LAND CONDITION ASSESSMENT

Smoky Creek Solar Farm

Client: RPS Australia East Pty Ltd

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Project Number: J000283
Status: Final
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Document Version Register

Version	Purpose	Lead Author	Reviewer	Approved for Issue	
				Approver	Date
1	Final	SD & JH	LMT	LMT	27/09/2019

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1. Introduction

Range Environmental was engaged by RPS Australia East Pty Ltd (RPS) on behalf of Edify Energy Pty Ltd to undertake a land condition assessment for the proposed Smoky Creek Solar Farm (Figure 1).

The proposed solar farm includes 10 lease areas that have a total area of 2188 hectares and are located within the following landholder properties:

- Maynard property: Lot 39 RN395 (Lease A) and Lot 37 RN1147 (Lease B1 & B2);
- Dunn property: Lot 29 RN210 (Lease E), Lot 32 RN194 (Lease F) and Lot 33 RN210 (Lease G1 & G2); and
- Fenech property: Lot 28 RN211 (Lease C) and Lot 18 RN271 (Lease D1 & D2).

The proposed solar farm site is currently used for cattle grazing. Land Resource Assessment and Management (LRAM) (2019[1]) prepared an indicative Agricultural Land Class (ALC) map for the site which indicated that it may potentially include cropping (ALC A) and grazing land (ALC C) (refer to Map 2 of the LRAM (2019) report) (Appendix A:).

The proposed solar farm is a temporary use and the land can be returned to agricultural use at the end of the solar farm life. The solar farm will not have a permanent impact on agricultural land values or quality if construction, operational and decommissioning works are managed correctly to minimise the risk of further land degradation occurring.

The land condition assessment was conducted to document and describe pre-development land and soil features at the site of the proposed solar farm. The purpose of this was to inform the preparation of further detailed plans for the development to prevent any worsening of existing land degradation or the creation of new land degradation issues. Examples of detailed plans may include: Erosion and Sediment Control Plan (ESCP), Environmental Management Plans (Construction and Operational), Soil and Rehabilitation Management Plan, Site Layout Plan, Earthworks Plan and Stormwater Drainage Plan.

[1] LRAM. 2019. Review of Qualitative Agricultural Land Assessment Smoky Creek Solar Farm. Prepared for Banana Shire Council.

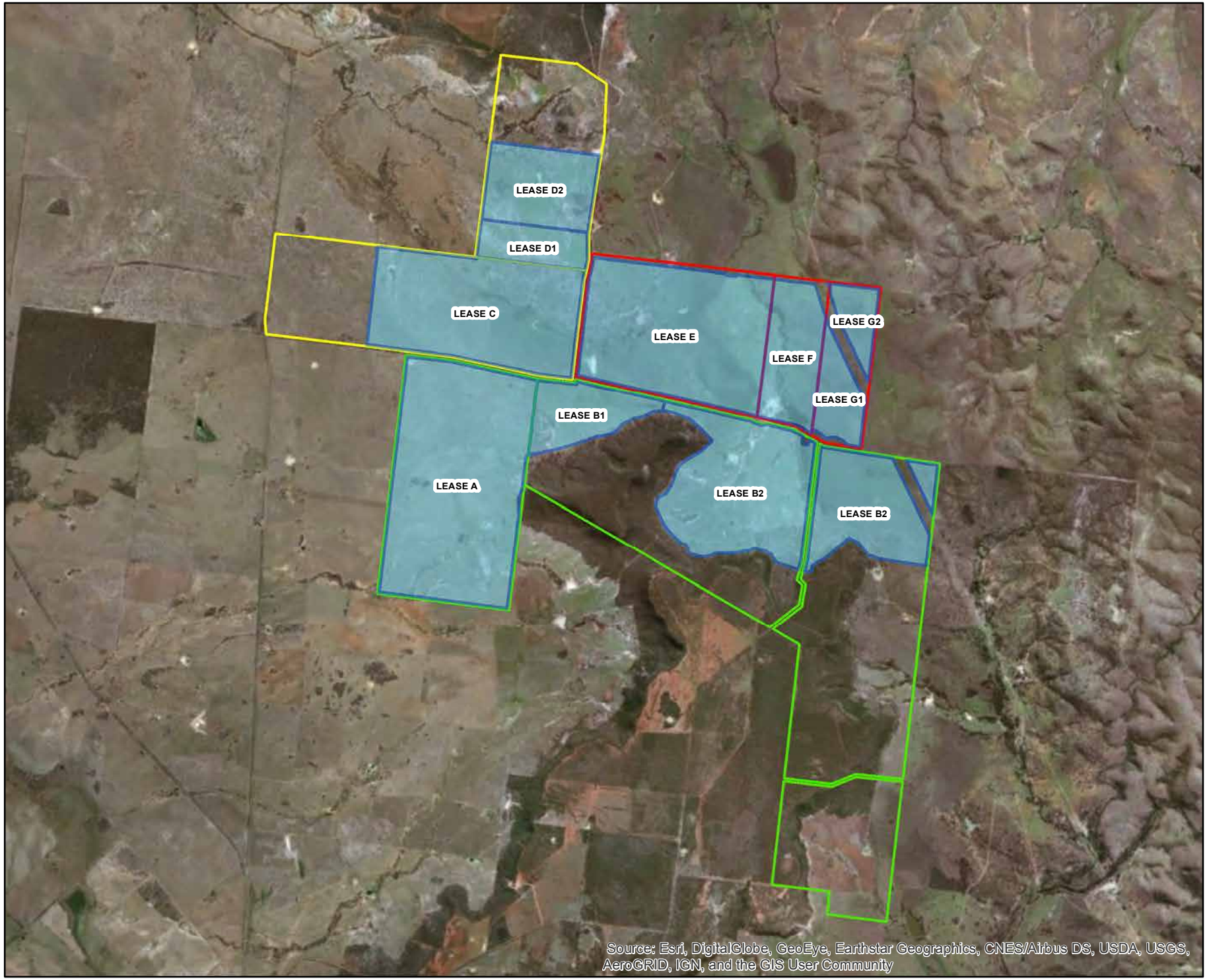

Figure 1
Site Locality

Project:
Land Condition Assessment

Client: RPS Australia East Pty Ltd

Project No.: J000283

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Kilometres
0 0.6 1.2

Legend

- Lease Area

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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Source: Cadastral data sourced from Queensland Globe (2017). Aerial imagery sourced from Esri (2019).

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2. General Property Descriptions

Table 1 below provides a general description of the properties that comprise the lease areas of the Smoky Creek Solar Farm, including the current and proposed agricultural land use activities. The locations of agricultural infrastructure at the properties is provided at Figure 2, Figure 3, Figure 4 and Figure 5.

Table 1 General description and agricultural conditions of the properties that comprise the lease areas

Descriptors	Maynard Property	Dunn Property	Fenech Property
General Property Descriptions			
Property Size (ha)	2093	657	874
Leases	A, B1 and B2	E, F, G1 and G2	C, D1 and D2
Leased area (ha)	1046	657	539
Property Plans	Appendix B	Appendix C	Appendix D
Current Agricultural Use[2]			
Type of activity	Cattle grazing	Cattle grazing	Cattle grazing
Stocking rate	1 head per 8 acres	1 head per 8 acres	1 head per 7-10 acres
Key pasture species	Buffel grass and Urochloa	Buffel grass and Urochloa	Buffel grass and Urochloa
Existing agricultural infrastructure			
Contour banks	Yes	Yes	Yes
Bores	No	No	No
Dams	Yes	Yes	Yes
Windmills	Yes	No	No
Cattle yards	Yes	Yes	No
Cattle dips	Yes - Lease A	Yes - Lease E	No
Homestead	No (abandoned)	Yes	No
Agricultural Uses During the Operational Life of Solar Farm[3]			
Co-location	As detailed in previous reports, there is no proposed co-location of agricultural land uses within the lease areas. Vegetation (grass cover) will be managed by slashing as required to simulate grazing pressures, with weed control also undertaken as required.		
Co-existence	Yes	No (lease areas occupy entire property)	Yes
Type of activity	Cattle grazing on land outside the lease areas	Not applicable	Cattle grazing on land outside the lease areas

[2] Findings of the site inspection and interviews with land holders on 18-19 September 2019.
[3] Information sourced from land holders during onsite interviews on 18-19 September 2019.

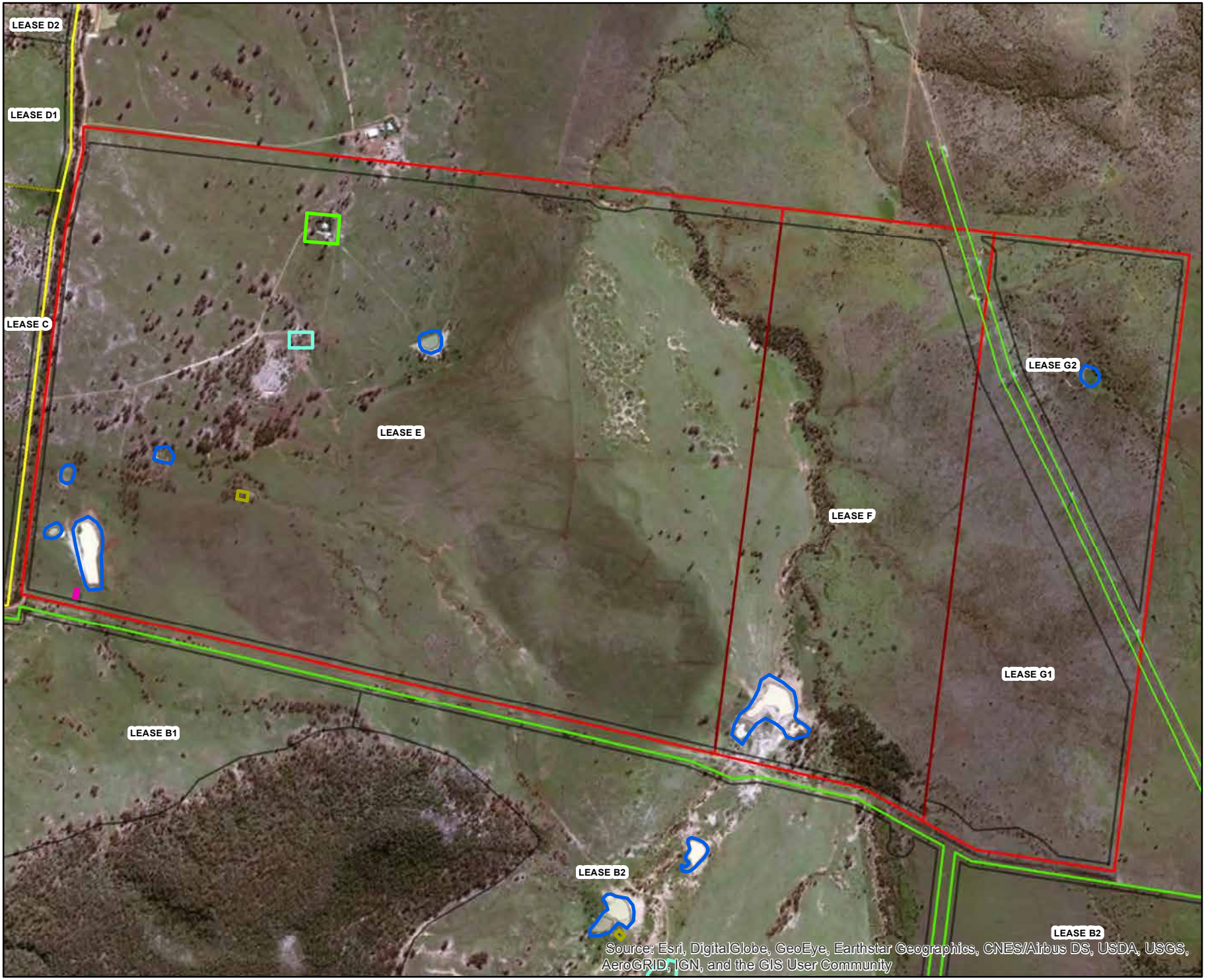

Figure 2
Key Infrastructure
Dunn Property

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0 0.25 0.5 Km

Legend

- Lease

Key Infrastructure

- Cattle dip
- Cattleyard
- Dam
- Homestead
- Waste burial pit
- Trough
- Watertank
- Powerlines

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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Source: Cadastral data sourced from Queensland Globe (2017). Aerial imagery sourced from Esri (2019).

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Figure 3
Key Infrastructure
Fenech Property

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0 0.25 0.5 Km

Legend

- Lease Area

Key Infrastructure

- Cattle dip
- Cattleyard
- Dam
- Homestead
- Waste burial pit
- Trough
- Watertank
- Powerlines

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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Source: Cadastral data sourced from Queensland Globe (2017). Aerial imagery sourced from Esri (2019).

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Figure 4
Key Infrastructure
Maynard Property

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0 0.25 0.5 Km

Legend

- Lease Area

Key Infrastructure

- Cattle dip
- Cattleyard
- Dam
- Homestead
- Waste burial pit
- Trough
- Watertank
- Powerlines

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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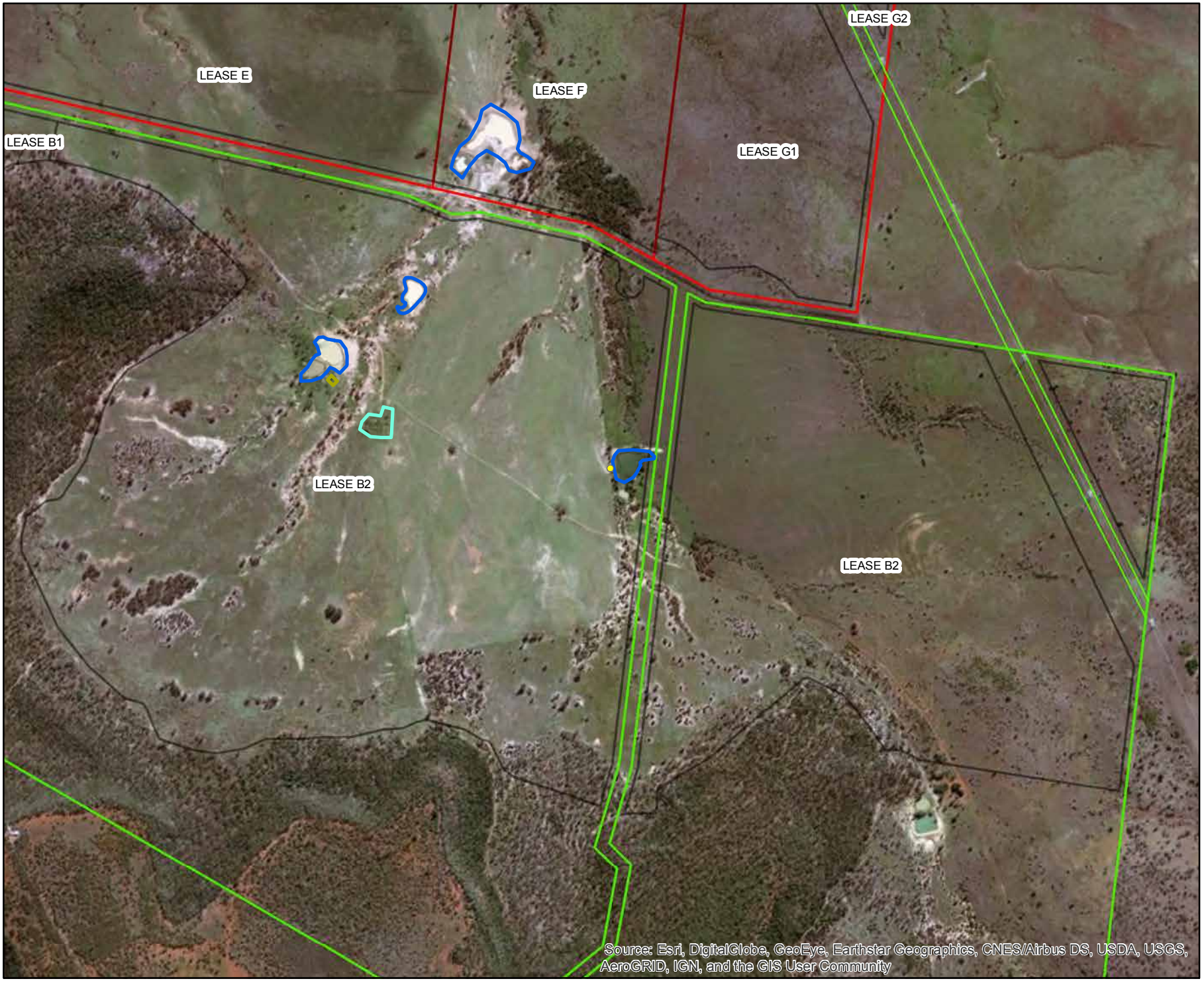

Figure 5
Key Infrastructure
Maynard Property

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0 0.2 0.4 Km

Legend

- Lease Area

Key Infrastructure

- Cattle dip
- Cattleyard
- Dam
- Homestead
- Waste burial pit
- Trough
- Watertank
- Powerlines

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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3. Land and Soil Features

Land and soil features observed at the site and determined from Muller (2008[4]) which may present potential constraints to future agriculture and/or construction and rehabilitation of the solar farm are identified in Table 2 and shown in Figure 6.

[4] Muller. P. G. 2008. Soils of the Banana Area Central Queensland.

Table 2 Key land and soil features

Constraint	Description	Soils	Representative Photograph
Gilgai microrelief (melonholes)	• Gilgai are depressions that form in the surface of cracking clay soils (Vertosols). They can hold water during wet conditions. • Continuous cultivation can level out some shallow gilgai. But they will reform if the ground is left undisturbed. • Gilgai soil profiles include soils that are dispersive, very strongly acid and moderately saline. • Melonhole gilgai were observed in the field to commonly be greater than 0.5 m deep and at least several metres wide. • Soils that form gilgai occur across 20% of the lease areas	Belldeen, Greycliffe and Greycliffe Melonhole Phase.	 View to the north of gilgai microrelief

Constraint	Description	Soils	Representative Photograph
Shrink swell soils	• Shrink-swell soils (or cracking clay soils) move or react to soil moisture. • Infrastructure engineering designs need to account for soil movement by shrink-swell soils. • Shrink swell soils occur across 39% of the lease areas.	Annandale, Belldeen, Clancy, Earlsfield, Greycliffe and Greycliffe Melonhole Phase.	 Example of shrink swell (Vertosol) soils

Constraint	Description	Soils	Representative Photograph
Surface rock	• Dense surface rock was observed in parts of the lease areas. Rocks ranged in size from medium pebbles (6-20mm) to stones (60-200 mm). • Surface rock can impede cultivation practices.	Kokotungo, Spier, Ulogie and Annandale	 Example of dense surface rock cover.

Constraint	Description	Soils	Representative Photograph
Dispersive soils	• Dispersive soils include soils with an Exchangeable Sodium Percentage (ESP) of 15 or more or a Ca:Mg ratio <0.1. Dispersive soils present a high erosion risk if exposed. They also impede drainage and root growth. • Topsoil (A horizon) is not normally dispersive soil. Dispersive soils commonly occur in the subsoil (B horizon). • Dispersive soils at the site are mainly associated with gilgai soils (from 0.2 m) and texture contrast soils (from 0.2 m). Dispersive soils occur at 0.8 m for Earlsfield soils (Vertosols). • Soils with dispersive soils in their profile occur across 75% of the lease areas.	Bluff, Desdemona, Earlsfield, Greycliffe, Greycliffe Melonhole Phase, Kokotungo and Ulogie.	 Example of dispersive soil erosion.
Very strongly acid soils	• Very strongly acid soils have a pH <5. Very strongly acid soils can limit plant growth for agriculture or rehabilitation due to decreased nutrient availability and increased elemental toxicity. • Very strongly acid soils at the site are mainly associated with gilgai soils (from 0.4 m) and acid texture contrast soils (Kurosols) (throughout the profile). Very strongly acid soils occur at depth (1.4 m) for the Spier soils. • Soils with very strongly acid soils in their profile occur across 27% of the lease areas.	Greycliffe, Greycliffe Melonhole Phase, Bluff and Spier.	Not available.

Constraint	Description	Soils	Representative Photograph
Moderately saline soils	• Moderately saline soils have an ECse greater than 4 dS/m. Saline soils can affect plant growth for agriculture or rehabilitation works. • Topsoil (A horizon) is not normally saline soil. Saline soils commonly occur in the subsoil (B horizon). • Moderately saline soils at the site are mainly associated with gilgai soils (from 0.2 m) and texture contrast soils (from 0.7m). Moderately saline soils occur at 0.6 m for Earlsfield soils (Vertosols). • Soils with moderately saline soils in their profile occur across 74% of the lease areas.	Bluff, Earlsfield, Greycliffe, Greycliffe Melonhole Phase, Kokotungo and Ulogie.	Not available.

Constraint	Description	Soils	Representative Photograph
Contaminated soil	• Cattle dips were located at Lease Areas A and E. • Common soil contaminants at cattle dips include arsenic and DDT. • Contamination at cattle dips is usually localised to the dip area (i.e. nominally within 30m of the dip and associated infrastructure[5]).	Greycliffe and Kokotungo	 View to the east of a livestock plunge dip

[5] NSW Agriculture. 1996. Assessment and Cleanup of Cattle Tick Dip Sites for Residential Purposes.

Constraint	Description	Soils	Representative Photograph
Steep slopes	• Steeply sloping land exceeds 3%. Steeply sloping land occurs in lease areas A, B1, B2, D2 and G2 • Steeply sloping land, particularly where dispersive soils occur, can increase the risk of erosion for land disturbing activities for agriculture or construction.	Annandale, Belldeen, Bluff, Clancy, Earlsfield, Greycliffe Melonhole Phase, Greycliffe, Kokotungo, Santo Fertile Phase, Santo Stony Phase, Spier, Ulogie	 View to the north of steeply sloping land.

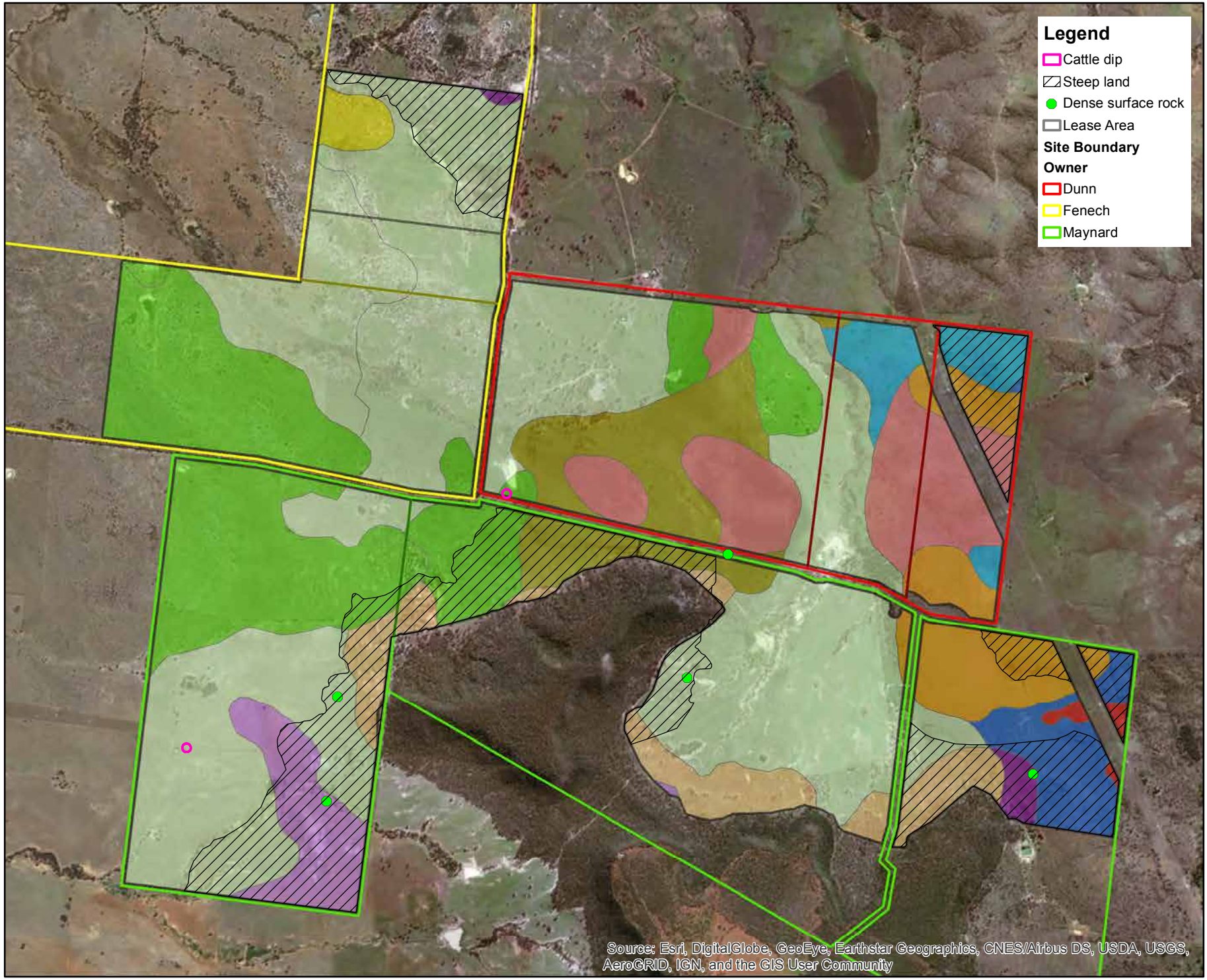

Figure 6
Key land & soil features

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Approved by: SKD Date: 25/09/2019

0 0.55 1.1 Km

Legend

Soils of the Banana Region (Muller, 2008)

- Annandale
- Belldeen
- Bluff (BAN)
- Clancy
- Desdemona
- Earlsfield
- Greycliffe
- Greycliffe Melonhole Phase
- Kokutungo
- Santo Fertile Phase
- Santo Stony Phase
- Spier
- Ulogie

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Source: Cadastral data sourced from Queensland Globe (2017). Aerial imagery sourced from Esri (2019).

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4. Existing Land Degradation

A summary of existing land degradation features across the lease areas is provided at Table 3 and is based on observations and measurements made during the land condition assessment undertaken by Sam Donald and Lucas Talbot of Range Environmental on 18-19 September 2019.

Further detailed assessment of existing land degradation features is provided at Appendix B: (Dunn Property) Appendix C: (Fenech Property) and Appendix D: (Maynard Property) and shown in Figure 7, Figure 8, Figure 9 and Figure 10.

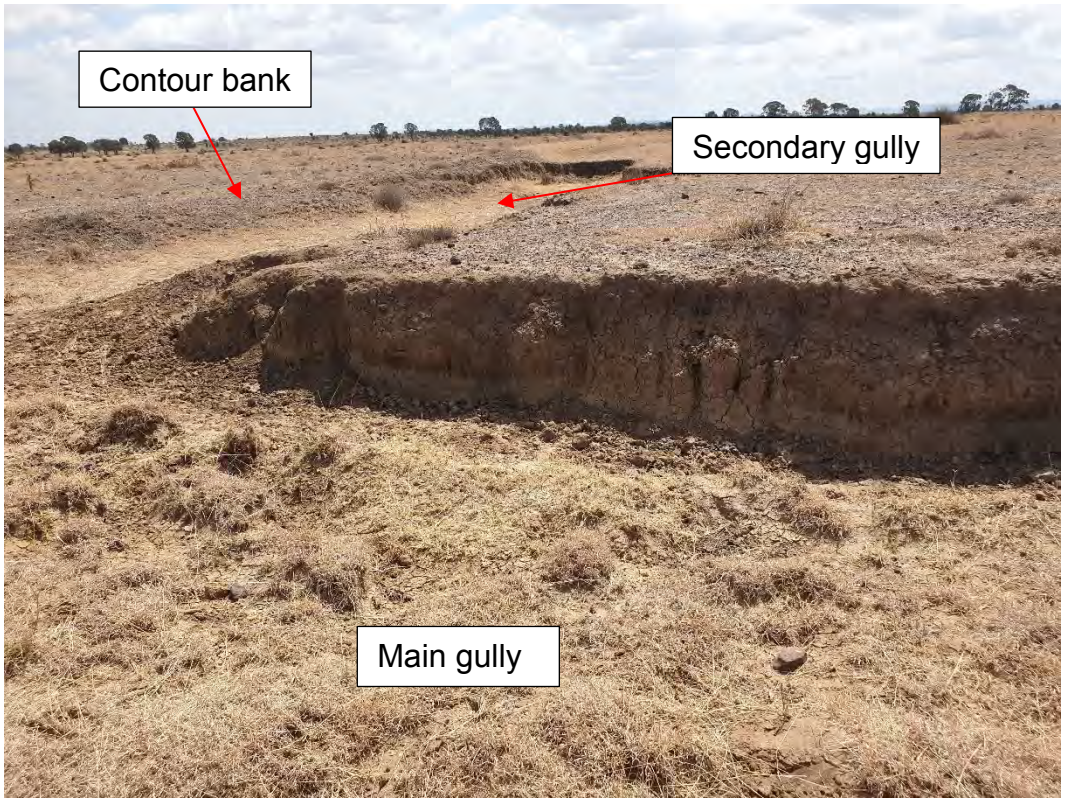
Table 3 Summary of existing land degradation features across the lease areas

	Maynard Property	Dunn Property	Fenech Property
Land degradation features	1. Gully erosion (including lateral bank erosion). 2. Sheet erosion. 3. Erosion of banks of watercourses. 4. Vegetation clearing. 5. Exposed subsoil.	1. Gully erosion. 3. Erosion of banks of watercourses.	1. Gully erosion. 3. Erosion of banks of watercourses. 4. Vegetation clearing.
General causes	1. Factors contributing to gully erosion included: a. Concentration of overland flow by contour banks and natural topographical features including open depressions (Photograph 3). b. Reduced groundcover by pastoral activities and climatic conditions, including drought (Photograph 1 and Photograph 5). c. Removal of vegetation, including along watercourses (Photograph 4). d. Livestock tracking. e. Exposure of dispersive subsoils (Photograph 2). 2. Sheet erosion was generally formed on areas with reduced groundcover, shallow topsoil (A horizon) and on steeper slopes, including adjoining banks of watercourses. 3. Factors contributing to the erosion of banks of watercourses included: a. Concentration of overland flow. b. Reduced groundcover by pastoral activities and climatic conditions, including drought. c. Removal of vegetation. d. Livestock tracking. e. Exposure of dispersive subsoils. 4. Vegetation clearing was considered to have been undertaken to facilitate the agricultural land use.		
General condition	1. The erosion features at the site (including gully, sheet and within watercourses) was generally described as active, unstable and eroding. This was due to: a. The lack of vegetation stabilising gully heads, sidewalls and gully floors. b. Fresh sediment deposits present on gully floors and deep cracking sidewalls. c. Dispersive subsoils which are common across the lease areas. d. Limited or ineffective management.		

	Maynard Property	Dunn Property	Fenech Property
General locations	1. Gully erosion was generally observed adjoining watercourses (e.g. lateral bank erosion) and within open depressions. Gully erosion was also observed at the ends of contour banks where flows were concentrated. 2. Sheet erosion was generally formed on steeper slopes, adjoining banks of watercourses and at areas with reduced groundcover. 3. Erosion of the banks of watercourses generally occurred on dispersive (sodic) soils. 4. Vegetation clearing occurred on Maynard and Fenech properties, including along drainage lines.		
Existing management	Establishment of exclusion areas (by fencing) around some high-risk areas such as dams and watercourses. Contour banks.		Contour banks.

Photograph 1 View to the west of a gully head with limited adjoining groundcover

Photograph 2 View to the north of a gully sidewall in dispersive soils



Photograph 3 View to the north of a secondary gully formed along the contour bank

Photograph 4 View to the north of cleared trees along a drainage line

Photograph 5 View to the south of low groundcover due to drought conditions

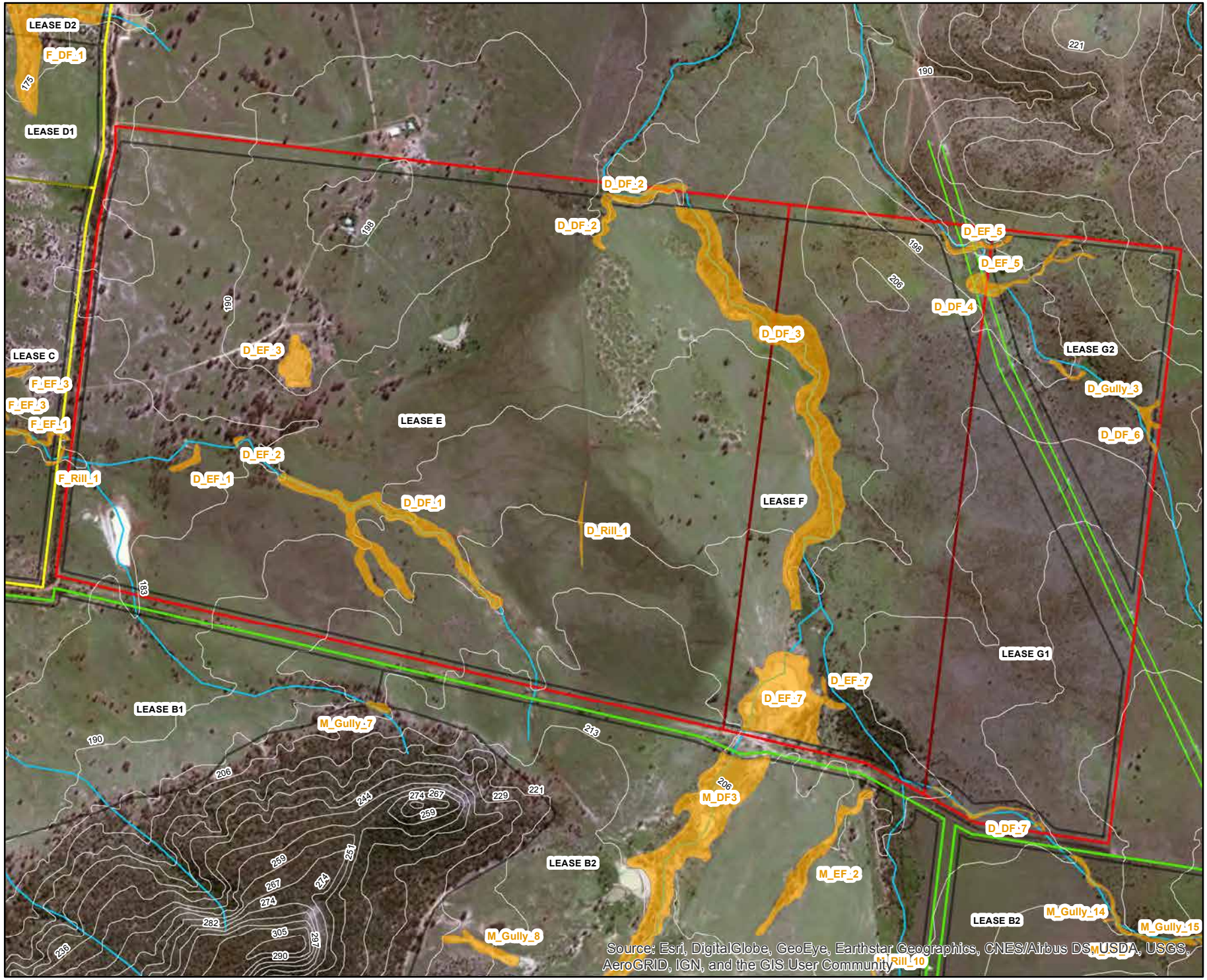


Figure 7
Land Degradation Features
Dunn Property

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0 0.25 0.5 Km

Legend

- Powerlines
- Regulated Vegetation (MSES) - Intersecting a watercourse
- Land Degradation Feature
- Lease Area
- 5m contours

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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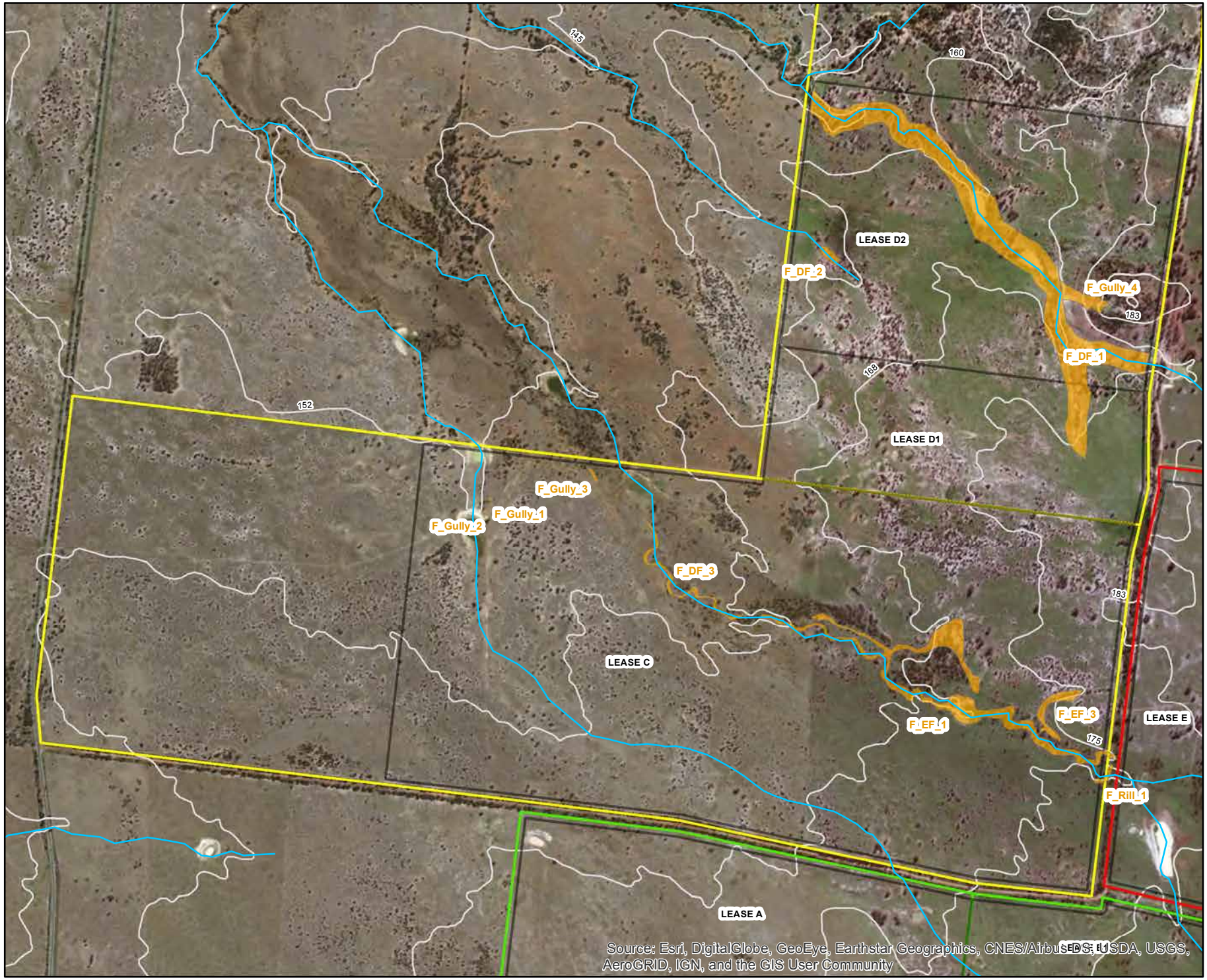

Figure 8
Land Degradation Features
Fenech Property

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0 0.25 0.5 Km

Legend

- Powerlines
- Regulated Vegetation (MSES) - Intersecting a watercourse
- Land Degradation Feature
- Lease
- **Site Boundary**
- **Owner**
- Dunn
- Fenech
- Maynard
- 5m contours

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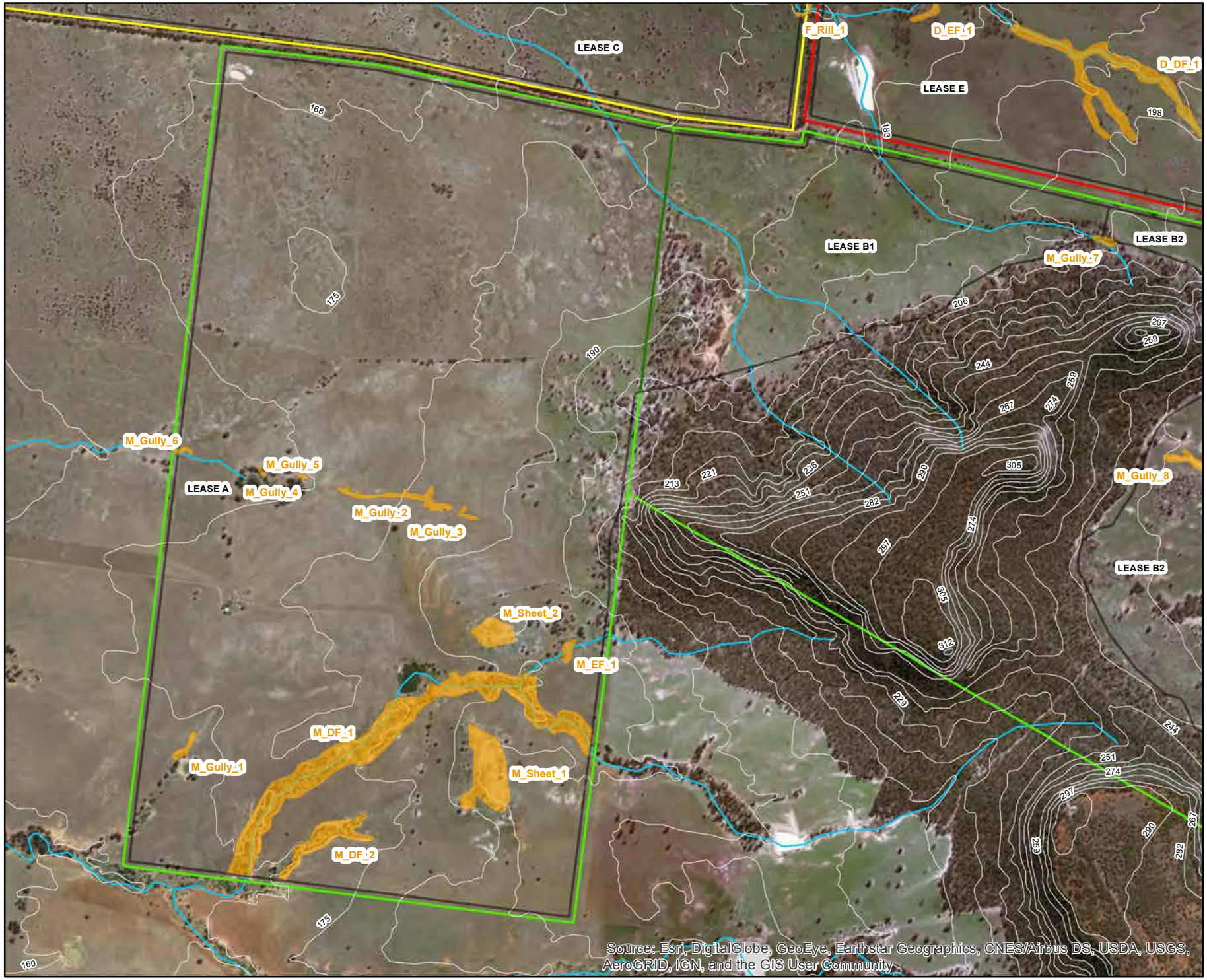

Figure 9 Land Degradation Features Maynard Property West

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Approved by: SKD Date: 25/09/2019

0 0.25 0.5 Km

Legend

- Regulated Vegetation (MSES) - Intersecting a watercourse
- Powerlines
- Land Degradation Feature
- Lease Area
- 5m contours

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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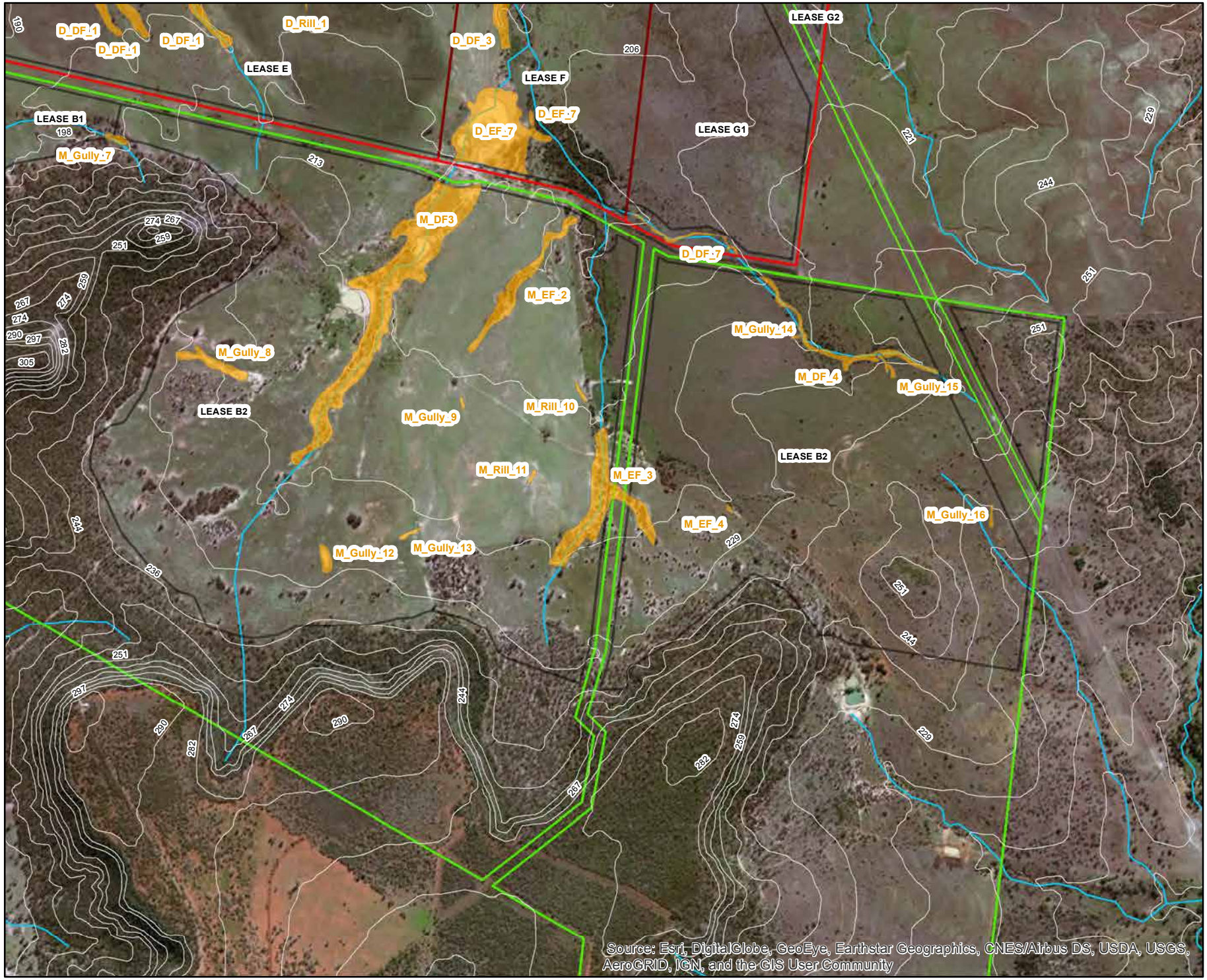

Figure 10 Land Degradation Features Maynard Property East

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Land Condition Assessment

Client: RPS Australia East Pty Ltd

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Compiled by: JLH Date: 25/09/2019
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0 0.25 0.5 Km

Legend

- Regulated Vegetation (MSES) - Intersecting a watercourse
- Powerlines
- Land Degradation Feature
- Lease Area
- 5m contours

Site Boundary

Owner

- Dunn
- Fenech
- Maynard

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Source: Cadastral data sourced from Queensland Globe (2017). Aerial imagery sourced from Esri (2019).

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5. Land Management Principles

Land degradation, namely in the form of erosion, has already occurred in parts of the solar farm lease areas. The construction, operation and decommissioning of the solar farm should be planned to prevent any worsening of existing land degradation or the creation of new land degradation issues. Achieving this will preserve the agricultural land values of the solar farm site.

Overarching land management principles are presented below to provide general guidance for more detailed planning for the solar farm development.

5.1 Management of Existing Land Degradation Features

Key management principles are provided in the subsections below and described in further detail in the following key resources:

- Carey BW, Stone B, Norman PL, Shilton P (2015) Chapter 13 - Gully Erosion and its control. In: Soil conservation guidelines for Queensland, Department of Science, Information Technology and Innovation, Brisbane.
- Wilkinson S, Hawdon A, Hairsine P, Austin J. 2015. Gully Toolbox. A technical guide for the Reef Trust Gully Erosion Control Programme 2015–16. Commonwealth of Australia.

5.1.1 Land Management

The following land management recommendations are provided to stabilise existing erosion features and manage the progression of erosion:

- Exclusion of established erosion features, including an adequate buffer area. Fences can be installed to establish exclusion areas. Exclusion areas prevent further physical disturbance (including grazing by native fauna) and assists in the rehabilitation (including groundcover) of erosion features.
- The design and layout of the solar farm should consider the location of vehicle tracks, fence lines, built infrastructure and rainfall runoff from solar panel driplines. These features can reduce the groundcover and concentrate stormwater flows.
    - This should include minimising the disturbance footprint upgradient of existing erosion features where practicable, including during construction and operation of the solar farm.
    - Where flows are concentrated (e.g. from solar panels, drains, roads etc), drainage works should be designed to ensure runoff is dispersed onto stable areas that have the capacity to receive increased flows.

- Promote rehabilitation and revegetation of natural drainage features where practicable. Direct sowing of grass species at upgradient areas may be required.
    - Surface cover is the key mitigating factor to the formation of erosion, including gully erosion. Surface cover reduces the risk of erosion by stabilising soils, improves rainfall infiltration and dissipates rainfall.
    - Retaining or re-establishing trees will assist in lowering the water table, drying out the soil profile and stabilising subsoils. This may only be practical in exclusion and riparian areas not subject to development and where shading will not impact solar panel performance.
    - Erosion control mats can be considered as they may assist with seed germination and provide protection from raindrop impact erosion. The mats are not intended for use in high-flow velocity areas.

5.1.2 Soil Management

The following soil management recommendations are provided to stabilise erosion features:

- Soil amelioration may assist in reducing the susceptibility of exposed soils to erosion, including sodic soils which are considered high risk and which occur across an extensive portion of the site.
    - Soil amelioration will also increase the rehabilitation success by promoting plant strike and persistence.
    - Soil sampling and analysis is required to calculate the appropriate amelioration rates.
- Reshaping or filling a gully may be considered if stabilisation (including amelioration and revegetation) is unsuccessful, impractical or if reclamation of land is beneficial to the development. Reshaping and filling works are not recommended in watercourses.
    - Reshaping can include earthmoving activities to batter the sides and head to a more gentle grade. Other reshaping activities include the installation of flumes, chutes, grade stabilisation which are further discussed in Section 5.1.3.
    - Shaping of the gully walls should be carried out only after the head of the gully has been stabilised.

5.1.3 Stormwater Management

Controlling stormwater flows in and surrounding gullies is a critical element for preventing worsening of existing erosion. Options for the management of stormwater flows include

diverting water around gullies or gully head management to control incoming flows. Examples include the following:

- Diversion banks can be used to direct runoff away from the gully and to a stable discharge point. Diversion banks are preferable where the gully is away from a natural drainage line. If the gully has formed in a drainage line care needs to be taken when using diversion banks to avoid causing erosion elsewhere. Discharge points need to be stable and capable of handling the increased runoff. This is very relevant to the site where gully erosion has already occurred due to concentration of flows by existing contour banks.
- Options to manage incoming flows to a gully may include gully stabilised chutes or drop-structures. Chutes are preferred over drop structures if the fall at the gully head is greater than 1m. Careful consideration needs to be given to undermining of structures that may occur in dispersive soils and managing erosion on the downstream side of stabilised gully head structures.
- Weirs can be used to manage flows to stabilise the gully bed. Weirs can be constructed from a range of materials. Careful consideration needs to be given to undermining of weirs that may occur in dispersive soils and managing erosion on the downstream side of the weir when it overtops.

5.2 Guidance for Detailed Management Planning

5.2.1 Erosion and Sediment Control

Erosion and Sediment Control Plans (ESCP) should be prepared for the construction and decommissioning phases of the development in accordance with Best Practice Erosion and Sediment Control (Aust IECA 2008[6]). ESCPs must consider proposed ground disturbing work, soil chemical properties (dispersive subsoils), topography and climate.

The ESCPs should all address the following three key elements of erosion and sediment control:

1. DRAINAGE - direct clean water around disturbed areas, control drainage in work areas and manage the discharge at the end of drains to prevent erosion.
2. EROSION - minimise the extent and duration of ground cover disturbance and progressively stabilise disturbed areas.
3. SEDIMENT - implement appropriate sediment controls to treat runoff from disturbed areas.

[6] Aust IECA. 2008. Best Practice Erosion and Sediment Control. Picton, Australia.

Temporary erosion and sediment controls should be implemented prior to the commencement of ground disturbing works, maintained throughout the works phase and only removed once permanent controls are in place and functioning correctly and the site is stable.

5.2.2 Soil Management

Soils at the site may have a range of properties that require careful management to prevent harm to soil resources during construction, operation and decommissioning of the solar farm. Such properties include dispersive subsoils, very strongly acid soils and moderately saline soils.

A baseline soil assessment should be undertaken prior to construction in accordance with the Guidelines for Surveying Soil and Land Resources (McKenzie et al., 2008[7]). It should focus on key areas of proposed soil disturbance at the site (i.e. areas of trenching, roads, pads for switching yard and laydown areas etc) to obtain the following information on soil resources:

- Topsoil (A horizon) depth and structure; and
- Exchangeable cations, pH, Electrical Conductivity (EC) and Chloride.

The findings of the baseline soil assessment can inform the preparation of a Soil and Rehabilitation Management Plan. Examples of fundamental soil management measures for construction and decommissioning works include:

- Strip and segregate topsoil and subsoil;
- Do not invert the soil profile when backfilling trenches; and
- Cover or ameliorate dispersive soils, very strongly acid soils or moderately saline soils.

Contaminated soils may occur near cattle dips. This matter will need to be considered and be managed appropriately to prevent exposure, mobilisation or redistribution of potential contaminants.

5.2.3 Groundcover Management

Groundcover within the solar farm lease areas should be slashed as required to simulate grazing pressure. This should be incorporated into the Operational Environmental Management Plan (OEMP).

[7] McKenzie et al., 2008. Guidelines for Surveying Soil and Land Resources. CSIRO Publishing. Australia.

5.2.4 Rehabilitation

At the end of the solar farm life the lease areas should be rehabilitated to allow agricultural land uses to recommence. Rehabilitation measures should be detailed in a Soil and Rehabilitation Management Plan. Overarching rehabilitation measures may include:

- Removal of all surface infrastructure that is not required by the landholder or other stakeholder;
- Removal of below ground infrastructure within 1 m of the ground surface that is not required by the landholder or other stakeholder;
- Reinstate soils as follows:
  - Do not have dispersive, very strongly acid or moderately saline soils within 300mm of the surface in areas of ALC A land or 100 mm in all other areas (except where this naturally occurs, for example very strongly acid soils are reported to occur in the surface of the Bluff soils).
  - Topsoil texture in rehabilitated areas should be consistent with the pre-disturbed condition determined by the baseline soil assessment.
- Areas that have been compacted shall be ripped.
- Disturbed areas shall be revegetated with existing pasture species (Buffel Grass and Urochloa).

5.2.5 Biosecurity

To meet the General Biosecurity Obligation (GBO) under the *Biosecurity Act 2014*, it is recommended that weed and pest control measures be outlined in the following documents to be prepared as part of the detailed planning and design works for the solar farm development:

- Construction Environmental Management Plan (CEMP);
- Operational Environmental Management Plan (OEMP); and
- Soil Management and Rehabilitation Plan.

Appendix A: LRAM (2019) Report

Council Chambers
62 Valentine Plains Road
Valentine Plains
Biloela Qld 4715

All Correspondence to
Chief Executive Officer
PO Box 412
Biloela Qld 4715

Phone 07 4992 9500
Fax 07 4992 3493
enquiries@banana.qld.gov.au
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ABN 85 946 116 646

Your Reference: PR140339-1
Our Reference: CW:nz 19-06 (FID 85501, COM002-18/19, 14704/00000, 14706/00000, 14682/10000, 14299/50000, ID1451981, ID15456646, 1462164, ID1478211)
Contact: Chris Welch

13 June 2019

Edify Energy
C/- RPS
PO Box 977
TOWNSVILLE QLD 4810

Attn: Mark Carter

Dear Mark

Re: COM002 - 18/19 Public Facility - Other (Solar PV Power Station)
Tomlins, Dodsons & Hibbs Roads, Goovigen & Dixalea
(Lots 39RN395, 28RN211, 18RN271, 37RN1147, 29RN210, 32RN194 & 33RN210)

Council acknowledges receipt of your response to our Information Request which contained the Qualitative Agricultural Land Assessment (QALA) prepared by Range Environmental Consultants. Council has engaged the services of Land Resource Assessment and Management Pty Ltd to review the QALA. That review raises a number of issues, most particularly the methodology used to determine that the site contains only Class C agricultural land. A copy of the review is attached for your information.

Council takes the opportunity provided by section 35 of the Development Assessment Rules (DA Rules) to provide you with this review as further advice and how the application may be amended as a result.

It is recommended that the methodology of the QALA be revisited to expand the schema of reviewed mapping to include those carried out in Council's review and that the assessment be validated by field investigations. In the event that the further assessment identifies that Class A and/or B exist on the development site, you are invited to amend the proposed panel layout area to avoid the identified areas.

In addition, Council's review identified concerns about possible erosion potential on the site as a result of the development. A more detailed assessment of this issue would enable a clearer understanding of the risk of erosion that would allow for appropriate and reasonable conditioning of the development.

Please note that section 26 of the DA Rules identifies that this correspondence and any subsequent changes to the development application does not alter the statutory timeframes under the *Planning Act 2016*.

Should you require further assistance in relation to this matter, please do not hesitate to contact Council's Development Services, on (07) 4992 9500.

Yours sincerely

Chris Welch
MANAGER ENVIRONMENT & PLANNING

Enc QALA Review

Resource
Planning Services – RPS Pty Ltd
(Incorporating LRAM Pty Ltd)
ABN 99 321 312 916 ACN 050412032

Review of
Qualitative Agricultural Land Assessment
Smoky Creek Solar Farm

Prepared by

W.P. (Bill) Thompson

Monday, June 10, 2019

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Summary

This review finds that up to 50% of the subject area is better quality agricultural land (ALC A and B) rather than the zero percent in the report. Whilst the applicant report appears to have accessed the same soil survey data as this review has accessed, the applicant mis applied the strategic cropping land rather than the regional framework land suitability criteria to their determination of what is cropping land as opposed to grazing land.

The review has also found that whilst it is highly likely that up to 50% may be better quality land, the frameworks and state planning data sets as well as the original soil survey data sets (accessed by the applicant) are inconsistent in identifying actual area location or extent. The applicant having presumably accessed these various data sets ought to have recommended that the location of the cropping suited land be mapped in the field using the state wide framework as part of the DA process.

The applicants report appears to understate the actual extent of impact in terms of grazing. 50% of leased area will not be able to be grazed and it is highly unlikely that the availability of lease payments will result in a 50% increase in sustainable grazing of that part of the lease area that remains in grazing land use. The impact on the grazing area, let alone access to croppable land will be major for the lifetime of the project.

The current low erosion status of the land appears to be based on land holder comments. In other projects of this type, the impact of changes in the hydrology of the area under panels has been a significant consideration when designing to avoid erosion impacts both within the development area and downstream of the development area.

The assessment of this project by council is therefore constrained in the following ways:

- The actual location and extent of better quality lands that ought to be avoided in the layout of the panel arrays has not been established.
- Because council has before it a proposal to condition rehabilitation on the basis that the land is grazing quality only, accepting this report would mean a lower level of compliance that what in fact would be advisable.
- The various layout and physical buffering requirements to mitigate impact from changes in hydrology appears not to have been identified

Introduction

This report is a desk based review of the report Qualitative Agricultural Land Assessment Smoky Creek Solar Farm prepared by Range Environmental Consultants (REC).

This review was requested by the Banana Shire Council. Whilst a desk based review, the author of this report is familiar with the mix of old softwood scrubs, deeply weathered uplands and adjoining tertiary clay plains.

The Range Environmental Consultants report was prepared to address the shires response to the application that found the application did not satisfy the performance criteria to sustain the productivity, viability or use of the identified agricultural land for agricultural purposes. The councils further requested that a qualitative agricultural land assessment was required to demonstrate the viability of Council's agricultural land class mapping of A, C1 and C2 for the subject site. The council also requested that if the agricultural assessment confirms the mapping then the applicant is to provide alternative agricultural uses and potential impacts that could co-exist with the intended use on the land during the life span of the solar farm.

Overview of REC report

The proposed development comprises 1993 ha within 3623 ha of land parcels which have a total cleared area of 2113 ha. This review assumes that 1993 ha of development footprint will be within the cleared lands although that is not clear from the REC report.

The report does not map the land uses on the proposed impact area, but simply states that the existing land use is grazing. Recent satellite imagery as well as historic imagery along with comments from landholders cited in the report indicates that dryland cropping has been practiced on the subject land. A decline in rainfall is cited as a primary driver of the decline in dryland cropping.

The report cites the 100,000 soil survey of the Banana Sheet by Muller in terms of soils and references the Agricultural Land Class map supplied by QDNRM on which the agricultural land overlay mapping in the shire plan is based.

REC concludes that the overlay mapping indicates that 25% of the subject area is in fact what used to be known as GQAL (Agricultural Land Class A and B) and the remainder is ALC or grazing quality land.

REC then uses the Strategic Cropping Land (SCL) criteria to conclude that all of the land is pastoral quality land.

REC then concludes that the impact on rural economic activity will be restricted to the loss in slaughter animal production from the solar farm area. This conclusion appears to assume that there is no current or future potential cropping activity and that grazing cannot be co-located within the panel area.

The report further cites the Mirani solar farm P&E court case decision involving a solar farm on cane lands in support of this project.

Agricultural Land Classes

The author of this review has reviewed a large number of projects within the rural sector over the last 20 years where developers and councils have reliance on land suitability at all stages of projects (feasibility, design, approval and compliance monitoring). The assessment of this project suffers from the same types of problems encountered in many projects which rely on land suitability schema and maps produced by the state agencies. Best practice would normally be to use the various schema that exist and do validate any assessment by field investigations.

In this case, there are in fact 4 schema that could help inform planning and assessment. These are as follows. These are discussed below.

Agricultural Land Overlay

The agricultural land overlay map used by the council in its strategic plan was provided to council by DNRM, however, the basis of the map and its classification system is not known, hence field validation is simply not possible. REC concluded that that mapping shows that 25% of the subject area is potential cropping land (ALC A or B) and that is a reasonable interpretation of the map face

Muller 1:100,000 soil survey

This mapping is very excellent quality regional scale soils mapping and in fact is the last in a series of this mapping. Whilst the mapping and report itself do not contain any land suitability classification; the report contains reference to soil parameters of critical importance to Agricultural Land Class Assessments that use land suitability. The digital data set supplied by QDNRM does however contain ALC codes. Map 1 contains the result and Table 1 shows that 85% of the subject land is either ALC A or B as opposed to the 25% figure from the overlay mapping.

Regional Framework Land Suitability Schema

This schema was published in 2013[1]. It posts dates the Muller report but pre dates the REC report. data is from. AALC can be inferred from this framework. The result is shown in Map 2 and also tabled in Table 1. It is important to stress that the land suitability and ALC designations is based solely on the Muller soils data. Table 1 shows that 47% of the subject land is ALC A or B compared to 25% from the overlay mapping and 85% from the Muller digital data.

Queensland agricultural land classes - land class A and B with urban mask

This state planning data post dates all of the above systems and whilst it is not referenced to the regional land suitability framework, it is likely that it uses that framework.

[1] DSITIA (2013) Regional Land Suitability Frameworks for Queensland

The data is available in GIS format[2] and is shown in Map 3 overlaying the regional framework map shown in Map 2. The proportion of the area that is ALC A or B is similar to that from applying the regional framework, although notably there one large area of land ranked as ALC C which this mapping shows as ALC A/B.

SCL framework

Finally, there is the SCL framework. This framework was developed to clearly identify those soils which were the very best quality cropping lands in the state. The plethora of classifications for land suitability using sometimes different criteria and thus producing different outcomes as shown in this study area meant that more quantified method was needed.

REC applied the SCL schema to the Muller data and concluded as a result that there was no ALC A in the project area. Whilst the schema reviewed above are obviously quantitatively different because they used different approaches to identify ALC A and B, the REC assessment is simply wrong. SCL criteria are a much stricter data set and at the very best will only identify a small part of those soils that are ALC A. Map 2 shows the one area which is likely to be SCL based on the Muller work. It is simply wrong to conclude that there is no ALC A because there is no SCL.

Extent ALC A and B

It is very regrettable that a decade of land assessment based on a very good quality soils map should produce such divergent desk based assessments. It is true that the soils and landscape of this area are complex but they are not as complex as the land suitability systems referred to above would lead one to believe.

It is regrettable that REC did not complete a similar review and, in that process, it is highly likely that somewhere between 10 and 40% of the project area would be ALC A and B. A quick field inspection of the potential areas could then refine that figure. The proposed solar farm layout could then be adjusted to avoid as much as possible of the better quality soils.

Apart from avoiding any unnecessary alienation of better quality land, this information is critical to ensuring that the project is conditioned (if approved) to return land to its pre project condition. If land is ALC A, then returning it to the soil depth, soil water store, salinity and pH condition of ALC C land would be a lower level of rehabilitation.

> It is recommended that the location of ALC and B be accurately determined and where appropriate the solar farm layout be adjusted to minimize being co-located on these lands.

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[2] This dataset comprises the 'best available' agricultural land class (ALC) data – land classes A and B only with an urban mask applied. This data set is a subset of the state-wide ALC Class A, B, C, D layer and is produced for use in the DSDMIP State Planning Policy interactive mapping system. ALC mapping identifies agricultural land that can be used sustainably for a range of land uses with minimal land degradation. The classes imply a decreasing range of land use choice and an increase in the severity of limitations and/or land degradation hazard. This data was released in January 2019. The data is sourced from individual soil surveys in the Queensland Governments corporate soil information system

Land Use Impact

The report draws a number of conclusions on the land use impact. These conclusions are paraphrased and commented on below.

1. The report concludes that **0.03%** of the CQ grazing lands will be directly impacted from the 1082 ha of lease area under panels out of 2188 ha. This conclusion ought to have been qualified by an interpretation of the same data which shows that **50%** of the lease area of 2188 ha will be directly impacted. Such a statement would more accurately give indication of the impact on agricultural activities on the subject land.
2. The report then indicated that only one of the land holders has indicated a belief that grazing production will increase on the remainder of the holding because income from the solar lease payments will be directed to improving productivity on the rest of the property. If the proposition that lease payments will be re-invested within the area of the property that is leased but not used for panels is an outcome, then subject to other planning issues, that would require an almost 50% doubling of grazing production each and every year of the lease period. This is not at all likely and ought not to be used as a justification for the project.
3. Rural Land Use co-exists or co-locates on the impact area. The report does indicate that grazing will be possible on the 50% of the leased not under panels. In other words, rural land use is not proposed to co-exist in the panel field. The report also cites the recent Mirani case in support of this project. It is important to note that in that case rural land use was proposed to co-exist in the panel area as grazing use under panels in order to manage excess growth. That is not proposed on this site and if proposed would require significant amendment to the design, for example to use form of grazing (sheep) and panel array changes that could co-locate on the panel area[3].
4. The report also notes that there are a number of drainage lines throughout the area and that the land holders also report that there is no erosion on the site. The report does not discuss the impact of changes in the runoff volume and intensity resulting from hard surfacing due to panels and access tracks on the erosion status or on the down stream impacts outside of panel area. Mitigation of these impacts may need to involve such strategies as drainage lines and overland flow path buffering strategies based on hydrological assessments, use of detention basins and diversion bunds and pasture improvement strategies. It is possible that these fundamental design and layout strategies my be identified in a hydrology assessment, however, the absence of such an assessment and reliance solely on land holders interpretation would suggest that caution is required before any conditions on the project or its designs can be properly identified.

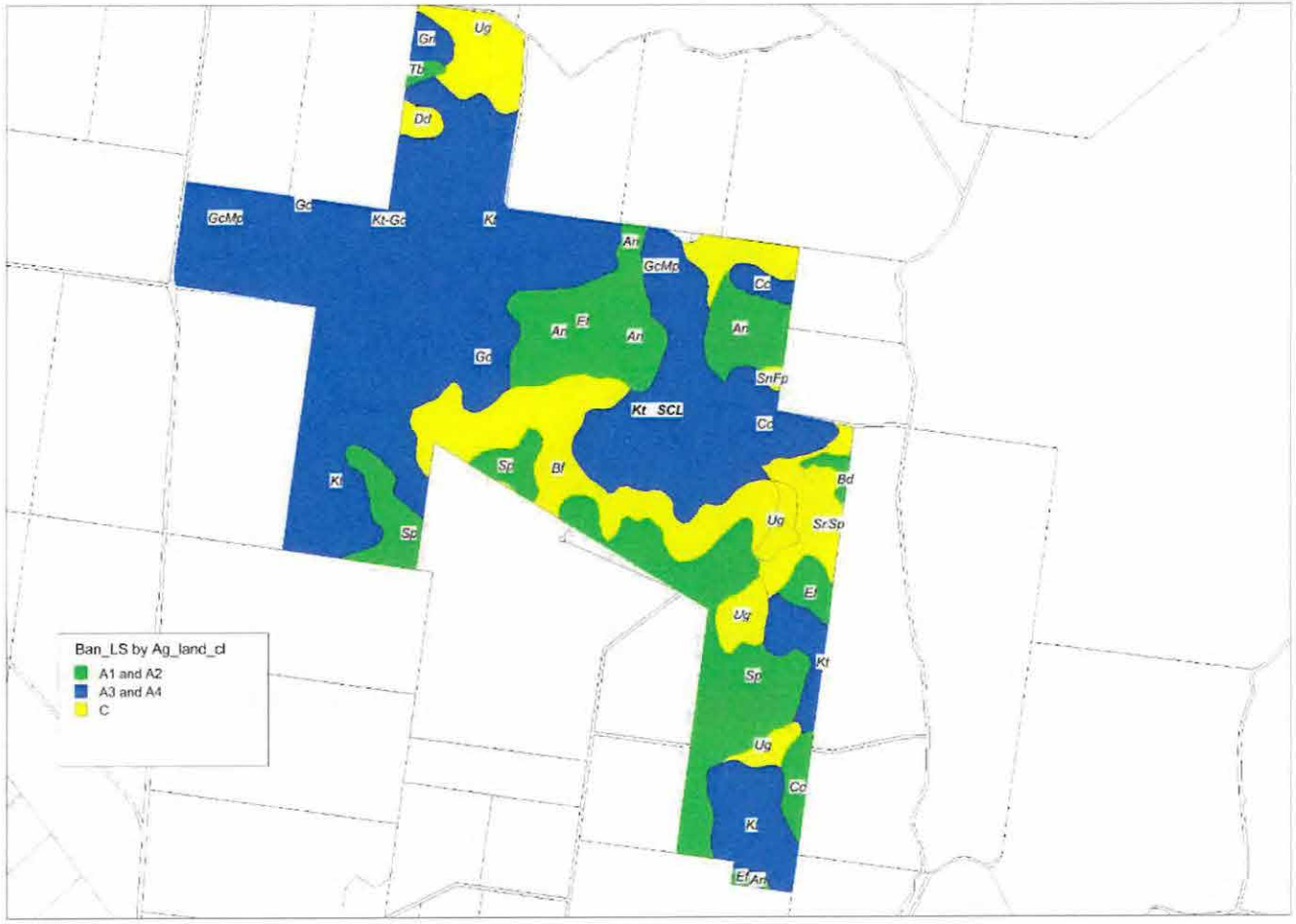
[3] The author of this review was an expert witness in that case and has also been involved in the DA process for numerous solar farm proposals where the issues of excluding ALC A and B, mitigation of impacts and co-exist versus co-locate are central matters

Table 1 Land Suitability within solar farm lease area

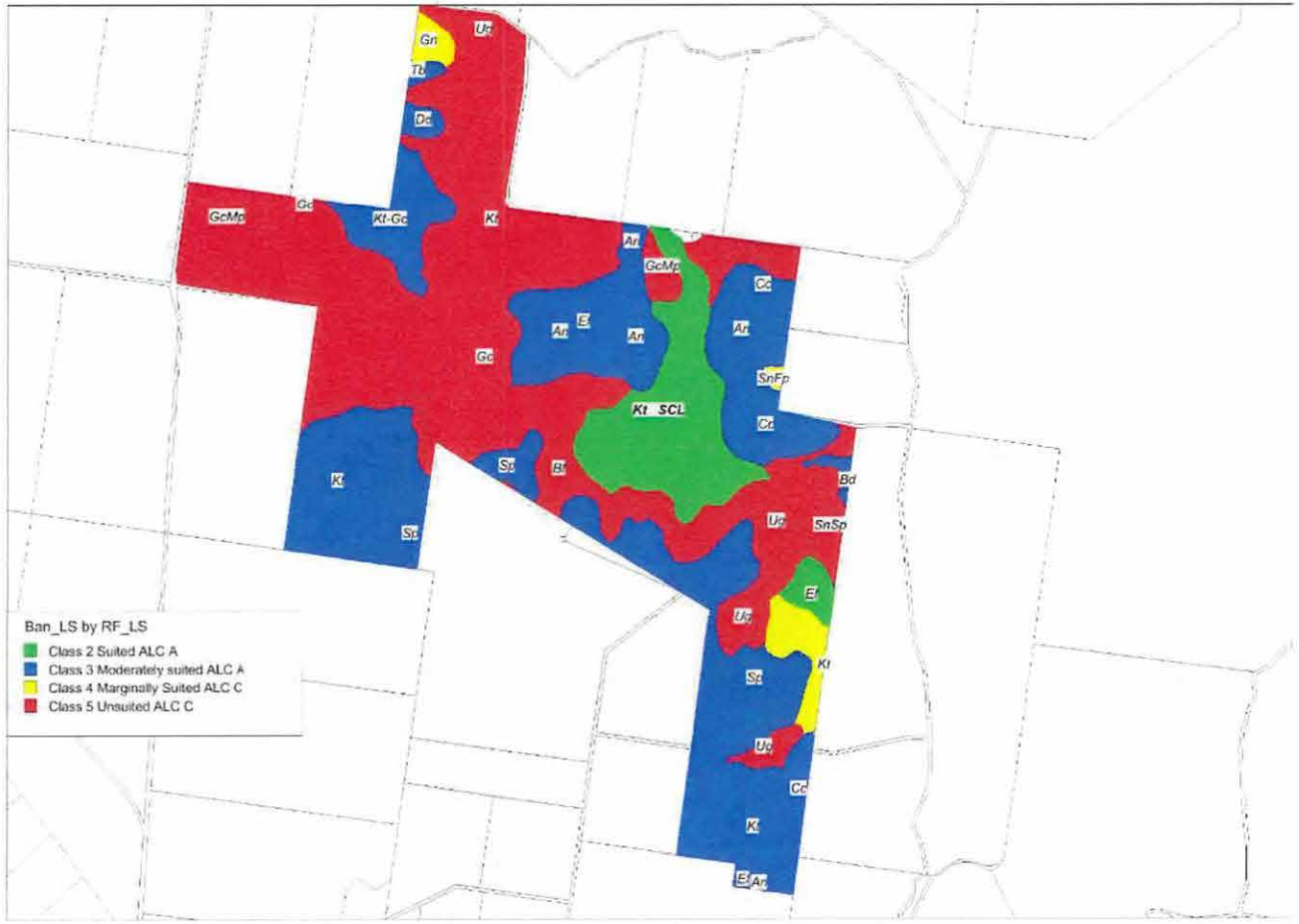
Bill Thompson description adapted from Appendix 1 of Muller 2008 1:100,000 soil survey	Data within QDNRM digital GIS files			Area in solar farm ha	Regional Framework	
	MAP CODE	Agricultural Land Class	Max Slope %		Land Suitability	ALC
Anandale, black CC on olivine basalt, 50 to 85 cm deep, PAWC >105	An	A1	2	5	3	A
	An	A1	4	81	3	A
	An	A1	6	94	3	A
Belldeen, BE linear gilgai on Permian Rocks, 70 to 150 cm deep PAWC >130	Bd	A2	5	12	3	A
Bluff, strongly acid duplex, deeply weathered sedimentary rock, 70 to 150, PAWC <40	Bf	C	200	332	4	C
Clancy, similar to Anandale but slightly deeper and higher clay content PAWC >85	Cc	A1	3	33	3	A
	Cc	A4	4	25	3	A
	Cc	A4	6	106	3	A
Desdemona neutral sodic duplex on sediment, over 150 cm deep PAWC >90	Dd	C	4	19	3	A
Earlsfield, deep self mulching CC, on alluvium, over 150 cm deep and PAWC>140	Ef	A1	3	160	2	A
	Ef	A1	5	37	3	A
Greycliffe, deep sodic brown carcking clay, on alluvium, over 150 cm deep and PAWC 70	Gc	A4	2	77	5	C
Grey cliffe melonhole,as above but with melonholes PAWC avg 50	GcMp	A4	2	28	5	C
	GcMp	A4	3	519	5	C
Granville sodic duplex over sandstone, 70 to 130 cm deep, PAWC 75	Gn	A4	6	25	4	C
Kokotungo, Very deep sodic duplex on sediments, over 150 cm deep, PAWC 90 mm	Kt	A3	2	341	2	A
	Kt	A3	4	353	3	A
	Kt	A3	5	63	4	C

Bill Thompson description adapted from Appendix 1 of Muller 2008 1:100,000 soil survey	Data within QDNRM digital GIS files			Area in solar farm ha	Regional Framework	
	MAP CODE	Agricultural Land Class	Max Slope %		Land Suitability	ALC
	Kt	A3	8	419	5	C
	Kt-Gc	A3	3	120	2	
5anto fertile phase, softwood scrub red/brown non cracking clay on basalt, 30 to 90 cm deep, PAWC avg 70 mm	SnFp	B2	5	6	4	C
	SnFp	B2	8	57	5	C
	SnSp	B2	30	111	5	C
Spier, very deep red gradational soils on deeply weather sandstone, >110 cm deep and PAWC avg 90	Sp	A1	4	72	3	A
	Sp	A1	5	371	3	A
Thalberg, brown duplex very deep on sediments, PAWC 130	Tb	A1	3	10	3	A
Ulogie very deep sodic duplex on sediments, >150 cm deep, PAWC <50	Ug	C	4	52	5	C
	Ug	C	6	108	5	C
	Ug	C	10	45	5	C
% of area as ALC A or B		**85%**				**47%**

Map 1 Muller Agricultural Land Classes



Map 2 Regional Framework Land Suitability Data



Map 3 SPP Agric Land Classes over the Regional Framework