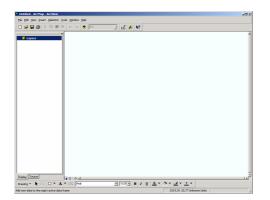
## **PROBLEM 1**

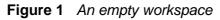
There is some spatial data available you should process using ArcMap in order to emphasize particular areas of interest.

Your first task is to highlight all areas less than 1000 meters away from the next main road.

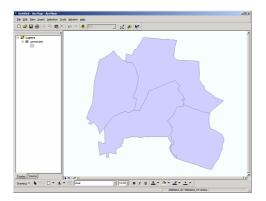
Before actually solving the problem, I had to set up properly the ArcMap workspace that is used all the way through this and the two follow-up problems.

An empty workspace welcomes me with a warm smile  $\ensuremath{\textcircled{\sc o}}$ 

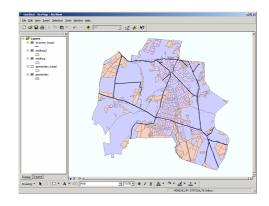




After right-clicking *Layers* in the sidebar on the left side of the window, a menus pops up enabling me to add all five data sets by repeatedly invoking *Add Data*. Then, the map becomes gradually populated by our desired items. Here are two exemplary screenshots:







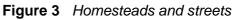


Figure 3 has been slightly modified with the intention of accentuating the streets. I altered their type to *major roads* so they became a bit thicker. All five layers bear German names because the data set has been taken from a German region (I am not sure – it could be a small part of Berlin). ArcMap offers at least two ways to rename a layer: the simplest but not very intuitive one is to select a layer and then clicking it again. Another interesting feature of this program allows one to reorder the layer in the sidebar, especially when the layers are not drawn in the desired order – ArcMap always draws the top-most layer last which may occlude parts of the previous. The result of all the steps mentioned can be seen in Figure 4 on the next page.

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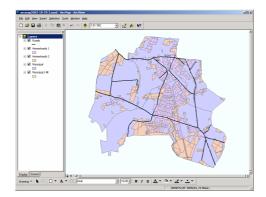


Figure 4 Initial composition of all five layers

The problem statement asks to highlight the region within 1000 meters. Before I can accomplish that aim, I need to define explicitly the metric scale. The *Properties* of *Layers* contain a tab named *General* where I found a drop-down list *Units*:

oata Frame Pi	operties					1×
Labels	Annotation	Extent Recl	angles	Frame	Size a	and Position
General	Data Frame	Coordin	ate System	Illum	ination	Grids
				_		
<u>N</u> ame:	Layers					
Description:				_		
				<u> </u>		
				_		
				<b>Y</b>		
Units				1		
<u>M</u> ap:	Meters		-			
Display:	Unknown Units		-	I		
Reference S	icale: 1 : 0			_		
Rotation:	0			_		
Hotation:	lo.					
Label Engine	ESRI	Label Engine		-		
		Γ	OK	Car	ncel	Apply

Figure 5 Switching to meters

ArcMap is capable of computing and composing buffers. Such a buffer has been created based on the *Roads* layer. Figure 6 to Figure 8 demonstrate the single steps. These dialogs were found in the menu *Tools*  $\rightarrow$  *Buffer Wizard*.

About buffers Buffers are rings drawn around features at a specified distance from the features.	C The graphics in the data frame (Default Annotation Target) (The features of a layer)
	Roads 38 Number of features: 38 Number of features selected: 0 Use only the selected features

Figure 6Tell ArcMap about the layer used

<ul> <li>At a specified distance</li> </ul>	1000	Meters	000
Based on a distance from	an attribute	✓ in Meters	• • •
As multiple buffer rings Number of rings: Distance between rings:	3	- Meters	000
ffer distance	l'		
Distance units are. Mi	xers	<u> </u>	

Figure 7 Distance of 1000 meters

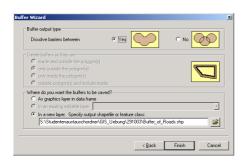
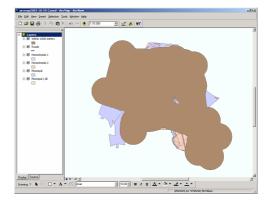


Figure 8 Output a new layer





Even though Figure 9 shows the exact area that is closer than 1000 meters to a road, the visual outcome does not convince me. In my eyes, a more satisfying picture should make a clear distinction between the distances of all the homesteads, too.

What I hate most about mathematics is set theory because of its incredible high level of abstraction. However, set theory helps me this time:

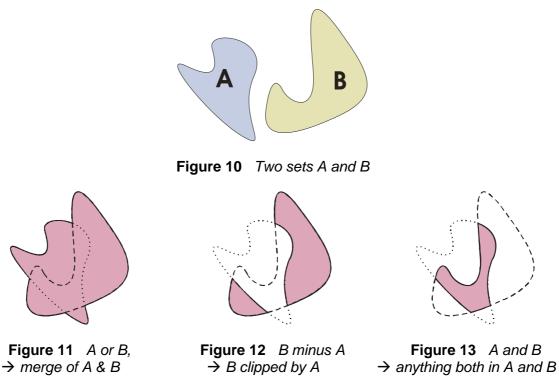


Figure 12 fits my needs if B be the homesteads and A the 1000-meter-buffer. Hence, the *Geoprocessing Wizard*, found in the *Tools* menu, created an intersection of homesteads I and the buffer plus an intersection of homesteads II and the buffer. The screenshots shown in Figure 14 and Figure 15 (see next page) underline the steps taken.

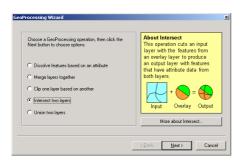
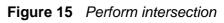
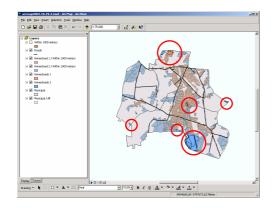


Figure 14 Select intersection

1. Select the input layer to intersect:	About Intersect This operation cuts an input
Homesteads 1	laver with the features from
Use selected features only	an overlay layer to produce
Number of features: 428	an output layer with features
2. Select a polygon overlay layer:	that have attribute data from both layers.
Within 1000 meters	bour rayers.
Use selected features only	
Number of features: 1	
3. Specify the output shapefile or feature class	Input Overlay Output
S:\Studentenaustauschordner\GIS_Uebung\	:[
_	More about Intersect



In addition to both intersections, I played a bit with the colour table because I did not like the colours chosen by the software.



**Figure 16** All homesteads (red circles denote homesteads >1000m)

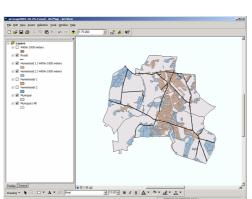


Figure 17 Only homesteads within 1000 m buffer

## PROBLEM 2

The map of Problem 1 contains 4 regions, called A, B, C and D. Shade the map's area to highlight these regions.

At first, I tried many method like intersections, merges etc.. But a friend told me about a quite smart solution which I will present here:

There is a bunch of attributes associated to each layer exposed by *Open Attribute Table* in the context menu of the layer, e.g., the Municipal layer consists of the ones displayed in Figure 18:

Т	FID	Shape*	AK	NAME	REGION	FLAECHE
•	0	Polygon		A	1	14952690,09
Т	1	Polygon		В	1	10433031,09
	2	Polygon		С	1	11009257,86
	3	Polygon		D	1	12292829,81

Figure 18 Attributes of layer Municipal

I immediately inferred from Figure 18 that I have to link attribute *Name* to some colours. The *Properties* in the context menu of the layer *Municipal* are pretty overloaded. After some time, you will find the *Symbology* tab from you should proceed to the *Categories* and then *Unique values*. Once *Name* in the *Value Field* has been selected, *Add All Values* inserts the four regions A, B, C and D into the list of available categories. I decided to overwrite the (randomly chosen ?) default colours by a greyscale. The checkbox *all other values* may be unchecked.

ayer Properties General Source Select	ion Display Symbology Fields	: Definition Query Labels	<u>۲</u> ]. Joins & Relates
Show: Features Categories Unique values Unique values, many I	Draw categories using unic		
Match to symbols in a Quantities Charts Multiple Attributes	Symbol         Value <all other="" values=""> <heading>         A           B         C           D         D</heading></all>	Label <ali other="" values=""> NAME A B C D</ali>	? ? ? ?
	Add All Values Add Values.	<u>R</u> emove <b>Rem</b> o	ove All Advanced*
		OK	Cancel Apply

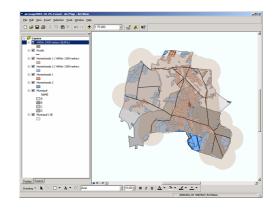
Figure 19 Extracting the regions

## **PROBLEM 3**

In addition to Problem 1 and Problem 2, .create a more satisfying map that removes **all** parts from the map not covered by the 1000 m buffer.

Figure 9 suffered from an insufficient visualization of homesteads within the 1000 m zone. A transparency can be attached to each layer – a value of 70% seems to be rather convincing (you will find the appropriate field in the *Properties*, section *Display*, of the *Buffer* layer).

ayer Properties	
General Source Selection Display Symbology Fields Definition Query Labels Joins & Relates	
Show MapTips (uses primary display field)	
Scale symbols when a reference scale is set	
Transparent: 🛛 🔟 🏂	
Hyperlinks	
Support Hyperlinks using field:	
© Document © URL © Macro: Create	
Feature Exclusion The following features are excluded from drawing:	
Feature ID Id Bestore Drawing	
Restore All	
4	



## Figure 20 Setting transparency to 70%



When intersecting the *Municipal* layer by the buffer and disabling the default *Homestead* layers, the solution looks as expected (Figure 22).

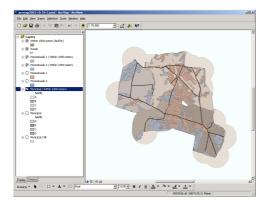


Figure 22 Final map