

MTIGT1104: SPATIAL DECISION SUPPORT SYSTEM

UNIT - 4

Linking of Spatial Database & with Non spatial Database

4. Linking of Spatial Database & with Non spatial Database: Verifying of common item, availability and joining of attribute – table with existing spatial records – spatial display of non spatial data.

15 Hrs.

Spatial and Non-spatial Data

- Spatial data refers to geographic areas or features. Features occupies a location.
- Non-spatial data has no specific location in space. It can however, have a geographic component and be linked to a geographic location
- Tabular and attribute data are non-spatial but can be linked to location.

- **One to One Relationship** between Spatial and Non-Spatial Data

Example: Well Data

- **One to Many Relationship** between Spatial and Non-Spatial Data

Example: Village with School Data

- **Many (Spatial Data) to One (Non-Spatial Data) Relationship**

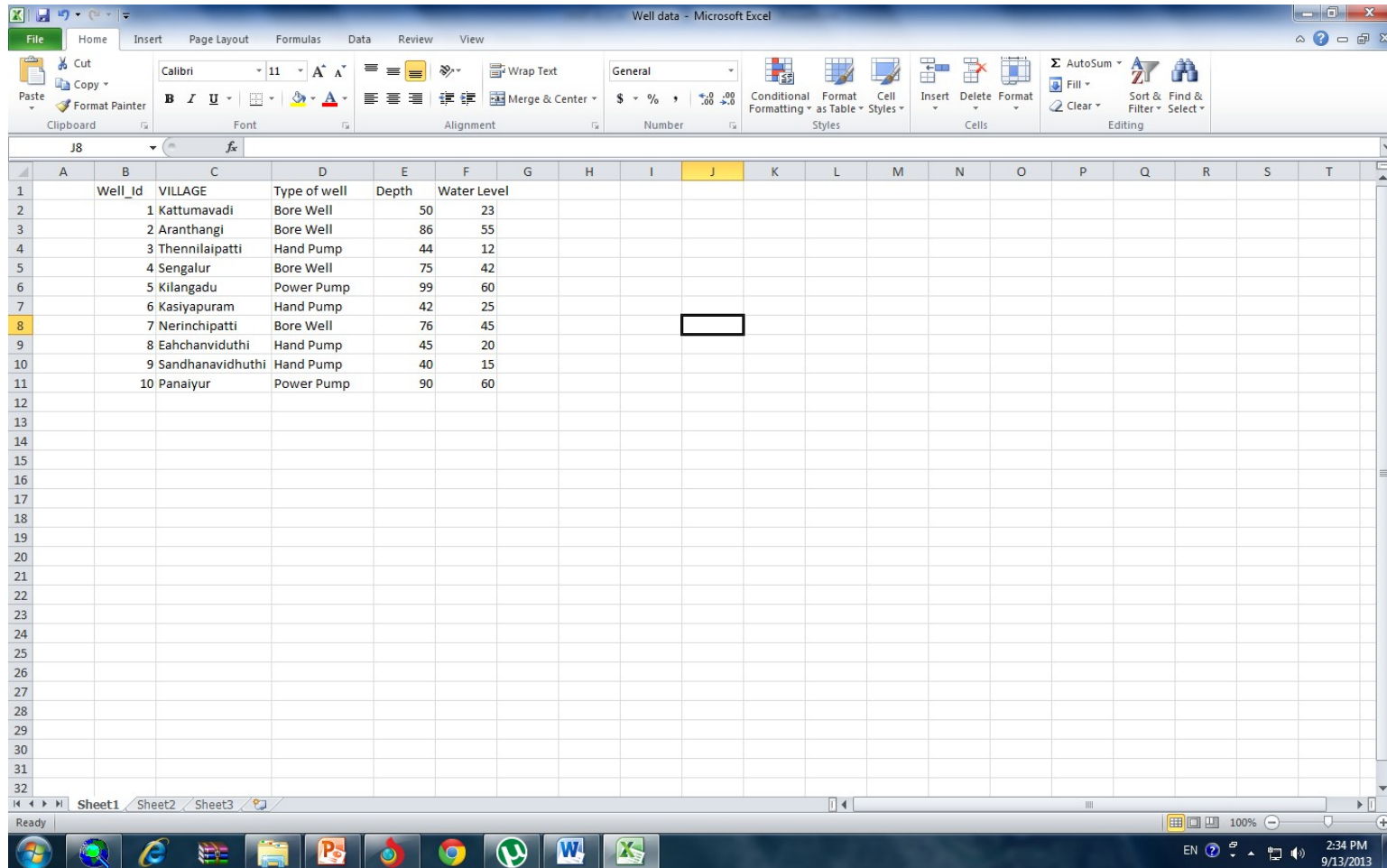
Example: Villages with a Police station

- **Many (Spatial Data) to Many (Non-Spatial Data) Relationship**

Example: Cities with multiple branches of Banks

One to One Relationship between Spatial and Non-Spatial Data

Example: Well Data



The screenshot shows a Microsoft Excel spreadsheet titled "Well data - Microsoft Excel". The spreadsheet contains a table with the following data:

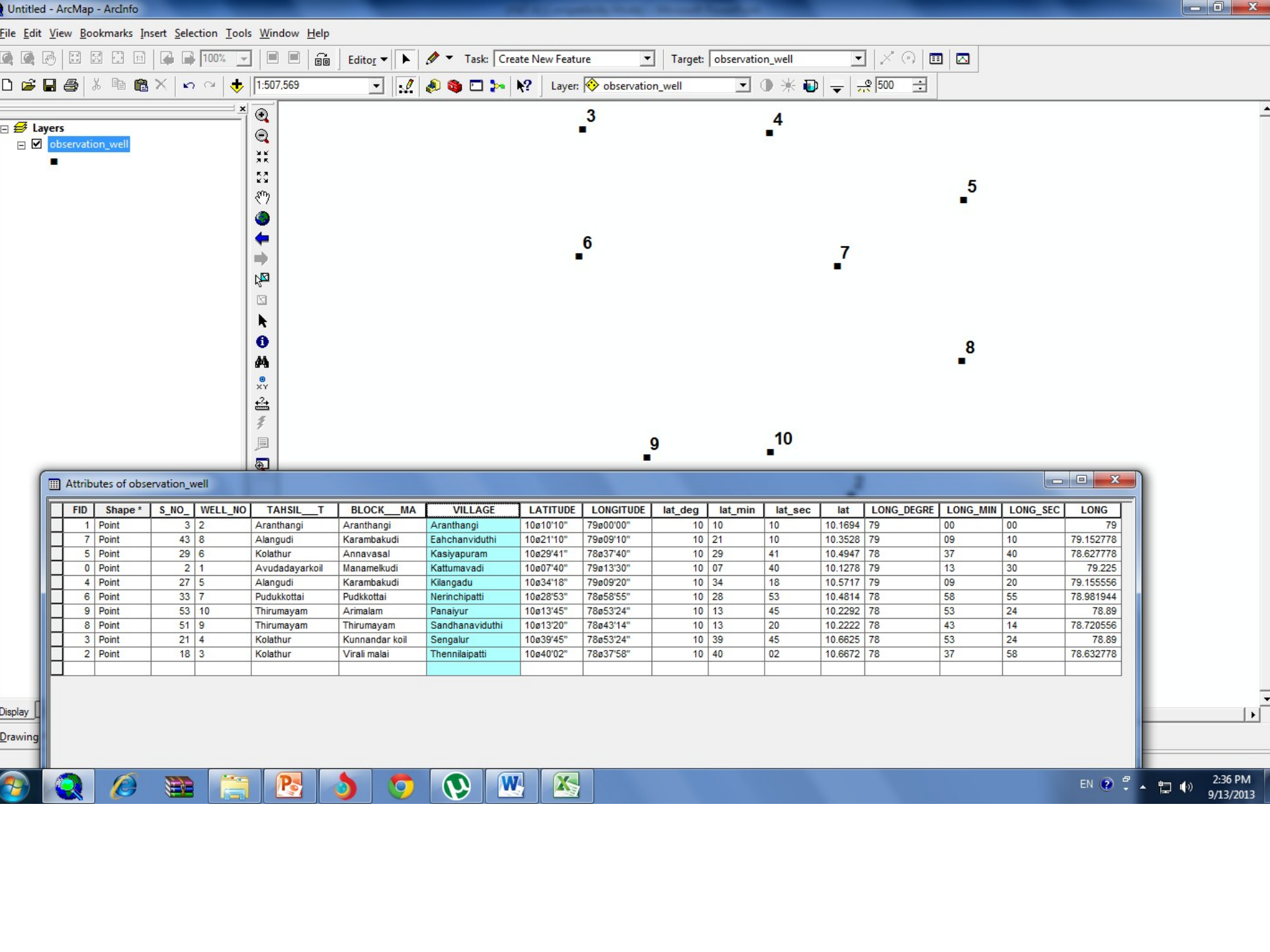
Well_Id	VILLAGE	Type of well	Depth	Water Level
1	Kattumavadi	Bore Well	50	23
2	Aranthangi	Bore Well	86	55
3	Thennilaipatti	Hand Pump	44	12
4	Sengalur	Bore Well	75	42
5	Kilangadu	Power Pump	99	60
6	Kasiyapuram	Hand Pump	42	25
7	Nerinchipatti	Bore Well	76	45
8	Eahchanviduthi	Hand Pump	45	20
9	Sandhanavidhuthi	Hand Pump	40	15
10	Panaiyur	Power Pump	90	60

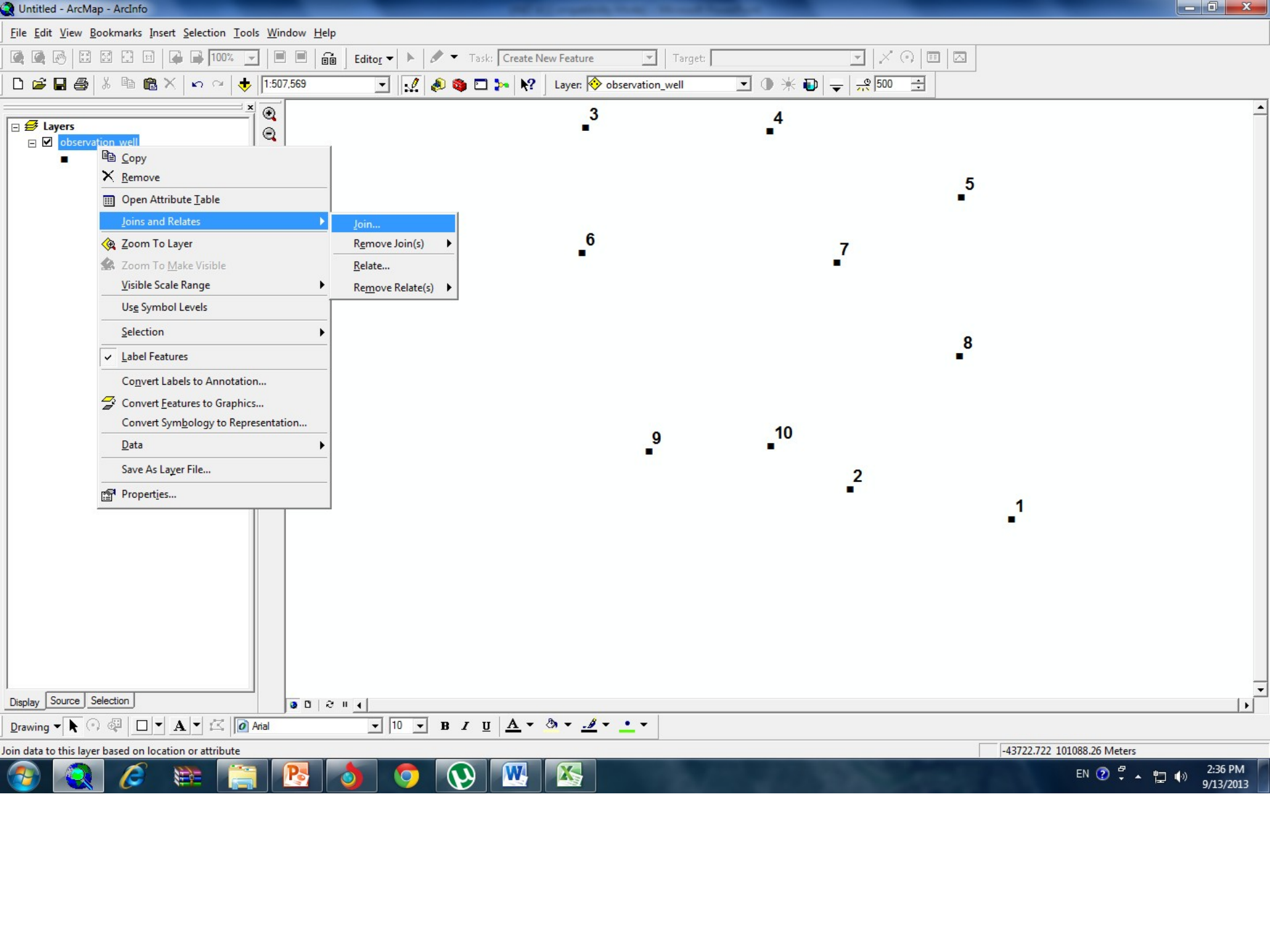
The spreadsheet interface includes the Microsoft Excel ribbon with tabs for File, Home, Insert, Page Layout, Formulas, Data, Review, and View. The Home tab is active, showing options for Clipboard, Font, Paragraph, Styles, Cells, and Editing. The status bar at the bottom indicates the current sheet is "Sheet1" and the date is 9/13/2013.

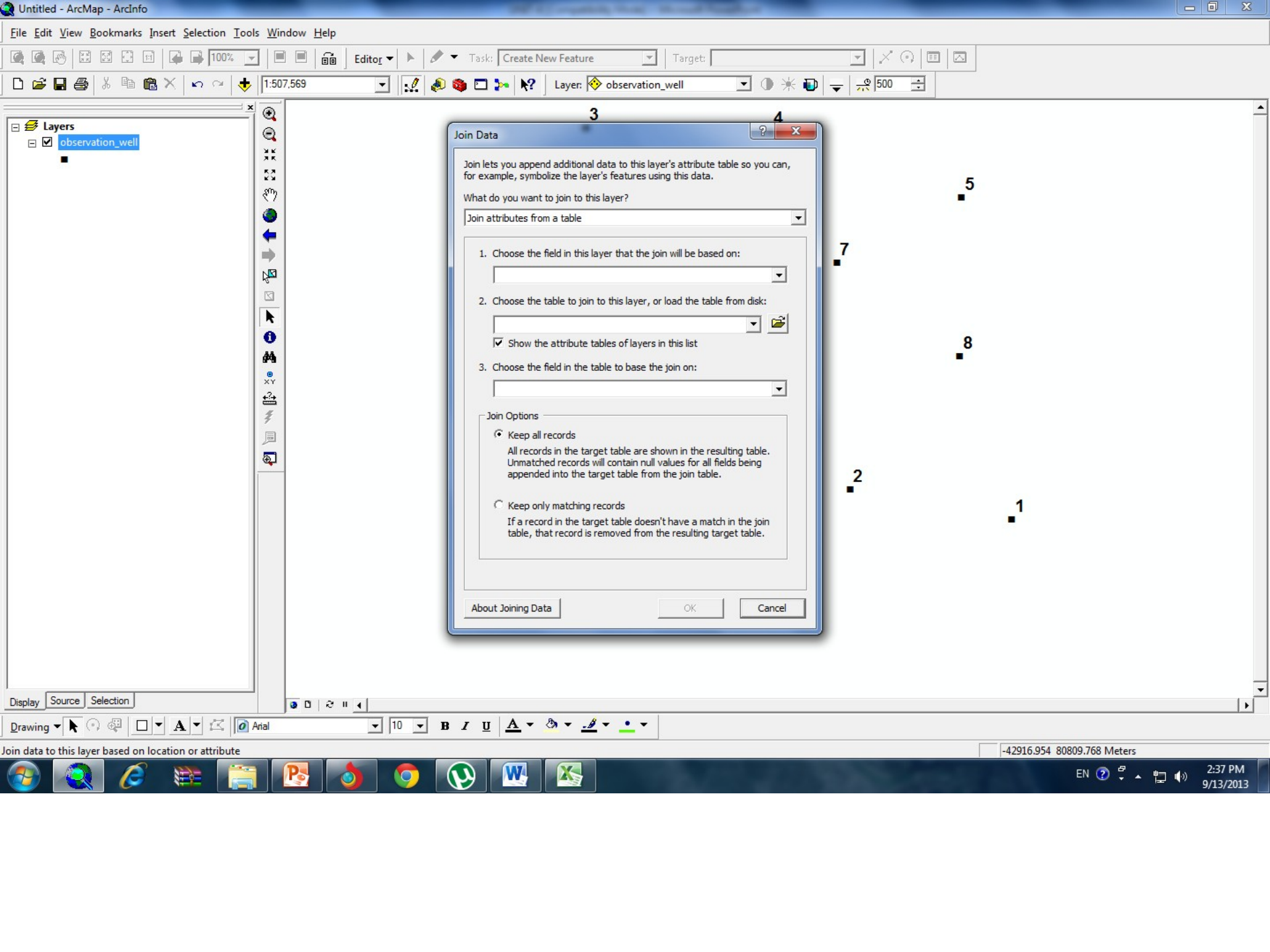
Layers

- observation_well









100% Editor Task: Create New Feature Target: Layer: observation_well 500

Layers

- observation_well

Display Source Selection

Join Data

Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.

What do you want to join to this layer?

Join attributes from a table

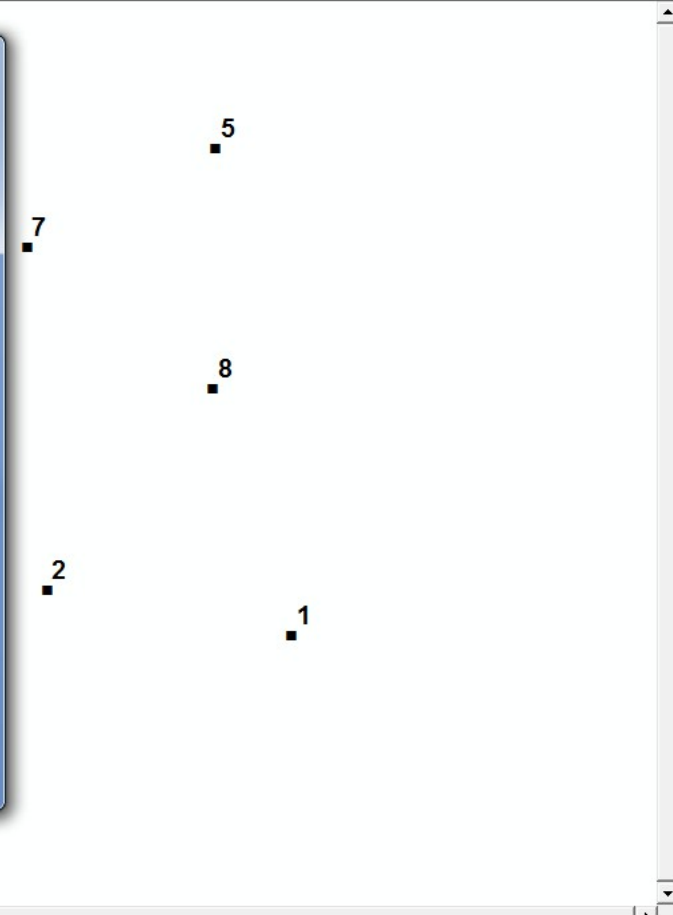
1. Choose the field in this layer that the join will be based on:

2. FID
S_NO_
WELL_NO
TAHSIL__T
BLOCK__MA
VILLAGE
LATITUDE
LONGITUDE
lat_deg
lat_min
lat_sec
lat
LONG_DEGRE
LONG_MIN
LONG_SEC
LONG

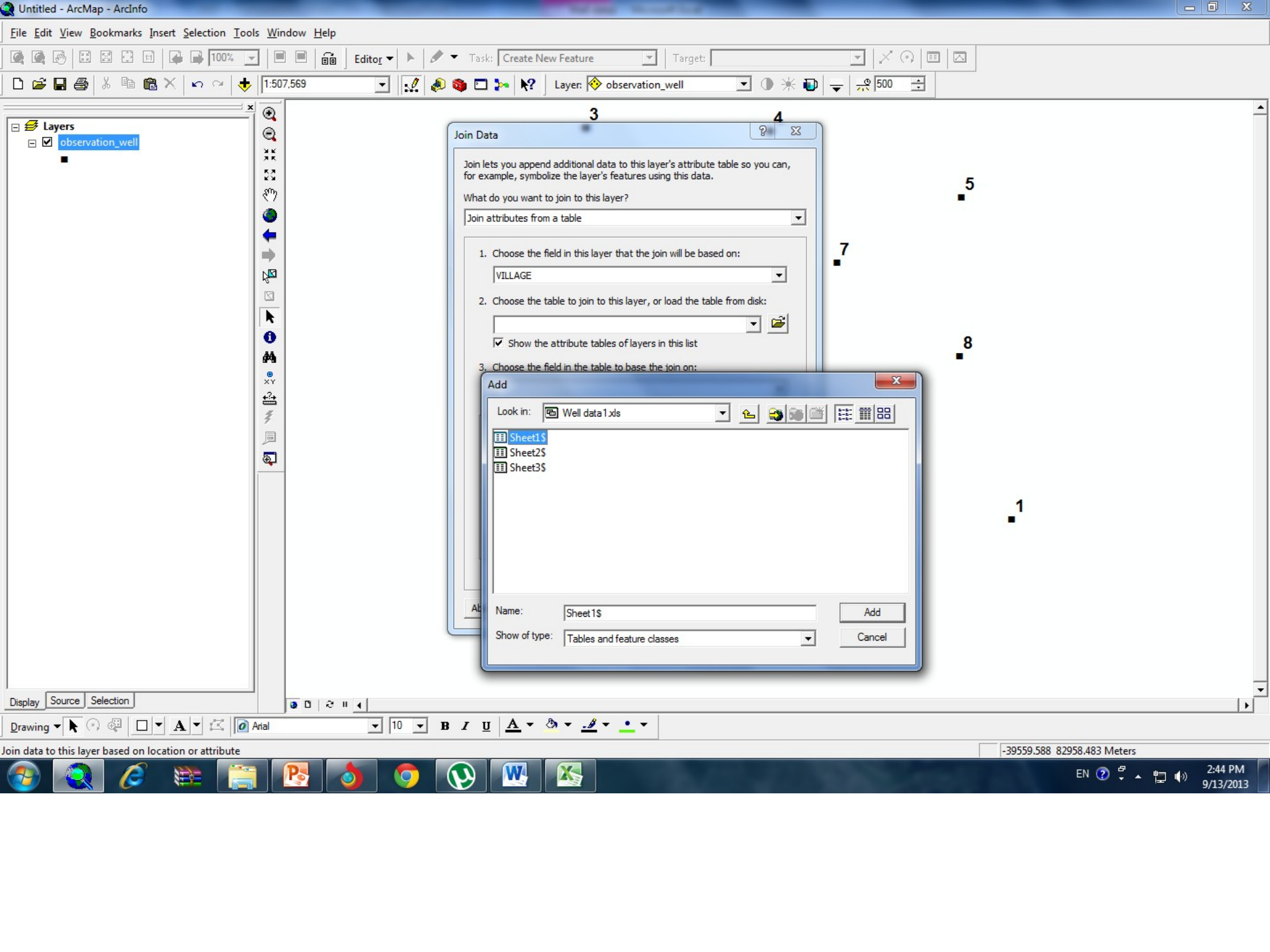
3. appended into the target table from the join table.

☐ Keep only matching records
If a record in the target table doesn't have a match in the join table, that record is removed from the resulting target table.

About Joining Data OK Cancel



Drawing Arial 10 B I U A



Layers

- observation_well

Display Source Selection

Join Data

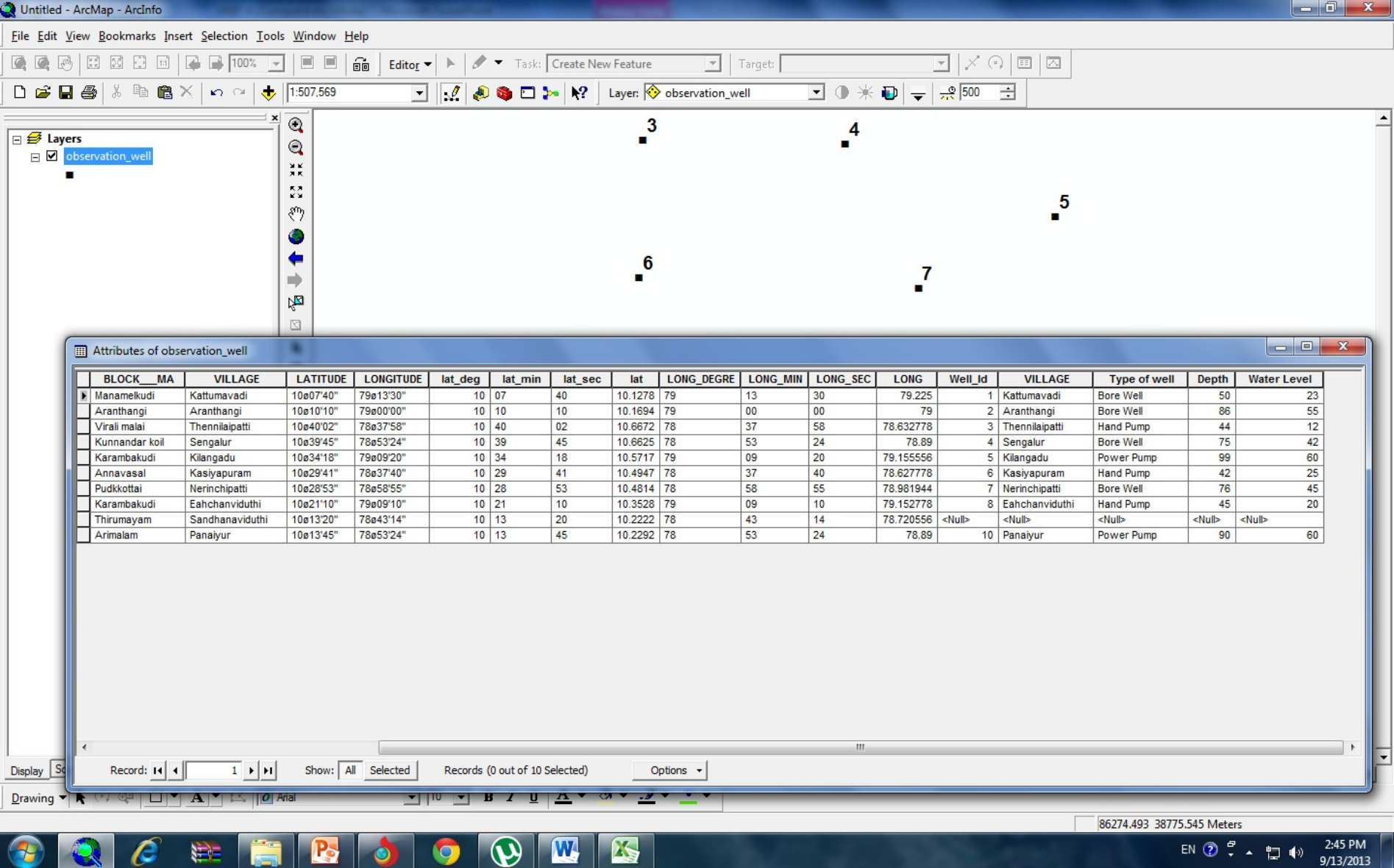
Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.

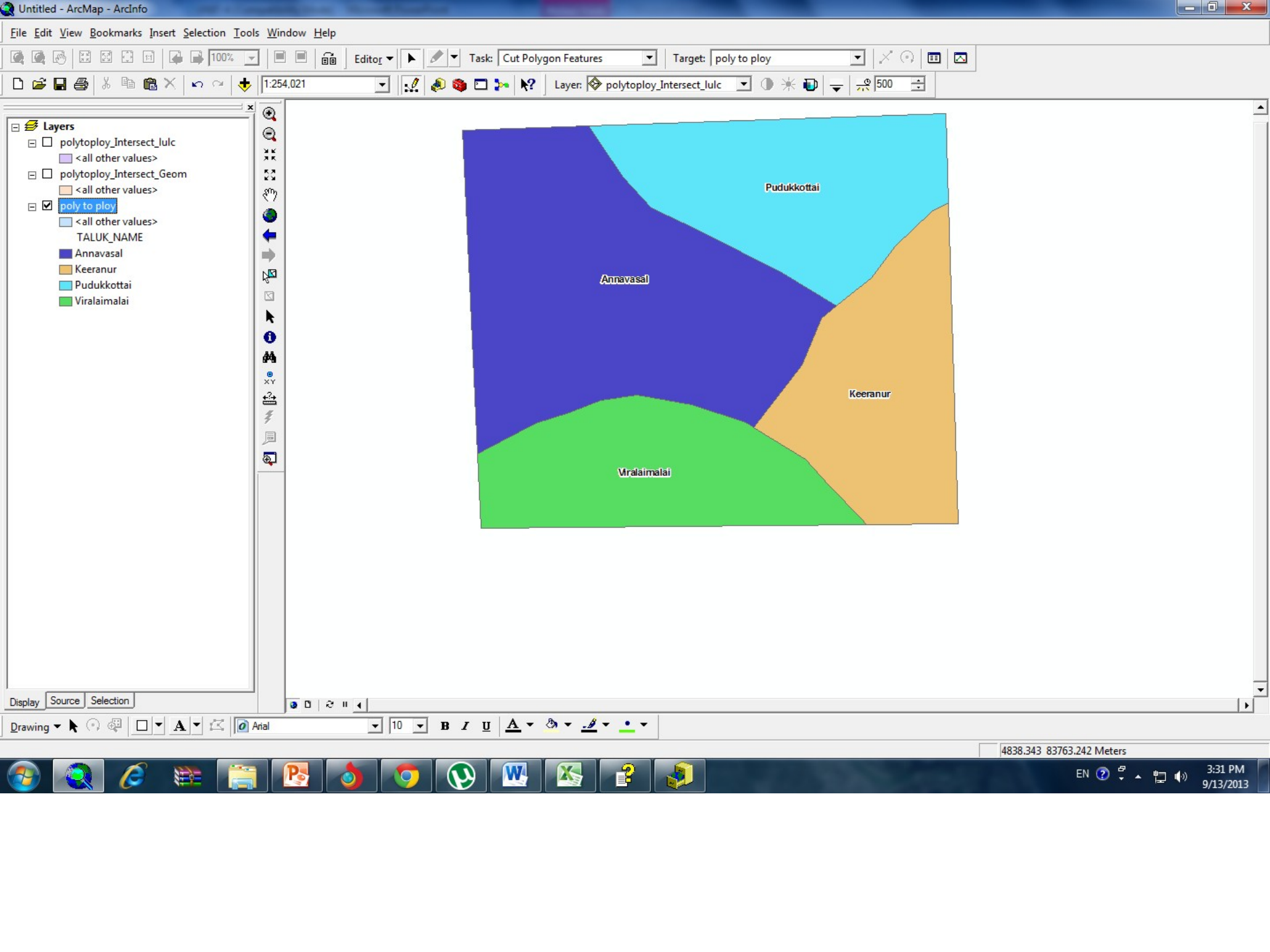
What do you want to join to this layer?

Join attributes from a table

1. Choose the field in this layer that the join will be based on:
VILLAGE
2. Choose the table to join to this layer, or load the table from disk:
Sheet15
☒ Show the attribute tables of layers in this list
3. Choose the field in the table to base the join on:
VILLAGE
Type of well
☒ Keep all records
All records in the target table are shown in the resulting table. Unmatched records will contain null values for all fields being appended into the target table from the join table.
☐ Keep only matching records
If a record in the target table doesn't have a match in the join table, that record is removed from the resulting target table.

About Joining Data OK Cancel

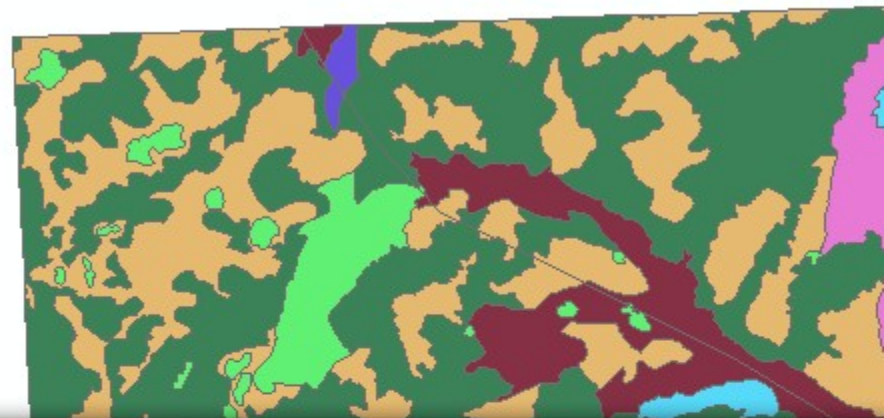






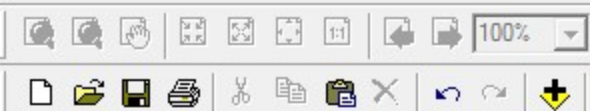
Layers

- ☐ polytoploy_Intersect_lulc
 - <all other values>
- ☒ polytoploy_Intersect_Geom
 - <all other values>
 - LEGEND_TEX
 - ALLUVIAL PLAIN OLDER
 - ALLUVIAL PLAIN YOUNGER
 - BURIED PEDIPLAIN DEEP
 - BURIED PEDIPLAIN MEDIUM
 - BURIED PEDIPLAIN SHALLOW
 - LINEAR RIDGE
 - LOWER PLATEAU(LATERITIC) - DISSE
 - PEDIMENT
- ☐ poly to play
 - <all other values>



Attributes of polytoploy_Intersect_Geom

	FID	Shape *	TALUK_NAME	GEOMORPHY_	LEGEND_TEX
	0	Polygon	Annavasal	2	BURIED PEDIPLAIN MEDIUM
	1	Polygon	Annavasal	51	ALLUVIAL PLAIN YOUNGER
	2	Polygon	Annavasal	52	BURIED PEDIPLAIN MEDIUM
	3	Polygon	Annavasal	58	ALLUVIAL PLAIN OLDER
	4	Polygon	Annavasal	62	BURIED PEDIPLAIN SHALLOW
	5	Polygon	Annavasal	85	BURIED PEDIPLAIN SHALLOW
	6	Polygon	Annavasal	92	BURIED PEDIPLAIN SHALLOW
	7	Polygon	Annavasal	101	PEDIMENT
	8	Polygon	Annavasal	117	PEDIMENT
	9	Polygon	Annavasal	119	BURIED PEDIPLAIN MEDIUM
	10	Polygon	Annavasal	120	ALLUVIAL PLAIN YOUNGER
	11	Polygon	Annavasal	123	PEDIMENT
	12	Polygon	Annavasal	128	PEDIMENT
	13	Polygon	Annavasal	130	BURIED PEDIPLAIN SHALLOW
	14	Polygon	Annavasal	134	BURIED PEDIPLAIN SHALLOW
	15	Polygon	Annavasal	135	BURIED PEDIPLAIN SHALLOW
	16	Polygon	Annavasal	137	BURIED PEDIPLAIN MEDIUM
	17	Polygon	Annavasal	139	PEDIMENT
	18	Polygon	Annavasal	140	PEDIMENT
	19	Polygon	Annavasal	142	BURIED PEDIPLAIN MEDIUM
	20	Polygon	Annavasal	144	BURIED PEDIPLAIN SHALLOW



Editor

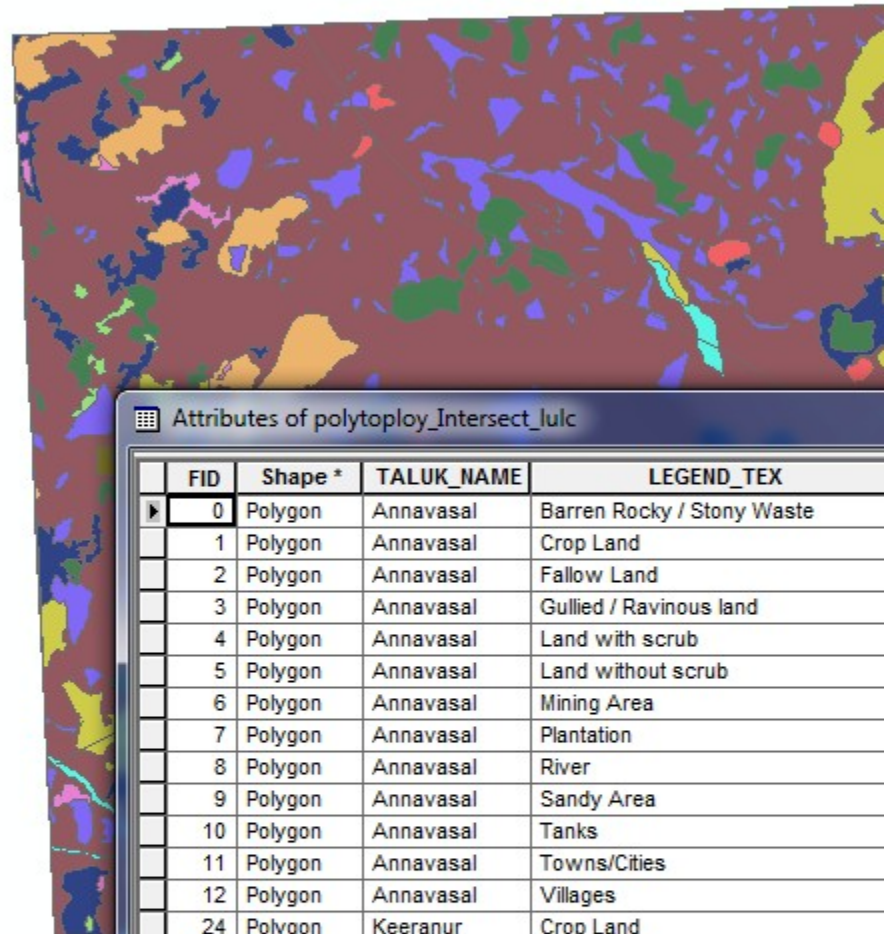
Task: Cut Polygon Features

Target:

1:254,021

Layer: polytoploy_Intersect_lulc

- Layers**
- ☒ polytoploy_Intersect_lulc
 - <all other values>
 - LEGEND_TEX
 - Barren Rocky / Stony Waste
 - Crop Land
 - Fallow Land
 - Gullied / Ravinous land
 - Land with scrub
 - Land without scrub
 - Mining Area
 - Plantation
 - River
 - Sandy Area
 - Tanks
 - Towns/Cities
 - Villages
 - ☒ polytoploy_Intersect_Geom
 - <all other values>
 - ☐ poly to ploy
 - <all other values>



Attributes of polytoploy_Intersect_lulc

	FID	Shape *	TALUK_NAME	LEGEND_TEX
	0	Polygon	Annavasal	Barren Rocky / Stony Waste
	1	Polygon	Annavasal	Crop Land
	2	Polygon	Annavasal	Fallow Land
	3	Polygon	Annavasal	Gullied / Ravinous land
	4	Polygon	Annavasal	Land with scrub
	5	Polygon	Annavasal	Land without scrub
	6	Polygon	Annavasal	Mining Area
	7	Polygon	Annavasal	Plantation
	8	Polygon	Annavasal	River
	9	Polygon	Annavasal	Sandy Area
	10	Polygon	Annavasal	Tanks
	11	Polygon	Annavasal	Towns/Cities
	12	Polygon	Annavasal	Villages
	24	Polygon	Keeranur	Crop Land
	25	Polygon	Keeranur	Fallow Land
	26	Polygon	Keeranur	Land with scrub
	27	Polygon	Keeranur	Plantation
	28	Polygon	Keeranur	River
	29	Polygon	Keeranur	Sandy Area
	30	Polygon	Keeranur	Tanks
	31	Polygon	Keeranur	Villages
	32	Polygon	Keeranur	Towns/Cities

Copy
Remove
Open Attribute Table

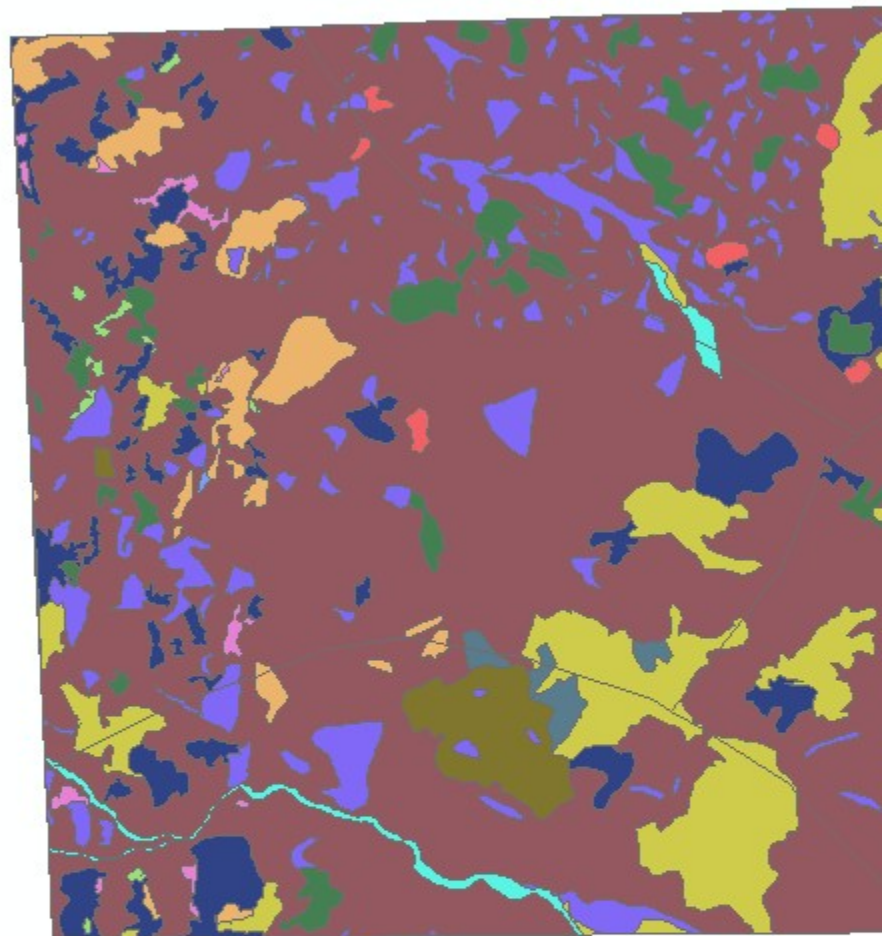
Joins and Relates

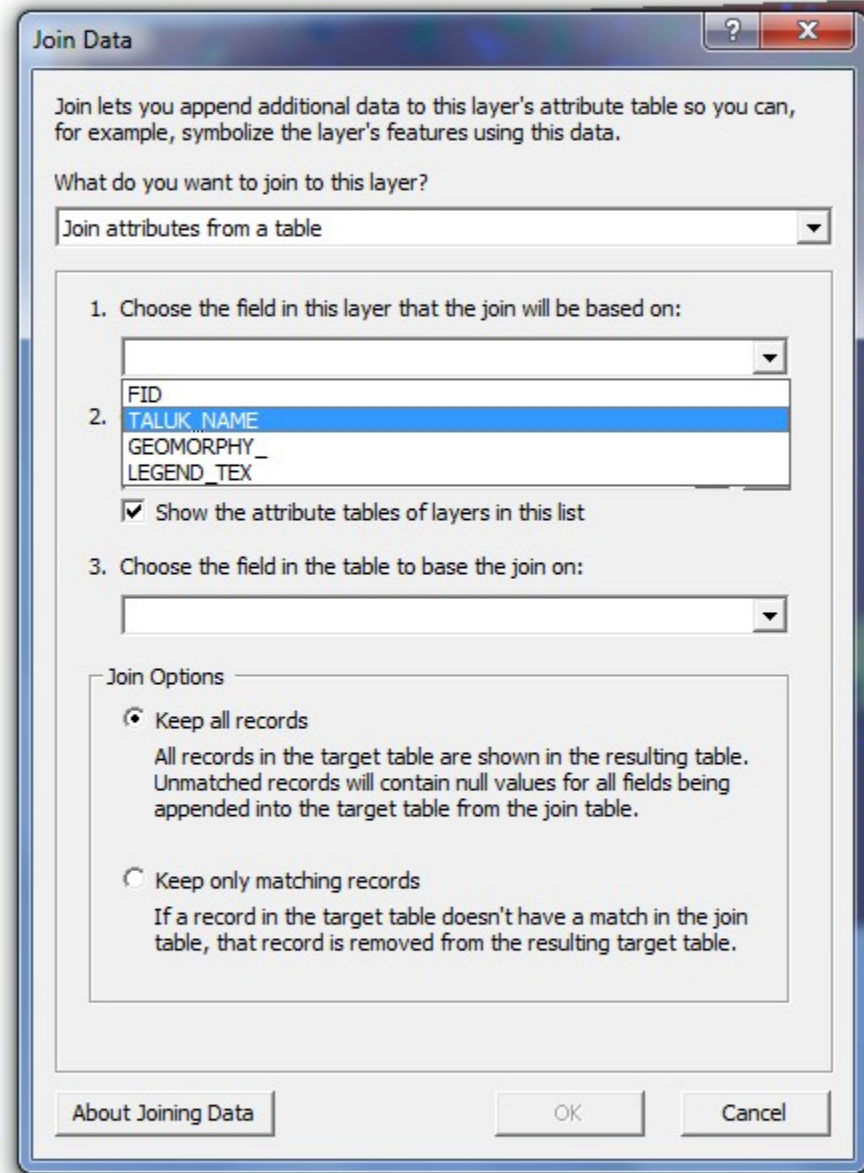
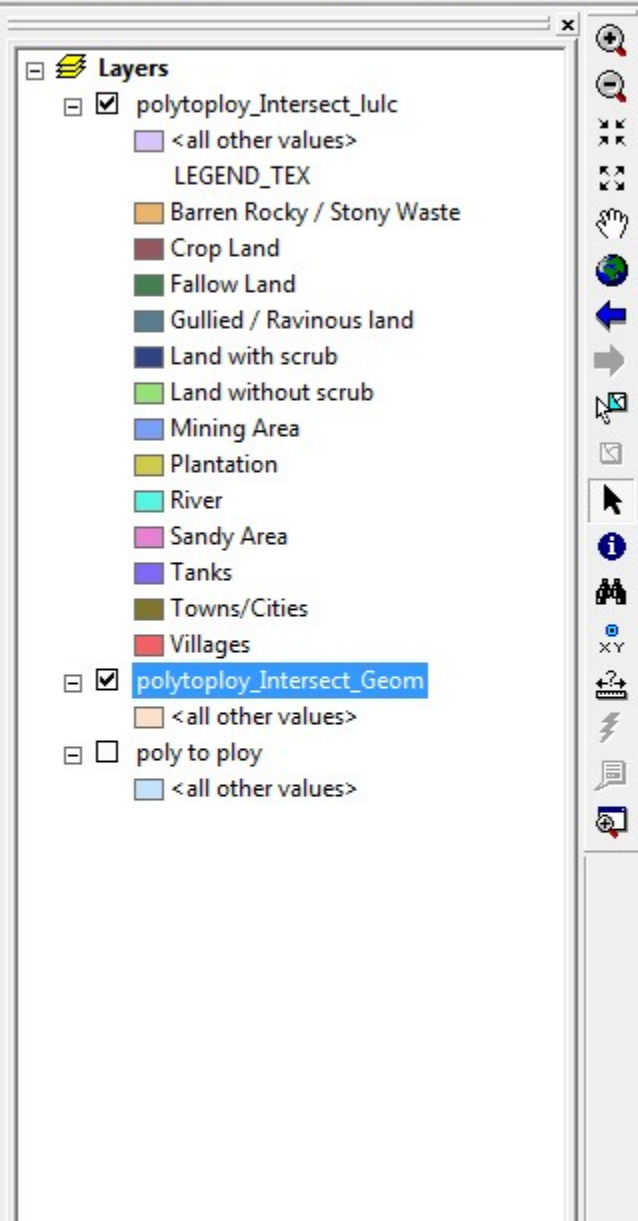
Zoom To Layer
Zoom To Make Visible
Visible Scale Range
Use Symbol Levels
Selection
Label Features
Convert Labels to Annotation...
Convert Features to Graphics...
Convert Symbolology to Representation...
Data
Save As Layer File...
Properties...

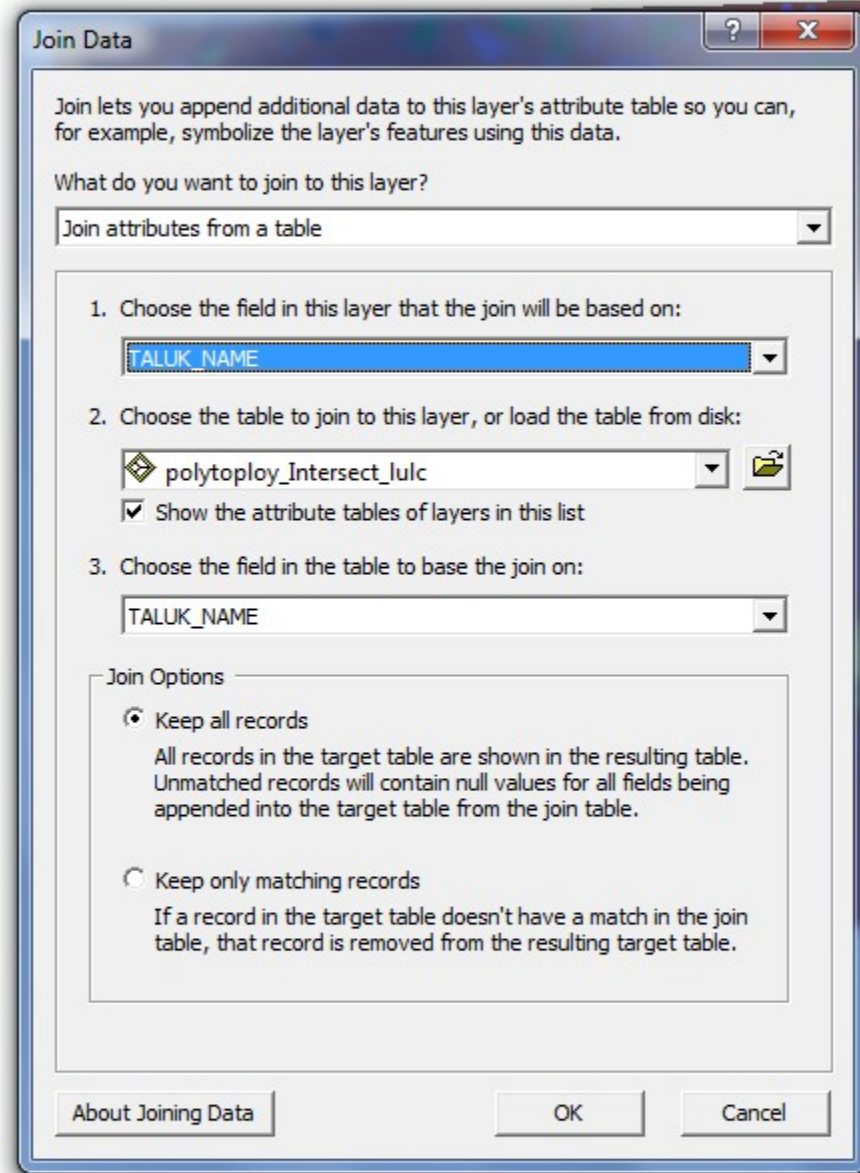
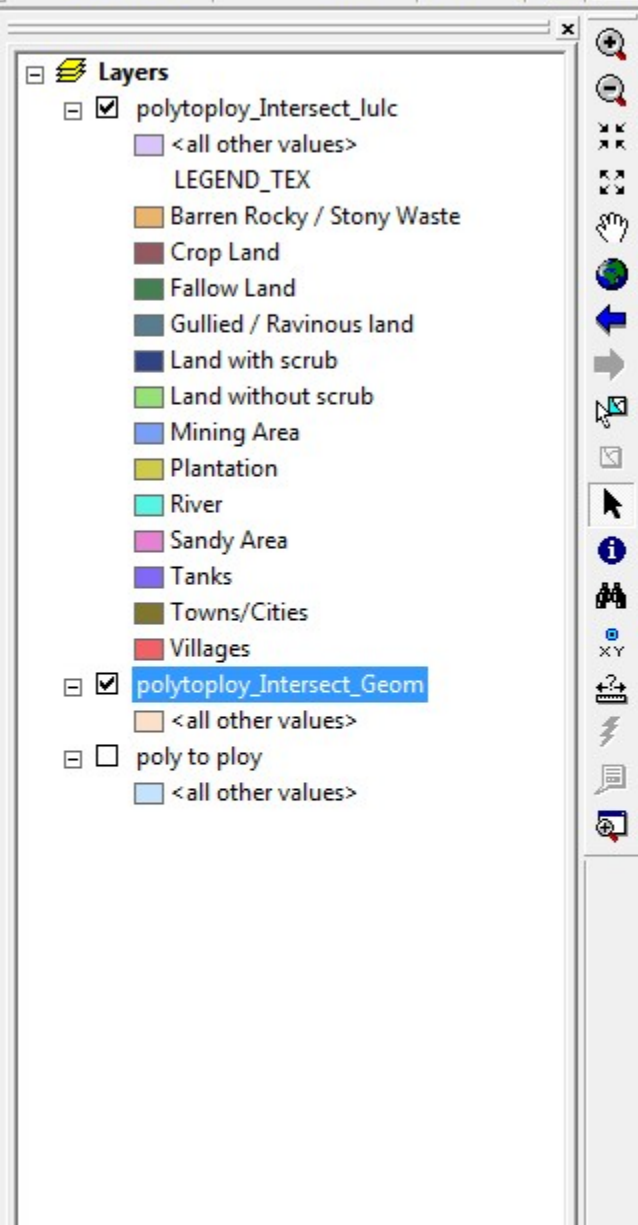
polytoploy_intersect_geom
<all other values>
poly to ploy
<all other values>

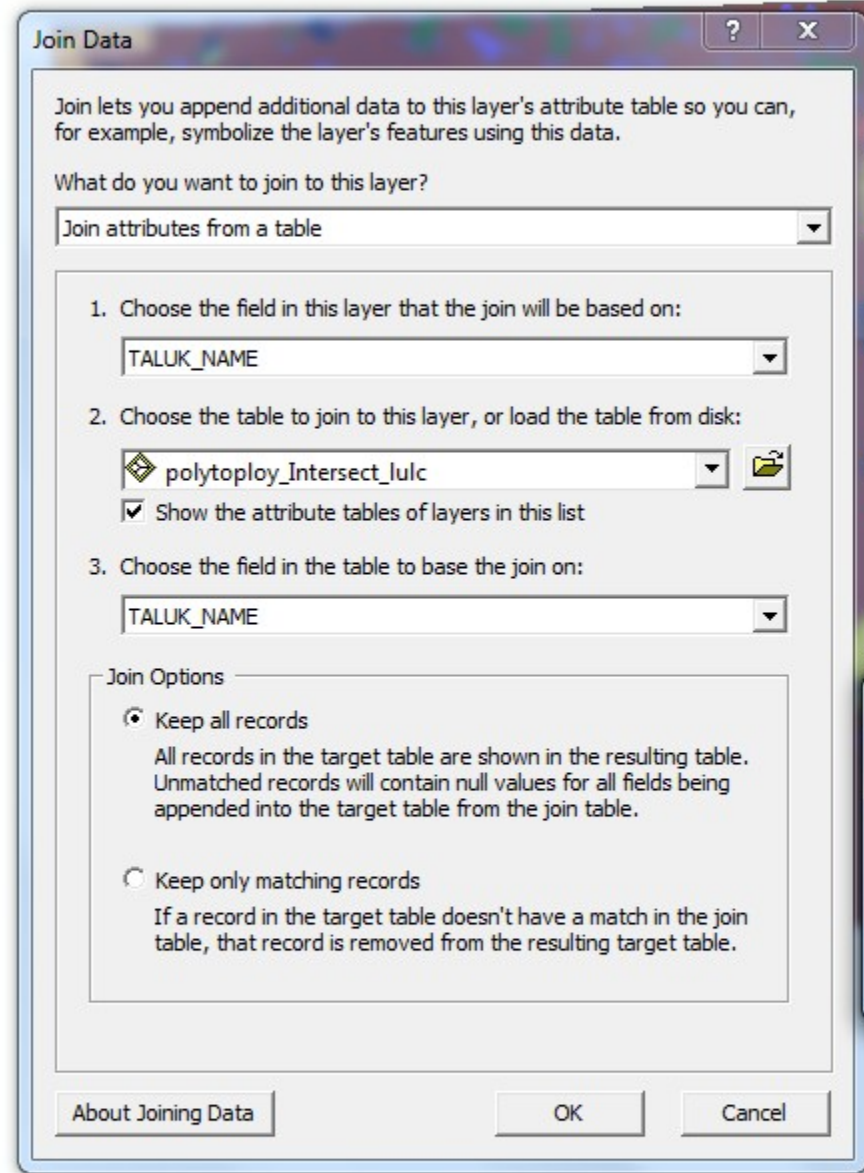
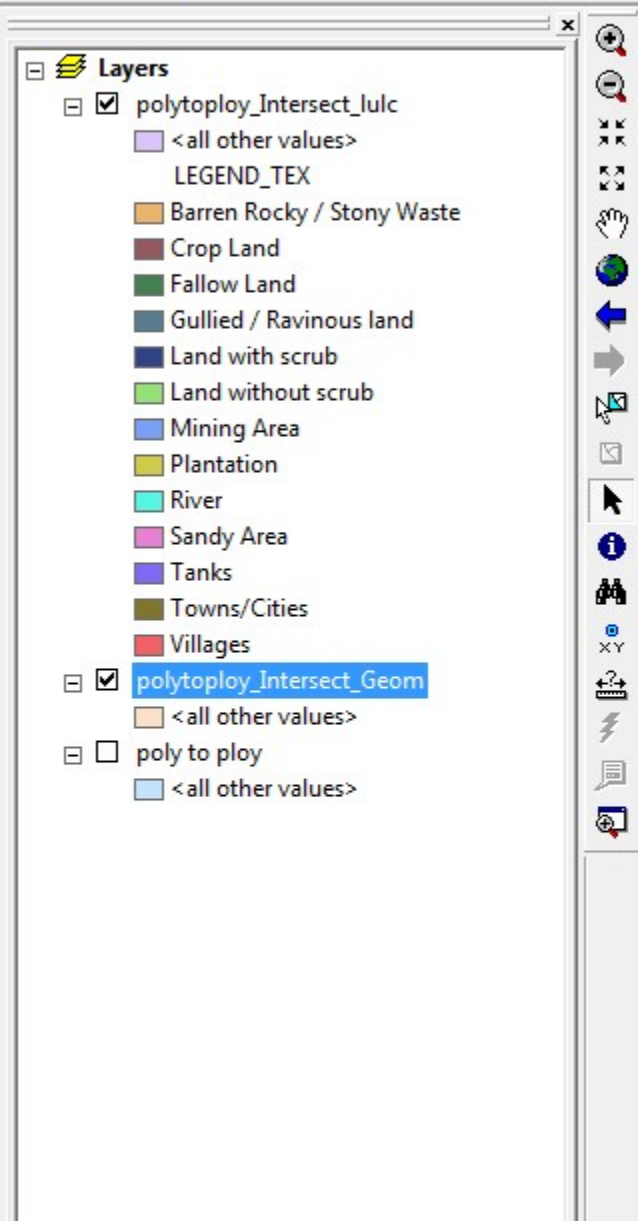
Editor Task: Cut Polygon Features Target:
Layer: polytoploy_intersect_lulc

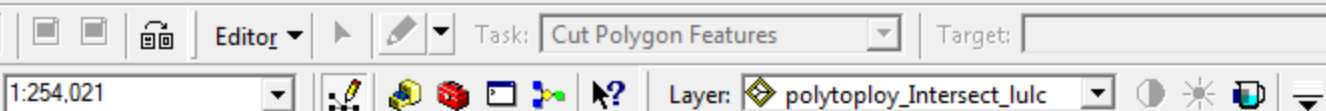
Join...
Remove Join(s)
Relate...
Remove Relate(s)





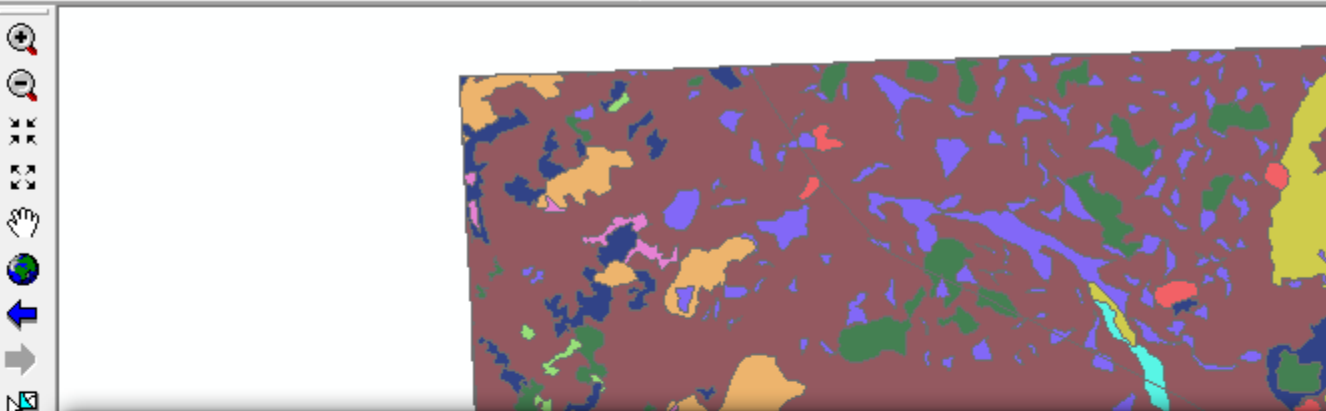






Layers

- ☒ polytoploy_Intersect_lulc
 - <all other values>
 - LEGEND_TEX
 - Barren Rocky / Stony Waste
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 - Gullied / Ravinous land
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 - Sandy Area
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 - Towns/Cities
 - Villages
- ☒ polytoploy_Intersect_Geom
 - <all other values>
- ☐ poly to play
 - <all other values>

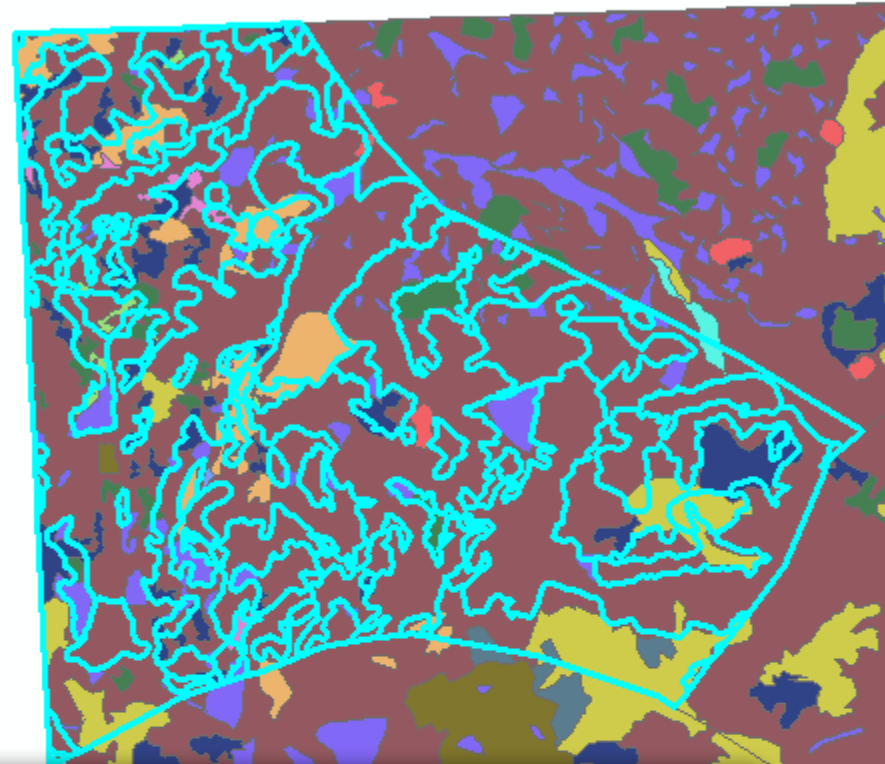


Attributes of polytoploy_Intersect_Geom

FID	Shape *	TALUK_NAME	GEOMORPHY_	LEGEND_TEX	FID	TALUK_N
0	Polygon	Annavaasal	2	BURIED PEDIPLAIN MEDIUM	0	Annavaasa
1	Polygon	Annavaasal	51	ALLUVIAL PLAIN YOUNGER	0	Annavaasa
2	Polygon	Annavaasal	52	BURIED PEDIPLAIN MEDIUM	0	Annavaasa
3	Polygon	Annavaasal	58	ALLUVIAL PLAIN OLDER	0	Annavaasa
4	Polygon	Annavaasal	62	BURIED PEDIPLAIN SHALLOW	0	Annavaasa
5	Polygon	Annavaasal	85	BURIED PEDIPLAIN SHALLOW	0	Annavaasa
6	Polygon	Annavaasal	92	BURIED PEDIPLAIN SHALLOW	0	Annavaasa
7	Polygon	Annavaasal	101	PEDIMENT	0	Annavaasa
8	Polygon	Annavaasal	117	PEDIMENT	0	Annavaasa
9	Polygon	Annavaasal	119	BURIED PEDIPLAIN MEDIUM	0	Annavaasa
10	Polygon	Annavaasal	120	ALLUVIAL PLAIN YOUNGER	0	Annavaasa
11	Polygon	Annavaasal	123	PEDIMENT	0	Annavaasa
12	Polygon	Annavaasal	128	PEDIMENT	0	Annavaasa
13	Polygon	Annavaasal	130	BURIED PEDIPLAIN SHALLOW	0	Annavaasa
14	Polygon	Annavaasal	134	BURIED PEDIPLAIN SHALLOW	0	Annavaasa
15	Polygon	Annavaasal	135	BURIED PEDIPLAIN SHALLOW	0	Annavaasa
16	Polygon	Annavaasal	137	BURIED PEDIPLAIN MEDIUM	0	Annavaasa
17	Polygon	Annavaasal	139	PEDIMENT	0	Annavaasa
18	Polygon	Annavaasal	140	PEDIMENT	0	Annavaasa
19	Polygon	Annavaasal	142	BURIED PEDIPLAIN MEDIUM	0	Annavaasa
20	Polygon	Annavaasal	144	BURIED PEDIPLAIN SHALLOW	0	Annavaasa
21	Polygon	Annavaasal	149	BURIED PEDIPLAIN MEDIUM	0	Annavaasa

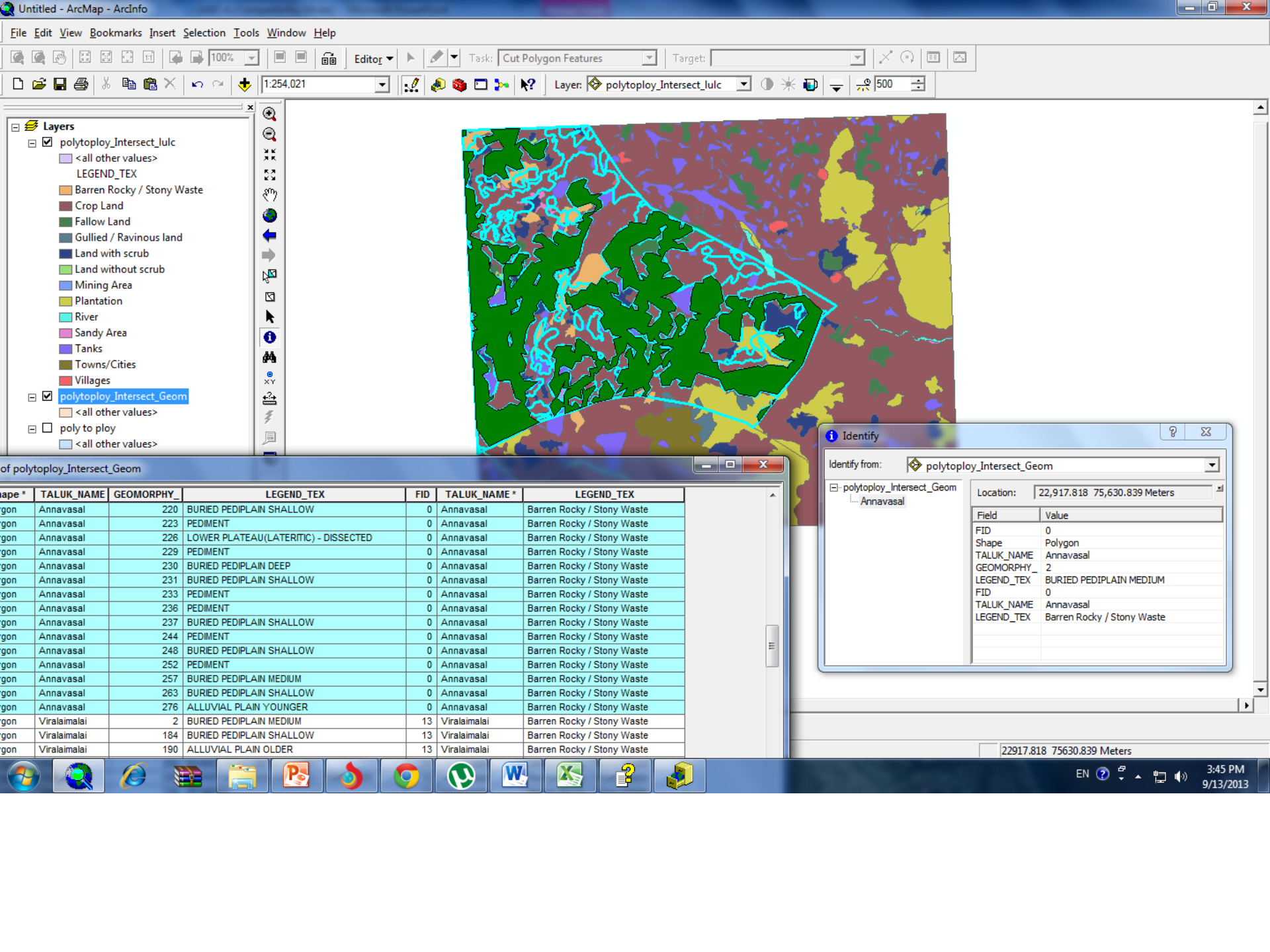
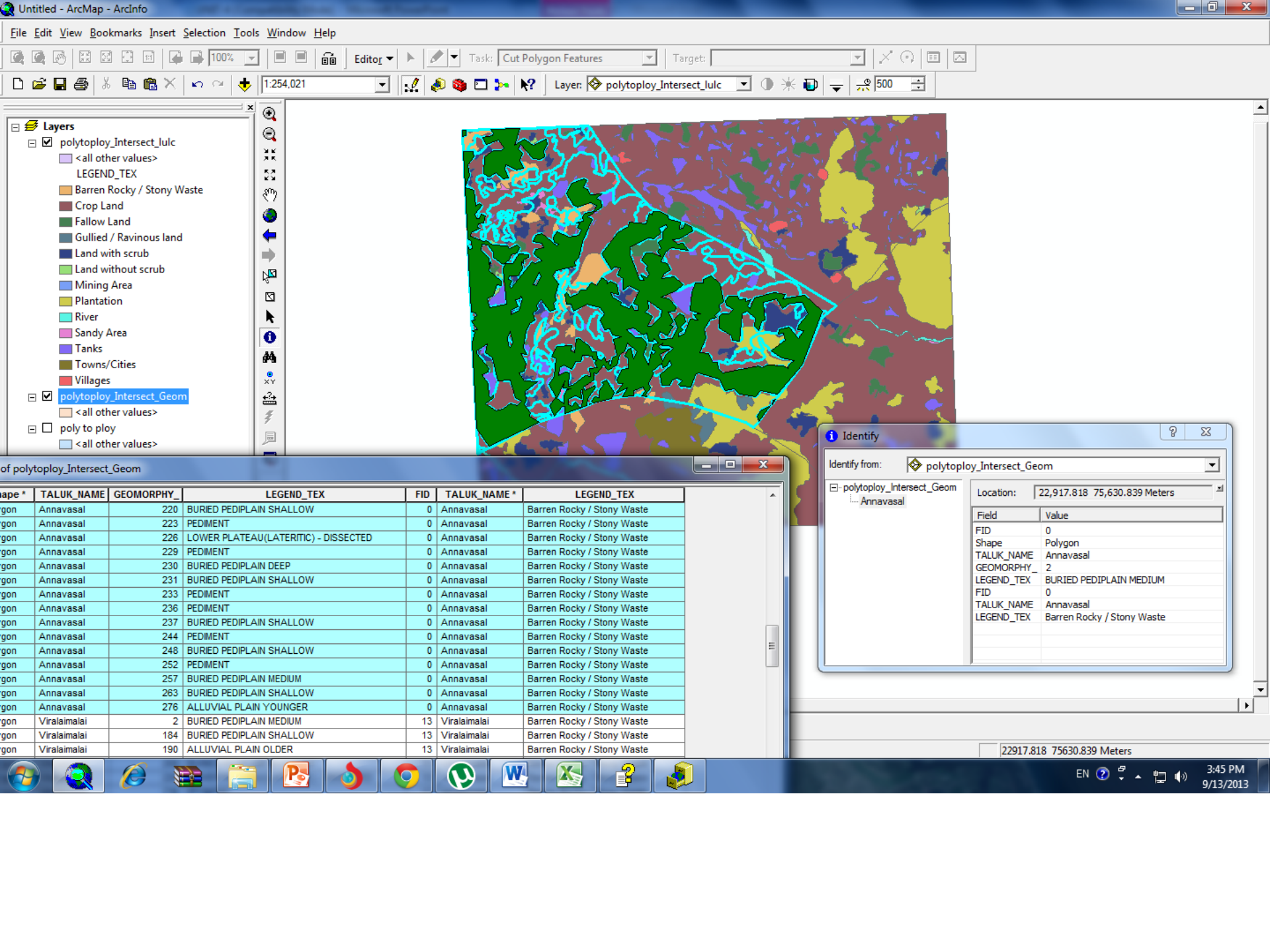
Layers

- ☒ polytoploy_Intersect_lulc
 - <all other values>
 - LEGEND_TEX
 - Barren Rocky / Stony Waste
 - Crop Land
 - Fallow Land
 - Gullied / Ravinous land
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 - Land without scrub
 - Mining Area
 - Plantation
 - River
 - Sandy Area
 - Tanks
 - Towns/Cities
 - Villages
- ☒ polytoploy_Intersect_Geom
 - <all other values>
- ☐ poly to ploy
 - <all other values>



of polytoploy_Intersect_Geom

Shape *	TALUK_NAME	GEOMORPHY_	LEGEND_TEX	FID	TALUK_NAME *	LEGEND_TEX
gon	Annavaasal	220	BURIED PEDIPLAIN SHALLOW	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	223	PEDIMENT	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	226	LOWER PLATEAU(LATERITIC) - DISSECTED	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	229	PEDIMENT	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	230	BURIED PEDIPLAIN DEEP	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	231	BURIED PEDIPLAIN SHALLOW	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	233	PEDIMENT	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	236	PEDIMENT	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	237	BURIED PEDIPLAIN SHALLOW	0	Annavaasal	Barren Rocky / Stony Waste
gon	Annavaasal	244	PEDIMENT	0	Annavaasal	Barren Rocky / Stony Waste



One to Many Relationship between Spatial and Non-Spatial Data

*Example: Villages with School Data and
Taluk with Features*

Map Selection

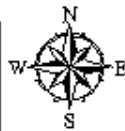
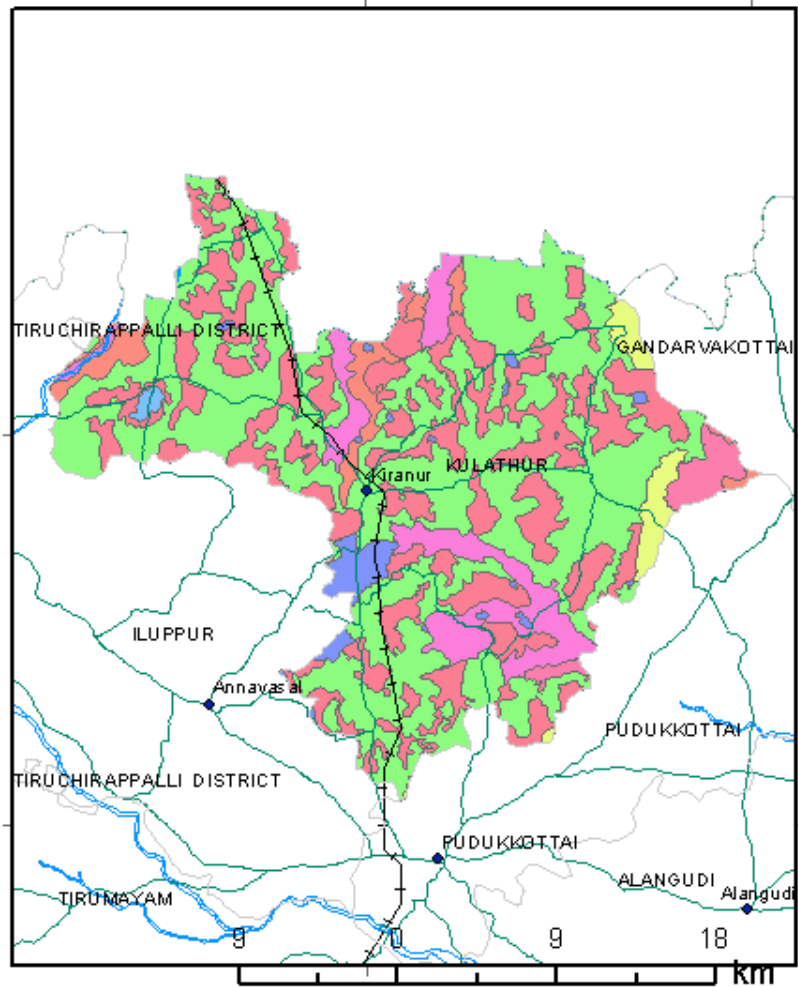
Statistics

- Thematic Maps
 - Talukwise
 - Base Map
 - Taluk Map
 - Block Map
 - Panchayat Village Map
 - Mini Watershed Map
 - IRS Mosaic
 - Road Network
 - Railway Network
 - Rock Types and Lithol
 - Structural Trendlines & Lineaments
 - Geomorphology
 - Drainages, Rivers & C

- Talukwise
 - ALANGUDI
 - ARANTANGI
 - AVUDAIYARKOIL
 - GANDARVAKOTTAI
 - ILUPPUR
 - KULATHUR**
 - MANAMEI KUDI

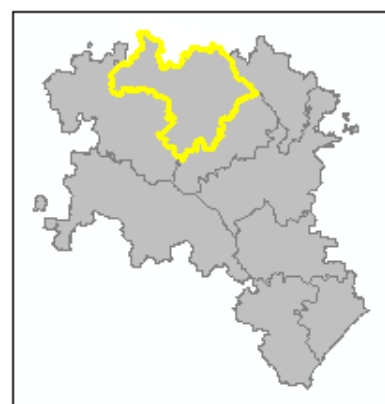
- Entire District
- ☒ Talukwise
- Blockwise
- Villagewise
- Mini Watershedwise
- Featurewise

GEOMORPHOLOGY - KULATHUR Pudukkottai District - Tamil Nadu



Legend

- Talukmap
- SETTLEMENT
- RIVER
- RAILROAD
- MAJORROAD
- Pediment
- Lower plateau(lateritic) - dissected
- Buried pediplain shallow
- Buried pediplain deep
- Buried pediplain medium
- Alluvial plain younger
- Alluvial plain older
- Massive type residual hills



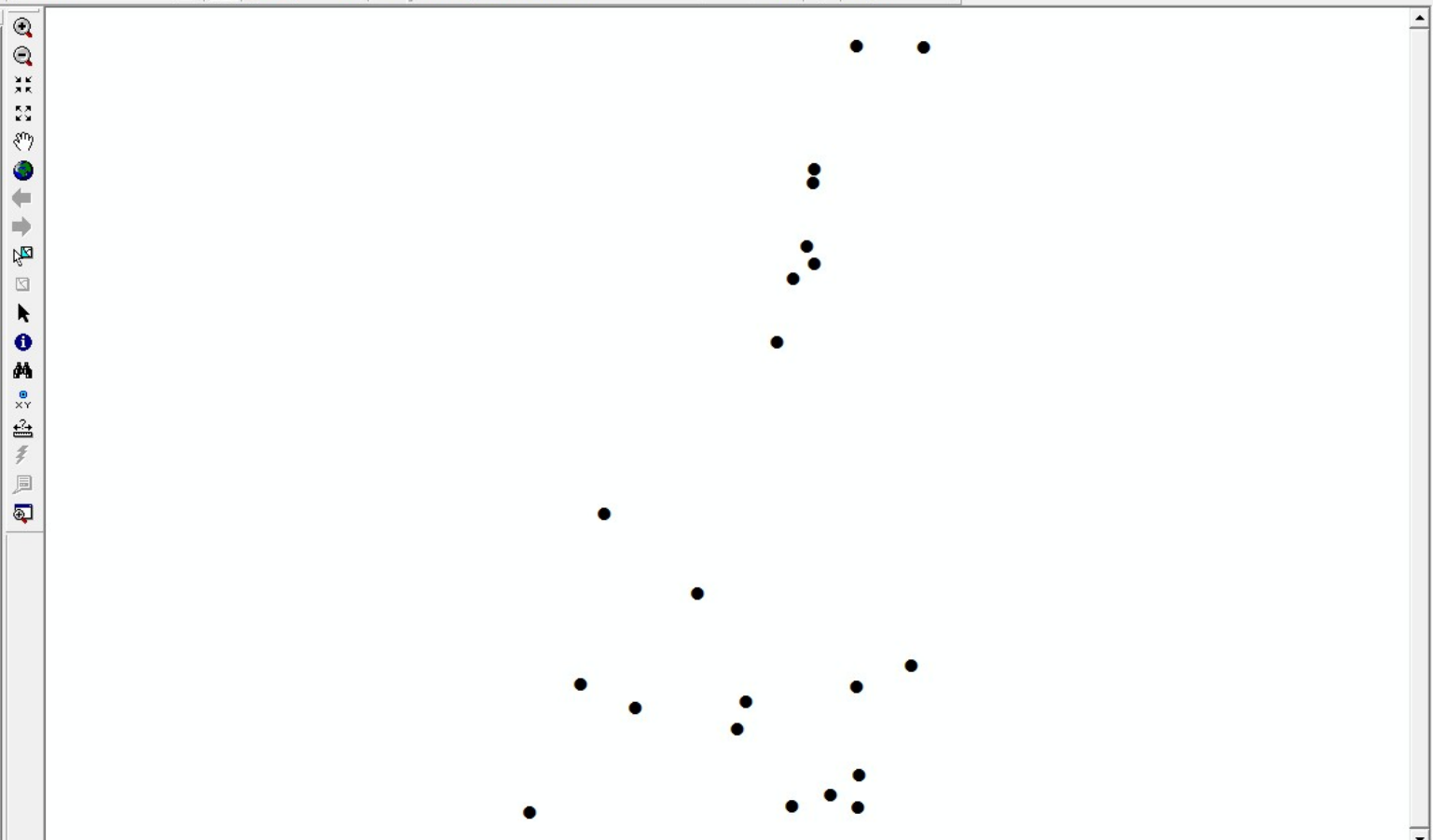
➤ **Many** (Spatial Data) to **One** (Non-Spatial Data)
Relationship

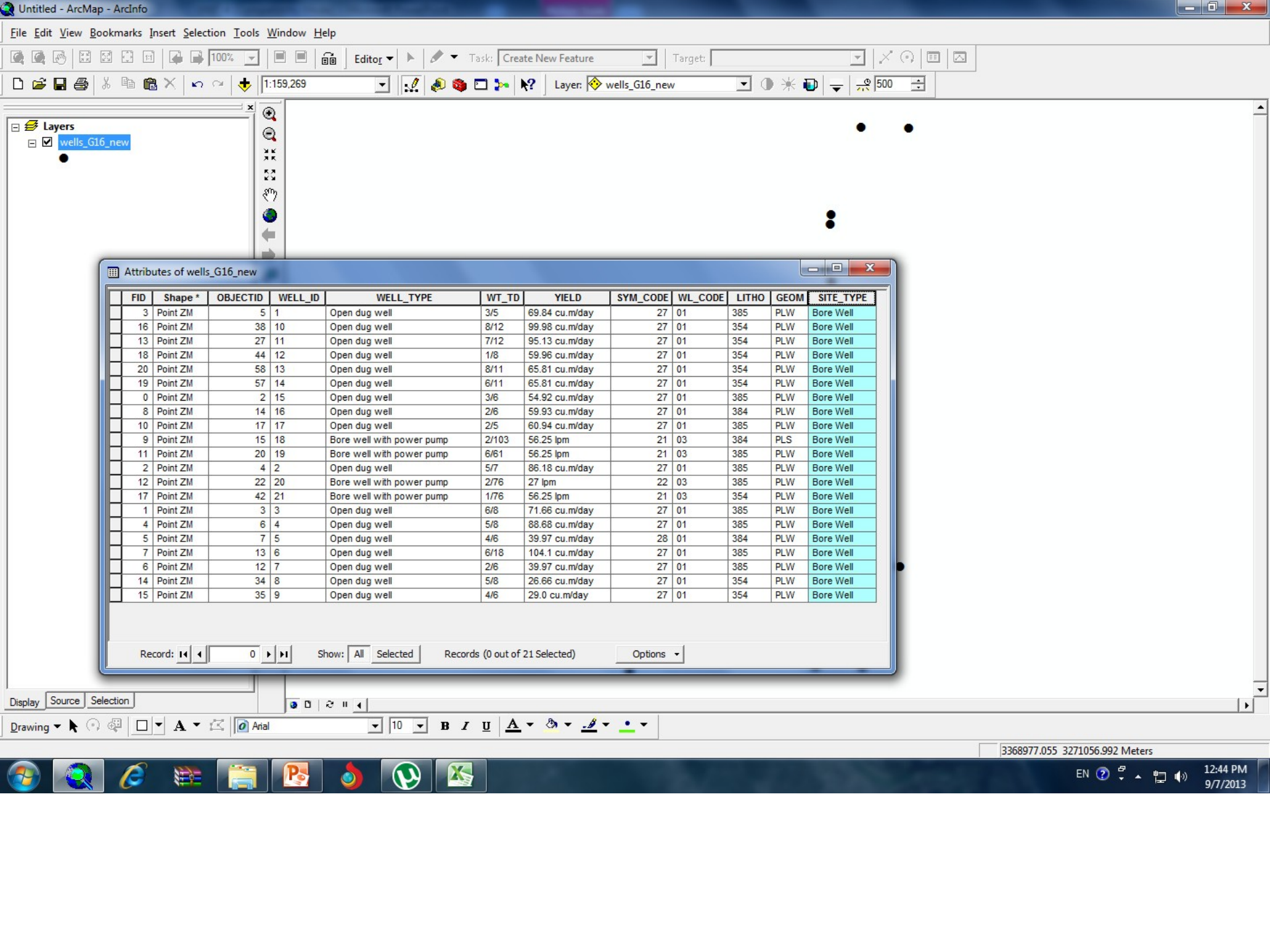
*Example: Police station with Villages and
Village with computers*

**Verifying of common item, its availability and joining of
attribute**

Layers

- ☒ wells_G16_new





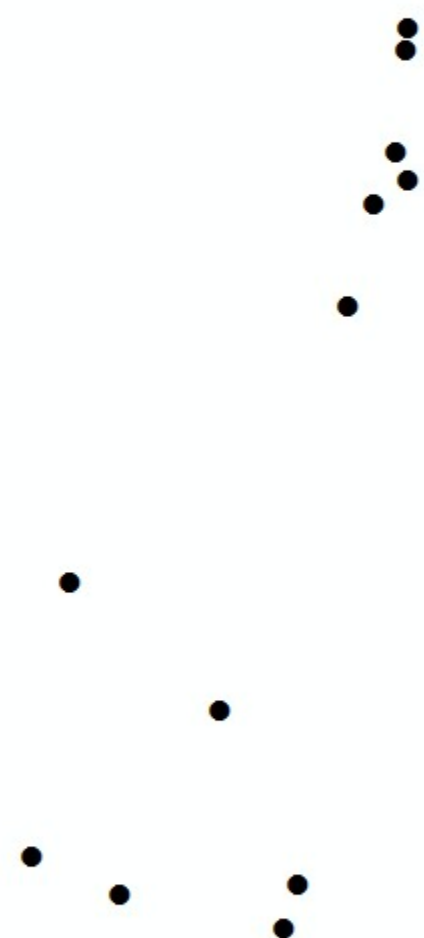
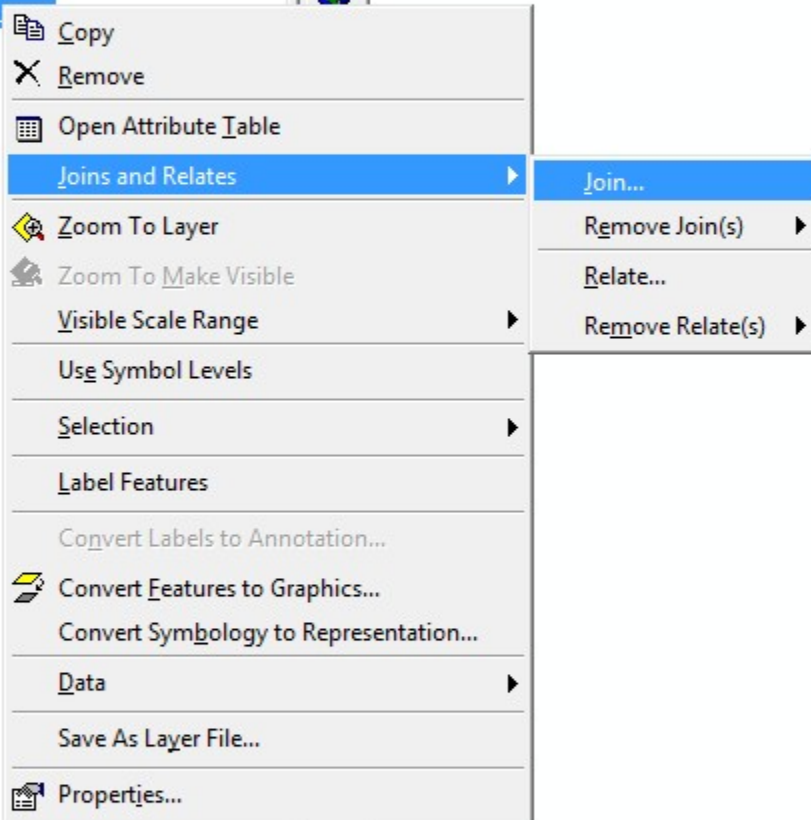
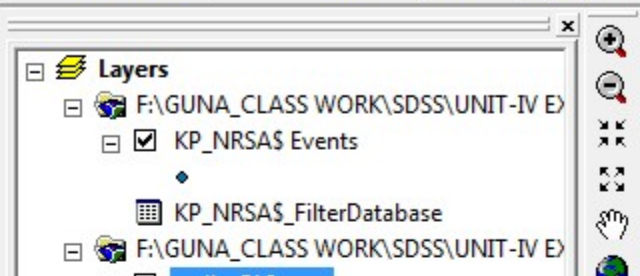
KP_NRSA [Compatibility Mode] - Microsoft Excel

File Home Insert Page Layout Formulas Data Review View

Clipboard Font Alignment Number Styles Cells Editing

AutoSum Fill Clear Sort & Filter Find & Select

	B1		SITE_TYPE														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	DISTRICT	SITE_TYPE	TAHSIL	VILLAGE	TOPO_NO	LATITUDE	LONGITUDE	DATE	DEPTH	WLS							
2	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	25-Jul-06	30	21.83							
3	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	25-Jul-06	30	23.3							
4	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	25-Jul-06	30	23.5							
5	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	26-Jul-06	30	8.45							
6	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	26-Jul-06	30	13.7							
7	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	26-Jul-06	30	15.28							
8	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	26-Jul-06	30	20.81							
9	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	28-Jul-06	30	20.8							
10	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	28-Jul-06	30	21.6							
11	Kolhapur	Bore Well	SHAHUWADI	Jambur	47G16	17°28" N	73°55'55" E	28-Jul-06	30	22.9							
12	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	29-Jun-06	34.65	14.95							
13	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	29-Jun-06	34.65	20.98							
14	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	3-Jul-06	34.65	11.88							
15	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	3-Jul-06	34.65	15.23							
16	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	3-Jul-06	34.65	17.3							
17	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	3-Jul-06	34.65	20.9							
18	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	25-Jul-06	34.65	17.1							
19	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	25-Jul-06	34.65	17.25							
20	Kolhapur	Bore Well	SHAHUWADI	Ukhalu	47G16	17°7'10" N	73°52'15" E	25-Jul-06	34.65	17.3							
21																	
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36																	
37																	



Layers

- F:\GUNA_CLASS WORK\SDSS\UNIT-IV E\
 - ☒ KP_NRSAS Events
 - KP_NRSAS_FilterDatabase
 - ☒ wells_G16_new

Join Data

Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.

What do you want to join to this layer?

Join attributes from a table

1. Choose the field in this layer that the join will be based on:

FID
OBJECTID
WELL_ID
WELL_TYPE
WT_TD
YIELD
SYM_CODE
WL_CODE
LITHO
GEOM
SITE_TYPE

Join Options

☒ Keep all records

All records in the target table are shown in the resulting table. Unmatched records will contain null values for all fields being appended into the target table from the join table.

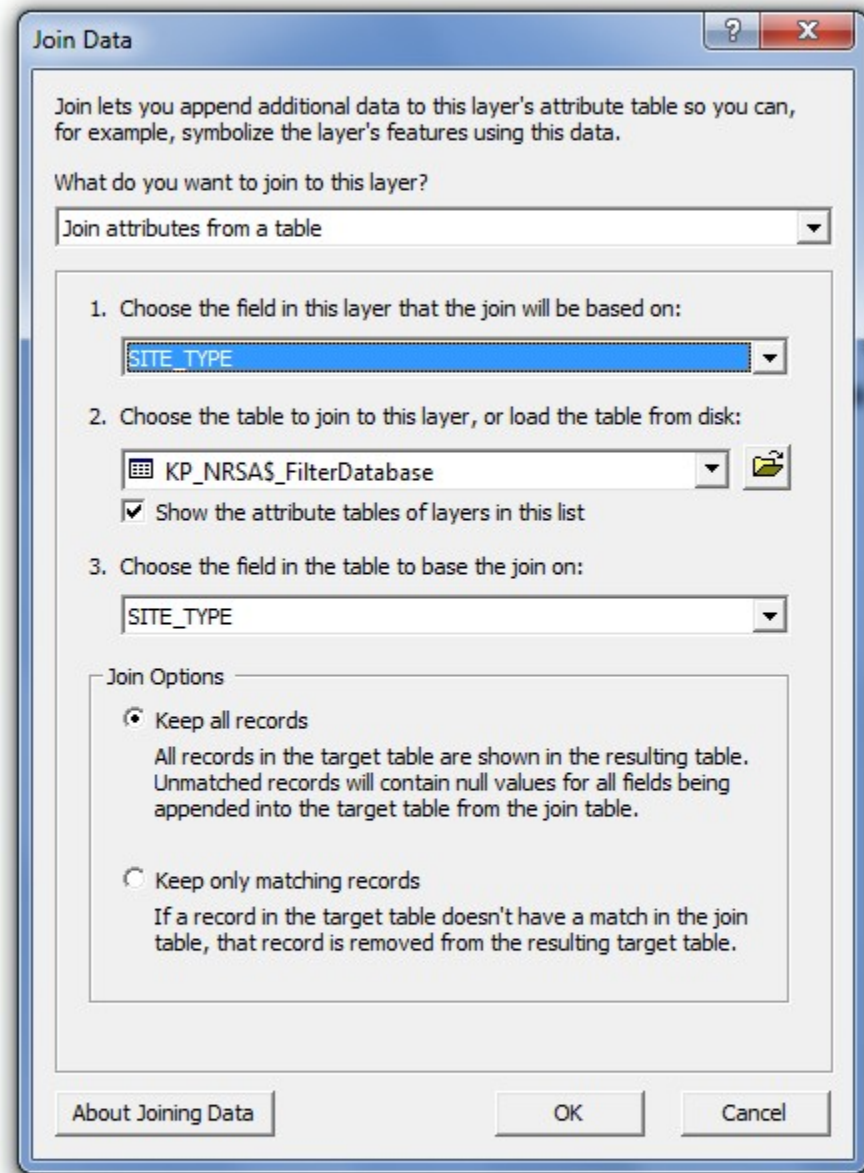
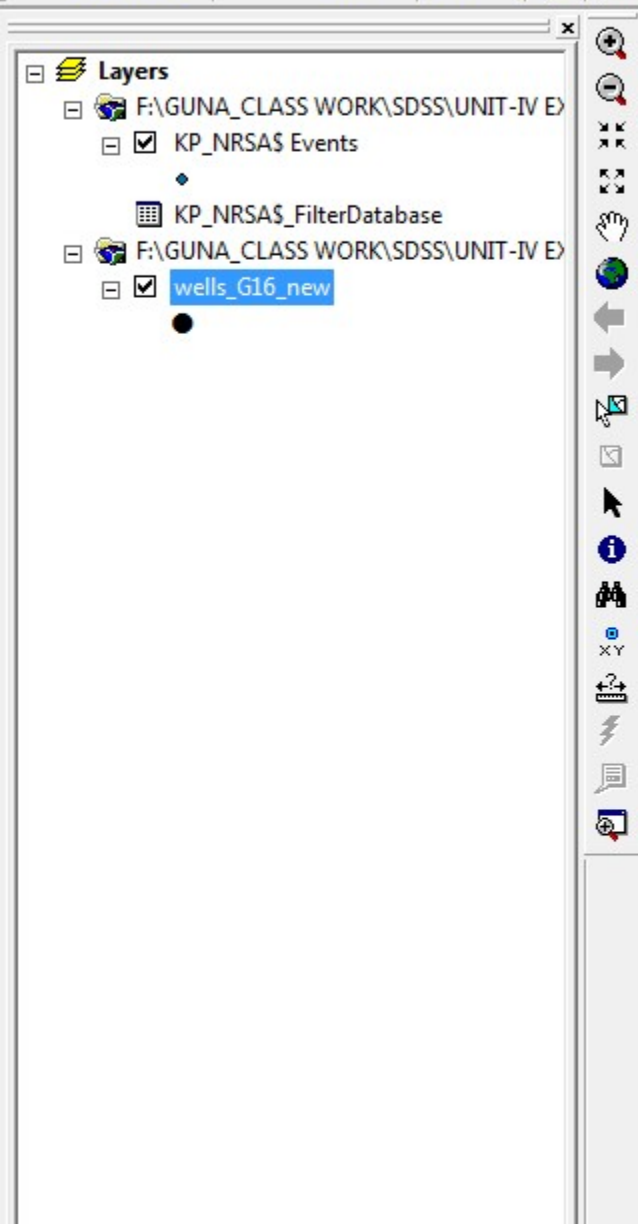
☐ Keep only matching records

If a record in the target table doesn't have a match in the join table, that record is removed from the resulting target table.

About Joining Data

OK

Cancel



**Spatial Decision Support System (SDSS) for Developmental Planning
– A Model Study for Pudukkottai District, Tamil Nadu, India**

NRDMS – PUDUKKOTTAI

BACKGROUND

“**NRDMS**” – (*Establishment of NRDMS Data Centre in Pudukkottai District*) with an aim of developing computerized spatial and non spatial data bases for Pudukkottai District on Natural, Physical and Human Resources.

The digital geospatial data bases were generated on various Themes related to

- **Natural resources and their conservation strategies,**
- **Physical resources belonging to various developmental sectors, etc.**

As the culmination of this, a first time computerized Spatial Decision Support System was developed using which the **Planners, Administrators, Technocrats** and all concerned with developmental activities can retrieve the above information from the computer for Quick Decision making on **District, Taluk, Block, Panchayat Village, Mini Watershed and Feature wise.**

GEOSPATIAL DATA BASES

Digital Thematic Data

The Satellite, Collateral and Ground based data were collected and digital spatial data bases were generated on the following themes for the entire Pudukkottai District covering an area of 4,663 sq.km.

1. Base Map
2. Taluk Map
3. Block Map
4. Village Panchayat Map
5. Mini Watershed Map
6. Satellite Image Mosaic of Pudukkottai District
7. Road Network
8. Railway Network
9. Rock Types & Lithology
10. Structural Trend lines & Fold Styles

11. Depth to Bedrock – (3G)
12. Transmissivity – (3G)
13. Permeability – (3G)
14. Storage Co-efficient – (3G)
15. Specific Yield – (3G)
16. Total Dissolved Solids – (3G)
17. Electrical Conductivity – (3G)
18. Groundwater Quality
19. Depleted Aquifers
20. Water Bearing and Water Barren Lineaments and
21. Active Faults.

Maps on Natural Resources

(a) Mineral Resources

1. Ornamental Stones
2. Building Stones & Road Metals

1. Metallic Minerals
2. Non-metallic Minerals and
3. Sand.

(b) Surface Water Resources

4. Surface Water Potentials
5. Major/Minor Tanks
6. Silted Water Bodies and
7. Sources of Silt.

(c) Groundwater Resources

8. Potential Groundwater Zones
9. Groundwater Suitable for Drinking
10. Groundwater Suitable for Agriculture
11. Groundwater Suitable for Industry
12. Zones of Poor Groundwater Quality
13. Poor Groundwater Quality due to Rock water Interaction and
14. Poor Groundwater Quality due to Salt water Intrusion.

(d) Geothermal Resources

1. Known Geothermal Springs and
2. Probable Zones of Geothermal Prospects.

(e) Soil Resources

3. Soil Types and
4. Soil Suitability.

2.2.2 Maps on Water Conservation

1. Areas of Natural Recharge
2. Functions of Natural Recharge
3. Suitable sites for Artificial Recharge
4. Artificial Recharge for Quality Management
5. Artificial Recharge for Improving Aquifer Health
6. Artificial Recharge through Desiltation
7. Artificial Recharge through Furrowing & Flooding
8. Artificial Recharge through Pitting
9. Artificial Recharge through Enechelon Damming
10. Artificial Recharge through Check Damming
11. Artificial Recharge through Batteries of Wells and
12. Artificial Recharge through Subsurface Dykes.

2.2.3 Maps on Soil Conservation

1. Areas of Soil Erosion and
2. Functional Model of Soil Erosion, etc.

2.3 Digital Data on Physical Resources

The physical resources data were grouped into 11 number of following sectors and Panchayat Village wise data were collected from the concerned line departments of Pudukkottai district and computerized.

- 1. Education Sector**
- 2. Health Sector**
- 3. Communication Facilities**
- 4. Agriculture Sector**
- 5. Electricity Sector**
- 6. Transport Sector**
- 7. Drinking Water Sector**
- 8. Irrigation Sector**
- 9. Veterinary Sector**
- 10. Public Facilities Sector and**
- 11. Revenue / Land Sector.**

In each and every sector, enormous amount of data were collected at village level. For example, the village level attribute data generated for education sector is given below.

- 1. Kinder Gartens / Anganwadis**
- 2. Primary / Elementary Schools**
- 3. Middle Schools**
- 4. High / Matriculation Schools**
- 5. Higher Secondary Schools**
- 6. I.T.I.s**
- 7. Polytechnics**
- 8. Engineering Colleges**
- 9. Arts & Science Colleges**
- 10. Agricultural Colleges and**
- 11. Medical / Para Medical / Nursing / Pharmacy Colleges.**

3.0 SPATIAL DECISION SUPPORT SYSTEM (SDSS)

For the above spatial data on various themes related to Natural resources, Water Conservation and Soil Conservation and non-spatial data pertaining to Physical resources, an advanced **Spatial Decision Support System** was developed with following advanced credentials, viz:

(i) Quick and Easy Information Retrieval

Quickest retrieval can be made easily on any spatial and non-spatial data in a maximum of 3 clicks at District, Taluk, Block, Village and Mini Watershed levels and also Feature wise for quick decision making for developmental planning.

(ii) Layer Wrapping

Any spatial layer can be overlaid over the displayed map and viewed together.

(iii) Zooming

All the displayed digital maps can be zoomed in / zoomed out to the user desired level, using 5 different map zooming tools available in SDSS.

(iv) Other Map Handling Tools

Other map handling tools such as Panning, Go to Previous Map Extent, Go to Next Map Extent, Get Full Map Extent, Graphical Selection, etc., are also kept in SDSS

(v) Data Listing

Map information and other available data can be listed with two options. (1) The 'Identify' tool can be used to list the details of a particular feature at any desired location in the displayed map. For example, data on silted tanks, viz.: perimeter of tanks, average level of silting, etc., can be seen by clicking the cursor over a silted tank from the displayed map. (2) The other one is the 'List Data' option available under Statistics menu which can be used to list entire details of the all features of the displayed map.

(vi) Distance Measurement

By utilizing the distance measurement tool, the actual or crow flying distance between any two objects / features / places / points can be measured.

(vii) Data Updation

Both Spatial maps and Non-spatial data can be added, removed or modified by the authorized user by getting into the 'Data Updation' menu. For example, if 50 water bodies are identified in the water conservation model for desiltation and later on, a few tanks have been desilted (say 5 tanks), the same can be updated and the subsequent view of the map will show the tanks to be desilted (45) and the desilted ones (5) both in different colors. A provision has also been made for the ***automatic updation*** of reachability data, i.e., once any data on the physical resources is added or altered by the authorized user then, automatically the reachability data will be calculated and updated.

(viii) User Defined Query Based Map Display

User defined simple and complex queries can be built and the results can be displayed in the SDSS using the 'Query Builder' option available in Statistics menu.

(ix) Display of User Defined Feature Label

For any displayed map, if the user is interested to display the label identity number or label text for easy map reading on different levels of zooming, then the same can be achieved by using the option named, 'Feature Layer Properties'.

(x) Hierarchy of Data

The spatial data on all natural resources have been kept in both raw (as basic maps) and as final GIS based models (resources / conservation maps). If one wants to develop new models of his own, he can do so using the raw maps too.

(xi) Special Credentials of SDSS

The model thus has got unique merits and besides many, the user need not know GIS and the software part, and in 15 – 20 minutes of training he can retrieve any data.

4.0 OPERATIVE PROTOCOL OF NRDMS-SDSS

4.1 Entry Points

On opening the program, a welcome screen will appear showing the project title, funding agency, implementing agency, Project Team and different options such as, ***Demo, NRDMS-SDSS, Data Structure, Help*** and ***Exit***. By clicking the icon named NRDMS-SDSS, the Main menu and a set of map handling tools will appear at the top screen and the status bar & task bar at the bottom along with a map display area at the middle screen. The Main menu consists of the following items:

- ➔ **Thematic Maps**
- ➔ **Natural Resources**
- ➔ **Water Conservation**
- ➔ **Soil Conservation**
- ➔ **Development Sector**
- ➔ **Data Updation**
- ➔ **Print**
- ➔ **Help and Exit.**

The following map handling tools will also be seen just below the menu bar for easy interaction by the users.

- Zoom in the Focus map 
- Zoom out the Focus map 
- Fixed zoom in 
- Fixed zoom out 
- Previous extent 
- Next extent 
- Original extent of the map 
- Pan 
- Identify (/ list details of) a particular feature 
- Graphical selection 
- Clear selection 
- Distance Measure tool 
- Print map 
- Export map (soft copy) 
- Clear Screen 
- Refresh Screen , etc.

4.2 Simple Retrieval and Display

- If one wants to see any of the thematic maps, while clicking on the 'Thematic Maps' option in the Main menu bar, all the available thematic maps will get listed in the Tree View Control (TVC) on the left margin of the window. If he clicks any desired theme, the same will be displayed in a map layout form in the system.
- For example, the Land use / Land cover map for the 'Entire District' is shown in Figure.
- Similarly, on clicking the other options in the Main menu, such as Natural Resources, Water Conservation and Soil Conservation, corresponding maps will be listed in the TVC and by clicking-in the desired map from the list the same can be displayed

4.3 Different Display Levels

In general, the District wise information retrieval is set as default option kept under the 'Display Level' at the bottom left side of the screen.

However, if one wants to see Block wise, he has to click the Block wise option button, then select the desired map and finally the Block name, thus the desired theme of that particular Block will get displayed in the map display (layout) area. Similarly, by clicking the 'Panchayat Village wise' option, the user can see village level data. Groundwater quality map (based on TDS) of Ponnamaravathi block and Geomorphology of Arantangi village so retrieved are shown as examples for Block level and Village level retrieval

4.4 Statistics

There are many special provisions made available in NRDMS-SDSS such as, Wrapping of any layer over any displayed map, Listing of data, User defined Query building, etc. All these options have been provided separately under Statistics Tab (Refer Fig. 7 for the said menu option).

4.4.1 Layer Wrapping

In order to wrap any layer over the displayed map, he has to select the Statistics tab, select any layer from 'Layers for Wrapping' option and the same will get wrapped. For example, the Lineament map wrapped over Potential Groundwater zones for Pudukkottai district is shown in Figure 7.

4.4.2 List Data

Spatial, non-spatial and Statistical details can be listed using the 'List Data' option kept below the 'Layers for Wrapping' option in Statistics tab (Ref. Fig. 7, above). For example, the statistical data so listed for the silted water bodies of Agarapatti village is shown in Figure 8. If the user is interested to see the cumulative values of the listed numerical data and get it printed, then the same can be seen/done by clicking the 'Options' button kept at the bottom right side of the small window showing the array of listed data (Fig. 8).

4.4.3 Query Builder

User defined simple and complex queries can be built by the user as and when required and the results can be displayed easily using the “**Query Builder**” option available in the Statistics tab.

For example, the tanks with >60% silt and covering an area of greater than 1 sq.km so selected using the ‘Query Builder’ option, getting highlighted with magenta coloured boundaries (polygon outlines) is shown in Figure 9 with zooming of that particular selected features.

4.4 Statistics

There are many special provisions made available in NRDMS-SDSS such as, Wrapping of any layer over any displayed map, Listing of data, User defined Query building, etc. All these options have been provided separately under Statistics Tab

4.5 Spatial Display of Non-spatial Data

As far as the Development sector is concerned, an innovative information mining system has been developed for Education, Health, Communication, Agriculture and Electricity sectors. All the non-spatial data available in these sectors can be displayed spatially village wise both for the entire district and also for any of the blocks of Pudukkottai district.

For example, to see any information in the Health sector, the “Development Sector’ option in the Main menu has to be clicked first and then the ‘Health Sector’ submenu. On clicking the ‘Health Sector’ sub menu, different categories of Hospitals, Doctors, Support Staff, Medical store facilities, Diseases, etc., will get listed in an another submenu. By clicking any of them, the options like, Available and Unavailable will get displayed in TVC. Under ‘Available’ option, the data ranges such as <2, 2-4, >4 & Overall Availability options are kept. Under ‘Unavailable’ option, <3km, 3-6km, >6km & Overall Availability and Reachability are kept. On clicking any of these options, the relevant villages having the user selected facilities / reachability will get displayed as map.

4.6 Data Updation

- By clicking the '**Data Updation**' option available in Main menu, there are two options seen in slide down menu, such as



Spatial Data and



Non-spatial data'.

- Inserting of new maps or updating of spatial data can be done by selecting the appropriate options under 'Spatial data' by the authorised user.
- Similarly, any non-spatial data can be updated by changing the already available data or by entering additional data can be done by clicking the Non-spatial data option again by the authorised user only.

Base Map

Pudukkottai District, Tamil Nadu



Legend

-  Hills
-  Major Tanks
-  River
-  Major Road
-  Railway Line
-  Major Settlement

0 5 10 20 km

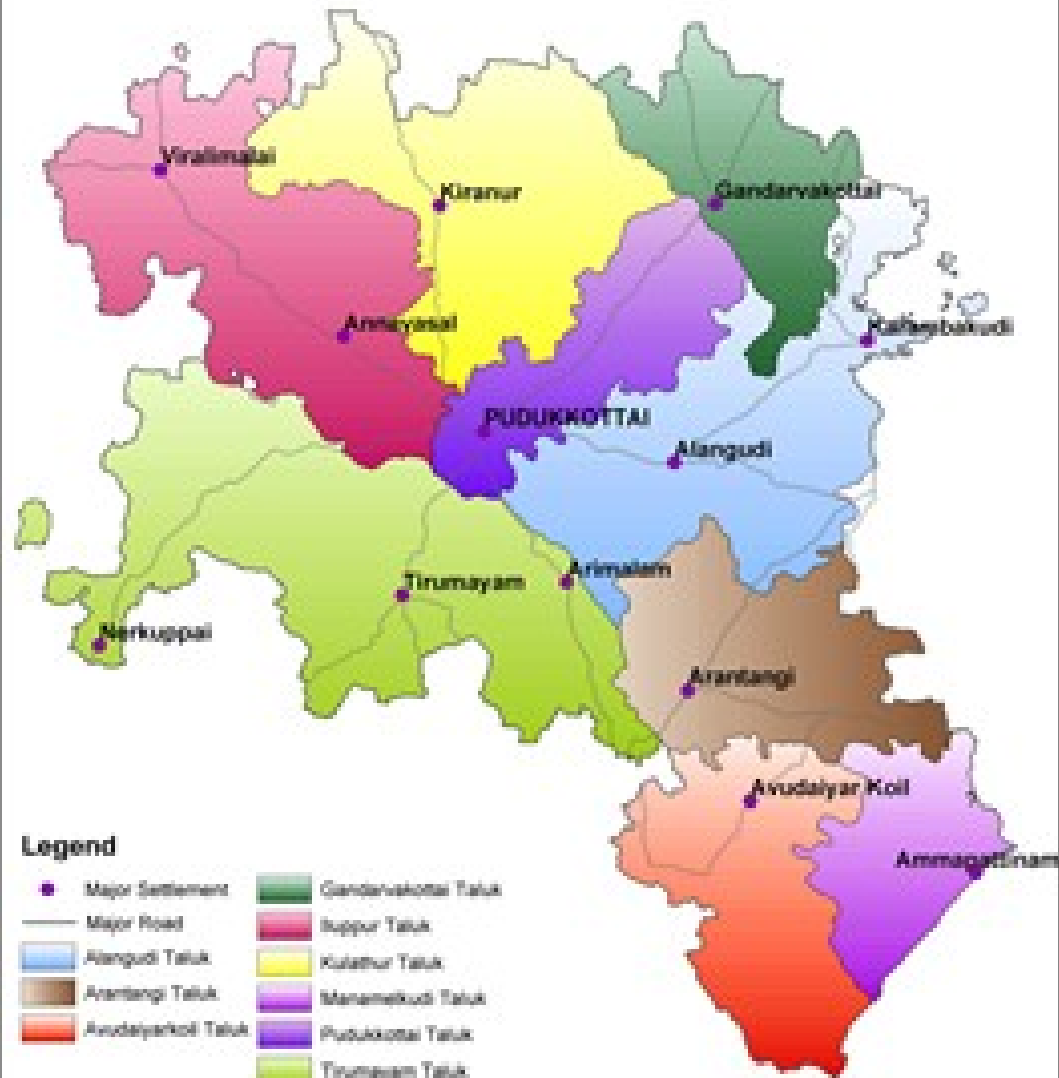
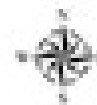
Taluk Map

The digital taluk map was prepared in ArcGIS using taluk boundary map supplied by Survey and Land Records Department, Pudukkottai (Fig. 4). There were 9 taluks in the Pudukkottai district, they are:

- 1. Illuppur taluk**
- 2. Kulathur taluk**
- 3. Gandarvakottai taluk**
- 4. Pudukkottai taluk**
- 5. Tirumayam taluk**
- 6. Alangudi taluk**
- 7. Aranthangi taluk**
- 8. Avudaiyarkoil taluk and**
- 9. Manamelkudi taluk.**

Taluk Map

Pudukkottai District, Tamil Nadu

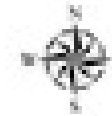


Block Map

The block map was prepared with the help of Survey of India topographic sheets and digitized subsequently using ArcView GIS (Fig. 5). The following 13 are the blocks in Pudukkottai district.

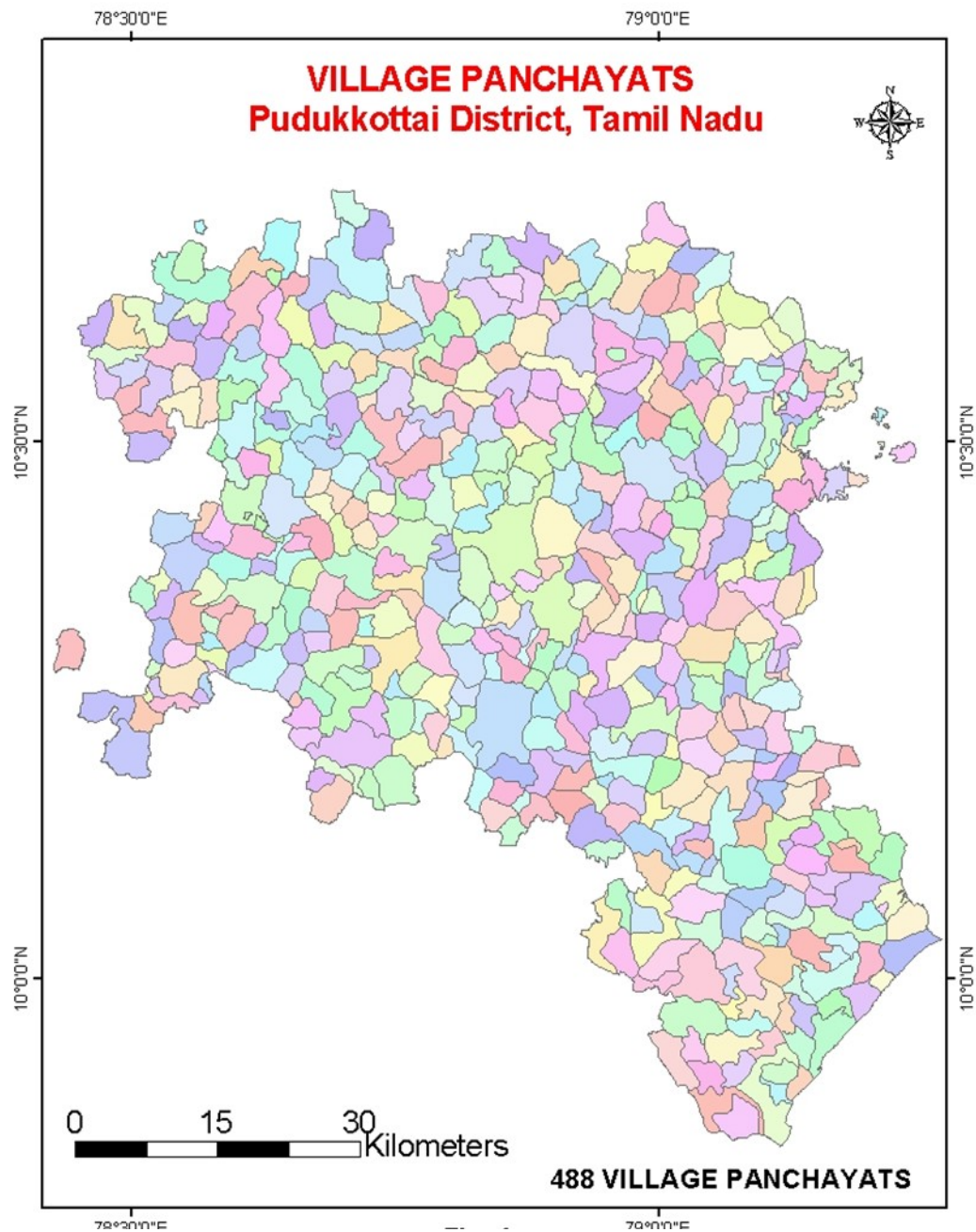
- 1. Annavasal block**
- 2. Viralimalai block**
- 3. Kunnandarkovil block**
- 4. Gandarvakkottai block**
- 5. Pudukkottai block**
- 6. Karambakudi block**
- 7. Ponnamaravathy block**
- 8. Tiruvarangulam block**
- 9. Tirumayam block**
- 10. Arimalam block**
- 11. Arantangi block**
- 12. Manamelkudi block and**
- 13. Avudaiyarkovil block.**

Block Map Pudukkottai District, Tamil Nadu



Panchayat Village Map

- The Panchayat Village was taken as the basic planning unit in SDSS.
- Using the Panchayat village map supplied by the Survey and Land Records Department of Pudukkottai district, the digital Panchayat Village Map was generated in ArcView GIS (Fig. 1). The list of 498 Panchayat Villages of Pudukkottai district



Mini Watershed Map

- The map showing mini watersheds with an aerial extent of 10-30 sq.km each was prepared with the help of drainage networks of Pudukkottai district traced from Survey of India Topographic map.
- There are 124 such mini watersheds delineated in the district. The mini watershed map of Pudukkottai district so prepared in ArcView GIS

Pudukkottai District, Tamil Nadu



- Major Settlement
- Major Road
- Mini Watershed Map

Centre for Remote Sensing, Bharathidasan University, Tiruchirappalli.