JH AGRICULTURE SERVICES (SA-0032697-W)
Specialise in soil survey, water management and oil palm agronomy advisory services.

SEMI DETAILED SOIL SURVEY AND SUITABILITY ASSESSMENT REPORT OF PT ANUGERAH ALAM PERSADA (PT AAP) – LOKASI 2 IN KECAMATAN SANGKULIRANG, KABUPATEN KUTAI TIMOR, PROVINCE OF KALIMANTAN TIMOR, INDONESIA

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SEMI DETAILED SOIL SURVEY AND SUITABILITY ASSESSMENT REPORT OF PT ANUGERAH ALAM PERSADA (PT AAP) – LOKASI 2 IN KECAMATAN SANGKULIRANG, KABUPATEN KUTAI TIMOR, PROVINCE OF KALIMANTAN TIMOR, INDONESIA

prepared for: PT ANUGERAH ALAM PERSADA

prepared by: JH AGRICULTURE SERVICES

date: FEBRUARY 2011

C O N T E N T S

AGRO MANAGEMENT RECOMMENDATION

TABLES

MAPS

Semi detailed soil survey and oil palm suitability assessment report of PT Anugerah Alam Persada – lokasi 2 in kecamatan Sangkulirang, kabupaten Kutai Timor in Kalimantan Timor,,Indonesia

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SEMI DETAILED SOIL SURVEY AND OIL PALM SUITABILITY ASSESSMENT REPORT OF PT ANUGERAH ALAM PERSADA (PT AAP) – LOKASI 2 IN KECAMATAN SANGKULIRANG, KABUPATEN KUTAI TIMOR IN KALIMANTAN TIMOR, INDONESIA

EXECUTIVE SUMMARY

Date of survey: ***7th – 11th January 2011***

Purpose of survey:

1) ***to conduct semi detailed soil survey in lokasi 2 jungle area of PT Anugerah Alam Persada (PT AAP)***
2) ***to provide assessment on soil suitability for oil palm cultivation***
3) ***to identify major soil limitation to oil palm planting and growth***
4) ***to provide general recommendation for soil and water management practices to overcome soil limitation***

Observation:

1) ***total area surveyed was 2,323 ha***
2) ***majority of the area is undulating to hilly.***

   104 ha (4%) are raised flat to undulating;

   993 ha (43%) are undulating to rolling;

   971 ha (42%) are rolling to hilly;

   255 ha (11%) are steep to very steep.
3) ***5 dominant soil series have been identified.***

4) ***5 Soil Mapping Units (SMU) have been demarcated***

5) ***stony and rocky soils are dominant, occupies 2,102 ha (91%)***

<u>Major soil limitation to oil palm growth and performance</u>:

1) ***stony and rocky***

2) ***steep to very steep terrain***

<u>Soil suitability for oil palm cultivation</u>:

- ***221 ha (9%) are suitable;***
- ***1,847 ha (80%) are marginal to unsuitable;***
- ***255 ha (11%) are unsuitable.***

<u>Recommendation for soil / water management practices</u>:

1) ***construct planting terrace on slope above 6^0***

2) ***establish vigorous leguminous ground cover such as Mucuna bracteata for soil / moisture conservation and erosion control***

INTRODUCTION

1.1 GENERAL INTRODUCTION

A semi detailed soil survey was conducted in the second lokasi in the jungle area of PT Anugerah Alam Persada (PT AAP) in kecamatan Sangulirang in kabupaten Kutai Timor, Kalimantan Timor. The objective of the survey is to assess soil suitability for oil palm cultivation. Soil and terrain limitations are identified. Soil and water management practices to overcome major soil limitations are also recommended.

1.2 LOCATION

The surveyed area is located in kecamatan Sangulirang, kabupaten Kutai Timor, in the province of Kalimantan Timor, Indonesia. It lies between latitudes of 156,600m N to 169,871m N and between longitudes of 594,800m E to 601,586m E *(Map 1)*.

1.3 ACCESSIBILITY

PT AAP can be accessed by speed boat from pelabuhan in Ronggang, Sangulirang. The journey by speed boat to pelabuhan PT EBL takes about 1 hour. The surveyed area is another 45 minutes by 4WD mobil through PT EBL estates' road.

1.4 EXTENT

The surveyed area in PT AAP lokasi 2 is 2,323 ha

ENVIRONMENT

2.1 TOPOGRAPHY

The topography of the surveyed area in PT AAP lokasi 2 ranges from raised flat to very steep (0-> 25^0 slopes). The elevation ranges from 90m to 273m above mean sea level.

The breakdown of the topography is as follow: *(Map 2, 3 and Table 1)*

Table 1: Topography of PT AAP-lokasi 2

Topography	Slope	Ha (%)
Raised flat to undulating	$0\text{-}2^0$	104 (4)
Undulating to rolling	$2\text{-}12^0$	993 (43)
Rolling to hilly	$6\text{-}20^0$	971 (42)
Steep to very steep	$20\text{->}25^0$	255 (11%)
	Total:	2,323 (100)

2.2 GEOLOGY

The geology of PT AAP lokasi 2 belongs to Domaring Formation of late Miocene to early Pliocene epoch. It consists mainly of coralline limestone, chalky limestone and marl.

2.3 RAINFALL

No rainfall records are available for the surveyed area. The neighboring PT EBL estate has less than 1 year rainfall record.

SOIL OF SURVEYED AREA

3.1 SOIL SURVEY METHOD

Semi detailed soil survey was carried out in lokasi 2 of PT AAP. Traverse rentis were made at about 1km apart. Soil auger examinations were made at about 200m interval along the traverse rentis. A total of 133 soil auger examination points were made, with an intensity of 17 ha per soil examination point. *(Map 4)*.

3.2 MAIN SOIL TYPES PRESENT

A total of 5 dominant soil series have been identified. These are tentatively classified as follow:

1.	Berlian Jaya series (BJA)	`from sedimentary rock
2.	Jaro series (JRO)	from sedimentary rock
3.	Sangulirang (SKL)	from sandstone underlain by limestone
4.	Ronggang (RNG)	from sandstone underlain by limestone
5.	Lithosol (LIT)	from limestone

The surveyed area is mapped into the following 5 'Soil Mapping Units' (SMU). These are demarcated in the Semi Detailed Soil Map *(Map 5 and Table 2)*

1.	JRO / BJA; arb	104 ha (4%)
2.	JRO / BJA; bc	117 ha (5%)
3.	RNG / SKL; bc	876 ha (38%)
4.	RNG / SKL; cd	971 ha (42%)

5.	LIT / RNG; ef	255 ha (11%)
	Total :	2,323 (100)

Explaination on SMU ***example :*** **JRO / BJA bc**

JRO = Jaro soil series

BJA = Berlian Jaya soil series

bc = undulating to rolling

.3.3 MAJOR SOIL CHARACTERISTICS

on sedimentary rock – shale (effective soil depth >100cm)

Berlian Jaya series (BJA); *Typic Kandiudult*; sub-soil brownish yellow to yellowish brown to strong brown; fine sandy clay to clay; 35-60% clay; deep to very deep soil; well drained; on raised flat to rolling terrain

on sedimentary rock – shale (effective soil depth 50-100cm)

Jaro series (JRO); *Typic Hapludult;* sub-soil brownish yellow to yellowish brown to strong brown; fine sandy clay to clay; 35-60% clay; somewhat shallow to moderately deep soil; moderately well drained; on raised flat to rolling terrain

on sedimentary rock – sandstone (stony and rocky limestone at 50-100cm)

Sangulirang series (SKL); *Lithic Hapludult;* sub-soil strong brown to yellowish brown to brownish yellow; sandy clay loam to sandy loam; 18-35% clay; somewhat shallow to

moderately deep soil; with limestone rocks at 50-100cm soil depth; well drained; on undulating to hilly terrain

on sedimentary rock – sandstone (stony and rocky limestone within 50cm)

Ronggang series (RNG); *Lithic Hapludult;* same as Sangulinang series but with limestone rocks at within 50 soil depth; very shallow to shallow soil; well-drained; on undulating to hilly terrain

Lithosol (LIT); *Lithosol;* continuous layer of consolidated sedimentary rock – mainly limestone

MAJOR SOIL LIMITATIONS TO OIL PALM GROWTH AND PERFORMANCE

Major soil limitations to oil palm growth and performance in the surveyed area in PT

AAP – lokasi 2 are:

4.1 STONY SOIL

Soils of Sangulinang series, Ronggang series and Lithosol are shallow stony soil on undulating to very steep terrain. The rocky layer occurs within 100cm soil depth. Upon terracing, the rocky layer will either be exposed to the soil surface or very close to the planting hole. Preparation of planting holes can be very difficult or impossible. These soils have shallow effective soil depth and limited root room area. It poses very serious limitation to oil palm roots penetration and development.

4.2 STEEP TERRAIN

About 255 ha (11%) of the surveyed area are steep hilly, with slope exceeding $20^{0.}$ The soils are shallow and rocky.

SOIL SUITABILITY FOR OIL PALM CULTIVATION

5.1 SOIL SUITABILITY

Major soil limitations and suitability for oil palm cultivation in PT AAP – lokasi 2 are presented in *Map 6* and *Table 3*.

AGRO MANAGEMENT RECOMMENDATION

6.1 SOIL / WATER / AGRO MANAGEMENT RECOMMENDATION

Soil / water / agro management practices to overcome soil limitations in the surveyed area in PT AAP lokasi 2 are provided in *Table 3*

CONCLUSION

Lokasi 2 of PT AAP are dominated by stony and rocky soil. It is estimated that about 2,102 ha or 91% are stony and rocky. The stony layer poses serious limitation to oil palm roots development. The surveyed area of lokasi 2 PT AAP is considered marginal to unsuitable for oil palm cultivation.

TABLES

Table 2 **: Soil Mapping Units (SMU) of PT AAP - lokasi 2**

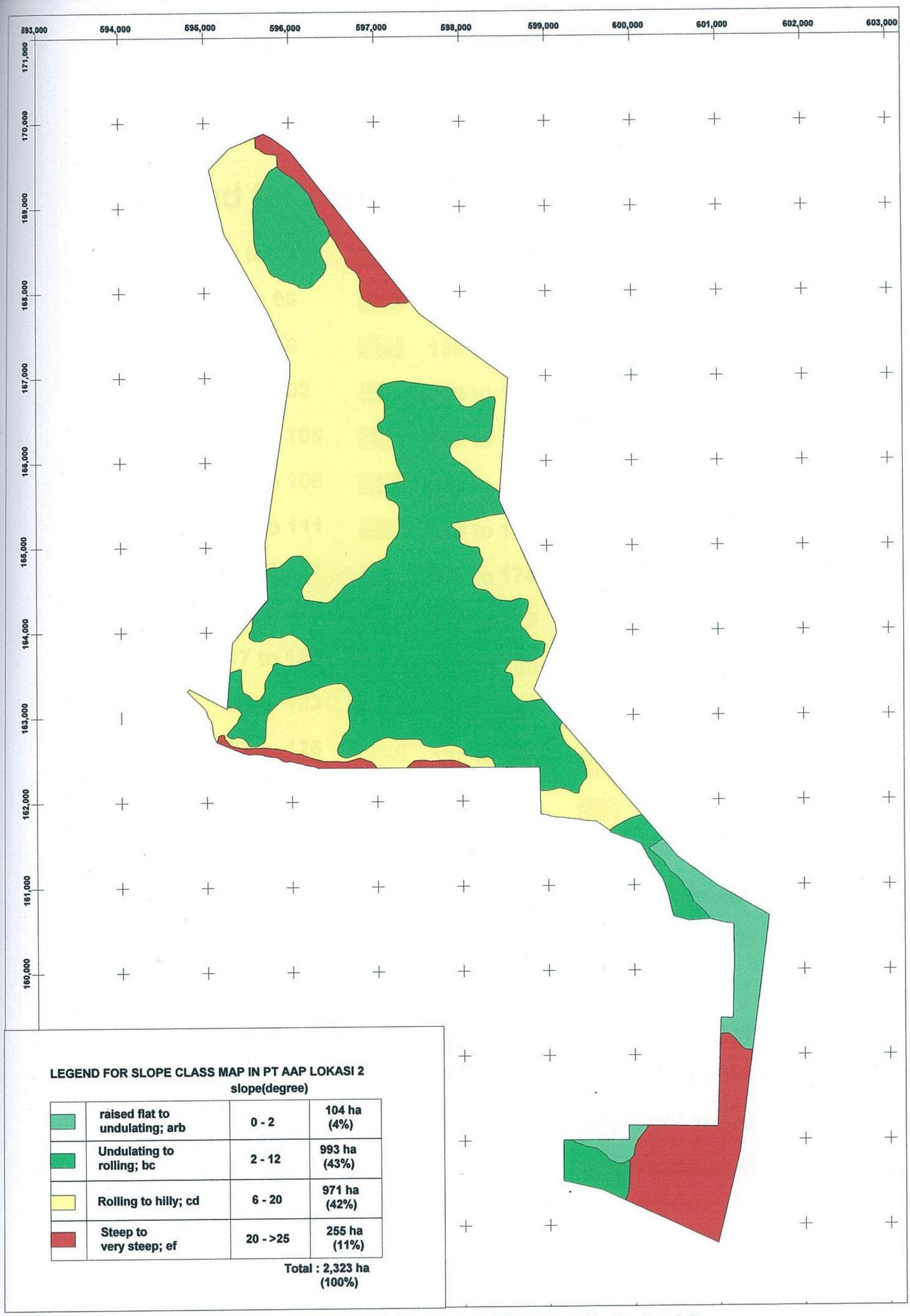
	SOIL MAPPING UNIT (SMU) Soil series / Soil association	TERRAIN	HA (%)
1	JRO/BJA; arb Jaro / Berlian Jaya Association	raised flat to undulating 0 - 6 degree	104 ha (4%)
2	JRO/BJA; bc Jaro / Berlian Jaya Association	undulating to rolling 2 - 12 degree	117 ha (5%)
3	RNG/SKL; bc Ronggang / Sangulinang Association	undulating to rolling 2 - 12 degree	876 ha (38%)
4	RNG/SKL; cd Ronggang / Sangulinang Association	rolling to hilly 6 - 20 degree	971 ha (42%)
5	Lithosol/RNG Rocks / Ronggang Association	steep hilly >20 degree	255 ha (11%)
		Total :	***2,323 ha (100%)***

Table 3 : **Soil limitation, suitability and soil / water / agro management recommendation for PT AAP lokasi 2**

Soil Mappin Unit (SMU)	Soil Group	Soil series	Soil Limitation	Suitability	Recommended soil / water / agro management
JRO/BJA; arb JRO/BJA; bc	1. sedimentary rock - shale/ sandstone; effective soil depth >100cm 2. sedimentary rock - shale/ sandstone; effective soil depth 50-100cm	Berlian Jaya series Jaro series	1. low on plant nutrient reserve (all soil series)	Suitable 221 ha (9%)	1. monitor fertilizer requirement through soil and leaf analysis results 2. establish *Mucuna bracterta* leguminous cover to conserve soil moisture and to improve soil structures 3. plant palms on 'planting terrace' for slope >6^0
RNG/SKL; bc RNG/SKL; cd	1. sedimentary rock - sandstone effective soil depth 50-100cm; (stony and rocky at 50-100cm) 1. sedimentary rock - sandstone effective soil depth <50cm; (stony and rocky at <50cm)	Sangulinang series Ronggang series	1. stony and rocky between 50-100cm soil depth (stony layer near to planting holes upon terracing on >6^0 slope) 2. stony and rocky within 50cm soil depth (stony layer at planting holes upon terracing on >6^0 slope)	Marginal to unsuitable 1,847 ha (80%)	1. monitor fertilizer requirement through soil and leaf analysis results 2. establish *Mucuna bracterta* leguminous cover to conserve top soil and soil moisture 3. plant palms on 'planting terrace' for slope >6^0 4. plant palms on 2.5m x 2.5m platform on steep ravine shoulder 5. not recommended for planting on stony Ronggang series
Lithosol/RNG;ef	1. sedimentary rock - sandstone effective soil depth <50cm; (stony and rocky at <50cm) 2. Rocky and stony	Ronggang series Lithosol	1. stony and rocky within 50cm soil depth (stony layer at planting holes upon terracing on >6^0 slope) 2. Rocky and stony on surface	Unsuitable 255 ha (11%)	Not recommended for oil palm planting

MAPS

MAP 1 : LOCATION MAP OF PT AAP-LOKASI 2



LEGEND FOR SLOPE CLASS MAP IN PT AAP LOKASI 2

	slope(degree)	
raised flat to undulating; arb	0 - 2	104 ha (4%)
Undulating to rolling; bc	2 - 12	993 ha (43%)
Rolling to hilly; cd	6 - 20	971 ha (42%)
Steep to very steep; ef	20 - >25	255 ha (11%)

Total : 2,323 ha (100%)

MAP 2 : SLOPE CLASS MAP OF PT AAP - Lokasi 2

Legend for elevation of PT AAP - lokasi 2

- 90 to 93
- 93 to 96
- 96 to 99
- 99 to 102
- 102 to 105
- 105 to 108
- 108 to 111
- 111 to 114
- 114 to 117
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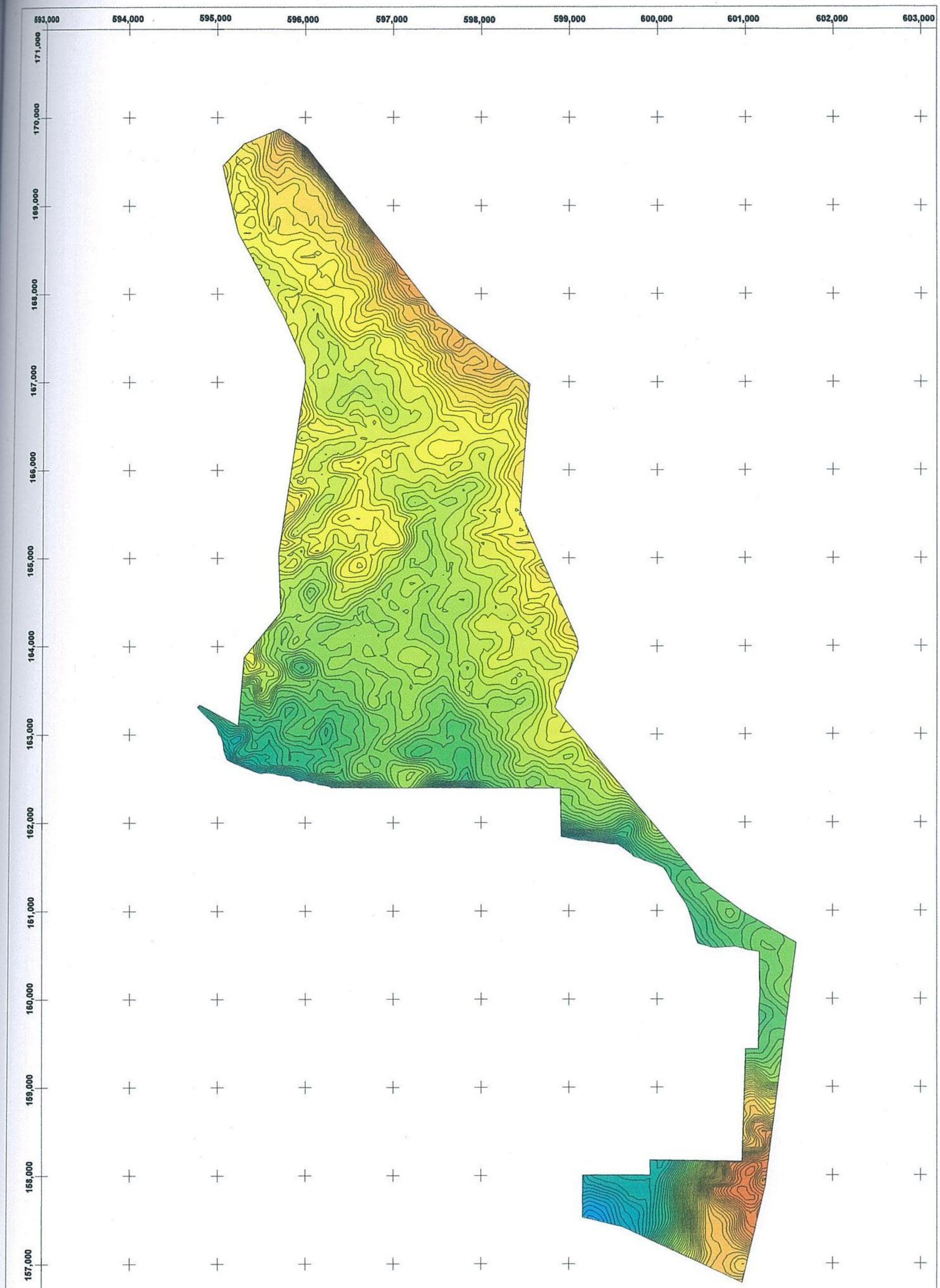
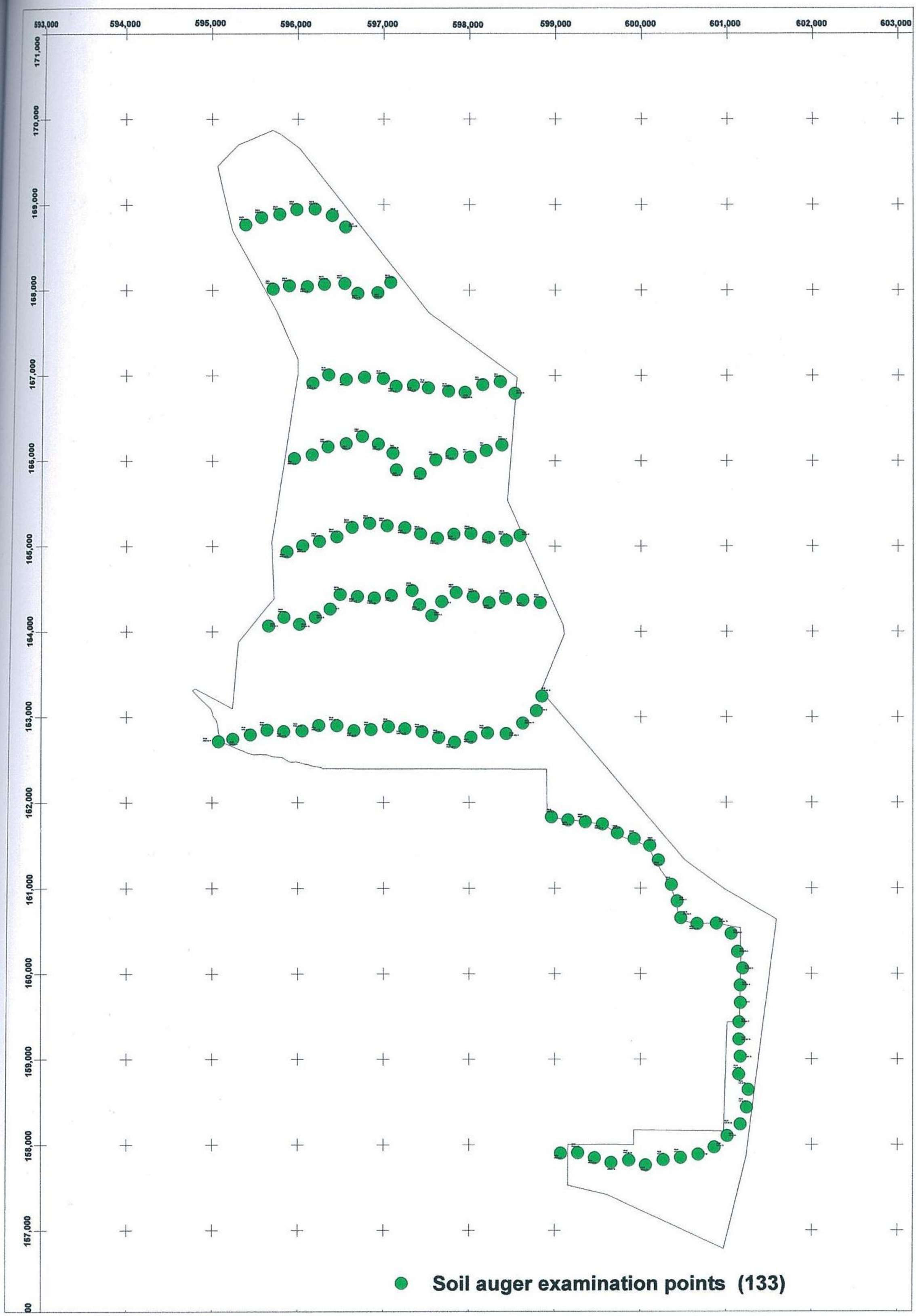
- 267 to 270
- 270 to 273

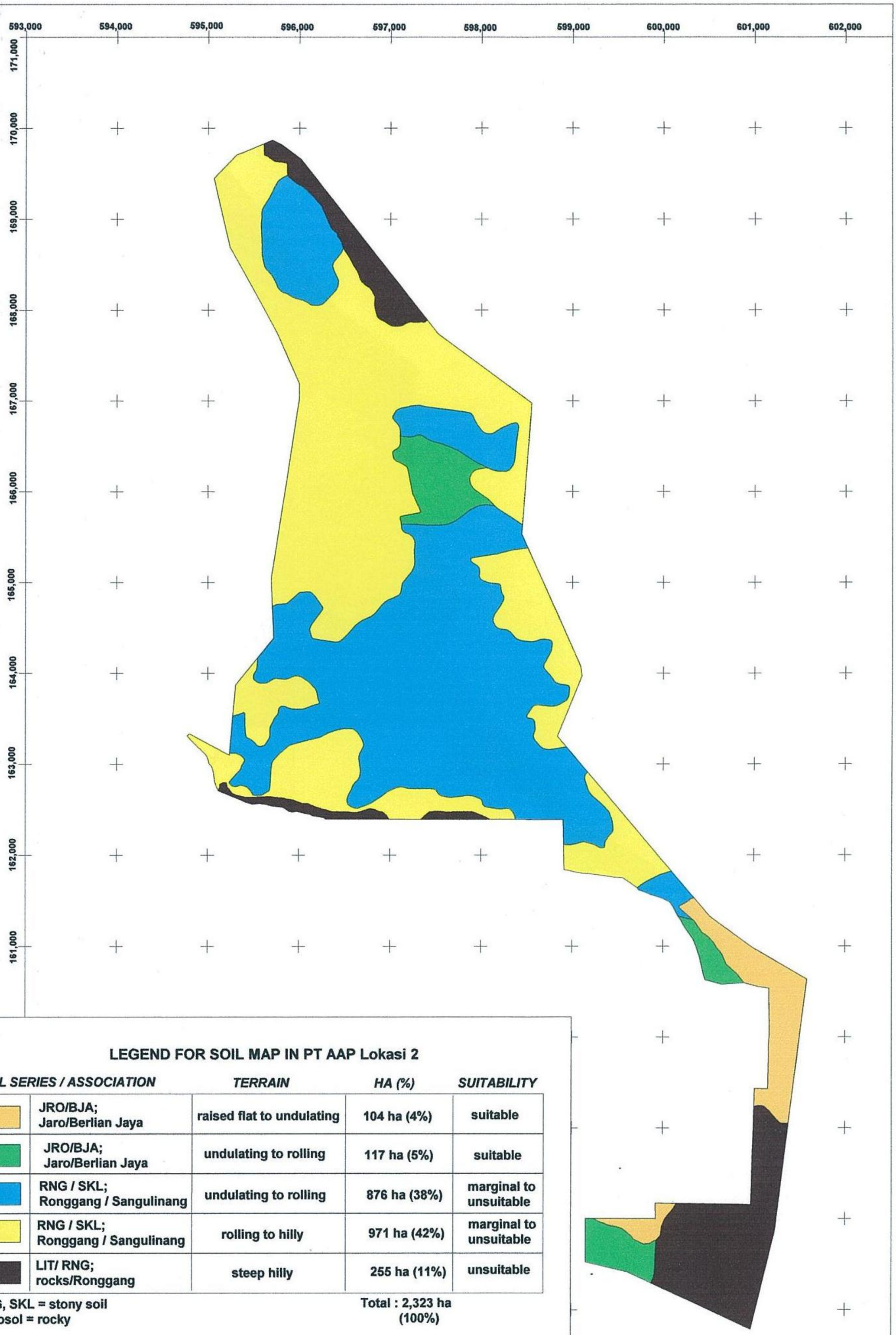
LEGEND FOR ELEVATION MAP OF PT AAP - LOKASI 2



MAP 3 : ELEVATION MAP OF PT AAP - Lokasi 2



MAP 4 : SOIL EXAMINATION POINTS OF PT AAP - Lokasi 2



LEGEND FOR SOIL MAP IN PT AAP Lokasi 2

SOIL SERIES / ASSOCIATION	TERRAIN	HA (%)	SUITABILITY
JRO/BJA; Jaro/Berlian Jaya	raised flat to undulating	104 ha (4%)	suitable
JRO/BJA; Jaro/Berlian Jaya	undulating to rolling	117 ha (5%)	suitable
RNG / SKL; Ronggang / Sangulinang	undulating to rolling	876 ha (38%)	marginal to unsuitable
RNG / SKL; Ronggang / Sangulinang	rolling to hilly	971 ha (42%)	marginal to unsuitable
LIT/ RNG; rocks/Ronggang	steep hilly	255 ha (11%)	unsuitable

RNG, SKL = stony soil
Lithosol = rocky

Total : 2,323 ha (100%)

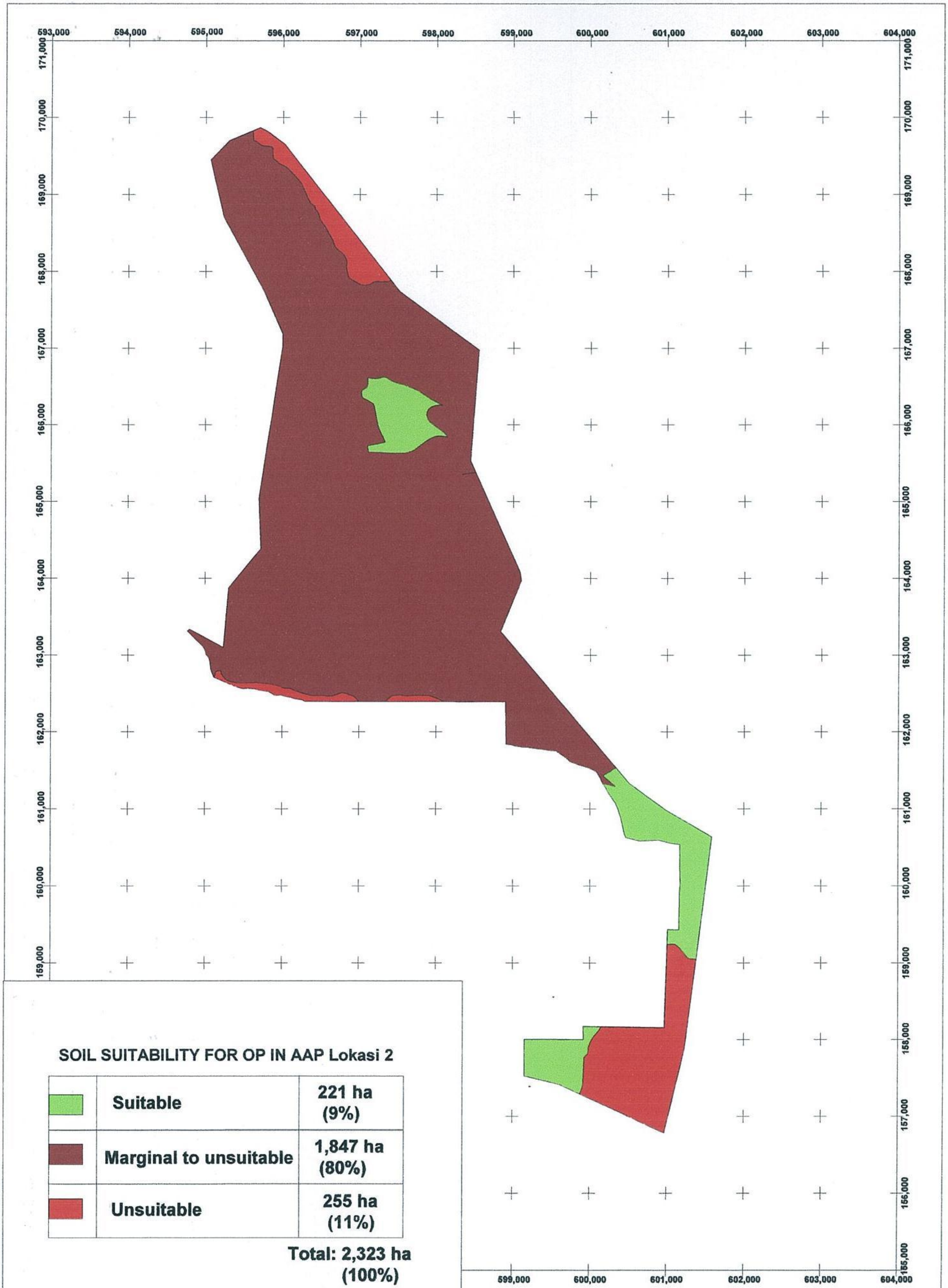
MAP 5 : SEMI DETAILED SOIL MAP OF PT AAP - LOKASI 2

SOIL SUITABILITY FOR OP IN AAP Lokasi 2

	Suitable	**221 ha (9%)**
	Marginal to unsuitable	**1,847 ha (80%)**
	Unsuitable	**255 ha (11%)**

Total: 2,323 ha (100%)

MAP 6 : SOIL SUITABILITY MAP OF PT AAP - LOKASI 2



SOIL SUITABILITY FOR OP IN AAP Lokasi 2

	Suitable	221 ha (9%)
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MAP 6 : SOIL SUITABILITY MAP OF PT AAP - LOKASI 2