



Grupo de Desenvolvimento de Tecnologia

Uberlândia

**GDT DE UBERLÂNDIA:
UTILIZAÇÃO DE MAPAS
NA AGRICULTURA MODERNA**

BALTAZAR REIS FIOMARI
GDT - Uberlândia

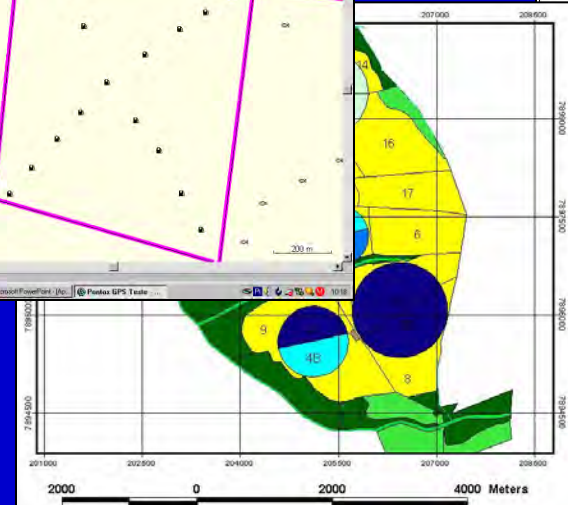
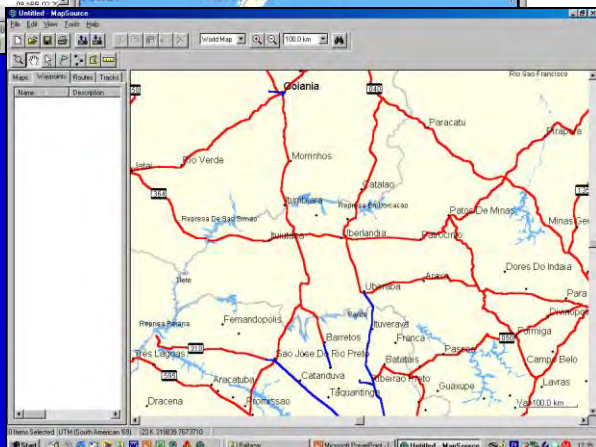
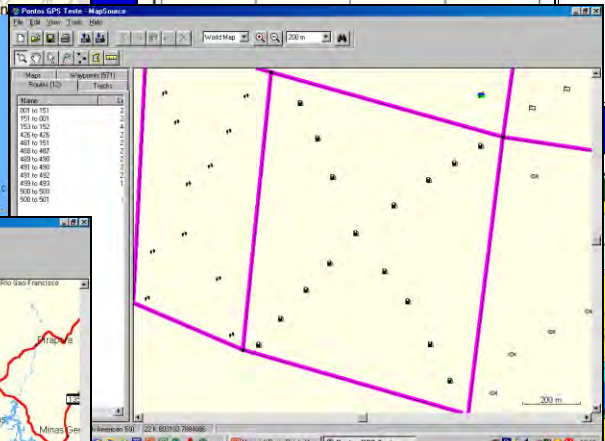
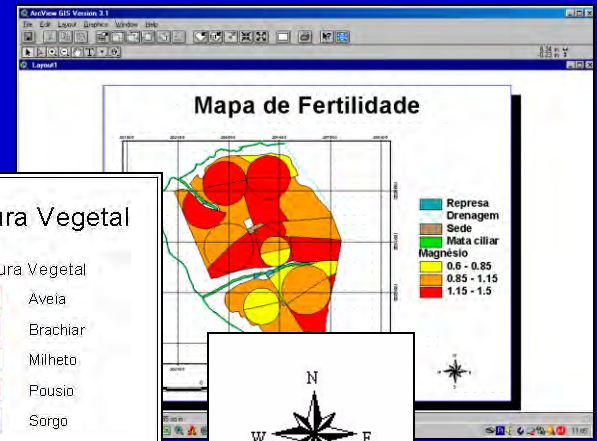
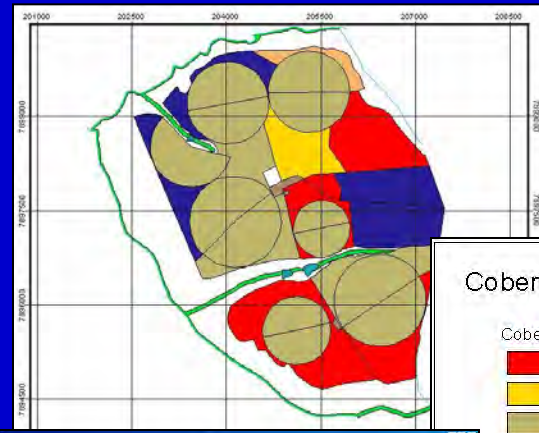
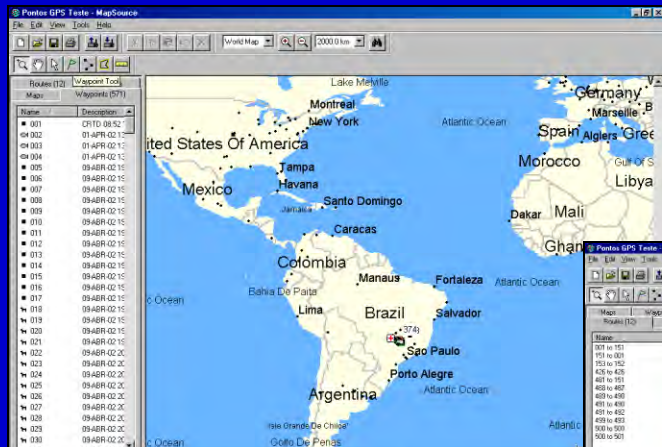
Fone/fax: (34) 3257-3837

E-mail: bfiomari@bol.com.br

3^o SIMPÓSIO SOBRE ROTAÇÃO SOJA/MILHO NO PLANTIO DIRETO
Piracicaba-SP, Julho 10-12, 2002



Utilização de Mapas na Agricultura Moderna



Coleta de Solo Geo-referenciada

Objetivos:

- **Realizar a amostragem de solo no talhão utilizando os recursos do GPS para a identificação dos pontos de amostragem;**
- **Retornar na mesma rota obedecendo os pontos (células) na coleta de solo futura, sincronizando resultados das análises de anos anteriores.**



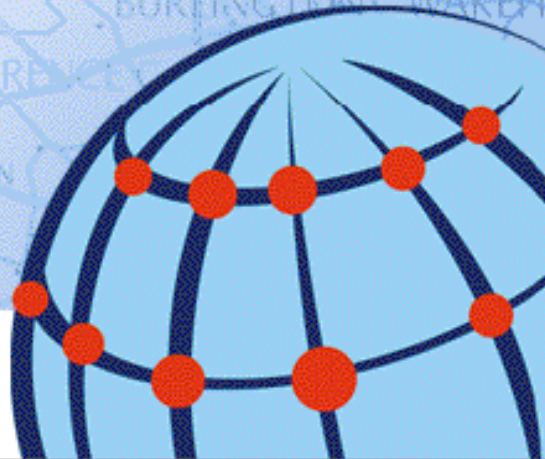
MapSource™

Version 3.02



GARMIN

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World Map [Zoom In] [Zoom Out] 2000.0 km [Home]

[Pan] [Zoom] [Measure] [Layers] [Layers On/Off] [Layers Style]

Routes (12) | Waypoint Tool

Maps | Waypoints (571)

Name	Description
001	CRTD 08:52
002	01-APR-02 13
003	01-APR-02 13
004	01-APR-02 13
005	09-ABR-02 15
006	09-ABR-02 15
007	09-ABR-02 15
008	09-ABR-02 15
009	09-ABR-02 15
010	09-ABR-02 15
011	09-ABR-02 15
012	09-ABR-02 15
013	09-ABR-02 15
014	09-ABR-02 15
015	09-ABR-02 15
016	09-ABR-02 15
017	09-ABR-02 15
018	09-ABR-02 15
019	09-ABR-02 15
020	09-ABR-02 15
021	09-ABR-02 15
022	09-ABR-02 20
023	09-ABR-02 20
024	09-ABR-02 20
025	09-ABR-02 20
026	09-ABR-02 20
027	09-ABR-02 20
028	09-ABR-02 20
029	09-ABR-02 20
030	09-ABR-02 20
031	09-ABR-02 20



0 Items Selected UTM (South American '69)

World Map [Zoom In] [Zoom Out] 700.0 km [Home]

[Navigation Tools: Pan, Zoom, Measure, etc.]

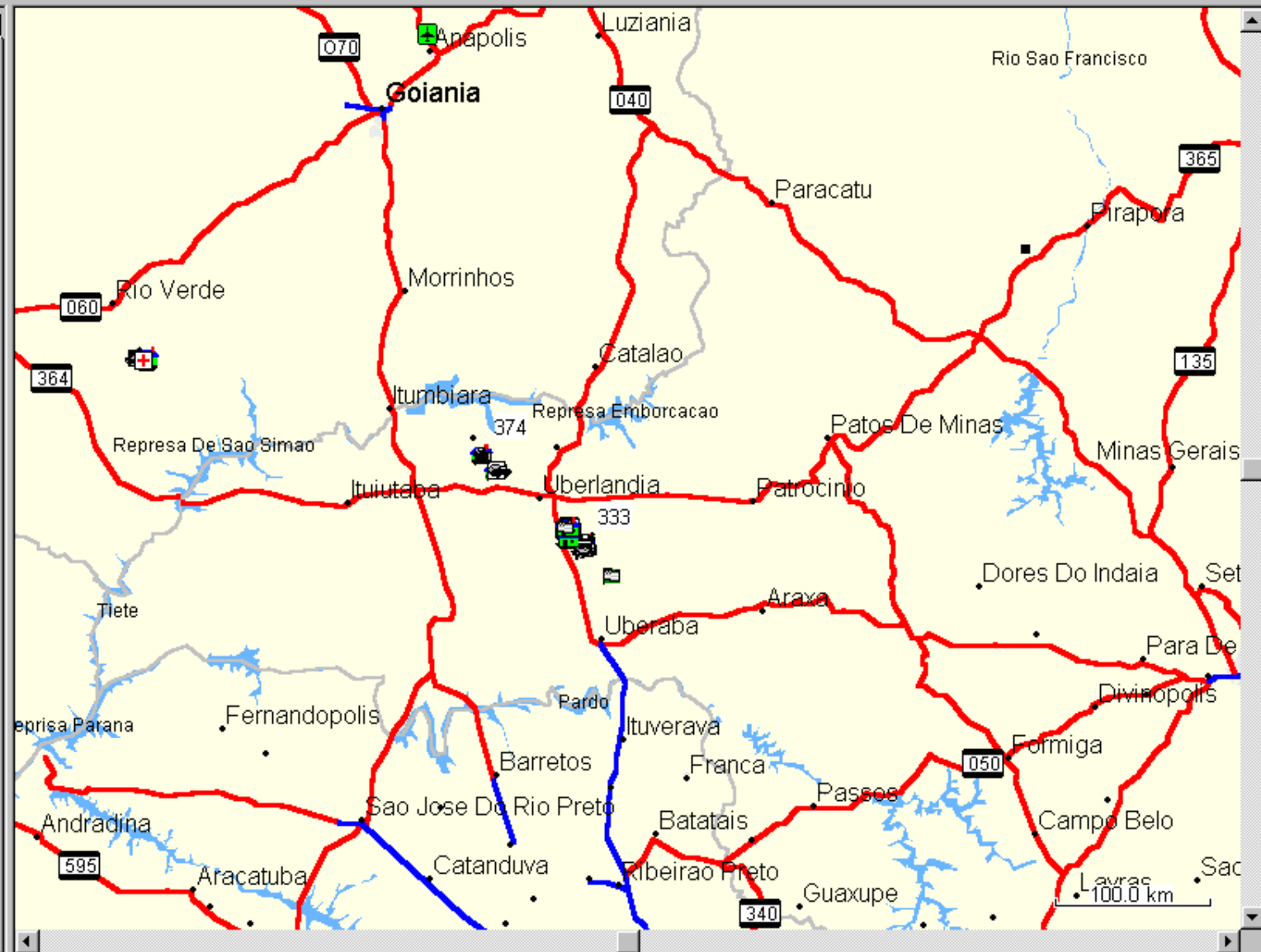
Routes (12)		Tracks	
Maps		Waypoints (571)	
Name	Description		
001	CRTD 08:52		
002	01-APR-02 13		
003	01-APR-02 13		
004	01-APR-02 13		
005	09-ABR-02 15		
006	09-ABR-02 15		
007	09-ABR-02 15		
008	09-ABR-02 15		
009	09-ABR-02 15		
010	09-ABR-02 15		
011	09-ABR-02 15		
012	09-ABR-02 15		
013	09-ABR-02 15		
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015	09-ABR-02 15		
016	09-ABR-02 15		
017	09-ABR-02 15		
018	09-ABR-02 15		
019	09-ABR-02 15		
020	09-ABR-02 15		
021	09-ABR-02 15		
022	09-ABR-02 20		
023	09-ABR-02 20		
024	09-ABR-02 20		
025	09-ABR-02 20		
026	09-ABR-02 20		
027	09-ABR-02 20		
028	09-ABR-02 20		
029	09-ABR-02 20		
030	09-ABR-02 20		
031	09-ABR-02 20		



World Map [Zoom In] [Zoom Out] 100.0 km [Compass]

[Hand] [Arrow] [Flag] [Layers] [Scale]

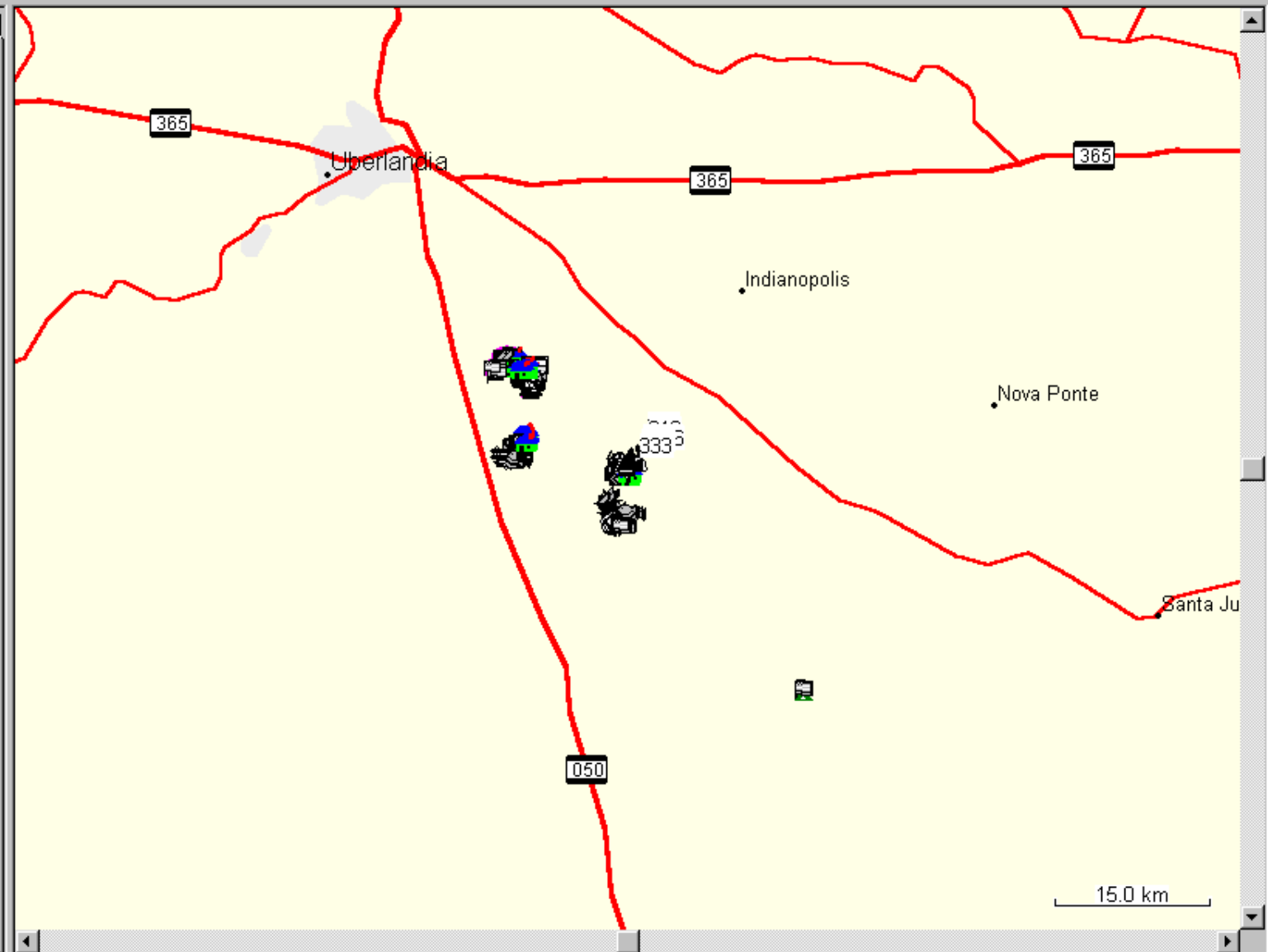
Routes (12)		Tracks	
Maps		Waypoints (571)	
Name	Description		
001	CRTD 08:52		
002	01-APR-02 13		
003	01-APR-02 13		
004	01-APR-02 13		
005	09-ABR-02 15		
006	09-ABR-02 15		
007	09-ABR-02 15		
008	09-ABR-02 15		
009	09-ABR-02 15		
010	09-ABR-02 15		
011	09-ABR-02 15		
012	09-ABR-02 15		
013	09-ABR-02 15		
014	09-ABR-02 15		
015	09-ABR-02 15		
016	09-ABR-02 15		
017	09-ABR-02 15		
018	09-ABR-02 15		
019	09-ABR-02 15		
020	09-ABR-02 15		
021	09-ABR-02 15		
022	09-ABR-02 20		
023	09-ABR-02 20		
024	09-ABR-02 20		
025	09-ABR-02 20		
026	09-ABR-02 20		
027	09-ABR-02 20		
028	09-ABR-02 20		
029	09-ABR-02 20		
030	09-ABR-02 20		
031	09-ABR-02 20		



World Map | [Zoom In] [Zoom Out] | 15.0 km | [Compass]

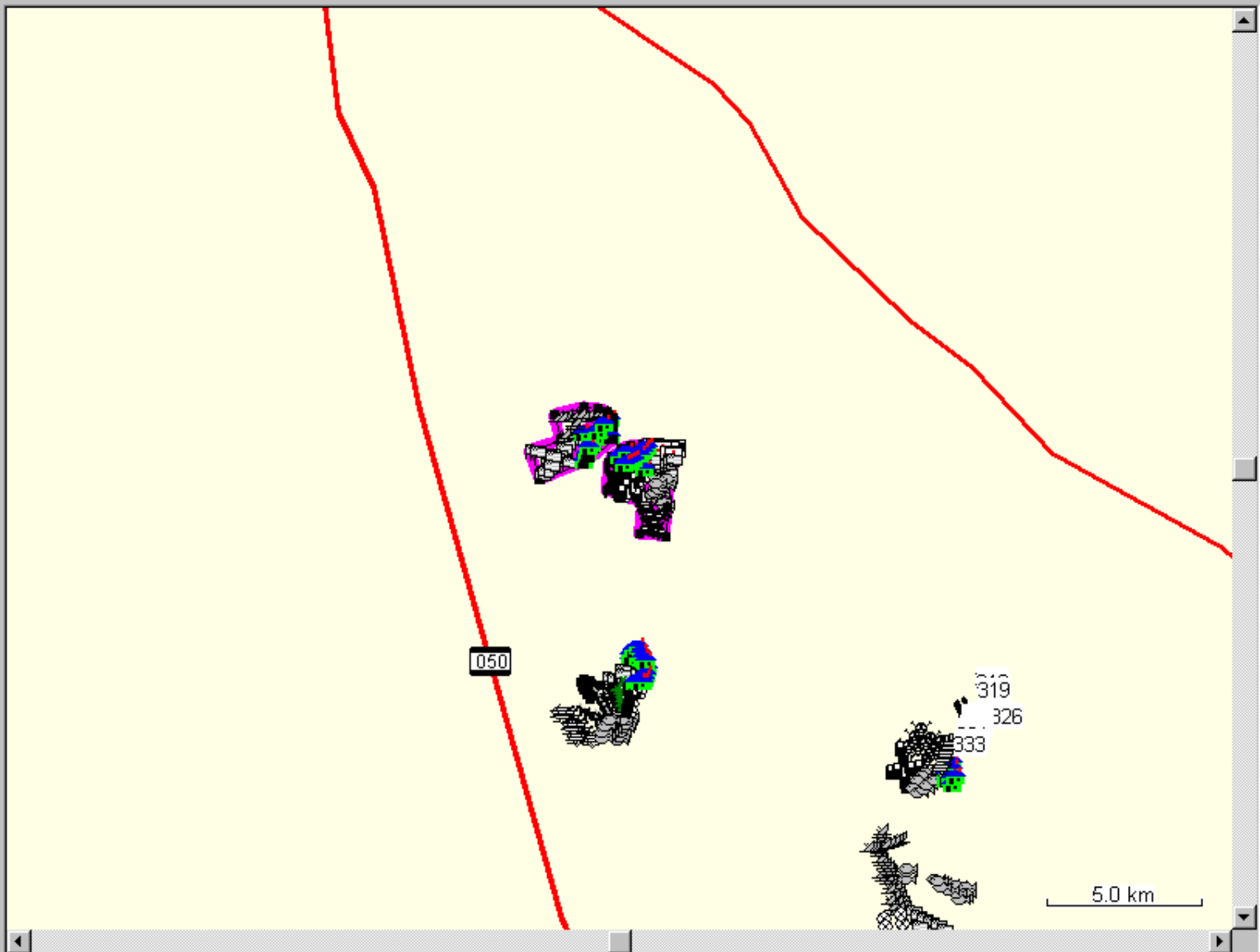
[Hand] [Arrow] [Flag] [Line] [MM]

Routes (12)	
Tracks	
Waypoints (571)	
Name	Description
001	CRTD 08:52
002	01-APR-02 13
003	01-APR-02 13
004	01-APR-02 13
005	09-ABR-02 15
006	09-ABR-02 15
007	09-ABR-02 15
008	09-ABR-02 15
009	09-ABR-02 15
010	09-ABR-02 15
011	09-ABR-02 15
012	09-ABR-02 15
013	09-ABR-02 15
014	09-ABR-02 15
015	09-ABR-02 15
016	09-ABR-02 15
017	09-ABR-02 15
018	09-ABR-02 15
019	09-ABR-02 15
020	09-ABR-02 15
021	09-ABR-02 15
022	09-ABR-02 20
023	09-ABR-02 20
024	09-ABR-02 20
025	09-ABR-02 20
026	09-ABR-02 20
027	09-ABR-02 20
028	09-ABR-02 20
029	09-ABR-02 20
030	09-ABR-02 20
031	09-ABR-02 20



World Map 5.0 km

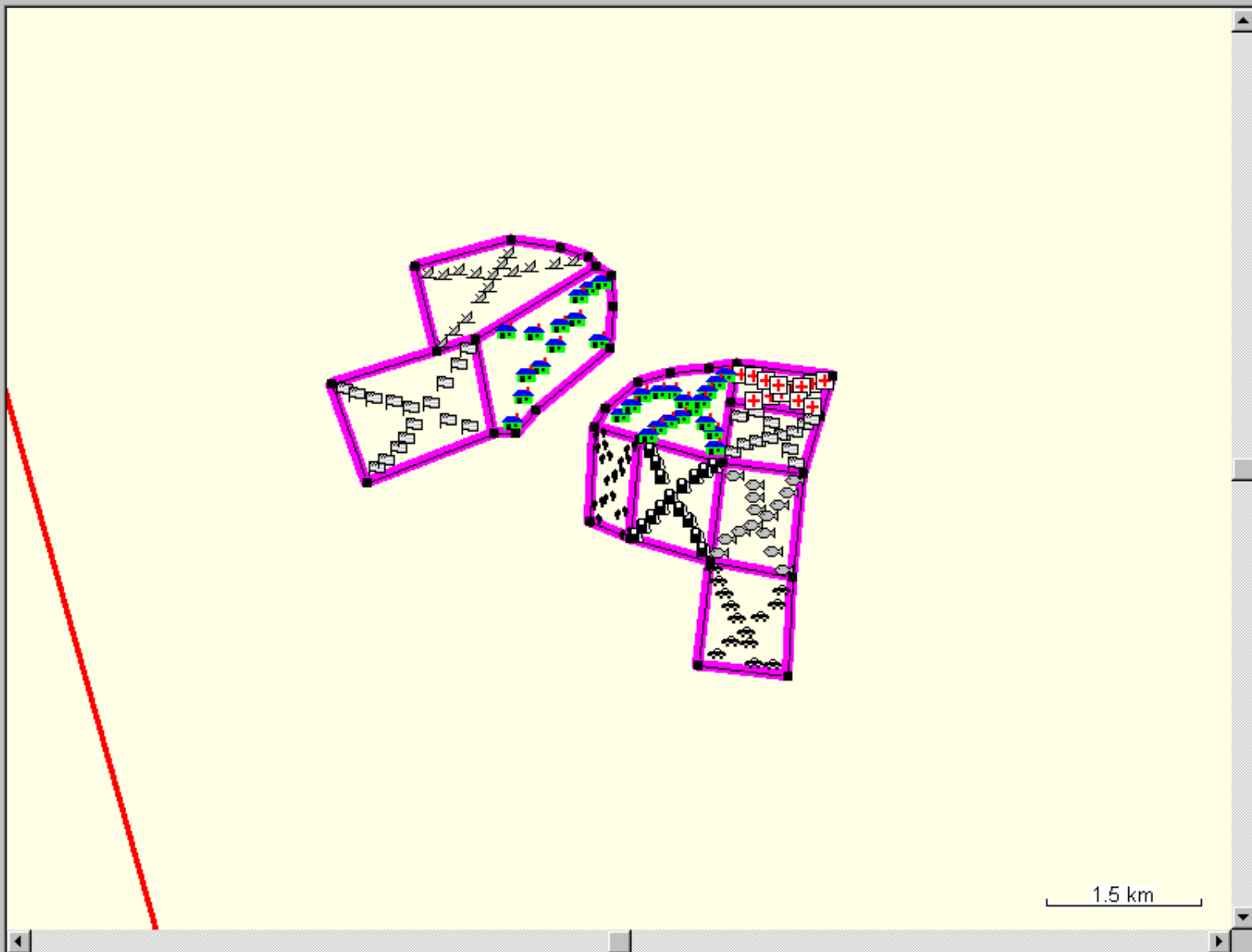
Routes (12)		Tracks	
Maps		Waypoints (571)	
Name	Description		
001	CRTD 08:52	■	
002	01-APR-02 13	☉	
003	01-APR-02 13	☉	
004	01-APR-02 13	☉	
005	09-ABR-02 15	■	
006	09-ABR-02 15	■	
007	09-ABR-02 15	■	
008	09-ABR-02 15	■	
009	09-ABR-02 15	■	
010	09-ABR-02 15	■	
011	09-ABR-02 15	■	
012	09-ABR-02 15	■	
013	09-ABR-02 15	■	
014	09-ABR-02 15	■	
015	09-ABR-02 15	■	
016	09-ABR-02 15	■	
017	09-ABR-02 15	■	
018	09-ABR-02 15	🚩	
019	09-ABR-02 15	🚩	
020	09-ABR-02 15	🚩	
021	09-ABR-02 15	🚩	
022	09-ABR-02 20	🚩	
023	09-ABR-02 20	🚩	
024	09-ABR-02 20	🚩	
025	09-ABR-02 20	🚩	
026	09-ABR-02 20	🚩	
027	09-ABR-02 20	🚩	
028	09-ABR-02 20	🚩	
029	09-ABR-02 20	🚩	
030	09-ABR-02 20	🚩	
031	09-ABR-02 20	🚩	



0 Items Selected | UTM (South American '69) | 22 K 792056 7885245

World Map 1.5 km

Routes (12)	
Tracks	
Waypoints (571)	
Name	Description
001	CRTD 08:52
002	01-APR-02 13
003	01-APR-02 13
004	01-APR-02 13
005	09-ABR-02 15
006	09-ABR-02 15
007	09-ABR-02 15
008	09-ABR-02 15
009	09-ABR-02 15
010	09-ABR-02 15
011	09-ABR-02 15
012	09-ABR-02 15
013	09-ABR-02 15
014	09-ABR-02 15
015	09-ABR-02 15
016	09-ABR-02 15
017	09-ABR-02 15
018	09-ABR-02 15
019	09-ABR-02 15
020	09-ABR-02 15
021	09-ABR-02 15
022	09-ABR-02 20
023	09-ABR-02 20
024	09-ABR-02 20
025	09-ABR-02 20
026	09-ABR-02 20
027	09-ABR-02 20
028	09-ABR-02 20
029	09-ABR-02 20
030	09-ABR-02 20
031	09-ABR-02 20

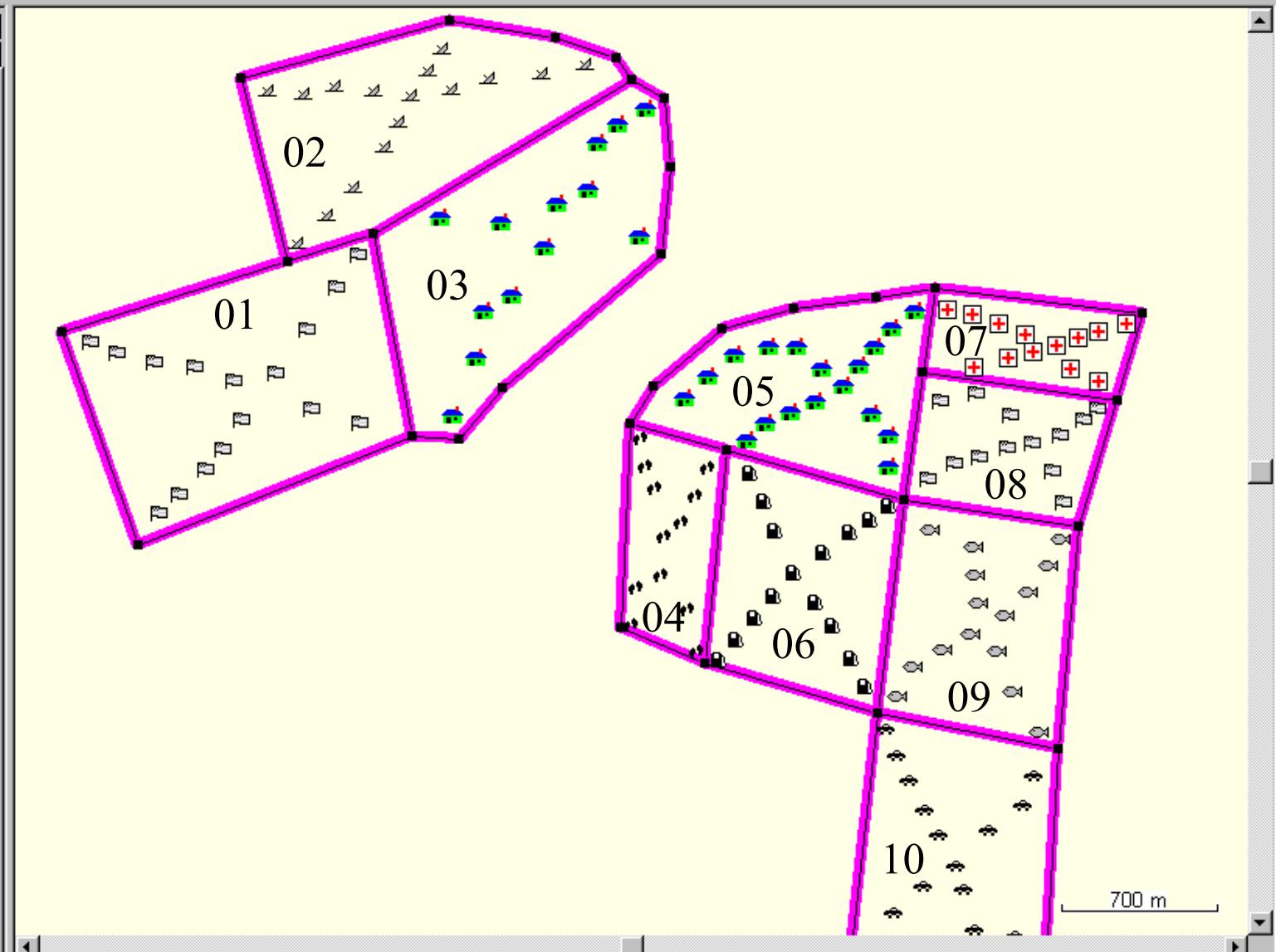


0 Items Selected UTM (South American '69)

World Map 700 m

Navigation icons: search, hand, arrow, flag, etc.

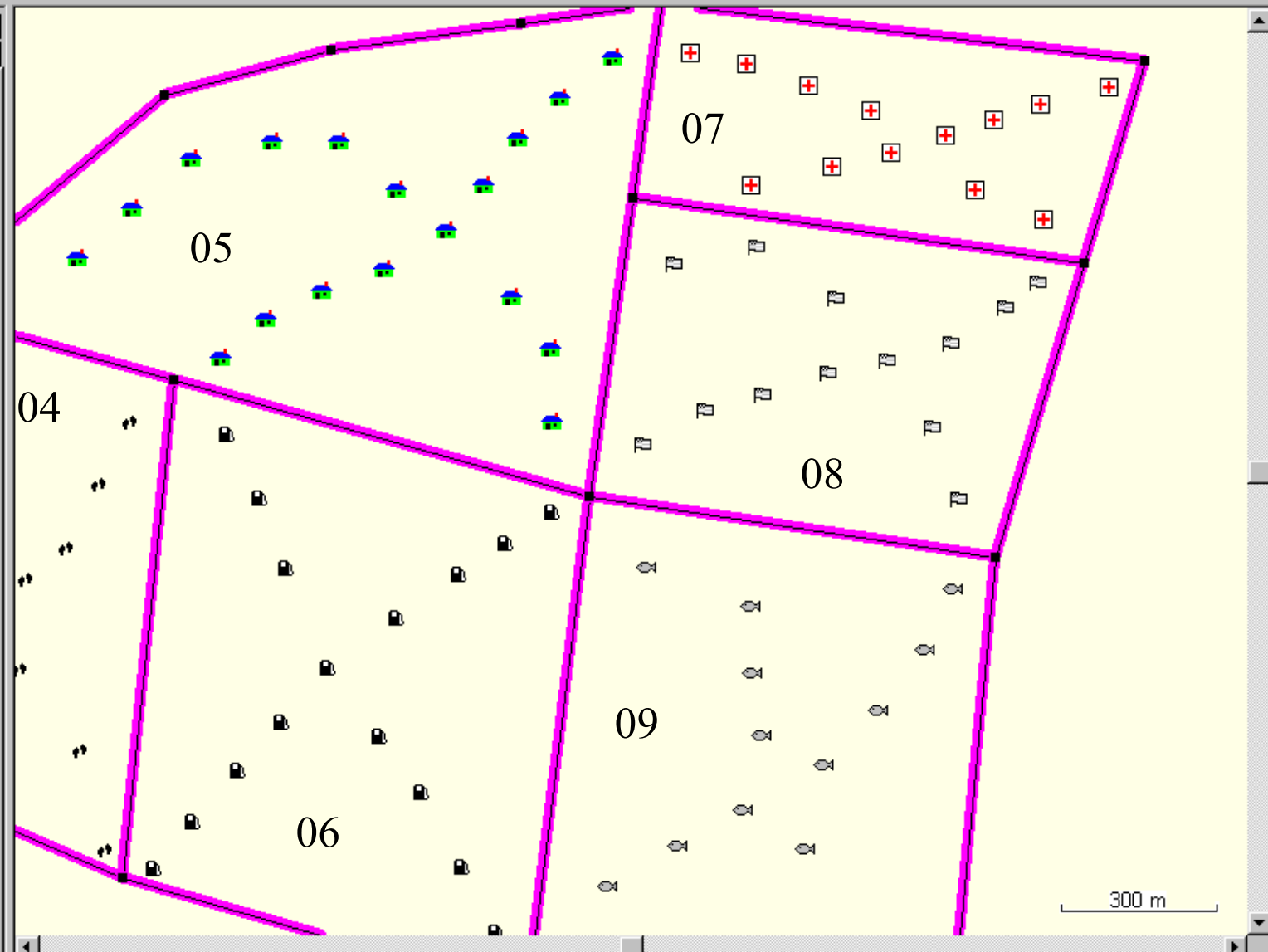
Maps		Waypoints (571)	
Routes (12)		Tracks	
Name	Le		
001 to 151	2		
151 to 001	2		
153 to 152	4		
426 to 426	2		
481 to 151	2		
488 to 487	2		
489 to 490	2		
491 to 490	2		
491 to 492	2		
499 to 493	1		
500 to 500			
500 to 501	8		



World Map 300 m

Navigation icons: zoom, pan, home, etc.

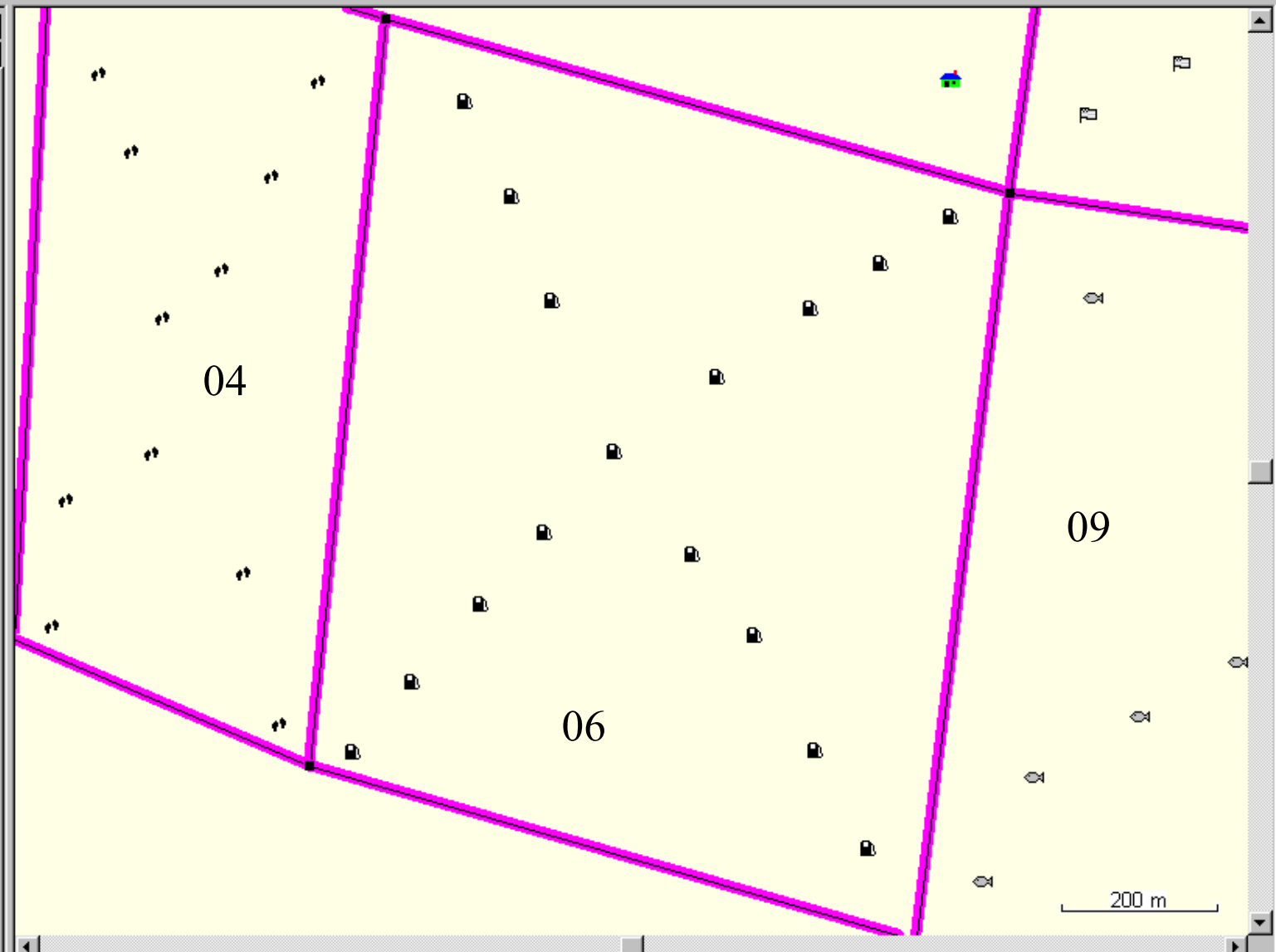
Maps		Waypoints (571)	
Routes (12)		Tracks	
Name	Le		
001 to 151	2		
151 to 001	2		
153 to 152	4		
426 to 426	2		
481 to 151	2		
488 to 487	2		
489 to 490	2		
491 to 490	2		
491 to 492	2		
499 to 493	1		
500 to 500			
500 to 501	8		



World Map 200 m

Navigation icons: Home, Stop, Move, Measure, etc.

Maps		Waypoints (571)	
Routes (12)		Tracks	
Name	Le		
001 to 151	2		
151 to 001	2		
153 to 152	4		
426 to 426	2		
481 to 151	2		
488 to 487	2		
489 to 490	2		
491 to 490	2		
491 to 492	2		
499 to 493	1		
500 to 500			
500 to 501	8		



Utilização de Mapas na Agricultura Moderna

Objetivos:

- **Melhorar o controle dos dados gerados pelas análises de solo, análises de folha e produtividade dos talhões;**
- **Controlar o custo de produção por talhão;**
- **Melhorar a qualidade da recomendação;**
- **Facilitar a visualização dos dados;**
- **Alcançar a agricultura de precisão.**

ArcView GIS Version 3.1



File Project Window Help



Untitled

Welcome to ArcView GIS

- Views
- Tables
- Charts
- Layouts
- Scripts



ArcView GIS

Version 3.1

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Reading avstart.....





Untitled

New Open Print

Views

Tables

Charts

Layouts

Scripts

This is a floating window titled 'Untitled'. It features a menu bar with 'New', 'Open', and 'Print' options. Below the menu bar is a vertical list of icons and labels: a globe icon, 'Views', a grid icon, 'Tables', a bar chart icon, 'Charts', a document icon, 'Layouts', and a document with lines icon, 'Scripts'. The main area of the window is currently empty.



New Open Print

Views
Tables
Charts
Layouts
Scripts

- Irigado Folha Feijão
- Irigado Solo
- Sequeiro Folha Feijão
- Sequeiro Folha Milho
- Sequeiro Folha Soja
- Sequeiro Solo
- View1
- Vista Geral



New Open Add

- Views
- Tables**
- Charts
- Layouts
- Scripts

- Attributes of Alumirg.shp
- Attributes of Culturas.shp
- Attributes of Enxofre
- Attributes of Mandag.shp
- Attributes of Mata
- Attributes of Palhada
- Attributes of Palhada.shp
- Attributes of pH em água
- Attributes of Pivos.shp
- Attributes of Potassio
- Attributes of Talhoe.shp
- Attributes of Talhoes.shp

File Edit Table Field Window Help

27 of 54 selected

Atributos Gerais

Shape	Poligoi	Area	Perimeter	Localidad	Numerouse	Textuseid	Ha	Potassic	Envolve
Polygon	1.000000	426031.178189	6129.423536	81.000000	1.000000	11	42.6	0.24	2.4
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Polygon	11.000000	291887.077518	4264.466764	92.000000	11.000000	Mata	29.2	0.00	0.0
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Polygon	13.000000	4198.635974	264.524458	94.000000	13.000000	Futebol	0.4	0.00	0.0
Polygon	14.000000	55027.302157	944.948425	95.000000	14.000000	Pasto	5.5	0.00	0.0
Polygon	15.000000	789724.336622	4206.000955	96.000000	15.000000	17	79.0	0.21	2.8
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Polygon	18.000000	17094.937945	518.296621	99.000000	18.000000	Represa	1.7	0.00	0.0
Polygon	19.000000	911956.030372	4019.813074	100.000000	19.000000	6	91.2	0.26	5.2
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Polygon	21.000000	199276.102254	2369.669710	102.000000	21.000000	Mata	19.9	0.00	0.0
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Polygon	35.000000	369804.319252	5626.626203	116.000000	35.000000	Mata	37.0	0.00	0.0
Polygon	36.000000	65284.411025	1326.399812	117.000000	36.000000	Sede	6.5	0.00	0.0



Scale 1: 40,769


- Represa
- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Palhada
 - Aveia
 - Brachiaria
 - Milheto
 - Pousio
 - Sorgo
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15



- Represa
- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Palhada
 - Aveia
 - Brachiaria
 - Milheto
 - Pousio
 - Sorgo
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15



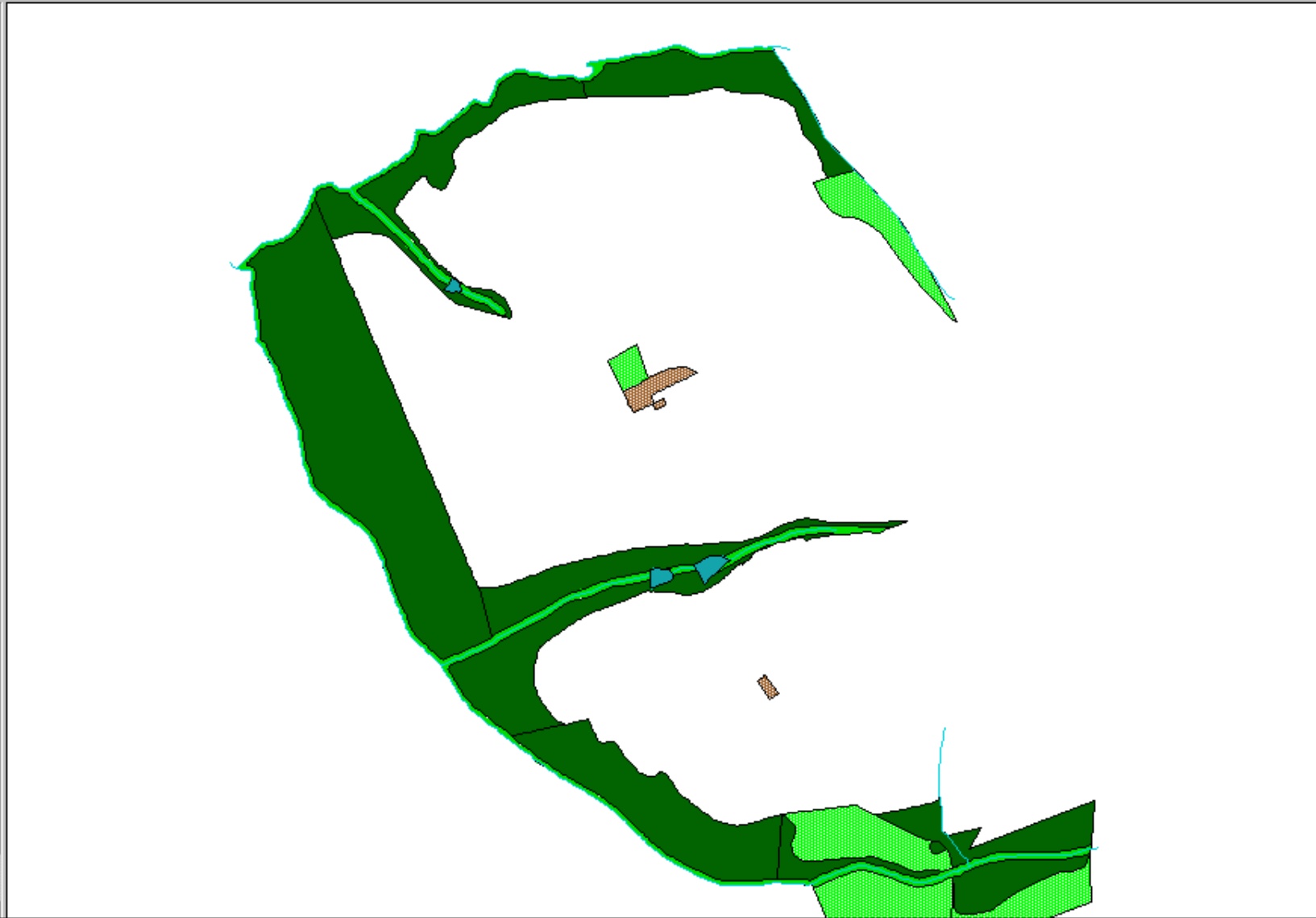
File Edit View Theme Graphics Window Help



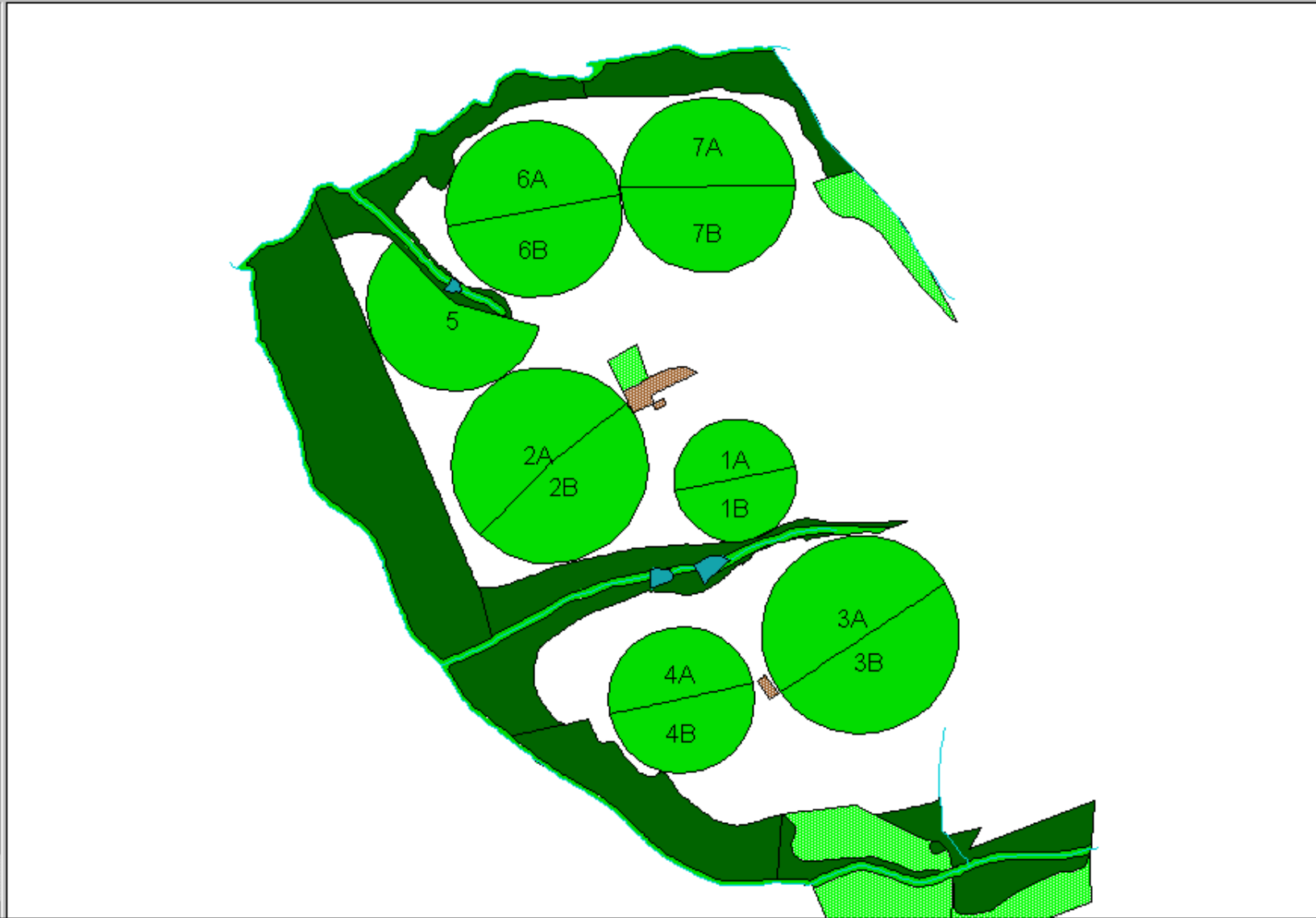
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Vista Geral

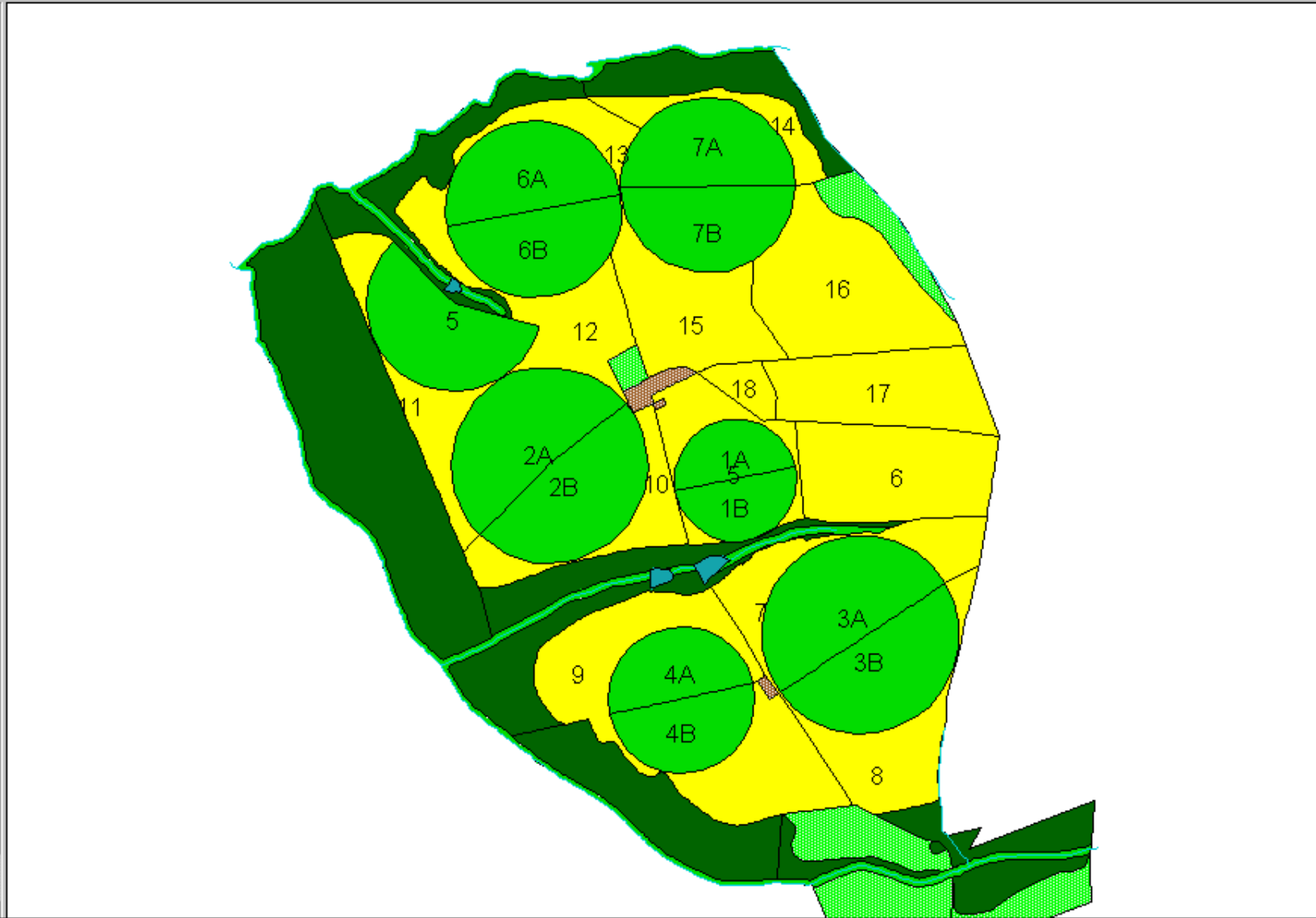
- Represa
- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Palhada
 - Aveia
 - Brachiaria
 - Milheto
 - Pousio
 - Sorgo
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15



- Represa
- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Palhada
 - Aveia
 - Brachiaria
 - Milheto
 - Pousio
 - Sorgo
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15



- Represa
- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Palhada
 - Aveia
 - Brachiaria
 - Milheto
 - Pousio
 - Sorgo
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15



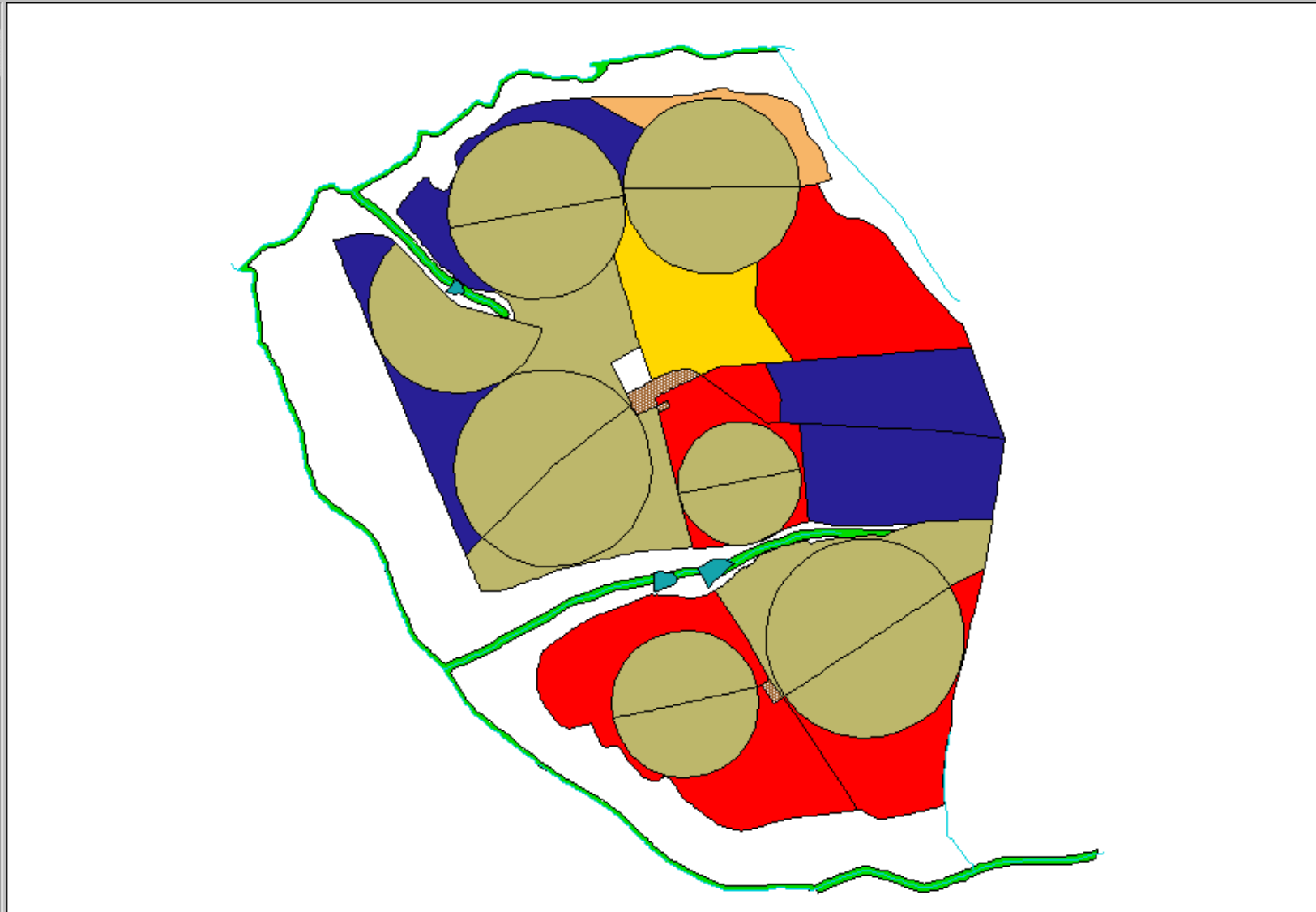


Scale 1: 40,769

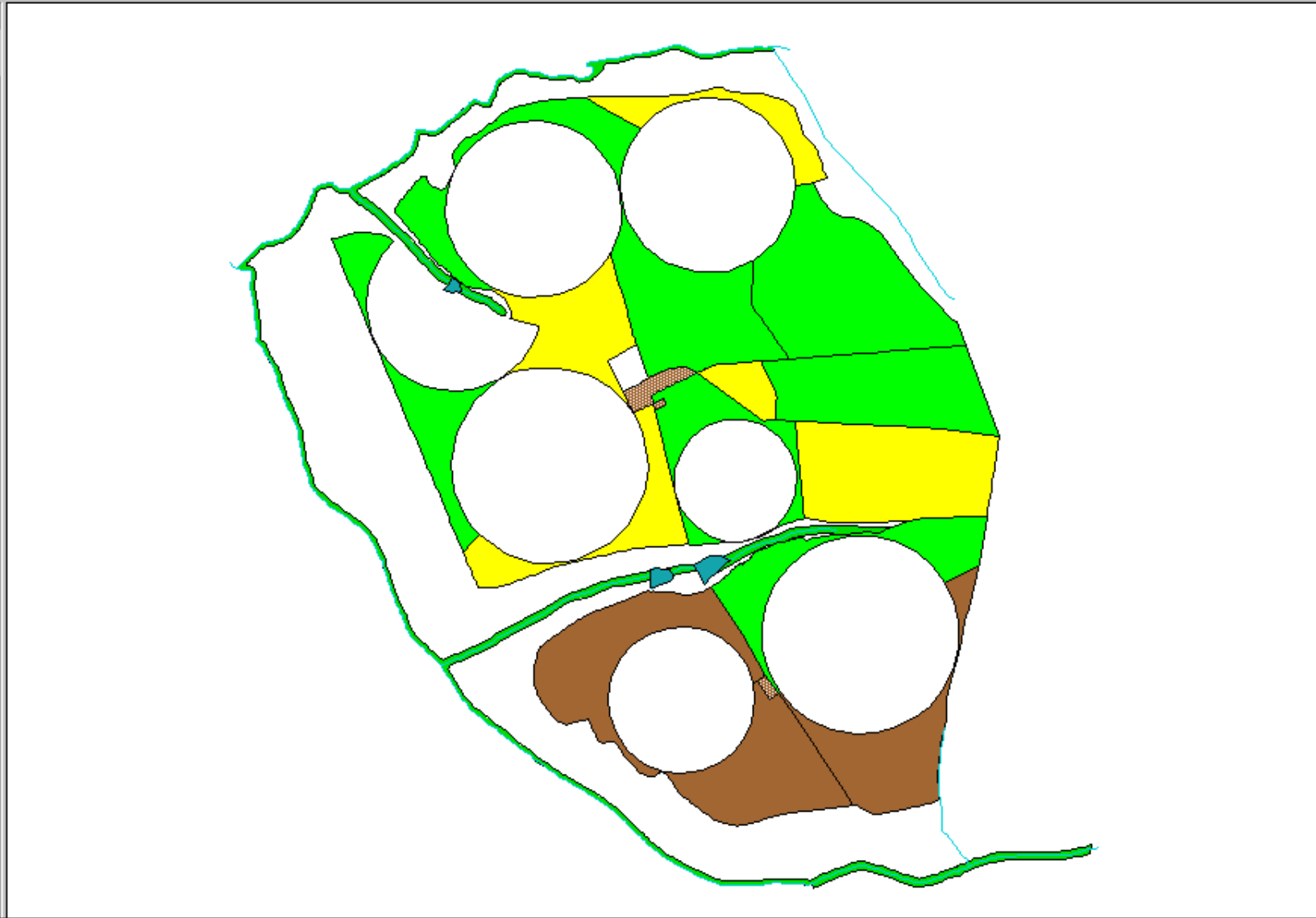
203,478.67
7,895,251.47

Vista Geral

- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15
 - 1.15 - 1.5
- Cobertura Vegetal
 - Aveia
 - Brachiar
 - Milheto
 - Pousio
 - Sorgo



- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15
 - 1.15 - 1.5
- Cobertura Vegetal
 - Aveia
 - Brachiar
 - Milheto
 - Pousio
 - Sorgo



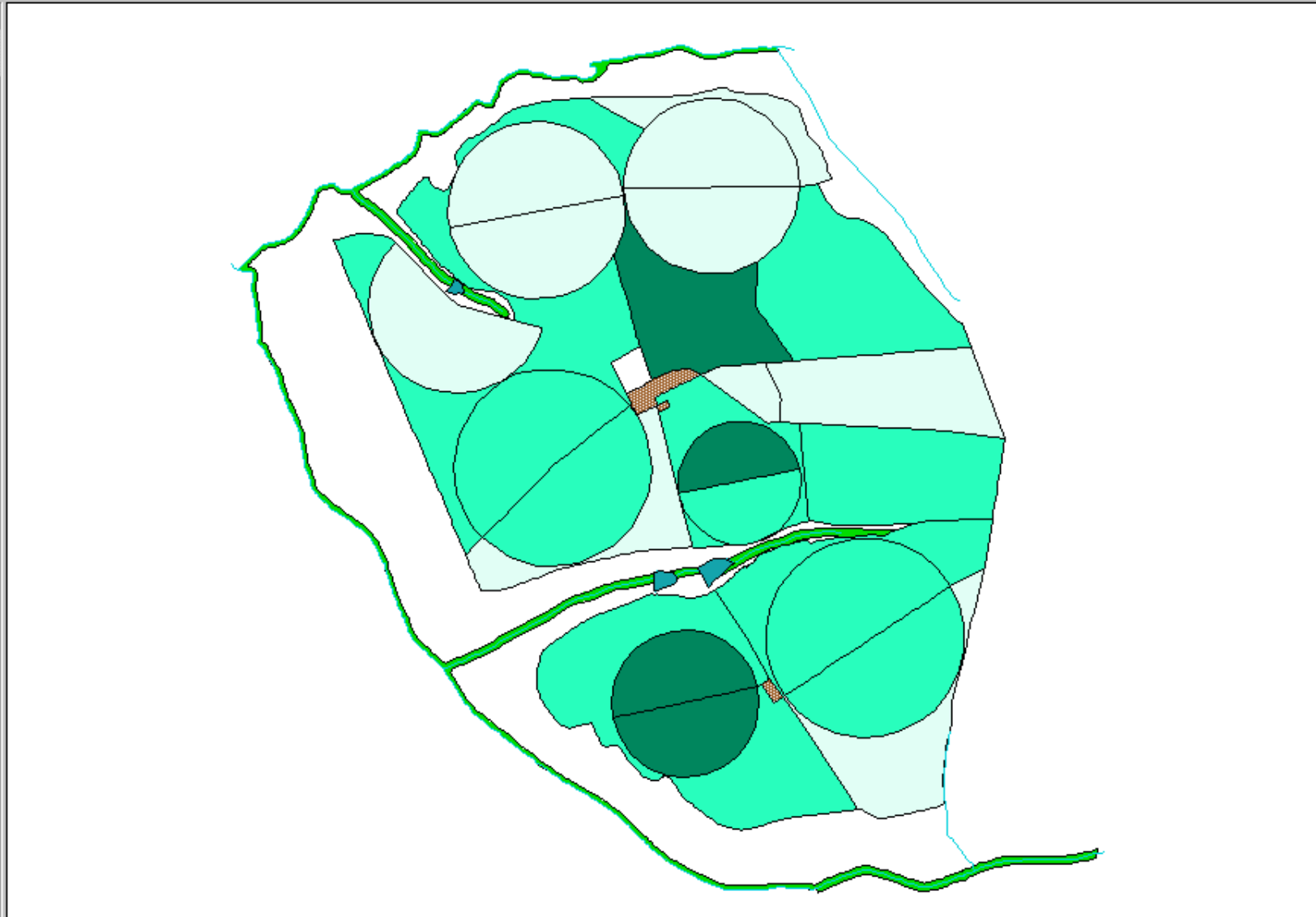


Scale 1: 40,769

202,216.61
7,895,488.78

Vista Geral

- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15
 - 1.15 - 1.5
- Cobertura Vegetal
 - Aveia
 - Brachiar
 - Milheto
 - Pousio
 - Sorgo



Project saved to 'mapluc.apr'

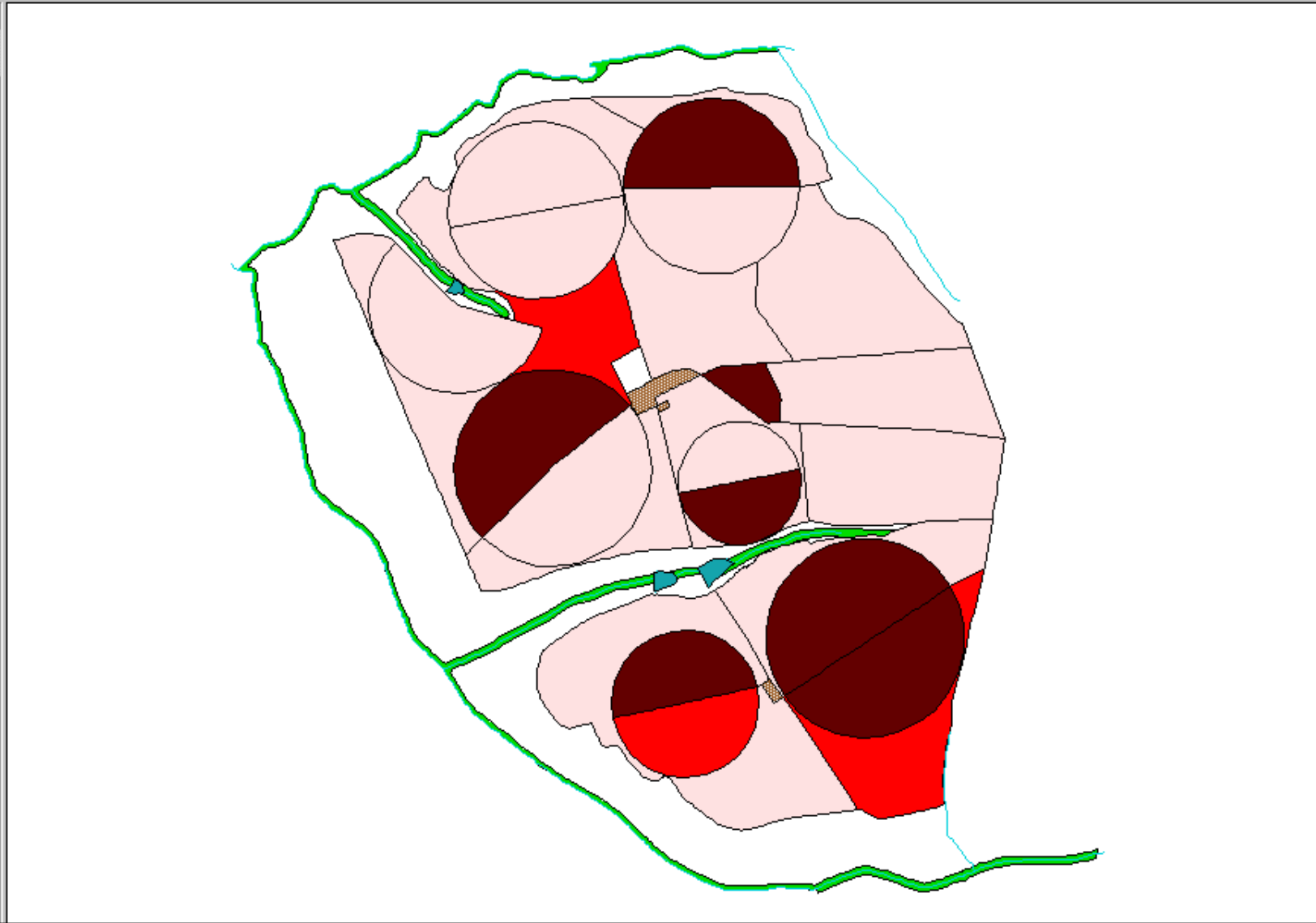


Scale 1: 40,769

201,256.57
7,895,747.67

Vista Geral

- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15
 - 1.15 - 1.5
- Cobertura Vegetal
 - Aveia
 - Brachiar
 - Milheto
 - Pousio
 - Sorgo



Project saved to 'mapluc.apr'

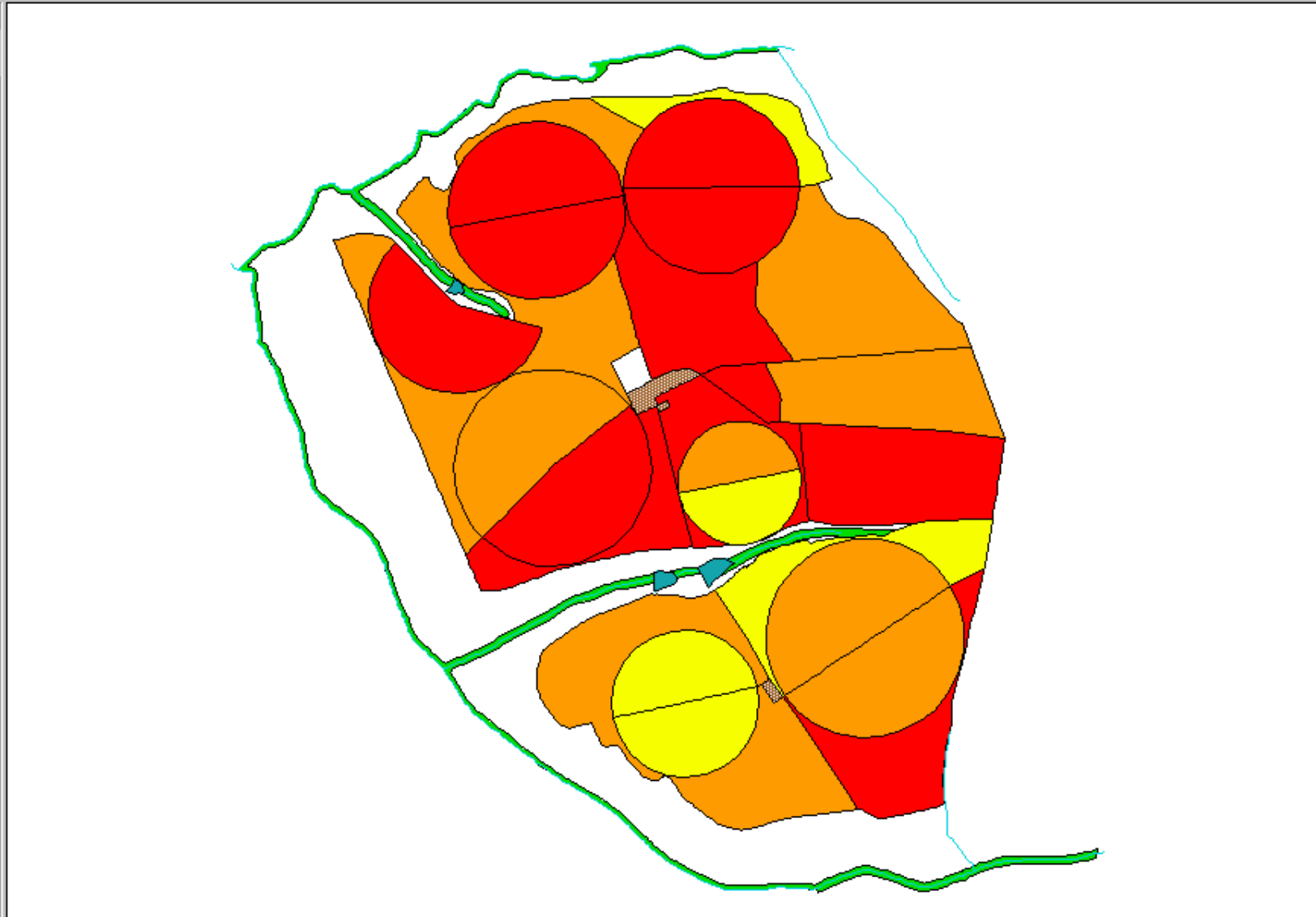


Scale 1: 40,769

201,159.49
7,894,226.72

Vista Geral

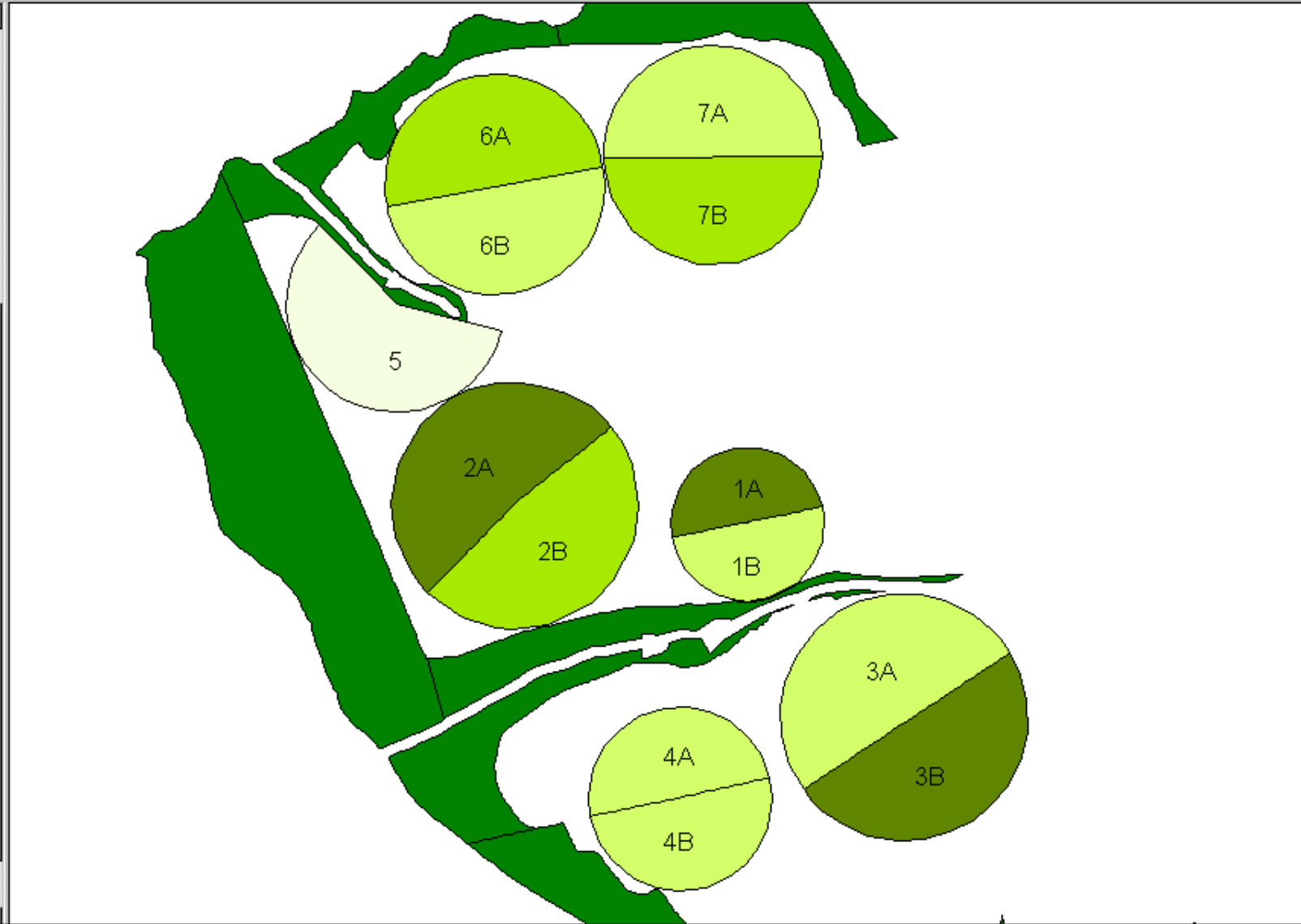
- Drenagem
- Sede
- Mata ciliar
- Mata
- Pasto
- Pivôs
- Talhões
- Culturas
 - Feijao
 - Milho
 - Soja
- Potassio
 - 0.13 - 0.22
 - 0.22 - 0.3
 - 0.3 - 0.4
- Enxofre
 - 2.2 - 6.1
 - 6.1 - 13.9
 - 13.9 - 26
- Magnésio
 - 0.6 - 0.85
 - 0.85 - 1.15
 - 1.15 - 1.5
- Cobertura Vegetal
 - Aveia
 - Brachiar
 - Milheto
 - Pousio
 - Sorgo



Project saved to 'mapluc.apr'



- Enxofre
 - 0
 - 0 - 6.2
 - 6.2 - 11
- V%
 - 0
 - 0 - 50.95
 - 50.95 - 63.45
- Matéria Orgânica
 - 2.7
 - 2.7 - 3.6
 - 3.6 - 3.8
 - 3.8 - 4.1
- P Mehlich
 - 0
 - 1 - 32
 - 33 - 73
- K
 - 0
 - 0 - 0.24
 - 0.24 - 0.41
- Mg
 - 0
 - 0 - 0.9
 - 0.9 - 1.2
- Ca
 - 0
 - 0 - 2.4
 - 2.4 - 3
- Al
 - 0
 - 0 - 0.1
 - 0.1 - 0.3
- Mata
 - 0
 - 0 - 5.4
 - 5.4 - 5.8
- pH em água
 - 0
 - 0 - 5.4
 - 5.4 - 5.8



Legend Editor

Theme: Matéria Orgânica

Legend Type: Graduated Color

Scale 1: 208,839.75
7,900,688.06

Classification

Type: Natural Breaks

Number of classes: 4

Round values at: d.ddd

OK Cancel

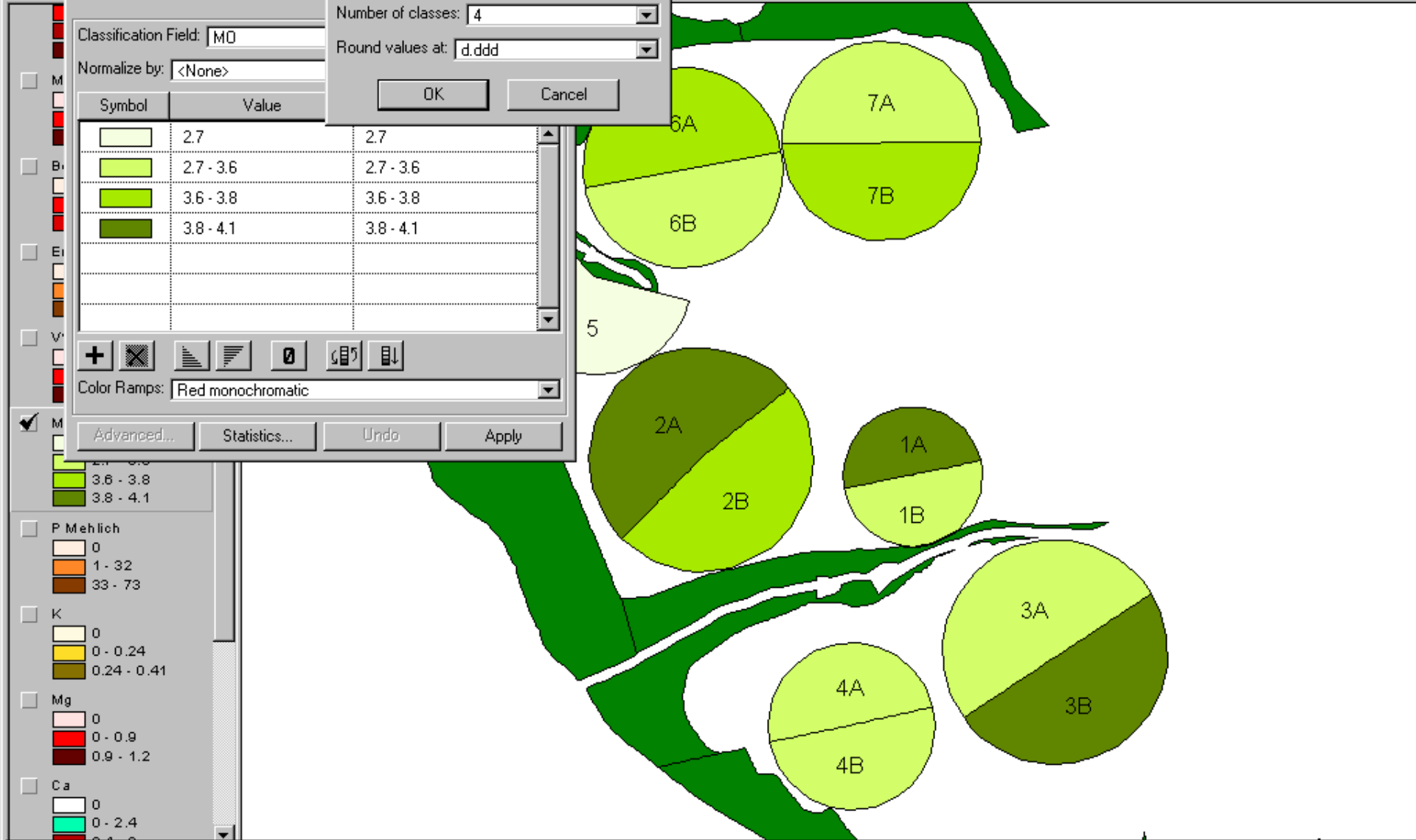
Classification Field: MO

Normalize by: <None>

Symbol	Value	Value
	2.7	2.7
	2.7 - 3.6	2.7 - 3.6
	3.6 - 3.8	3.6 - 3.8
	3.8 - 4.1	3.8 - 4.1

Color Ramps: Red monochromatic

Advanced... Statistics... Undo Apply



Legend Editor

Theme: **Matéria Orgânica** [Load...]

Legend Type: **Graduated Color** [Save...]

[Default]

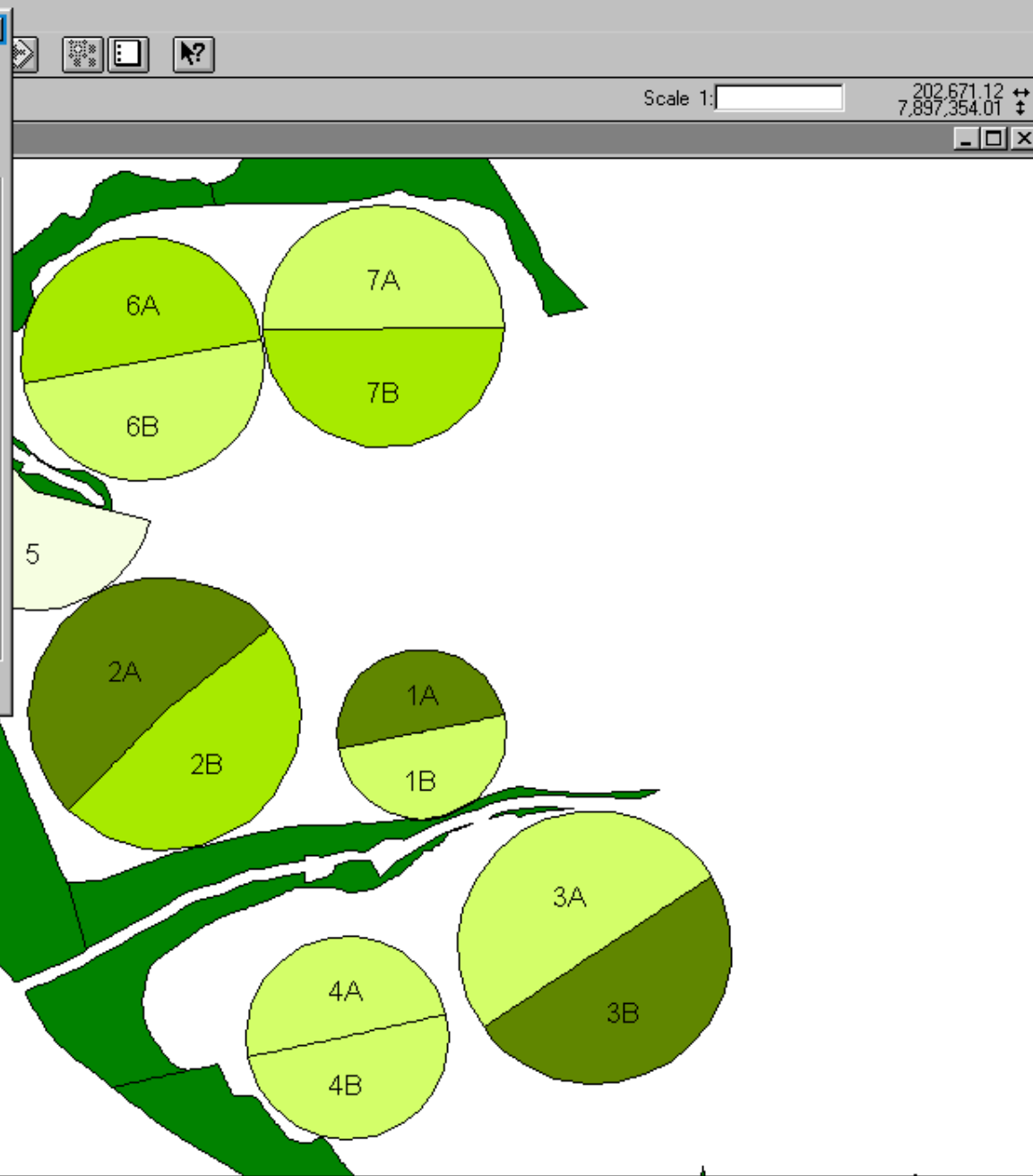
Classification Field: **MO** [Classify...]

Normalize by: **<No**

Symbol	Value	Label
	2.7	
	2.7	
	3.6	
	3.8 - 4.1	3.8 - 4.1

Color Ramps: **Chartreuse monochromatic**

[Advanced...] [Statistics...] [Undo] [Apply]

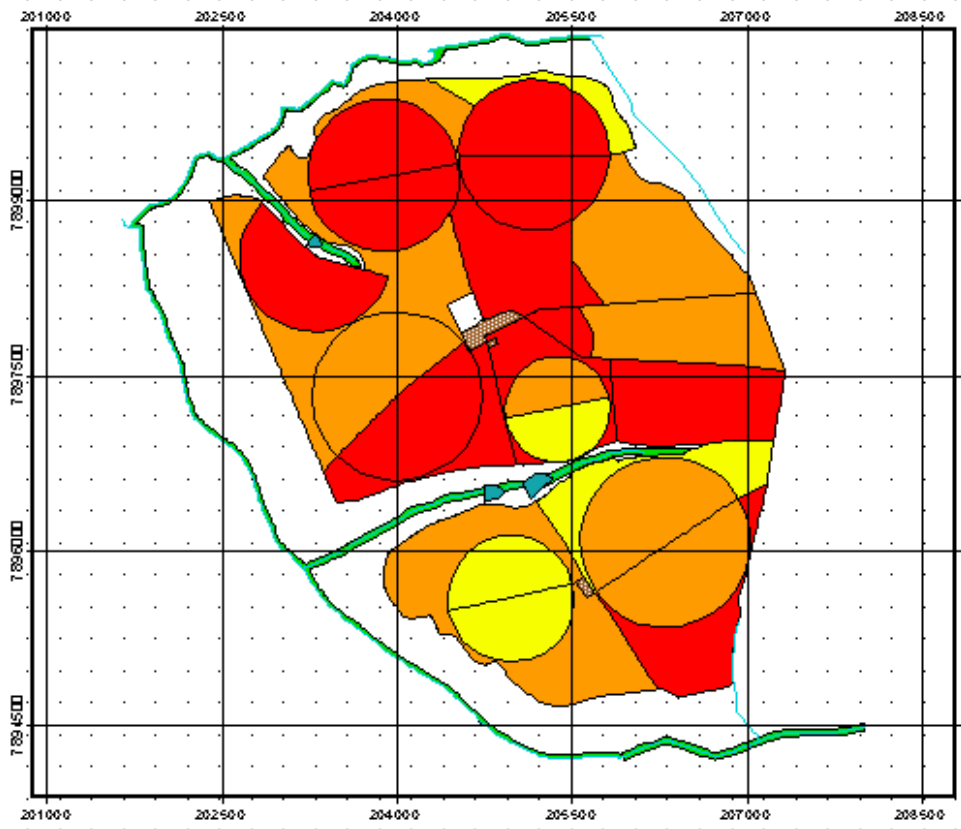









Legend

- M
- B
- E
- V
- M**
 - 2.7 - 3.6
 - 3.6 - 3.8
 - 3.8 - 4.1
- P Mehlich
 - 0
 - 1 - 32
 - 33 - 73
- K
 - 0
 - 0 - 0.24
 - 0.24 - 0.41
- Mg
 - 0
 - 0 - 0.9
 - 0.9 - 1.2
- Ca
 - 0
 - 0 - 2.4

Scale 1: [] 202,671.12
7,897,354.01

Mapa de Fertilidade

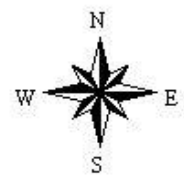
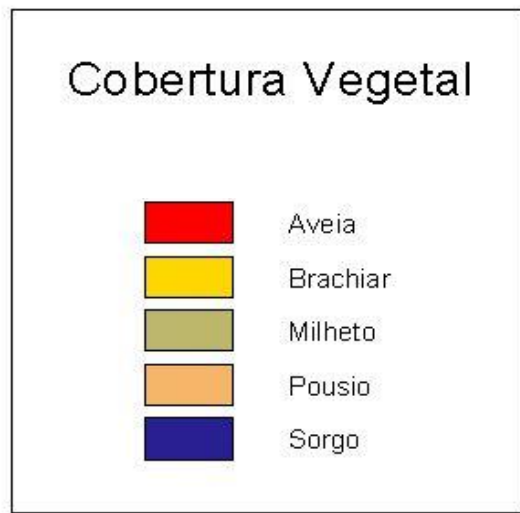
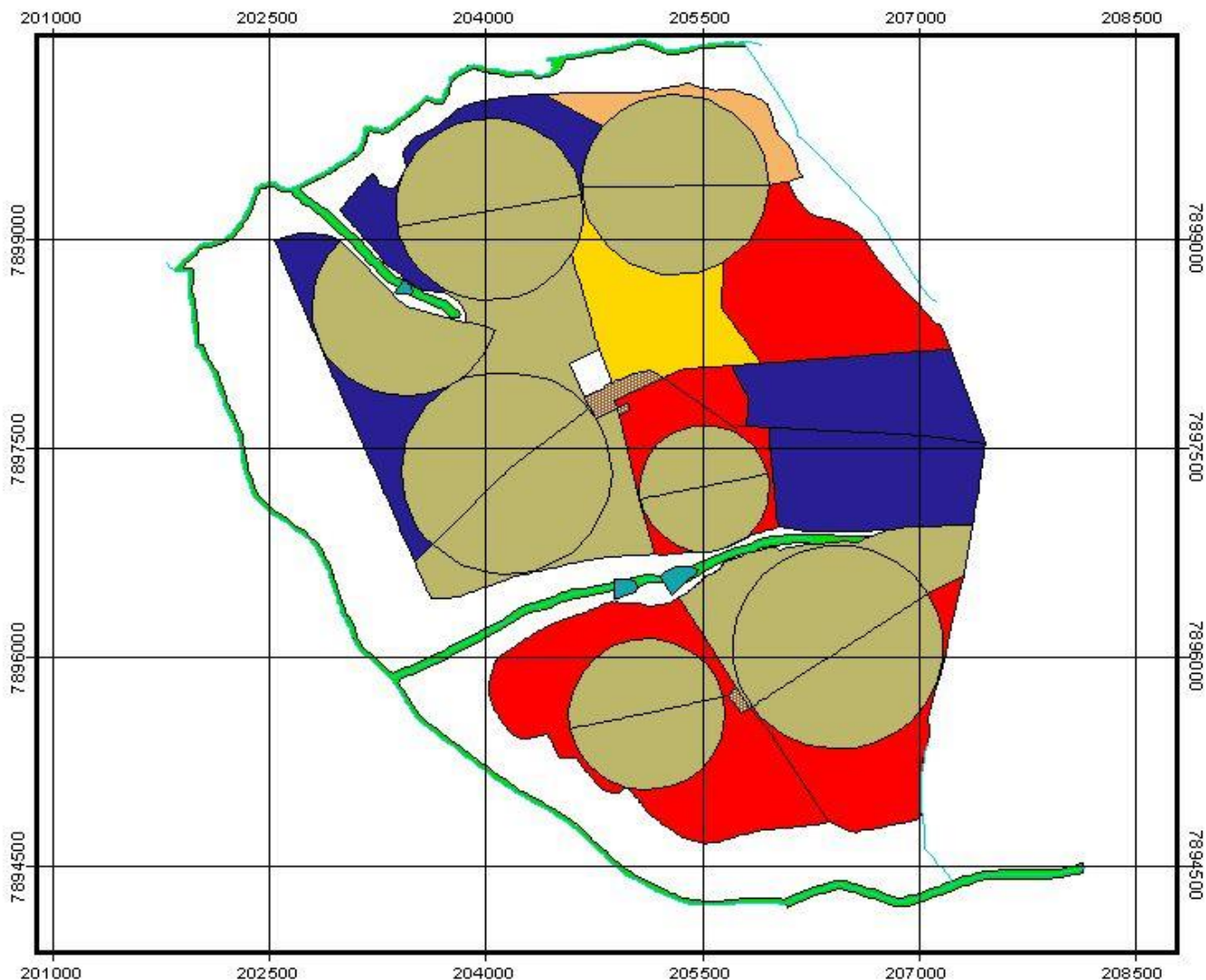


-  Represa
-  Drenagem
-  Sede
-  Mata ciliar
- Magnésio**
-  0.6 - 0.85
-  0.85 - 1.15
-  1.15 - 1.5

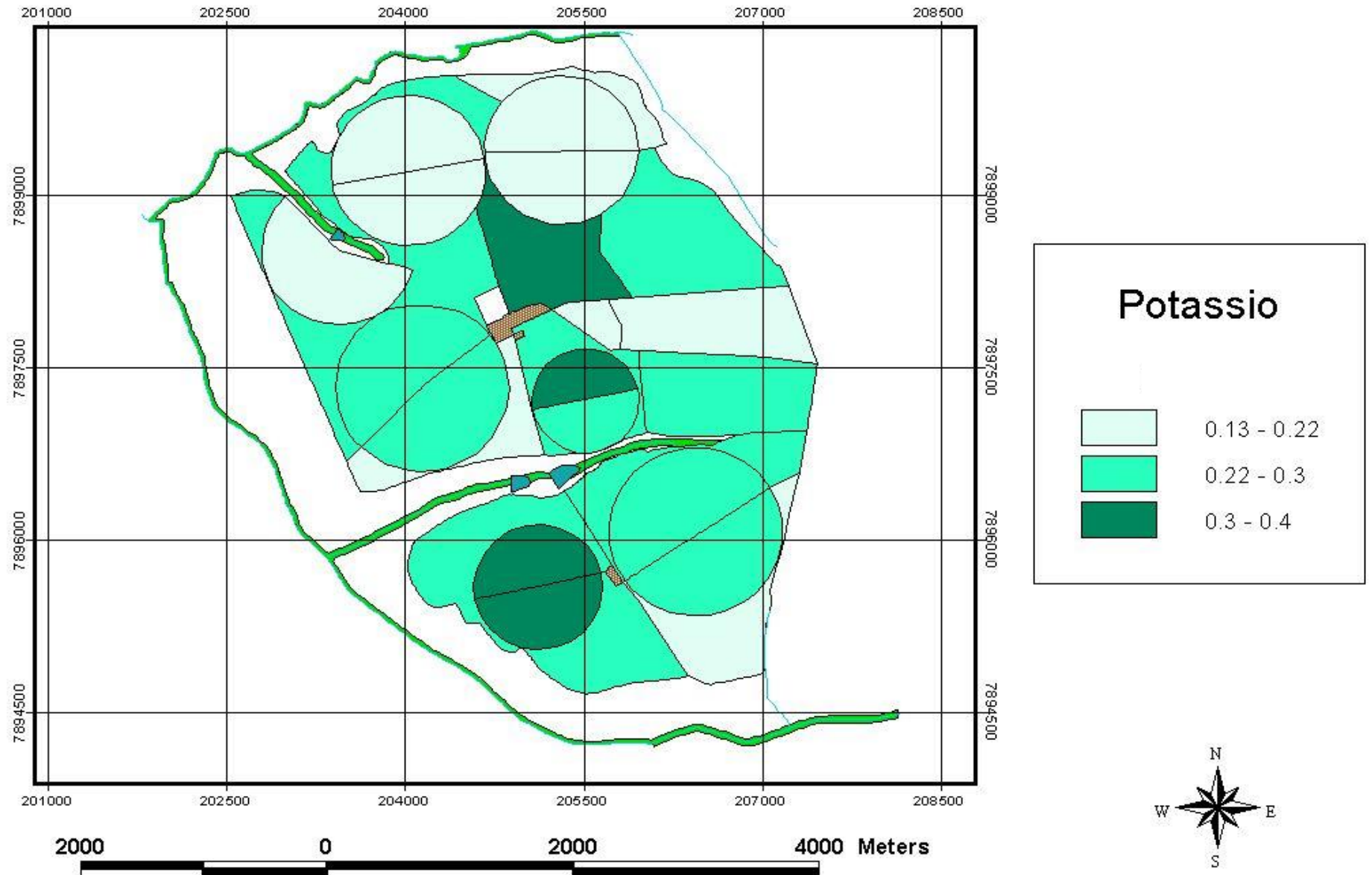
2000 0 2000 4000 Meters



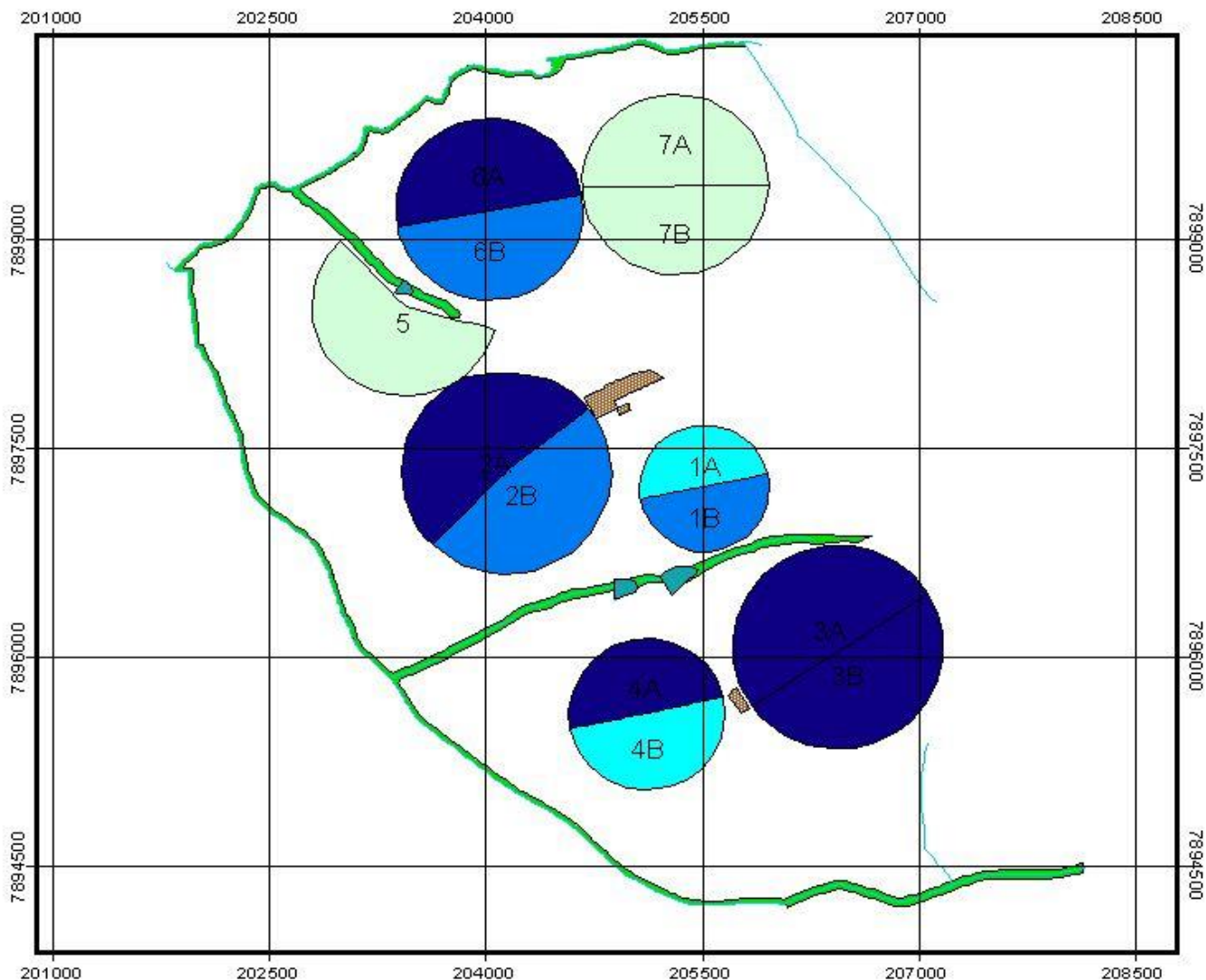
Mapa de Cobertura Vegetal (Safrá 2002/2003)



Mapa de Potássio (Safrá 2002/2003)

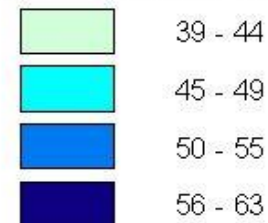


Mapa de Produtividade de Feijão (Safrá 2002)

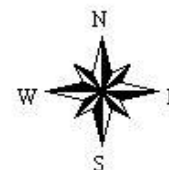


Vista Geral

Produtividade de Feijão



2000 0 2000 4000 Meters



Utilização de Mapas na Agricultura Moderna

Conclusões Finais:

- **A utilização de mapas proporciona um melhor controle da propriedade tanto no aspecto de recomendação da adubação quanto no de controle do custo por talhão;**
- **O convívio com esta tecnologia nos dará subsídio para a utilização da agricultura de precisão com mais êxito.**