Managing data - Create shapefile

 Digitizing in ArcMap 9.3
 Contours from DEM

 Change a projection to another
 Clip, merge, split features
 Add and display X,Y data
 Attribute Queries
 Georeferencing

ArcGIS 9.3 - How To...

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Czech Geological Survey

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Create a new folder Create a new shapefile Add shapefile to ArcMap

Step by step:

- Open ArcCatalog.
- Find or create target folder.
- Create a new shapefile in the folder.
- Type name, select feature type and coordinate system on the "Create Shapefile" dialog box.
- Open ArcMap and add the shapefile you have created.

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Open ArcCatalog. Browse to the directory in which you'd like to create a folder. Right-click on that directory, select "New" and click on "Folder".



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Right-click on the folder you have created. Choose "New" and click on "Shapefile".



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"Create New Shapefile" dialog box appears. Fill out the name of your new shapefile and select the feature type ("point", "Polyline" - for lines, "Polygon")

Add spatial reference: Click the "Edit" button. On a new dialog box click the "Select" and find out the projection.

Adindan projection example: *Projected Coordinate Systems/UTM/Other GCS/Adindan UTM Zone 37N.prj*

Click "OK".

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Create New Shapefile	3	×
Name:	Faults	
Feature Type:	Polyline	•
Spatial Reference		
Description:		
Projected Coordina Name: Adından_L Geographic Coordir Name: GCS_Adin	te System: JTM_Zone_37N nate System: dan	*
		-
	•	
Show Details	Edit	
Coordinates will	contain M values. Used to store route da contain Z values. Used to store 3D data	ata.
	OK Car	ncel

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Now open ArcMap and add your new shapefile to it.

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Step by step:

- Add shapefile you'd like to digitize to ArcMap.
- Open the "Editor" toolbar.
- Enable editing by the "Start Editing" tool.
- Select target layer (if your project has more then one layer).
- Select "Sketch Tool" (the pencil button) to start digitizing.
- Fill attributes in the attribute table.
- Save edits.
- Press "Stop Editing" to finish digitizing.

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Open the "Editor" toolbar: Click the "Editor Toolbar" icon on the "Standard Toolbar":

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	Editor Toolbar

"Editor" toolbar appears:



Click the "Editor" menu on the "Editor" toolbar and click "Start Editing":



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If you have more than one workspace in your ArcMap project, "Start Editing" dialog will appear. You will need to choose the folder you want to edit.

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source	TOD & COUNTING AND A FUR TO DO TOMAT	Type Descend Condetables	
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: \Dokumenty \Etiopie \geodat	abase@losaina_lithology.mdb	Personal Geodatabase	
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ese lavers and tables curren	ly in your map reside in the source selecter	d above:	
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Select the target layer:

Editor			8
Editor 🔻 🕨 🖉 👻 Task: Create New Feature	▼ Targ	t: Faults	
		Eithology	-

Start digitizing using "Sketch Tool"

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Select "Sketch Tool" and click somewhere in the map window. Now you are adding vertices ("points") of a new feature.

There are three possibilities to finish the sketch: double click, press "F2" key or right-click and select "Finish Sketch".

If you want, you can continue with creating another feature now.

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Do not forget to save your edits:



To modify a feature: there is a useful tool called "Edit Tool":



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Delete a feature

Select the "Edit Tool", click the feature you want to delete and press the "Delete" key.

Modify an edge

Select the "Edit Tool", double click the feature you want to modify and move the pointer over a vertex (point). Drag the vertex and drop it into a new position. Managing data - Create shapefile
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Delete a vertex

Select the "Edit Tool", double click the feature you want to modify and move the pointer over a vertex (point), right-click and select "Delete Vertex" from menu.

Insert a vertex

Select the "Edit Tool", double click the feature you want to modify and move the pointer over an edge. Right-click and select "Insert Vertex" from menu. It is possible to delete a vertex during digitizing. On the Main Menu, go to "Edit" and click "Undo Add vertex" Managing data - Create shapefile

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Snapping can establish exact locations in relation to other features. Mostly you want to ensure that the vertex connects precisely to other feature. Snapping helps you to avoid overlaps, dangles etc.

Go to the "Editor" menu on the "Editor" toolbar and click "Snapping":



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Check all check boxes (Vertex, Edge, End) for your layer. Try to digitize a new feature. If the pointer is close to a feature, the vertex will automatically connect.



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Once you begin an edit session, you'll be able to edit attributes through the "Attribute Table". Right-click the name of the layer (in the "Table Of Contents") and select "Open Attribute Table":



Edit attributes. Each feature is represented by one row. Each column corresponds to one attribute.

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You may need to add a new field. It can be done directly in the attribute table but notice that it is only possible if you are out of edit session! If not: click the "Edit" menu on the "Editor" toolbar and select "Stop Editing". Then click the "Options" button in the attribute table and select "Add Field...":



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Fill out the name of your new field, select the field type and properties:

Add Field		? ×
Name:	MAP	
Type:	Text	•
Field Prop	erties	
Length	20	
	ОК	Cancel

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To know which row represents which feature click on the small box placed on the left side of each row. Corresponding feature will be highlighted in the map window.

📰 A	attributes of I	Faults		
	FID	Shape *	ld	MAP
	0	Polyline	0	
	1	Polyline	0	
	2	Polyline	0	
	3	Polyline	0	

Edit attributes (Remember, you must be in edit session). Do not forget to save your edits!

Attributes of Faults							
	FID	Shape *	ld	MAP			
	0	Polyline	0				
	1	Polyline	0	HOSAINA			
	2	Polyline	0				
	3	Polyline	0				

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Deleting fields: Ensure you are out of edit session. Right-click the name of the field you want to delete and select "Delete Field":

ſ		Attributes of I	Faults				
		FID	Shape *	ld		M/ C	1
		0	Polyline	0			. Sort Ascending
	Ц	1	Polyline	0	HOSAINA	- 7	Sort Descending
	Н	2	Polyline	0			
	ш	3	Polyline	0		_ Z	Advanced Sorting
l							Summarize
						Σ	Statistics
						Ē	Eield Calculator
							<u>C</u> alculate Geometry
							Turn Field Off
							Freege/Unfreeze Column
						×	Delete Field
							Propertjes

3. Contours from DEM

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Step by step:

- Add DEM to ArcMap.
- Open arcToolbox.
- Run the "Contour" tool.
- Smooth contours.
- Remove short contours irrelevant to display in map.

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Add DEM to ArcMap:

Open ArcToolbox (click the "Show/Hide ArcToolbox Window" icon on the "Standard" toolbar):

Show/Hide ArcToolbox Window

Open "Contour" tool ("3D Analyst Tools/Raster Surface/")



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Fill in input parameters:

Input raster				
DEM			-	2
Output polyline features				_
C:\Users\David\Documents\Contours.shp				2
Contour interval				_
1				50
Base contour (optional)				<u> </u>
Z factor (optional)	 	 	 	1

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Look at the output layer. In some cases, contours may be jagged and it is necessary to smooth them. There are same possibilities to do it. First: Open ArcToolbox and use the "Focal Statistics" tool ("ArcToolbox/Spatial Analyst Tools/Neighborhood/Focal Statistics"):



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As the input layer choose your DEM. Leave "Rectangle" as "Neighborhood". You can change width and height of the rectangle according to the smoothness of output contours.

DEM				. 🛎
Output raster				_ =
C: Users Davi	d/Documents/smool	h_DBM		
veighborhood ((optional)			
Rectangle	-			
Neighborhoor	d Settings			
Height:	7			
Width:	7	_		
Units:	Cell	С Мар		
Statistics type	(optional)			
MEAN				•

After you have created your smooth DEM, use the "Contour" tool again. You can see differences:



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Another possibility is to smooth contour lines directly. Run the "Smooth Line" tool ("ArcToolbox/Data Management Tools/Generalization/Smooth Line"):



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Leave "PEAK" smoothing algorithm on the "Smooth Line" dialog box and set up the tolerance. The value of tolerance may initially be experimental issue.

Input Features		 		
Contours				🚬 🖃
Output Feature Class				
C:\Dokumenty\CGS\Contours_	smooth.shp			🚅
Smoothing Algorithm				
PAEK				•
Smoothing Tolerance				
1			0,1	Decimal degrees 🔹
Preseve endpoint for closed	lines (optional)			
Handling Topological Errors (opt	ional)			
NO_CHECK				•

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See differences:



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The last step is to remove contours that are too small to display. Add a new field to the attribute table called "Length" and calculate length of each contour:

Right-click the name of the "Contours" layer in the table of contents and select "Open Attribute Table". Then click on the "Options" button and click "Add Field..."
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Add Field		8 ×
Name:	Length	
Type:	Double	-
Field Prop	erties	
Precisio	n 0	
Scale	0	
	OK	Cancel
	-	

Type "Length" to the "Name" box and choose "Double" field type.

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Right-click the name of the field and select "Calculate Geometry":

1	II 4	Attrib	utes of Co	ntour	s_smooth_de	ec1		1000		
h	Т	FID	Shape	ID	CONTOUR	LENGTH			1	-
1		0	Polyline	1	1500	228,771	1	Sort Ascending		
1		1	Polyline	2	1000	181,0	Ŧ	Sort Descending		-
		2	Polyline	3	1500	817,385	÷.,	Sort Descending		
1		3	Polyline	- 4	1000	19,616	2.	Advanced Sorting		
1		- 4	Polyline	5	1000	411,168				
1		5	Polyline	6	2000	1036,154		Summarize		
		6	Polyline	7	2500	796,672	7	Canalization		
		7	Polyline	8	1000	1961,181	~	Stanznes		
1	_	8	Polyline	9	2500	990,052	EI.	Field Calculator		
1	Ц.	9	Polyline	10	1000	134,629	-	2		
1		10	Polyline	11	1000	819,582				
		11	Polyline	12	1000	1116,197	_			
	ц.	12	Polyline	13	2500	1196,014		Turn Field Off		
1	Ц.	13	Polyline	14	1000	422,658				
1	Ц.	14	Polyline	15	1000	1498,346		Freeze/Unfreeze Column		
		15	Polyline	16	2000	1206,458				
	Ц.	16	Polyline	17	1000	189,870	×	Delete Field		
1	Щ.	17	Polyline	18	1000	178,145				
1	_	18	Polyline	19	1000	2127,073		Properties		
1	Ц.	19	Polyline	20	1000	483,704	-	-	1	
	4	20	Polyline	21	1000	1698,258	464			
I	Щ.	21	Polyline	22	1500	5653,056	866			
		22	Polyline	23	2500	7985,431	639			÷
ľ		Re	cord: 14			Show	v: [All Selected Records (0 o	ut of 2360 Selected) Options 👻	

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Ensure that the "Contours" layer has defined projected coordinate system.

Calculate Geo	metry	2 ×
Property: Coordinate	Length System	•
PCS: A C Use cool GCS: V	dinder system of the data fr idinate system of the data fr IGS 1984	me:
Units:	Meters [m]	
Colculate	selected records only	OK Cancel

Select the "Length" property and click "OK". Lengths of each contour will be computed. Right-click the name of the field and select "Sort Ascending". You can see contours with minimum lengths.

Select contours whose length is less then 10 000 meters: Click the "Options" button and select "Select By Attributes...":



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Type the query as shown bellow and click the "Apply" button:

Select by Attributes
Enter a WHERE clause to select records in the table window. Method : [Greate a new selection] ["FID" "TD" "TD" "TD" "CONTOUR" "
• • • • • • • • • • • • • • • • • • •

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Open the "Editor" toolbar click the "Editor" menu and select "Start Editing". In attribute table of "Contours" layer right-click the small boxes on the left side of the table and select "Delete Selected":



Save your edits.

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See differences:



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Step by step:

- Add a layer to ArcMap.
- Run the "Define Projection" tool.

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Add a shapefile to ArcMap and open "ArcToolbox":



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Open the "Define Projection" tool ("ArcToolbox/Data Management Tools/ Projections and Transformations/Define Projection"). Doesn't matter if the projection of layer is defined or not.



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Select the input layer and choose new coordinate system.

Define Projection	1	14.	182		<u> </u>
Input Dataset or F	eature Class				*
contour				🛁 🖉	
Coordinate System					
Adindan_UTM_Zo	ne_37N			1	
					-
	ОК	Cancel	Environments	Show Help >>	

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Clip Merge layers Merge features Split layers Split features - lines Split features - polygons

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5. Clip, merge, split features

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Clip features: Add to ArcMap the features to be clipped and the features used to clip the input features (must be polygons). In the example below we use "Contours" as the layer to be clipped and a map sheets as the clipping polygon layer.



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In the "ArcToolbox" window search the "Clip" tool ("ArcToolbox/Analysis Tools/Extract/Clip").



Clip

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Γ	Input Features
	Contours 💌 🖻
	Clip Features
	Map_sheet 🗾 🖻
	Output Feature Class
	C:\Dokumenty\Contours_dip.shp
	XY Tolerance (optional)
	Meters
ľ	
	OK Cancel Environments Show Help >>

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Output layer:



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Merge: You can merge both layers and features. To merge layers use the "Merge" tool ("ArcToolbox/Data Management Tools/General/Merge"):

				100			
Input Datasets							^
					•	. 🖻	
Contours_clip						+	
Contours_additional							
						×	E
						+	
						+	
Output Dataset							
C:\Dokumenty\Contours_merge.shp							
Field Map (optional)							
⊞ ID (Double)						+	
E CONTOUR (Double)							
E CENGIN (DOUDIE)						×	-
	ОК	(Cancel	Environme	nts Sho	w Help >>	
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On the "Merge" dialog: Add layers you'd like to merge. Define output layer and run the function.



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To merge features run the "Merge" tool from "Editor" menu on the "Editor" toolbar. See the attribute table before merge.



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On the "Editor" toolbar click the "Editor" menu and "Start editing". Then select the "Edit Tool":



Hold the "Shift" key and click features you want to merge:



Image: A math a math

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Clip Merge layers Merge features Split layers Split features - lines Split features - polygons

Click on the "Editor" menu and select "Merge ... ":



As the dialog below sais: "Choose the feature with which other features will be merged" and press "OK":



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Split layers: Run the "Split" tool in the ArcToolbox ("ArcToolbox/Analysis Tools/Extract/Split"). Input layers example: contours and Map sheets:



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ArcToolbox 30 Analyst Tools 40 Analyst Tools 50 An	Input Features
	OK Cancel Environments Show Help >>

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The result: four separated layers.



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Split features: Use "Editor" toolbar. Start editing. If you'd like to split lines: select the "Edit Tool" and click the line you want to split:



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Ensure that snapping is checked (Editor/Snapping). Select the "Split Tool" on the "Editor" toolbar:



click the selected line.

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If you'd like to Split polygons select polygon you want to split by "Edit Tool". In the "Task" pop-up menu select "Cut Polygon Features":



Using the "Sketch Tool" create a line that will cross over the polygon boundaries. Polygon is separated after you finish the sketch.

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Managing data - Create shapefile

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 Clip, merge, split features
 Add and display X,Y data

 Attribute Queries
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6. Add and display X,Y data

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Step by step:

- Add txt or xls file to ArcMap.
- Assign X and Y coordinates to appropriate fields.
- Define projection of points.
- Export your X, Y data to a shapefile.

This chapter shows how to import tabular data to ArcMap. You need a table or a text file that must contain two fields: x-coordinate and y-coordinate. As example create a txt file similar to this one:

points	- Poznámko	vý blok	x
Soubor	Upravy Fo	rmát Zobrazení	
Nápověc	la		
Point	х	Y	~
1	327772	802345	
2	337139	765316	
13	35/922	/932/0	
4	383242	806882	
5	275046	757550	
0	57 3040	1 37 3 3 9	
			-

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In ArcMap click the "Tools" menu and click "Add XY Data...":



Browse the txt file you have created. Click the X Field drop-down arrow and click the field containing x-coordinate values. Do the same with y-coordinate. Define the coordinate system and units represented in the x and y fields! Managing data - Create shapefile

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Add XY Data		? ×
A table contain map as a layer	ng X and Y coordinate data car	be added to the
Choose a table	from the map or browse for ano	(hertable:
points.txt		- 🖻
Specify the fi	elds for the X and Y coordinates	
X Field:	x	-
Y Field:	Y	•
Coordinate Sy Description: Projected C Name: Adi Geographic Name: GC	rstem of Input Coordinates	*
٠		*
Show De	tails	Edit
🔽 Wam me if	the resulting layer will have restr	icted functionality
	ОК	Cancel

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Click "OK" button. Check the warn me box that says that you will not be able to make selections, perform relates and edit your points because the "ObjedtID" field is missing. Click "OK". You can create a new feature class from this data and be able to perform those tasks. Right-click the layer in the table of contents, point to "Data", then click "Export Data...":



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Leave "Export: All features". Click the Browse button and navigate to a location to save the exported data. Type the name for the output data source and click "OK".



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"Export Data" function is also useful when you'd like to store only a layer selection. You may do same analysis for example. Its result is a selection. You can use this selection and export it to a new shapefile as your result data. Select few features from a shapefile. Right-click the layer in the table of contents, click "Data" and select "Export Data...". Click the "Export:" drop-down arrow and click "Selected features".

7. Attribute Queries

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This chapter will provide an overview of basic attribute queries. Effective way to select features is a sql expression. You build expressions on the "Select by Attributes" dialog box.

Open the "Select by Attributes" dialog box. You can open it from attribute table: Click the "Options" button and click the "Select By Attributes..." or from main menu: "Selection/Select By Attributes".

For the presentation we will use two layers: geology and borehole. Look at their attribute tables: Managing data - Create shapefile

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geology:

Attributes of geology			
Geology	LIT Code	HG Code	LIT Legend
Qb - Undifferentiated eluvium and alluvium (Undifferentiated elluvium)	Qel	B2	eluvium
Qa - Alluvium (Alluvium)	Qal	B2	alluvium
Qe - Eluvium (Eluvium)	Qel	82	eluvium
Tv - Olivine basati (Olivine Basati)	Tvb	B4	basaltic volcanic rocks
JI1 - Jerder Imestones:Mudstones fossil reef Imestones to wackstones, black shales,dolomitic wackstones,pelletal-grainstones and sandstones (Jerder Limestone)	Mist	B4	limestone
JI2 - Melmel limestone: Pelletal grainstones, mudstones, aternate beds of wackstones to packstones and packstones to grainstones, congiomerates and chalky limestones (Melmel Limestone)	Mist	B4	limestone
Pgs - Quartz-graphite schist with intrecalated minor marble and quartz-sericite schist (Mormora group)	Pm	B5	metamorphic rocks
Psrp - serpentinite (Adola group)	Pm	B5	metamorphic rocks
Pqfm - Quartzofeldspathic mylonite, minor quartzofelspathic, biotite-plagioclase-microcline-quartz gneiss and biotite granite (Wadera group)	Pm	B5	metamorphic rocks
Pqkg - Biotite-plagioclase-K-feldspar-quartz mylonite with subordinate hornblende biotite and hornblende gneiss (Awata group)	Pm	B5	metamorphic rocks
Prigt - Migmatte (Alghe group)	Pm	B5	metamorphic rocks
Ptts - Talc, tremolte-chlorite-talc, chlorite, chlorite-actinolite and actinolite schist (Adola group)	Pm	B5	metamorphic rocks
Pbhg - Biotite-hornblende gneiss with subordinate biotite, hornblende biotite, quartzofeldspathic gneisses and biotite granite (Alghe group)	Pm	B5	metamorphic rocks
Pfgt - syntectonic biotite granite (Syntectonic Biotite granite)	Pi	B5	intrusive rocks
Pmg - Metagabrro (Adola group)	Pm	B5	metamorphic rocks
Pgbs - Quartz-blotte, guartz-sericite and garnet-staurolite-guartz-blotte schists with lenses of chlorite and actinolite schists (Mormora group)	Pm	B5	metamorphic rocks
Pcas - Actinoite schist with subordinate actinoite-quartz epidote schist (Adola group)	Pm	B5	metamorphic rocks
Ppgt - post-tectonic pegmatoidal granite (Post-tectonic pegmatoidal granite)	PI	B5	intrusive rocks
Pgt - post-tectonic biotite granite (Post-tectonic biotite granite)	Pi	B5	intrusive rocks
Pbg - Biotite gneiss with subordinate hornblende biotite quartzofeldspathic gneisses and biotite granite (Alghe group)	Pm	B5	metamorphic rocks
Pgt - post-tectonic biotite granite (Post-tectonic biotite granite)	Pi	B5	intrusive rocks
e III			
Record: 14 4 1 + H Show: All Selected Records (0 out of 21 Selected) Options •			

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borehole:

Site ID	Locality	Grid Zone	X utm	Y utm	Elevation	Origin	Aquifer
BH-11	Bidre/Medawelabu,Bale	37	571686	654216	909	Limestone	Limestone
BH-23	Bikitu/Wadera,Guj	37	543218	635423	1045	Basement	Biotte hornblende gneiss
BH-5	Bulegily(Qitabule)/Liben,Guj	37	584051	594806	1983	Limestone	Limestone
BH-13	Danisa/Medawelabu,Bale	37	551780	662493	723	Basement	Biotte-Hornblende gneiss
BH-27	Debe Guchi/Liben,Guji	37	567588	586091	1097	Limestone	Limestone
BH-28	Debe Guchi/Liben,Guji	37	567588	586091	1098	Limestone	Limestone
BH-4	Debeno/Liben,Guji	37	574730	589574	836	Limestone	Limestone
BH-22	Eba Eida/Wadera,Guji	37	543702	641039	1325	Basement	Quartzofeldspathic gneiss
BH-3	Fulo/Liben,Guji	37	581486	582304	1066	Limestone	Limestone
BH-3A	Fulo/Liben,Guj	37	581486	582304	1066	Limestone	Limestone
BH-6	Godo/Liben,Guji	37	583791	588601	2470	Limestone	Limestone
BH-25	Harekelo/Gorodola,Guji	37	543943	612965	547	Basement	Biotite granite
BH-26	Harekelo/Gorodola,Guji	37	542985	614068	1066		
BH-30	Higil/Liben,Fitu	37	625183	573427	0	Limestone	Limestone
BH-10	Kerju/Medawelabu,Bale	37	556790	647615	468	Basement	Biotite gneiss
BH-17	Kiltamura/Adolarede,Guji	37	502452	654595	267	Basement	Biotite Schist
BH-7	Korati/Liben,Guji	37	575881	558097	4350	Limestone	Limestone
BH-1	Leganegele/Liben,Guji	37	563579	588469	1055	Basement	Biotte granite
BH-16	Marade/Sabbaboru,Guji	37	514251	625863	805	Basement	Biotte gneiss
BH-12	Medicho/Medawelabu,Bale	37	565280	649682	188.2	Alluvial	Alluvial
BH-9	Mugayo/Liben,Guji	37	548321	575354	1009	Basement	Quartzofeldspathic gneiss
BH-18	Orone(chooki)/Adolarede, Guii	37	500671	640885	426	Basement	Biotite granite
BH-29	Qurabool/Liben,Fitu	37	635402	573743	0	Limestone	Limestone
BH-15	Sirebuke/Sabbaboru,Guji	37	507084	611719	364	Alluvium	Alluvium
BH-8	Siru/Liben,Filtu	37	645116	573689	2330	Limestone	Limestone
BH_24	Sokora lenu/Wadera Guii	37	531840	620067	971	Bagement	Biotite oranite
			11				

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The easiest example describes a selection where an attribute is equal to a specified value: Double-click a field to add the field name to the expression box. Click the equals operator to add it to the expression. Click "Get Unique Values" to see the values for the selected field. Double-click a value to add it to the expression. Click the "Apply" button:



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Sometimes it is better to use "LIKE" operator instead of "equals". It allows you to use only a part of an attribute value in your expression. In this case the percent sign substitute each character or each group of characters in a value:

	Attributes of geology	_	_	
	Geology	UIT Code	NG Code	LIT Leased
	K Cb - Undifferentiated eluvium and alkylum (Undi-	Qel	82	elevium
	Ga - Aluvian (Aluvian)	QN .	82	aleviett
8 22	Ce - Elivium (Elivium)	ON	62	elevise
	Tv - Ohine bosalt (Ohine Bosalt)	TVb	84	basallo valcanio racka
	11 - Jerder Imestones Wudstones fessil reef Im.	Mat	54	Investore
elect records in the Sable window.	JQ - Melmel Imentone Pelletal grainatones, mudat	Mat	04	Investorie
	Pgs - Quarto-graphite schiat with intrecalated mi	Pm	86	metamorphic rocks
· ·	Parp - serpertinite (Adda group)	Fm	66	metamorphic rocks
10.14	Polin - Quartzofeldspathic mybride minor quartz	Pts	85	metamorphic rocks
	Polg - Diette-plagioclase-K-fektspor-guartz mylo	Pre	55	metamorphic rocks
C20	Prigt - Mignetite (Alghe group)	Pm	55	metamorphic rocks
×	Pita - Taic, trenolite-chlorite-taic, chlorite, chlorite-	Pts	85	metamorphic rocks
	Pohg - Botte-hombiende gneiss with subordinat	Pre	46	metamorphic rocks
	Pfgt - syntectonic biattle granite (Syntectonic B)	6	65	intrusive rocks
	Prig - Melagabino (Adola prova)	Pre	85	metamorphic rocks
	Pobe - Quartz-biotte, quartz-sericite and gamet-	Pm	55	metamorphic rocks
	Pcas - Actinoite schiel with subordinate actinoit	Pm	55	metamorphic rocks
	Post - post-tectoric pegnatokial granite (Post-te	PL	16	intrusive rocks
	Pot - post-tectoric biotte grante (Post-tectoric	PL .	66	cousive racks
	Pbg - Billite preiss with subordinate homblende	Fit	85	metamorphic rocks
	Pot - post-lectonic bioffe grante (Post-lectonic	PI	80	Intrusive racks
Get Usique Values Go To:	Recent 14 4 1 1 11 200	c Al Sele	cted R	ecords (2 out of 25 Selecte
ogy WHERE:				
2 <u>7.</u> ×		R		len a

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Or:

Method : Cr	ate a new selection		•
"Geology" "LIT_Code" "HG_Code" "LIT_Legend" "Shape_Leng" "Shape_Area"			1
• <> > >= < <= _ % 0	Like And Or Not		
ls	Get Unique Values	s Go To:	
SELECT * FROM	geology WHERE:		_
Geology" LIKE	4Hadie group 4		×

	Attributes of geology	• X
F	Geology	LIT Code
Þ	Qb - Undifferentiated eluvium and aluvium (Undifferentiated eluvium and aluvium)	Gel
r	Ga - Alluvium (Alluvium)	Qal
Г	Ge - Eluvium (Eluvium)	Qel
Г	Tv - Olivine basalt (Olivine Basalt)	Tvb
С	JI1 - Jerder Imestones Mudstones fossil reef Imestones to wackstones, black shales, dolomtic w	Mist
С	JI2 - Melmel Imestone: Pelletal grainstones, mudstones, alternate beds of wackstones to packston	Mist
Г	Pos - Quartz-graphite schist with intrecalated minor marble and guartz-sericite schist. (Mormora g	Pm
г	Psrp - serpentinite (Adola group)	Pm
С	Pgfm - Quartzofeldspathic mylonite,minor guartzofelspathic, biotite-plagioclase-microcline-guartz	Pm
	Pokg - Biotte-plagioclase-K-feldspar-quartz mylonite with subordinate hornblende biotte and horn	Pm
E	Prigt - Migmatite (Alghe group)	Pm
Е	Ptts - Taic, tremoite-chlorite-taic, chlorite, chlorite-actinoite and actinoite schist (Adola group)	Pm
С	Pbhg - Biotte-hornblende gneiss with subordinate biotte,hornblende biotte, guartzofeldspathic gn	Pm
	Pfgt - syntectonic biotite granite (Syntectonic Biotite granite)	Pi
	Pmg - Metagabrro (Adola group)	Pm
	Pqbs - Quartz-biotite, quartz-sericite and garnet-staurolite-quartz-biotite schist with lenses of chil	Pm
С	Pcas - Actinoite schist with subordinate actinoite-guartz epidote schist (Adola group)	Pm
E	Ppgt - post-tectonic pegmatoidal granite (Post-tectonic pegmatoidal granite)	Pi
	Pgt - post-tectonic biotite granite (Post-tectonic biotite granite)	Pi
	Pbg - Biotte gneiss with subordinate homblende biotte guartzofeldspathic gneisses and biotte gr	Pm
E	Pgt - post-tectonic biotite granite (Post-tectonic biotite granite)	PI
Г		
4		•
	Record: H 4 1 H Show: Al Selected Records (4 out of 21 S	elected) 💌



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You can also make expressions using operators "greater than" or "less then" (in case of numeric attributes):

Select by Attributes
Enter a WHERE clause to select records in the table window.
Method : Create a new selection
"Localty" A d' "Grid_Zone"
"X_utm" =
"Orgin" *
E C Uke
> >= And
< <= Or
_ % () Not
Is Get Unique Values Go To:
SELECT * FROM Negele_borehole WHERE:
"Bevation" > 2000
Clear Verfy Help Load Save
Apply Close

Site ID	Locality	Grid Zone	X utm	Y utm	Elevation	Origin	Aquifer
BH-3A	Fulo/Liben,Guji	37	581488	582304	1066	Limestone	Limestone
BH-6	Godo/Liben,Guji	37	583791	588601	2470	Limestone	Limestone
BH-25	Harekelo/Gorodola,Guj	37	543943	612965	547	Basement	Biotite granite
BH-26	Harekelo/Gorodola,Guji	37	542985	614068	1066		
BH-30	Higil/Liben,Fitu	37	625183	573427	0	Limestone	Limestone
BH-10	Kerju/Medawelabu,Bale	37	556790	647615	468	Basement	Biotite gneiss
BH-17	Kiltamura/Adolarede,Guj	37	502452	654595	267	Basement	Biotite Schist
BH-7	Korati/Liben,Guji	37	575881	558097	4350	Limestone	Limestone
BH-1	Leganegele/Liben,Guji	37	563579	588469	1055	Basement	Biotite granite
BH-16	Marade/Sabbaboru,Guj	37	514251	625863	805	Basement	Biotite gneiss
BH-12	Medicho/Medawelabu,Bale	37	565280	649682	188,2	Aluvial	Aluvial
BH-9	Mugayo/Liben,Guji	37	548321	575354	1009	Basement	Quartzofeldspathic gneiss
BH-18	Orone(chooki)/Adolarede, Guji	37	500671	640885	426	Basement	Biotite granite
BH-29	Qurabool/Liben/Filtu	37	635402	573743	0	Limestone	Limestone
BH-15	Sirebuke/Sabbaboru,Guji	37	507084	611719	364	Aluvium	Aluvium
BH-8	Siru/Liben,Fitu	37	645116	573689	2330	Limestone	Limestone
BH-24	Sokora legu/Wadera,Guji	37	531640	629967	971	Basement	Biotite granite
BH-21	Sokorajida/Wadera,Guji	37	528950	641758	868	Basement	Biotite-Quartz gneiss
BH-2	Tekari/Liben,Guji	37	557569	574319	7120	Basement	Quartz-Biotite Schist
BH-20	Tulem(korkit)/Wadera,Guji	37	535372	635906	179,7	Basement	Biotite gneiss
BH-14	Worre/Medawelabu,Bale	37	557378	660617	1888	Basement	Biotite gneiss
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It is possible to combine queries using operator "AND":

Enter a WHERE cla	suse to select records	in the table winds	w.
Method : Creat	e a new selection		-
"X_utm"			× 1
"Bevation"			
"Origin"			E.
"WP_Type"			*
. 01	ike		
	-na		
< <=	Or		
_ % 0	Not		
b	Get Unique	Values Go To:	
SELECT * FROM N	egele_borehole WHE	RE:	
"Aquifer" = 'Biotte	gneiss' AND "Elevati	an" > 1000	A.
			*

	Attributes of Negele_borehole	_	_	_	_				<u> </u>
Π	Locality	Grid Zone	X utm	Yutm	Elevation	Origin	Aquifer	WP Type	-
	Godo/Liben,Guji	37	583791	588601	2470	Limestone	Limestone	Borehole	
	Harekelo/Gorodola, Guji	37	543943	612965	547	Basement	Biotite granite	Borehole	
	Harekelo/Gorodola,Guj	37	542985	614068	1066			Borehole	
	Higili/Liben, Fitu	37	625183	573427	0	Limestone	Limestone	Borehole	
	Kerju/Medawelabu,Bale	37	556790	647615	468	Basement	Biotite gneiss	Borehole	
	Kitamura/Adolarede,Guj	37	502452	654595	267	Basement	Biotte Schist	Borehole	
	Korati/Liben.Gui	37	575881	558097	4350	Limestone	Limestone	Borehole	1
	Leganegele/Liben/Guji	37	563579	588469	1055	Basement	Biotite granite	Borehole	1
	Marade/Sabbaboru,Guji	37	514251	625863	805	Basement	Biotte gneiss	Borehole	11
	Medicho/Medawelabu,Bale	37	565280	649682	188,2	Alluvial	Aluvial	Borehole	1
	Mupsyo/Liben,Guji	37	548321	575354	1009	Basement	Quartzofeldspathic gneiss	Borehole	1
	Orone(chooki)/Adolarede, Guji	37	500671	640885	426	Basement	Biotite granite	Borehole	11
	Qurabool/Liben,Filtu	37	635402	573743	0	Limestone	Limestone	Borehole	1
	Sirebuke/Sabbaboru.Guii	37	507084	611719	364	Alluvium	Aluvium	Borehole	1
	Siru/Liben/Fitu	37	645116	573689	2330	Linestone	Limestone	Borehole	1
	Sokora legu/Wadera,Guji	37	531640	629967	971	Basement	Biotte granite	Borehole	11
	Sokorajda/Wadera,Guj	37	528950	641758	868	Basement	Biotite-Quartz gneiss	Borehole	
	Tekari/Liben,Gui	37	557569	574319	7120	Basement	Quartz-Biotite Schist	Borehole	1
	Tulem(korkit)/Wadera,Guji	37	535372	635906	179,7	Basement	Biotte gneiss	Borehole	11
	Worre/Medawelabu,Bale	37	557378	660617	1888	Basement	Biotte gneiss	Borehole	
	Xiro/Adolarede,Guji	37	508200	640792	1267	Basement	Biotite gneiss	Borehole	-
4								-	
	Record: If (1) H	Show: All	Selected	Reco	rds (2 out of 3	1 Selected)	Options +		



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In some cases it is preferable to create a listing of values: It can be done by "IN" operator. To parenthesis type your values separated by comma:

Select by Attributes 2 23	_
Method : Create a new selection	1
"X_utm" "Y_utm" "Bevaton"	
"Aqufer" "WP_Type"	
Eke Botte greiss' Aud Botte greiss' Aud	
S S Price Particle Control of the Control of t	
_ % () Not Quart-Botte Schist +	
SELECT * FROM Negele_borehole WHERE:	
"Aquifer" IN ('Limestone' , 'Biotte gness' , 'Biotte-Quartz gness')	
Clear Verify Help Load Save	1
Apply Close]

	Attributes of Negele_borehole						l		×
F	Locality	Grid Zone	X utm	Yutm	Elevation	Origin	Aquifer	WP Typ	
Г	Fulo/Liben.Gui	37	581488	582304	1066	Limestone	Limestone	Borehole	
Е	Godo/Liben,Guji	37	583791	588601	2470	Linestone	Linestone	Borehole	
E	Harekelo/Gorodola,Guji	37	543943	612965	547	Basement	Biotte granite	Borehole	
E	Harekelo/Gorodola,Guji	37	542985	614068	1066			Borehole	
	Higill/Liben,Fitu	37	625183	573427	0	Linestone	Linestone	Borehole	
E	Kerju/Medawelabu,Bale	37	556790	647615	468	Basement	Biotte gneiss	Borehole	
E	Kitamura/Adolarede,Guji	37	502452	654595	267	Basement	Biotite Schist	Borehole	
E	Korati/Liben, Guji	37	575881	558097	4350	Limestone	Limestone	Borehole	
	Leganegele/Liben,Guji	37	563579	588469	1055	Basement	Biotite granite	Borehole	
E	Marade/Sabbaboru,Guji	37	514251	625863	805	Basement	Biotte gneiss	Borehole	
E	Medicho/Medawelabu,Bale	37	565280	649682	188,2	Alluvial	Aluvial	Borehole	
	Mupsyo/Liben,Guji	37	548321	575354	1009	Basement	Quartzofeldspathic gneiss	Borehole	
	Orone(chooki)/Adolarede, Guji	37	500671	640885	426	Basement	Biotte granite	Borehole	-
E	Qurabool/Liben,Filtu	37	635402	573743	0	Limestone	Linestone	Borehole	
E	Sirebuke/Sabbaboru,Guji	37	507084	611719	384	Alluvium	Alluvium	Borehole	
L	Siru/Liben,Fitu	37	645116	573689	2330	Linestone	Linestone	Borehole	
	Sokora legu/Wadera,Guji	37	531640	629967	971	Basement	Biotte granite	Borehole	
E	Sokorajda/Wadera,Guj	37	528950	641758	868	Basement	Biotite-Quartz gneiss	Borehole	
E	Tekari/Liben,Guji	37	557569	574319	7120	Basement	Quartz-Biotite Schist	Borehole	_
	Tulem(korkit)/Wadera,Guji	37	535372	635906	179,7	Basement	Biotte gneiss	Borehole	
E	Worre/Medawelabu,Bale	37	557378	660617	1888	Basement	Biotte gneiss	Borehole	
1									F
	Record: H + H	Show: Al	Selected	Reo	ords (18 out of :	31 Selected)	Options -		



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Or select all values except those in the listing:

Method : Cr "X_utm" "Y_utm" "Bevation" "Origin" "Aquifer" "WP Type"	eate a ne	w selection
= <> > >= < <= _ % 0	Like And Or Not	Aluvia" Aluvia" Biote Schis" Biote gneisi Biote gneisi Biote gneisi Biote gneisi
IS SELECT * FROI "Aquifer" NOT I	/ Negele, N ('Alluvi	Get Unique Values Ge Te:

Attributes of Negele_borehole								<u> </u>
Locality	Grid Zone	X utm	Y utm	Elevation	Origin	Aquifer	WP Type	
Fulo/Liben,Guji	37	581488	582304	1066	Limestone	Limestone	Borehole	8
Godo/Liben,Guji	37	583791	588601	2470	Linestone	Linestone	Borehole	
Harekelo/Gorodola,Guji	37	543943	612965	547	Basement	Biotte granite	Borehole	
Harekelo/Gorodola,Guji	37	542985	614068	1066			Borehole	4
Higill/Liben,Fitu	37	625183	573427	0	Linestone	Linestone	Borehole	1
Kerjul/Medawelabu,Bale	37	556790	647615	468	Basement	Biotte gneiss	Borehole	
Kitamura/Adolarede,Guj	37	502452	654595	267	Basement	Biotite Schist	Borehole	
Korati'Liben,Guj	37	575881	558097	4350	Limestone	Limestone	Borehole	
Leganegele/Liben,Guji	37	563579	588469	1055	Basement	Biotte granite	Borehole	
Marade/Sabbaboru,Guji	37	514251	625863	805	Basement	Biotte gneiss	Borehole	
Medicho/Medawelabu,Bale	37	565280	649682	188,2	Alluvial	Aluvial	Borehole	
Mugayo/Liben,Guji	37	548321	575354	1009	Basement	Quartzofeldspathic gneiss	Borehole	
Orone(chooki)/Adolarede, Guji	37	500671	640885	426	Basement	Biotte granite	Borehole	1
Qurabool/Liben,Fitu	37	635402	573743	0	Limestone	Limestone	Borehole	
Sirebuke/Sabbaboru,Guji	37	507084	611719	364	Alluvium	Aluvium	Borehole	
Siru/Liben,Fitu	37	645116	573689	2330	Linestone	Linestone	Borehole	
Sokora legu/Wadera,Guji	37	531640	629967	971	Basement	Biotte granite	Borehole	
Sokorajda/Wadera,Guji	37	528950	641758	868	Basement	Biotite-Quartz gneiss	Borehole	
Tekari/Liben,Guji	37	557569	574319	7120	Basement	Quartz-Biotite Schist	Borehole	1
Tulem(korkiti)/Wadera,Guji	37	535372	635906	179,7	Basement	Biotte gneiss	Borehole	
Worre/Medawelabu,Bale	37	557378	660617	1888	Basement	Biotte gneiss	Borehole	٣
K								
Record: 14 4 1 F FI Show: All Selected Records (29 out of 31 Selected) Options -								



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As you can combine queries with the "AND" operator you can also use "OR":

Method :	Create a new selection	•
"FID" "OBJECTI "Geology" "LIT_Code "HG_Code "UT_Lege	ר " חל"	*
	> Like 182' = And 185' = Or) Not	
IB SELECT - F	Get Unique Values Go To: ROM geology WHERE:	
"LIT_Code"	" = 'Mst' OR 'HG_Code" = '82'	*
Clear	Verify Help Load	Save Close

	Attributes of geology				
Г	Geology	LIT Code	HG Code	LIT Legend	
Þ	Qb - Undifferentiated eluvium and alluvium (Undifferentiated eluvium and alluvium)	Qel	82	eluvium	
	Qa - Aluvium (Aluvium)	Qal	82	alluvium	
	Qe - Eluvium (Eluvium)	Qel	82	eluvium	
	Tv - Olivine basalt (Olivine Basalt)	Tvb	84	basaltic volcanic rocks	
	JH - Jerder linestones:Mudstones fossil reef linestones to wackstones, black shales, dolomtic w	Mist	B4	limestone	
	JI2 - Melmel Imestone:Pelletal grainstones, mudstones, alternate beds of wackstones to packston	Mist	84	Imestone	
	Pgs - Quartz-graphite schist with intrecalated minor marble and guartz-sericite schist. (Mormora g	Pm	85	metamorphic rocks	
	Psrp - serpentinite (Adola group)	Pm	BS	metamorphic rocks	
	Pgfm - Quartzofeldspathic mylonite,minor quartzofelspathic, biotte-plagioclase-microcline-quartz	Pm	B5	metamorphic rocks	
	Pgkg - Biotte-plagioclase-K-feldspar-quartz mylonite with subordinate homblende biotte and hom	Pm	85	metamorphic rocks	
1	Prigt - Migmatite (Alghe group)	Pm	B5	metamorphic rocks	
	Ptts - Talc, tremolite-chlorite-talc,chlorite,chlorite-actinolite and actinolite schist (Adola group)	Pm	BS	metamorphic rocks	
	Pbhg - Biotite-homblende gneiss with subordinate biotite, homblende biotite, quartzofeldspathic gn	Pm	85	metamorphic rocks	
Pfgt - syntectonic biotite granite (Syntectonic Biotite granite)			85	intrusive rocks	
Pmp - Metapabrro (Adola group)			BS	metamorphic rocks	
	Pgbs - Quartz-biotte, guartz-sericite and garnet-staurolite-guartz-biotite schist with lenses of chl	Pm	85	metamorphic rocks	
Pcas - Actinolite schiat with subordinate actinolite-guartz epidote schiat (Adola group)			85	metamorphic rocks	
Post - post-tectonic peomatoidal granite (Post-tectonic peomatoidal granite)			BS	intrusive rocks	
Pot - post-tectonic biotte granite (Post-tectonic biotte granite)			85	intrusive rocks	
Pbg - Biotite gneiss with subordinate homblende biotite guartzofeldspathic gneisses and biotite gr			85	metamorphic rocks	
	Pgt - post-tectonic biotite granite (Post-tectonic biotite granite)	Pi	BS	intrusive rocks	
۲				,	
Record: 14 (1) H Show: Al Selected Records (5 out of 21 Selected) Options •					
	MAN ANTINA				



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8. Georeferencing

David Cizek - david.cizek@geology.cz ArcGIS 9.3 - How To...

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Step by step:

- Add the raster dataset that you want to align with your projected data in ArcMap.
- Zoom to area where you will align the raster.
- Display the raster in current view.
- Align the raster with control points.
- Save georeferencing.

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Georeferencing allows you to align a raster dataset to a known coordinate system. Known positions in map coordinates can be identified by a reference layer. For example map sheet layer:



For this case it is better to change the symbology of the reference layer. Click the layer symbol in the table of contents. The Symbol Selector dialog box is displayed. Select the "Hollow" symbol:



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Display only the Hosaina map sheet: Go to layer properties, open the "Definition Query" tab, click "Query Builder..." button. Double-click "MAP_ NAME", then add "=" symbol. Click the "Get Unique Values" button, find out "HOSAINA" and double-click the value to add it to the expression. Your query must looks like this:

Query Builder	9 X
"FID" "MAP" "MAP NAME" "YEAR" "AREA"	1
- <> Like GORE GULH G	•
Is Get Unique Values Ge Te: SELECT FRUM Map Shares WHERE:	
"MAP_NAME" - 'HOSAINK	^
Cear Verfy Help Load OK	Save Cancel

Confirm dialog boxes. Now only the Hosaina map sheet is displayed. Zoom to it.

Image: A image: A

Add the raster dataset to ArcMap. Click the "View" menu, point to "Toolbars" and click "Georeferencing":



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On the "Georeferencing" toolbar select your raster dataset:



Click the "Georeferencing" pop-up menu and select "Fit To Display". Raster will appear in the current map view.



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Before marking control points it is necessary to enable snapping: Start editing, go to "Editor" menu, click "Snapping" and check the "Vertex" check box for the map sheets layer.

Open the "Viewer" window: Click the "Create Viewer Window" icon on the "Tools" toolbar:



In data view use the tool's crosshairs to draw a viewer at upper left corner of raster map:

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Start to add control points: On the "Georeferencing" toolbar click "Add Control Points":



Click at position of map sheet corner in raster (in the "Viewer" window), then click (snap) the corner in vector (in data view).



Close the "Viewer" window and create a new at the upper right map sheet corner in raster (again use "Create Viewer Window" icon). Click the "Add Control Points" and mark second point (first raster then vector). In the same way, add the remaining two points.



On the "Georeferencing" toolbar click the "Georeferencing" pop-up menu and select "Update Georeferencing". This will create additional files to the raster (in the same folder) and your georeferencing is saved.



If a control point was wrongly marked there is a possibility to repair it. On the "Georeferencing" toolbar click the last icon ("View Link Table"). In this table you can delete wrong points and they can be exchanged for new by "Add Control Points" tool.