
FLORA & VEGETATION ASSESSMENT

EARL GREY LITHIUM PROJECT

MODIFIED GREAT EASTERN HIGHWAY PIPELINE ALIGNMENT AND BOOSTER STATION ACCESS AREAS

WATER PIPELINE ALIGNMENT SUPPLEMENTARY REPORT

Prepared By



Mattiske Consulting Pty Ltd

Prepared For

Covalent Lithium Pty Ltd

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TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	2
1. INTRODUCTION.....	3
1.1 Location and Scope of Project	3
1.2 Environmental Legislation and Guidelines	3
2. OBJECTIVES.....	4
3. METHODS.....	4
3.1 Field Survey.....	4
3.2 Vegetation descriptions.....	8
4. FIELD SURVEY RESULTS	9
4.1 Climate.....	9
4.2 Field Survey Coverage, Limitations and Constraints	9
4.3 Great Eastern Highway modified pipeline alignment survey area.....	11
4.4 Booster Station access survey area	13
4.6 Condition of the Vegetation.....	15
5. DISCUSSION AND CONCLUSION	16
6. PERSONNEL	16
7. REFERENCES.....	17

TABLES

- 1: Potential flora and vegetation survey limitations for the Great Eastern Highway modified pipeline alignment and booster station access survey areas
- 2: Booster Station access vegetation assessment quadrat data

FIGURES

- 1: Water Pipeline Locality
- 2: Great Eastern Highway survey area detail
- 3: Booster Station access survey area detail
- 4: Rainfall and temperature data for Southern Cross Airfield

PLATES

- 1: Photograph of modified Great Eastern Highway pipeline alignment survey area (PS1)
- 2: Photograph of modified Great Eastern Highway pipeline alignment survey area (PS2)
- 3: Photograph of modified Great Eastern Highway pipeline alignment survey area (PS3)
- 4: Representative photograph of booster station access vegetation quadrat

LIST OF ABBREVIATIONS

- BAM Act:** *Biosecurity and Agriculture Management Act 2007 (WA)*
- BC Act:** *Biodiversity Conservation Act 2016 (WA)*
- BOM:** Bureau of Meteorology
- Covalent** Covalent Lithium Pty Ltd
- EGLP** Earl Grey Lithium Project
- EP Act:** *Environmental Protection Act 1986 (WA)*
- EPA:** Environmental Protection Authority
- ESCAVI** Executive Steering Committee for Australian Vegetation Information
- IBRA:** Interim Biogeographical Regionalisation for Australia
- Mattiske Consulting** Mattiske Consulting Pty Ltd
- NVIS** National Vegetation Information System
- PEC:** Priority ecological community
- TEC:** Threatened ecological community
- WAH:** Western Australian Herbarium (PERTH)

EXECUTIVE SUMMARY

Mattiske Consulting Pty Ltd was engaged in September 2020 by Covalent Lithium Pty Ltd to undertake a reconnaissance flora and vegetation assessment of two locations associated with the proposed Moorine Rock to Earl Grey Lithium Project water pipeline alignment. Mattiske Consulting Pty Ltd completed a reconnaissance survey of the water pipeline alignment in March 2020, the results of which have been reported.

The first survey location was a 0.7487 ha area for a modification to the water pipeline alignment along the Great Eastern Highway, located approximately 1.3 km west of the town of Moorine Rock. The second location, an access area to a booster station, was a 0.5342 ha area situated approximately 65 km south of Moorine Rock along the Southern Cross South Road on the edge of cleared agricultural lands. The scope of the survey was to undertake a reconnaissance flora and vegetation survey of the two areas to identify any potential flora and vegetation values which may act as constraints on development, and thus enable appropriate mitigation measures to be planned.

The survey was undertaken during the optimum time of year for surveys in the Avon Wheatbelt, Mallee, and Coolgardie bioregions, and whilst rainfall in the months preceding the survey was 80% of the long term average, this did not have a detrimental effect on the presence of annual species. The survey was not subject to constraints which would materially affect the outcomes of the survey nor the conclusions formed.

No threatened flora or priority taxa were recorded within either the modified water pipeline alignment or booster station access survey areas. Potential conservation significant species which may be present had been identified during the desktop assessment completed for the water pipeline corridor reconnaissance survey in March 2020. None of these species, nor any other suspected conservation significant flora were recorded during the present survey. This was consistent with the results of the original water pipeline corridor reconnaissance survey undertaken in March 2020.

Both the modified water pipeline alignment and booster station access survey areas were in a poor to degraded condition, as a result of a combination of historical land clearing practices and the presence of introduced species. The portion of the modified water pipeline alignment situated on the northern side of the Great Eastern Highway, which was originally part of a railway track sub-structure, was completely degraded.

Given the absence of conservation significant flora, and the degraded to poor condition of the vegetation at both survey areas, there are no concerns with respect to the flora and vegetation values at both locations in respect of infrastructure placement.

1. INTRODUCTION

In February 2020 Mattiske Consulting Pty Ltd (Mattiske Consulting) was engaged by Covalent Lithium Pty Ltd (Covalent) to undertake a reconnaissance survey of the flora and vegetation within a proposed water pipeline corridor which would provide for the supply of potable water from the Goldfields Water Supply Pipeline near Moorine Rock, to the Earl Grey Lithium Project (EGLP) located approximately 130 km to the south-east of Moorine Rock. The results of this survey, which was completed in March 2020, have been reported (Mattiske Consulting 2020).

Since the completion of the March 2020 reconnaissance survey there have been some modifications to the pipeline alignment which have necessitated an additional supplementary survey. These modifications are: (1) a small alteration to the original pipeline route where it crosses the Great Eastern Highway west of the town of Moorine Rock to connect to a proposed pump station, and (2) the need to construct an access route to a booster station from the pipeline alignment along the Southern Cross South Road, approximately 65 km south of the town of Moorine Rock. In September 2020, Covalent engaged Mattiske Consulting to undertake a supplementary survey of the two additional areas along the water pipeline alignment.

This report should be read in conjunction with the Water Pipeline Alignment survey report (Mattiske Consulting 2020).

1.1 Location and Scope of Project

The proposed water pipeline alignment and its regional setting have been described in Mattiske Consulting (2020). Figure 1 shows the project area locality and the positions of the survey areas relevant to the current survey.

The modified pipeline alignment survey area (Figure 2), located adjacent to the Great Eastern Highway, approximately 1.3 km to the west of the town of Moorine Rock, occupies an area of 0.7487 ha. The booster station access survey area (Figure 3), which is located in the roadside reserve on the western side of the Southern Cross South Road, is approximately 65 km along the pipeline alignment from its origin, and occupies an area of 0.5342 ha.

The scope of the survey was to undertake a reconnaissance flora and vegetation survey of the two areas to identify any potential flora and vegetation values which may act as constraints on development, and thus enable appropriate mitigation measures to be planned.

1.2 Environmental Legislation and Guidelines

The following key Commonwealth (federal) legislation relevant to this survey is the:

- *Environment Protection and Biodiversity Conservation Act 1999.*

The following key Western Australian (state) legislation relevant to this survey include the:

- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act);
- *Environmental Protection Act 1986* (EP Act); and

Furthermore, key Western Australian guidelines relevant to this survey are the:

- *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority [EPA] 2016a); and

- *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b).

2. OBJECTIVES

The aim of this survey was to complete a reconnaissance flora and vegetation survey of two areas of land which form the modifications to the pipeline alignment near the Great Eastern Highway near Moorine Rock and the access route from the pipeline alignment to the booster station located along the Southern Cross South Road. Specifically, the objectives included:

- Record visual observations on the fire regimes, grazing pressures and overall health of the vegetation to allow for an assessment of the overall condition of the flora and vegetation within the survey area;
- Assess the status of any potentially conservation significant ecological communities;
- Undertake botanical data collection in quadrats or relevés that are representative of any potentially conservation significant ecological communities;
- Define any management issues related to flora and vegetation values;
- Provide recommendations on the local and regional significance of the vegetation communities; and,
- Prepare a report summarising the findings.

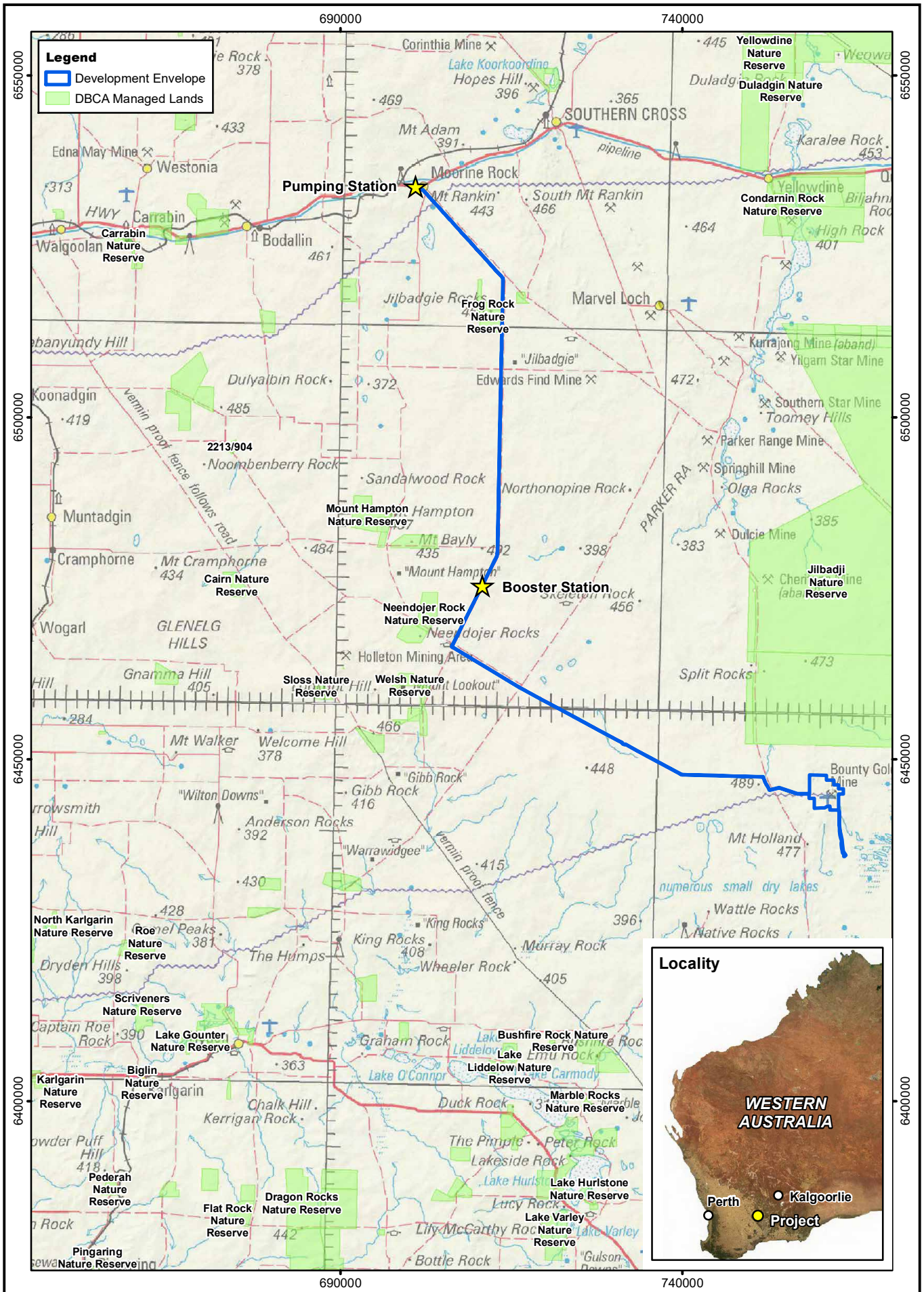
3. METHODS

The boundaries of the modified pipeline alignment along the Great Eastern Highway and the access area to the booster station along the Southern Cross South Road were supplied by Covalent. The reconnaissance survey was completed to the standards set out in *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016b) and *Environmental Factor Guideline: Flora and Vegetation* (EPA 2016a).

3.1 Field Survey

The Reconnaissance flora and vegetation assessment of both survey areas (Figures 2 and 3) was undertaken by two experienced botanists from Mattiske Consulting on the 7th September 2020. Both botanists held valid collection licenses to collect flora for scientific purposes, issued under Regulation 62 of the *Biodiversity Conservation Regulations 2018*. Additionally, one botanist held a valid permit to take Declared Rare Flora, issued under Section 40 of the BC Act.

During the field survey, botanists had access to all relevant data in the Esri iOS application, Collector for ArcGIS on Apple iPads (provided and maintained by CAD Resources). Data layers accessible in the field included the survey area boundary, locations of all known conservation significant flora from both historical and contemporary surveys, TEC buffer polygons and aerial imagery acquired by CAD Resources. One vegetation survey quadrat was established in the roadside vegetation which forms the proposed access area to the booster station along the Southern Cross South Road. (Figure 3). Both survey areas were traversed on foot to determine if any conservation significant flora were present.

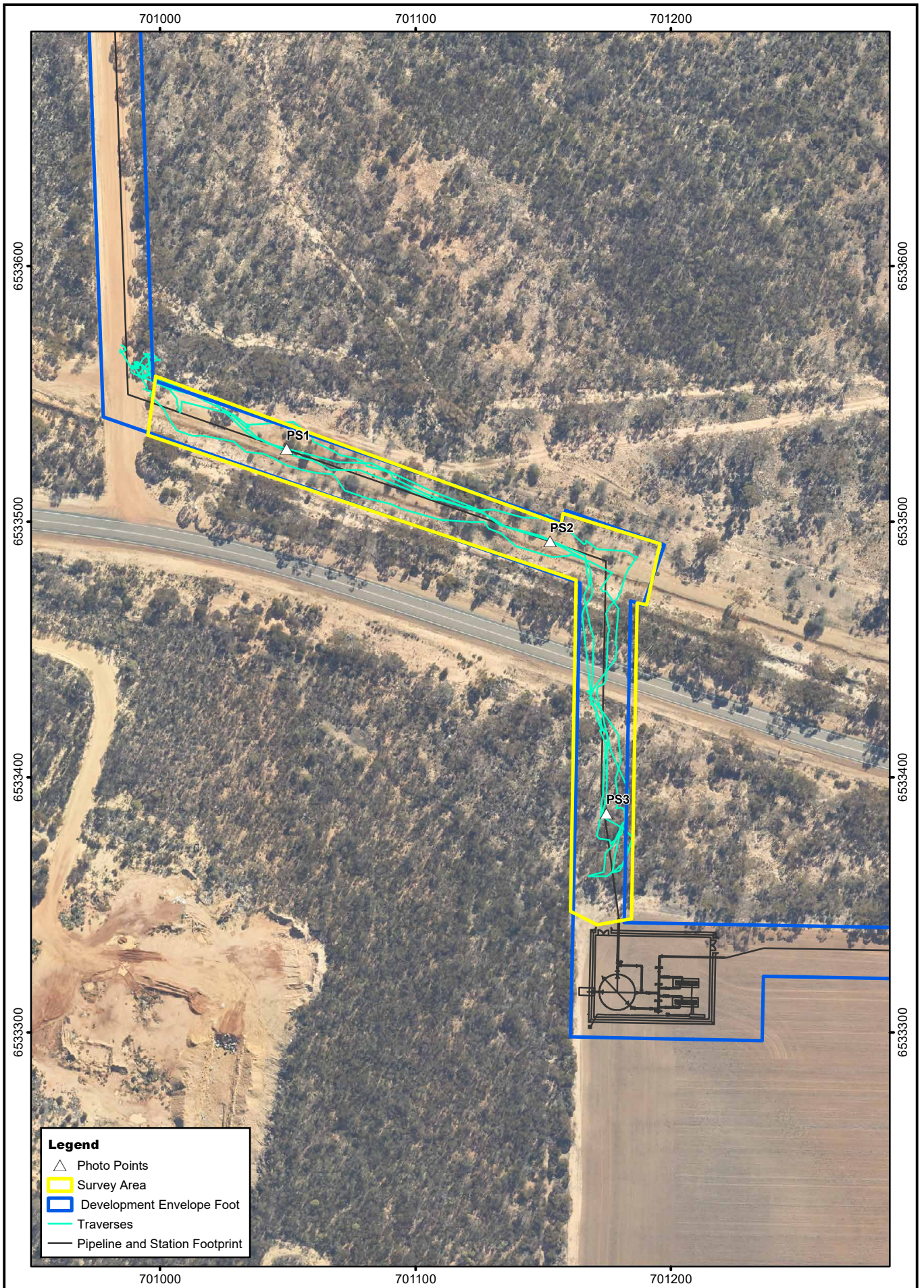


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Covalent Lithium Pty Ltd
Earl Grey Lithium Project
 Project Area Locality

Figure:
1



Legend

- △ Photo Points
- ▭ Survey Area
- ▭ Development Envelope Foot
- Traverses
- Pipeline and Station Footprint

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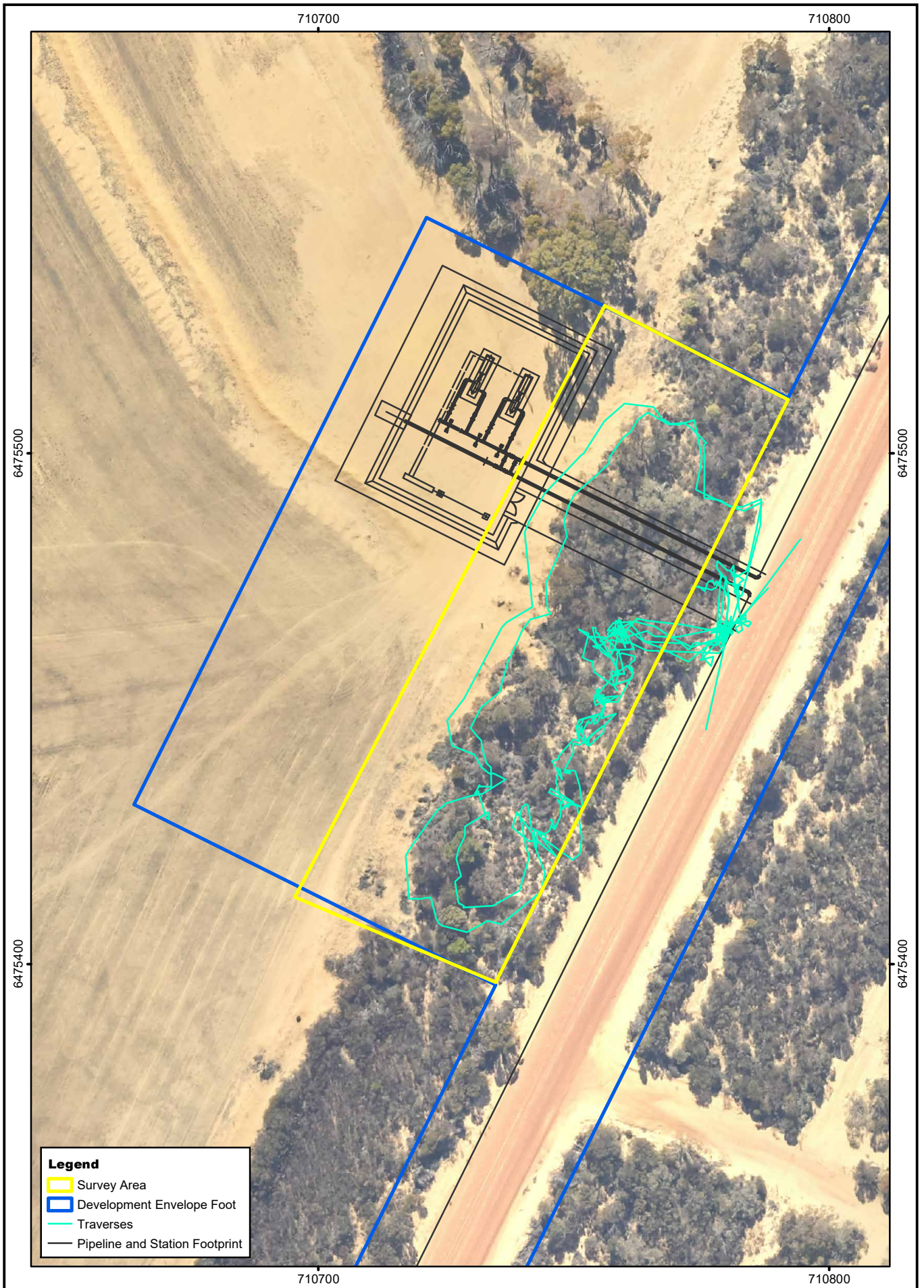
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Covalent Lithium Pty Ltd
Earl Grey Lithium Project
 Great Eastern Highway Survey Area

Figure:
2



- Legend**
- Survey Area
 - Development Envelope Foot
 - Traverses
 - Pipeline and Station Footprint

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Covalent Lithium Pty Ltd
Earl Grey Lithium Project
 Booster Station Access Survey Area

Figure:
3

The flora and vegetation were sampled and described systematically at the vegetation survey quadrat, and additional opportunistic collecting was undertaken wherever previously unrecorded plants were observed. The following floristic and environmental parameters were recorded:

- GPS location (GDA94 datum);
- soil type, colour and any additional observations;
- local site topography;
- presence of any outcropping rocks and their type;
- aspect of the hill-slopes;
- percentage of litter cover (logs, twigs and/or leaves);
- percentage of bare ground;
- time since fire;
- condition of the vegetation, based on Keighery's (1994) condition ratings (Appendix A5); and
- alive and dead percentage of foliage cover and average height of each species recorded.

All plant specimens collected during the field survey were dried and processed in accordance with the requirements of the Western Australian Herbarium (WAH). All plant specimens were identified through comparisons with pressed specimens housed at the Mattiske Consulting herbarium and the WAH. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded is in accordance with the WAH (1998-).

3.2 Vegetation descriptions

Vegetation descriptions were based on Alpin's (1979) modification of the vegetation classification system of Specht (1970), to align with the National Vegetation Information Systems (NVIS). Vegetation communities were described at the association level of the NVIS classification framework, as defined by the Executive Steering Committee for Australian Vegetation Information.

4. FIELD SURVEY RESULTS

The reconnaissance survey of the Great Eastern Highway modified pipeline alignment and the booster station access survey areas incorporated the establishment of a vegetation survey quadrat at the booster station access survey area, and foot traverses of both survey areas to determine if any of the conservation significant taxa identified in the desktop assessment (Mattiske Consulting 2020) were present within the survey area.

4.1 Climate

Beecham (2001) described the climate of the wider region in which the survey areas are situated, as semi-arid (dry) warm Mediterranean, consistent with descriptions of a characteristically arid to semi-arid climate with 200-300 mm of precipitation (Beard 1990, Cowan *et al.*, 2001). Southern Cross Airfield, which is located approximately 24 km to the east of the survey area has an average annual rainfall of 306.2 mm (Bureau of Meteorology, BOM 2020). Rainfall and temperature data for Southern Cross Airfield is illustrated in Figure 4. The rainfall and temperature data displayed covers the period September 2019 to August 2020. Rainfall in the four months preceding the September 2020 survey was 99.8 mm, which is approximately 82% of the long-term average for the corresponding period.

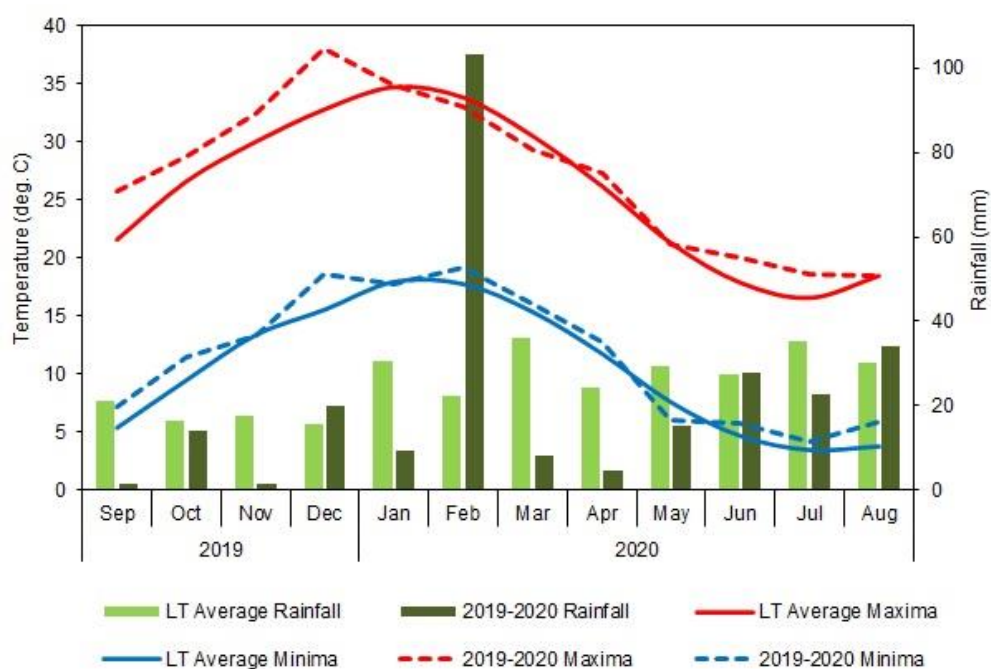


Figure 2: Rainfall and temperature data for Southern Cross Airfield (BOM Station 012320)
Long term average rainfall and temperature data, together with monthly rainfall data for the period September 2019 to August 2020 are shown (BOM 2020).

4.2 Field Survey Coverage, Limitations and Constraints

The coverage of the two survey areas, based on survey quadrat location, tracks and foot traverses is illustrated in Figures 2 and 3. An assessment of the survey against a range of factors which may have had an impact on the outcomes of the present survey was prepared (Table 1). Based on this assessment, the survey has not been subject to constraints which would affect the thoroughness of the survey and the conclusions which have been formed.

Table 1: Potential flora and vegetation survey limitations for the Great Eastern Highway modified pipeline alignment and booster station access survey areas.

POTENTIAL SURVEY LIMITATION	IMPACT ON SURVEY
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	Not a constraint. Reference resources such as Beard's mapping, historical survey data in both the vicinity of the survey area and in the broader region (Beecham 2001; Cowan <i>et al.</i> 2001), recent survey work completed by Mattiske Consulting for the water pipeline alignment (Mattiske Consulting 2020), together with online flora and vegetation information, has provided a comprehensive level of information for the current survey.
Scope (i.e. what life forms, etc., were sampled).	Not a constraint. Vascular flora, which were the focus of the present survey, were thoroughly sampled and assessed.
Proportion of flora collected and identified (based on sampling, timing and intensity).	Not a constraint. The survey was conducted within the recommended survey period (Spring) when the highest percentage of flora are flowering and are readily identifiable. Botanists were familiar with conservation significant taxa in the vegetation associated with the water pipeline alignment (Mattiske Consulting 2020). Botanist were able to identify most conservation significant taxa whilst sterile.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed).	Not a constraint. The reconnaissance survey of the pump and booster stations survey areas was thorough. Further survey work is not required.
Mapping reliability.	Not a constraint. The aerial imagery used and spatial coverage of the survey area is considered to be excellent.
Timing, weather, season, cycle.	Not a constraint. The EPA (2016b) recommends that flora and vegetation surveys in the Avon Wheatbelt, Mallee, and Coolgardie regions should be undertaken after the main rainfall period in the winter months. The present survey was conducted in Spring (September) during the optimal time for flora and vegetation surveys in the region. Whilst rainfall in the region was slightly below average, it was not such that it compromised the survey results.
Intensity (in retrospect, was the intensity adequate).	Not a constraint. The reconnaissance survey intensity of the two survey areas was considered to be adequate for extent of any proposed clearing of native vegetation.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	Not a constraint. Resources, in terms of equipment, support and personnel were good.
Access problems (i.e. ability to access survey area).	Not a constraint. Both survey areas were readily accessible from public roads
Experience levels (e.g. degree of expertise in plant identification to taxon level).	Not a constraint. The two botanists were experienced in the local flora and vegetation from extensive work at the EGLP. Additionally, one of the botanists had been part of the survey of the original water pipeline alignment (Mattiske Consulting 2020). All plants specimens collected were identified by the Mattiske Consulting botanists. No suspected conservation significant taxa were recorded.

4.3 Great Eastern Highway modified pipeline alignment survey area

The modified Great Eastern Highway pipeline alignment survey area (0.7487 ha) was located along the Great Eastern Highway, approximately 1.3 west of the town of Moorine Rock (Figure 2). The survey area was 20 m in width and 330 m in length. The majority of the survey area was located on the northern side of the Great Eastern Highway, in degraded land which formerly comprised the raised sub-structure for a railway track (Plates 1 and 2). This portion of the survey area was substantially clear of vegetation. That which was present consisted principally of a range of introduced species, and *Borya constricta*. No species of conservation significance were present. The portion of the pump station survey area which was situated to the south of the Great Eastern Highway (Plate 3) was situated on degraded land adjacent to agricultural lands. The vegetation in this area comprised eucalypt mallees over *Borya constricta*, *Lomandra collina* and *Lepidosperma sanguinolentum*, together with a range of introduced species. The vegetation was floristically the same as that described as Section 1 of the water pipeline alignment report, Appendix G (Mattiske Consulting 2020). This vegetation was described as *Eucalyptus sheathiana* open mallee woodland over *Banksia laevigata* subsp. *fuscolutea*, *Melaleuca atroviridis*, *Melaleuca scalena* open shrubland over *Olearia* sp. *eremicola* (Diels & Pritzel s.n. PERTH 00449628), *Lepidosperma sanguinolentum* sparse heathland. In the case of this section of the survey area, the vegetation was degraded compared to the survey quadrat assessed as part of the water pipeline alignment report.



Plate 1: Photograph of the modified Great Eastern Highway pipeline alignment survey area (Figure 2 - photo point PS1) facing east.



Plate 2: Photograph of the modified Great Eastern Highway pipeline alignment survey area (Figure 2 - photo point PS2) facing east.



Plate 3: Photograph of the modified Great Eastern Highway pipeline alignment survey area (Figure 2 - photo point PS3) facing south.

4.4 Booster Station access survey area

The booster station access survey area (0.5342 ha), was located along the Southern Cross South Road, approximately 65 km south of the town of Moorine Rock (Figure 3). The survey area was 40 m in width and 130 m in length. In addition to the area indicated on Figure 3, the area between Southern Cross South Road and the booster station access survey area was incorporated into the survey.

A single vegetation survey quadrat was established within the booster station access survey area. A summary of the vegetation present is set out in Table 2. A representative photograph of the vegetation is shown in Plate 4. No conservation significant flora were recorded within the survey area.



Plate 4: Representative photograph of booster station access vegetation quadrat, taken from the north-west corner.

Table 2. Booster Station access vegetation assessment quadrat data

Coordinates of quadrat north-west corner: 710756 mE, 6475465 mN (GDA94, zone 50)			
Vegetation community description			
<i>Allocasuarina acutivalvis</i> , <i>Eucalyptus rigidula</i> , <i>Callitris preissii</i> sparse mallee shrubland over <i>Allocasuarina spinosissima</i> , <i>Hakea erecta</i> , <i>Petrophile stricta</i> sparse mallee shrubland, over <i>Melaleuca cordata</i> , <i>Persoonia coriacea</i> , <i>Beaufortia interstans</i> low sparse shrubland.			
Soils and Landforms: light brown sandy clay soils on flats			
Surface rocks: absent		Outcropping: absent	
Litter cover: 65%		Condition: degraded	
		Bare ground: 30%	
		Time since fire: 10 years +	
Species	Height (cm)	PFC¹ Alive (%)	PFC¹ Dead (%)
<i>Eucalyptus rigidula</i>	400	4	-
<i>Allocasuarina acutivalvis</i>	450	10	-
<i>Callitris preissii</i>	400	2	-
<i>Santalum acuminatum</i>	300	1.5	-
<i>Allocasuarina spinosissima</i>	200	10	-
<i>Hakea erecta</i>	200	1.5	-
<i>Petrophile stricta</i>	180	0.25	0.5
<i>Hakea meisneriana</i>	140	0.25	-
<i>Leucopogon</i> sp.	120	0.05	-
<i>Banksia</i> sp.	100	0.75	-
<i>Melaleuca cordata</i>	100	1.2	-
<i>Baeckea muricata</i>	80	0.04	-
<i>Melaleuca calyptroides</i>	70	0.25	-
<i>Persoonia coriacea</i>	60	0.8	-
<i>Gastrolobium</i> sp.	40	0.01	-
<i>Hysterobaeckea</i> sp.	40	0.01	-
<i>Thysanotus</i> sp.	40	0.01	-
<i>Beaufortia interstans</i>	40	0.1	-
<i>Lepidosperma</i> sp.	25	0.3	-
<i>Poaceae</i> sp.	20	0.01	-
* <i>Brassica x napus</i>	10	0.2	-
<i>Schoenus hexandrus</i>	10	0.01	-
<i>Euryomyrtus maidenii</i>	5	0.1	0.01
<i>Drosera</i> sp. (climbing)	5	0.01	-

1. Projected foliage cover

4.5 Threatened and Priority Flora

No threatened flora taxa pursuant to subsection (1), section 19 of the BC Act 2016 and as listed by the WAH (1998-) were recorded within either of the two survey areas. No priority flora taxa, as listed by WAH (1998-), were recorded within either of the two survey areas.

4.6 Condition of the Vegetation

The condition of the vegetation within the modified Great Eastern Highway pipeline alignment survey area ranged from completely degraded on the northern side of the Great Eastern Highway, where the original railway substructure exists, to poor on the southern side of the Great Eastern Highway, where partial clearing and numerous introduced species are present (Trudgeon 1998).

The condition of the vegetation at the booster station access survey area, some areas of which have been cleared or impacted by introduced species, was classified as poor (Trudgeon 1998).

5. DISCUSSION AND CONCLUSION

Mattiske Consulting was commissioned in September 2020 by Covalent to undertake a reconnaissance flora and vegetation assessment of two locations associated with the proposed Moorine Rock to EGLP water pipeline alignment (Mattiske Consulting 2020). The first survey location was a 0.7487 ha area for a modification to the Great Eastern Highway section of the pipeline alignment, located approximately 1.3 km west of the town of Moorine Rock, along the Great Eastern Highway (Figure 2). The second location was a 0.5342 ha area situated approximately 65 km south of Moorine Rock along the Southern Cross South Road on the edge of cleared agricultural lands (Figure 3). The scope of the survey was to undertake a reconnaissance flora and vegetation survey of the two areas to identify any potential flora and vegetation values which may act as constraints on development, and thus enable appropriate mitigation measures to be planned.

The survey was undertaken during the optimum time of year for surveys in the Avon Wheatbelt, Mallee, and Coolgardie bioregions, and whilst rainfall in the months preceding the survey was 80% of the long term average, this did not have a detrimental effect on the presence of annual species. The survey was not subject to constraints which would materially affect the outcomes of the survey nor the conclusions formed.

No threatened flora taxa pursuant to subsection (1), section 19 of the BC Act 2016 and as listed by the WAH (1998-) were recorded within either of the two survey areas. No priority flora taxa, as listed by WAH (1998-), were recorded within either of the two survey areas. Potential conservation significant species which may be present had been identified during the desktop assessment completed for the water pipeline corridor reconnaissance survey (Mattiske Consulting 2020). None of these species, nor any other suspected conservation significant flora were recorded during the survey. This was consistent with the results of the original water pipeline corridor reconnaissance survey (Mattiske Consulting 2020).

Both the modified Great Eastern Highway pipeline alignment and booster station access survey areas were in a poor to degraded condition, as a result of historical land clearing practices and the presence of introduced species. The portion of the modified pipeline alignment situated on the northern side of the Great Eastern Highway, which was originally part of an elevated railway track sub-structure, was completely degraded.

Given the absence of conservation significant flora, and the degraded to poor condition of the vegetation at both survey areas, there are no concerns with respect to the flora and vegetation values at both locations in respect of infrastructure placement.

6. PERSONNEL

The following MCPL personnel were involved in this project:

NAME	POSITION	SURVEY INVOLVEMENT	FLORA COLLECTION PERMIT
Dr E. M. Mattiske	Managing Director & Principal Ecologist	planning, management & reporting	N/A
Mr D. Angus	Senior Botanist	planning, management, fieldwork, plant identifications, data analysis & report preparation	FB62000022-2 and TFL25-1920
Mr Nicholas Watson	Botanist	fieldwork	FB620000146

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