Mesa H
Desktop Mesa Façade Assessment
October 2017

Prepared for
Robe River Mining Co. Pty Ltd

astron

Report Reference: 14289-17-BISR-1Rev0_180209

This page has been left blank intentionally.

Mesa H
Desktop Mesa Façade Assessment

Prepared for
Robe River Mining Co. Pty Ltd

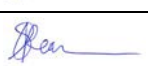
Job Number: 14289-17

Reference: 14289-17-BISR-1Rev0_180209

Revision Status

Rev	Date	Description	Author(s)	Reviewer
A	13/10/2017	Draft Issued for Client Review	J. Johnston	R. Archibald
B	20/11/2017	Draft Issued for Client Review	J. Johnston	R. Archibald
0	09/02/2018	Final Issued for Information	J. Johnston	R. Archibald

Approval

Rev	Date	Issued to	Authorised by	
			Name	**Signature**
A	13/10/2017	M. Brand	S. Pearse	
B	20/11/2017	M. Brand	S. Pearse	
0	09/02/2018	M. Brand	S. Pearse	

Abbreviations

Abbreviation	Definition
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
ha	Hectares
MNES	Matters of National Environmental Significance
P	Priority
PEC	Priority Ecological Community
SD	Standard deviation
SRE	Short Range Endemic
TEC	Threatened Ecological Community

Executive Summary

Astron was engaged to undertake a desktop mesa façade ecological value assessment for the potential development of the Mesa H deposit. The purpose of the mesa façade assessment was to assist in determining which mesa façades should be prioritised for retention/avoidance if the Proposal proceeds. The Mesa H survey area is located adjacent to the existing Mesa J Operation, south-west of Pannawonica, Western Australia and is 4,930 hectares.

The mesa façade assessment area was 446.8 hectares and consisted of 48 assessment sites of approximately 500 metre long sections. The desktop assessment utilised the field data and literature already gathered and compiled during Level 2 flora, vegetation and fauna surveys completed by Astron and aligns with the Environmental Protection Authority's guideline for landforms. Each mesa section was scored for a number of ecological factors (flora and vegetation, vertebrate fauna and invertebrate fauna) and the total scores were used to determine the priority for retention rating. The priority for retention rating scales of high, moderate and low were determined using the mean and standard deviation of all mesa assessment sites.

Twenty per cent (91.2 ha) of the total area of mesa façades within the survey area were rated as high priority for retention, 56% (250.2 ha) as moderate priority for retention and 24% (105.4 ha) as low priority for retention. Ten of the 48 assessment sites were rated as high priority for retention (21%), 25 were rated as moderate priority (52%) and 13 were rated as low priority (27%). The 10 sites rated as high were found along the western façade near the Robe River and a small section along the northern façade that passes close to the Robe River within the Mesa H survey area. The western façade along the Robe River is characterised by structurally diverse habitats with high moisture retention, providing refuge and shelter sites for Matters of National Environmental Significance species such as the Ghost Bat, Northern Quoll and Pilbara Olive Python. In addition, vegetation analogous to the Priority 3 Priority Ecological Community '*Triodia sp. Robe River assemblages of mesas of the West* Pilbara' was present in these areas.

In accordance with the Environmental Protection Authority guideline on landforms, the mesa landforms within the survey area were assessed for their significance – rarity, variety, integrity and ecological importance. The mesas within the survey area are associated with the Robe land system, represented by only 0.7% of all land systems within the Pilbara bioregion; however, the survey area comprises only 0.3% of the land system occurrence within the Pilbara bioregion. Similar mesa landforms are common within the Robe Valley; although, a number of these are already approved or are proposed for mining, so the potential for cumulative impacts are increased. However, large sections of mesa façade are being retained along these mesas (currently approved or proposed for mining) to maintain the landscape geodiversity, important habitats, heritage values and visual amenity. The mesas do not appear to support any endemic or highly restricted terrestrial flora or fauna. The Robe land system is generally not susceptible to vegetation degradation or erosion as the mesa landforms are robust. Hence, if the façade is retained, while the mesa is mined, its condition and ecological function should be preserved.

Table of Contents

List of Figures

List of Appendices

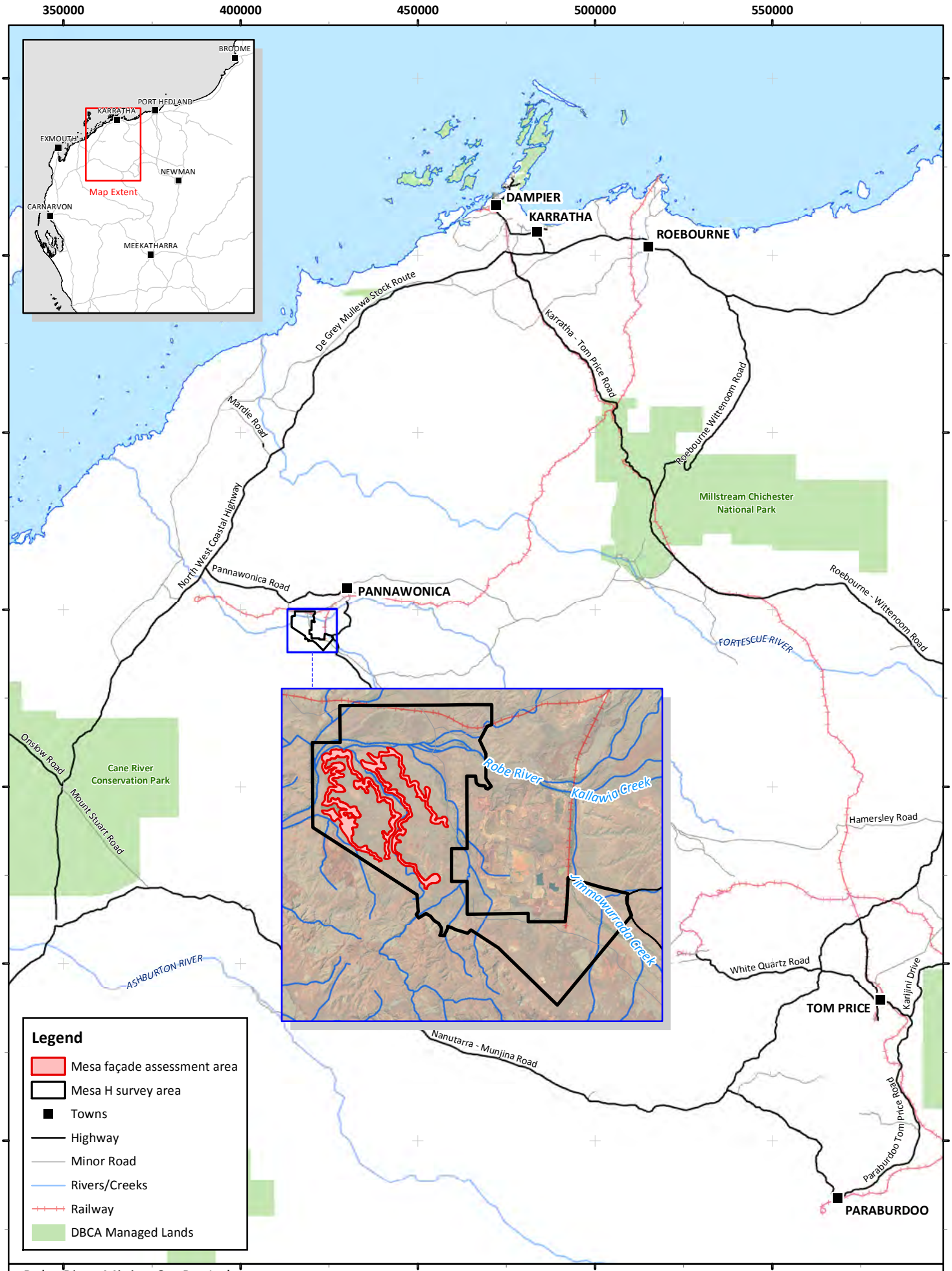
1 Introduction

1.1 Project Background

Rio Tinto, on behalf of Robe River Mining Co. Pty. Ltd (the Proponent), engaged Astron to undertake a mesa façade ecological value assessment for the potential development of the Mesa H deposit (the Proposal), located adjacent to the existing Mesa J Operation, south-west of Pannawonica, Western Australia. The assessment is required to provide data on the ecological value of the mesa façades to assist in determining which mesa façades (or sections of mesa façades) should be retained if the Proposal proceeds. The Mesa H survey area is 4,930 ha and the mesa façade assessment area is 446.8 ha (Figure 1).

1.2 Scope and Objectives

The objective of the assessment was to undertake a mesa façade ecological value assessment to assist in determining which mesa façades to be prioritised for retention/avoidance if the Proposal proceeds. The specific scope of work was to undertake a desktop assessment using the field data and literature already gathered and compiled during the Level 2 flora, vegetation and fauna surveys completed by Astron (Astron Environmental Services 2017a, 2017c, 2017b, 2017d) and align it with the Environmental Protection Authority's (EPA) *Environmental Factor Guideline – Landforms* (Environmental Protection Authority 2016).



Robe River Mining Co. Pty Ltd

Mesa H – Desktop Mesa Façade Assessment, October 2017

Figure 1: Survey area location

astron
delivering environmental intelligence™

Author: J. Johnston	Date: 12-10-2017	Datum: GDA 1994 - Projection: MGA Zone 50
Drawn: T. Pedersen	Figure Ref: 14289-17-ENVDR-1RevA_171012_Fig01	0 10 20 30 40 50 Km

N

2 Methods

The EPA has recently released a bulletin detailing how a landform is considered in the Environmental Impact Assessment (EIA) processes (Environmental Protection Authority 2016). This guidance document will inform proponents as to the value a certain type of landform will have within an EIA process. A landform was described as 'a distinctive, recognisable physical feature of the earth's surface having a characteristic shape produced by natural processes' (Environmental Protection Authority 2016). In this case, the mesas of the survey area represent a distinct type of landform, although Mesa H is not as distinct as other mesas in the Robe Valley (John Cleary Planning 2005). Mesa H was described by John Cleary Planning (2005) as:

- a discrete mesa, although tends to blend into the adjacent landform in the south-east
- moderate-sized escarpment on the river/west side
- has a second tier in places
- shallow valleys and rounded tops on the south side
- long valley separates the two forms
- highly eroded with small mesas in the south-east
- eroded with rounded forms in the east
- stronger mesa formation in the north-east.

The mesa façades that were to be assessed within the survey area were defined and provided by Rio Tinto. The survey area provided captures 50 m of the mesa crest, breakaway and slope habitats, so the survey area does contain some areas that do not necessarily reflect just the high quality habitat. The mesa façade areas were divided into approximately 500 m sections of mesa façade for individual assessment (Figure 2). This assessment was only undertaken as a desktop assessment, and no specific field assessments beyond the field survey work for the Level 2 fauna and vegetation and flora surveys were conducted to assess the mesa façade within the Mesa H survey area.

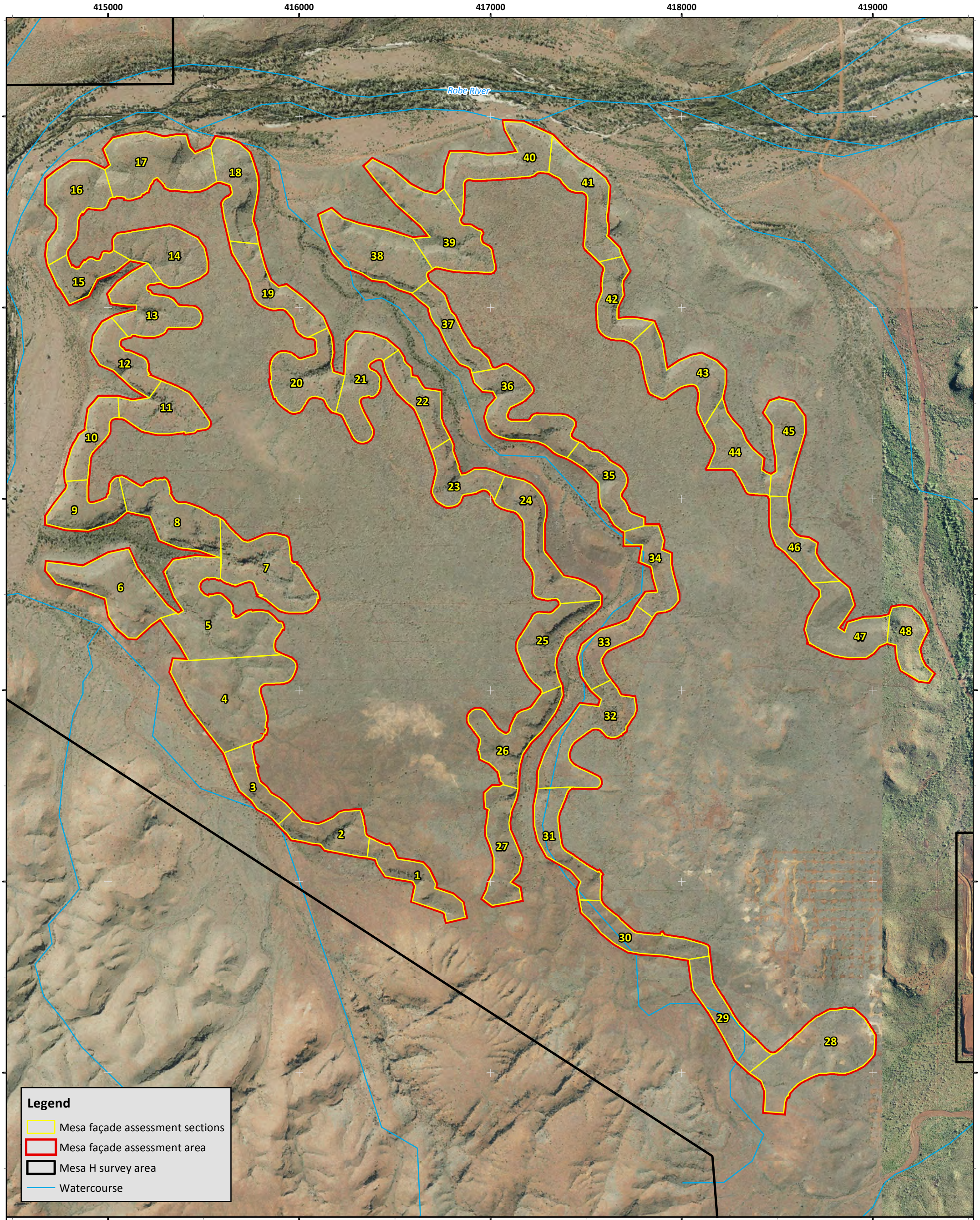
A desktop assessment was undertaken to assess whether any listed flora and fauna species, introduced species, Short Range Endemic (SRE) invertebrate species, Priority Ecological Communities (PEC), Threatened Ecological Communities (TEC) or SRE communities have been recorded within the survey area and specifically on the mesas of the survey area. Background information (including database searches) and field data already gathered and compiled by Level 2 flora, vegetation and fauna surveys were used in the assessment. Specifically, all data previously compiled and collected from the following reports were used:

- Mesa H Level 2 Fauna Assessment – May 2016 (Astron Environmental Services 2017b)
- Mesa H Level 2 Vegetation and Flora Assessment – May 2016 (Astron Environmental Services 2017c)
- Mesa H Ghost Bat, *Macroderma gigas*, Contextual Study – September 2017 (Astron Environmental Services 2017a)
- Mesa H Riparian Community Assessment – June 2016 (Astron Environmental Services 2017d)

Each mesa section was scored for each ecological factor with a rating of 0 to 4 being applied as per the criteria in Table A.1 (Appendix A). The higher the value, the higher the ecological value was for that particular factor. Each mesa section assessed received a total score for the following factors:

- flora and vegetation ecological value (seven factors)
- vertebrate fauna ecological value (11 factors)
- invertebrate fauna ecological value (four factors)
- overall ecological value (22 factors).

The overall score of the mesa section determined the ecological façade rating as either a high, moderate or low priority for retention. The priority rating scales for high, moderate and low was determined by calculating the mean and standard deviation for all mesa assessment sites. One standard deviation (1SD) either side of the mean was considered to be the upper and lower bounds of a moderate rating. All scores 1SD above the mean received a high rating and all scores 1SD below the mean received a low rating. Overall scores for each mesa assessment site were checked manually to ensure sites with one or two highly significant attributes (e.g. Pilbara Olive Python den) were not rated as a lesser priority due to low scores for other attributes. The rating scales are summarised in Table A.2 (Appendix A).



Robe River Mining Co. Pty Ltd

Mesa H – Desktop Mesa Façade Assessment, October 2017

Figure 2: Mesa façade assessment sections

Author: J. Johnston	Date: 13-11-2017	Coordinate System: GDA 1994 MGA Zone 50
Drawn: T. Pedersen	Figure Ref: 14289-17-BIDR-1RevB_171113_Fig02	0 200 400 600 800 1,000 Metres; N

astron
delivering environmental intelligence™

3 Results

3.1 Mesa Assessment Sites

Forty-eight mesa façade assessments were undertaken by Astron, 27 assessments on the western side and 21 assessments on the eastern side of Mesa H (Figure 2 and Table B.1; Appendix B).

3.2 Flora and Vegetation

Vegetation considered to be analogous to the Priority (P) 3 PEC '*Triodia sp. Robe River assemblages of mesas of the West Pilbara*' was recorded in association with tops, breakaways and gullies of mesa landforms in the survey area (Astron Environmental Services 2017c). In addition, two conservation significant flora species were recorded within the mesa façade sections (Astron Environmental Services 2017c). *Triodia* sp. Robe River (M.E. Trudgen et al. MET 12367) P3 was recorded across a number of mesa assessment sites in association with mesas, low hills and ranges, particularly favouring rocky ledges and breakaways in these habitats (Figure B.1; Appendix B). *Rhynchosia bungarensis* P4 was recorded in locations along the Robe River and was only recorded within mesa assessment site 7 (Figure B.1, Appendix B).

Seven mesa assessment sites (15, 24, 25, 26, 32, 33 and 34) were rated as high priority for flora and vegetation (Table B.1; Appendix B). This was primarily due to the inferred (not confirmed) presence of the P3 PEC '*Triodia sp. Robe River assemblages of mesas of the West Pilbara*', as well as the number of other Priority flora species recorded at these sites and the lack of weed species present (Figure B.1; Appendix B).

Mesa assessment sites 3, 4, 6, 28 and 30 were rated as low priority for flora and vegetation, mainly due to the lack of priority flora records as well as the presence of weed species. Mesa assessment site 28 was the only site that contained a weed species (Table B.1; Appendix B).

3.3 Vertebrate Fauna

Eleven mesa assessment sites (6, 7, 8, 9, 10, 11, 12, 13, 15, 16, and 40) were rated as high priority for vertebrate fauna (Table B.1; Appendix B). The high rating was generally due to records of species of Matters of National Environmental Significance (MNES), particularly the Ghost Bat, or contained a number of caves suitable for Ghost Bats and Pilbara Leaf-nosed Bats (Table B.1; Appendix B). A number of the assessments within the Mesa H survey area have focussed on roost habitat, specifically the presence of potential maternal and diurnal roosts, for conservation significant bat species, particularly the Ghost Bat (Astron Environmental Services 2017a, 2017b).

Mesa assessment sites 39 and 40 contained Pilbara Olive Python records (Figure B.1; Appendix B), but mesa assessment site 39 was only rated as moderate due to a lack of other MNES species records, significant caves and gorges/gullies. Given suitable habitat and its cryptic nature, it is likely that this species occurs more widely within the mesa assessment sites.

Twelve mesa assessment sites were rated as low priority for vertebrate fauna and were generally found along the eastern most façade of the mesa (sites 43 to 48), as well as mesa façade sections within the south of the Mesa H survey area (sites 1, 23, 27 to 30).

3.4 Invertebrate Fauna

Mesa assessment sites rated as high priority for SRE invertebrate fauna were generally the same sites as those for vertebrate fauna. Six assessment sites (5, 7, 8, 11, 12 and 13) were rated as high priority for invertebrate fauna (Table B.1; Appendix B) and were associated with two main gorges on

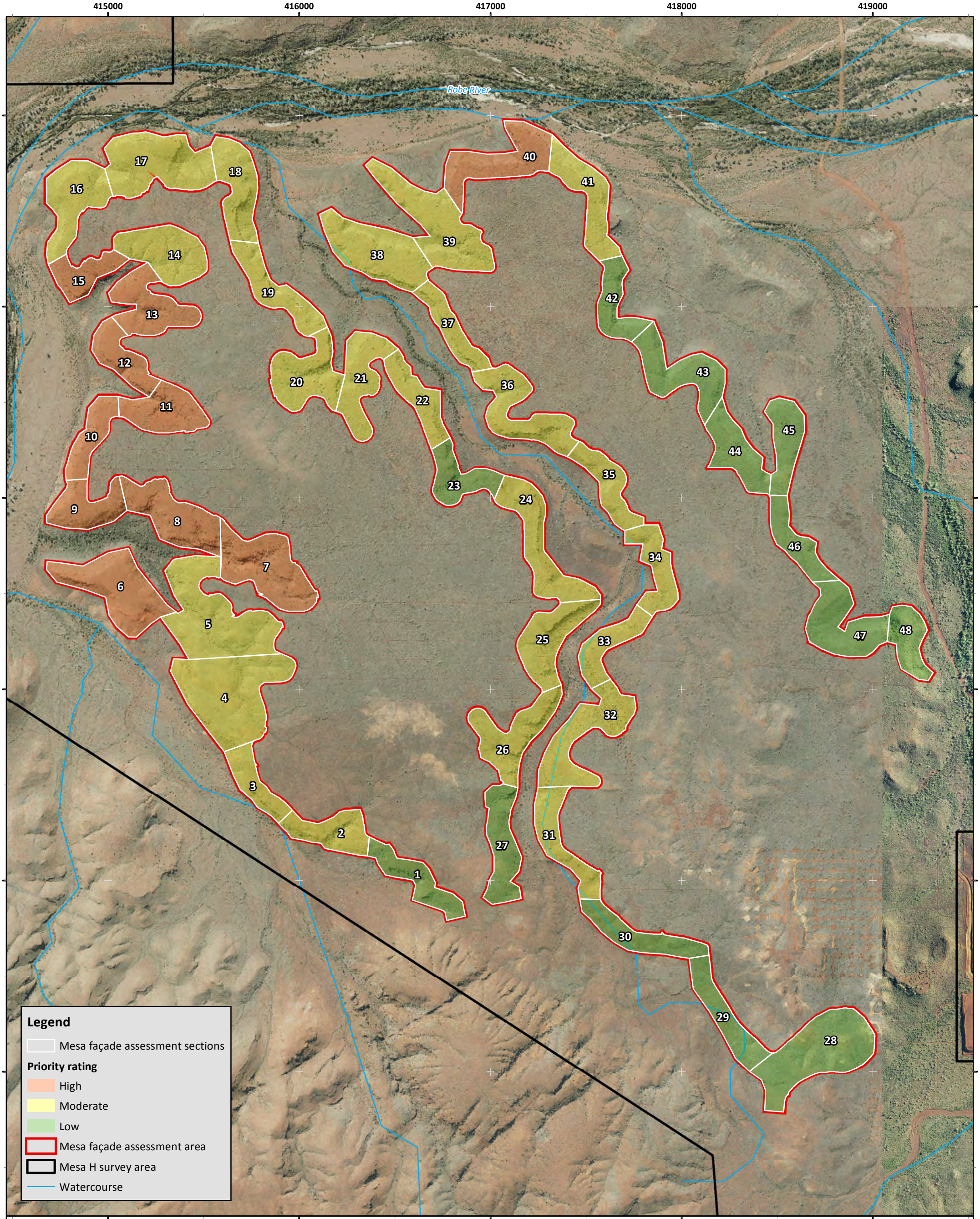
the western façade of the Mesa H survey area along the Robe River. This was due to the record of the potential SRE species *Buddelundia* '61' at site 7 (Figure B.1; Appendix B) and the presence of structurally diverse habitats with high moisture retention on south facing façades.

Fifteen mesa assessment sites were rated as low priority for invertebrate fauna and included most of the assessment sites along the eastern most façade of the mesa (sites 41 to 48) as well as mesa façade sections within the south of the Mesa H survey area.

3.5 Overall Ecological Value

Of the mesa façade assessments within the Mesa H survey area, 10 were rated as high priority for retention (21%), 25 were rated as moderate priority (52%) and 13 were rated as low priority (27%; Figure 3). The 10 sites rated as high were found within the two main gorges on the western façade along the Robe River (sites 6 to 13 and 15) and a small section of façade (site 40) along the northern section near the Robe River (Figure 3 and Table A.1; Appendix A). The 13 sites rated as low priority for retention were generally found along the eastern façades of both mesa façades (sites 23 and 27 to 30 and sites 42 to 48) as well as mesa assessment site 1 (Figure 3). Three of the mesa assessment sites (sites 5, 16 and 32) rated as moderate priority for retention had high overall rating scores of 41 and were close to being ranked as high priority for retention. These sites were generally found adjacent to those sites rated as high priority for retention (Figure 3).

Twenty per cent (91.2 ha) of the total area of mesa façades within the survey area were rated as high priority for retention, 56% (250.2 ha) as moderate priority for retention and 24% (105.4 ha) as low priority for retention (Figure 3 and Table B.1; Appendix B).



Robe River Mining Co. Pty Ltd

Mesa H – Desktop Mesa Façade Assessment, October 2017

Figure 3: Mesa façade sections classified according to priority for retention based on overall ecological value

astron
delivering environmental intelligence™

Author: J. Johnston	Date: 13-11-2017
Drawn: T. Pedersen	Figure Ref: 14289-17-BIDR-1RevB_171113_Fig03

Coordinate System: GDA 1994 MGA Zone 50

0 200 400 600 800 1,000 Metres

N

4 Conclusions

In accordance with the guidance statement (Environmental Protection Authority 2016), the criteria for assessing the significance of the mesa landforms within the survey area are detailed below. The criterion of Scientific and Social Importance is not discussed as this could not be addressed within the scope of this mesa façade assessment.

Rarity

The mesas within the survey area are all associated with the Robe land system (van Vreeswyk et al. 2004). The Robe land system represents only 0.7% of all land systems within the Pilbara bioregion (van Vreeswyk et al. 2004). However, the survey area comprises only 0.3% of the Robe land system occurrence within the Pilbara bioregion.

Variety

All the mesas occur within the Robe land system, and given that the survey area represents 0.3% of this land system within the Pilbara, similar landforms exist outside the survey area. The mesas found within the Mesa H survey area are not considered to represent a particularly good or important example of their type and other similar intact mesas currently exist outside the survey area.

Integrity

The Robe land system is not generally susceptible to vegetation degradation or erosion. Mesas are robust and have resisted a large amount of erosion and natural degradation process over time. Less resistant surrounding formations are eroded away on the surface into valleys, where they collect water drainage from the surrounding area, while the more resistant layers are left standing out and elevated in the landscape resulting in a mesa formation. Hence, if the façade is retained, while the mesa is mined, its condition and ecological function should be preserved.

The mesas within the Mesa H survey area were considered to still be intact and in good condition, although they are not in pristine condition (John Cleary Planning 2005). The Robe land system has been the target of considerable mining activity due to its geology (van Vreeswyk et al. 2004). A number of the mesas within the Robe Valley have been approved for, or are proposed for, mining, indicating that the potential for cumulative impacts on the mesa formations within the immediate area is relatively high. However, the majority of the mesa façades are being retained within these mesas (currently approved or proposed for mining) to maintain the landscape geodiversity, important habitats, heritage values and visual amenity.

Ecological Importance

Fifty-six per cent (250.2 ha) and 24% (105.4 ha) of the total area of mesa façades were rated as moderate and low priority for retention, respectively. Twenty per cent (91.2 ha) of the total area of mesa façades within the survey area were rated as high priority for retention.

The areas of mesa façades rated as high priority for retention were located along the western façade near the Robe River and a small section along the northern façade that passes close to the Robe River within the survey area. These areas are characterised by structurally diverse habitats with high moisture retention, providing refuge and shelter sites for MNES species such as the Ghost Bat, Pilbara Olive Python and Northern Quoll. In addition, vegetation analogous to the P3 PEC '*Triodia sp. Robe River assemblages of mesas of the West Pilbara*' was present in these areas. The mesas do not appear to support any endemic or highly restricted flora or fauna. The potential SRE species recorded within the mesa façade site 7 has also been collected from multiple habitats that extend far beyond the survey area.

5 References

Astron Environmental Services 2017a, *Mesa H Ghost Bat, Macroderma gigas, Contextual Study September 2017*, unpublished report prepared for Robe River Mining Co. Pty Ltd.

Astron Environmental Services 2017b, *Mesa H Level 2 Fauna Assessment - May 2016*, unpublished report for Robe River MIning Co. Pty Ltd, Perth.

Astron Environmental Services 2017c, *Mesa H Level 2 Vegetation and Flora Assessment - May 2016*, unpublished report for Robe River MIning Co. Pty Ltd, Perth.

Astron Environmental Services 2017d, *Mesa H Riparian Community Assessment - June 2016*, unpublished report for Robe River Mining Co. Pty Ltd.

Environmental Protection Authority 2016, *Environmental Factor Guideline: Landforms*, Environmental Protection Authority, Perth.

John Cleary Planning 2005, *Mesa A - Warramboo Robe River. Landscape and Geodiversity Assessment Study*, prepared for Robe River Iron Associates.

van Vreeswyk, AME, Payne, AL, Leighton, KA & Hennig, P 2004, *An inventory and condition survey of the Pilbara region, Western Australia. Technical Bulletin No. 92*, Department of Agriculture and Food, Perth.

Appendix A: Mesa Façade Assessment Criteria

This page has been left blank intentionally.

Table A.1: Criteria for rating ecological factors for the mesa façade assessment.

Ecological factor	Rating score				
	(4)	(3)	(2)	(1)	(0)
Flora and vegetation					
Threatened ecological communities (Matters of National Environmental Significance (MNES))	Confirmed as present	Inferred as present	Potential habitat	Low likelihood of occurrence	Not present
Priority Ecological Communities	Confirmed as present	Inferred as present / analogous community present	Potential habitat	Low likelihood of occurrence	Not present
Threatened flora (MNES)	Recorded	Likely occurrence – suitable habitat and close proximity of previous records	Potential occurrence – suitable habitat or close proximity of previous records	Unlikely occurrence – no suitable habitat	Not recorded
Priority flora (P1 to P2)	Recorded	Likely occurrence – suitable habitat and close proximity of previous records	Potential occurrence – suitable habitat or close proximity of previous records	Unlikely occurrence – no suitable habitat	Not recorded
Other Priority flora or vegetation of conservation significance including undescribed taxa and groundwater dependent ecosystems	Confirmed as present	Inferred as present	Potential habitat	Low likelihood of occurrence	Not present
Vegetation condition	Excellent	Very Good	Good	Poor/Very Poor	Degraded
Weed species	Not present	Suitable weed habitat (disturbances, close proximity of tracks, etc.)	Confirmed as present – non-invasive (not declared) species	Confirmed as present – invasive (not declared) species	Confirmed as present – declared pests

Ecological factor		Rating score				
		(4)	(3)	(2)	(1)	(0)
Vertebrate fauna						
MNES fauna habitat suitability	**Pilbara Olive Python**	Recorded	**Potential shelter and foraging habitat**	**Suitable foraging and dispersal habitat**	**Limited foraging and dispersal habitat**	No suitable habitat
	Pilbara Leaf-nosed Bat	Recorded	**Potential shelter and foraging habitat**	**Suitable foraging and dispersal habitat**	**Limited foraging and dispersal habitat**	No suitable habitat
	Ghost Bat	Recorded	**Potential shelter and foraging habitat**	**Suitable foraging and dispersal habitat**	**Limited foraging and dispersal habitat**	No suitable habitat
	Northern Quoll	Recorded	**Potential shelter and foraging habitat**	**Suitable foraging and dispersal habitat**	**Limited foraging and dispersal habitat**	No suitable habitat
Threatened fauna		Recorded	Likely occurrence – suitable habitat and close proximity of previous records	Potential occurrence – suitable habitat or close proximity of previous records	Unlikely occurrence – no suitable habitat	Not present

Ecological factor	Rating score				
	(4)	(3)	(2)	(1)	(0)
Priority (or migratory) fauna	Recorded	Likely occurrence – suitable habitat and close proximity of previous records	Potential occurrence – suitable habitat or close proximity of previous records	Unlikely occurrence – no suitable habitat	Not present
Roosts/caves present	1 or more maternal roosts	1 or more diurnal roosts	>3 other caves(e.g. nocturnal feeding shelters)	1-2 other caves (e.g. nocturnal feeding shelters)	None present
Breakaway habitat present	Predominantly mapped as and south-facing	Predominantly mapped as breakaway but not south-facing	Partly mapped as breakaway and south-facing	Partly mapped as breakaway but not south-facing	Limited or no breakaway habitat mapped
Gorge/gullies present	>10	10 – 5	5 – 2	1	0
Permanent pools	≥2 within 500 m	1 within 500 m	≥2 within 1 km	1 within 1 km	None within 1 km
Distance to riverine habitat (i.e. Robe River)	<100 m	<250 m	<500 m	<1 km	>1 km
Invertebrate fauna					
Threatened and listed invertebrate fauna	Recorded	Likely occurrence based on proximity of previous records	Potential occurrence based on proximity of previous records	Unlikely occurrence – no or very few previous records	Not present
SRE fauna	Recorded	Likely occurrence based on proximity of previous records	Potential occurrence based on proximity of previous records	Unlikely occurrence – no or very few previous records	Not present

Ecological factor	Rating score				
	(4)	(3)	(2)	(1)	(0)
Relictual habitats	Structurally diverse habitats with high moisture retention ubiquitous (i.e. many deeply incised gullies and shaded runoffs)	Structurally diverse habitats with high moisture retention widespread but not ubiquitous (i.e. incised gorge present)	Less diverse habitat (one or two types) and limited moisture-holding capacity (i.e. shallow gullies)	Limited habitat suitability (i.e. flat and exposed, no moisture-holding capacity and limited ground cover)	No relictual habitats
Specialist habitats	Specialist habitats ubiquitous (i.e. rocky outcrops, fringing woodlands)	Specialist habitats widespread (i.e. rocky outcrops, fringing woodlands)	Specialist habitats present but not widespread or few types	Specialist habitats rare; area generally exposed and little diverse	No specialist habitats

Table A.2: Rating scale for the priority of retention for mesas or mesa sections.

Priority rating for retention	Flora and vegetation	Vertebrate fauna	Invertebrate fauna	Overall
High	≥13	≥24	≥7	≥42
Moderate	11-12	10-23	4-6	26-41
Low	≤10	≤9	≤3	≤25

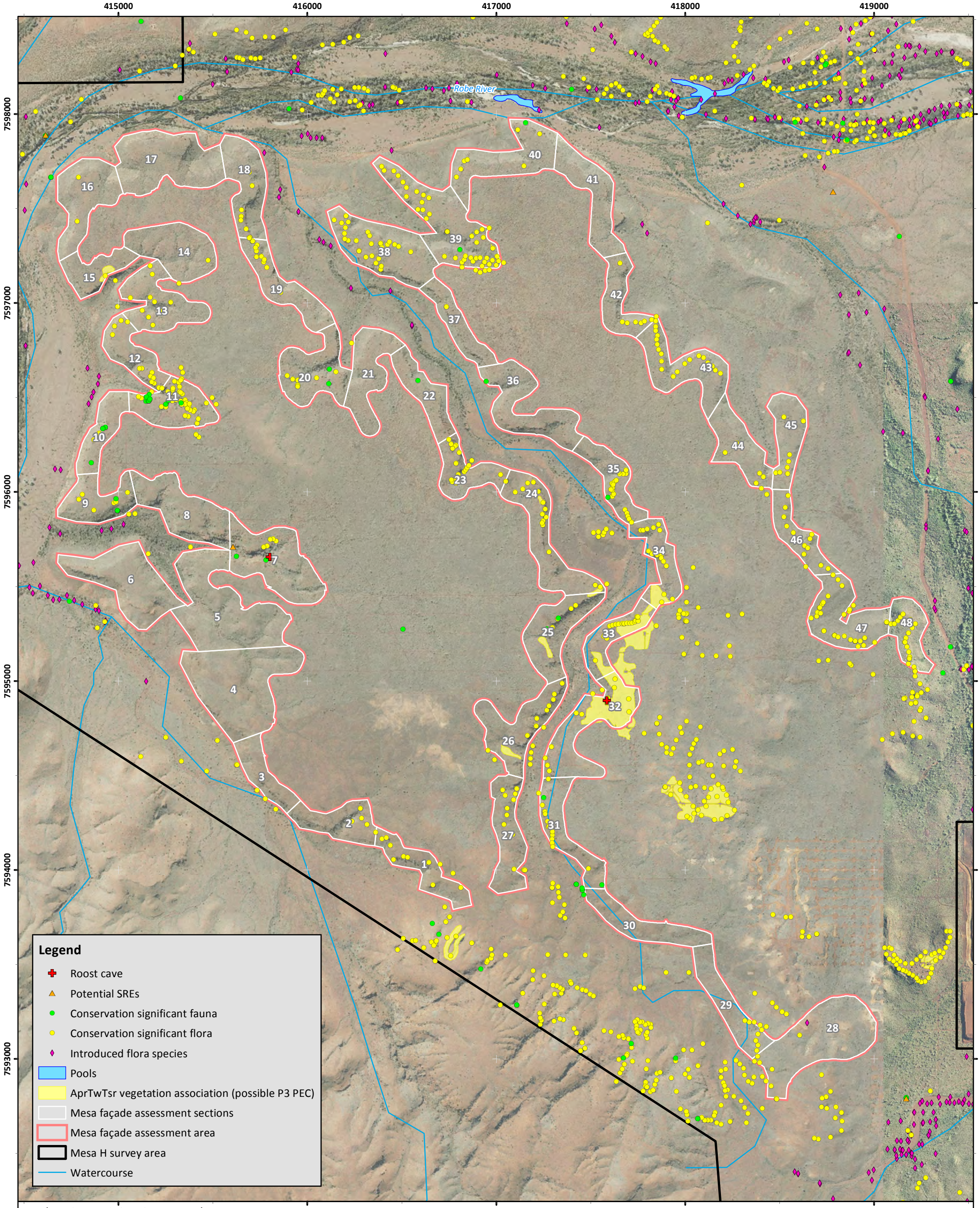
Appendix B: Mesa Façade Assessment Results

This page has been left blank intentionally.

Table B.1: Mesa façade assessment site scores.

Mesa façade sections	Area (ha)	FLORA AND VEGETATION								VERTEBRATE FAUNA										INVERTEBRATE FAUNA				Flora and vegetation total	Vertebrate fauna total	Invertebrate fauna total	TOTAL
		TECs	PECs	Threatened flora (MNES)	Priority flora (P1 to P2)	Other Priority flora or vegetation of conservation significance	Vegetation condition	Weed species	Pilbara Olive Python habitat	Pilbara Leaf-nosed Bat habitat	Ghost Bat habitat	Northern Quoll habitat	Threatened fauna	Priority (or migratory) fauna	Roosts/caves present	Breakaway habitat present	Gorges/gullies present	Distance to riverine habitat (i.e. Robe River)	Permanent pools	Threatened and listed invertebrate fauna	SRE fauna	Relictual habitats	Specialist habitats				
1	6.68	0	0	0	0	4	4	4	1	1	1	1	2	2	0	0	0	0	0	0	1	1	1	**12**	**8**	**3**	**23 (low)**
2	6.86	0	0	0	0	4	4	4	3	1	1	3	2	2	0	4	0	0	0	0	1	2	2	**12**	**16**	**5**	**33 (moderate)**
3	5.26	0	0	0	0	2	4	4	3	2	2	2	2	2	0	2	0	0	0	0	1	2	2	**10**	**15**	**5**	**30 (moderate)**
4	19.90	0	0	0	0	2	4	4	3	2	2	3	2	2	0	2	0	0	0	0	1	2	2	**10**	**16**	**5**	**31 (moderate)**
5	19.23	0	0	0	0	3	4	4	3	3	3	3	3	2	0	3	1	1	1	0	1	3	3	**11**	**23**	**7**	**41 (moderate)**
6	13.62	0	0	0	0	3	4	3	3	3	2	3	3	2	0	4	1	2	3	0	1	3	2	**10**	**26**	**6**	**42 (high)**
7	13.50	0	0	0	0	4	4	4	3	3	4	3	4	2	3	4	1	0	1	0	4	3	3	**12**	**28**	**10**	**50 (high)**
8	11.08	0	0	0	0	3	4	4	3	3	3	3	3	2	0	4	1	2	1	0	1	3	3	**11**	**25**	**7**	**43 (high)**
9	7.17	0	0	0	0	4	4	3	3	3	3	3	4	2	1	4	0	2	3	0	1	2	2	**11**	**28**	**5**	**44 (high)**
10	5.55	0	0	0	0	4	4	3	3	3	4	4	4	4	0	3	1	2	3	0	1	3	2	**11**	**31**	**6**	**48 (high)**
11	8.30	0	0	0	0	4	4	4	3	3	4	4	4	4	2	3	1	2	2	0	1	3	3	**12**	**32**	**7**	**51 (high)**
12	6.22	0	0	0	0	4	4	4	3	2	2	3	3	2	0	4	1	2	2	0	1	3	3	**12**	**24**	**7**	**43 (high)**
13	9.50	0	0	0	0	4	4	4	3	3	3	3	3	2	0	4	1	1	2	0	1	3	3	**12**	**25**	**7**	**44 (high)**
14	10.11	0	0	0	0	4	4	4	1	1	1	1	3	2	0	0	0	2	2	0	1	1	1	**12**	**13**	**3**	**28 (moderate)**
15	5.31	0	3	0	0	4	4	4	3	2	2	3	3	2	0	4	0	3	3	0	1	3	2	**15**	**25**	**6**	**46 (high)**
16	10.24	0	0	0	0	4	4	4	3	2	2	3	3	2	0	3	0	3	3	0	1	2	2	**12**	**24**	**5**	**41 (moderate)**
17	14.82	0	0	0	0	3	4	4	3	2	2	3	3	2	0	3	0	4	1	0	1	2	2	**11**	**23**	**5**	**39 (moderate)**
18	8.99	0	0	0	0	4	4	3	3	2	2	3	2	2	0	3	0	3	0	0	1	2	2	**11**	**20**	**5**	**36 (moderate)**
19	7.74	0	0	0	0	4	4	4	3	2	2	3	2	2	0	3	0	1	0	0	1	2	2	**12**	**18**	**5**	**35 (moderate)**
20	9.88	0	0	0	0	4	4	4	3	2	2	4	4	4	0	1	0	1	0	0	1	2	2	**12**	**21**	**5**	**38 (moderate)**
21	8.82	0	0	0	0	3	4	4	3	2	2	3	3	2	0	3	0	0	0	0	1	2	2	**11**	**18**	**5**	**34 (moderate)**
22	6.33	0	0	0	0	4	4	4	3	2	2	3	4	2	1	3	0	0	0	0	1	2	2	**12**	**20**	**5**	**37 (moderate)**
23	6.29	0	0	0	0	4	4	4	1	1	1	1	2	2	0	1	0	0	0	0	1	2	1	**12**	**9**	**4**	**25 (low)**
24	11.20	0	3	0	0	4	4	4	3	2	2	3	2	2	0	3	0	0	0	0	1	2	2	**15**	**17**	**5**	**37 (moderate)**
25	9.42	0	3	0	0	4	3	4	3	2	2	3	4	2	1	1	0	0	0	0	1	2	2	**14**	**18**	**5**	**37 (moderate)**
26	9.90	0	3	0	0	4	3	4	3	2	2	3	2	2	0	3	0	0	0	0	1	2	2	**14**	**17**	**5**	**36 (moderate)**
27	8.54	0	0	0	0	4	3	4	1	1	1	1	2	2	0	0	0	0	0	0	1	1	1	**11**	**8**	**3**	**22 (low)**
28	16.89	0	0	0	0	4	4	1	1	1	1	1	2	2	0	0	0	0	0	0	1	1	1	**9**	**8**	**3**	**20 (low)**
29	7.40	0	0	0	0	4	4	4	1	1	1	1	2	2	0	0	0	0	0	0	1	1	1	**12**	**8**	**3**	**23 (low)**
30	7.24	0	0	0	0	2	4	4	1	1	1	1	2	2	0	0	0	0	0	0	1	1	1	**10**	**8**	**3**	**21 (low)**

Mesa façade sections	Area (ha)	FLORA AND VEGETATION								VERTEBRATE FAUNA										INVERTEBRATE FAUNA				Flora and vegetation total	Vertebrate fauna total	Invertebrate fauna total	TOTAL
		TECs	PECs	Threatened flora (MNES)	Priority flora (P1 to P2)	Other Priority flora or vegetation of conservation significance	Vegetation condition	Weed species	Pilbara Olive Python habitat	Pilbara Leaf-nosed Bat habitat	Ghost Bat habitat	Northern Quoll habitat	Threatened fauna	Priority (or migratory) fauna	Roosts/caves present	Breakaway habitat present	Gorges/gullies present	Distance to riverine habitat (i.e. Robe River)	Permanent pools	Threatened and listed invertebrate fauna	SRE fauna	Relictual habitats	Specialist habitats				
31	7.35	0	0	0	0	4	4	4	3	2	2	3	4	4	1	1	0	0	0	0	1	2	2	**12**	**20**	**5**	**37 (moderate)**
32	11.75	0	3	0	0	4	3	4	3	2	2	3	4	2	3	3	0	0	0	0	1	2	2	**14**	**22**	**5**	**41 (moderate)**
33	5.85	0	3	0	0	4	3	4	3	2	2	3	2	2	0	3	0	0	0	0	1	2	2	**14**	**17**	**5**	**36 (moderate)**
34	6.52	0	3	0	0	4	4	4	1	2	2	3	2	2	0	1	0	0	0	0	1	2	2	**15**	**13**	**5**	**33 (moderate)**
35	6.35	0	0	0	0	4	4	4	3	1	1	1	2	4	0	2	0	0	0	0	1	1	1	**12**	**14**	**3**	**29 (moderate)**
36	10.91	0	0	0	0	3	4	4	3	2	2	3	4	2	1	4	0	0	0	0	1	2	2	**11**	**21**	**5**	**37 (moderate)**
37	5.68	0	0	0	0	4	4	4	3	2	2	3	2	2	0	3	0	1	0	0	1	2	2	**12**	**18**	**5**	**35 (moderate)**
38	13.38	0	0	0	0	4	3	4	3	2	2	3	2	2	0	3	0	2	1	0	1	2	2	**11**	**20**	**5**	**36 (moderate)**
39	14.84	0	0	0	0	4	4	4	4	2	2	3	4	2	0	3	0	2	1	0	1	2	2	**12**	**23**	**5**	**40 (moderate)**
40	10.98	0	0	0	0	4	4	4	4	2	2	3	4	2	0	1	0	4	3	0	1	2	2	**12**	**25**	**5**	**42 (high)**
41	8.85	0	0	0	0	3	4	4	1	1	1	1	1	2	0	0	0	3	3	0	1	1	1	**11**	**13**	**3**	**27 (moderate)**
42	5.99	0	0	0	0	4	4	4	1	1	1	1	1	2	0	0	0	1	2	0	1	1	1	**12**	**10**	**3**	**25 (low)**
43	10.11	0	0	0	0	4	4	4	1	1	1	1	1	2	0	0	0	0	0	0	1	1	1	**12**	**7**	**3**	**22 (low)**
44	7.69	0	0	0	0	4	4	4	1	1	1	1	1	2	0	0	0	0	0	0	1	1	1	**12**	**7**	**3**	**22 (low)**
45	6.62	0	0	0	0	4	4	4	1	1	1	1	1	2	0	0	0	0	0	0	1	1	1	**12**	**7**	**3**	**22 (low)**
46	5.75	0	0	0	0	4	4	4	1	1	1	1	1	2	0	0	0	0	0	0	1	1	1	**12**	**7**	**3**	**22 (low)**
47	10.55	0	0	0	0	4	3	4	1	1	1	1	1	2	0	0	0	0	0	0	1	1	1	**11**	**7**	**3**	**21 (low)**
48	5.66	0	0	0	0	4	3	4	1	1	1	1	1	2	0	0	0	0	0	0	1	1	1	**11**	**7**	**3**	**21 (low)**



Robe River Mining Co. Pty Ltd

Mesa H – Desktop Mesa Façade Assessment, October 2017

astron
delivering environmental intelligence™

Figure B.1: Locations of all significant features, conservation significant species and introduced flora species recorded within the survey area

Author: J. Johnston	Date: 13-11-2017	Coordinate System: GDA 1994 MGA Zone 50
Drawn: T. Pedersen	Figure Ref: 14289-17-BIDR-1RevB_171113_FigB1	0 200 400 600 800 1,000 Metres; N

This page has been left blank intentionally.