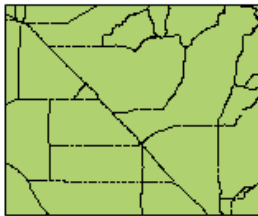
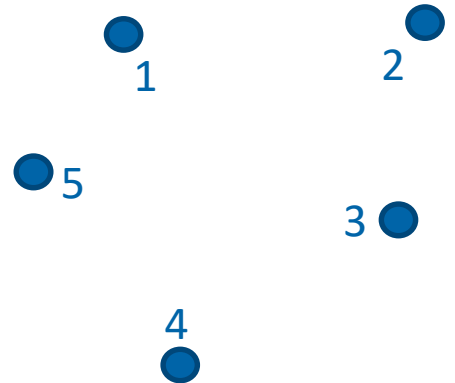
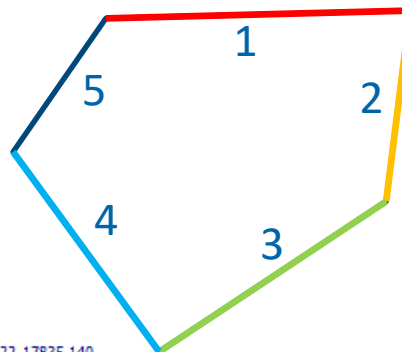
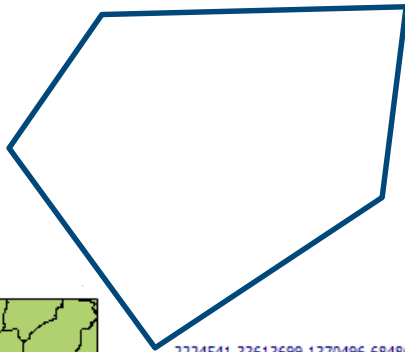
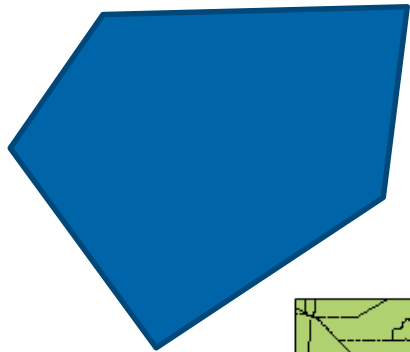


Übung Grundlagen GIS

Selektion, Umwandlung und ASCII Export von *Features*



```
2224541.33613699 1370496.68486305 0022 17835 140
2220135.31311496 1370432.59965421 0023 18892 420
2227341.50786065 1369808.37270419 0021 18685 73
2228319.94093507 1370738.52168905 0020 17250 158
2229829.34338989 1369923.97803480 0019 16598 198
2214911.22397849 1368486.14370611 0084 20685 600
2218233.16495470 1367303.79943394 0024 18506 411
```


Inhalt dieser Übungseinheit

1. Selektion von einzelnen *Features* einer *Feature class*
 - Manuell, interaktiv
 - Über Attribute
 - Über Lagebeziehungen zu anderen *Features*
2. Umwandlung von *Features* in *Features* anderen Typs
3. Geometrie als Attribut
4. ASCII-Export von *Features* / *Attribute Tables*

Vorarbeiten: Laden Sie das ArcMap Projekt „Klingenberg.mxd“ und setzen Sie die Datenquelle aller *Feature Classes* auf die Geo-Database „Klingenberg“.

Selektion: manuell, interaktiv

Interaktiv:  Links-Klick auf *Feature* oder Aufspannen der Selektions-Polygons

Über *Attribute Table*: Links – Klick 

10	Point	1	111947
11	Point	1	113428
12	Point	1	114810

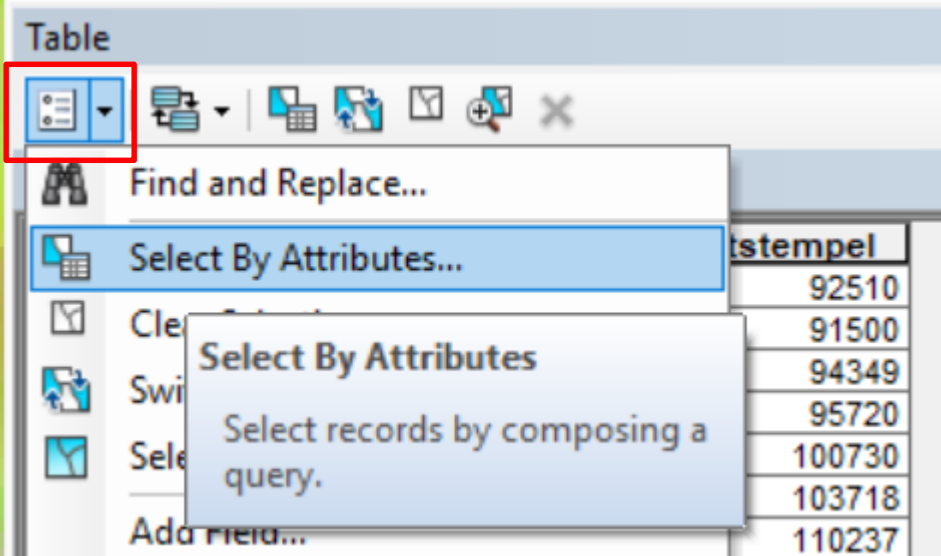
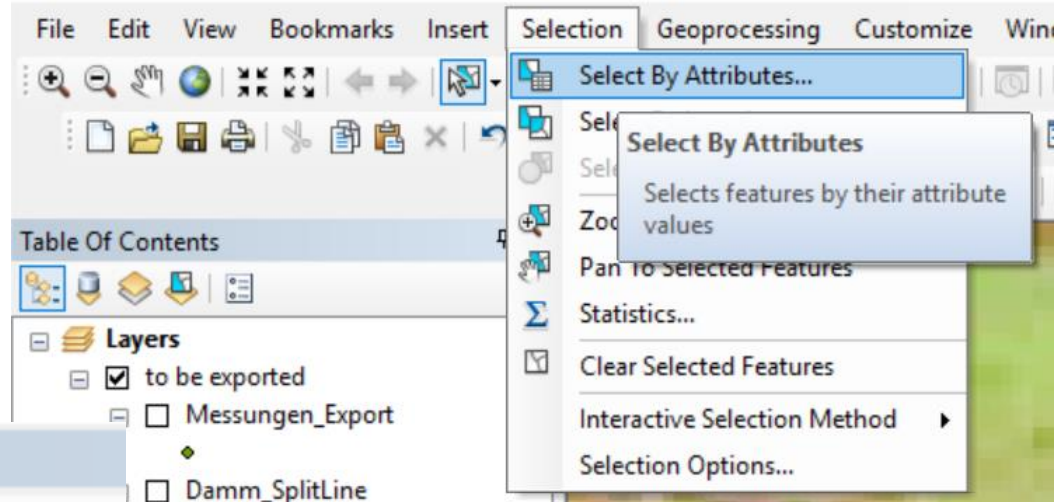
Multi-Selektion: Strg + Neu-Selektion oder Shift + Neu-Selektion

Deselektion: 

Selektion: Attribute

- Über Menü
- *Attribute Table*

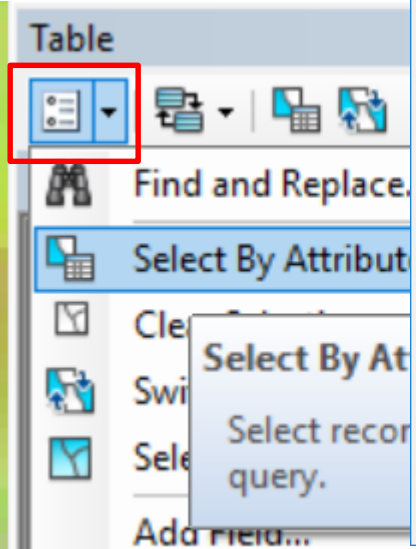
csvExport.mxd - ArcMap



Selektion

- Über M...
- *Attribut*

Table



Find and Replace...

Select By Attribut...

Select By At...

Select recor...

query.

Add field...

Select By Attributes

Layer:

Only show selectable layers in this list

Method:

OBJECTID
OBJECTID_1
Pb_ppm
X

= <> Like

> >= And

< <= Or

_ % () Not

Is In Null Get Unique Values Go To:

SELECT * FROM Messungen WHERE:

Clear Verify Help Load... Save...

OK Apply Close

Selection

Select By Attributes...

Select By Attributes

Selects features by their attribute values

Zoo...

Pan To Selected Features

Statistics...

Clear Selected Features

Interactive Selection Method

Selection Options...

Export


Line



Selektion: Attribute

- *Layer: Selektion aus Feature Class*

Select By Attributes

Layer:  Messungen

Only show selectable layers in this list

Method: Create a new selection

OBJECTID
OBJECTID_1
Pb_ppm
X

= <> Like
> >= And
< <= Or
_ % () Not
Is In Null Get Unique Values Go To:

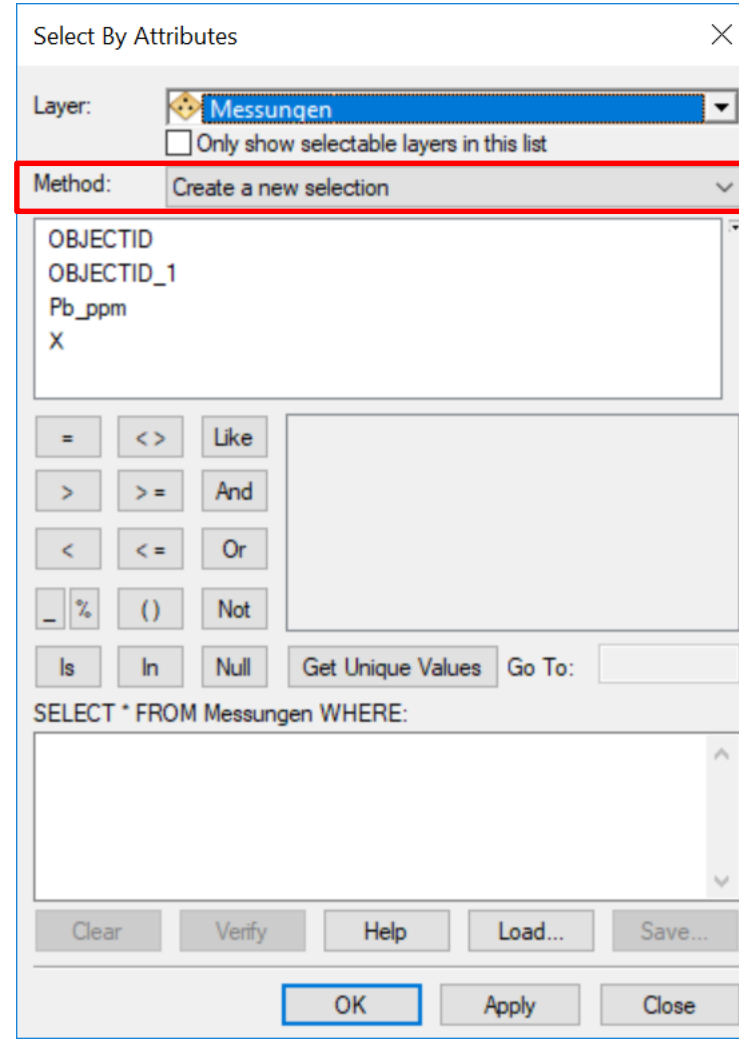
SELECT * FROM Messungen WHERE:

Clear Verify Help Load... Save...


OK Apply Close

Selektion: Attribute

- *Layer: Selektion aus Feature Class*
- *Method:*
 - *Create a new Selection*
 - *Add to current Selection*
 - *Remove from current Selection*
 - *Select from current Selection*



Select By Attributes

Layer:  Messungen

Only show selectable layers in this list

Method: Create a new selection

OBJECTID
OBJECTID_1
Pb_ppm
X

= <> Like
> >= And
< <= Or
_ % () Not
Is In Null Get Unique Values Go To:

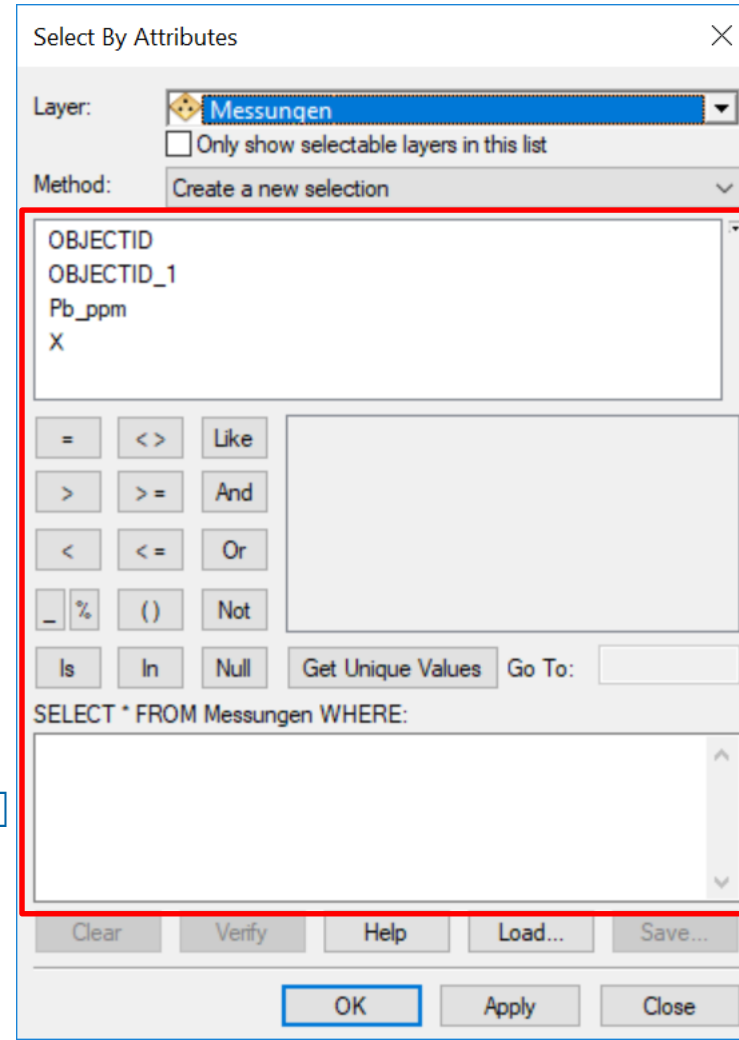
SELECT * FROM Messungen WHERE:

Clear Verify Help Load... Save...

OK Apply Close

Selektion: Attribute

- *Layer: Selektion aus Feature Class*
- *Method:*
 - *Create a new Selection*
 - *Add to current Selection*
 - *Remove from current Selection*
 - *Select from current Selection*
- *Selektionsbedingung*
 - *Attribut Operator Wert*
 - [AND Attribut Operator Wert]*
 - [OR Attribut Operator Wert]*



Select By Attributes

Layer: Only show selectable layers in this list

Method:

OBJECTID
OBJECTID_1
Pb_ppm
X

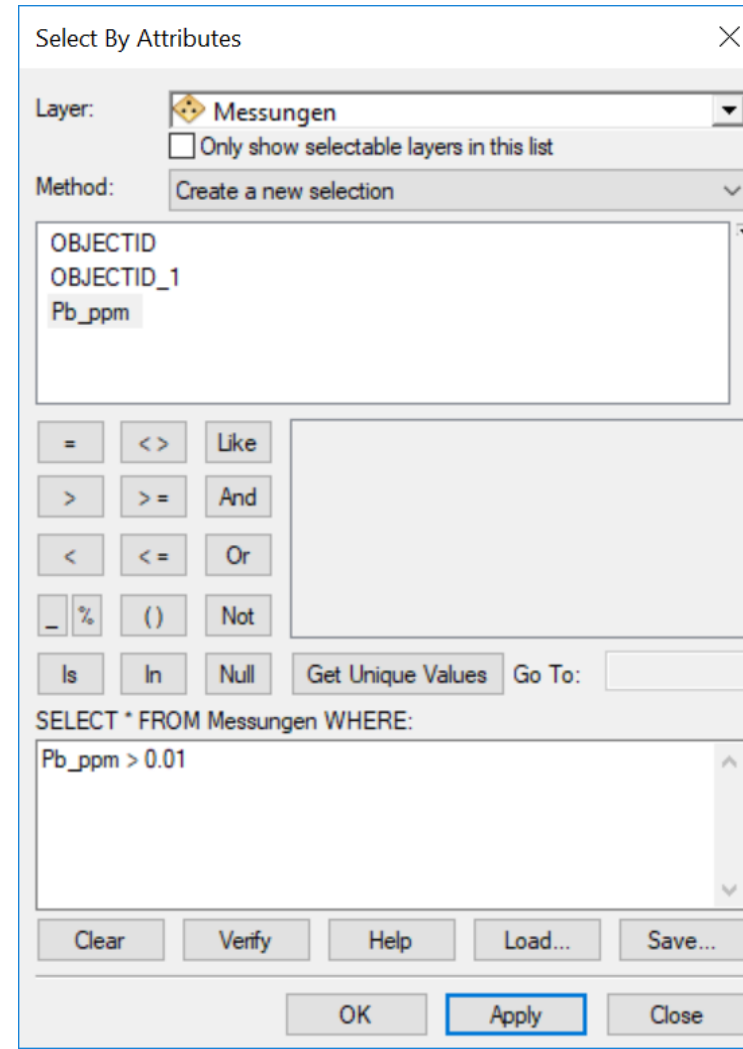
= <> Like
> >= And
< <= Or
_ % () Not
Is In Null Get Unique Values Go To:

SELECT * FROM Messungen WHERE:

Clear Verify Help Load... Save...
OK Apply Close

Selektion: Attribute, Beispiel

1. Punkt *Feature Class* „Messungen“.
2. Selektieren Sie alle Punkte mit Bleiwerten über dem Grenzwert von 0.01 ppm.

The screenshot shows the 'Select By Attributes' dialog box. The 'Layer' dropdown is set to 'Messungen'. The 'Method' dropdown is set to 'Create a new selection'. The attribute list contains 'OBJECTID', 'OBJECTID_1', and 'Pb_ppm', with 'Pb_ppm' selected. The comparison operators are '=', '<>', 'Like', '>', '>=', 'And', '<', '<=', 'Or', '_', '%', '()', and 'Not'. The 'Is', 'In', and 'Null' buttons are also present. The 'Get Unique Values' button and 'Go To:' field are visible. The SQL query 'SELECT * FROM Messungen WHERE: Pb_ppm > 0.01' is displayed in the text area. The 'Clear', 'Verify', 'Help', 'Load...', and 'Save...' buttons are at the bottom. The 'OK', 'Apply', and 'Close' buttons are at the very bottom.

Select

- 1.
- 2.

Table

Messungen

OBJECTID*	Shape*	OBJECTID	Pb_ppm
1	Point Z	1	0,02
2	Point Z	2	0,01
3	Point Z	3	0,015
4	Point Z	4	0,02
5	Point Z	5	0,015
6	Point Z	6	0,008
7	Point Z	7	0,006
8	Point Z	8	0,005
9	Point Z	9	0,01
10	Point Z	10	0,009
11	Point Z	11	0,007
12	Point Z	12	0,011

(5 out of 12 Selected)

Messungen

Select By Attributes

Layer: Only show selectable layers in this list

Method:

OBJECTID
OBJECTID_1
Pb_ppm

= <> Like
> >= And
< <= Or
_ % () Not
Is In Null Get Unique Values Go To:

SELECT * FROM Messungen WHERE:
Pb_ppm > 0.01

Clear Verify Help Load... Save...

OK Apply Close

Selektion: Attribute, Aufgabe

1. Punkt *Feature Class* „Wegpunkte“.
Innerhalb von 2 Tagen wurde die Talsperre Klingenberg zu Fuß umrundet. Dabei wurden zu verschiedenen Zeitpunkten Wegpunkt-Koordinaten aufgezeichnet.
2. Selektieren Sie alle Wegpunkte, die am Vormittag des zweiten Tages aufgezeichnet wurden.

Selekt

1. Pun
Inne
Dab
aufg
2. Sele
aufg

Table

Waypoints

OBJECTID *	SHAPE *	Tag	Zeitstempel
1	Point	1	92510
2	Point	1	91500
5	Point	1	94349
6	Point	1	95720
7	Point	1	100730
8	Point	1	103718
9	Point	1	110237
10	Point	1	111947
11	Point	1	113428
12	Point	1	114810
13	Point	2	160604
14	Point	2	163728
15	Point	2	153710
16	Point	2	151632
17	Point	2	143143
18	Point	2	141416
19	Point	2	135620
20	Point	2	134040
21	Point	2	133109
22	Point	1	123050
23	Point	1	130204
24	Point	2	130428
25	Point	2	125832
26	Point	2	124845
27	Point	2	123439
28	Point	2	122657
29	Point	2	122056
30	Point	1	133745
31	Point	1	141030
32	Point	1	145512
33	Point	1	151020
34	Point	1	151610
35	Point	1	153251
36	Point	1	154323

de

perre Klingenberg zu Fuß umrundet.
 Punkten Wegpunkt-Koordinaten
 im Vormittag des zweiten Tages

Selekt

1. Pu
Inn
wu
2. Se
au

OBJECTID*	SHAPE*	Tag	Zeitstempel
17	Point	2	143143
18	Point	2	141416
19	Point	2	135620
20	Point	2	134040
21	Point	2	133109
22	Point	1	123050
23	Point	1	130204
24	Point	2	130428
25	Point	2	125532
26	Point	2	124845
27	Point	2	123439
28	Point	2	122657
29	Point	2	122056
30	Point	1	133745
31	Point	1	141030
32	Point	1	145512
33	Point	1	151020
34	Point	1	151610
35	Point	1	153251
36	Point	1	154323
37	Point	1	161256
38	Point	1	163709
39	Point	1	165039
40	Point	1	170437
41	Point	2	112856
42	Point	2	111500
43	Point	2	113844
44	Point	2	114923
45	Point	2	120406

(4 out of 43 Selected)

Select by Attributes

Enter a WHERE clause to select records in the table window.

Method: Create a new selection

OBJECTID
Tag
Zeitstempel

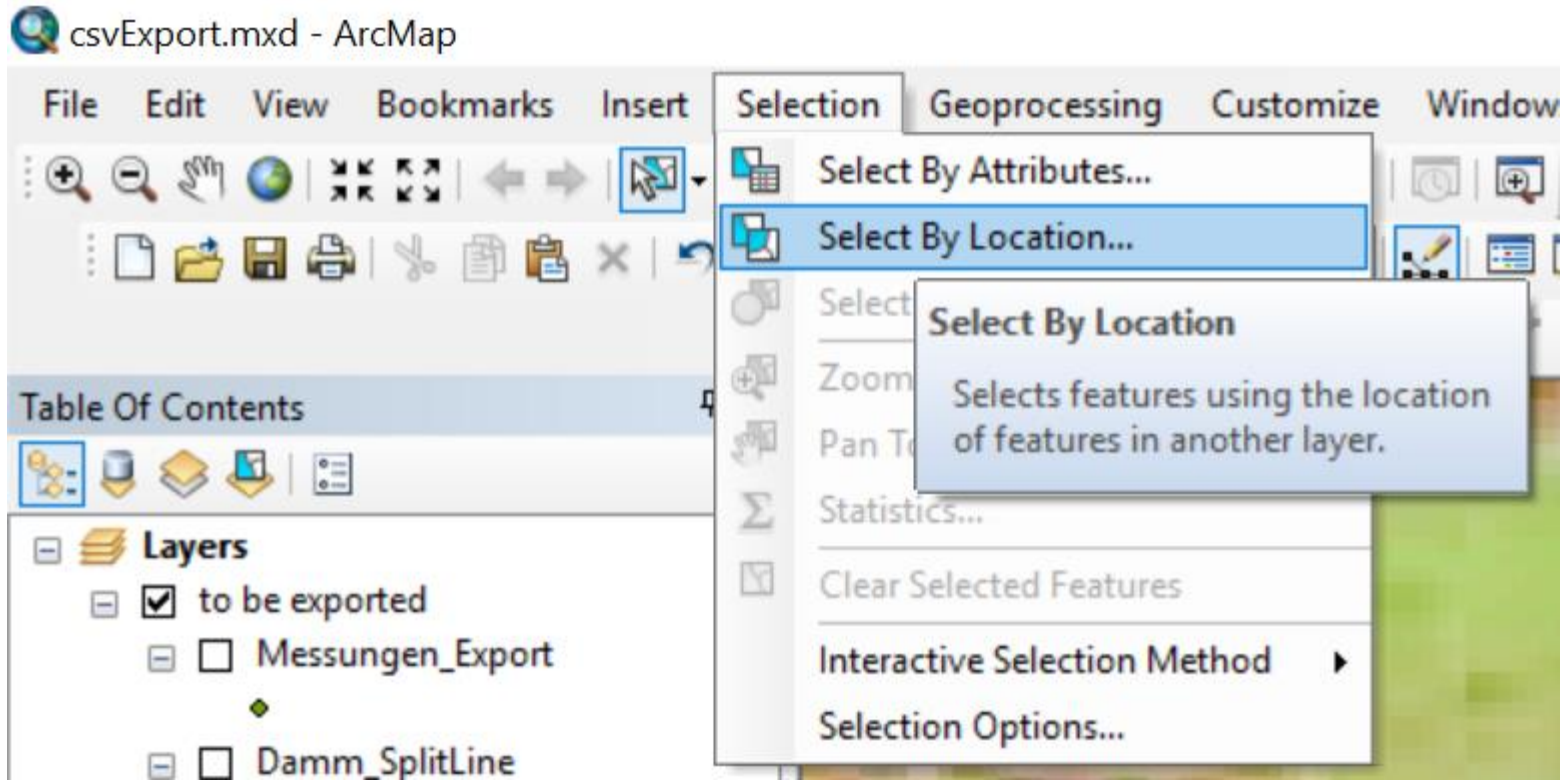
= <> Like
> >= And
< <= Or
_ % () Not
Is In Null Get Unique Values Go To:

SELECT * FROM Waypoints WHERE:
Tag =2 AND Zeitstempel <120000

Clear Verify Help Load... Save...
Apply Close

endet. Dabei
ngezeichnet.
Tages

Selektion: Lagebeziehungen



The screenshot shows the ArcMap interface with the 'Selection' menu open. The 'Select By Location...' option is highlighted, and a tooltip is displayed over it. The tooltip text reads: 'Select By Location' followed by 'Selects features using the location of features in another layer.' The background shows the 'Table Of Contents' panel with a layer named 'to be exported' checked, and other layers like 'Messungen_Export' and 'Damm_SplitLine' unchecked.

csvExport.mxd - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Window

Select By Attributes...
Select By Location...
Select...
Zoom...
Pan To...
Statistics...
Clear Selected Features
Interactive Selection Method ▶
Selection Options...

Select By Location
Selects features using the location of features in another layer.

Table Of Contents

Layers

- to be exported
- Messungen_Export
- Damm_SplitLine

Selektion: Lagebeziehungen

- *Selection method:*
 - *select features from*
 - *add to currently selected features in*
 - *remove from currently selected features in*
 - *Select from currently selected features in*

Select By Location ✕

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:
select features from ▼

Target layer(s):

- to be exported
- Messungen
- Waypoints
- Waypoint_Path
- Talsperre_PolygonToLine_Spli
- Talsperre_PolygonToLine
- features
- original data

Only show selectable layers in this list

Source layer:
Talsperre ▼

Use selected features (0 features selected)

Spatial selection method for target layer feature(s):
are within a distance of the source layer feature ▼

Apply a search distance
300,000000 Meters ▼

[About select by location](#) OK Apply Close

Selektion: Lagebeziehungen

- *Selection method:*
 - *select features from*
 - *add to currently selected features in*
 - *remove from currently selected features in*
 - *Select from currently selected features in*
- *Target layer(s): Feature Classes für zu selektierende Features*

Select By Location

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:
select features from

Target layer(s):

- to be exported
- Messungen
- Waypoints
- Waypoint_Path
- Talsperre_PolygonToLine_Spli
- Talsperre_PolygonToLine
- features
- original data

Only show selectable layers in this list

Source layer:
Talsperre

Use selected features (0 features selected)

Spatial selection method for target layer feature(s):
are within a distance of the source layer feature

Apply a search distance
300,000000 Meters

[About select by location](#)

Selektion: Lagebeziehungen

- *Selection method:*
 - *select features from*
 - *add to currently selected features in*
 - *remove from currently selected features in*
 - *Select from currently selected features in*
- *Target layer(s): Feature Classes für zu selektierende Features*
- *Source layer: Referenzlayer für Lagebeziehung*

Select By Location

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:
select features from

Target layer(s):

- to be exported
- Messungen
- Waypoints
- Waypoint_Path
- Talsperre_PolygonToLine_Spli
- Talsperre_PolygonToLine
- features
- original data

Only show selectable layers in this list

Source layer:
Talsperre

Use selected features (0 features selected)

Spatial selection method for target layer feature(s):
are within a distance of the source layer feature

Apply a search distance
300,000000 Meters

[About select by location](#)

Selektion: Lagebeziehungen

- *Spatial selection method for target layer feature(s): Lagebeziehung*
 - *Intersect with source layer feature*
 - *Are within a distance to source layer feature*
 - *Contains the source layer feature*
 - *Are within the source layer feature*
 - *Touch the boundary of source layer feature*
 - ...

Select By Location

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:
select features from

Target layer(s):

- to be exported
- Messungen
- Waypoints
- Waypoint_Path
- Talsperre_PolygonToLine_Spli
- Talsperre_PolygonToLine
- features
- original data

Only show selectable layers in this list

Source layer:
Talsperre

Use selected features (0 features selected)

Spatial selection method for target layer feature(s):
are within a distance of the source layer feature

Apply a search distance
300,000000 Meters

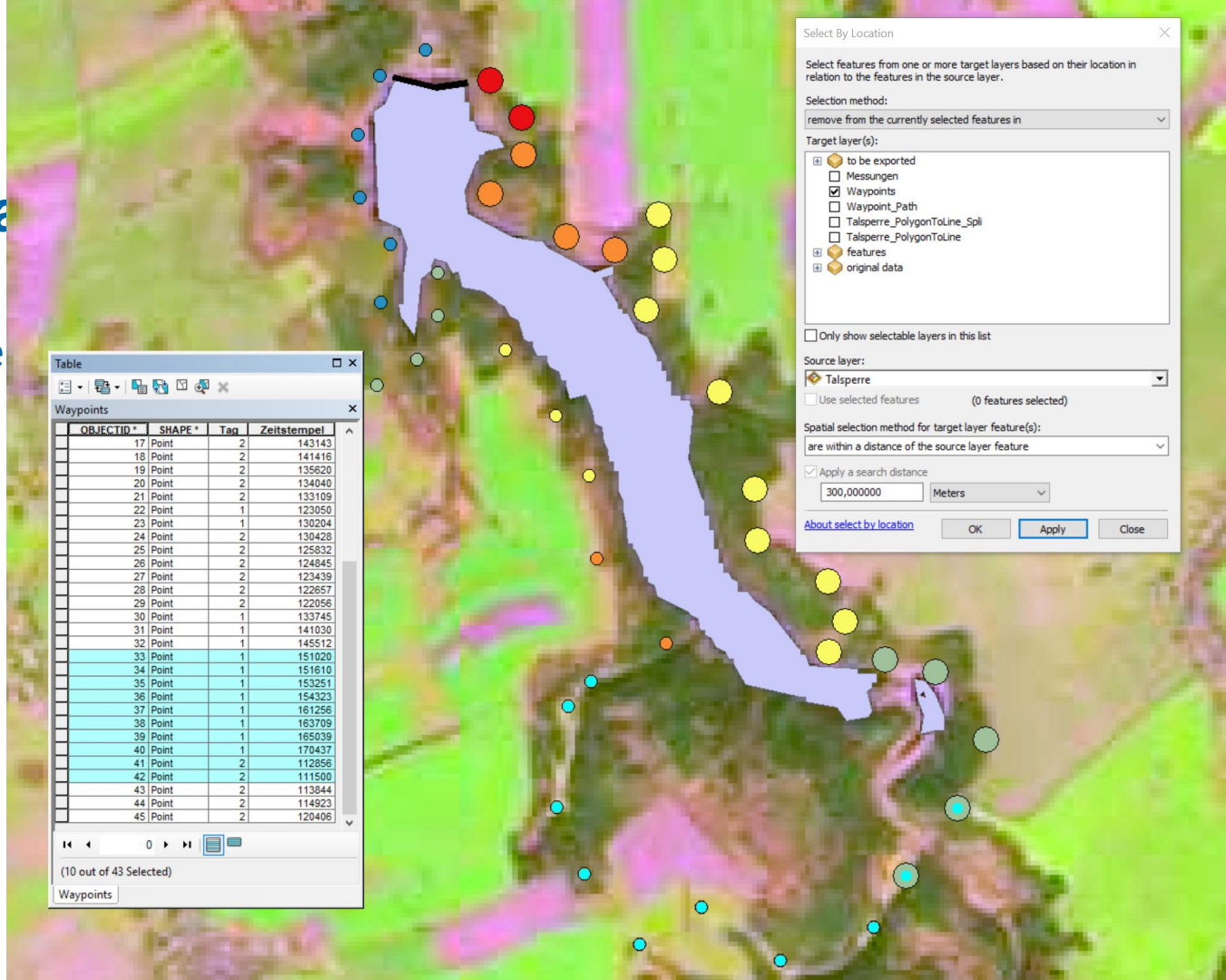
[About select by location](#)

Selektion: Lagebeziehungen, Aufgabe

- Selektieren Sie alle Wegpunkte, die sich weiter als 300 m von der Talsperre entfernt befinden.

Selektion: La

- Selektieren Sie der Talsperren



OBJECTID *	SHAPE *	Tag	Zeitstempel
17	Point	2	143143
18	Point	2	141416
19	Point	2	135620
20	Point	2	134040
21	Point	2	133109
22	Point	1	123050
23	Point	1	130204
24	Point	2	130428
25	Point	2	125832
26	Point	2	124845
27	Point	2	123439
28	Point	2	122857
29	Point	2	122056
30	Point	1	133745
31	Point	1	141030
32	Point	1	145512
33	Point	1	151020
34	Point	1	151610
35	Point	1	153251
36	Point	1	154323
37	Point	1	161256
38	Point	1	163709
39	Point	1	165039
40	Point	1	170437
41	Point	2	112856
42	Point	2	111500
43	Point	2	113844
44	Point	2	114923
45	Point	2	120406

(10 out of 43 Selected)

Select By Location

Select features from one or more target layers based on their location in relation to the features in the source layer.

Selection method:
remove from the currently selected features in

Target layer(s):

- to be exported
- Messungen
- Waypoints
- Waypoint_Path
- Talsperre_PolygonToLine_Spli
- Talsperre_PolygonToLine
- features
- original data

Only show selectable layers in this list

Source layer:
Talsperre (0 features selected)

Use selected features

Spatial selection method for target layer feature(s):
are within a distance of the source layer feature

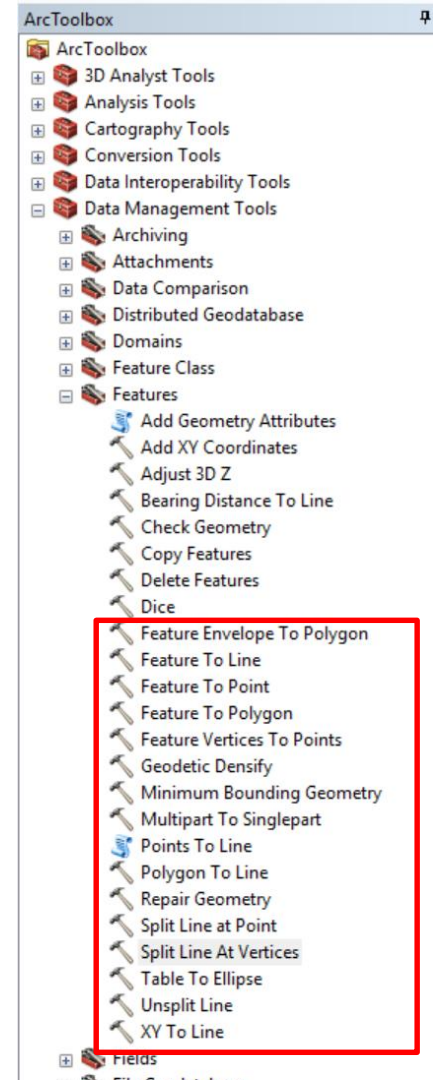
Apply a search distance
300,000000 Meters

[About select by location](#)

Umwandlung von *Feature Classes* ...

Data Management Tools > Features

- Bearbeitung von *Features*, Validierung von Geometrien
- **Umwandlung** von *Features* in neue *Feature Classes*, z.B.
 - Punkt *Features* zu Linien *Features*
 - *Features* zu Polygonen
 - Polygone zu Linien
 - ...
- Vorhandene Felder im *Attribute Table* werden meist bei der Umwandlung übernommen/kopiert



Beispiel: Punkte in Linien umwandeln

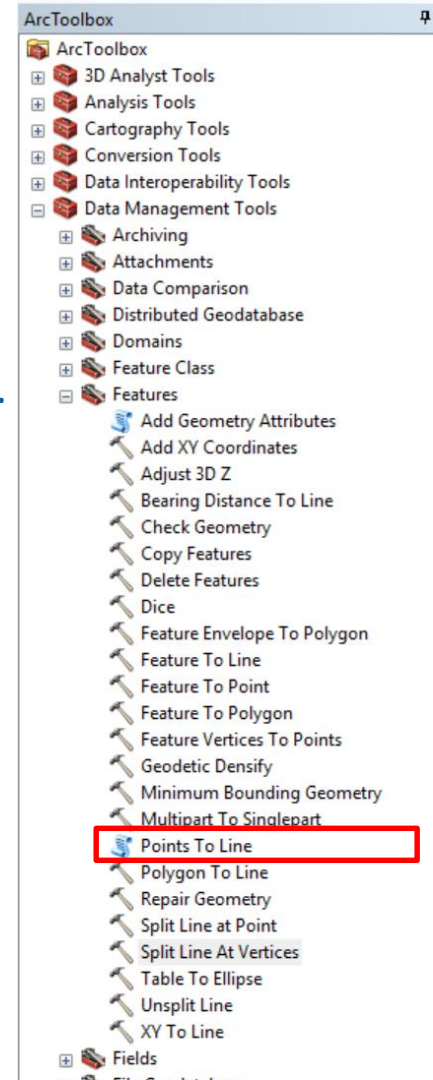
Automatische Alternative zu manueller Neuerstellung von Linien.

Relevante Felder in der Punkt *Feature Class*

- *Line Field*: Definiert die Zugehörigkeit zu Einzellinie
- *Sort Field*: Punktreihenfolge in Einzellinie (optional)



<http://desktop.arcgis.com/de/arcmap/latest/tools/data-management-toolbox/points-to-line.htm>



Aufgabe

Innerhalb von 2 Tagen wurde die Talsperre Klingenberg zu Fuß umrundet. Dabei wurden zu verschiedenen Zeitpunkten Wegpunkt-Koordinaten aufgezeichnet. Welche Wegstrecke wurde pro Tag zurückgelegt?

1. Punkt *Feature Class* „Wegpunkte“.



Aufgabe

Innerhalb
Klingentals
verschiedene
aufgezeigte
zurückge
1. Punkt

OBJECTID *	SHAPE *	Tag	Zeitstempel
1	Point	1	92510
2	Point	1	91500
5	Point	1	94349
6	Point	1	95720
7	Point	1	100730
8	Point	1	103718
9	Point	1	110237
10	Point	1	111947
11	Point	1	113428
12	Point	1	114810
13	Point	2	160604
14	Point	2	163728
15	Point	2	153710
16	Point	2	151632
17	Point	2	143143
18	Point	2	141416
19	Point	2	135620
20	Point	2	134040
21	Point	2	133109
22	Point	1	123050
23	Point	1	130204
24	Point	2	130428
25	Point	2	125832
26	Point	2	124845
27	Point	2	123439
28	Point	2	122657
29	Point	2	122056
30	Point	1	133745
31	Point	1	141030
32	Point	1	145512
33	Point	1	151020
34	Point	1	151610
35	Point	1	153251
36	Point	1	154323

e
den zu
ordinaten
pro Tag



Aufgabe

Innerhalb von 2 Tagen wurde die Talsperre Klingenberg zu Fuß umrundet. Dabei wurden zu verschiedenen Zeitpunkten Wegpunkt-Koordinaten aufgezeichnet. Welche Wegstrecke wurde pro Tag zurückgelegt?

1. Punkt *Feature Class* „Wegpunkte“.

Hinweis: ArcGIS berechnet die Länge von Linien *Features* in einer Geo-Database „on-the-fly“ als Feld im *Attribute Table*.



Aufgabe

Innerhalb von 2 Tagen wurde die Talsperre

Table

Waypoint_Path

OBJECTID *	Shape *	Shape Length	Tag
1	Polyline	6706,759969	1
2	Polyline	5027,103986	2

Waypoint_Path

en g
feld



Berechnung von Geometrieinformationen als Attribut

Warum?

- *Shape* Feld im *Attribute Table* für *Feature Classes* „codiert“ Geometrie und interne Topologie; erlaubt aber keinen direkten Zugriff

Lösung:

- Übertragung einzelner Geometrieinformationen in neue Felder im *Attribute Table*
- Funktion: *Calculate Geometry*

Berechnung von Geometrie ... Achtung!

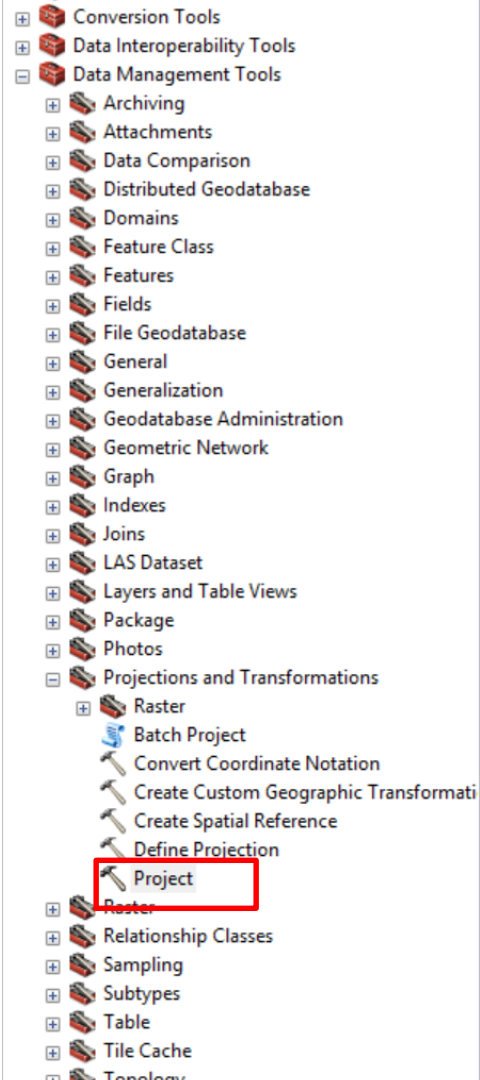
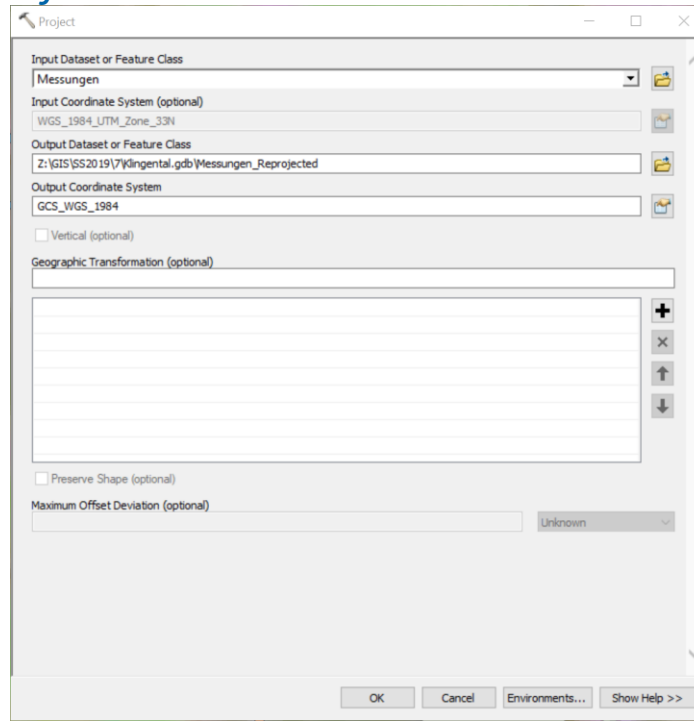
Feature Geometrie ist an Spatial Reference der Feature Class gebunden.

Ist Spatial Reference korrekt?

Wenn nicht :

➤ *Data Management Tools > Projections and Transformation > Project*

➤ **Hinweis:** Projektionen können fehlerbehaftet sein!



Berechnung von Geometrieinformationen als Attribut

- *Open Attribute Table ...*
- *Add Field* (Benennen und Datentyp Double oder Float)
- Rechts-Klick auf neu angelegtes Feld (Spalte)
 - *Calculate Geometry ...*

Calculate Geometry ✕

Property: X Coordinate of Point

Coordinate System

Use coordinate system of the data source:
PCS: WGS 1984 UTM Zone 33N

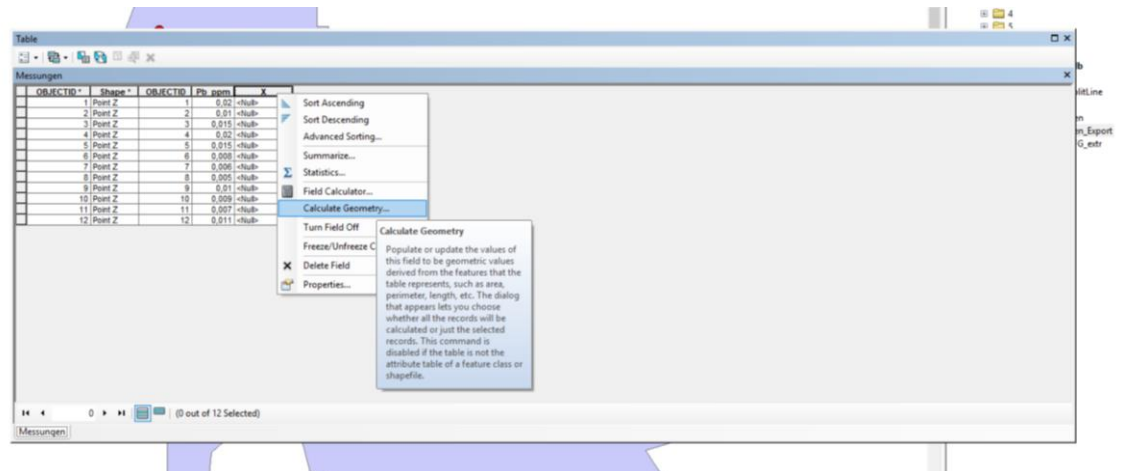
Use coordinate system of the data frame:
PCS: WGS 1984 UTM Zone 33N

Units: Meters [m]

Calculate selected records only

[About calculating geometry](#)

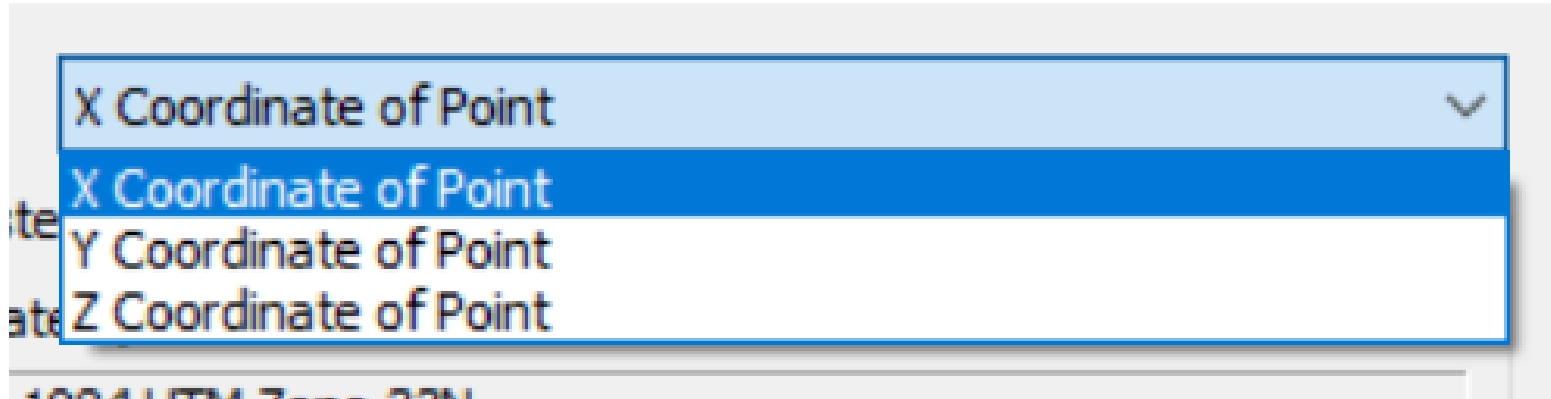
OK
Cancel



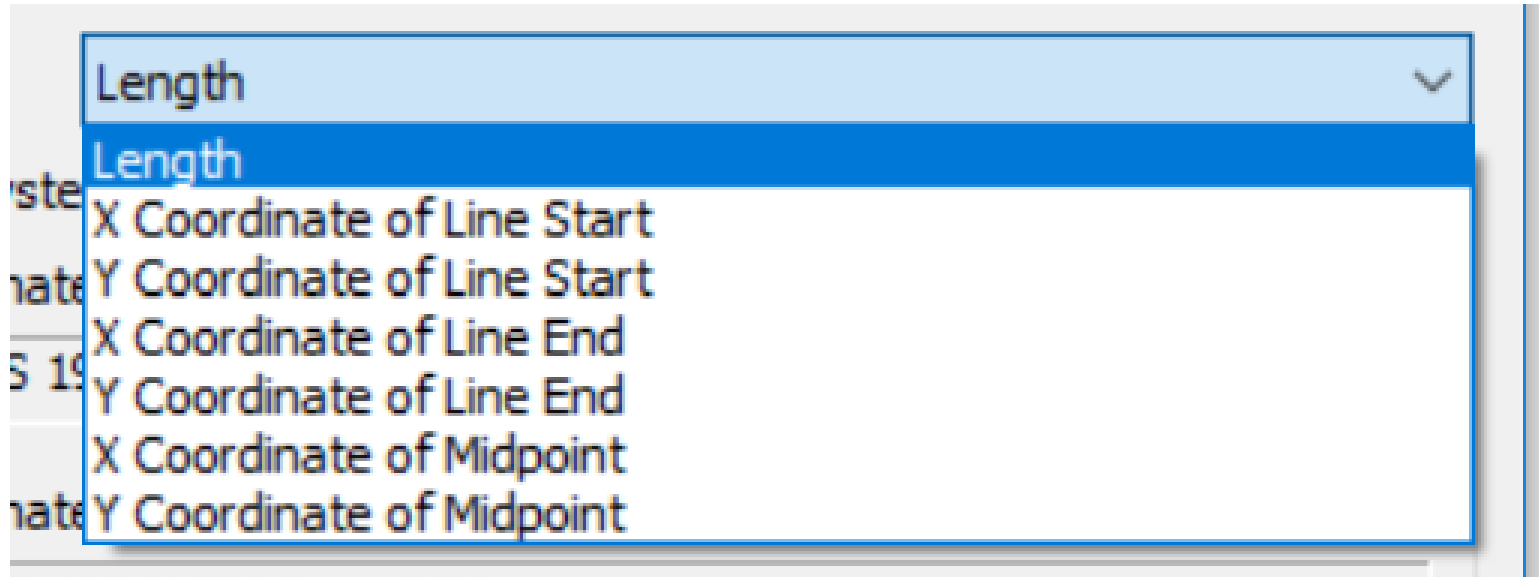
The screenshot shows the 'Attribute Table' window in ArcGIS. The table contains 12 rows of data with columns: OBJECTID, Shape, OBJECTID, Pn, ppm, and X. The 'X' column is selected, and a context menu is open over it. The 'Calculate Geometry...' option is highlighted. A tooltip for 'Calculate Geometry' is visible, explaining that it populates or updates the values of the selected field with geometric values like area, perimeter, or length.

OBJECTID	Shape	OBJECTID	Pn	ppm	X
1	Point Z	1	0,01	+Hub	
2	Point Z	2	0,01	+Hub	
3	Point Z	3	0,015	+Hub	
4	Point Z	4	0,02	+Hub	
5	Point Z	5	0,015	+Hub	
6	Point Z	6	0,050	+Hub	
7	Point Z	7	0,050	+Hub	
8	Point Z	8	0,005	+Hub	
9	Point Z	9	0,01	+Hub	
10	Point Z	10	0,050	+Hub	
11	Point Z	11	0,007	+Hub	
12	Point Z	12	0,011	+Hub	

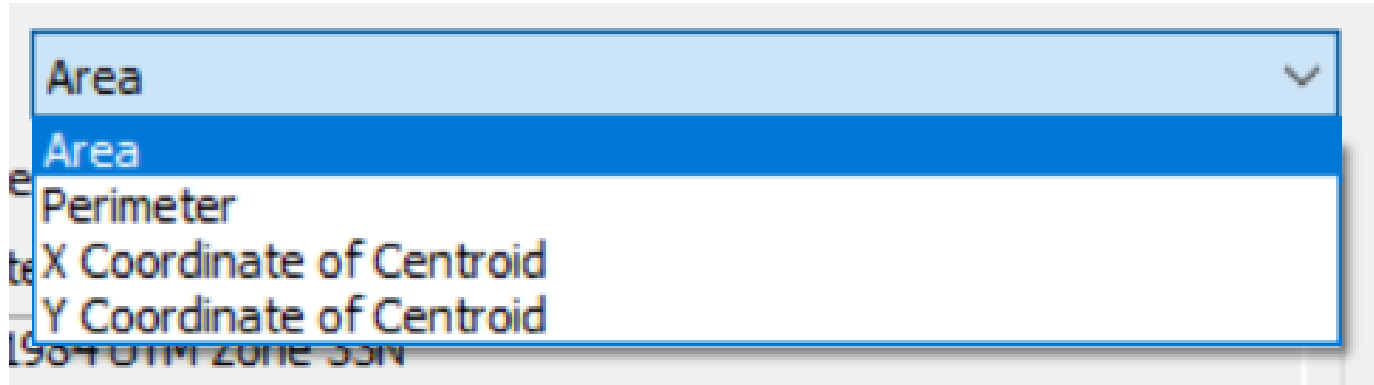
Calculate Geometry ... Punkt Features



Calculate Geometry ... Line Features



Calculate Geometry ... Polygon Features



Calculate Geometry ...

Calculate Geometry ... erlaubt Berechnung/Ausgabe von

- Punkte: Koordinaten (X, Y, Z)
- Linie: Start-, Mittel- und End-Punktkoordinaten (X, Y), Linienlänge
- Polygon: Umfang, Fläche, Koordinate des Centroids (X, Y)

Calculate Geometry ... bietet keine Möglichkeit zur Ausgabe von

- Aller Knotengeometrien von Linien oder Polygonfeatures
- Knotensequenzen

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Calculate Geometry ... bietet keine Möglichkeit zur Ausgabe von

- Aller Knotengeometrien von Linien oder Polygonfeatures
- Knotensequenzen
- **Lösung: Umwandlung von Polylinien und Polygonen in Gruppen von einzelnen Liniensegmenten oder separater Punkte!**

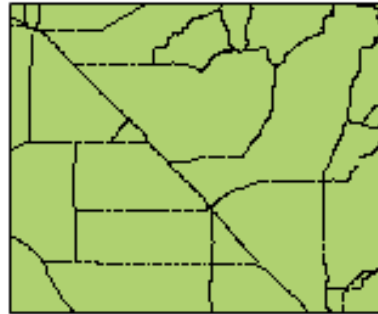
Feature ASCII Export

Warum?

- ...
- ...

Was wird benötigt?

- ...
- ...
- ...



```
2224541.33613699 1370496.68486305 0022 17835 140
2220135.31311496 1370432.59965421 0023 18892 420
2227341.50786065 1369808.37270419 0021 18685 73
2228319.94093507 1370738.52168905 0020 17250 158
2229829.34338989 1369923.97803480 0019 16598 198
2214911.22397849 1368486.14370611 0084 20685 600
2218233.16495470 1367303.79943394 0024 18506 411
```

Feature ASCII Export

Warum?

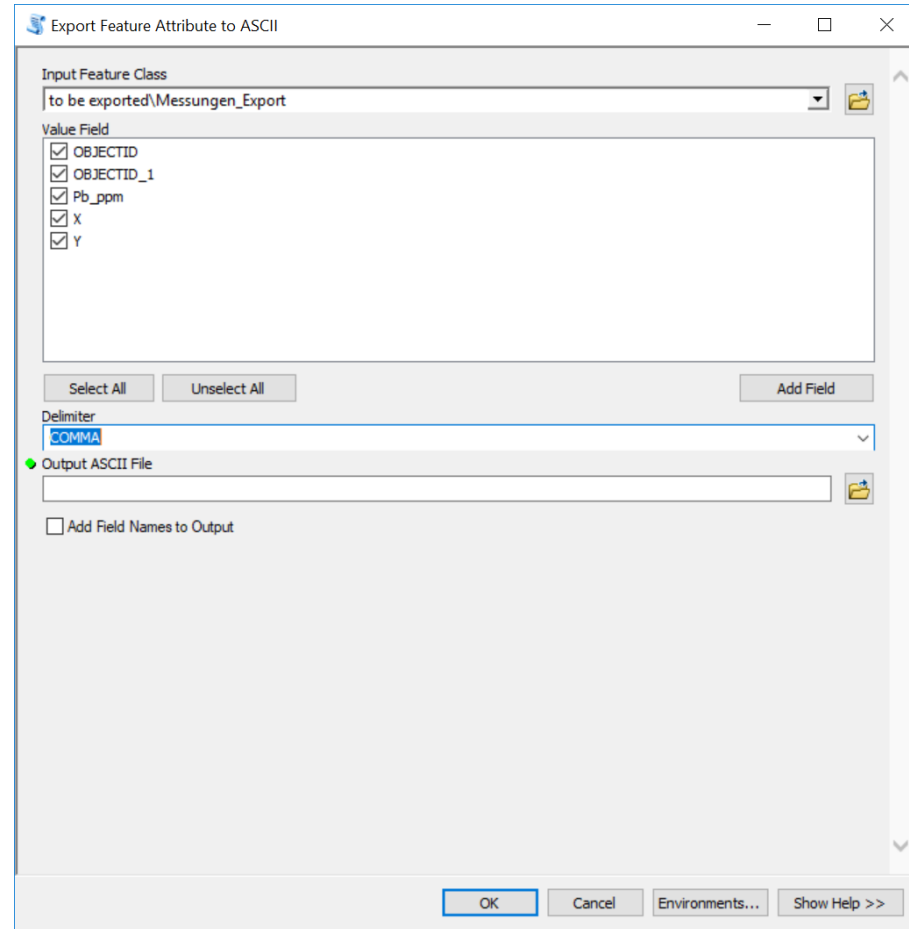
- Features können die Grundlage für externe Arbeiten bilden.
- Oft ist der Export als *Shapefile* nicht ausreichend und der Export als einfache strukturierte Textdateien (.csv) notwendig.
 - Diese lassen sich leicht in beliebige Software importieren und mittels Programmiersprachen lesen und bearbeiten.

Was wird benötigt?

- Attribute
- Geometrie der Vertices
- Vertex-Sequenzen für Linien, Polylinien und Polygone

Export Attribute Table als ASCII Datei

- *Spatial Statistics Tools > Utilities > Export Feature Attributes to ASCII*



Aufgabe

Bereiten Sie die beiden Polygone für die Talsperre so auf, dass Ihre Fläche mit Matlab/Python/... berechnet werden kann, ohne das auf externe Funktionen zum Shapefile-Import zurückgegriffen werden muss.

- Erstellen Sie eine Tabelle/*Attribute Table* der alle notwendigen Daten enthält, um die Polygone extern repräsentieren zu können.
- Exportieren Sie die Tabelle als strukturierte ASCII-Datei.



Siehe auch

- <http://desktop.arcgis.com/de/arcmap/10.6/map/working-with-layers/using-select-by-attributes.htm>
- <http://desktop.arcgis.com/de/arcmap/10.6/map/working-with-layers/using-select-by-location.htm>
- <http://desktop.arcgis.com/de/arcmap/latest/tools/data-management-toolbox/an-overview-of-the-features-toolset.htm>
- <http://desktop.arcgis.com/de/arcmap/latest/tools/data-management-toolbox/points-to-line.htm>
- <http://desktop.arcgis.com/de/arcmap/10.6/manage-data/tables/calculating-area-length-and-other-geometric-properties.htm>
- <http://desktop.arcgis.com/de/arcmap/10.6/tools/spatial-statistics-toolbox/export-feature-attribute-to-ascii.htm>