

Table

Table E 2.1.1 Data Utilized for GIS-based Irrigation Block Mapping

Item	Source	Nachchaduwa		Rajangana			Thruwila	Data						
		HLMC* Tissa FO	LLMC* Isuru FO	RB* Tract No.4 Saliya Gama FO	RB Tract No.8 Mahasen FO	LB Tract No.2 Sri Udara FO		Area	Title	Number of Sheet	Year	Form		
Basic Data														
-Topographic Map in CAD format	JICA Study Team	+	+	-	-	-	-	Nachchaduwa	(i) Dry zone M/P Report Figure PF3.1	7	2000	Digital		
-Satellite Image	JICA Study Team	-	-	+	+	+	-	Rajangana	(i) Purchased	6	2002/ 2003	Digital		
-Aerial Photograph	Survey Department	-	-	-	-	-	+	Thruwila	(i) shot in 1992 by the Survey Department	2	1996	Photo		
Others														
General Layout	ID	+	+	+	+	+	+	Nachchaduwa	(i) Layout of Channel System Entire Area	1	not clear	Blueprint		
								Rajangana	(i) Maintenance Diagram Entire Area	1	2001	Blueprint		
								Thruwila	(i) Final Village Plan	4		Copy		
-Issue Tree	ID	+	+	+	+	+	+	Nachchaduwa	(i) Issue Tree Entire Area	4	1987	Blueprint		
								Rajangana	(i) Issue Tree Entire Area	10	not clear	Copy		
									(ii) Issue Tree Entire Area attached in Water Management Performance Evaluation Report Rehabilitation of Rajangan Scheme (RB Tract (iii) 4,8 and LB Tract 2)	2	1991 (?)	Copy		
										3	1973	Copy/Blue		
								Thruwila	(i) Issue Tree Entire Area	2	not clear	Copy		
- Irrigation Diagram	JICA Study Team	+	+	-	-	-	-	Nachchaduwa	(i) Dry zone M/P Report Figure M5.4 (1/8-8/8) & Figure M5.5 (1/5-5/5)	13	2000	Digital		
-Blocking Out Plan (BOP)	ID	-	-	+	+	+	-	Rajangana	(i) Rehabilitation of Rajangana Scheme	3	1973	Copy/ Blueprint		

*HLMC: High Level Main Canal, LLMC: Low Level Main Canal

**RB: Right Bank, LB: Left Bank

Table E 4.2.1 Details of GIS Layer (1/6)

1. Polyline: Canal Features

Layer Name	Attributes	Range	Comments
rajangana_canal_net*	ID	1 - 9,999,999 Feature ID	Unique identifying number.
	CLASS	Main Canal D-canal F-canal Drainage canal	All in this layer is classed as canals.
	NAME	Canal name (text)	The name must be obtained from ancillary data provided by JICA Study Team.
	Length	-	Calculated using GIS function

* Scheme or tract name is assigned for layer name.

2. Polyline: Road

Layer Name	Attributes	Range	Comments
roads	ID	1 - 9,999,999 Feature ID	Unique identifying number.
	TYPE	Main road Minor road Foot path	Serial number for data management during field survey

3. Point: Canal Features (Evaluation)

Layer Name	Attributes	Range	Comments
canal_sec	ID	1 - 9,999,999 Feature ID	Unique identifying number.
	SNO	Specific no.	Serial number for data management during field survey
	SCHEME	Nachchaduwa, Rajangana Thruwila	Scheme name surveyed
	TRACT_NO	Tract number	Tract No. surveyed
	MC_X	Specific information	X coordinate of the points
	MC_Y	Specific information	Y coordinate of the points
	CANALNAME	Specific information	Canal name dependent on
	PURPOSE	Irrigation, drainage or others	Purpose of the canal
	VISITDATE	Specific date	Survey date
	MEMBERS	Specific information	Members surveyed
	ACCESS	Good Moderate bad	Accessibility to survey points

Table E 4.2.1 Details of GIS Layer (2/6)

Layer Name	Attributes	Range	Comments
	UPSTREAM	Specific canal name	Upstream of the canal section, dimension of which are surveyed
	UP_B1	Canal dimension (m)	Upstream top width
	UP_B2	Canal dimension (m)	Upstream bottom width
	UP_H1	Canal dimension (m)	Upstream canal depth
	UP_H2	Water depth (m)	Upstream water depth, if any
	UP_TYPE	Canal type Earth, concrete, or random rubble masonry	Upstream canal type
	DOWNSTRE_1	Specific canal name	Downstream of the canal section, dimension of which are surveyed
	DN1_B1	Canal dimension (m)	Downstream top width
	DN1_B2	Canal dimension (m)	Downstream bottom width
	DN1_H1	Canal dimension (m)	Downstream canal depth
	Dn1_H2	Water depth (m)	Downstream water depth, if any
	DN1_TYPE	Canal type Earth, concrete, or random rubble masonry	Downstream canal type
	DOWNSTRE_2	Specific canal name	Downstream of the canal section, dimension of which are surveyed
	DN2_B1	Canal dimension (m)	Downstream top width
	DN2_B2	Canal dimension (m)	Downstream bottom width
	DN2_H1	Canal dimension (m)	Downstream canal depth
	Dn2_H2	Water depth (m)	Downstream water depth, if any
	DN2_TYPE	Earth Concrete Random rubble masonry	Downstream canal type
	DOWNSTRE_3	Specific canal name	Downstream of the canal section, dimension of which are surveyed
	DN3_B1	Canal dimension (m)	Downstream top width
	DN3_B2	Canal dimension (m)	Downstream bottom width
	DN3_H1	Canal dimension (m)	Downstream canal depth
	DN3_H2	Water depth (m)	Downstream water depth, if any
	DN3_TYPE	Canal type Earth, concrete, or random rubble masonry	Downstream canal type

Table E 4.2.1 Details of GIS Layer (3/6)

Layer Name	Attributes	Range	Comments
	SEDIMENTS	None Some Serious	Based on field survey
	VEGETATION	None Some Serious	Based on field survey
	EROSION	None Some Serious	Based on field survey
	LEAKAGE	None Some Serious	Based on field survey
	OVERFLOW	None Some Serious	Based on field survey
	ILLEGALCHE	None Some Serious	Based on field survey
	INSPECTION	None Some Serious	Based on field survey
	OTHERS	-	Specified, if any
	EVALUATION	A: Fully functioning B: Partly deteriorated C: Not functioning well D: Completely not functioning	Overall evaluation based on field survey
	PHOTONO	Specific name	File name of photograph
	PHOTOPATH	Specific link	Hyperlinks

4. Point: Structure Features

Layer Name	Attributes	Range	Comments
isuru_canal_structures*	ID	1 - 9,999,999 Feature ID	Unique identifying number.
	SNO	Specific no.	Serial number for data management during field survey
	MC_X	Specific information	X coordinate of the points
	MC_Y	Specific information	Y coordinate of the points
	TRACT_NO	Tract number	Tract No. surveyed
	CANALNAME	Specific information	Canal name dependent on
	STRUCTURET	Turnout Duckbill weir Diagonal weir Drop Spillway Culvert	Type of structure

Table E 4.2.1 Details of GIS Layer (4/6)

Layer Name	Attributes	Range	Comments
		Farm turnout Other structures	
	DESCRIPTION	Structure name	Specify if other structures are selected in above layer.
	VISITDATE	Specific date	Survey date
	ACCESS	Good Moderate bad	Accessibility to survey points
	STRUCTUREC	None Some Serious	Structures condition based on field survey
		Other issues	Specify, if any
		A: Fully functioning B: Partly deteriorated C: Not functioning well D: Completely not functioning	Overall evaluation based on field survey
	SCHEME	Nachchaduwa, Rajangana Thruwila	Scheme name surveyed
	GATE	A: Good B: C: D: Serious NA: Not applicable	Gate is available or missing?
	OPERATION	A: Good B: C: D: Serious NA: Not applicable	Is it difficult to operate (open or close)?
	CORROSION	A: Good B: C: D: Serious NA: Not applicable	Gate is seriously corroded?
	CRACKS	A: Good B: C: D: Serious NA: Not applicable	Are there any cracks in any part of the structure?
	LEAKAGE	A: Good B: C: D: Serious NA: Not applicable	Any leakage from the structure is found?
	DAMAGE	A: Good B: C: D: Serious NA: Not applicable	Downstream apron is scoured or damaged?
	MDEVICE	A: Good B: C: D: Serious NA: Not applicable	Measuring device is available or missing?

Table E 4.2.1 Details of GIS Layer (5/6)

Layer Name	Attributes	Range	Comments
	PHOTONO	Specific name	File name of photograph
	PHOTOPATH	Specific link	Hyperlinks

* Scheme or tract name is assigned for layer name.

5. Polygon: Socio-economic Features

Layer Name	Attributes	Range	Comments
nachchaduwa_socio*	ID	1 - 9,999,999 Feature ID	Specific scheme name is given in layer name. Unique identifying number.
	SCHEME	Nachchaduwa, Rajangana Thruwila	Scheme name surveyed
	CANAL_NO	Specific information	Canal name dependent on
	ALOT_NO.	Unique number	Allotment number
	FRM_NO	1 - 9,999,999 number	Unique identifying number.
	NAME	Specific information	Operators' name
	OPT_ID	1 - 9,999,999 number	Unique identifying number.
	SALOT_NO.	Unique number	Sub-allotment number
	LO_TITLEDE	As explained in section 3.2	Type of land ownership
	MEMBERS	Specific information	Members surveyed
	YALA	Paddy OFC Banana Others	Land use in Yala season
	MAHA	Paddy OFC Banana Others	Land use in Maha season
	MEMBERSHIP	Yes No	Member of FO or not?
	OMFEE	Yes No	O&M fee is paid or not?
	ATT_SHRAMA	Yes No	Attending shramadana or not?
	VISITDATE	Specific date	Survey date
	AREA	Specific information	Calculated using GIS

* Scheme or tract name is assigned for layer name.

Table E 4.2.1 Details of GIS Layer (6/6)

6. Polygon: Soil condition Features

Layer Name	Attributes	Range	Comments
nachchaduwa_soil*	ID	1 - 9,999,999 Feature ID	Specific scheme name is given in layer name. Unique identifying number for polygon.
	TEXTUAL	0: Reddish brown earths (well drained deep soils) 1: Reddish brown earths (well drained moderately deep soils) 2: Reddish brown earths (well drained moderately shallow soils) 3: Reddish brown earths (moderately well drained deep soils) 4: Reddish brown earths (imperfectly drained deep soils) 5: Low humid gley soils 6: Alluvial soils 7: Water logged area 8: Rock	Based on field survey
	DRAINAGE	0: Very poorly drained 1: Poorly drained 2: imperfectly drained 3: Moderately drained 4: Well drained 5: Somewhat excessively drained 6: Excessively drained	Based on field survey
	SALTALKALI	0: Soils free of excess salt or alkali 1: Soils slightly affected 2: Soils moderately affected by salt or alkali 3: Soils strongly affected by salt or alkali	Based on field survey
	FERTILITY	0: Poor 1: Moderate 2: High	Preliminary assessment based on field survey

* Scheme or tract name is assigned for layer name.

Table E 5.3.1 Legend Description of Soil Textual Classification and Land Suitability (1/2)

Legend of Soil Textual Classification	Description	Legend of Land Suitability	Land Use Recommendation
WD.d	Well drained deep Reddish Brown Earth (RBE) soils. Dark grayish brown to dark reddish brown sandy clay loam topsoil. Dark red to red sandy clay loams and clay loam subsoil. Gravel occurs at some depth below 30cm Gravel size is variable. Abundance of gravel is less than 50% by volume.	U1	Deep rooted perennial crops such as mango, banana, papaya, cashew, citrus, with supplementary irrigation. Annual crops such as onion, tomato, chilies, wild rice, sunflower, peanut, maize, green gram, soybean with rotation and with drip/sprinkler irrigation when necessary.
WD.md	Well drained deep Reddish Brown Earth (RBE) soils. Dark grayish brown to dark reddish brown sandy clay loam topsoil. Dark red to red sandy clay loams and clay loam subsoil. Gravel occurs between 60cm and 90cm. Gravel size is variable. Abundance of gravel is more than 50% by volume.	U2	Deep rooted perennial crops such as mango, banana, papaya, cashew, citrus, with adequate irrigation in the dry season. Annual crops such as onion, tomato, chilies, wild rice, sunflower, peanut, maize, green gram, soybean with rotation and with drip/sprinkler irrigation when necessary.
WD.ms	Well drained deep Reddish Brown Earth (RBE) soils. Dark grayish brown to dark reddish brown sandy clay loam topsoil. Dark red to red sandy clay loams and clay loam subsoil. Gravel occurs between 30cm and 60cm. Gravel size is variable. Abundance of gravel is more than 50% by volume.	U3	Annual crops such as onion, tomato, chilies, wild rice, sunflower, peanut, maize, green gram, soybean with rotation and with frequent drip/sprinkler irrigation when necessary.
MWD.d	Moderately well drained deep Reddish Brown Earth (RBE) soils. Dark grayish brown to brow sandy loams and sandy clay loam topsoil. Brown to red clay loam, sandy clay loam and sandy clay subsoil. Water table action at 75cm.	U1	Deep rooted perennial crops such as mango, banana, papaya, cashew, citrus, with supplementary irrigation. Annual crops such as onion, tomato, chilies, wild rice, sunflower, peanut, with rotation and with drip/sprinkler irrigation when necessary.
I.d	Imperfectly drained deep Reddish Brown Earth (RBE) soils. Dark grayish brown to dark gray sandy clay loam topsoil. Dark brown to brown sandy clay loam and clay loam subsoil. Inverted gleying in the topsoil. Fine gravel may occur between 60cm and 90cm. Abundance of gravel is more than 50% by volume. Water table action at 60cm.	U5R2	Annual crops such as onion, tomato, chilies, wild rice, sunflower, peanut, maize, green gram, soybean in the dry season with rotation and with drip/sprinkler irrigation when necessary. Provide adequate drained facilities. Leave fallow or grow rice in the wet season.

Table E 5.3.1 Legend Description of Soil Textual Classification and Land Suitability (2/2)

Legend of Soil Textual Classification	Description	Legend of Land Suitability	Land Use Recommendation
LHG.d	Deep low Humic Gley (LHG) soils. Poorly and very poorly drained. Dark gray to grayish brown sandy loams and sandy clay loams. Olive gray and gray clay loams and sandy clay loam subsoil. Calcium carbonate concretion and occasional manganese concretions in the lower subsoil. Ground water table and perched water table action evident in the profile.	U5R1	Annual crops such as tomato, chilies in the dry season with drip / sprinkler irrigation. Provide adequate drained facilities. Wetland rice in the wet season with supplementary flood irrigation and also in the dry season with flood irrigation if not used for other crops.
LHG.V. PD.d	Same as LHG.d	R1	Wetland rice in the wet season with supplementary flood irrigation and also in the dry season with flood irrigation
Al.d	Deep alluvial soils. Poorly and very poorly drained. Dark gray to grayish brown sandy loam and sandy clay loam top soil. Gray to olive gray clay loam and sandy clay subsoil. Manganese concretions in the subsoil. Ground water table and perched water table action evident in the profile.	U5R1	Annual crops such as tomato, chilies in the dry season with drip / sprinkler irrigation. Provide adequate drained facilities. Wetland rice in the wet season with supplementary flood irrigation and also in the dry season with flood irrigation if not used for other crops.
Al.V.PD.d	Ditto	R1	Wetland rice in the dry season with supplementary flood irrigation and also in the dry season with flood irrigation.

Figure

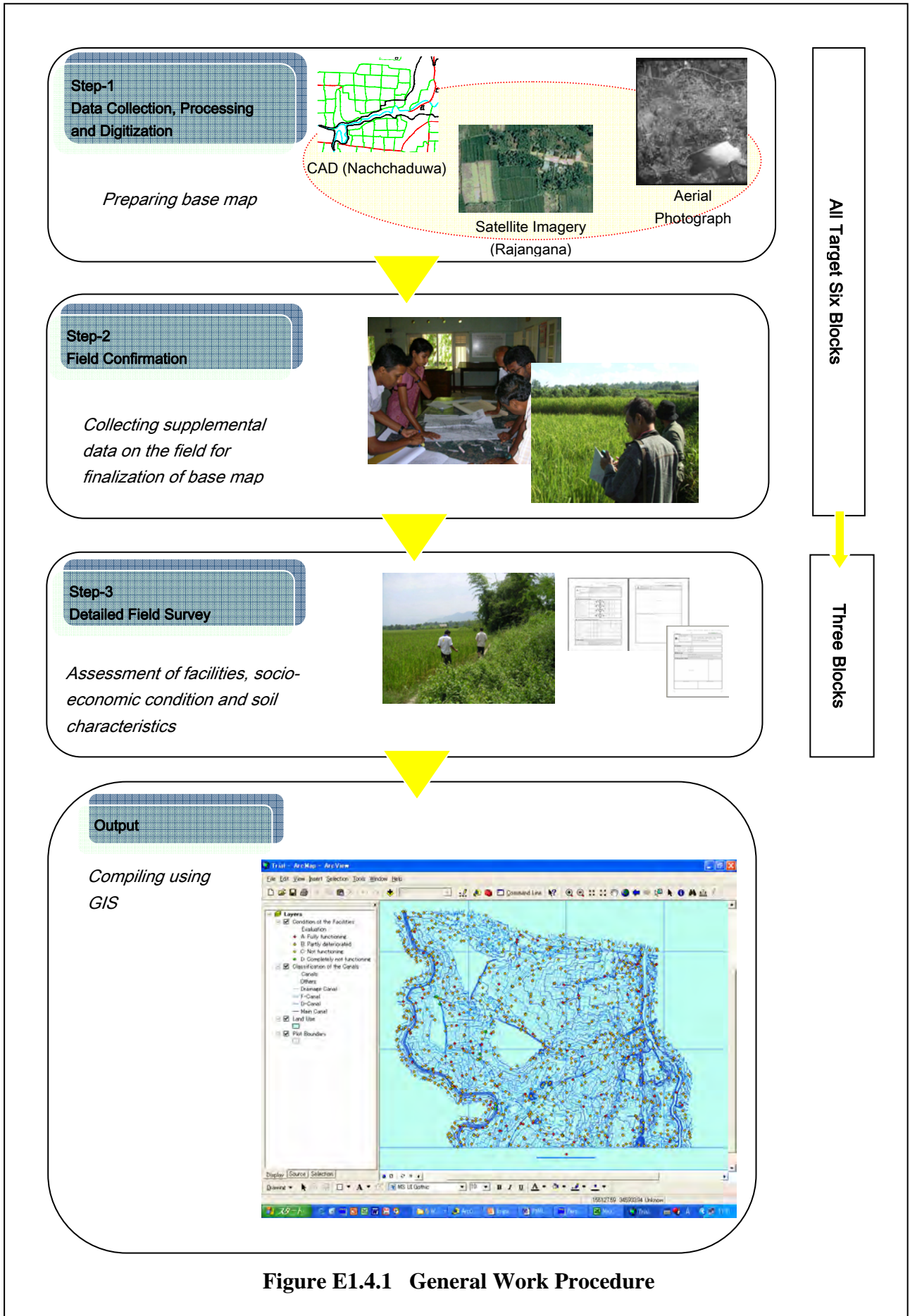


Figure E1.4.2 Information Collected at Each Work Step

		Step-1		Step-2		Step-3		
	Data Category	Data Type (GIS)	Preparatory Works	Field Verificator	Data Input and Digitization	Data Processing (Aerial Photograph and/or	Field Survey and/or Verification	Data Input/revision and Digitization
	Data Collection	-	+	-	-	-	-	-
	Entire Command Area	Entire Command area	Polygon	-	+	+	+	+
	F-Canal Command Area	Main canal	Line	-	-	+	+	+
		D-canal	Line	-	-	+	+	+
		F-canal	Line	-	-	+	+	+
		Drainage canal	Line	-	-	+	+	+
		F-canal command area	Attribute data	-	-	-	+	+
Facilities Condition	Turn-out on main canal	Point	-	-	-	-	+	+
	Other structures on main canal	Point	-	-	-	-	+	+
	Turn-out on D-canal	Point	-	-	-	-	+	+
	Other structures on D-canal	Point	-	-	-	-	+	+
	Farm inlet on F-canal	Point	-	-	-	-	+	+
	Other structures on F-canal	Point	-	-	-	-	+	+
Socio-economic Condition	Type of Land Ownership	Attribute data	-	-	-	-	+	+
	Land Use	Attribute data	-	-	-	-	+	+
	FO Activities	Attribute data	-	-	-	-	+	+
Soil	Te-tual Classification	Polygon	-	-	-	-	+	+
	Drainage Class	Polygon	-	-	-	-	+	+
	Fertility	Polygon	-	-	-	-	+	+

Note: + data and/or information obtained
 - data and/or information not obtained

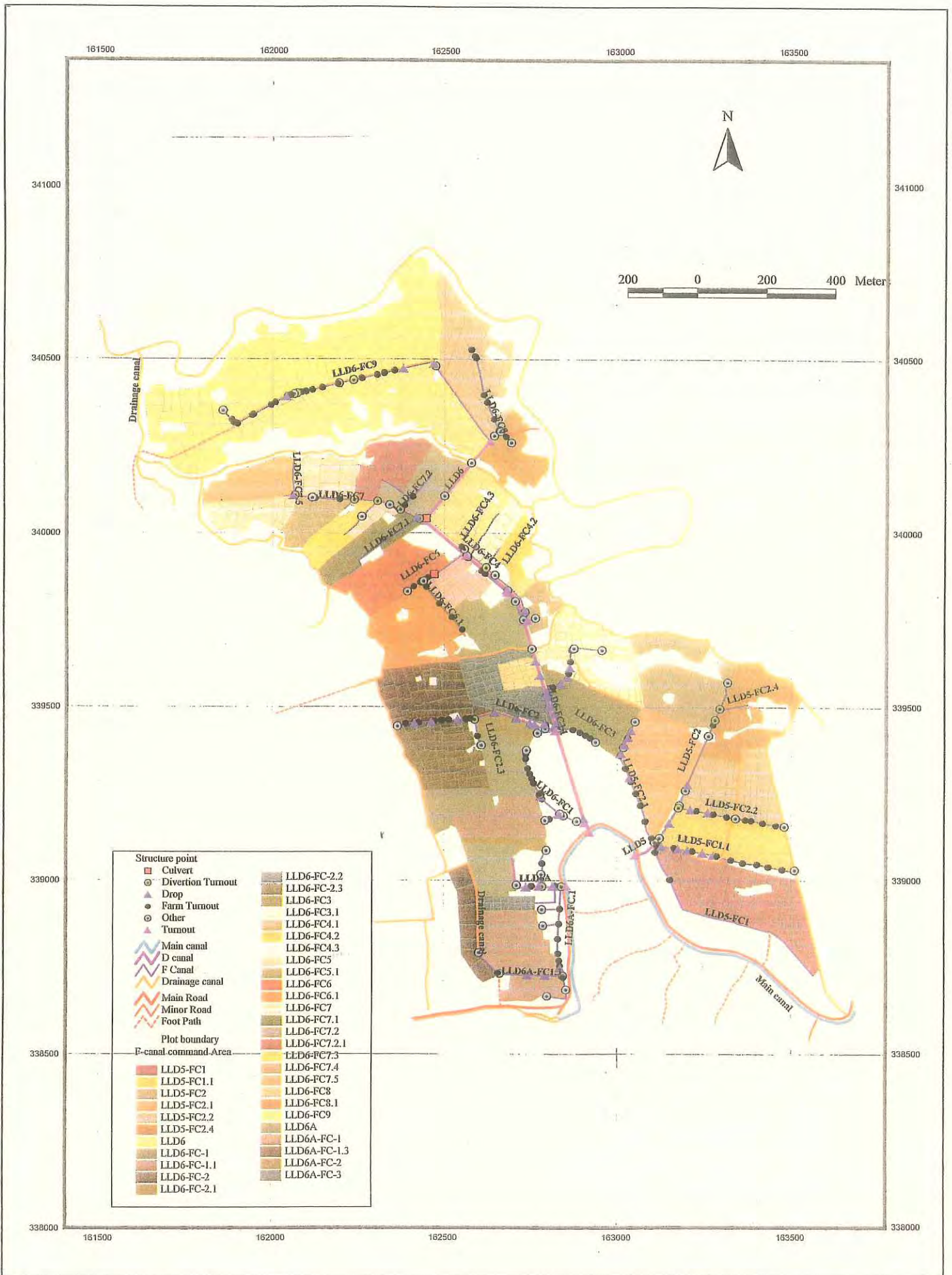


Figure E5.1.1 Location of Facilities (Nachchaduwa Major Scheme - Isuru FO)

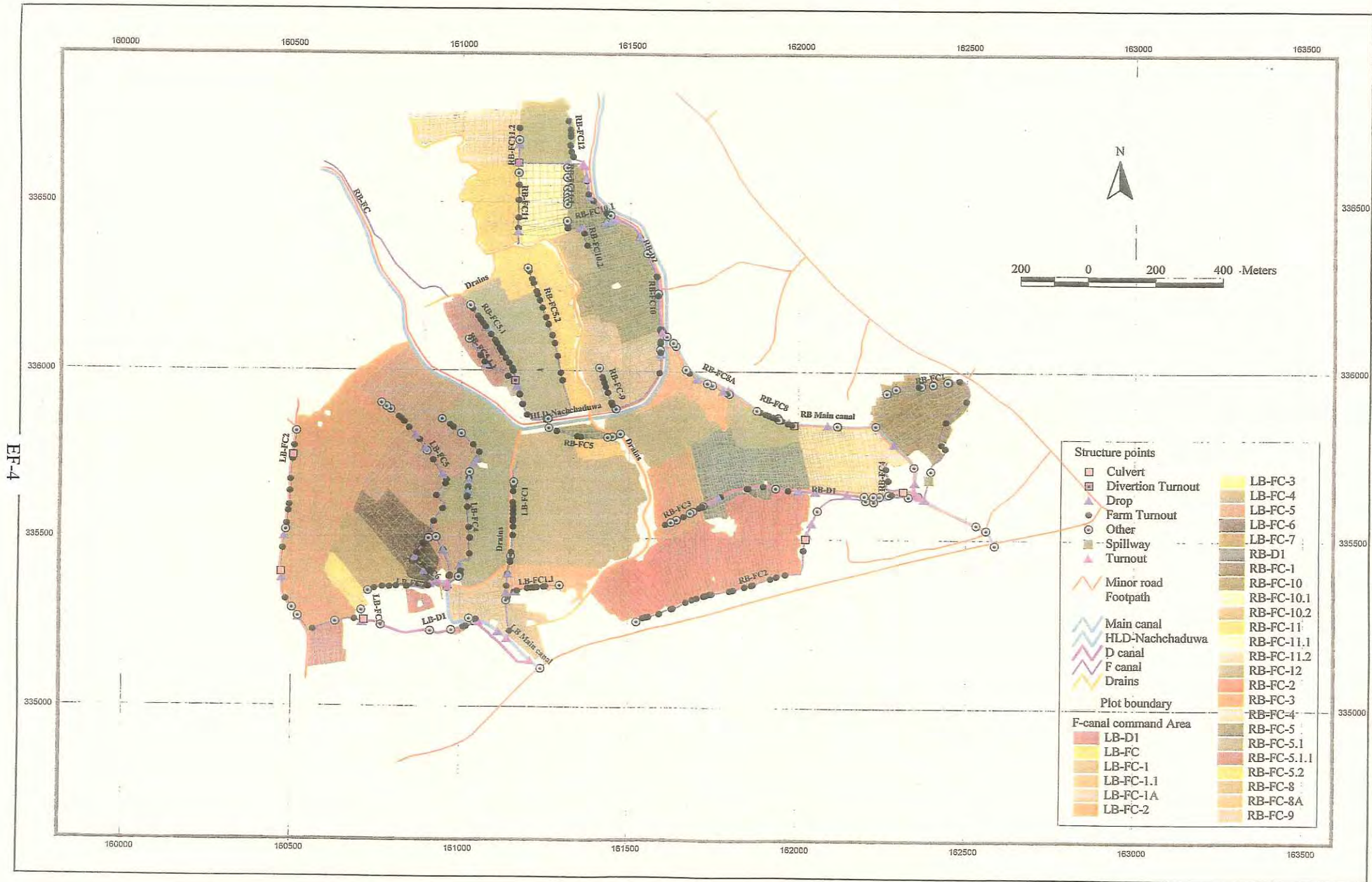


Figure E5.1.2 Location of Facilities (Thruwila Medium Scheme)

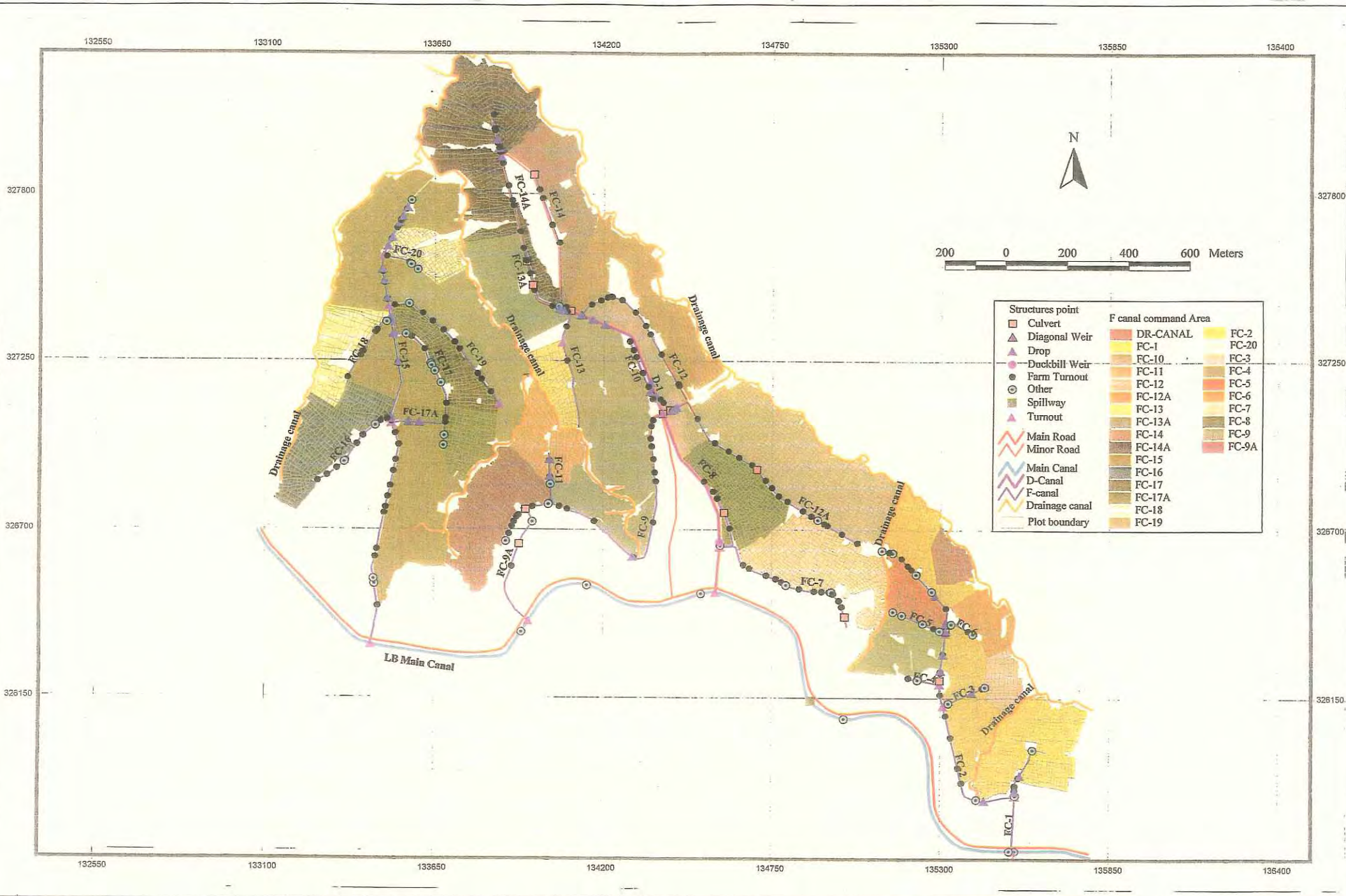


Figure E5.1.3 Location of Facilities (Rajangana Major Scheme – LB Tract 2)

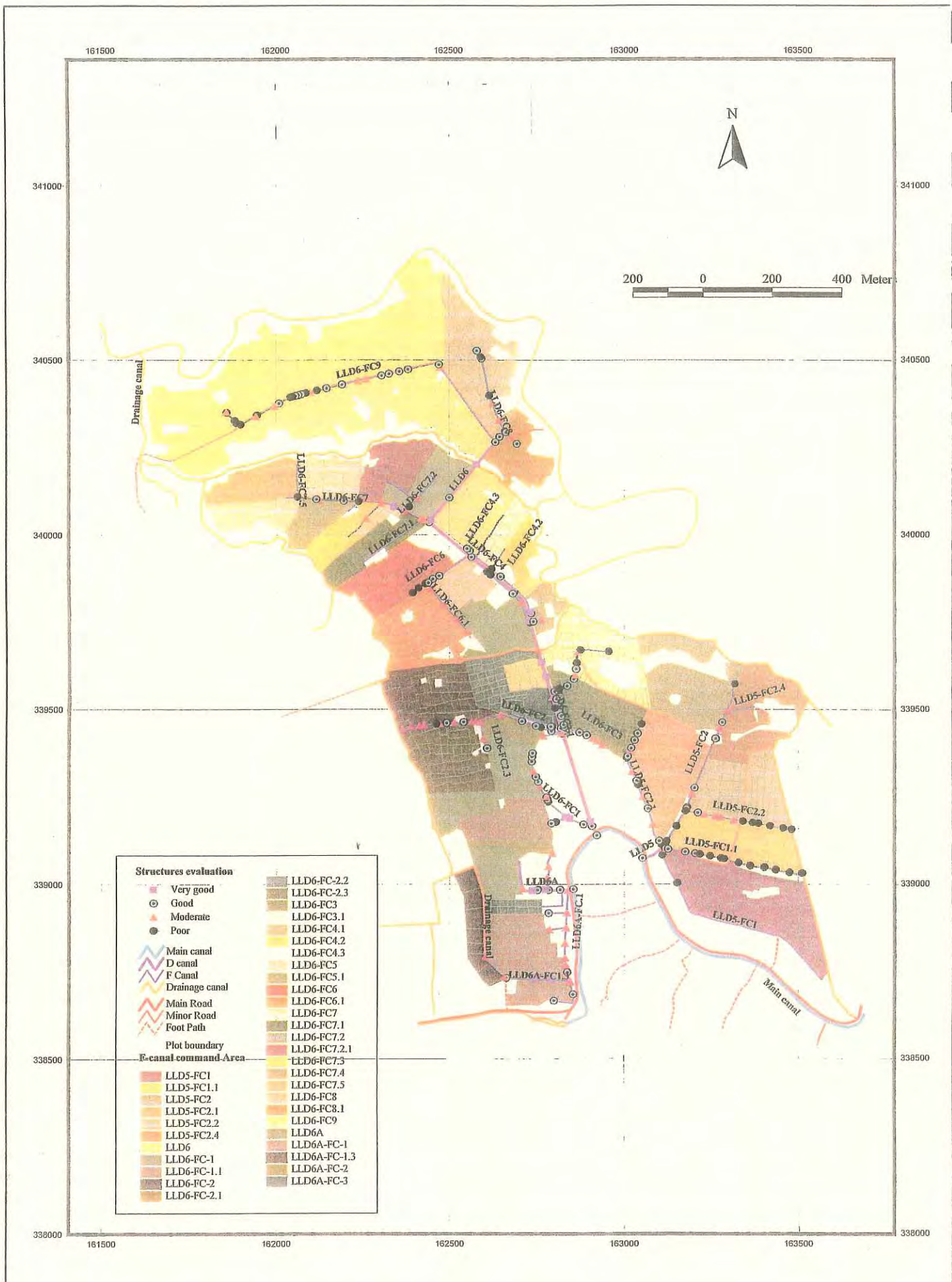


Figure E5.1.4 Evaluation of Facilities (Nachchaduwa Major Scheme - Isuru FO)

EF-7

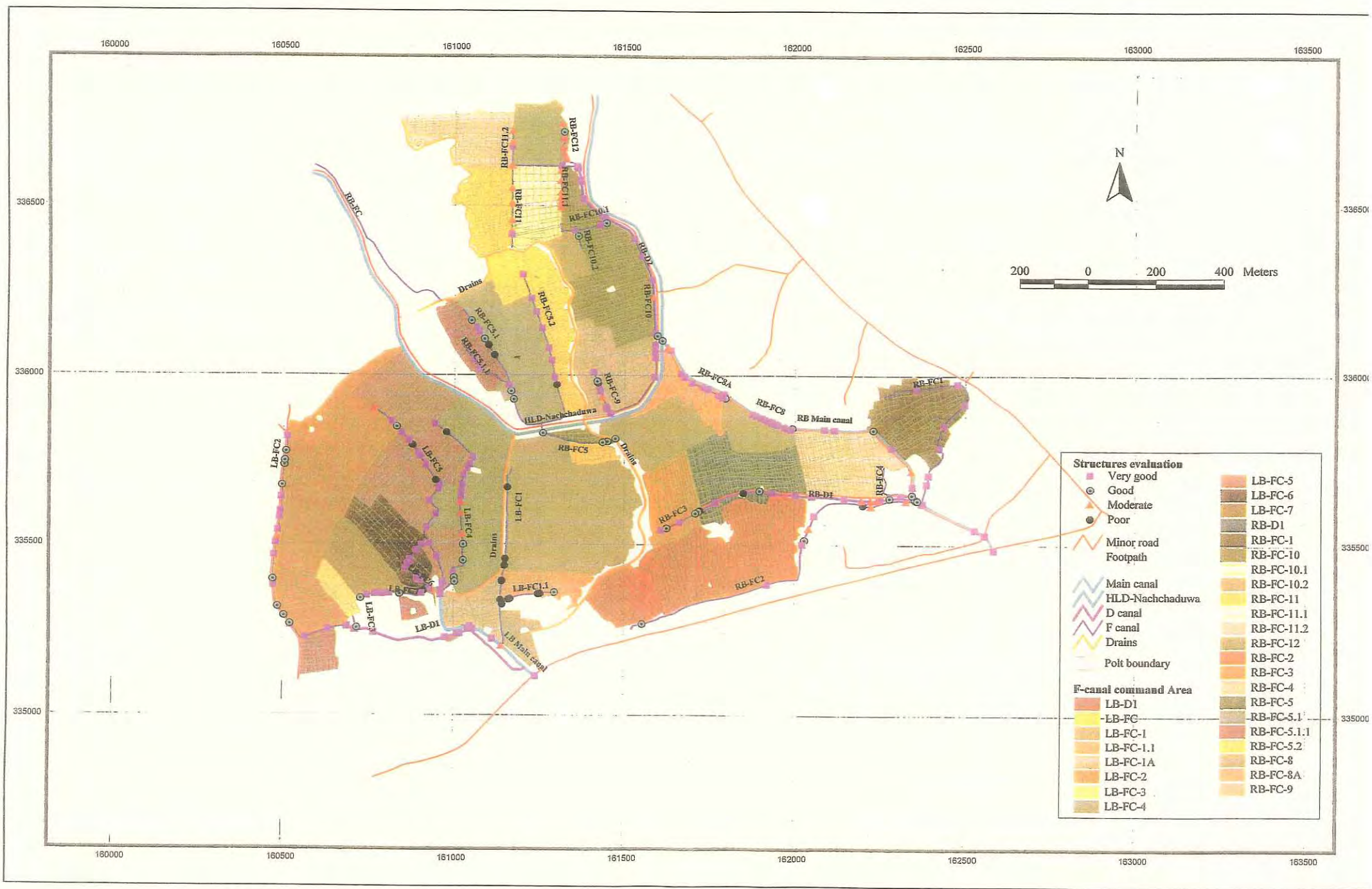


Figure E5.1.5 Evaluation of Facilities (Thruwila Medium Scheme)

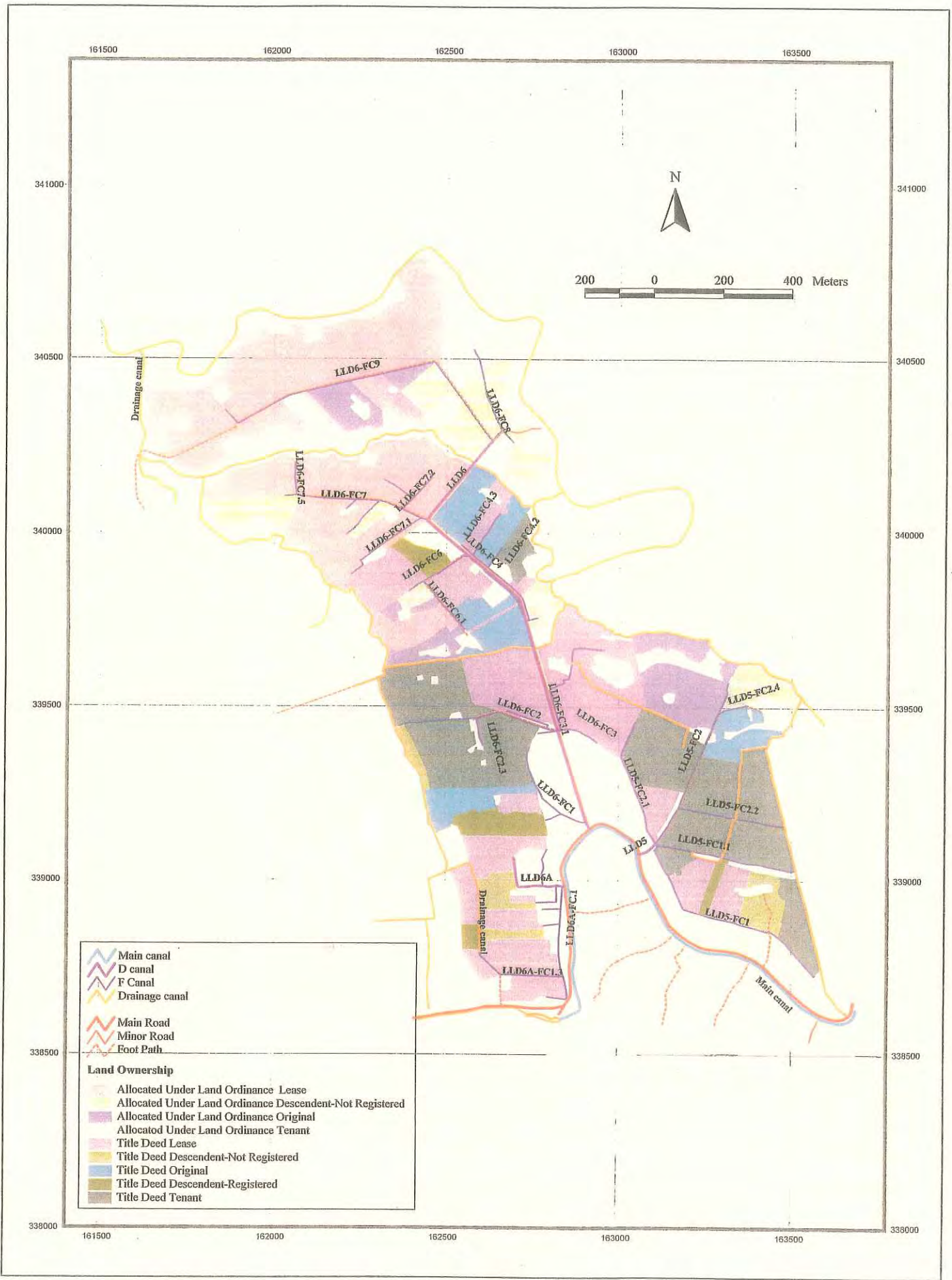


Figure E5.2.1 Type of Land Ownership (Nachchaduwa Major Scheme - Isuru FO)

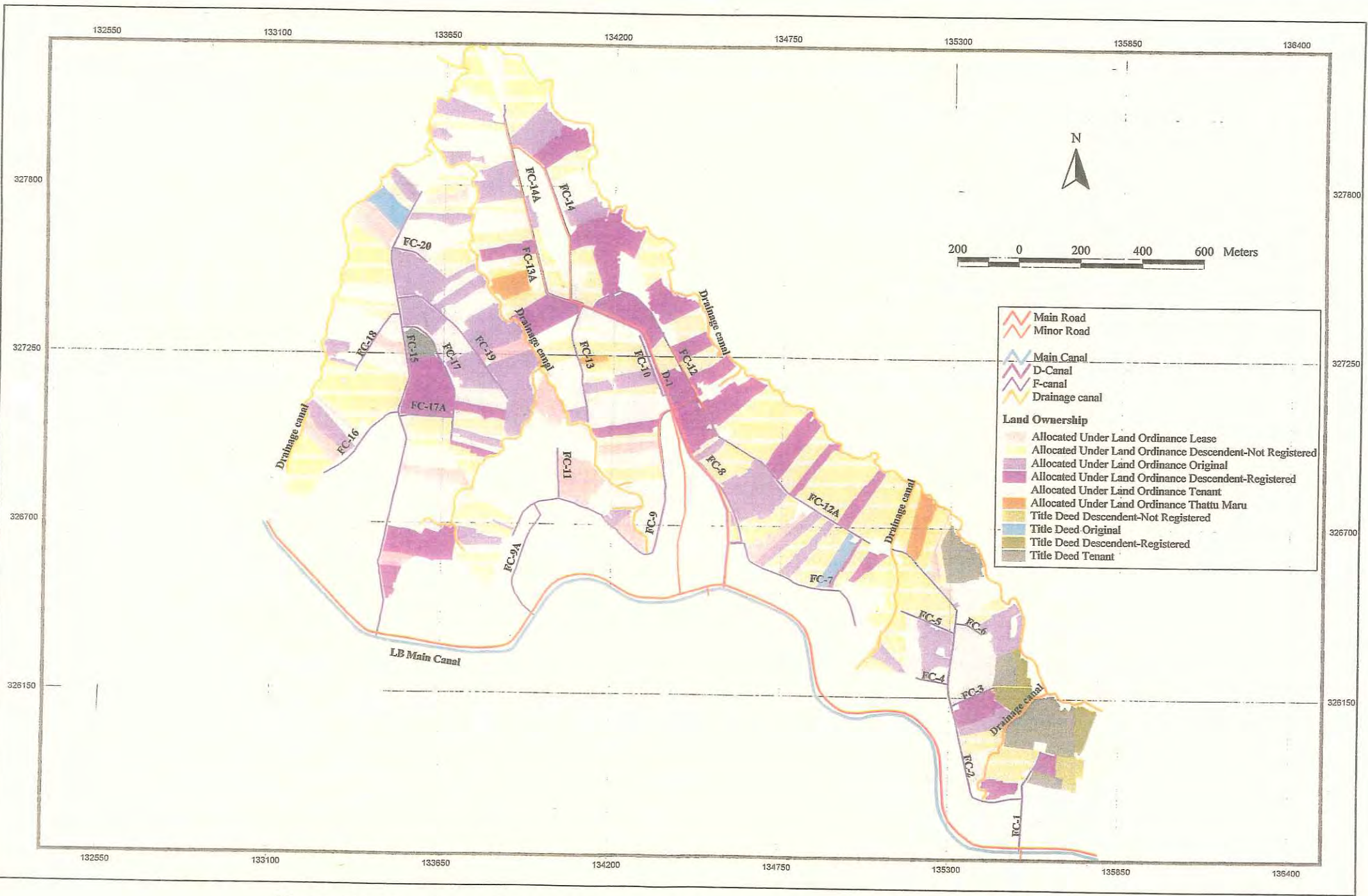


Figure E5.2.3 Type of Land Ownership (Rajangana Major Scheme – LB Tract 2)

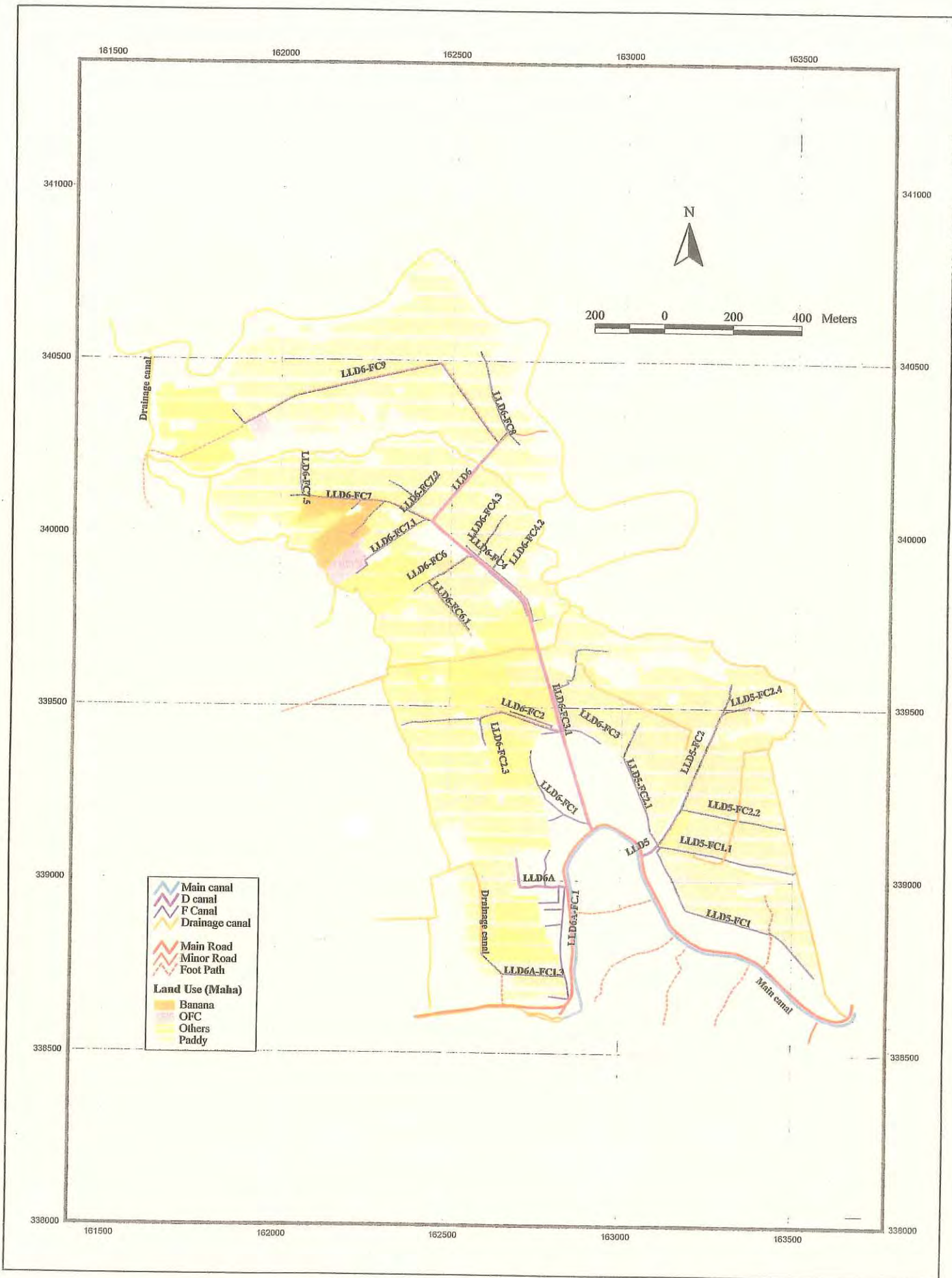


Figure E5.2.5 Land Use in Maha (Nachchaduwa Major Scheme - Isuru FO)

EF-13

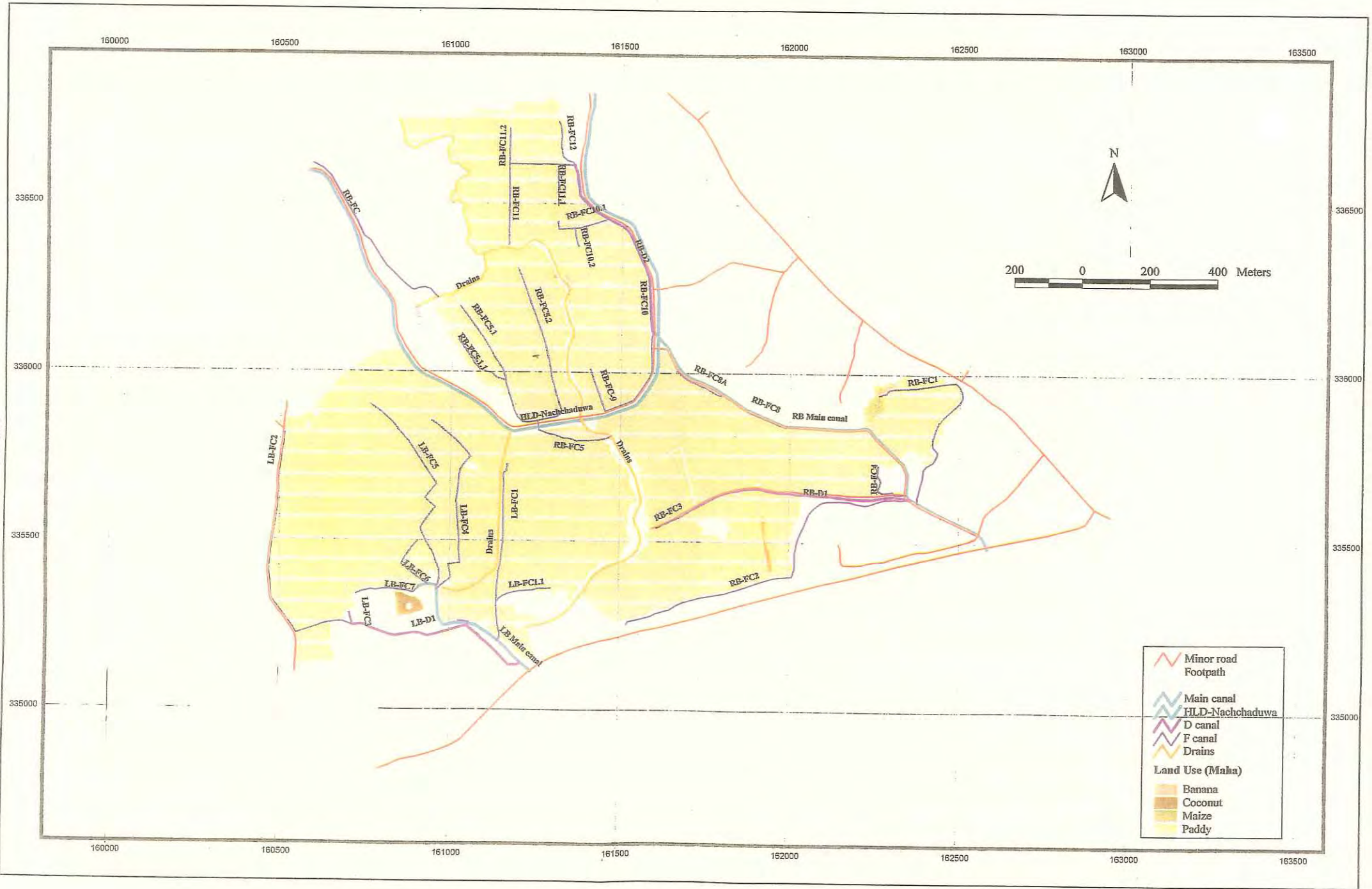


Figure E5.2.6 Land Use in Maha (Thruwila Medium Scheme)

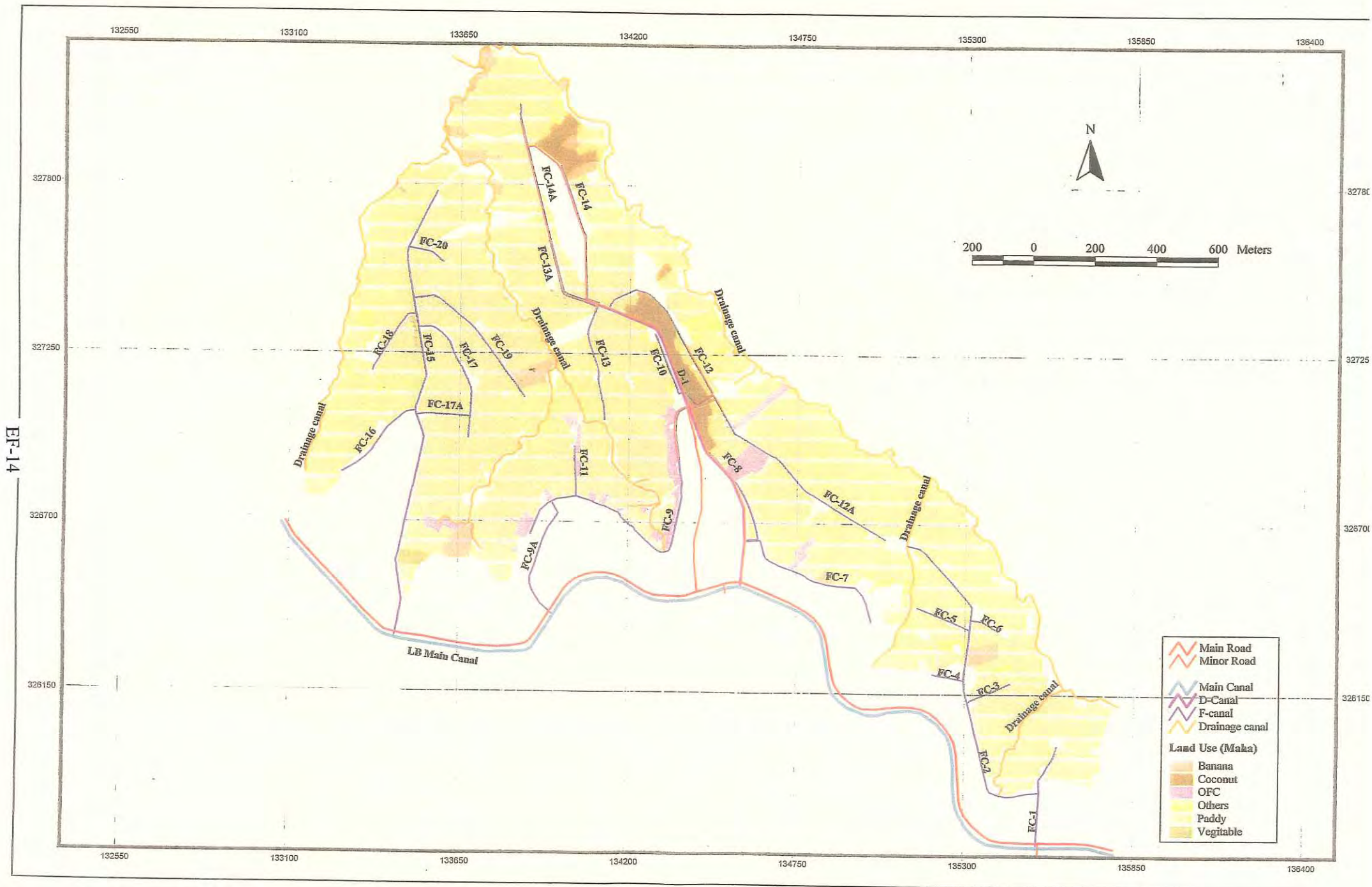


Figure E5.2.7 Land Use in Maha (Rajangana Major Scheme – LB Tract 2)

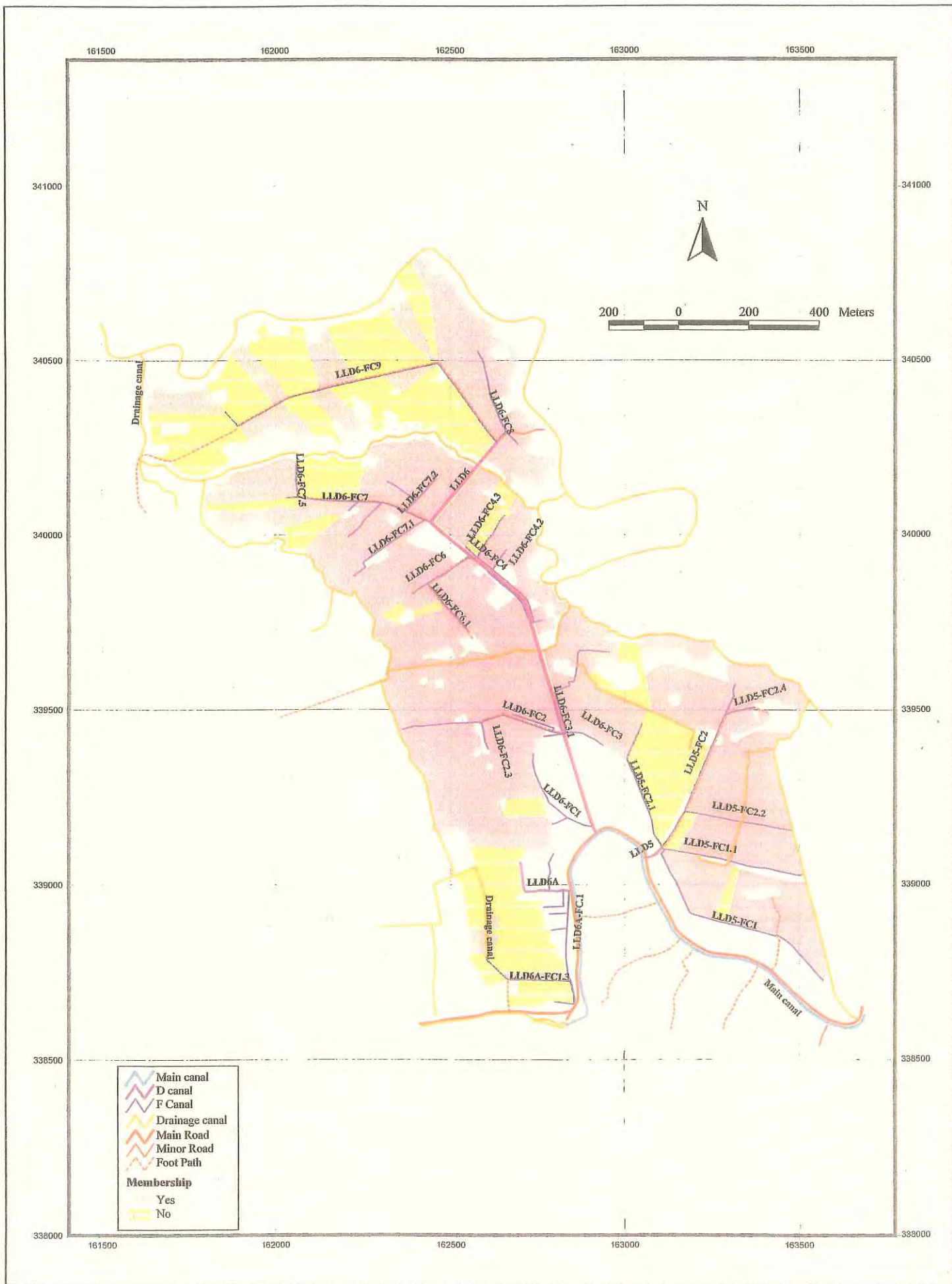


Figure E5.2.10 Membership (Nachchaduwa Major Scheme - Isuru FO)

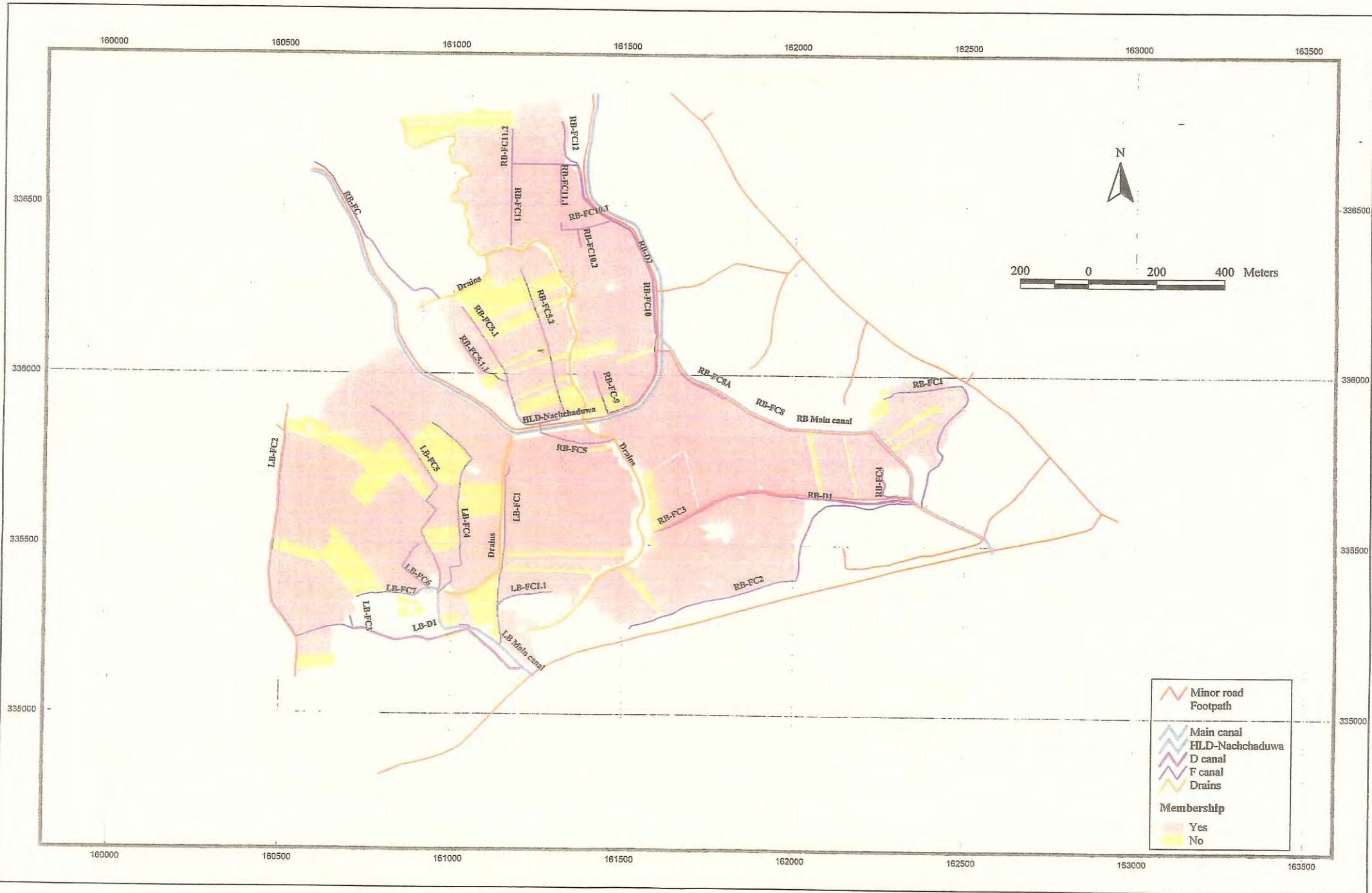


Figure E5.2.11 Membership (Thruwila Medium Scheme)

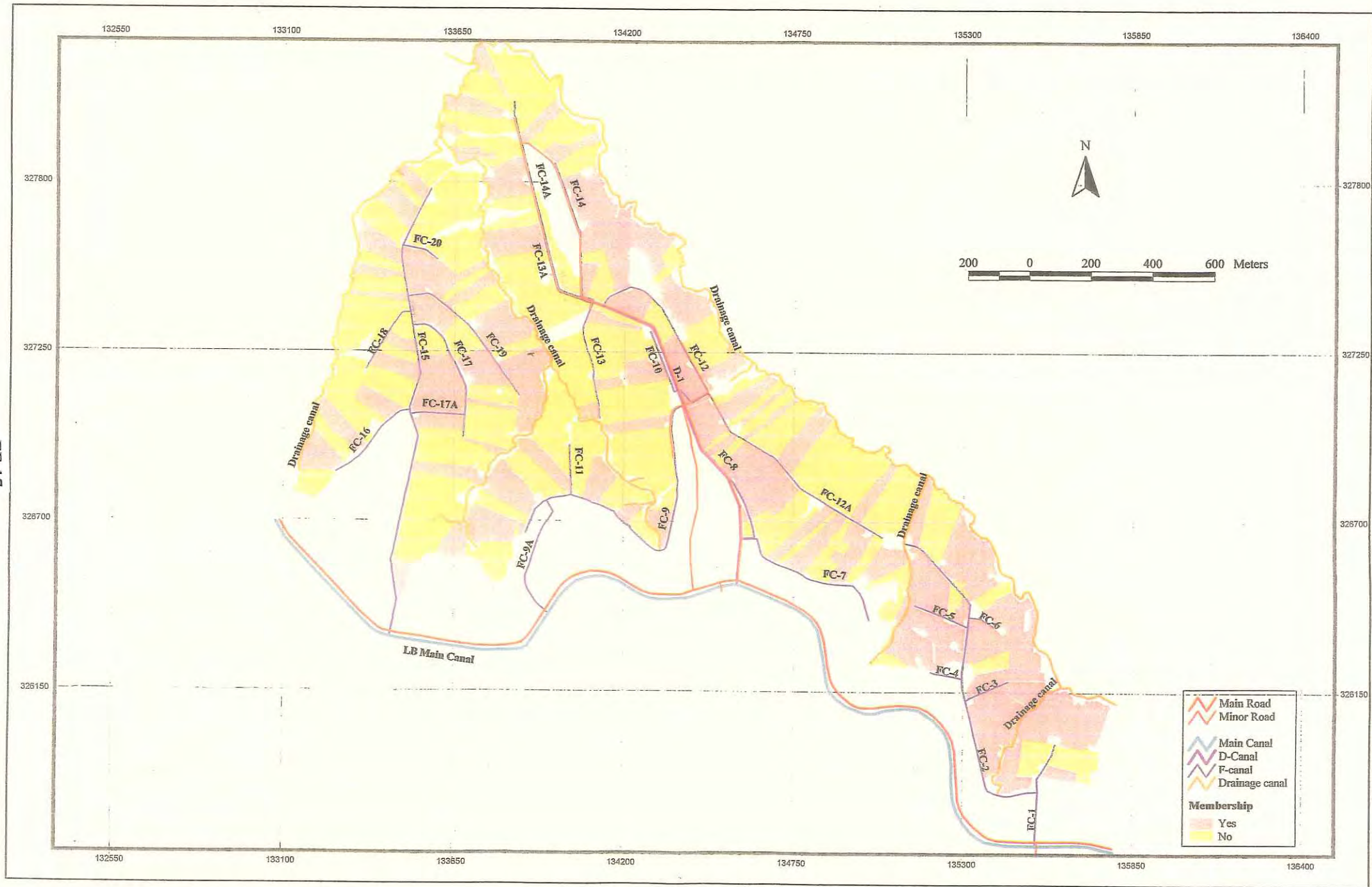


Figure E5.2.12 Membership (Rajangana Major Scheme – LB Tract 2)

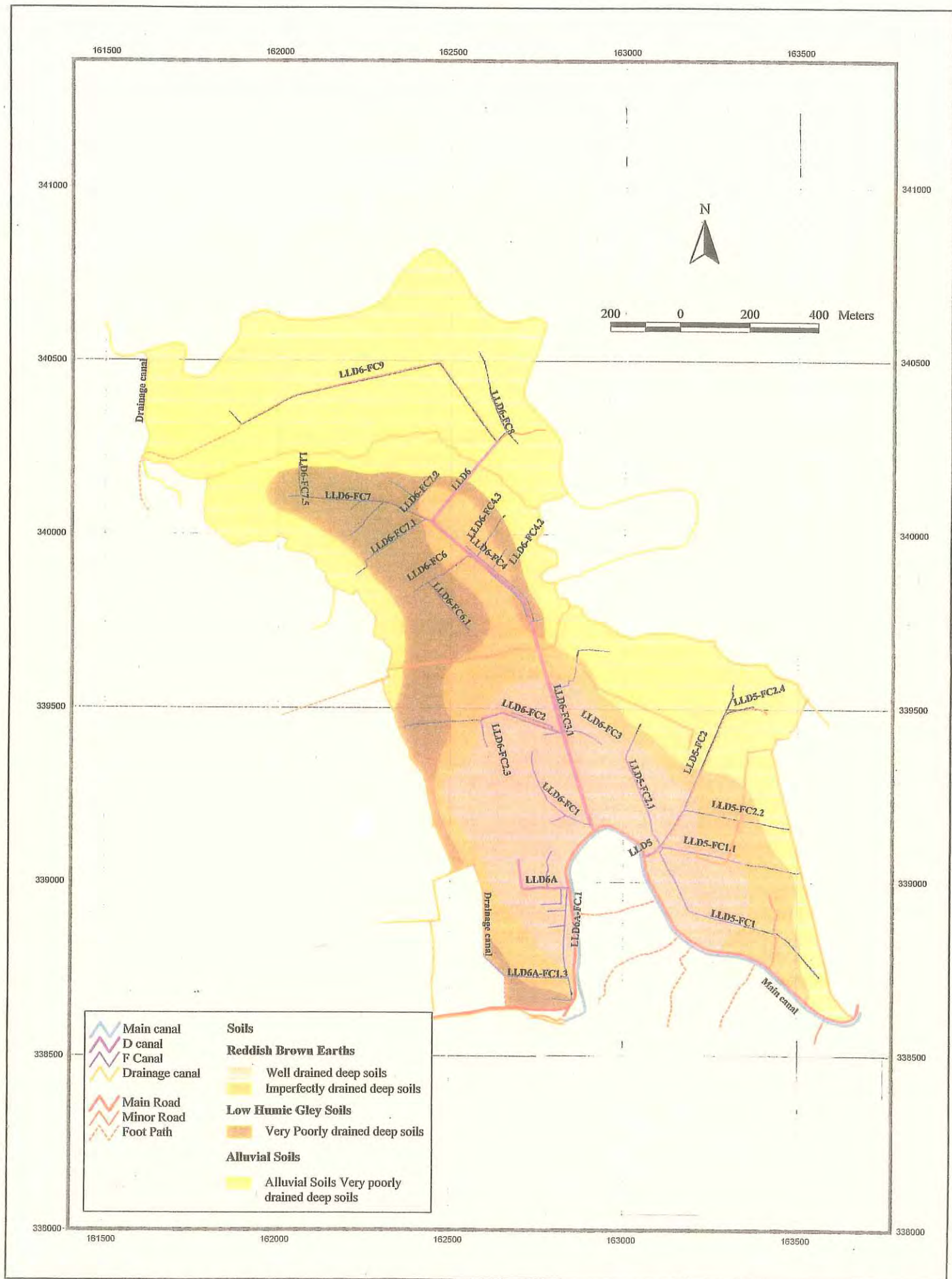


Figure E5.3.1 Textual Classification (Nachchaduwa Major Scheme - Isuru FO)

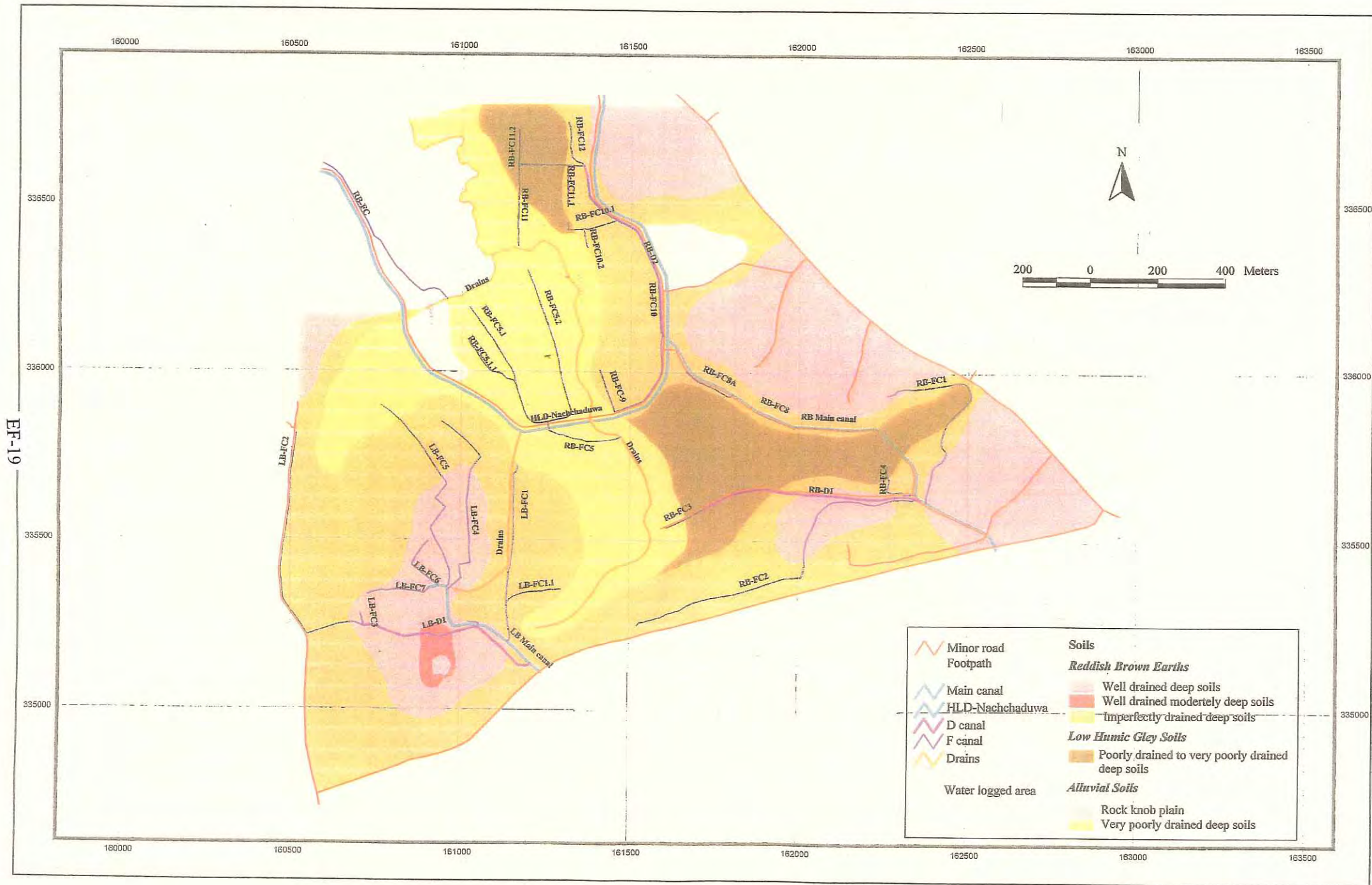


Figure E5.3.2 Textual Classification (Thruwila Medium Scheme)

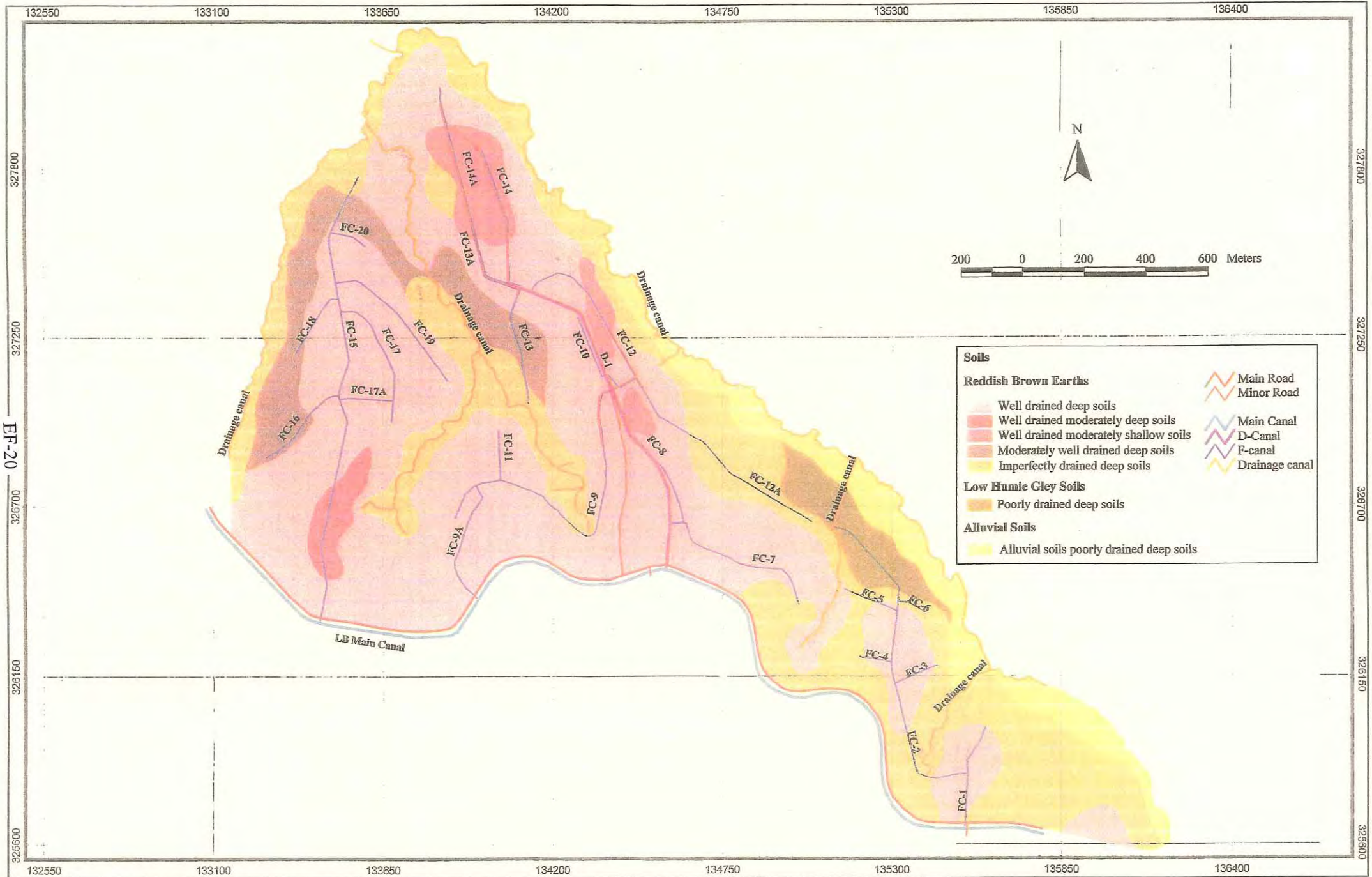


Figure E5.3.3 Textual Classification (Rajangana Major Scheme – LB Tract 2)

Attachment

THE STUDY
ON
INCREASING THE CAPACITY OF INTEGRATED MANAGEMENT
IN
IRRIGATION SECTOR
IN
SRI LANKA

Annex E Attachment (How to Use ArcGIS and Edit GIS Data)

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How to Use Arc GIS and Edit GIS Data

1. Composition of Arc GIS

Most basic information required for GIS Operation, different from ArcView 3 series, Arc GIS consist of three different type of application...

Arc GIS consists of three types of Application: ArcMap, ArcCatalog and ArcToolbox, function of which are described as follows:

- Arc Map: Viewing, querying, editing map and attribute table, constructing and modifying new GIS data, calculating and analyzing, arranging print layout and printing
- Arc Catalog: New layer/dataset creation and GIS data management
- Arc Toolbox: GIS data conversion (data import and export) and other complicated data analysis

2. Start up Arc Map

Most basic information required for GIS Operation. This is the operation, first and foremost for GIS operation...

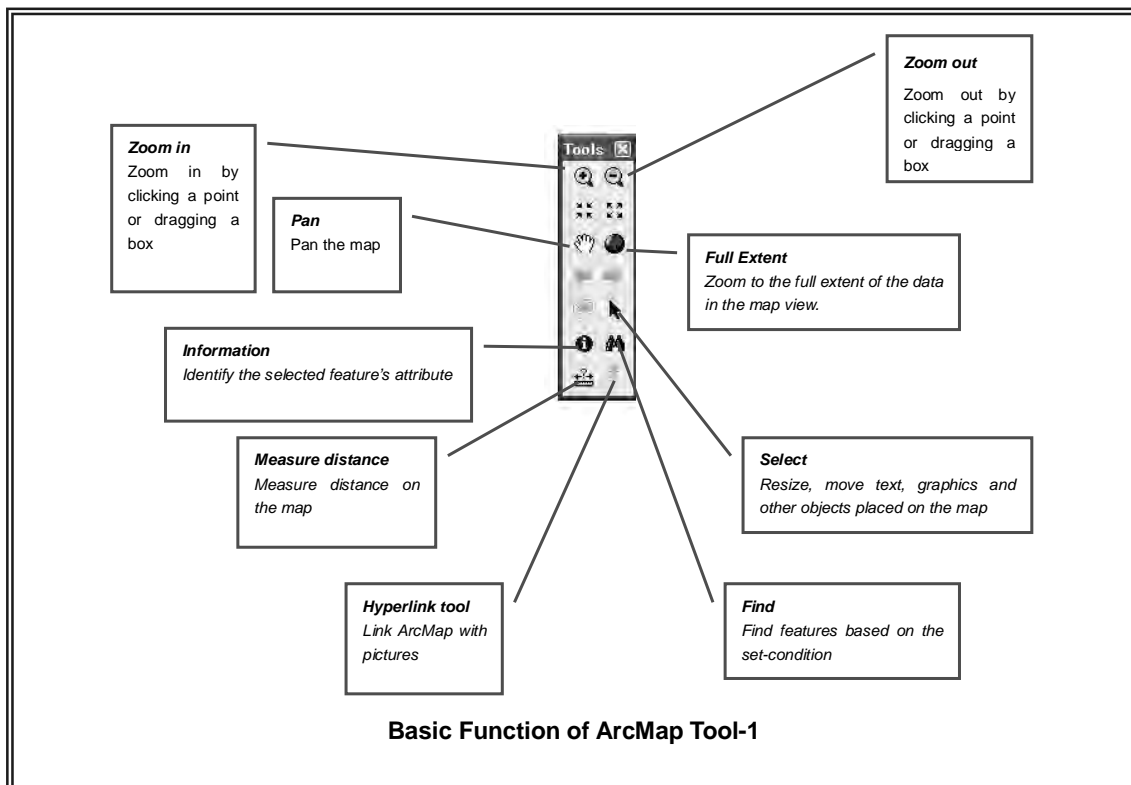
Select "START" - "Arc GIS" - "Arc Map"

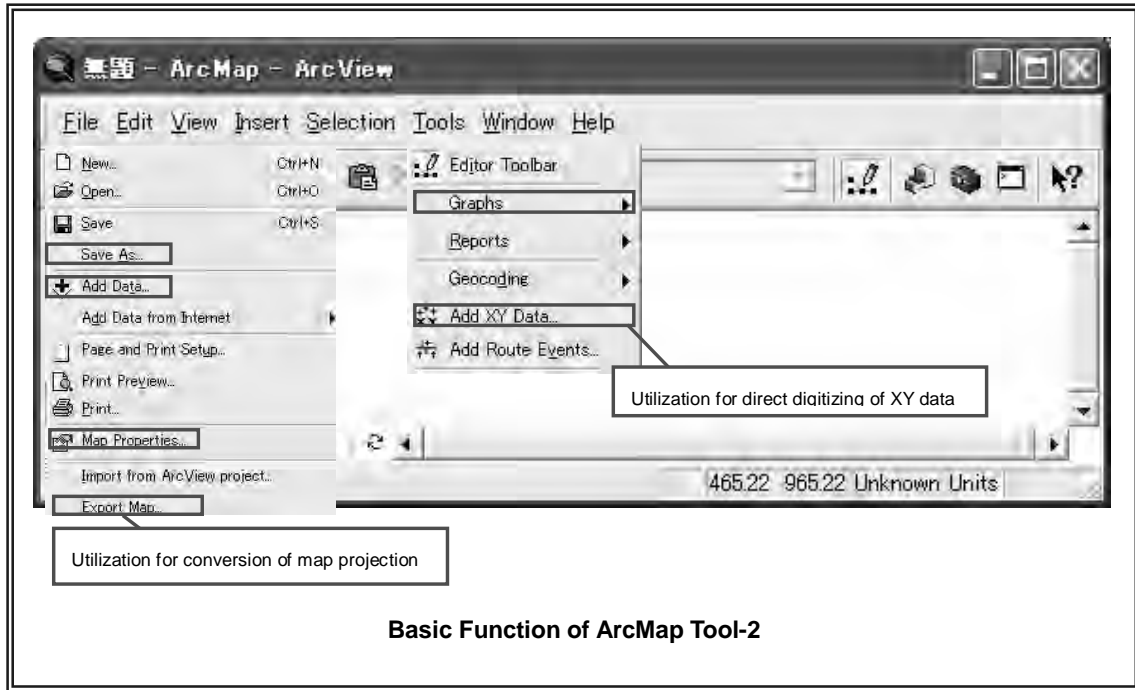
Open the view of Arc Map explained as follows.

3. Overview of "Tool" box

Most basic information required for GIS Operation...

Basic function of Arc Map "Tool" box is shown as below:

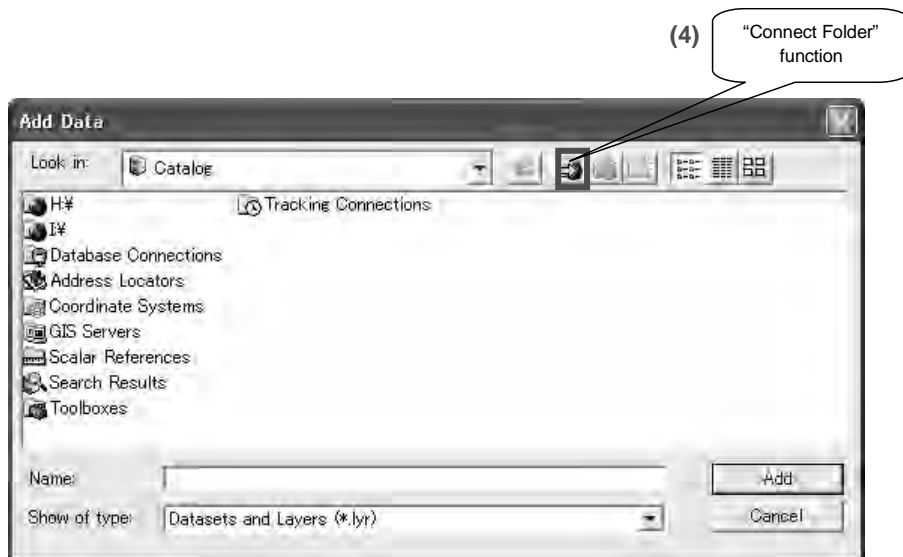




4. Add GIS layer

If you want to add any additional layer in the map to integrate with other layers...

- (1) Start Arc Map.
- (2) Create a new map or open an exiting map.
- (3) Select the data/map you want to add to your map.
- (4) Select "Connect to Folder" and search the data you want as shown below:



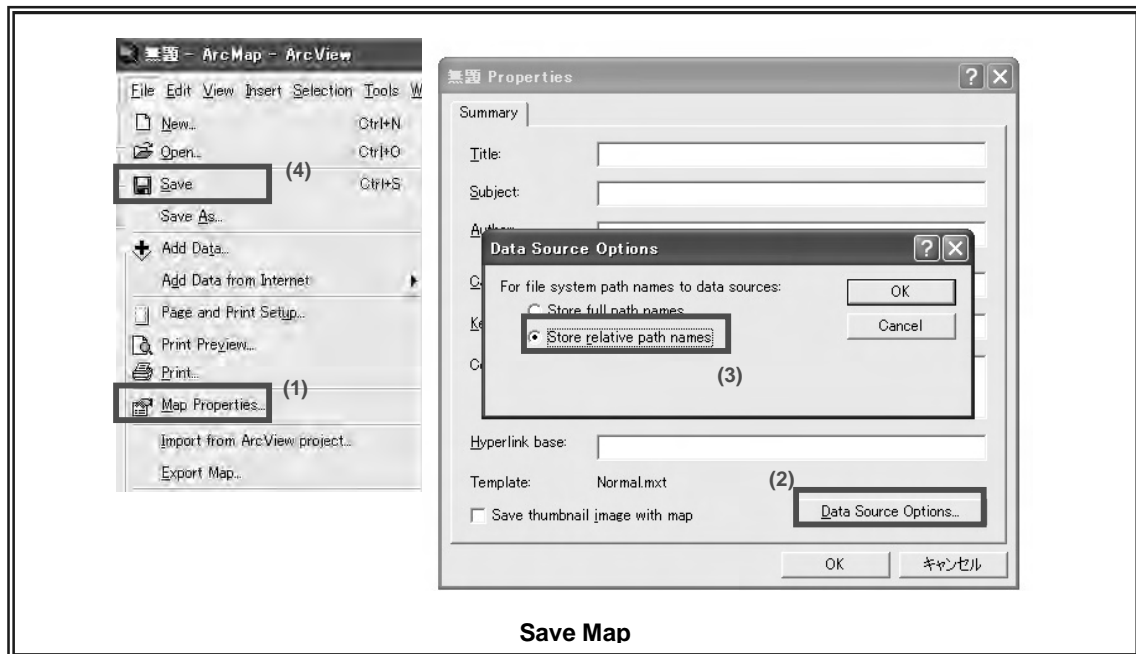
- (5) If you want to select plural layers, click one by one with shift key.

5. Save Map

Most basic information required for GIS Operation...

This section shows how to save the working result.

- (1) Click “File” and select “Map Properties...”
- (2) Click “Data Source Options...” and
- (3) Select “store relative path names”
- (4) Finally, click “File” and select “Save as...” and type file name you want so that the file is saved as “APR file”.

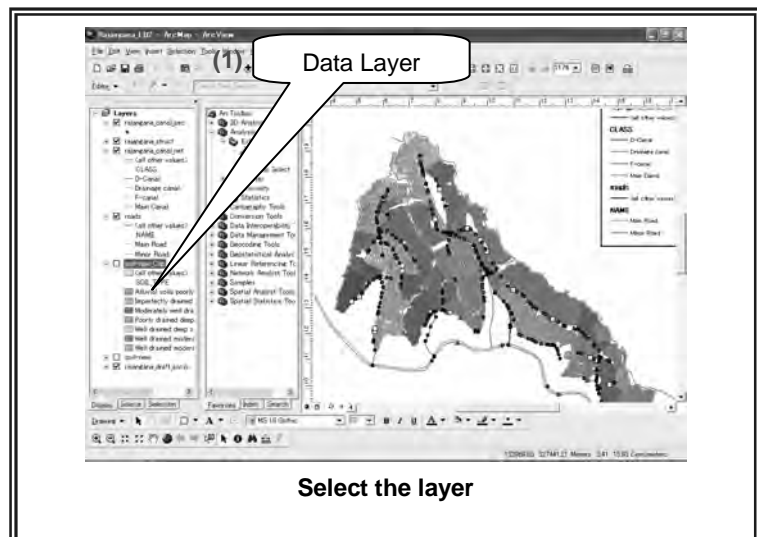


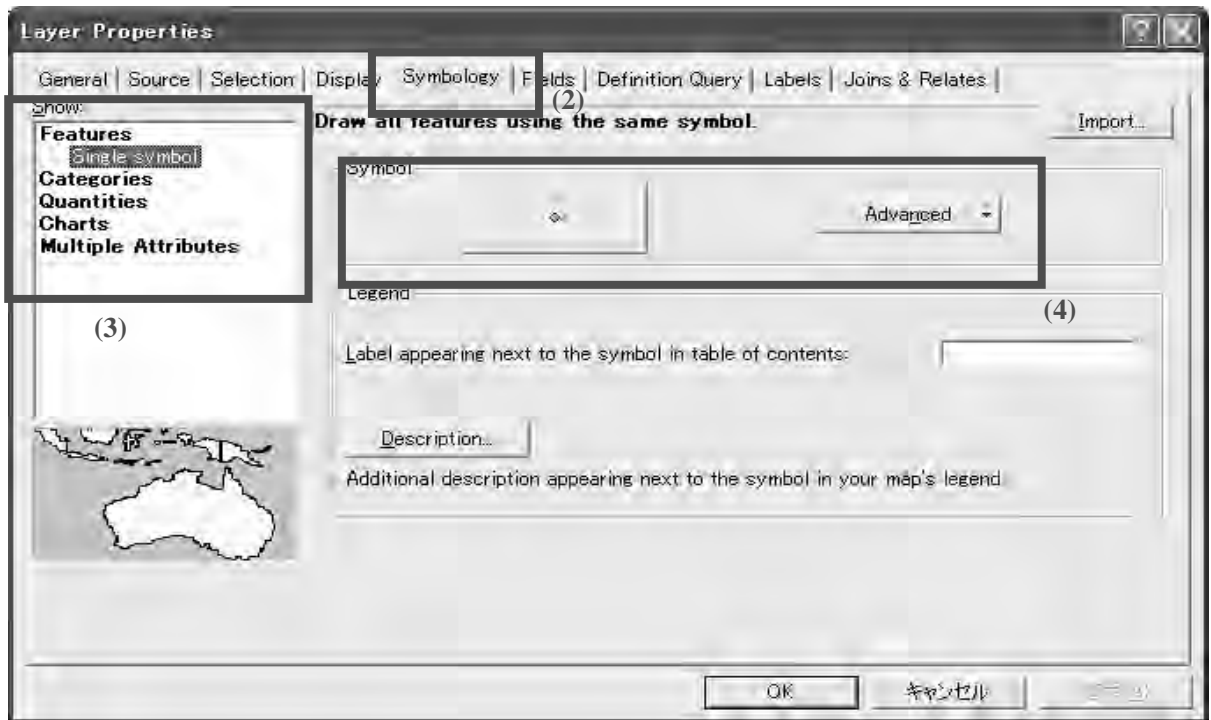
6. Change of Map Symbology

Map symbol can be changed into more suitable style depicting specific layer making better presentation and facilitating understanding of map users...

You can change the symbol scheme for the layer, as well as its appearance in the table of contents by using this function.

- (1) Select the layer you want to change and right click.
- (2) Select “Layer Properties...” and click “Symbology” Tab on the properties dialog box.
- (3) Select the type of symbol, and
- (4) Change color / and style, you want.





7. Search Data from Attribute Table 1

When you want to find specific data from all data set correspondent to the criteria (e.g. structure with poor condition)...

The find button lets you search a map for features that match your search criteria.

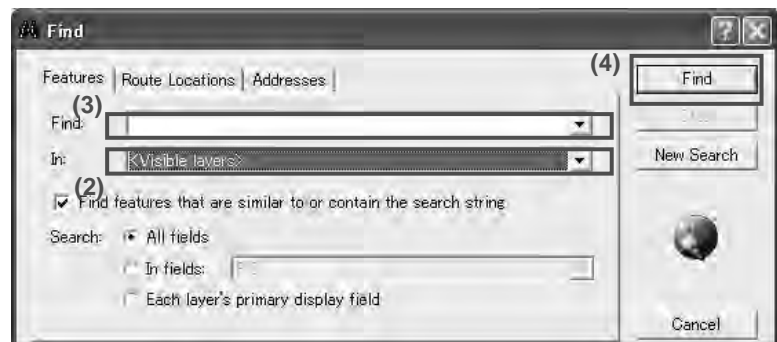


(1) When you click "Find" icon from Toolbar, the dialog box appears. You can search for features from a particular layer or from all layers on the map.

(2) Select the layer you want to search from "In" box.

(3) Input text/number you want to search in "Find" box.

(4) Click Find and then the results are shown in the box.



Tip-1: Attribute Table

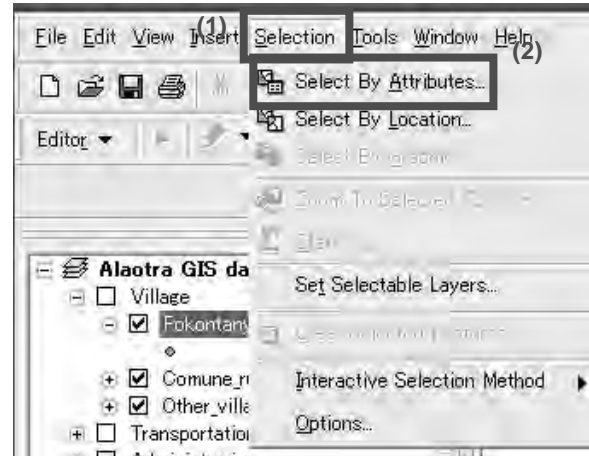
Attribute Table are used to record the non-spatial characteristics of an entity. Attributes are also called items or variables. Attributes may be envisioned as a list of characteristics that help to describe and define the features we wish to represent in a GIS. Structure layer (scheme name_struct) includes, for instance, coordinates where assessment was made, structures type, evaluation, path to photograph and so forth is saved. Basically,

attributes of different types may be grouped together to describe the non-spatial properties of each object of database. Therefore, GIS-based irrigation block maps for Nachchaduwa, Thruwila and Rajangana consist of six layers: canal features (network), road, canal features (evaluation), structure features (evaluation), socio-economic conditions and soil conditions.

8. Search data from attribute table 2

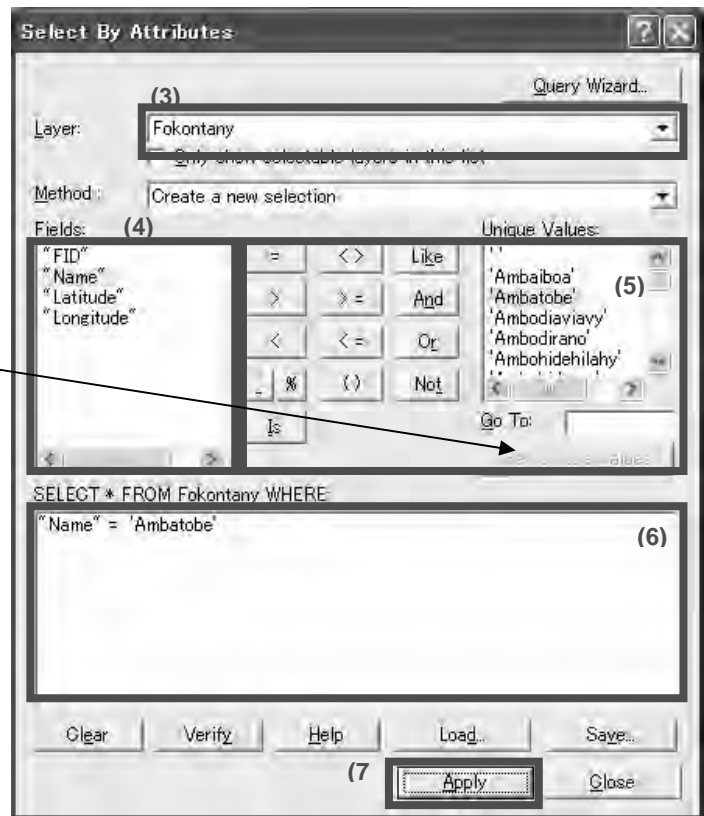
When you want to find specific data from all data set correspondent to the criteria (e.g. structure with poor condition)...

- (1) Click "Selection" from toolbar and
- (2) Select "Select By Attributes..."



- (3) Select layer to search from "Layer:" box.
- (4) Select Field to search from "Fields:" box and double click the target field.
- (5) Create the equation using calculation button and "Unique Values:" box.
- (6) Created equation is shown in the bottom box.
- (7) Click "Apply" button. The result is shown in Arc Map Viewer with blue color.

**When you want to show all data of selected fields in "Unique values:" box, click "Get Unique Values:" button.*

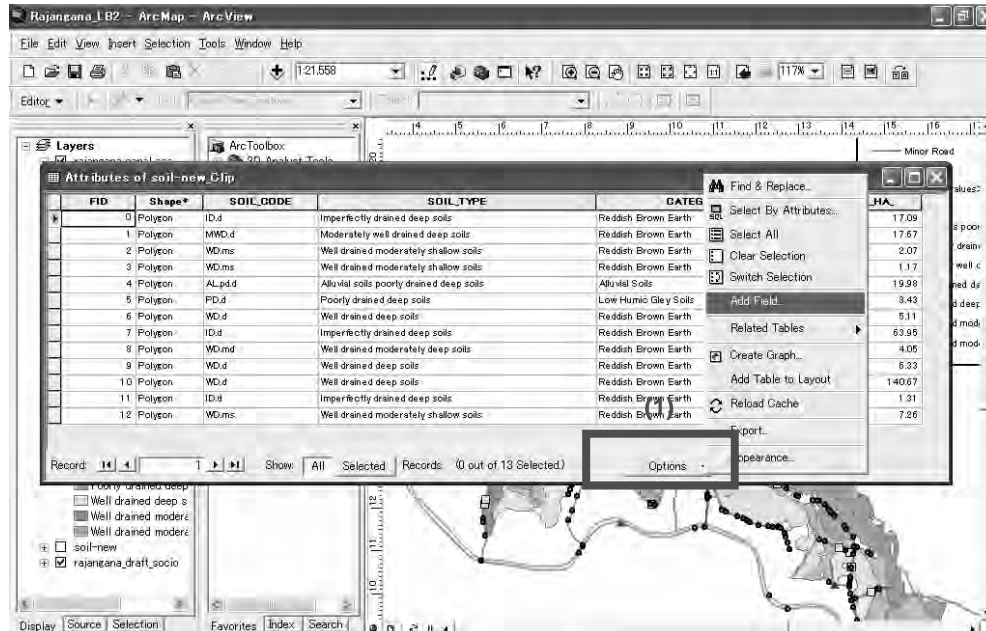


9. Managing Attribute Table

When you want to update or modify data such as facilities evaluation result based on field evaluation (canal and structure condition, land use and so forth)...

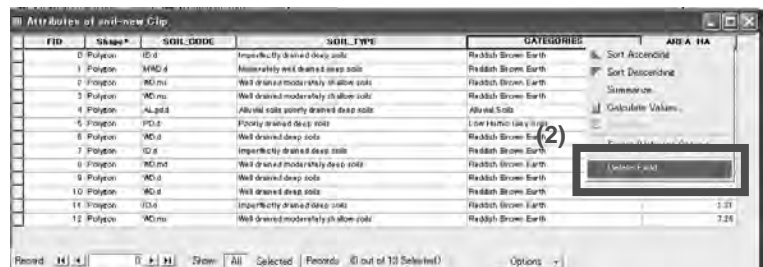
Right click the layer to manage and select “Open Attribute Table”.

(1) Add new field by clicking Options and select “Add Field...”



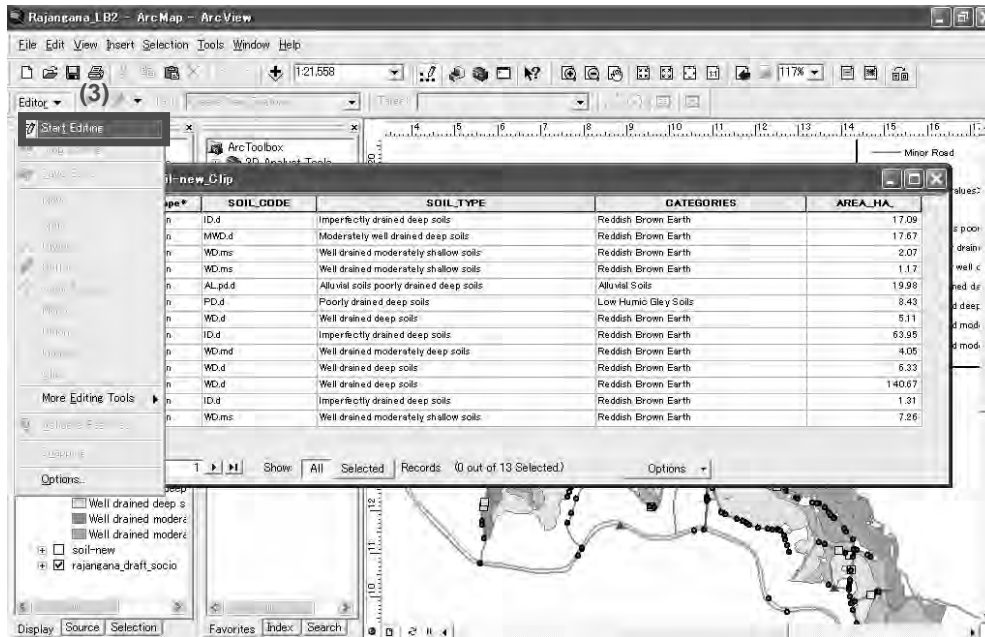
(2) Delete field

In order to delete the field, select the field and right click to select “Delete Field” command.



(3) Change and/or updating data

Before changing and/or updating any data in attribute table, select “Start Editing” from Editor Tool Bar (If the toolbar cannot be found, Click “View” - “Toolbars” and switch on “Editor”).




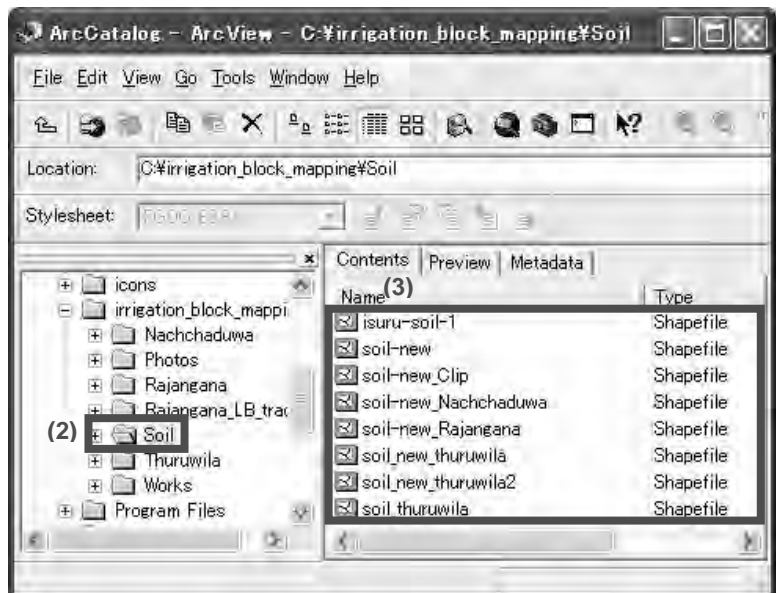
Click the layer to be edited and select “Editor” from Editor Tool Bar - “Start Editing”. Then, open attribute table from the layer. Click the column to be edited and input the data.

After changing the data, click “Editor” and select “Stop editing” and save the modification.

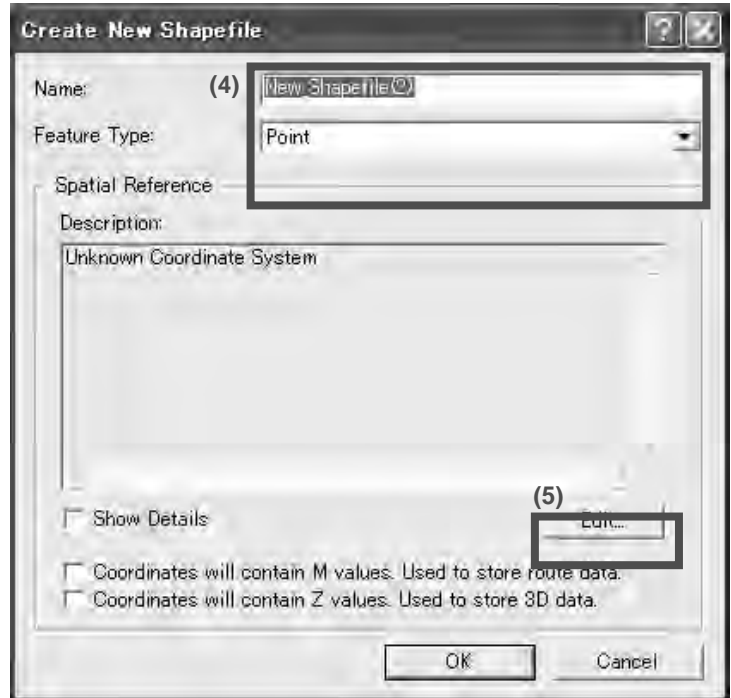
10. Create New Layer

When you want to add new layer related with irrigation management...

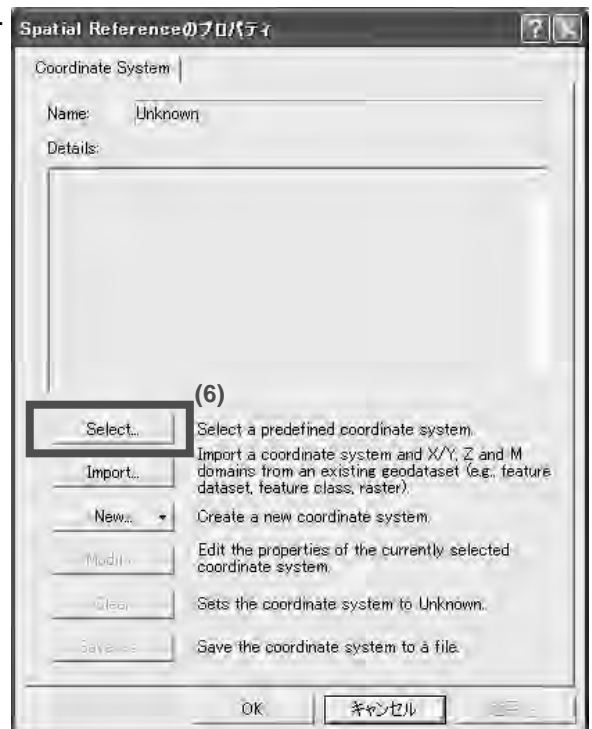
- (1) Start Arc Catalog. 
- (2) Open the folder where you would like to create new layer.
- (3) Right click open space in the right window and select “New” – “Shapefile”.



- (4) Input name of new layer and select the type of feature: point, polyline, polygon, multipoint or multipatch.
- (5) Click "Edit" button and,



- (6) Select coordinate System from "Select..." button.



11. Create New Feature

(1) & (4) (2) (3)

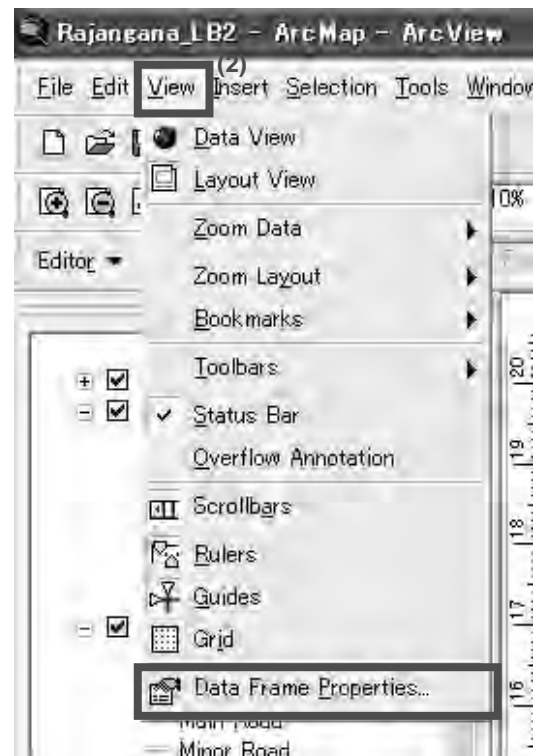


- (1) Click the Task drop-down arrow to “Start Editing” in “Editor...” toolbar.
- (2) Click “Sketch Tool” button and draw points / lines / polygons on the layer.
Before you draw new features, select categories of new features to be created from “Target:” window. The new features are classified into the layer shown in “Target:” window.
- (3) Then, check “Create New Feature” is shown in the window of “Task:”
- (4) After drawing, select “Save Edits” to save the drawing, then “Stop Editing” in “Editor” toolbar.

12. Modify the Map Coordination of Existing Layer

Different source of the data has different coordinate system, therefore, this function can change the system so that all the maps can be appropriately overlaid.

- (1) Start Arc Map.
- (2) Select “View” of the Tool Bar and select “Data Frame Properties.”
- (3) Click “Coordinate System” tab and select the coordinate system to apply.
- (4) Click OK.





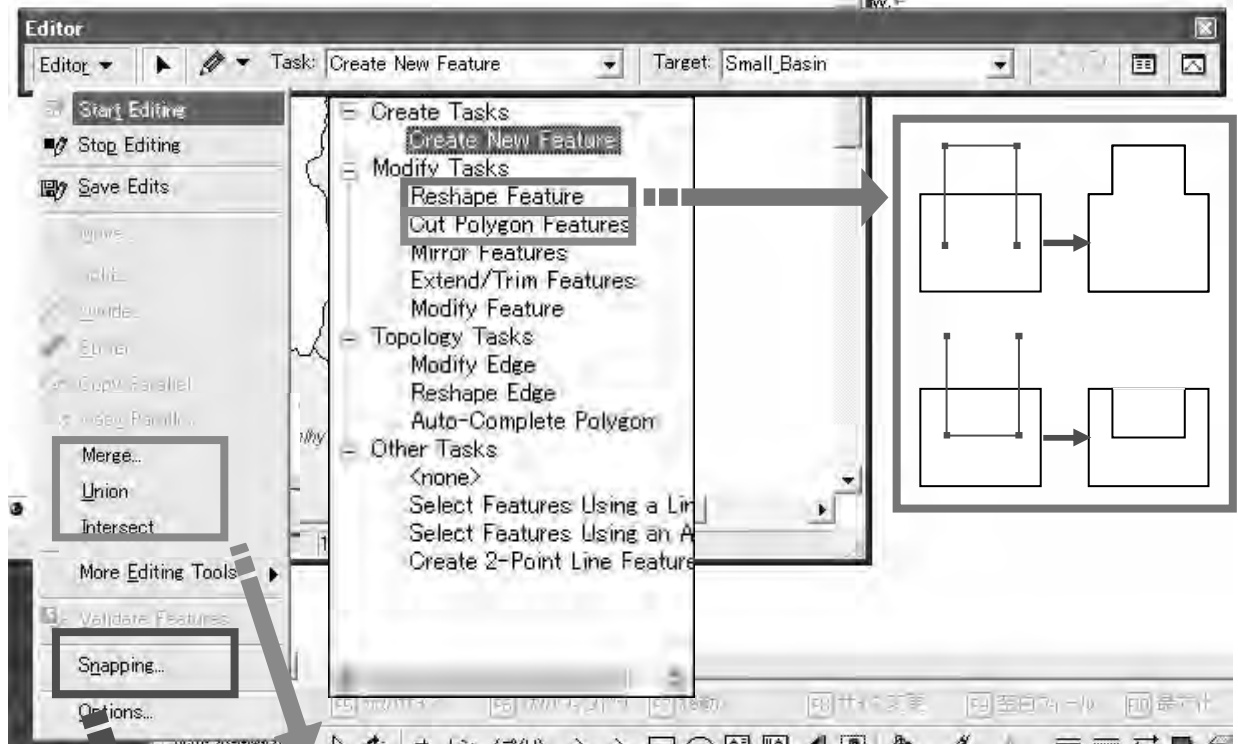
Tip-2: Why is Coordinate Transformation Required?

As briefly explained above, coordinate transformation is a common operation in the development of spatial database for GIS. A coordinate transformation brings spatial data into an Earth-based map coordinate system so that each data layer aligns vertically with every other data layer. This vertical alignment ensures features fall in their proper relative position when digital data from different layers are combined. Within the limits of data accuracy, a good transformation helps avoid inconsistent spatial relationships such as farm road crossing farm plot and irrigation structures located in the center of the farm plot.

13. Modify Existing Feature

When any features needs to be modified such as changing of canal and road alignment, F-canal command area and plot boundaries...

The procedure of feature modification is similar to that of creating new feature, from “Start Editing” to “Stop Editing”. The function of feature modification is depicted below.



Merge...	Merge:	Combine different features in the same layer into one feature.
Union	Union:	Overlay that includes all data from both the bounding and data layers
Intersect	Intersect:	Overlay that combines data from both layers but only for the region where both layers contain data



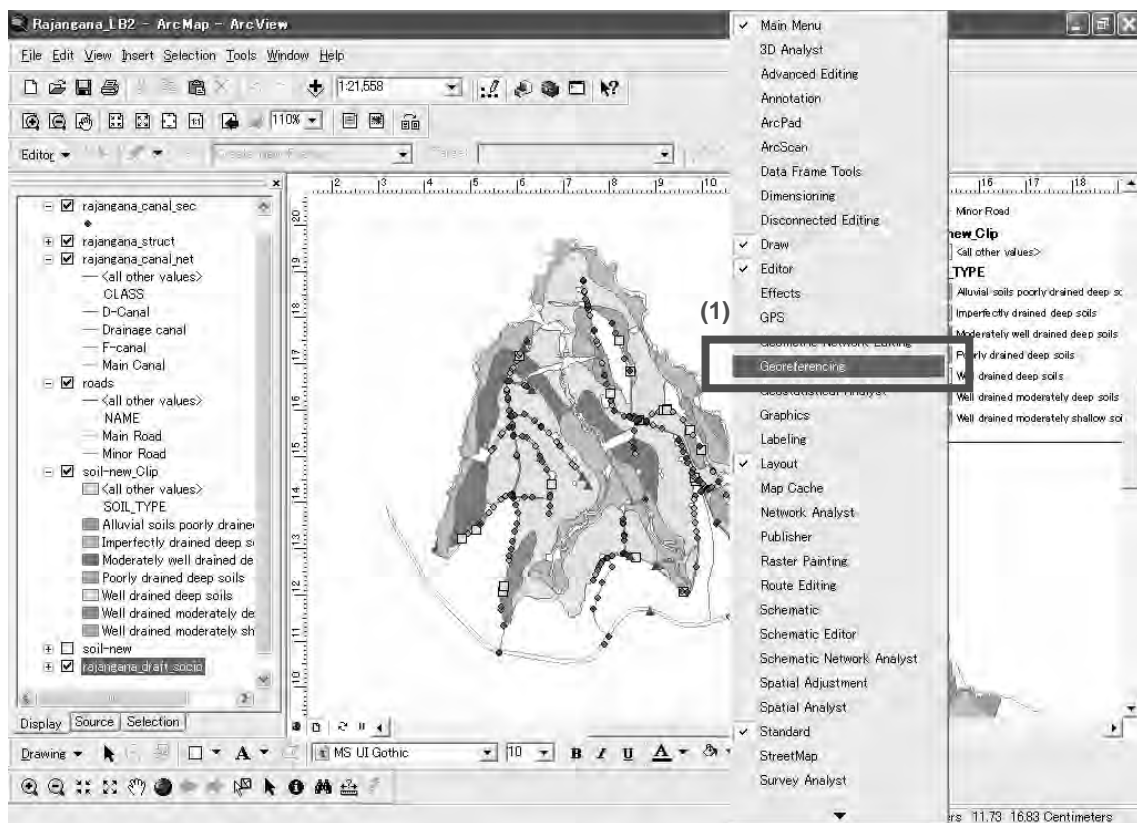
Snapping:
The vertex of created / modified features are snapped to the vertex of the other layers (see tip below for details).

Tip-3: Snapping function
Undershoots and overshoots are common errors that occur when digitizing. Under JICA Study, preparation of soil maps from paper-based information and/or digitization of plot boundaries from CAD-converted data would be such examples. Undershoots are nodes that don't quite reach a node or line, and overshoots are lines that cross over existing nodes or lines. Undershoots cause unconnected networks and unclosed polygons. Overshoots typically do not cause problems when defining polygons, but it may cause difficulties when defining and analyzing line networks. Therefore, snapping is useful function to rectify such situations.

14. Rectify Raster Images

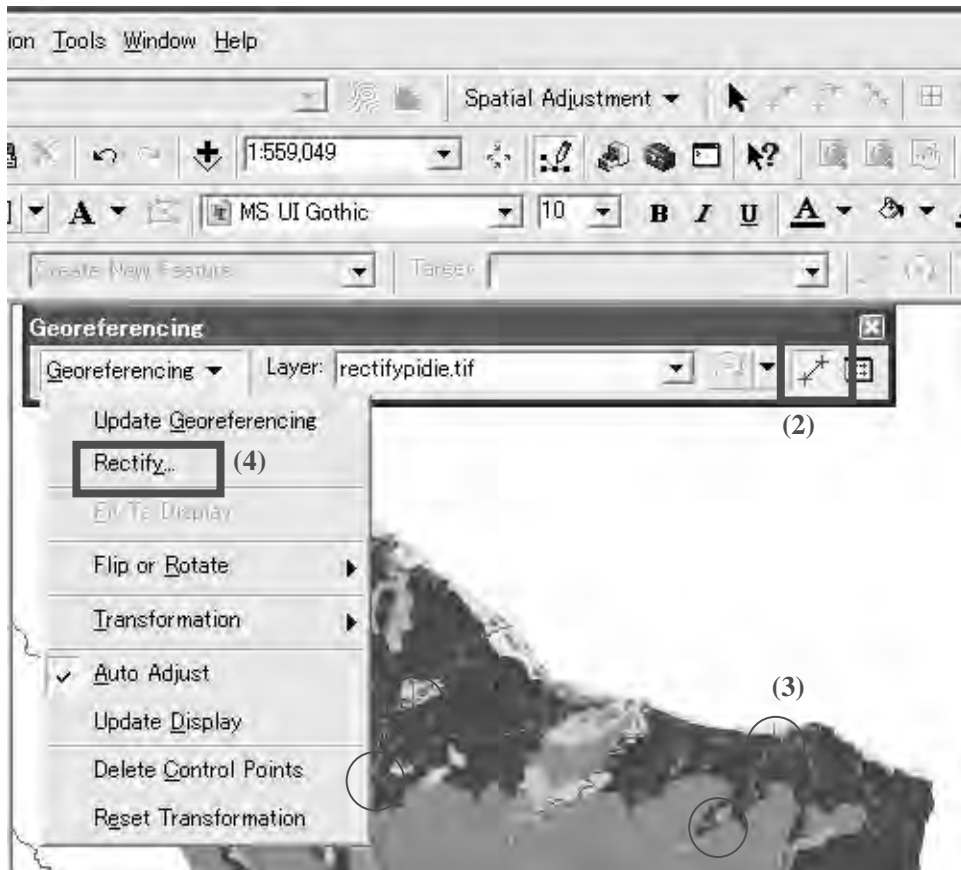
This would be necessary when you want to rectify raster image suiting with your existing data layer. This function would be required in the future if new layer is developed to be overlaid using different source of maps.

- (1) Right click "View and select "georeferencing" under "toolbars" to implement this function
 - (2) Add raster layer to rectify and geo-referenced GIS data (see 4 Add New GIS Layer).
 - (3) Select control point icon and drop each control point one by one on the display (at least 4 points) in order to maintain accuracy.
 - (4) After define the control points, select "Rectify" in "Georeferencing" button
- * If you don't select "Rectify," raster image cannot be permanently saved.



Tip-4: Vector Data and Raster Data

Vector data and raster data is the common spatial data models for GIS. Vector data models uses sets of coordinates and associated attribute data to define discrete objects. There are three basic types of vector objects: points, lines, and polygons. Therefore, data of GIS-based irrigation block maps generally consists of vector data. On the other hand, raster data models define the area as a regular set of cells in a grid pattern. Typically these cells are square and evenly spaced in the x and y directions. in this sub-section, function of "rectify raster images" is required when any data is automatically processed using processing software and needs to be accordingly overlaid on existing layers.



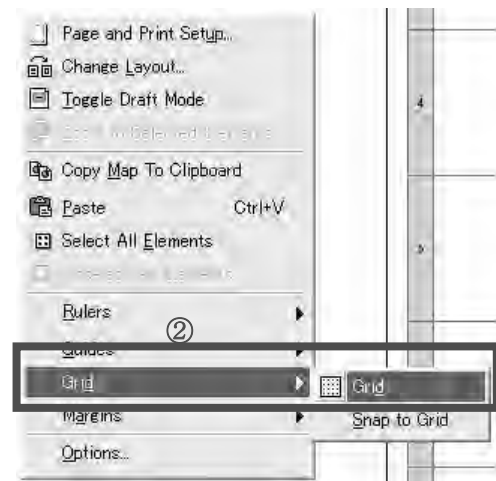
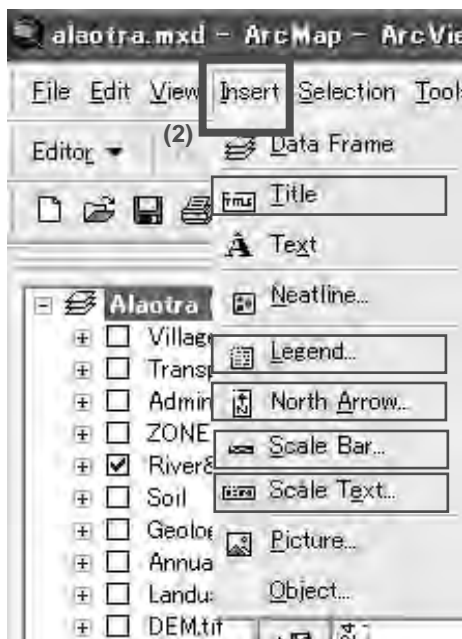
15. Making Maps for Presentation

Printing out the Map for any presentation...

It is easily possible to print the maps composed in ArcMap, which can facilitate understanding of general condition of the scheme among stakeholders. This work generally requires following steps: create data frame, modify the data frames to show the required layers and geographic extent, and add the other map and graphic elements such as north arrow, title, logo, map reference information, graphic rectangles.

In practical, at first, you have to switch from "Data View" to "Layout View" so that "Layout" toolbar is shown in the viewer. Layout of Maps can be arranged using this function before they are printed.

- (1) **Add grid line:** Right click the layer and select "Grid" tab. Then, create new grid line from "New Grid..." button. Finally after right click on map viewer and select "Grid" – "Grid", the selected grid line is shown in the map viewer.
- (2) **Insert additional information in the map:** Click "Insert" in toolbar and select either title, legend north arrow, scale bar or so on, the additional information you want to add in the map.
- (3) **Print map:** Click "File" in toolbar and select "Print..."



Form

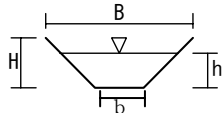
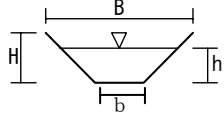
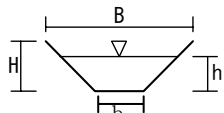
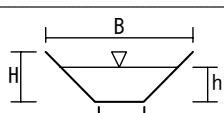
FORM-A: MAIN, D AND F-CANAL (1/2)

Serial Number : A-_____

I. General

A-1	Location	Map Coordinate	
		Name of Canal	
	Date of visit (member)	Purpose	Irrigation / Drain / Others
Access	Good Moderate Bad		

II. Dimension and Conditions

Upstream Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth
Downstream-1 Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth
Downstream-2 Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth
Downstream-3 Canal dimensions and conditions	Canal name		B: (m) H: (m) h: (m) b: (m)	Concrete Lined Earth

III. Problems on the Canal and the Structure

1. Sediments	none some serious	7. Canal road	good moderate bad none
2. Vegetation	none some serious	8. Others (specify below, if any)	none some serious
3. Erosion	none some serious		
4. Leakage	none some serious		
5. Overflow	none some serious		
6. Illegal checking	none some serious		

IV. Evaluation

A	Fully functioning
B	Partly deteriorated, but functioning in a satisfactory range
C	Not functioning well and/or affecting the downstream flow
D	Completely not functioning

FORM-A: MAIN, D AND F-CANAL (2/2)

Serial Number : A-

A ₋₂	Canal	
	Number of Photo	
	Map Coordinate	
photograph		
Sketch with direction of the photograph		

FORM-B ATTACHMENT

Serial Number : B1-_____

Structure Assessment (Details)

Scheme:	Nachchaduwa	Rajangana	Thruwila
Canal Name:			
Type of Structure	Turnout / Duckbill Weir / Diagonal Weir / Drop / Spillway / Culvert / Field Inlet (Concrete) / Field Inlet (PVC) / Others (Specify) _____		
Date of visit (member)			

Assessment Point

1. Gate is available or missing?
2. Is it difficult to operate (open or close)?
3. Gate is seriously corroded?
4. Are there any cracks in any part of the structure?
5. Any leakage from the structure is found?
6. Downstream apron is scoured or damaged?
7. Measuring device is available or missing?

No	Item	Condition				Not Applicable
		Good			Serious	
1	Gate	A	B	C	D	NA
2	Operation	A	B	C	D	NA
3	Corrosion	A	B	C	D	NA
4	Cracks	A	B	C	D	NA
5	Leakage	A	B	C	D	NA
6	Downstream Damage	A	B	C	D	NA
7	Measuring Device	A	B	C	D	NA

A: None, it is in good condition

B: Partly, but not so serious

C: Not functioning well

D: Seriously damaged and structure is completely not functioning

NA: Not Applicable

FORM-B ATTACHMENT

Serial Number : B1-_____

Structure Assessment (Details)

Scheme:	Nachchaduwa	Rajangana	Thruwila
Canal Name:			
Type of Structure	Turnout / Duckbill Weir / Diagonal Weir / Drop / Spillway / Culvert / Field Inlet (Concrete) / Field Inlet (PVC) / Others (Specify) _____		
Date of visit (member)			

Assessment Point

1. Gate is available or missing?
2. Is it difficult to operate (open or close)?
3. Gate is seriously corroded?
4. Are there any cracks in any part of the structure?
5. Any leakage from the structure is found?
6. Downstream apron is scoured or damaged?
7. Measuring device is available or missing?

No	Item	Condition				Not Applicable
		Good			Serious	
1	Gate	A	B	C	D	NA
2	Operation	A	B	C	D	NA
3	Corrosion	A	B	C	D	NA
4	Cracks	A	B	C	D	NA
5	Leakage	A	B	C	D	NA
6	Downstream Damage	A	B	C	D	NA
7	Measuring Device	A	B	C	D	NA

A: None, it is in good condition

B: Partly, but not so serious

C: Not functioning well

D: Seriously damaged and structure is completely not functioning

NA: Not Applicable

