

HORIZON POWER

IDENTIFICATION OF ENVIRONMENTALLY SENSITIVE AREAS (ESAs) IN THE GASCOYNE/MIDWEST REGION

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
1 INTRODUCTION	1
1.1 AIMS	1
1.2 HP NETWORK SPATIAL DATA	2
1.3 DEC DATABASE SEARCHES	2
1.3.1 ‘Planning’ Search	2
1.3.2 ‘Detailed’ Search	3
2 METHODS.....	4
3 RESULTS.....	5
3.1 POTENTIAL ESA SITES	5
3.1.1 Threatened Flora Species	5
3.1.2 Threatened Ecological Communities	6
3.1.3 Priority Ecological Communities	6
3.1.4 Ramsar Wetlands (Wetlands of International Importance).....	7
3.2 HIGH PRIORITY ESA SITES	7
3.3 MEDIUM PRIORITY ESA SITES	7
3.4 LOW PRIORITY ESA SITES.....	8
4 DISCUSSION AND CONCLUSIONS	9
5 REFERENCES	12

TABLES

Table 1: Conservation Significant Flora Species that have the Potential to Occur Within ESAs in the Gascoyne/Midwest Region and their Flowering Period	
Table 2: Threatened Ecological Communities that Occur Within Areas of Horizon Power Infrastructure in the Gascoyne/Midwest Region	
Table 3: Priority Ecological Communities that Occur Within Areas of Horizon Power Infrastructure in the Gascoyne/Midwest Region	
Table 4: Priority Ecological Communities that have Horizon Power Infrastructure Occurring in Close Proximity in the Gascoyne/Midwest Region	
Table 5: Potential High Priority ESA Sites that May Occur Within Close Proximity to Horizon Power Infrastructure in the Gascoyne/Midwest Region	
Table 6: Potential Medium Priority ESA Sites that May Occur Within Close Proximity to Horizon Power Infrastructure in the Gascoyne/Midwest Region	
Table 7: Potential Low Priority ESA Sites that May Occur Within Close Proximity to Horizon Power Infrastructure in the Gascoyne/Midwest Region	

APPENDICES

- Appendix A: Conservation Codes for Western Australian Flora (Smith 2012)
- Appendix B: Definitions, Categories and Criteria for Threatened Ecological Communities and Priority Ecological Communities (Department of Environment and Conservation 2010)
- Appendix C: Potential Environmentally Sensitive Area (ESA) sites within the Gascoyne/Midwest Region

FIGURES

- Figure 1.0: Gascoyne/Midwest Environmentally Sensitive Areas – Overview – Distribution Network – Locality
- Figure 1.1: Gascoyne/Midwest Environmentally Sensitive Areas – Carnarvon
- Figure 1.2: Gascoyne/Midwest Environmentally Sensitive Areas – Coral Bay
- Figure 1.3: Gascoyne/Midwest Environmentally Sensitive Areas – Cue
- Figure 1.4: Gascoyne/Midwest Environmentally Sensitive Areas – Denham
- Figure 1.5: Gascoyne/Midwest Environmentally Sensitive Areas – Exmouth
- Figure 1.6: Gascoyne/Midwest Environmentally Sensitive Areas – Gascoyne Junction
- Figure 1.7: Gascoyne/Midwest Environmentally Sensitive Areas – Laverton
- Figure 1.8: Gascoyne/Midwest Environmentally Sensitive Areas – Leonora
- Figure 1.9: Gascoyne/Midwest Environmentally Sensitive Areas – Meekatharra
- Figure 1.10: Gascoyne/Midwest Environmentally Sensitive Areas – Menzies
- Figure 1.11: Gascoyne/Midwest Environmentally Sensitive Areas – Mount Magnet
- Figure 1.12: Gascoyne/Midwest Environmentally Sensitive Areas – Sandstone
- Figure 1.13: Gascoyne/Midwest Environmentally Sensitive Areas – Wiluna
- Figure 1.14: Gascoyne/Midwest Environmentally Sensitive Areas – Yalgoo

EXECUTIVE SUMMARY

Horizon Power (HP) is proposing to update their Environmentally Sensitive Area (ESA) database prior to initiating field assessments and management programs. HP has nominated the Gascoyne/Midwest Region as an area requiring updating.

HP Gascoyne/Midwest Region consists of the following 14 'islanded' networks (displayed in Figure 1.0):

- Carnarvon;
- Coral Bay;
- Cue;
- Denham;
- Exmouth;
- Gascoyne Junction;
- Laverton;
- Leonora;
- Meekatharra;
- Menzies
- Mt Magnet;
- Sandstone;
- Wiluna; and
- Yalgoo.

Threatened flora and ecological community database information has been provided by the Department of Environment and Conservation (DEC) to HP as part of a data licence agreement. The HP Infrastructure was overlaid over DEC Threatened Flora (T - Declared Rare Flora (DRF)), Priority Flora (PF), Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) locations and Woodman Environmental (WEC) Project database information, within a Geographical Information System (GIS). The DEC datasets included the government dataset information for threatened flora, this being the Threatened and Priority Flora database (TPFL), and Threatened Ecological Community locations (Threatened Ecological Communities database). The WEC dataset included information on Threatened and Priority flora locations.

Potential Environmentally Sensitive Areas (ESAs) site location information and HP GIS network information was then overlaid on aerial photography in a GIS environment. All potential sites underwent a desktop review with respect to existing vegetation, areas of potential habitat, and the presence of any threatened flora populations that may occur within 500m of the HP Gascoyne/Midwest Network areas. Potential ESA locations were then identified for on-ground verification via targeted surveys.

Sites were grouped into priority categories for additional investigation, High, Medium and Low based on:

- proximity to HP infrastructure;

- conservation ranking of threatened flora;
- quality of data (source and confidence of the record used); and
- age of data.

A total of 22 potential ESA sites were identified during this desktop study within this regional network area. Of the 22 sites identified, eight sites have been ranked as High priority, eight have been ranked as Medium and six ranked as Low.

1 INTRODUCTION

Horizon Power (HP) is proposing to update their Environmentally Sensitive Area (ESA) database prior to initiating field assessments and management programmes. Horizon Power has nominated the Gascoyne/Midwest Region as an area requiring updating.

Horizon Power has requested Woodman Environmental Consulting Pty Ltd (Woodman Environmental) review all publicly available conservation significant flora and ecological community data for the Gascoyne/Midwest Region to identify potential ESAs requiring site assessment and preparation of management procedures.

The HP Gascoyne/Midwest Region contains the following 14 ‘islanded’ networks (displayed in Figure 1.0):

- Carnarvon;
- Coral Bay;
- Cue;
- Denham;
- Exmouth;
- Gascoyne Junction;
- Laverton;
- Leonora;
- Meekatharra;
- Menzies;
- Mt Magnet;
- Sandstone;
- Wiluna; and
- Yalgoo.

1.1 AIMS

The aims of this report are to:

- Review data on locations of Threatened flora (T - DRF), Priority flora (PF), Priority and Threatened Ecological Communities (PECs and TECs) in relation to HP infrastructure to determine potential ESAs;
- Inspect aerial photography of all known locations with respect to proximity to Horizon Power infrastructure and vegetation that may host the selected environmental issue to identify potential ESA locations for field investigation; and
- Provide a short report presenting methods and results of the project including a table of potential ESAs listing locations, issue and priority for investigation.

1.2 HP NETWORK SPATIAL DATA

HP captures all network information spatially via the Distribution Facilities Information System (DFIS)¹. The system was inherited from Western Power in 2006. The accuracy of assets locations (coordinates) from this system vary due to:

- Limitations of DFIS system (lack of aerial photography to reference);
- Age of the networks (and the accuracy of GPS technology available during installation); and
- Source of reference datasets (i.e. cadastral boundaries sourced from Landgate with accuracy varying throughout the State).

The following spatial data extracted from DFIS were utilised for this Study:

- Distribution poles
- Overhead lines
- Underground lines

1.3 DEC DATABASE SEARCHES

1.3.1 'Planning' Search

In February 2012, HP received the results of 'Planning' searches undertaken of the following Department of Environment and Conservation (DEC) databases (DEC 2012a, b), via the Species and Communities Branch:

- Threatened and Priority Ecological Communities Database; and
- Threatened and Priority Flora Database (TPFL), including the Threatened and Priority Flora List.

The database results did not include records from the Western Australian Herbarium (WAHerb).

The results of these searches provided HP with the following information:

1. Threatened and Priority Flora Database

The planning search provided HP with all the TPFL records within regional Western Australia (WA). Details for each T - DRF and PF flora taxon included:

- Spatial data of record;
- Date recorded;
- Conservation category;
- Population identification/number; and
- Vesting of the land.

¹ As of December 2012 this system will be replaced by Small World, Electric Office.

2. Threatened and Priority Ecological Communities Database

The planning search provided HP with all TEC/PECs within regional WA. Information provided for each TEC/PEC included:

- Spatial data of administrative ‘buffer’ applied to each community boundary (radius of administrative buffers differ depending on the type and landform occurrence of the TEC/PECs);
- Community name;
- Conservation category; and
- Community identification/number.

1.3.2 ‘Detailed’ Search

Due to the limited information provided for each ‘potential’ ESA record as a result of the ‘Planning’ search, HP requested a ‘detailed’ search be undertaken of DEC databases (DEC 2012b, c), via the Species and Communities Branch.

The results of these searches provided HP with the following information:

1. Threatened and Priority Flora Database

HP then requested a detailed search of TPFL for any records occurring within 500m of the centreline of existing infrastructure. These results provided the following information for each record:

- Spatial data of record;
- Date recorded;
- Species name;
- Conservation category;
- Population identification/number;
- Location Information;
- Vesting of the land; and
- DEC District.

2. Threatened and Priority Ecological Communities Database

HP then requested a detailed search (using available TEC/PEC ‘boundary’ information) from the DEC of TEC/PECs occurring within 1km of the centreline of existing infrastructure. These results provided the following information for each TEC/PEC:

- Spatial data of community boundary;
- Community name;
- Conservation category;
- Community identification/number;
- Radius of buffer to be applied to the boundary (in metres); and
- Area of the community in hectares.

2 METHODS

DEC datasets (DEC 2012a, b) were initially overlaid with HP network datasets within a GIS environment to conduct a preliminary review of potential ESA sites within the region. Following a review of the information provided a further detailed search request was made to DEC (DEC 2012b, c) which involved:

- a detailed search from the DEC Threatened and Priority Flora database (TPFL) records occurring within 500m of the centreline of existing infrastructure; and
- a detailed search (using available TEC/PEC 'boundary' information) from the DEC of TEC/PECs occurring within 1km of the centreline of existing infrastructure.

The results of the DEC database searches (DEC 2012a, b, c) were combined with the Woodman Environmental Project database and HP network datasets within a GIS environment. Any locations of T-DRF and P flora and TEC/PEC boundaries which occurred on or within 500m of HP network were considered as potential ESA locations.

Potential ESA site location information and HP GIS network information was then overlaid on aerial photography. All potential sites were then inspected (via desktop) with respect to existing remnant vegetation and the presence of T-DRF or PF populations in proximity to the HP Network. Potential ESA locations were then identified.

Potential ESA sites were then grouped into priority categories (High, Medium and Low) for additional investigation. These categories were based on:

- Proximity to HP infrastructure;
- Conservation ranking of threatened flora;
- Quality of data (source and confidence of the record used); and
- Age of data.

High Priority sites were deemed to be:

- T-DRF species located up to 500m from HP infrastructure;
- Priority flora locations within 50m of HP infrastructure;
- High confidence in the quality of data of the record used;
- HP Infrastructure occurring within PEC or TEC areas; and
- HP Infrastructure occurring within Ramsar Wetland areas.

Medium Priority sites were deemed to be:

- Priority 1 and 2 flora locations up to 500m from HP infrastructure; and
- Priority 3 and 4 flora locations up to 200m from HP infrastructure.

Low Priority sites were deemed to be:

- Priority 3 and 4 flora location between 200 – 500m from HP infrastructure;
- Low confidence in the quality of data of the record used; and
- Age of data deemed to be historical (over 20 years).

3 RESULTS

3.1 POTENTIAL ESA SITES

3.1.1 Threatened Flora Species

Nine conservation significant flora species have the potential to occur under and or near HP network infrastructure (Table 1). This includes one Threatened (T - Declared Rare Flora-extant (DRF)) species, where T species are protected under the *Wildlife Conservation Act 1950* which prevents them from being removed or taken without prior written approval from the Minister for the Environment.

Priority flora, are considered to be poorly known taxa with few to several populations which have an array of potential threats which may affect population numbers and therefore alter their conservation status (Appendix A). Priority flora are ranked from one to five, with priority one and two taxa potentially under consideration for declaration as ‘rare flora’ but are in urgent need of further survey, as generally only up to five populations may be known. Priority three and four taxa are known from several populations, and are not believed to be under immediate threat due to the number of known populations or known populations being large, and either widespread or in protected conservation reserves. Priority five taxa are taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within 5 years.

A total of eight Priority (P) flora species have the potential to occur under and or near HP network infrastructure, consisting of two Priority 1 taxa, two Priority 2 taxa, two Priority 3 taxa and two Priority 4 taxa (Table 1). Table 1 also provides information on the flowering period for the conservation significant flora (DEC 2012d). This coincides with the most appropriate time for surveying for the taxa and assists in locating and identifying the species.

Table 1: Conservation Significant Flora Species that have the Potential to Occur within ESAs within the Gascoyne/Midwest Region and their Flowering Period

Conservation status	Species Name	Flowering time/survey period
T (DRF)	<i>Eremophila rostrata</i> subsp. <i>rostrata</i>	June - September
P1	<i>Gnephosis</i> sp. Billabong (B. Nordenstam & A. Anderberg 203)	September - October
P1	<i>Rhodanthe ascendens</i>	August
P2	<i>Daviesia pleurophylla</i>	August - October
P2	<i>Tinospora esiangkara</i>	July
P3	<i>Acacia alexandri</i>	June - September
P3	<i>Grevillea calcicola</i>	May - August
P4	<i>Dodonaea amplisemina</i>	June - September
P4	<i>Grevillea inconspicua</i>	June - August

3.1.2 Threatened Ecological Communities

Table 2 presents the threatened ecological communities that occur within areas of HP infrastructure. Definitions of conservation rankings of TECs are presented in Appendix B.

Table 2: Threatened Ecological Communities that Occur Within Areas of Horizon Power Infrastructure in the Gascoyne/Midwest Region

Threatened Ecological Community	Horizon Power Network Area
CAMERON01 (Camerons) - Camerons Cave Troglobitic Community (Critically Endangered)	Exmouth

3.1.3 Priority Ecological Communities

Table 3 presents the priority ecological communities that have a defined boundary within a buffer boundary that occur within areas of HP infrastructure. Definitions of conservation rankings of PECs are also presented in Appendix B.

Table 3: Priority Ecological Communities that Occur Within Areas of Horizon Power Infrastructure in the Gascoyne/Midwest Region

Priority Ecological Community	Horizon Power Network Area
Wiluna BF (Wiluna BF Calcrete) - Wiluna BF calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station (Priority 1)	Wiluna
Yalgoo 1, (Yalgoo BIF) Yalgoo vegetation complexes (banded ironstone formation) (Priority 1)	Yalgoo
Wagga Wagga (Wagga Wagga and Yalgoo Calcrete) Wagga Wagga and Yalgoo calcrete groundwater assemblage type on Yalgoo palaeodrainage on Wagga Wagga Station and Moore Palaeodrainage on Yoweragabbie Station	Yalgoo

Information provided for the Wagga Wagga and Yalgoo Calcrete PEC within the Yalgoo Network (Figure 1.14), shows that the PEC boundary just intersects with HP network and will require on ground field surveys to determine if the PEC is present under HP infrastructure.

Table 4 presents the priority ecological community that occurs within 500m of HP infrastructure. Although HP infrastructure occurs within the buffer boundary for this priority ecological community, it does not occur within the mapped defined boundary of the PEC.

Table 4: Priority Ecological Communities that have Horizon Power Infrastructure Occurring Within Close Proximity in the Gascoyne/ Midwest Region

Priority Ecological Community	Horizon Power Network Area
Uramurdah (Uramurdah) Uramurdah Lake calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station (Priority 1)	Wiluna

The Uramurdah Calcrete in the Wiluna Network (Figure 1.13) occurs within 150m of HP network, but as this PEC has defined boundaries that do not intersect with HP infrastructure, it has not been included within the assessment for potential ESA sites, but should be noted for any proposed future works in these areas.

3.1.4 Ramsar Wetlands (Wetlands of International Importance)

No Ramsar wetlands which are wetlands of international importance listed under the Convention on Wetlands also known as the Ramsar Convention were identified during the assessment.

3.2 High Priority ESA Sites

A total of eight high priority sites were determined using methods presented in Section 2. Table 5 shows the breakdown of potential high priority sites and its related issue in regard to HP infrastructure. Figures 1.1 – 1.14 show the distribution of High priority sites over the HP Gascoyne/Midwest Network.

Table 5: Potential High Priority ESA Sites that May Occur Within Close Proximity to Horizon Power Infrastructure in the Gascoyne/Midwest Region

Issue	No. of Potential ESA sites
T (DRF)	3
P1	0
P2	0
P3	1
P4	0
Threatened Ecological Community	1
Priority Ecological Community	3
Ramsar Wetlands	0

3.3 Medium Priority ESA Sites

A total of eight Medium Priority sites were determined using methods presented in Section 2. Table 6 shows the breakdown of potential Medium Priority sites and their related issues in regard to HP infrastructure. Figures 1.1 – 1.14 show the distribution of Medium Priority sites over the HP Gascoyne/Midwest Network.

Table 6: Potential Medium Priority ESA Sites that May Occur Within Close Proximity to Horizon Power Infrastructure in the Gascoyne/Midwest Region

Issue	No. of Potential ESA sites
T (DRF)	0
P1	4
P2	1
P3	3
P4	0
Threatened Ecological Community	0
Priority Ecological Community	0
Ramsar Wetlands	0

Two identified medium sites have the potential to be combined within the Exmouth Network (Figure 1.5). These sites in addition due to their close proximity to two other identified potential sites could potentially become one site following groundtruthing and survey results (Appendix C). These potentially combined sites have not been included in the overall calculation for number of Medium and Low Priority ESA sites.

3.4 Low Priority ESA Sites

A total of six Low Priority sites were determined using methods in Section 2. Table 7 shows the breakdown of potential low priority sites and its related issue in regard to HP infrastructure. Figures 1.1 – 1.14 show the distribution of Low priority sites over the HP Gascoyne/Midwest Network.

Table 7: Potential Low Priority ESA Sites that May Occur Within Close Proximity to Horizon Power Infrastructure in the Gascoyne/Midwest Region

Issue	No. of Potential ESA sites
T (DRF)	0
P1	0
P2	0
P3	3
P4	3
Threatened Ecological Community	0
Priority Ecological Community	0
Ramsar Wetlands	0

Appendix C presents the Low priority sites over the HP Gascoyne/Midwest Network.

4 DISCUSSION AND CONCLUSIONS

The HP Network within the Gascoyne/Midwest Region consists of 14 isolated localities. A total of 22 potential ESA sites were identified during this desk top study within this regional network area. From this eight sites have been ranked as High priority, eight have been ranked as Medium and six ranked as Low.

The HP infrastructure at Carnarvon (Figure 1.1) has one medium priority site for the P1 flora species *Gnephosis* sp. Billabong (B. Nordenstam & A. Anderberg 203) which occurs within 300 metres of HP infrastructure (Appendix C).

No potential ESA sites were recorded for the Coral Bay network area (Figure 1.2).

The HP infrastructure at Cue (Figure 1.3) has three High priority sites and three Low priority sites (Appendix C). Three high priority threatened flora sites occur for the conservation significant flora *Eremophila rostrata* subsp. *rostrata* (T – DRF), with all sites occurring within 400 metres of HP infrastructure (Appendix C). Three Low priority threatened flora sites also occur with one site identified for the conservation significant flora *Dodonaea amplisemina* (P4) and two sites identified for *Grevillea inconspicua* (P4) (Appendix C).

No potential ESA sites were recorded for the Denham network area (Figure 1.4).

The HP infrastructure at Exmouth (Figure 1.5) has two High priority sites, four Medium and three Low priority sites (Appendix C). One of the High priority sites is where a small section of HP infrastructure occurs within the Threatened Ecological Community (TEC) boundary (and buffer boundary) for ‘Camerons Cave Troglotic Community’ (CAMERON01). This TEC has a conservation ranking of Critically Endangered. The remaining High priority site occurs for the conservation significant flora location of *Acacia alexandri* (P3) which occurs within 50 metres of HP infrastructure (Appendix C). Four medium priority sites were identified for the conservation significant flora locations of *Acacia alexandri* (P3), *Daviesia pleurophylla* (P2), *Grevillea calcicola* (P3) and *Tinospora esiangkara* (P2) and three Low priority site identified for two locations of *Acacia alexandri* (P3) and one location of *Grevillea calcicola* (P3) (Appendix C).

Please note that due to vegetation maintenance activities that were proposed within the Exmouth HP network for October 2012, that this area has had its potential ESA sites assessed and signposted. The results of these surveys led to the following ESA sites being established (Appendix C):

- ESA HPF074 which incorporated one High priority, two Medium priority and one Low priority flora site.
- ESA HPC075 which incorporated one High priority Threatened ecological community site.
- ESA HPF076 was the result of surveying for a Low priority flora site but, locating another conservation significant flora under HP infrastructure at this location.

- ESA HPF077 was the result of surveying at Medium and Low priority flora site locations but locating another conservation significant flora under HP infrastructure and a new location of the species found at the Medium priority flora location.
- ESA HPF078 was an opportunistic site where one species of conservation significant flora was found under HP infrastructure whilst surveying suitable areas of habitat.
- ESA HPF079 was an opportunistic site where two species of conservation significant flora was found under HP infrastructure whilst surveying suitable areas of habitat.
- One Medium priority site was surveyed and no conservation significant flora were found under the line although, one conservation significant flora species was found in close proximity to HP infrastructure. This site was not signposted as an ESA.

The HP infrastructure at Gascoyne Junction (Figure 1.6) has one Medium priority site for the flora species *Rhodanthe ascendens* (P1) which occurs within 250 metres of HP infrastructure (Appendix C).

No potential ESA sites were recorded for the Laverton network area (Figure 1.7), Leonora network area (Figure 1.8), Meekatharra network area (Figure 1.9) and Menzies network area (Figure 1.10).

The HP infrastructure at Mount Magnet (Figure 1.11) has two Medium priority sites for the flora species *Stenanthemum mediale* (P1) which occurs within 400 metres of HP infrastructure and *Calytrix uncinata* (P3) which occurs within 80 of HP infrastructure (Appendix C).

No potential ESA sites were recorded for the Sandstone network area (Figure 1.12).

The HP infrastructure at Wiluna (Figure 1.13) has one High priority sites (Appendix C). This High priority sites is where a section of HP infrastructure occurs within the Priority Ecological Community (PEC) boundary for ‘Wiluna BF calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station (Wiluna BF Calcrete)’, (Site: Wiluna_BF) (Appendix C). It should be noted that HP infrastructure passes through the buffer boundary for the Priority Threatened Ecological Community ‘Uramurdah Lake calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station’ (Uramurdah Calcrete), (site: Uramurdah), but not within the PEC defined boundary. HP infrastructure occurs 150 metres to the west of this boundary and is not deemed an ESA site. Any future proposed works to the east of HP infrastructure at this location will require liaison with DEC.

The HP infrastructure at Yalgoo (Figure 1.14) has two High priority sites (Appendix C). One of these High priority sites occur where a large section of HP infrastructure occurs within the Priority Ecological Community (PEC) boundary and buffer area for ‘Yalgoo vegetation complexes (banded ironstone formation) (Yalgoo BIF)’, (Site: Yalgoo 1). The other High priority site is where HP infrastructure occurs within the Priority Ecological Community (PEC) buffer boundary and touches the boundary for ‘Wagga Wagga and Yalgoo calcrete groundwater assemblage type on Yalgoo palaeodrainage on Wagga Wagga

Station and Moore Palaeodrainage on Yoweragabbie Station (Wagga Wagga and Yalgoo Calcrete)', (Site: Wagga Wagga) (Appendix C).

Please note that due to vegetation maintenance activities that were proposed within the Yalgoo HP network for October 2012, that this area has had its potential ESA sites assessed and signposted. The results of these surveys led to the following ESA sites being established (Appendix C):

- ESA HPC 080 was established for the PEC 'Yalgoo vegetation complexes (banded ironstone formation)'.
- The other remaining High priority site for the PEC 'Wagga Wagga and Yalgoo calcrete groundwater assemblage type on Yalgoo palaeodrainage on Wagga Wagga Station and Moore Palaeodrainage on Yoweragabbie Station' was assessed with the area surveyed and found to occur on cleared road verge with no HP network occurring within the PEC and hence it was not deemed an ESA.

There is the potential for a number of ESA sites within the Gascoyne/Midwest Region to be combined as single ESA sites due to their close proximity and hence the overall number of ESAs could be less than the total number suggested.

During the establishment of High Priority sites, it is suggested that to reduce site visitation that all other categories of potential ESA sites (Medium & Low) are surveyed during on-site visits to these locations. This has the potential to reduce the overall number of ESA sites to be established and reduce the number of site visits. This is also the case for Medium Priority sites that have the potential to have Low Priority sites in close proximity.

It is recommended that HP investigate and conduct field assessments of potentially High Priority ESA sites as a priority, and develop procedures for ESA sites similar to that of Western Power. Potential sites of lower category should be investigated following the completion of the assessment of the potentially High Priority ESA sites and where possible fieldwork for lower priority sites that occur in areas where High priority sites occur should be conducted concurrently to decrease overall time conducting survey and ground truthing and also to reduce costs involved with surveying.

Regular review of ESA site details for currency - particularly conservation significant flora species should be conducted using *Florabase* (DEC 2012c) as this site issue conservation status and even taxonomic identity can change over time. Regular review of ESA site details for currency – particularly Threatened and Priority Ecological communities should be conducted by using publicly available lists that are provided by the DEC on the WA Threatened Ecological Communities site (DEC 2012e, DEC 2012f).

5 REFERENCES

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Legend
 Horizon Power Network Locality



This map should only be used in conjunction with WEC report HP12-42-01.

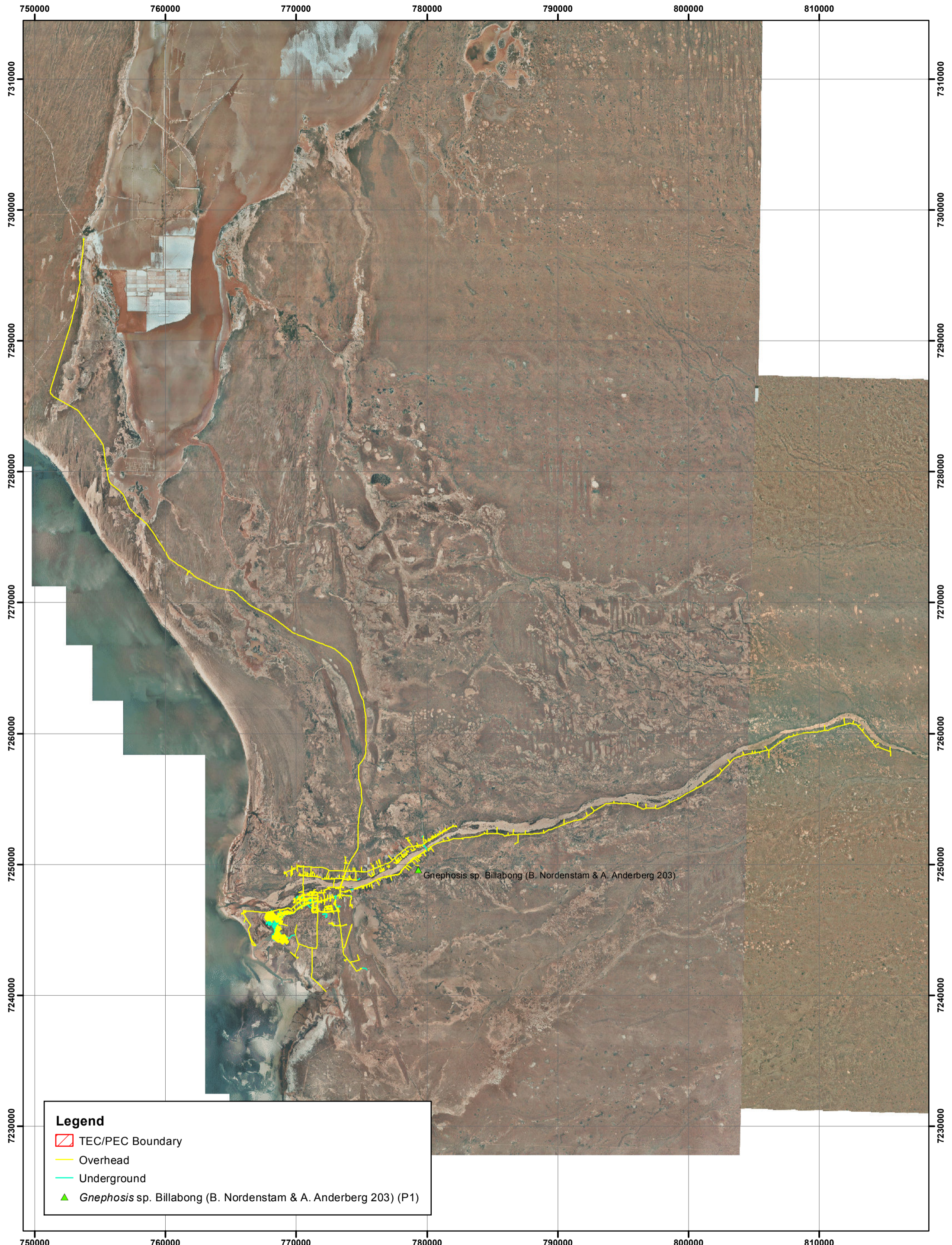


**Gascoyne/Midwest
 Environmentally Sensitive Areas
 Overview – Distribution Network – Locality**

Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Locality.mxd
Scale: 1:5,000,000 (A3) Grid: MGA Zn 50

**Figure
 1.0**



Legend

- TEC/PEC Boundary
- Overhead
- Underground
- Gnephosis* sp. Billabong (B. Nordenstam & A. Anderberg 203) (P1)



This map should only be used in conjunction with WEC report HP12-42-01.



**Gascoyne/Midwest
Environmentally Sensitive Areas
Carnarvon**




Revision: B - February 2012

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Carnarvan.mxd
Scale: 1:250,000 (A3) Grid: MGA Zone 49

**Figure
1.1**



Legend

-  TEC/PEC Boundary
-  Overhead
-  Underground



This map should only be used in conjunction with WEC report HP12-42-01.



**Gascoyne/Midwest
Environmentally Sensitive Areas
Coral Bay**

Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Coral-Bay.mxd
Scale: 1:10,000 (A3) Grid: MGA Zone 49

**Figure
1.2**

590000

595000

600000

6975000

6975000

6970000

6970000

6965000

6965000

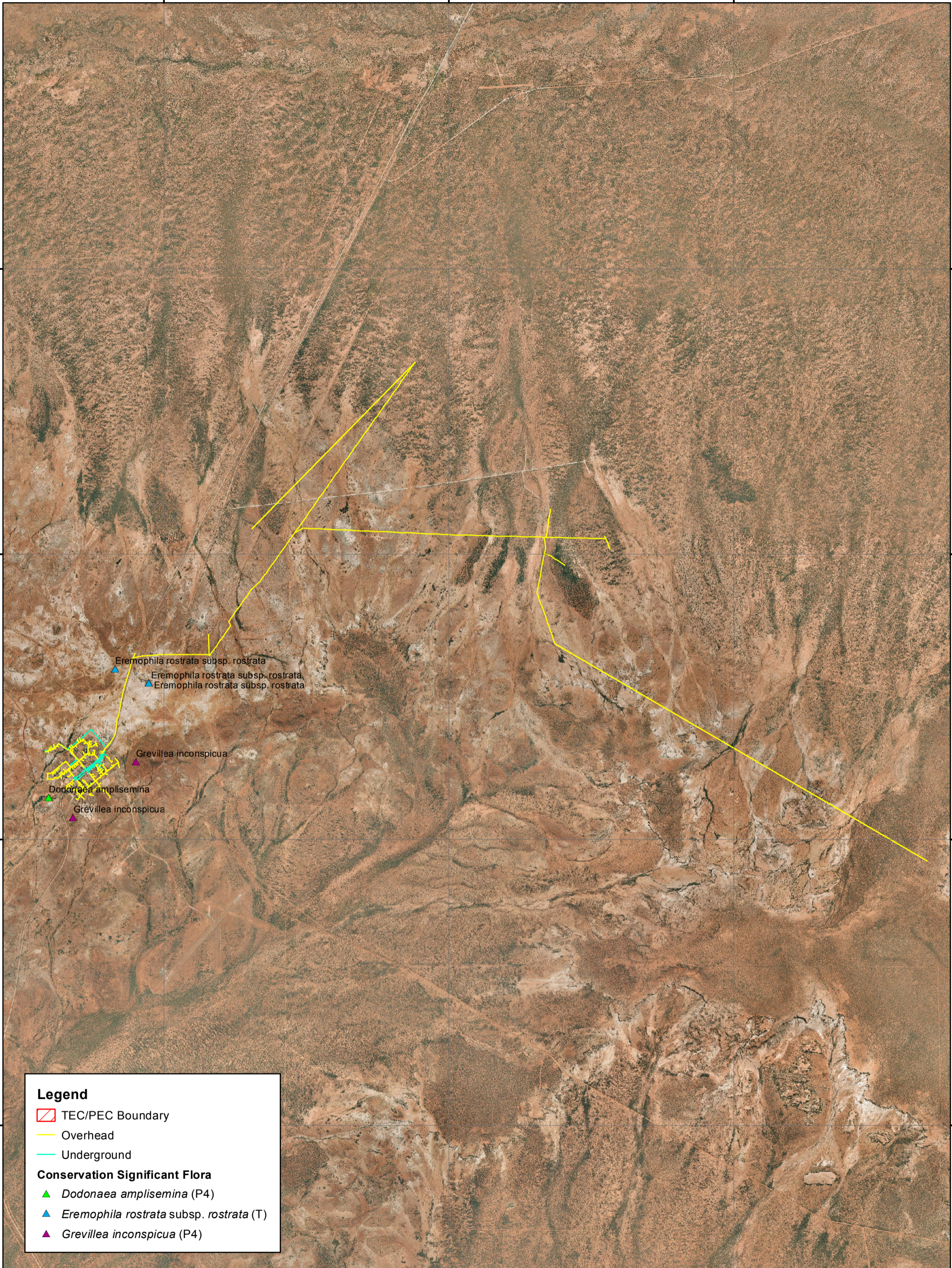
6960000

6960000




590000

595000




600000



Legend




-  TEC/PEC Boundary
-  Overhead
-  Underground

Conservation Significant Flora

-  *Dodonaea amplisemina* (P4)
-  *Eremophila rostrata* subsp. *rostrata* (T)
-  *Grevillea inconspicua* (P4)



Legend

-  TEC/PEC Boundary
-  Overhead
-  Underground



This map should only be used in conjunction with WEC report HP12-42-01.

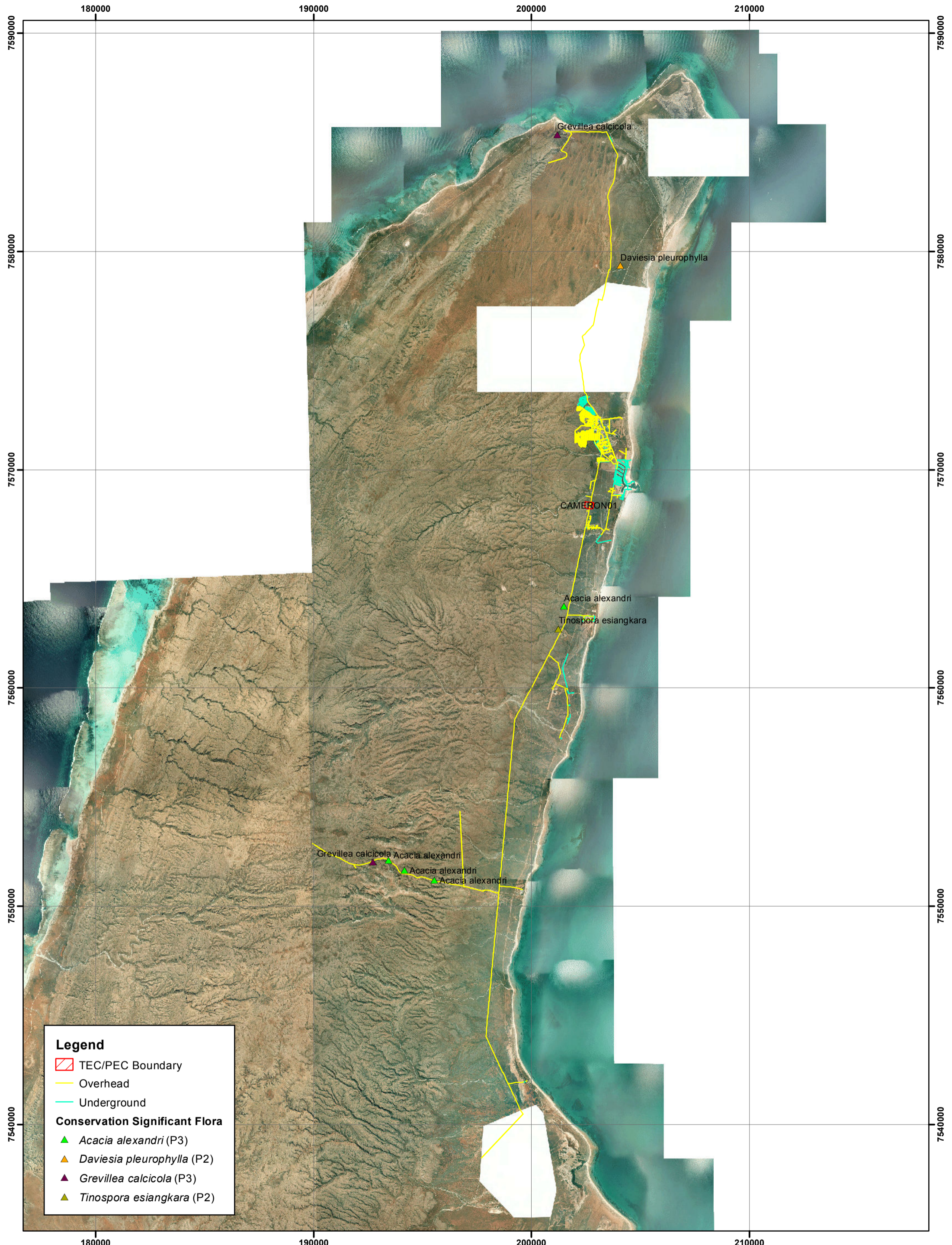


**Gascoyne/Midwest
Environmentally Sensitive Areas
Denham**

Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Denham.mxd
Scale: 1:12,500 (A3) Grid: MGA Zone 49

**Figure
1.4**



Legend

- TEC/PEC Boundary
- Overhead
- Underground

Conservation Significant Flora

- Acacia alexandri* (P3)
- Daviesia pleurophylla* (P2)
- Grevillea calcicola* (P3)
- Tinospora esiangkara* (P2)



This map should only be used in conjunction with WEC report HP12-42-01.

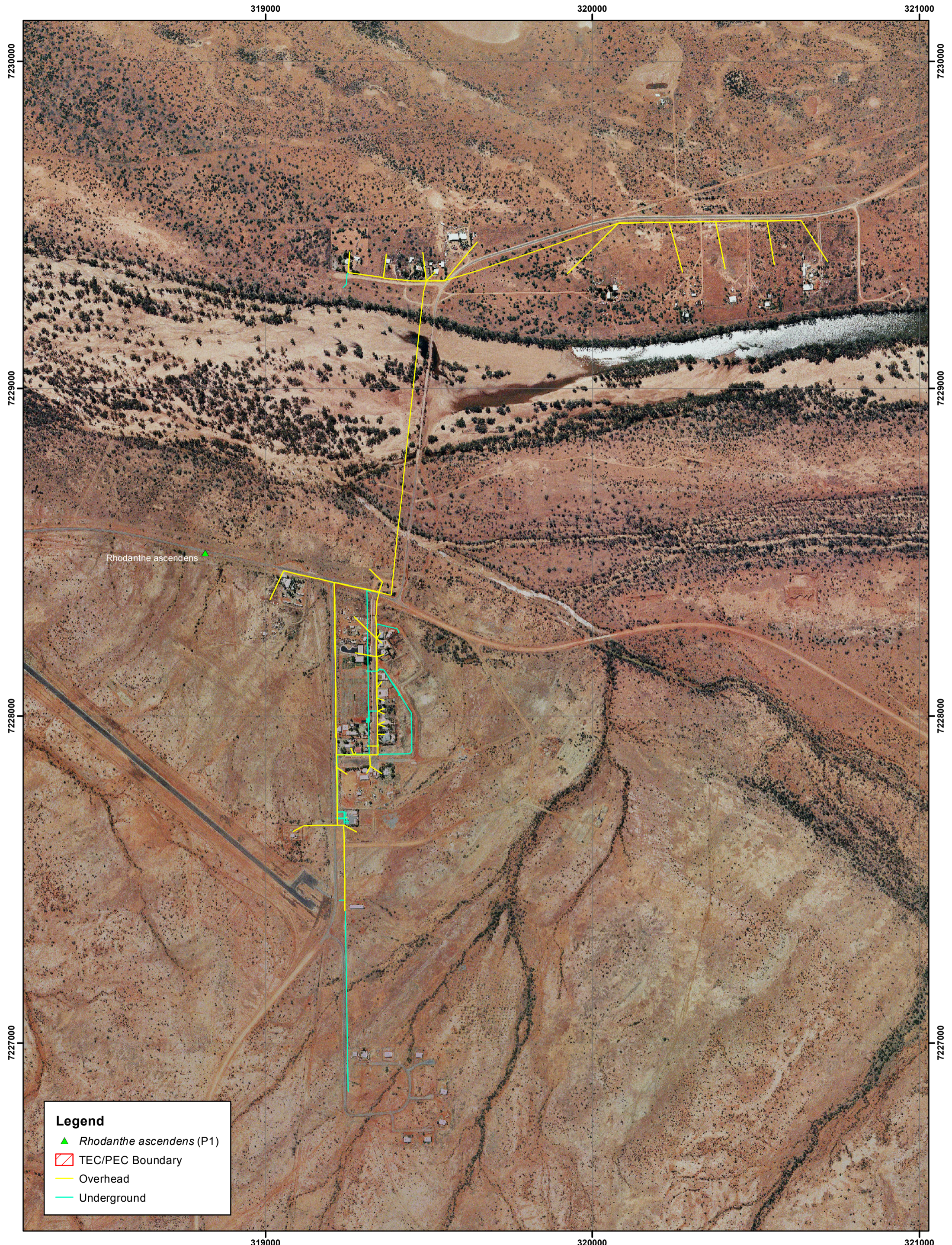


**Gascoyne/Midwest
Environmentally Sensitive Areas
Exmouth**

Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Exmouth.mxd
Scale: 1:150,000 (A3) Grid: MGA Zone 50

**Figure
1.5**



Legend

- ▲ *Rhodanthe ascendens* (P1)
- TEC/PEC Boundary
- Overhead
- Underground



This map should only be used in conjunction with WEC report HP12-42-01.

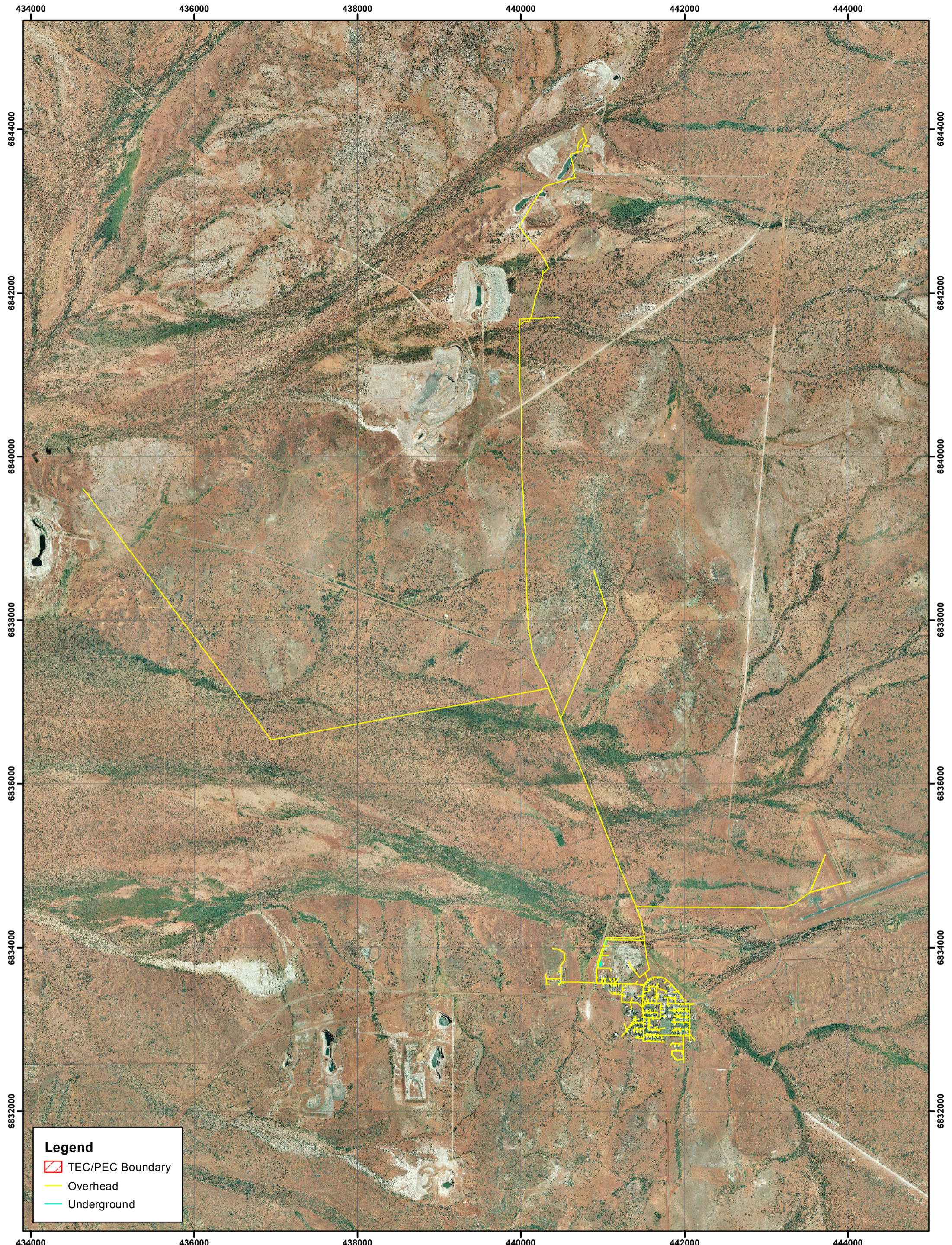


**Gascoyne/Midwest
Environmentally Sensitive Areas
Gascoyne Junction**




Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Gasoyne.mxd
Scale: 1:10,000 (A3) Grid: MGA Zone 50

**Figure
1.6**



Legend

-  TEC/PEC Boundary
-  Overhead
-  Underground



This map should only be used in conjunction with WEC report HP12-42-01.

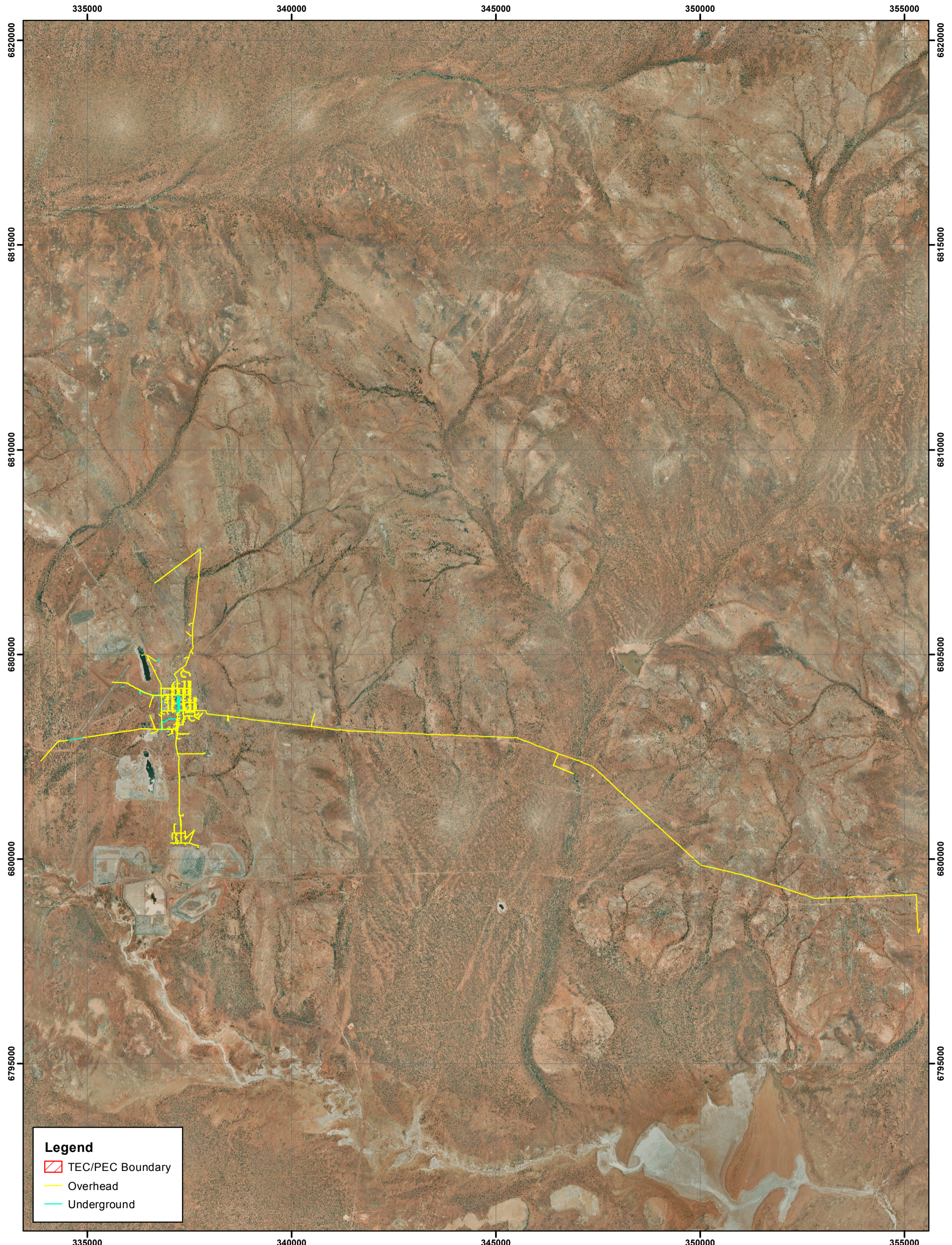


**Gascoyne/Midwest
Environmentally Sensitive Areas
Laverton**




Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Laverton.mxd
Scale: 1:40,000 (A3) Grid: MGA Zone 51

**Figure
1.7**



Legend

-  TEC/PEC Boundary
-  Overhead
-  Underground



This map should only be used in conjunction with WEC report HP12-42-01.



**Gascoyne/Midwest
Environmentally Sensitive Areas
Leonora**

Revision: B - February 2013




Author: Kim Kershaw
 WEC Ref: HP12-42-01
 Filename: HP12-42-01-Leonora.mxd

Scale: 1:80,000 (A3) Grid: MGA Zone 51

**Figure
1.8**



Legend

-  TEC/PEC Boundary
-  Overhead
-  Underground



This map should only be used in conjunction with WEC report HP12-42-01.

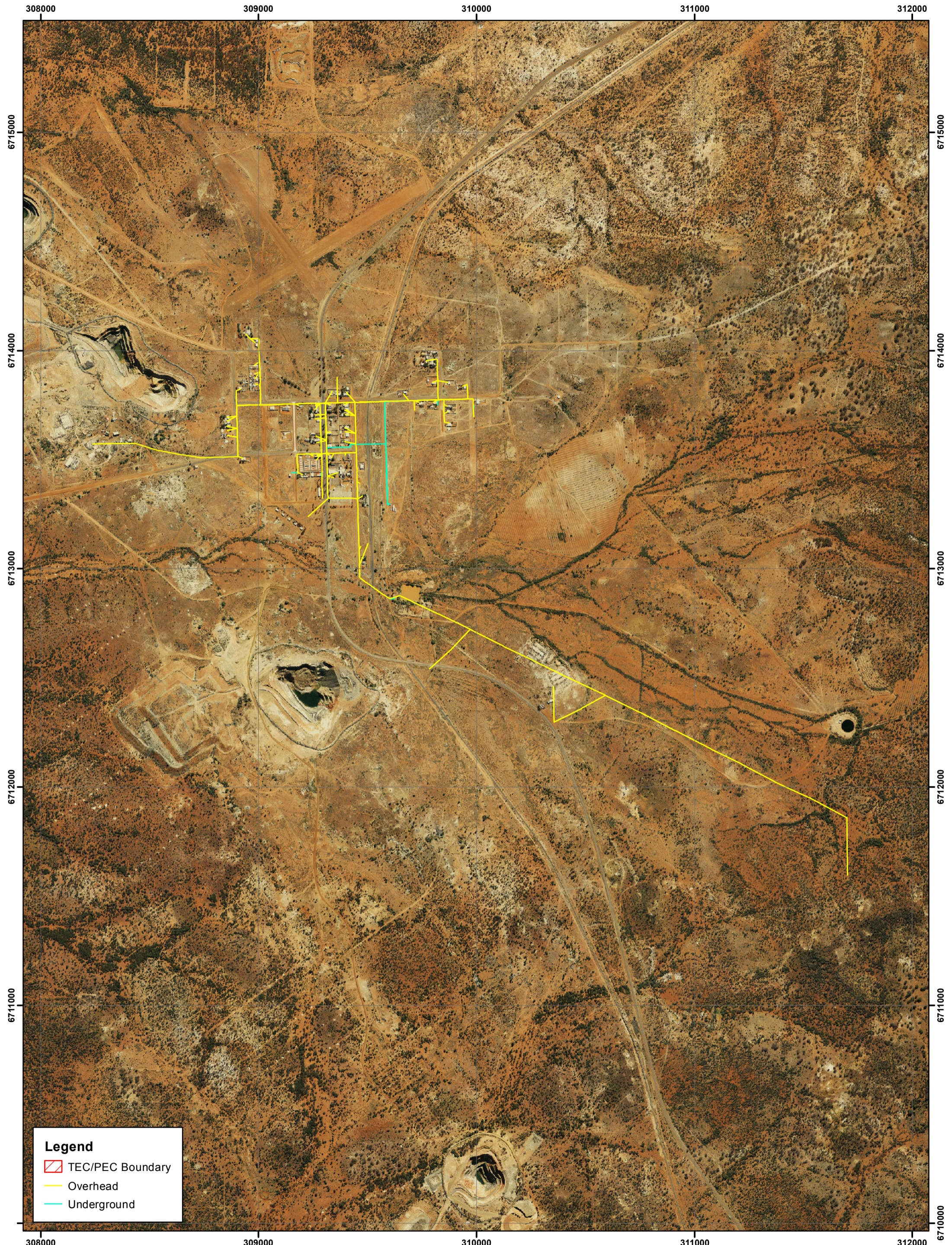


**Gascoyne/Midwest
Environmentally Sensitive Areas
Meekatharra**

Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Meekatharra.mxd
Scale: 1:50,000 (A3) Grid: MGA Zone 50

**Figure
1.9**



Legend

- TEC/PEC Boundary
- Overhead
- Underground



This map should only be used in conjunction with WEC report HP12-42-01.



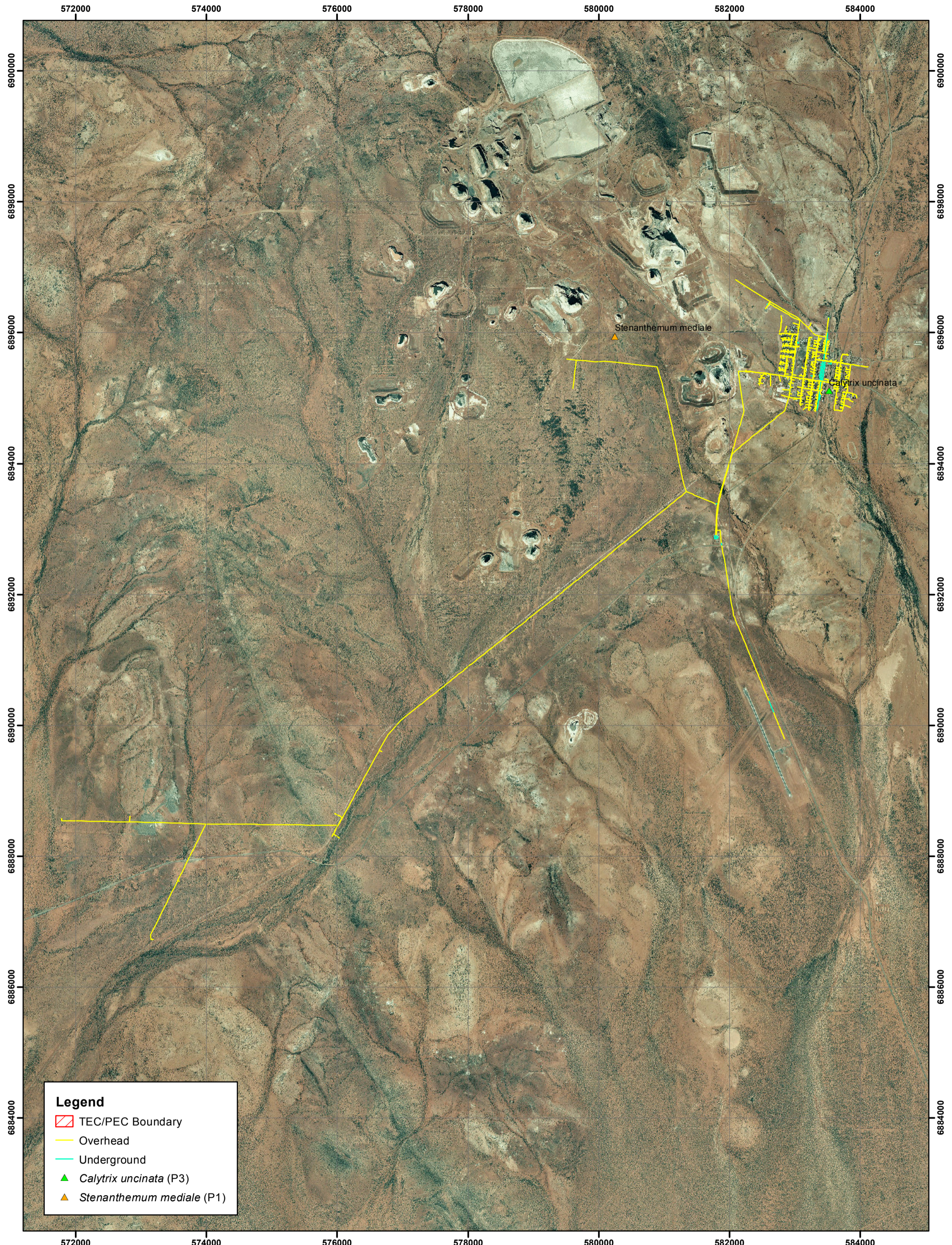
**Gascoyne/Midwest
Environmentally Sensitive Areas
Menzies**

Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Menzies.mxd

Scale: 1:15,000 (A3) Grid: MGA Zone 51

**Figure
1.10**



Legend

- TEC/PEC Boundary
- Overhead
- Underground
- Calytrix uncinata* (P3)
- Stenanthemum mediale* (P1)



This map should only be used in conjunction with WEC report HP12-42-01.

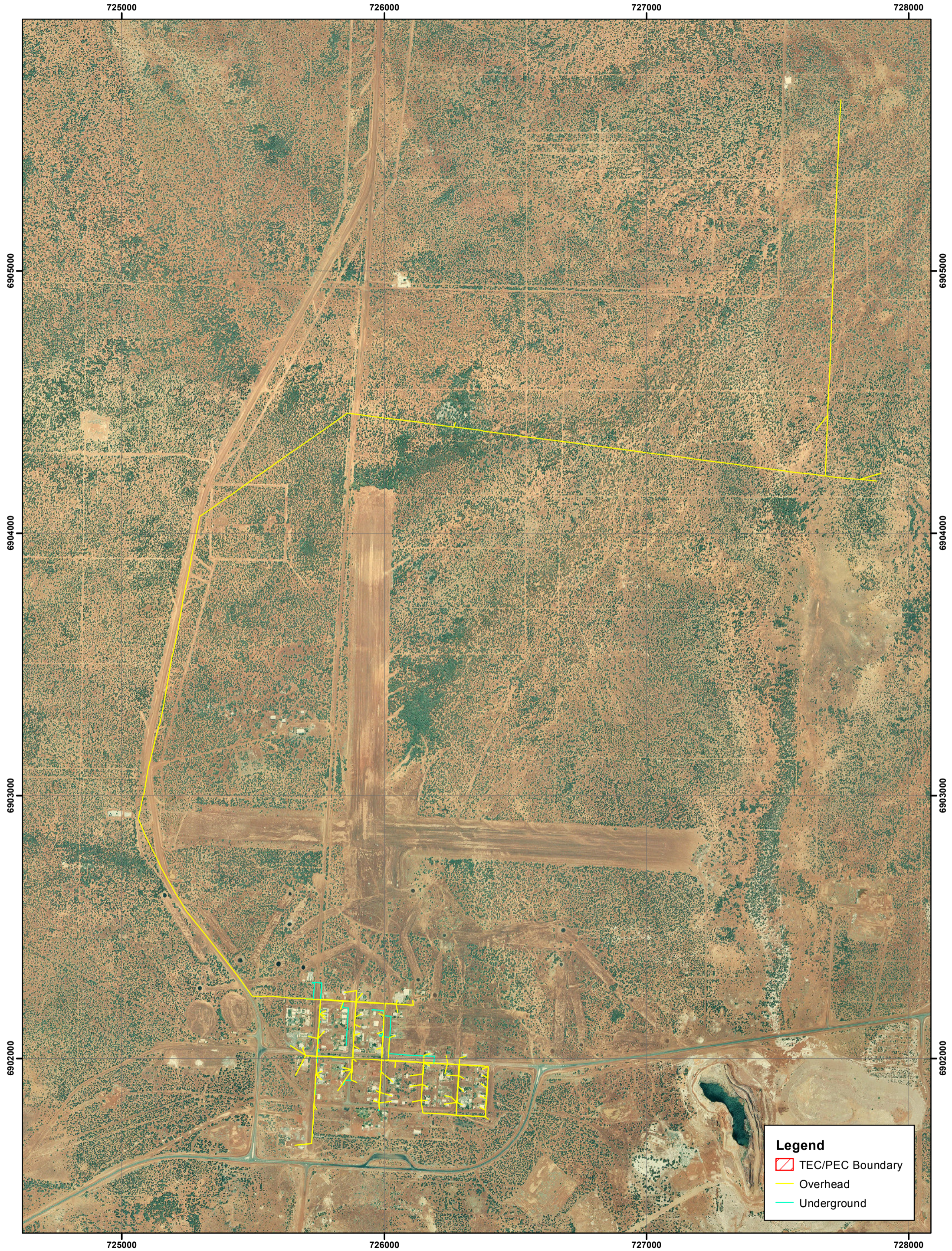


**Gascoyne/Midwest
Environmentally Sensitive Areas
Mount Magnet**




Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Mt-Magnet.mxd
Scale: 1:50,000 (A3) Grid: MGA Zone 50

**Figure
1.11**



Legend

-  TEC/PEC Boundary
-  Overhead
-  Underground



This map should only be used in conjunction with WEC report HP12-42-01.



**Gascoyne/Midwest
Environmentally Sensitive Areas
Sandstone**

Revision: B - February 2013

Author: Kim Kershaw
WEC Ref: HP12-42-01
Filename: HP12-42-01-Sandstone.mxd

Scale: 1:12,500 (A3) Grid: MGA Zone 50

**Figure
1.12**



Legend

- TEC/PEC Boundary
- Overhead
- Underground



This map should only be used in conjunction with WEC report HP12-42-01.



**Gascoyne/Midwest
Environmentally Sensitive Areas
Wiluna**

Revision: B - February 2013

Author: Kim Kershaw
 WEC Ref: HP12-42-01
 Filename: HP12-42-01-Wiluna.mxd

Scale: 1:50,000 (A3) Grid: MGA Zone 51

**Figure
1.13**

468000

470000

472000

6870000

6870000

6868000

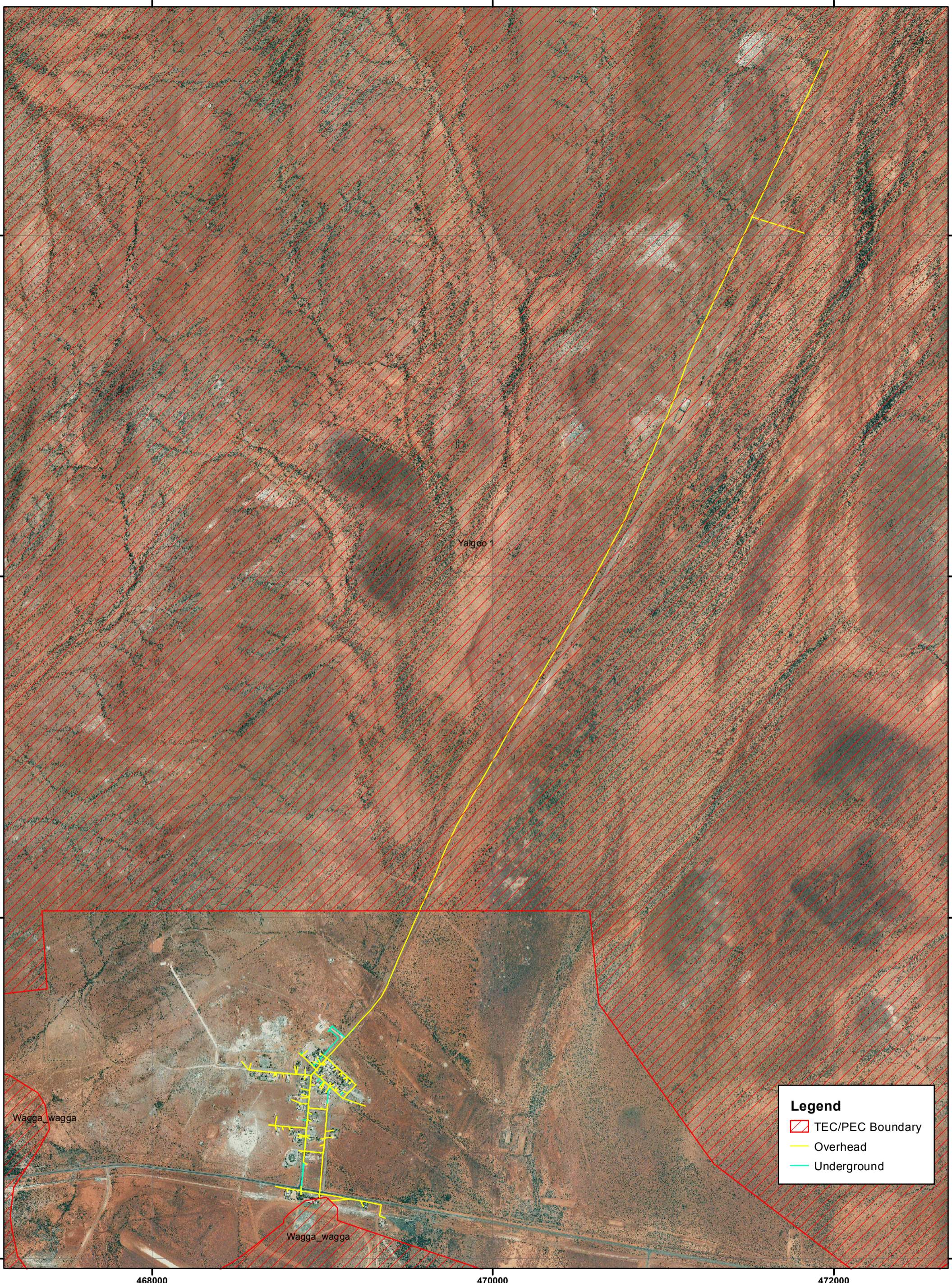
6868000

6866000




6866000

6864000

6864000



Legend

-  TEC/PEC Boundary
-  Overhead
-  Underground



This map should only be used in conjunction with WEC report HP12-42-01.



**Gascoyne/Midwest
Environmentally Sensitive Areas
Yalgoo**

Revision: B - February 2013

Author: Kim Kershaw
 WEC Ref: HP12-42-01
 Filename: HP12-42-01-Yalgoo.mxd
 Scale: 1:20,000 (A3) Grid: MGA Zone 50

**Figure
1.14**

Appendix A: Conservation Codes for Western Australian Flora (Smith 2012)

Under the Wildlife Conservation Act, the Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection. Schedules 1 and 2 deal with those that are threatened and those that are presumed extinct, respectively.

T: Threatened Flora (Declared Rare Flora – Extant)

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the Wildlife Conservation Act 1950).

Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List Criteria:

- CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild
- EN: Endangered – considered to be facing a very high risk of extinction in the wild
- VU: Vulnerable – considered to be facing a high risk of extinction in the wild

X: Presumed Extinct Flora (Declared Rare Flora – Extinct)

Taxa that have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the Wildlife Conservation Act 1950).

Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora List under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Taxa that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

1: Priority One – Poorly-known Taxa

Taxa that are known from one or a few collections or sight records (generally less than 5), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

2: Priority Two – Poorly-known Taxa

Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc.

Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

3: Priority Three – Poorly-known Taxa

Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

4: Priority Four – Rare, Near Threatened and other taxa in need of monitoring

1. **Rare.** Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands

2. **Near Threatened.** Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

3. Taxa that have been removed from the list of threatened species during the past 5 years for reasons other than taxonomy.

5: Priority 5 – Conservation Dependent Taxa

Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within 5 years.

Appendix B: Definitions, Categories and Criteria for Threatened Ecological Communities and Priority Ecological Communities (Department of Environment and Conservation 2010)

2: Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities

Presumed Totally Destroyed (PD)

An ecological community which has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant **and either** of the following applies (A or B):

- A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats **or**
- B) All occurrences recorded within the last 50 years have since been destroyed

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

An ecological community will be listed as **Critically Endangered** when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting **any one or more of** the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii):
 - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);
 - ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.

- B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii):
- i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);
 - ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;
 - iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.
- C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B, or C):

- A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement **and either or both** of the following apply (i or ii):
- i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);
 - ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

- B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii):
- i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);
 - ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;
 - iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.
- C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long term future. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B or C):

- A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
- B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
- C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

3: Definitions and Criteria for Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent Ecological communities are placed in Priority 5.

Priority One: Poorly-Known ecological communities

Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences are a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-Known ecological communities

Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly-Known ecological communities

- (i.) Communities that are known from several to many occurrences, a significant number of area of which are not under threat of habitat destruction or degradation or;
- (ii.) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under immediate threat, or;
- (iii.) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Poorly-Known ecological communities

Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

- (a) Rare. Ecological communities known from a few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close for qualifying for Vulnerable.
- (c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation-Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix C: Potential Environmentally Sensitive Area (ESA) Sites for the Gascoyne/Midwest Region

Type	Population ID	Environmental Issue: Community Name (TEC/PEC) / Taxa	Conservation code	PICK_ID	Distance (m)	Comments	Priority category
TPFL	92191	Gnephosis sp. Billabong (B. Nordenstam & A. Anderberg 203)	P1	514098	299		Medium
TPFL	104647	Eremophila rostrata subsp. rostrata	T	659164	249		High
TPFL	104641	Eremophila rostrata subsp. rostrata	T	1033285	394		High
TPFL	104642	Eremophila rostrata subsp. rostrata	T	1033285	394		High
TPFL	85598	Grevillea inconspicua	P4	1033616	270		Low
TPFL	85597	Grevillea inconspicua	P4	1033625	312		Low
TPFL	96024	Dodonaea amplisemina	P4	1035525	274		Low
TPFL	85458	Grevillea calcicola	P3	201708	380	Adjacent ESA HPF076	Low
TPFL	92194	Daviesia pleurophylla	P2	201623	466	No ESA established	Medium
TPFL	101532	Acacia alexandri	P3	302977	225	Adjacent ESA HPF077	Low
TPFL	93916	Tinospora esiangkara	P2	302808	184	Adjacent ESA HPF077	Medium
TPFL	85455	Grevillea calcicola	P3	1015694	54	ESA HPF074	Medium
TPFL	90694	Acacia alexandri	P3	1015651	58	ESA HPF074	Medium
TPFL	90691	Acacia alexandri	P3	1015647	201	ESA HPF074	Low
TPFL	90693	Acacia alexandri	P3	1015642	49	ESA HPF074	High
TEC	CAMERON01	Camerons Cave Troglitic Community	Critically Endangered	254	intersects	Line goes through boundary, within buffer, ESA HPC075	High
TPFL	90941	Rhodanthe ascendens	P1	194819	246		Medium
TPFL	93191	Stenanthemum mediale	P1	654882	395		Medium
WEC		Calytrix uncinata	P3		79	WaHerb record	Medium
PEC	Wiluna_BF	Wiluna BF calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station	P1	3388	intersects	Line goes through boundary, line within buffer	High
PEC	Yalgoo 1	Yalgoo vegetation complexes (banded ironstone formation)	P1	2590	intersects	Line goes through boundary, line with buffer	High
PEC	Wagga_wagga	Wagga Wagga and Yalgoo calcrete groundwater assemblage type on Yalgoo palaeodrainage on Wagga Wagga Station and Moore Palaeodrainage on Yoweragabbie Station	P1	3387	intersects	Line goes through buffer, close to boundary	Touches boundary - High