf-Nosed and Ghost Bat Activity from Cave Sound and Vibration Levels during Drilling Operations*, The Western Australian Naturalist Vol 29 No. 3

shown in Table 2-4 is the mid-point of the curves that apply in the frequency range where vibration energy from blasting is typically concentrated (~10Hz to ~50Hz).

2.2 Sensitive Habitat

There are no regulations applicable in Western Australia that specify noise or vibration limits for the habitat of protected fauna. However, the *Australian Department of Agriculture, Water and Environment 'Significant Impact Guidelines - Matters of National Environmental Significance (2009)'* specifies that activities should not 'disrupt the breeding cycle of an important population'. This could occur if bat roosts were exposed to noise or vibration that disrupted bat behaviour. A review of the literature did not identify potential for airblast to disrupt bat activity.

Bullen and Creese (2014) observed that sound levels up to 70 dB(A) generated at the entrance of a category 2 cave by nearby drilling operations did not cause Ghost Bats to flush from the cave. Therefore, a noise threshold of 70 dB(A) at a cave entrance was adopted for bat roosts.

Rio Tinto undertook a trial to document the behavioural response of the Pilbara Leaf-nosed bat to blasting and vibration disturbance in 2013[4]. The trial involved the use of explosive charges of incrementally increasing intensity and proximity to an adit / cave system and related these to the behavioural responses of the resident bats during daylight hours. The trial adopted a nominal threshold vibration of 10 mm/s PPV, based on available standards for humans and limited data in the literature in relation to bat colonies.

The adopted threshold vibration of 10 mm/s PPV was exceeded at the roost by one of six trial blasts, conducted at 134 m, which produced vibration of 12.2 and 18.7 mm/s PPV at the nearest two monitoring sites. Very little evidence of any disturbance behaviour was detected associated with the trial blasts. Only three of the 51 calls recorded were concurrent with blast timing and on each occasion, calls were detected from only a single individual (a population of approximately 430 individuals was estimated to be present in the roost). The great majority of the colony was not disturbed even by the strongest and closest blast. There was no evidence that blasting significantly disturbed the colony, i.e. there was no blast that resulted in most, or all, bats taking flight within the cavern as a result of the blast.

Based on the results of the blasting trial, the adopted threshold vibration of 10 mm/s PPV was determined to be appropriate because of the lack of behavioural response of the bats to vibrations levels of 12.2 and 18.7 mms PPV at the two monitoring sites closest to the cavern.

2.3 Locations with Cultural Value

The ground vibration limit for locations with cultural value were derived from German Standard DIN 4150-3[5]. DIN 4150-3 was used because it specifies a vibration limit for structures that are

[4] Rio Tinto 2013d. *Blasting adjacent to the Koodaideri bat adit: Results and recommendation from seismic field trials*.

[5] Deutsches Institut fur Normung E.V. (DIN) 4150-3, 2016 Edition, December 2016 - *Vibrations in buildings - Part 3: Effects on structures*

particularly sensitive to vibration and of 'great intrinsic value'. Australian standards do not specify an equivalent limit.

DIN 4150-3 specifies vibration limits as frequency-dependent Peak Particle Velocity (PPV) limit curves, that become progressively less stringent as frequency increases. The limit for locations with cultural value, 3 mm/s PPV, was taken from the lowest point of the curve.

The noise limit for 'Noise sensitive premises: any area other than highly sensitive area' of L_{AS10} 60 dB from the Environmental Protection (Noise) Regulations 1997 is applied to locations with cultural value.

3 METHODOLOGY

3.1 Noise Model

A numerical computer model has been developed using SoundPlan version 8.2. This program calculates sound pressure levels at nominated receiver locations or produces noise contours over a defined area of interest around the noise sources. SoundPlan can be used to model different types of noise, such as industrial noise, traffic noise and aircraft noise, and it is recognised internationally including in Australia. The inputs required in SoundPlan are noise source data, ground topographical data, meteorological data and receiver locations.

The noise model has been used to generate noise contours for the area surrounding the deposits and infrastructure included in the Proposal and predict noise levels at the noise sensitive locations.

The noise model does not include noise emissions from any source other than the proposed plant operations. Therefore, noise emissions from other neighbouring industrial sources, road traffic, aircraft noise, animals, domestic sources, etc are excluded from the modelling.

3.1.1 Algorithm

The CONCAWE algorithm[6] for industrial noise simulation has been used to predict the sound levels at each of the noise sensitive receivers. The algorithm has been approved by the Department of Water and Environmental Regulation (DWER).

3.1.2 Topography

The elevation data for the area was provided by Rio Tinto. The topographical data was also modified for pits and the surrounding dumps. The original topographical model was modified to incorporate these additional contours.

3.1.3 Ground Absorption

A ground type corresponding to 'compacted dense ground' was selected in the model. Note that this is a 'conservative' estimate, because areas of softer ground will result in lower predicted noise levels.

[6] C.J. Manning, (1981) *The propagation of noise from petroleum and petrochemical complexes to neighbouring communities*, CONCAWE Report no. 4/81

3.1.4 Source Sound Power Level

The sound power levels of the noise sources in the model were based on previously measured data from Pilbara iron ore mining operations.

For the purposes of this assessment it has been assumed that all items of plant are operational 24 hours per day, 7 days a week. A full list of these sound power sources, and their associated levels are shown in APPENDIX A.

3.1.5 Meteorological Conditions

SoundPlan calculates predicted noise levels for defined meteorological conditions. The following variables are included in the prediction algorithms and will affect the predicted noise level: temperature; Pasquill stability (temperature inversion); relative humidity; wind speed; and wind direction.

The "default meteorological conditions" as suggested by the *Draft Guideline on Environmental Noise for Prescribed Premises, Department of Environment Regulation, May 2021* have been used to determine the 'worst-case' overall predicted noise levels at each selected noise sensitive receiving location as shown in **Table 3-1**.

Table 3-1 : Noise Model Meteorological Inputs for 'Worst-Case' Predictions

Time of Day	Temperature	Pasquill Stability	Wind speed	Wind Direction	Relative Humidity
Day and Evening	20 ºC	Pasquill Stability E	4 m/s	Worst-case (source to receiver)	50%
Night	15 ºC	Pasquill Stability F	3 m/s	Worst-case (source to receiver)	50%

3.2 Blast Vibration Model

The peak particle velocity (PPV in mm/s) due to blasting was modelled using the formula in *Australian Standard AS 2187.2-2006 (J7.3(1))* shown below:

$$V = k\left(\frac{R}{\sqrt{Q}}\right)^{-a}$$

Where:

R = distance from the charge to the point of interest (m)

Q = maximum instantaneous charge mass (kg)

k = site constant

a = propagation constant

The variable 'k' is dependent on the rock or ground type. A value of 1140, which typically used for conservative estimates of blast vibration level in Australia, was adopted for this study.

The variable 'e' is dependent on the dominant wave type that develops in the ground, which may be shear, compression or Rayleigh (elliptical) types. The dominant wave type depends on the ground structure and can't be reliably predicted in advance. Therefore, a conservative[7] value of 1.6 was assumed.

3.3 Airblast Model

Airblast overpressure levels due to burden-controlled blasts were predicted using a model of the form shown below[8]. Burden controlled blasts were modelled because levels in front of the face are higher than those for stemming controlled blast types, being 6 to 10 dB higher[13].

$$D_{115} = \left(\frac{k_b d}{B}\right)^{2.5} m^{1/3}$$

Where

D_{115} = Distance to the 115 dB airblast contour level (m)

d = hole diameter (mm)

B = Burden (mm)

m = charge mass per hole (kg)

k_b = site constant

In the absence of site-specific data, a conservative value of 250 was used for site constant k_b[15]. A charge mass (m) per delay of 430 kg, representative of a production blast, has been assumed based on advice provided by Rio Tinto[9].

3.4 Operational Scenarios Modelled

The operational scenarios modelled are described in Table 3-2 below. The scenarios represent likely worst-case noise impacts during the life of the mining areas, when the highest intensity

[7] A. Richards, A. Moore *Blast Vibration Course* P13, Terrock Consulting Engineers

[8] A. B. Richards (2013) *Predictive modelling of airblast overpressure*, Mining Technology, 122:4, 215-220

[9] Rio Tinto personal comms by email November 2020

activities are closest to sensitive receivers. The following data, assumptions and estimates were employed in modelling of the activities:

- All activities within a deposit were assumed to occur at surface in the pits and dumps closest to the noise sensitive receivers.
- Excavator and loader equipment quantities, makes and models were taken directly from a mine plan for the Proposal.
- Haul truck makes and models were also taken from the mine plan; however, quantities were estimated from haul truck hours, based on an assumed 80% utilisation factor.
- One scraper was allocated to each active haul road and one dozer was allocated to each active dump. Equipment makes and models were assumed, based on typical equipment fleet in Pilbara iron ore mines.
- One blasting drill rig was allocated per active pit.

Table 3-2 : Maximum operational scenarios modelled

Scenario	Approval	Deposit	Equipment
1	Other Approved	-	West Angelas fixed plant
		A West	2x Komatsu 930AHS Haul Truck; 1x Komatsu LT2350 Loader; Drill rig.
		C	2x Komatsu 930AHS Haul Truck; 1x Komatsu LT2350 Loader; Drill rig.
		D	16x Komatsu 930AHS Haul Truck; 6x Hitachi 5600EX Excavator; 3x CAT D10T Dozer; 3x CAT 631D Scraper; Drill rig.
		G	4x Komatsu 930AHS Haul Truck; 1x Hitachi 3600EX Excavator; Drill rig.
	This Proposal	Western Hill	7x Komatsu 930AHS Haul Truck; 2x Hitachi 3600EX Excavator; 1x CAT D10T Dozer; 2x CAT 631D Scraper; Drill rig.
		H	9x Komatsu 930AHS Haul Truck; 3x Hitachi 5600EX Excavator; 2x CAT D10 Dozer; 1x CAT WA1200 Loader; 1x CAT 631D Scraper; Drill rig.
2	Other Approved	-	West Angelas fixed plant
		A West	9x Komatsu 930AHS Haul Truck; 1x Hitachi 3600EX Excavator; 1x CAT D10T Dozer; 1x CAT 631D Scraper; Drill rig.
		C	5x Komatsu 930AHS Haul Truck; 1x Hitachi 5600EX Excavator; 1x CAT D10 Dozer; 1x CAT 631D Scraper; Drill rig.
		D	6x Komatsu 930AHS Haul Truck; 1x Hitachi 5600EX Excavator; 1x CAT D10 Dozer; 1x CAT 631D Scraper; Drill rig.
		G	2x Komatsu 930AHS Haul Truck; 1x CAT WA1200 Loader; Drill rig.
	This Proposal	Western Hill	3x Komatsu 930AHS Haul Truck; 1x Komatsu LT2350 Loader.1x CAT D10T Dozer; 1x CAT 631D Scraper; Drill rig.
		H	4x Komatsu 930AHS Haul Truck; 1x CAT D10T Dozer; 1x CAT WA1200 Loader; Drill rig.
		Deposit J	3x Komatsu 930AHS Haul Trucks; 1x CAT D10T Dozer; 1x CAT 631D Scraper; 1x CAT WA1200 Loader; Drill rig.
		Mt Ella East	4x Komatsu 930AHS Haul Truck; 1x CAT D10T Dozer; 1x CAT WA1200 Loader; Drill rig.
3	Other Approved	-	West Angelas fixed plant
		A West	5x Komatsu 930AHS Haul Truck; 1x Hitachi 3600EX Excavator; Drill rig.
		E	4x Komatsu 930AHS Haul Truck; 1x Hitachi 3600EX Excavator. Drill rig.
	This Proposal	Western Hill	4x Komatsu 960AHS Haul Truck; 2x Hitachi 5600EX Excavator; 2x CAT D10T Dozer; 1x CAT 631D Scraper; 1x CAT WA1200 Loader; Drill rig.
		Deposit J	8x Komatsu 930AHS Haul Truck; 2x Hitachi 5600EX Excavator; 3x CAT D10T Dozer; 1x CAT 631D Scraper; 1x CAT WA1200 Loader; Drill rig.
		Deposit F North	3x Komatsu 930AHS Haul Truck; 1x Hitachi 5600EX Excavator; 1x CAT 631D Scraper; 1x CAT WA1200 Loader; Drill rig.

Scenario	Approval	Deposit	Equipment
4	Other Approved	-	West Angelas fixed plant
		E	4x Komatsu 960AHS Haul Truck; 2x Hitachi 3600EX Excavator; 1x CAT D10T Dozer; 1x CAT 631D Scraper; 1x CAT WA1200 Loader; Drill rig.
	This Proposal	Western Hill	13x Komatsu 930AHS Haul Truck; 5x Hitachi 5600EX Excavator; 4x CAT D10 Dozer; 1x CAT 631D Scraper; 2x CAT WA1200 Loader; Drill rig.
		Deposit J	4x Komatsu 930AHS Haul Truck; 1x CAT 631D Scraper; 1x 5600EX Excavator; 1x CAT D10T Dozer; 1x CAT WA1200 Loader; Drill rig.
		Mt Ella East	1x Komatsu 930AHS Haul Truck; 1x 5600EX Excavator; 1x CAT WA1200 Loader; Drill rig.

4 RESULTS AND DISCUSSION

4.1 Noise from Mining Operations

The predicted noise levels due to the Proposal in isolation (iso.) and due to the cumulative impact of the Proposal and the approved developments (cum.[10]), are shown in Table 4-1 and Table 4-2 below. The predicted noise levels:

- Fall well below the most stringent noise limit at the West Angelas Village (65 dB(A)) in all years;
- Would result in higher noise levels at the West Angelas Village, with the contribution of noise from other approved developments being more significant. Noise measurements undertaken at the West Angelas Village in 2019 showed that noise levels ranged from L_{10} 36 dB(A) during the daytime to L_{10} 32 dB(A) during the night time. The predicted cumulative noise level exceeds the measured night time noise level by up to 8.3 dB, whereas noise due to the Proposal in isolation exceeds the measured night time noise level by up to 3.3 dB.

  The 2019 noise level study found that mining noise was not audible at the West Angelas Village. The predicted increased mining noise levels could be audible at the Village during times when local noise sources (e.g. bathroom extract fans, wastewater treatment plant) are quiet.
- Fall below the threshold for sensitive habitat (70 dB(A)) at all identified bat caves during all mining years assessed.

Table 4-1: Modelled noise levels at West Angelas Village

Location	Modelled Noise Level, dB(A) [Assigned level, L_{AS10} 65 dB]							
	Scenario 1		2		3		4	
	Iso.	Cum.	Iso.	Cum.	Iso.	Cum.	Iso.	Cum.
West Angelas Village	35.3	40.3	26.3	38.7	24.6	32.8	32.1	32.8

[10] Noise due to operation of the MAR was excluded from the prediction of cumulative noise at the West Angelas Village due to the significant separation distance (>10km).

Table 4-2: Modelled noise levels at sensitive habitat

Name	Significance	Nearest Deposit	Modelled Noise Level, dB(A) [Threshold noise level, 70 dB(A)]							
			Scenario 1		2		3		4	
			Iso.	Cum.	Iso.	Cum.	Iso.	Cum.	Iso.	Cum.
CWAN_01	Potential Day Roost	W. Hill	50.8	50.9	47.6	47.7	36.5	36.6	48.5	48.5
CWAN_02	Potential Day Roost	W. Hill	40.1	40.9	36.6	38.6	30.3	30.4	45.1	45.1
CWAN_03	Potential Day Roost	W. Hill	47.9	48.0	41.2	41.9	45.5	45.5	49.6	49.6
CWAN_04	Confirmed GB maternity roost	W. Hill	47.8	47.9	47.7	47.9	35.4	35.4	45.6	45.6
CWAN_05	Potential Day Roost	W. Hill	54.9	54.9	54.8	54.9	54.8	54.8	36.7	36.7
CWAN_06	Potential GB maternity roost	W. Hill	31.3	31.4	32.2	32.2	50.6	50.6	51.9	51.9
CWAN_07	Potential Ghost Bat maternity roost	W. Hill	26.7	26.9	26.8	26.9	30.9	30.9	37.0	37.0
CWAN_08	Night Roost	Mt Ella East	13.3	34.1	42.6	43.2	27.4	46.0	28.2	48.0
CWAN_09	Night Roost	Deposit H	58.9	58.9	57.8	57.8	29.9	30.2	15.0	19.2
CWAN_10	Potential Day Roost	Deposit J	<0	15.5	30.4	30.6	38.0	38.1	40.2	40.3
CWAN_11	GB night roost	Mt Ella East	9.7	25.2	42.8	42.9	13.6	29.4	47.9	48.2
CWAN-28	Night Roost	W. Hill	38.9	38.9	13.4	18.4	31.3	31.3	48.5	48.5
CWAN-29	Potential Day Roost	W. Hill	38.8	38.9	13.5	18.5	31.1	31.1	48.5	48.5
CWAN-31	Potential Day Roost	W. Hill	51.5	51.5	49.0	49.0	28.5	28.6	38.5	38.5
CWAN-32	Night Roost	W. Hill	52.8	52.9	48.4	48.4	29.1	29.2	38.8	38.8
CWAN-33	Night Roost	W. Hill	46.8	47.1	44.7	45.2	45.9	45.9	69.1	69.1
CWAN-34	Night Roost	Mt Ella East	13.0	22.6	42.1	42.1	26.4	30.6	28.3	43.6
Pebble Mouse Mounds	Habitat	Deposit H	37.8	37.8	32.0	32.0	6.6	7.3	<0	0.8

Table 4-3: Modelled noise levels at cultural value receivers

Location	Modelled Noise Level, dB(A) [Assigned level, L_{AS10} 60 dB]							
	Scenario 1		2		3		4	
	Iso.	Cum.	Iso.	Cum.	Iso.	Cum.	Iso.	Cum.
Deposit H Waterhole	35.9	35.9	30.9	30.9	6.7	30.9	0.4	30.9
DF-SH1	10.0	23.2	26.7	28.3	23.8	28.3	31.5	28.3
Mt Ella East S Con Pit	10.3	22.0	38.3	38.4	23.7	38.4	38.5	38.4
Mt Ella East SE Con Pit	19.6	21.9	29	29.3	28.3	29.3	29.5	29.3
RR21	22.4	39.0	14.7	45.6	15.1	45.6	22.5	45.6
Turtle Pool	17.9	18.0	12.4	12.7	5.9	12.7	3.2	12.7
WA-16-45-ENG	16.8	61.6	15.1	59.3	14.5	59.3	18.3	59.3
WA-16-57-ENG	28.3	57.8	27.1	54.9	18.1	54.9	28.5	54.9
WA-16-61-SS	0.7	27.6	39.2	39.5	50.0	39.5	40.2	39.5
WA-19-ETH-01	17.5	25.6	44.9	44.9	22.4	44.9	53.2	44.9
WAN20-012	49.3	49.3	39.9	39.9	27.3	39.9	45.4	39.9
WANETH06-2	22.8	49.3	20.0	50.7	24.3	50.7	32.7	50.7
WARE14-16-RS	57.8	57.8	58.5	58.5	26.8	58.5	15.4	58.5
YINHARR-18	6.6	22.3	40.3	40.4	47.8	40.4	48.3	40.4
YINHARR-19	17.7	33.9	26.8	33.9	30.6	33.9	28.5	33.9
YINHARR-39	1.7	19.8	47.5	47.5	27.4	47.5	58.6	47.5

Noise contours for the activities associated with the West Angelas Revised Proposal only are shown in **Appendix C**.

4.2 Airblast

The range at which the predicted airblast level falls below the assessment limit (refer Table 2-4) is:

- 115 dB L_{ZPeak}: 2,670 m

The West Angelas Village is beyond these ranges from the deposits included in the Proposal. The closest deposit, Western Hill, is approximately 3,300 m from the Village.

4.3 Vibration from Blasting

Throughout the Proposal development and operation, the blasting required will vary depending on the purpose (production) and location (grade/contour). Rio Tinto undertake prediction of vibration from the scheduled blasts as part of the planning process, which incorporates consideration of sensitive locations in the vicinity.

The ranges at which the predicted ground vibration level due to blasting falls below the assessment limits (refer Table 2-3) for a blast with a MIC of 4,500 kg, which is representative of a production blast, are:

- Cultural value receivers (3 mm/s PPV): 2,300 m
- Residential buildings, bat disturbance (10 mm/s PPV): 1100 m; and
- Cave structural integrity (25 mm/s PPV): 620 m.

Cultural value and sensitive habitat receivers have been identified within range of several hundred meters of deposits included within the Proposal. As a result, modified blasting practices, including use of lower than usual charge mass per delay, would be required close to these locations. The distances at which the vibration limits would be exceeded for MIC ranging from 100 kg to 5,500 kg are presented in Table 4-4 below.

Table 4-4: Distances at which vibration levels fall below assessment thresholds

Charge Mass (kg within 8ms delay)	Minimum Distance (m)		
	Cultural Value Locations (3mm/s PPV)	Bat Disturbance (10mm/s PPV)	Cave Structural Integrity (25mm/s PPV)
100	349	165	93
200	494	233	131
500	781	368	207
1,000	1,120	520	293
2,000	1,560	736	415
4,000	2,200	1,041	587
5,500	2,600	1,220	688

5 CONCLUSION

The results of the noise modelling undertaken indicate that cumulative noise levels generated by current/approved deposits and activities associated with the West Angelas Revised Proposal are predicted to fall below the Assigned Levels and thus meet the Noise Regulations (1997). Noise due to the Revised Proposal is predicted to contribute to increased noise at the West Angelas Village, however the contribution is less significant than that from other approved developments. The predicted cumulative noise levels also fall below the assigned level (65 dB(A)).

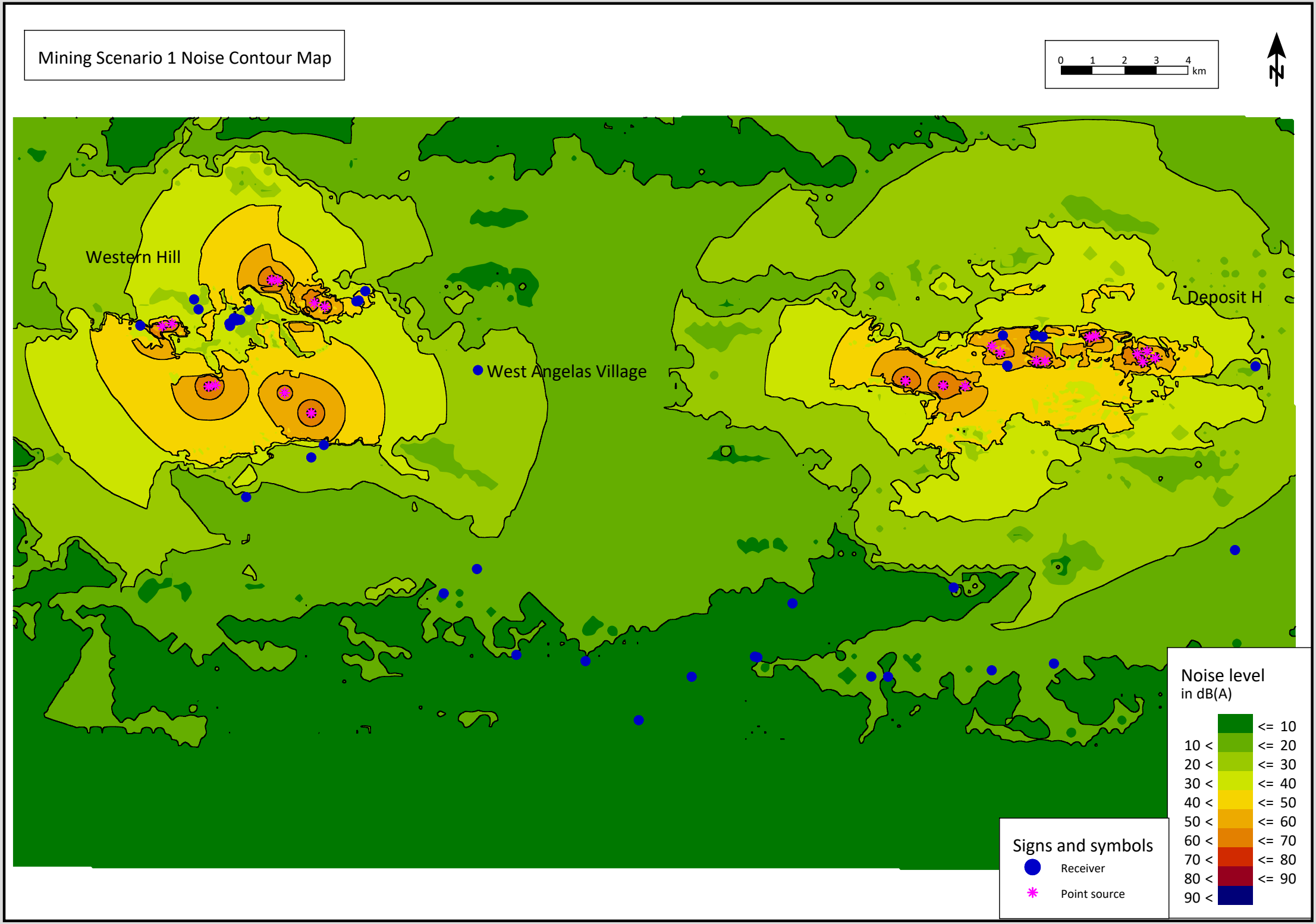
The results also indicate that noise levels would fall below the conservative threshold (70 dB(A)) at all identified bat cave entrances, and below the conservative threshold (60 dB(A)) for receivers with cultural value, during all mining years assessed.

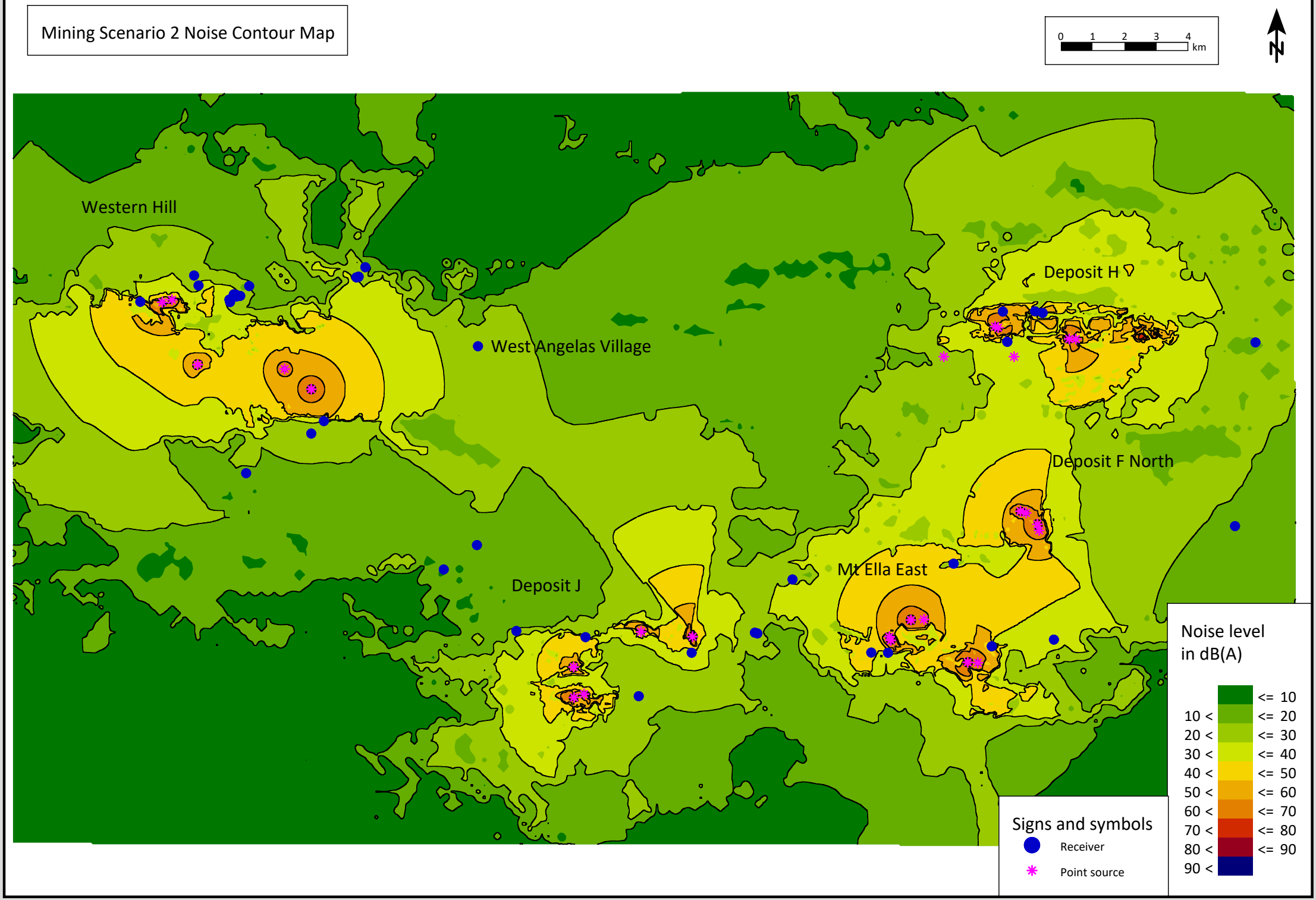
Vibration due to blasting could exceed the conservative threshold (10 mm/s PPV) for blasts undertaken within 1100 m of a significant cave system or exceed the conservative threshold (3 mm/s PPV) for blasts undertaken within 2,300 m of a site with cultural value. Implementation of appropriate vibration management for blasting would result in vibration falling below the assessment thresholds.

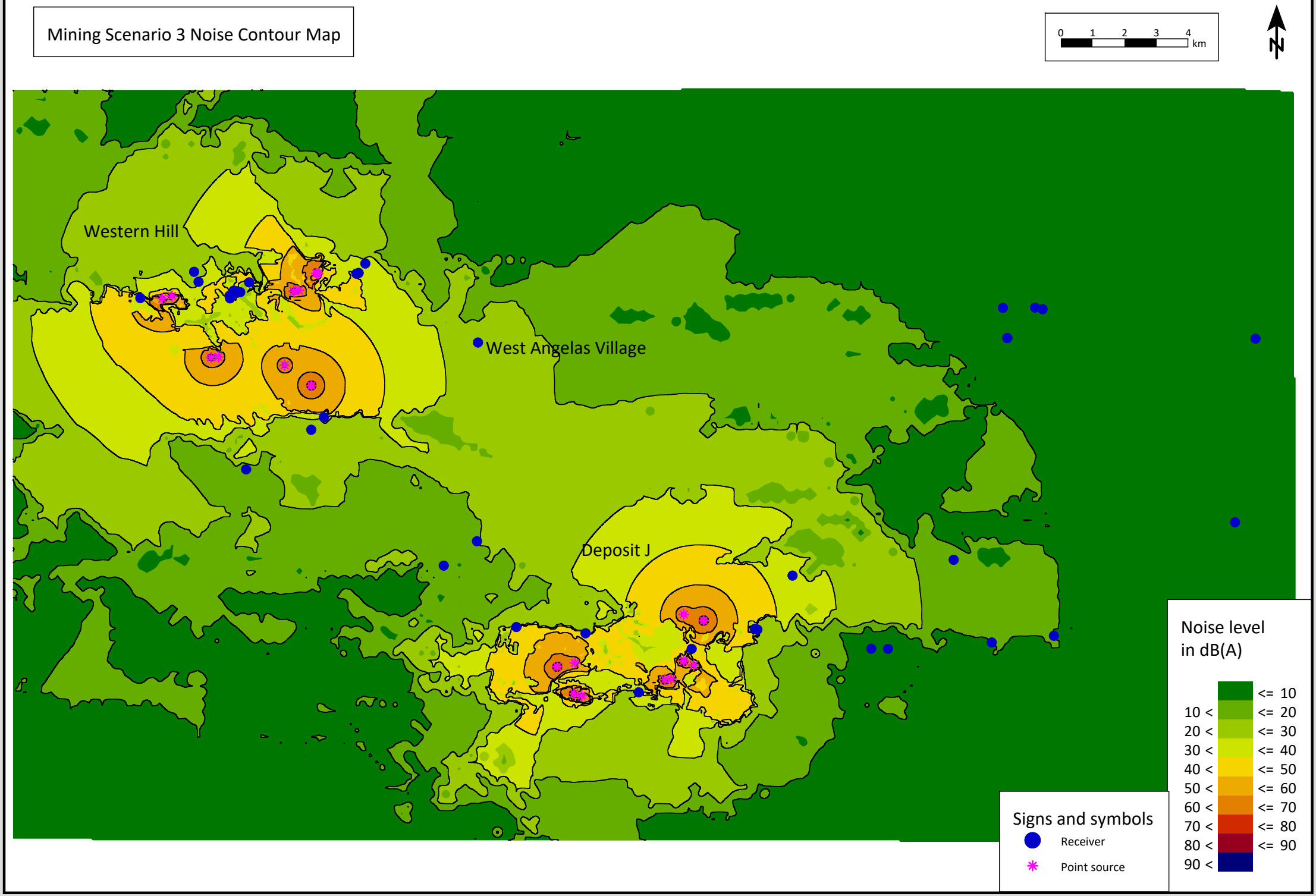
APPENDIX A NOISE SOURCES

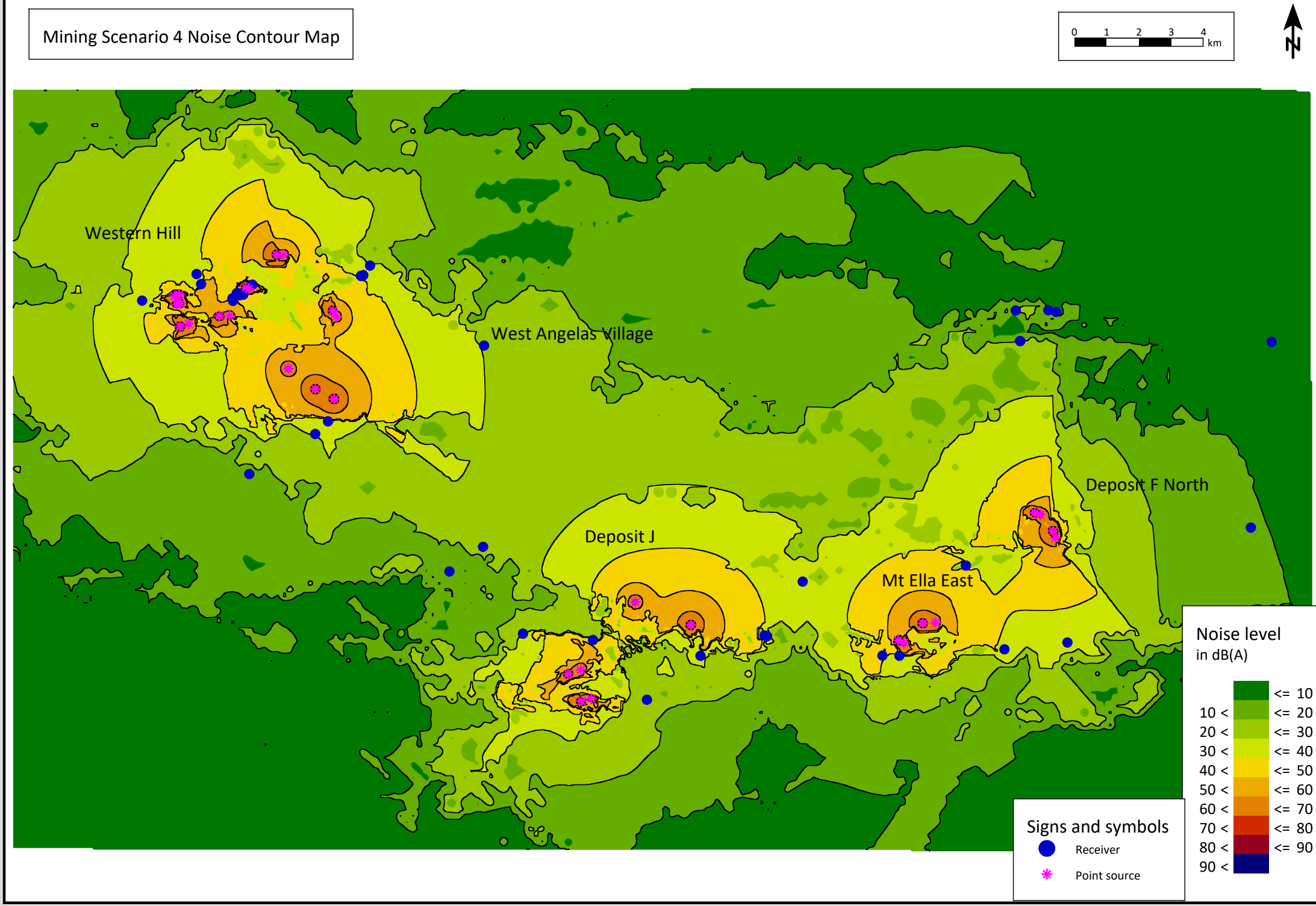
Equipment	Octave Band Sound Power Levels in dB									Overall level dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
CAT D10T Dozer	118	108	115	114	113	108	104	98	90	113.7
Excavator EX3600	109	108	118	117	114	111	109	101	93	116.5
Komatsu 930E Haul truck	112	122	122	123	122	117	115	106	96	123
Komatsu 960E Dump truck	112	122	122	123	122	117	115	106	96	123
CAT 631D Scraper	111	108	118	115	113	112	111	100	92	116.7
Komatsu WA1200 Loader	107	112	123	118	116	114	111	106	98	119
Komatsu LT2350 Loader	108	113	124	119	117	115	112	107	99	120
Excavator EX5600	119	118	114	117	120	117	113	102	97	121.1
Fixed Plant Total	**125**	**126**	**127**	**125**	**125**	**123**	**119**	**115**	**106**	**127.4**
Primary Crusher	122	113	116	111	110	108	102	107	98	113.6
Scalping & Screening Plant	116	115	113	112	111	112	113	108	94	117.5
Secondary Crushing Plant	114	109	114	114	115	116	111	107	99	119.4
Plant conveyors & stockyard conveyors (per m)	87	93	95	93	92	90	84	79	72	95.0

APPENDIX B NOISE LEVEL CONTOUR MAPS


Mining Scenario 1 Noise Contour Map
0 1 2 3 4 km
N
Western Hill
West Angelas Village
Deposit H
Noise level
in dB(A)
<= 10
10 < <= 20
20 < <= 30
30 < <= 40
40 < <= 50
50 < <= 60
60 < <= 70
70 < <= 80
80 < <= 90
90 <
Signs and symbols
Receiver
Point source


Mining Scenario 2 Noise Contour Map
0 1 2 3 4 km
N
Western Hill
West Angelas Village
Deposit H
Deposit F North
Mt Ella East
Deposit J
Noise level in dB(A)
<= 10
10 < <= 20
20 < <= 30
30 < <= 40
40 < <= 50
50 < <= 60
60 < <= 70
70 < <= 80
80 < <= 90
90 <
Signs and symbols
Receiver
Point source


Mining Scenario 3 Noise Contour Map
0 1 2 3 4 km
N
Western Hill
West Angelas Village
Deposit J
Noise level in dB(A)
<= 10
10 < <= 20
20 < <= 30
30 < <= 40
40 < <= 50
50 < <= 60
60 < <= 70
70 < <= 80
80 < <= 90
90 <
Signs and symbols
Receiver
Point source


Mining Scenario 4 Noise Contour Map
0 1 2 3 4 km
N
Western Hill
West Angelas Village
Deposit J
Mt Ella East
Deposit F North
Noise level
in dB(A)
<= 10
10 < <= 20
20 < <= 30
30 < <= 40
40 < <= 50
50 < <= 60
60 < <= 70
70 < <= 80
80 < <= 90
90 <
Signs and symbols
Receiver
Point source