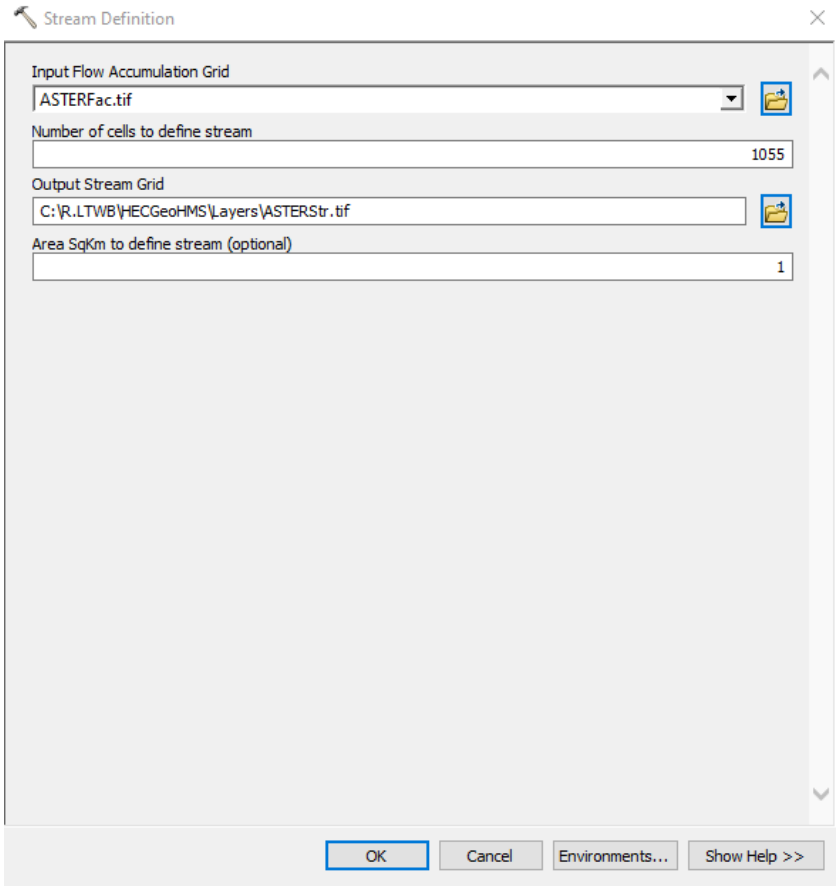
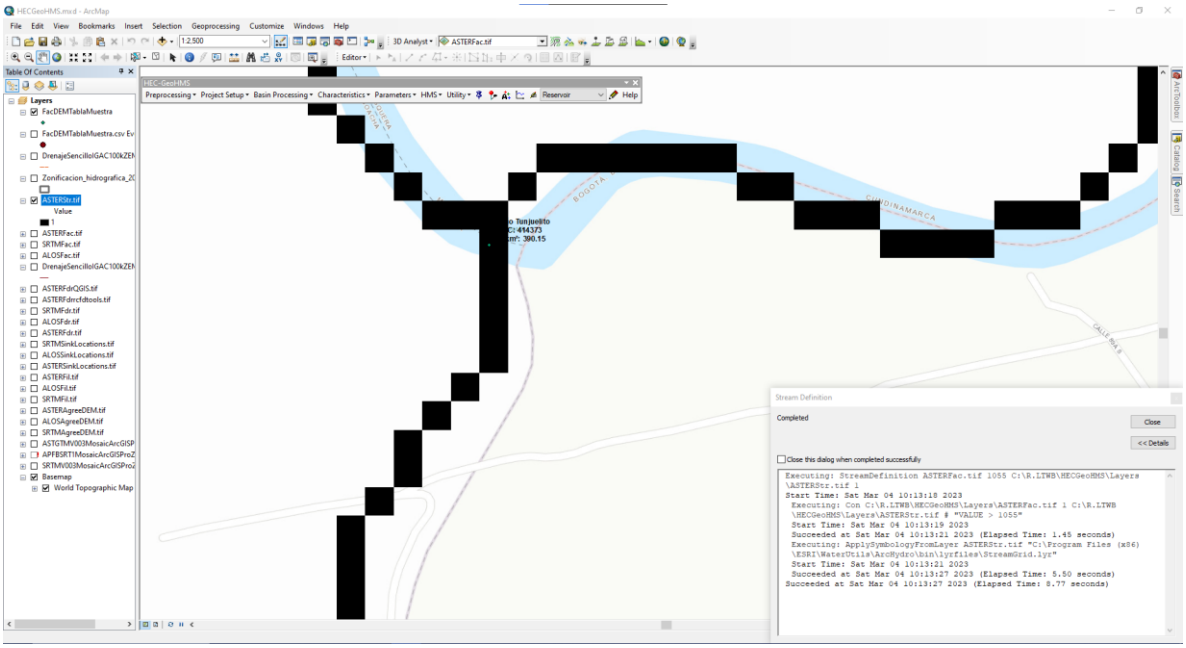
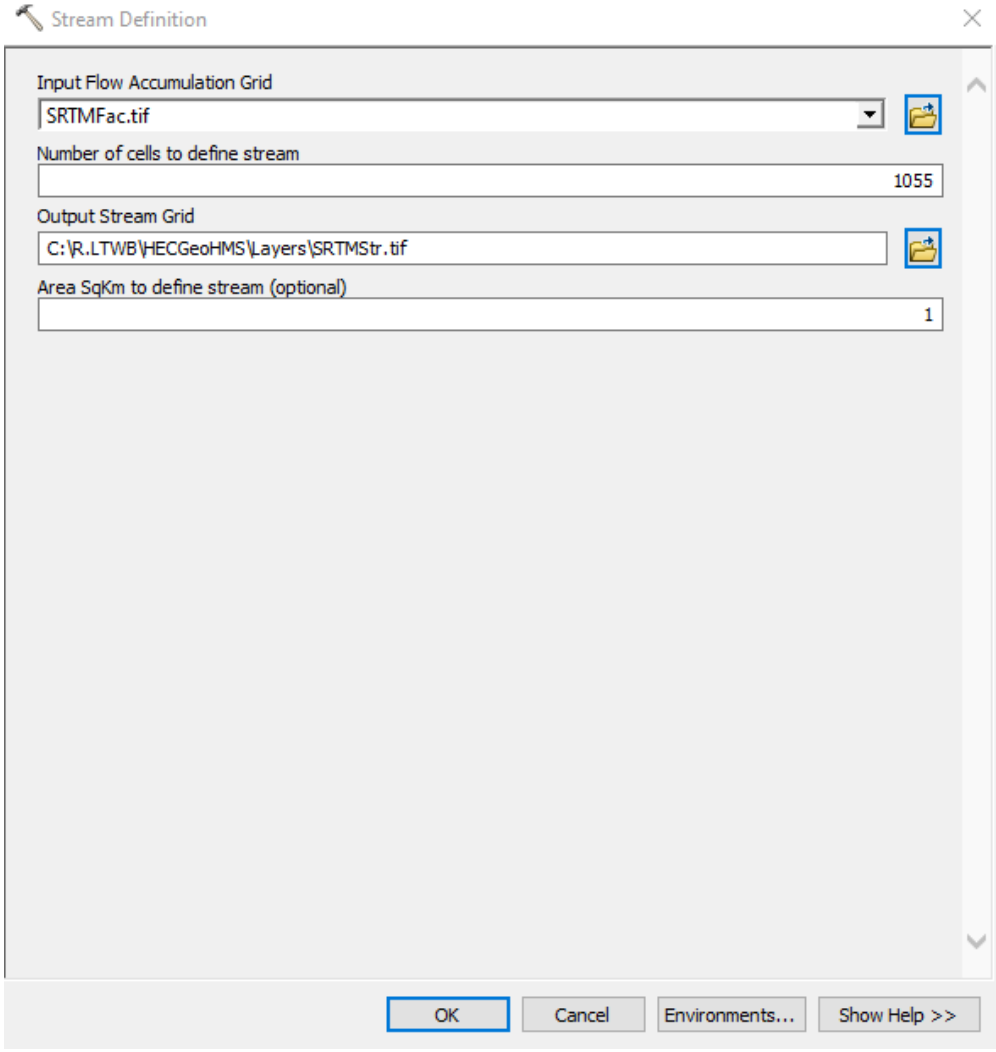
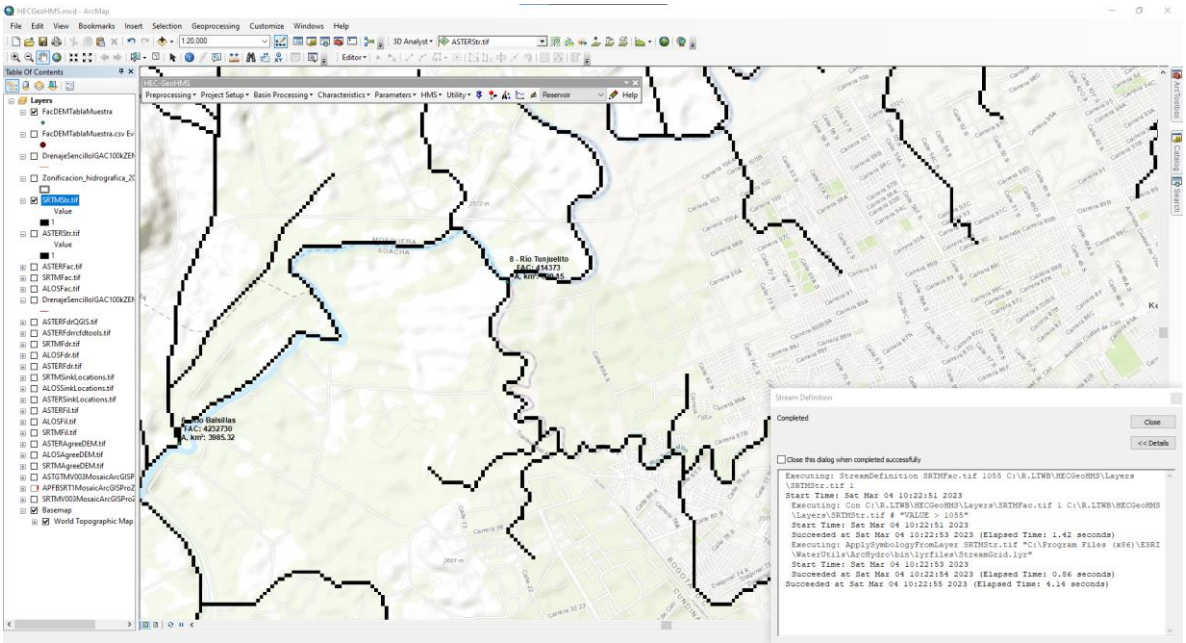
SECTION 02-STRDEM, CURSO LTWB

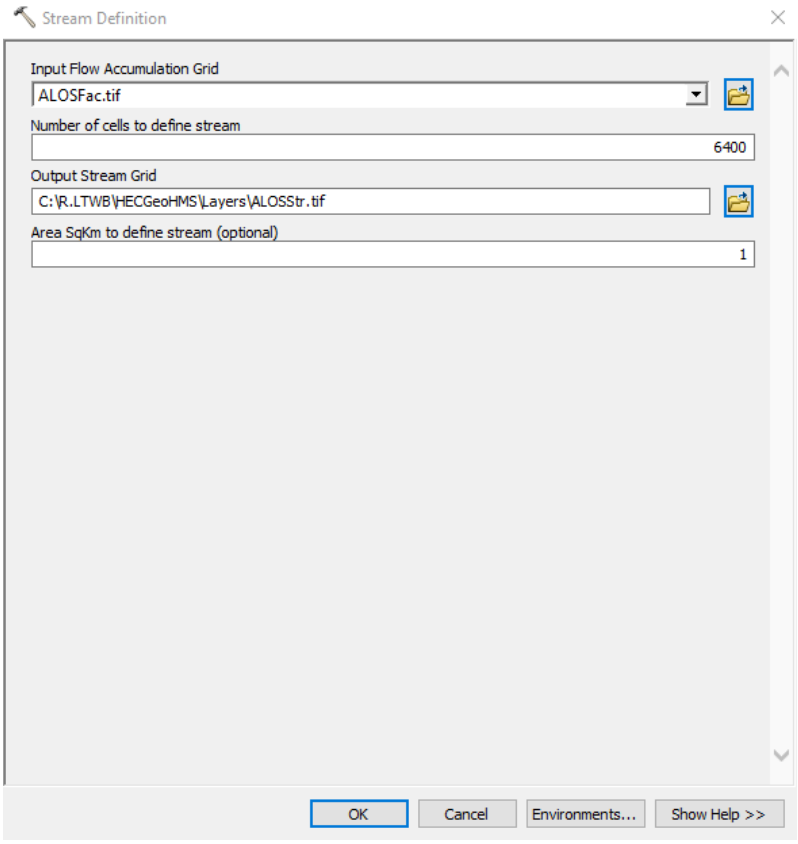
Herramienta Stream Definition

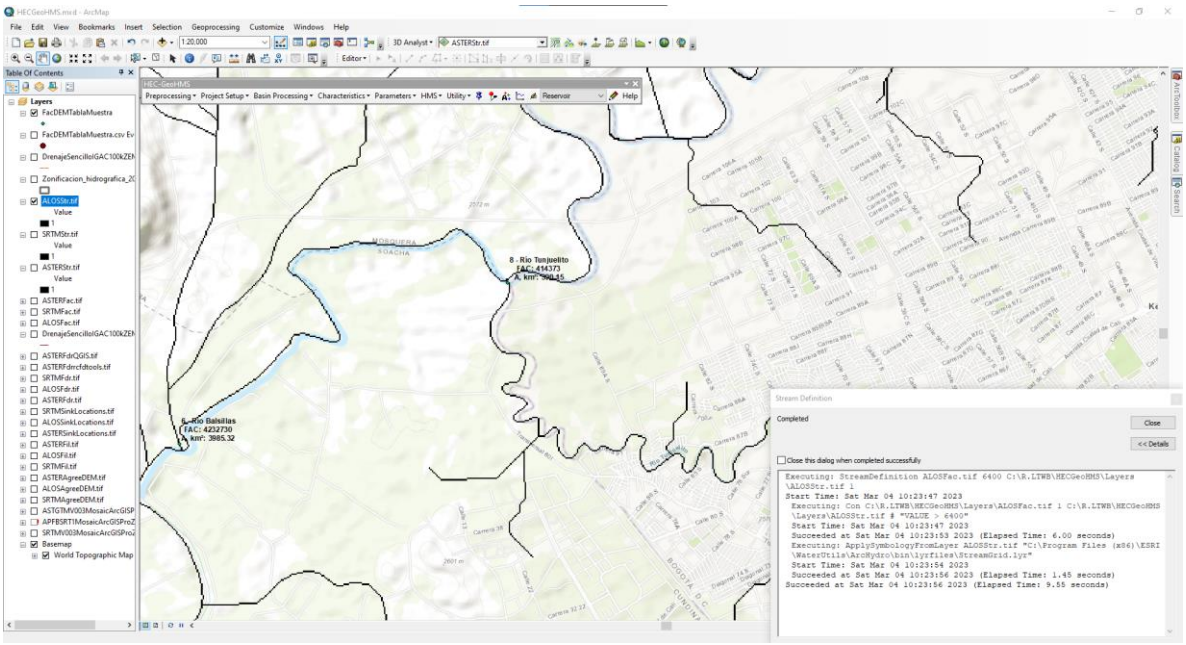




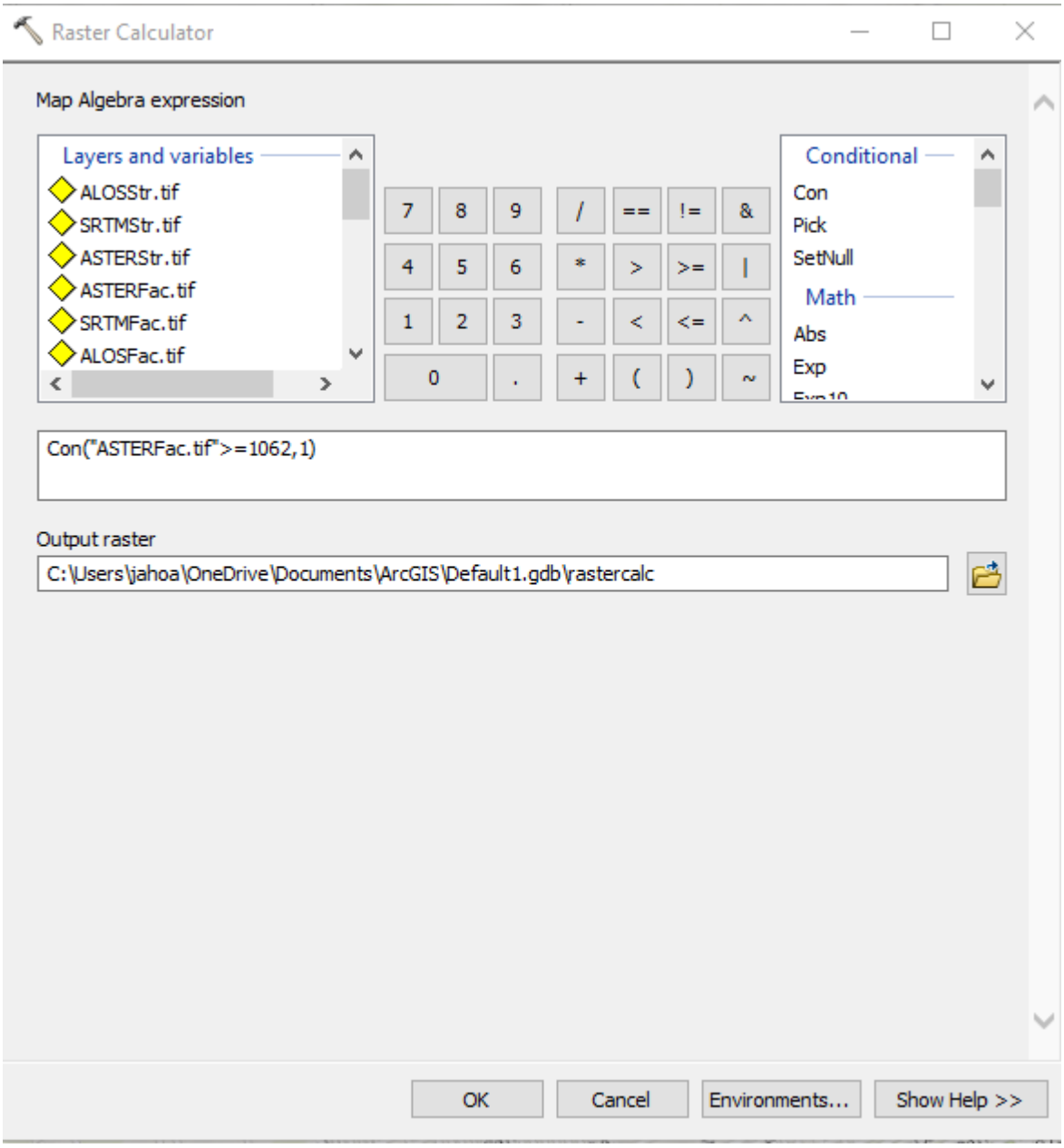

Stream Definition
Input Flow Accumulation Grid
SRTMFac.tif
Number of cells to define stream
1055
Output Stream Grid
C:\R.LTWB\HECGeoHMS\Layers\SRTMStr.tif
Area SqKm to define stream (optional)
1
OK
Cancel
Environments...
Show Help >>


8 - Rio Tunjuelito
Stream Definition
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: StreamDefinition SRTMFac.tif 1055 C:\R.LTWB\HECGeoHMS\Layers
\SRTMStr.tif 1
Start Time: Sat Mar 04 10:22:51 2023
Executing: Con C:\R.LTWB\HECGeoHMS\Layers\SRTMFac.tif 1 C:\R.LTWB\HECGeoHMS
\Layers\SRTMStr.tif # "VALUE > 1055"
Start Time: Sat Mar 04 10:22:51 2023
Succeeded at Sat Mar 04 10:22:53 2023 (Elapsed Time: 1.42 seconds)
Executing: ApplySymbologyFromLayer SRTMStr.tif "C:\Program Files (x86)\ESRI
\WaterUtils\ArcHydro\bin\lyrfiles\StreamGrid.lyr"
Start Time: Sat Mar 04 10:22:53 2023
Succeeded at Sat Mar 04 10:22:54 2023 (Elapsed Time: 0.86 seconds)
Succeeded at Sat Mar 04 10:22:55 2023 (Elapsed Time: 4.14 seconds)

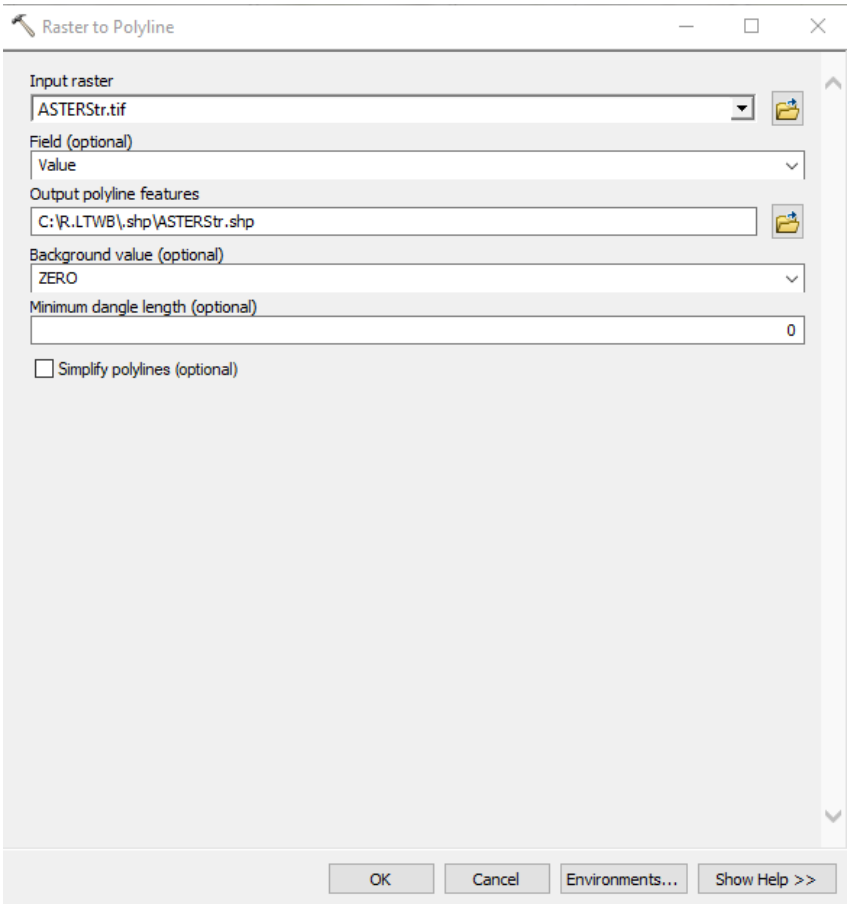

Stream Definition
Input Flow Accumulation Grid
ALOSFac.tif
Number of cells to define stream
6400
Output Stream Grid
C:\R.LTWB\HECGeoHMS\Layers\ALOSStr.tif
Area SqKm to define stream (optional)
1
OK
Cancel
Environments...
Show Help >>

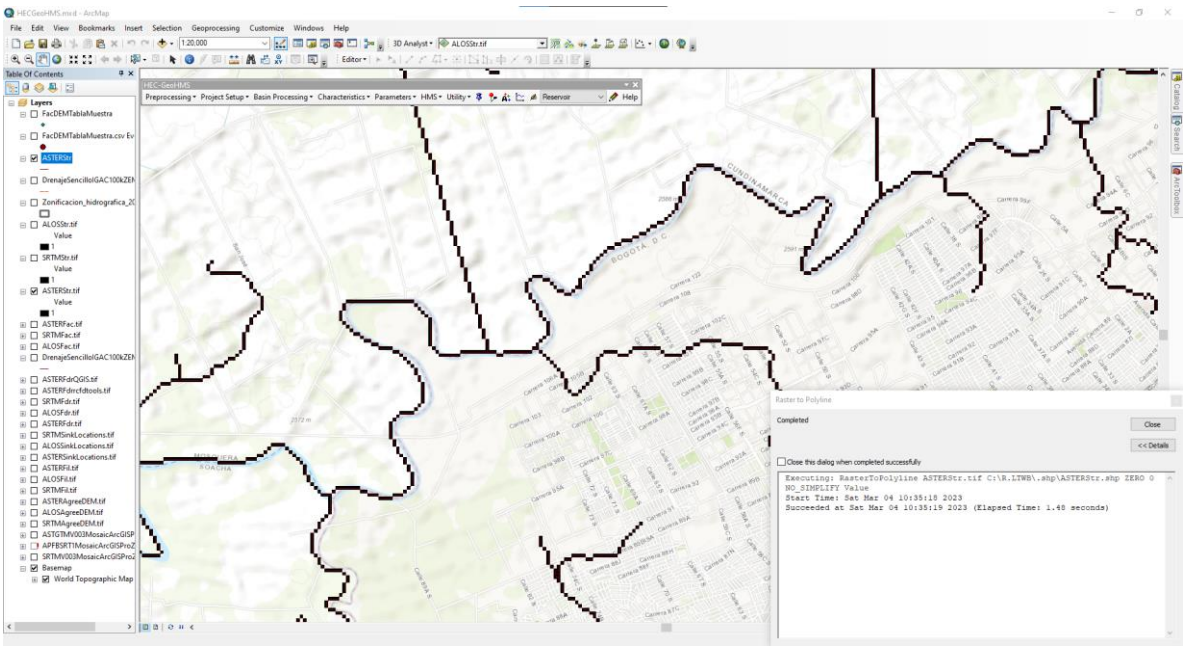

Stream Definition
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: StreamDefinition ALOSFac.tif 6400 C:\R.LTWB\HECGeoHMS\Layers
\ALOSStr.tif 1
Start Time: Sat Mar 04 10:23:47 2023
Executing: Con C:\R.LTWB\HECGeoHMS\Layers\ALOSFac.tif 1 C:\R.LTWB\HECGeoHMS
\Layers\ALOSStr.tif # "VALUE > 6400"
Start Time: Sat Mar 04 10:23:47 2023
Succeeded at Sat Mar 04 10:23:53 2023 (Elapsed Time: 6.00 seconds)
Executing: ApplySymbologyFromLayer ALOSStr.tif "C:\Program Files (x86)\ESRI
\WaterUtils\ArcHydro\bin\lyrfiles\StreamGrid.lyr"
Start Time: Sat Mar 04 10:23:54 2023
Succeeded at Sat Mar 04 10:23:56 2023 (Elapsed Time: 1.45 seconds)
Succeeded at Sat Mar 04 10:23:56 2023 (Elapsed Time: 9.55 seconds)

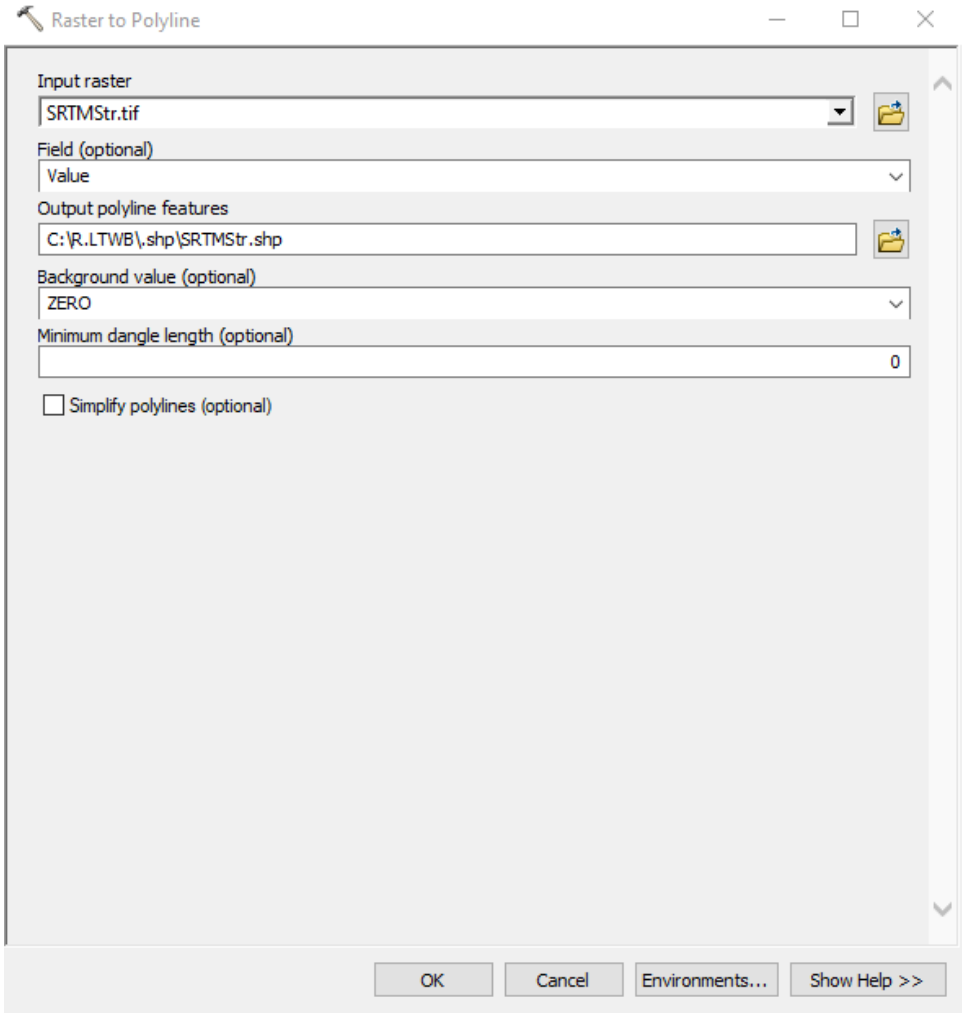
La herramienta de Raster Calculator permite identificar y marcar las celdas que igualan o exceden el valor del área de aportación definido

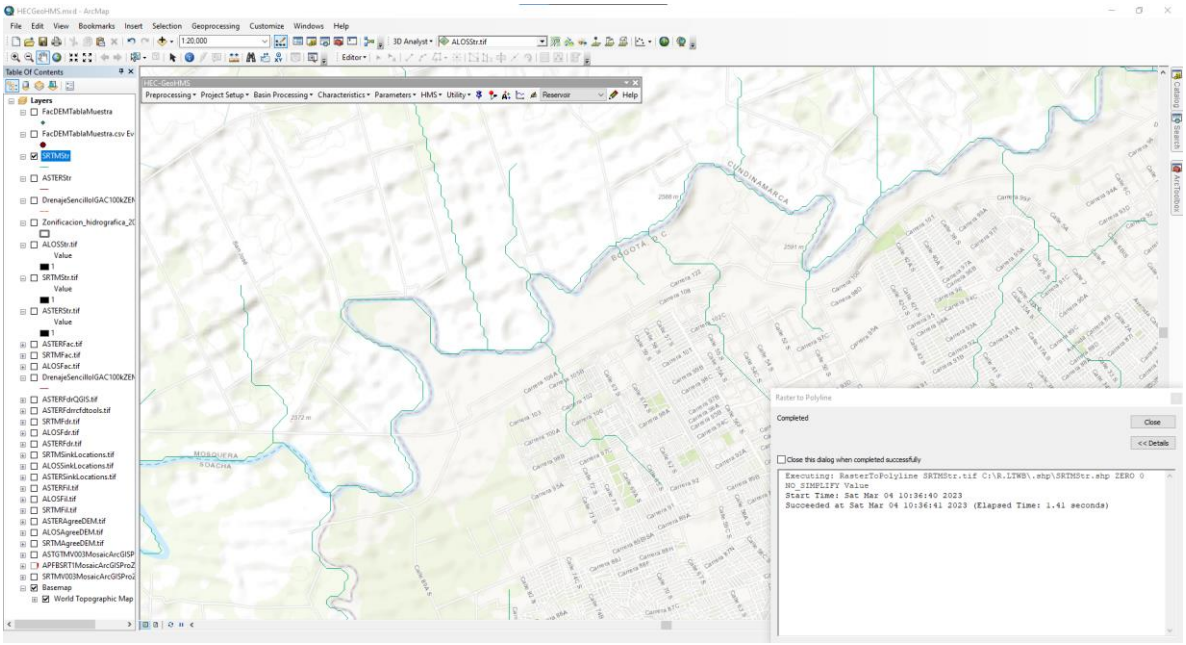


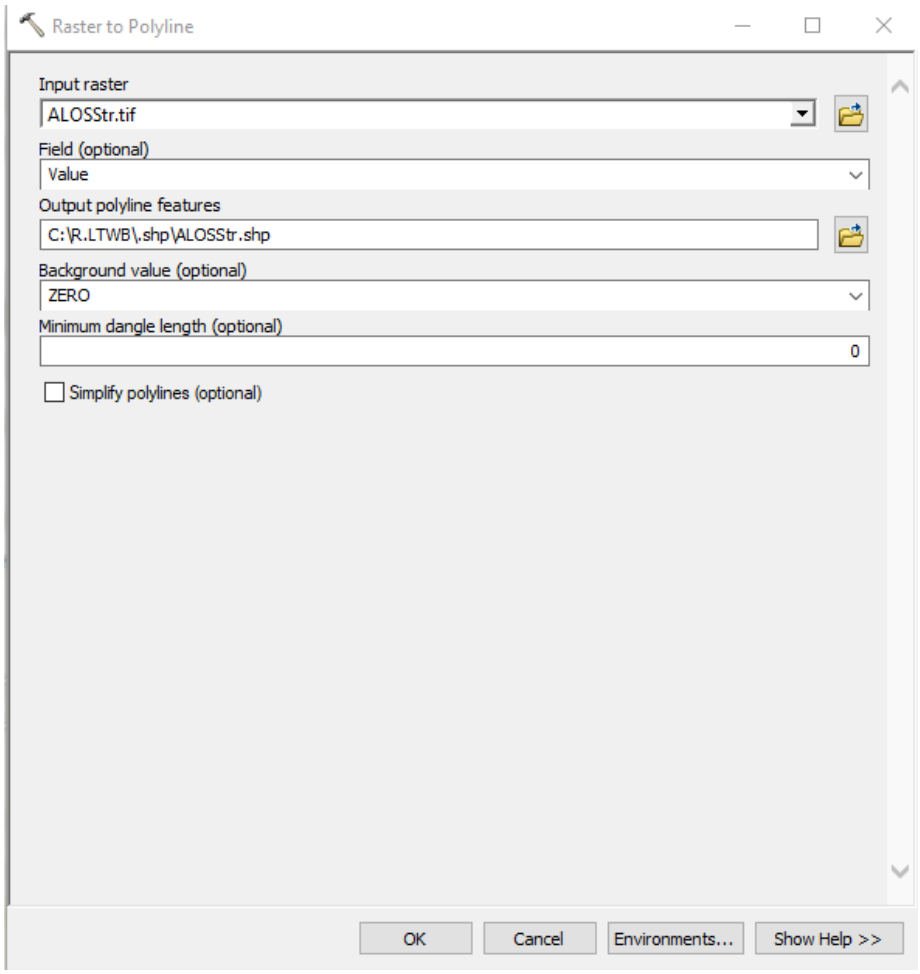
Herramienta Raster to Polyline

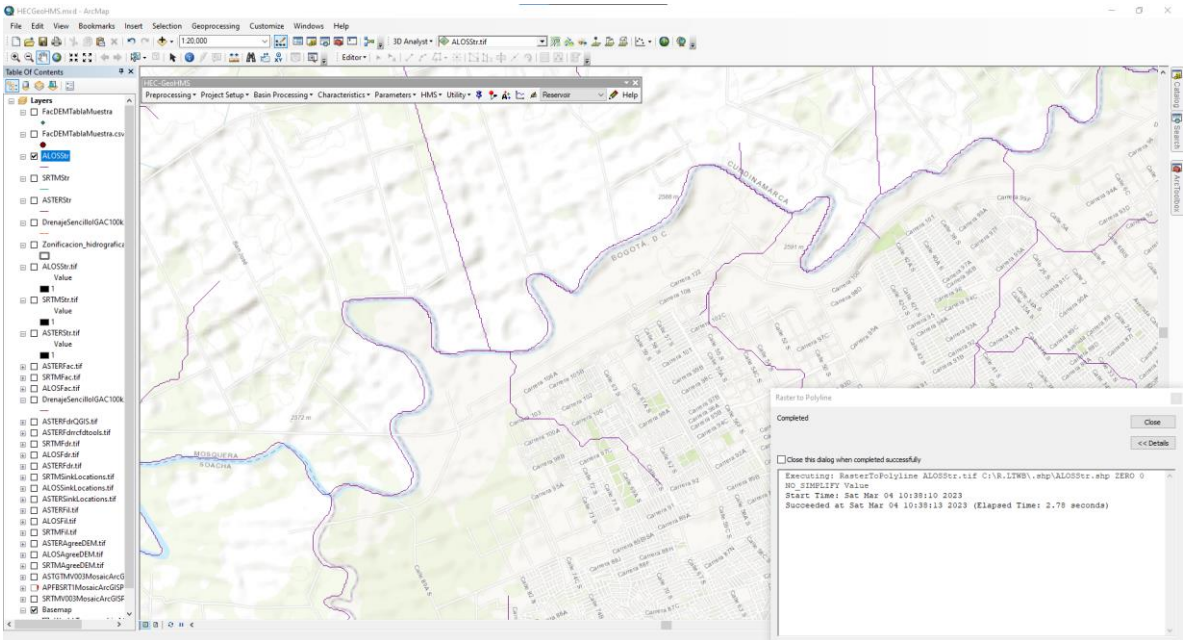




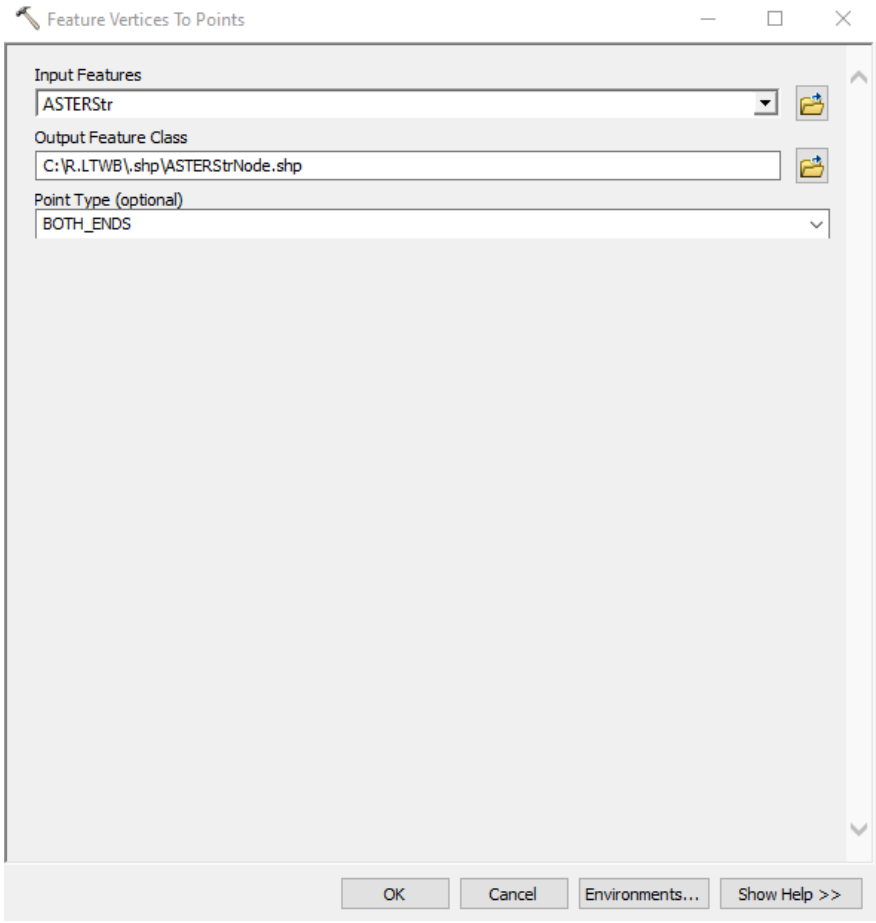

Raster to Polyline
Input raster
SRTMStr.tif
Field (optional)
Value
Output polyline features
C:\R.LTWB\.shp\SRTMStr.shp
Background value (optional)
ZERO
Minimum dangle length (optional)
0
Simplify polylines (optional)
OK
Cancel
Environments...
Show Help >>

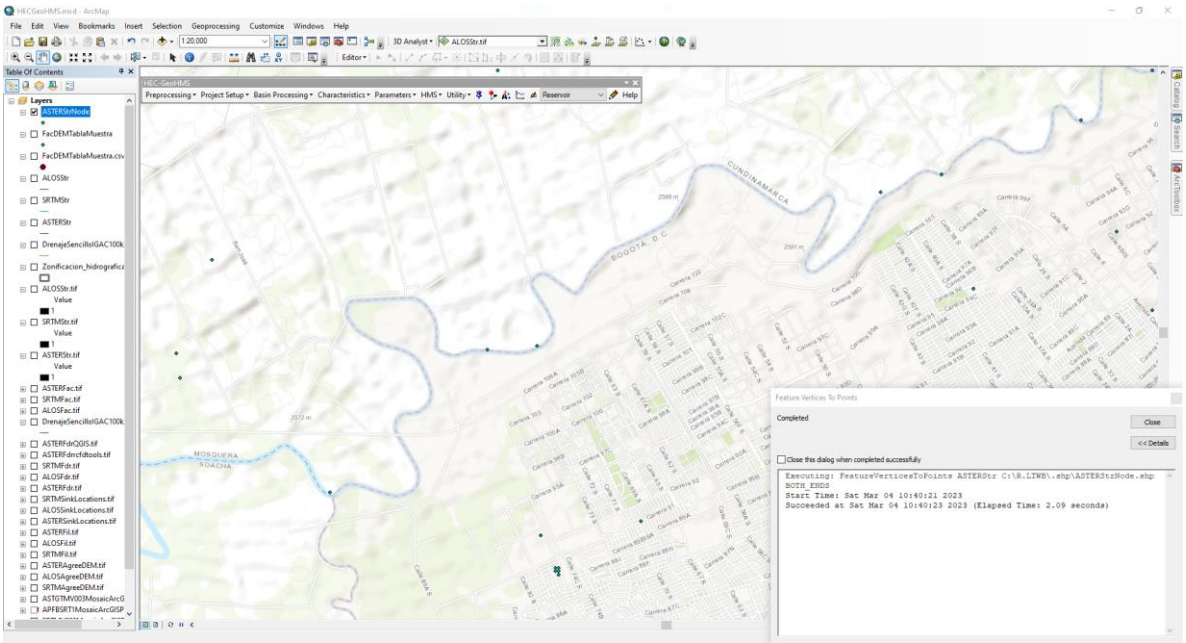

Raster to Polyline
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: RasterToPolyline SRTMStr.tif C:\R.LTWB\.shp\SRTMStr.shp ZERO 0
NO_SIMPLIFY Value
Start Time: Sat Mar 04 10:36:40 2023
Succeeded at Sat Mar 04 10:36:41 2023 (Elapsed Time: 1.41 seconds)

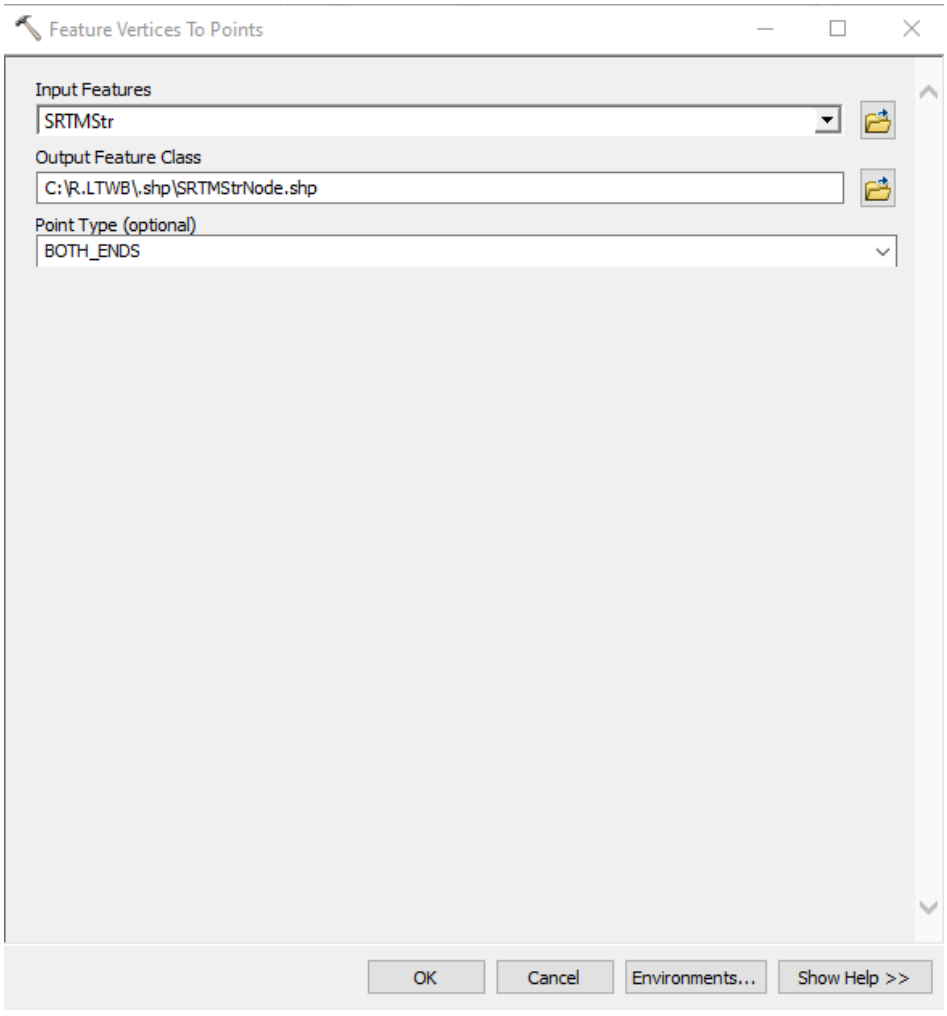

Raster to Polyline
Input raster
ALOSStr.tif
Field (optional)
Value
Output polyline features
C:\R.LTWB\.shp\ALOSStr.shp
Background value (optional)
ZERO
Minimum dangle length (optional)
0
Simplify polylines (optional)
OK
Cancel
Environments...
Show Help >>

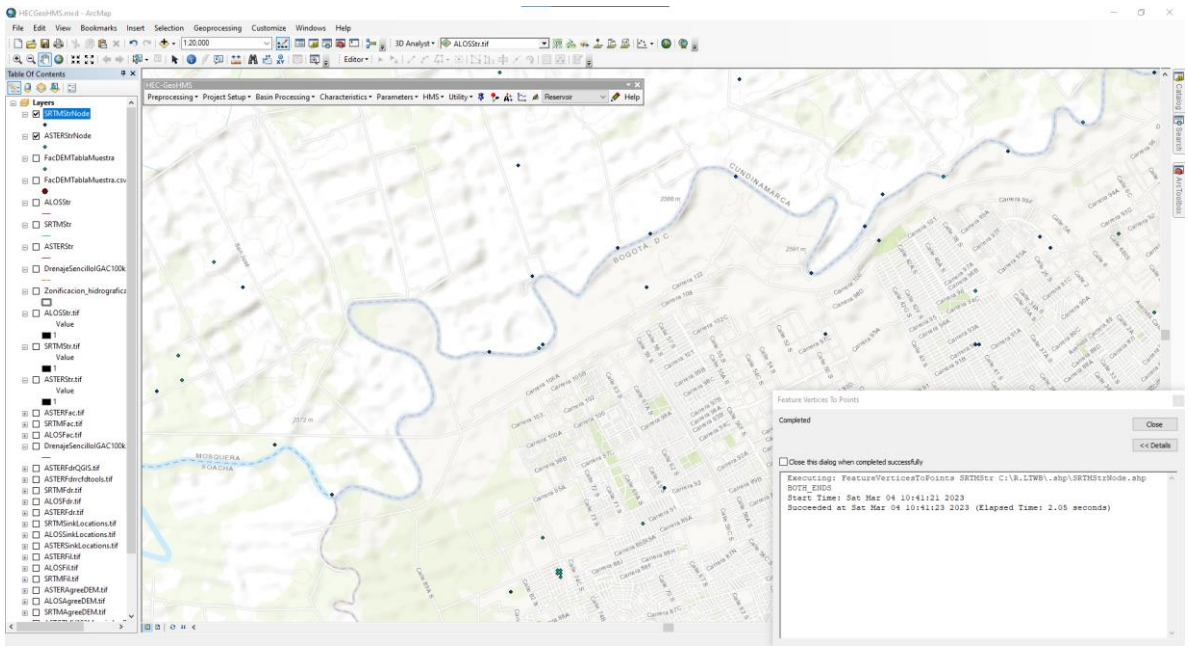

Raster to Polyline
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: RasterToPolyline ALOSStr.tif C:\R.LTWB\.shp\ALOSStr.shp ZERO 0 NO_SIMPLIFY Value
Start Time: Sat Mar 04 10:38:10 2023
Succeeded at Sat Mar 04 10:38:13 2023 (Elapsed Time: 2.78 seconds)

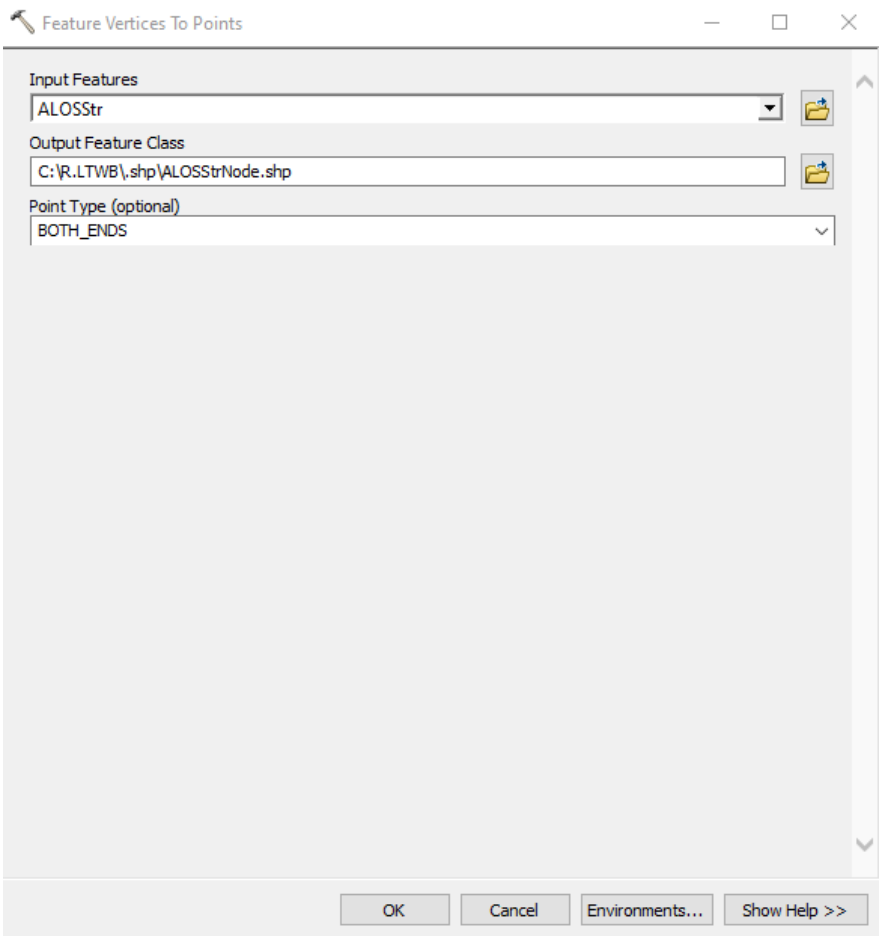
Herramienta Feature Vertices To Points

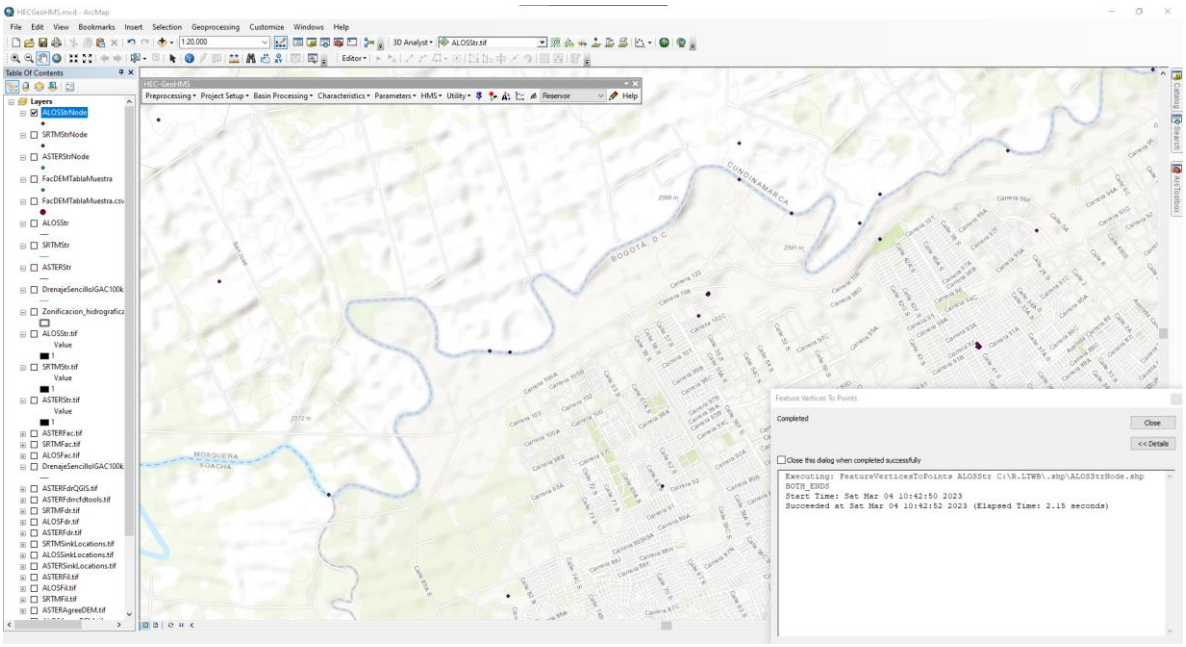




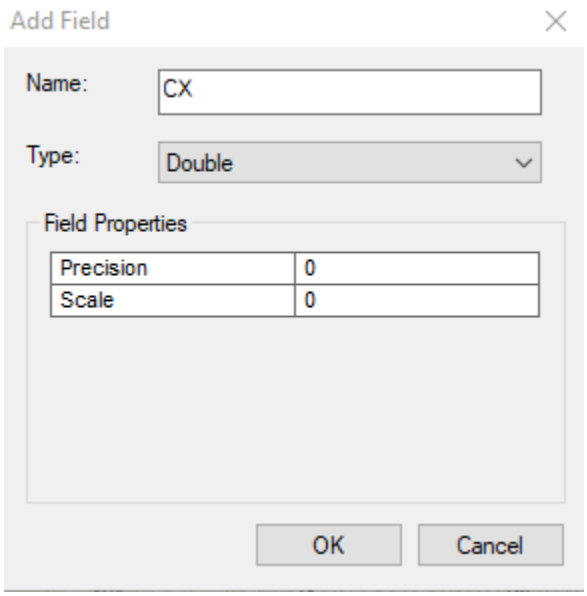

Feature Vertices To Points
Input Features
SRTMStr
Output Feature Class
C:\R.LTWB\.shp\SRTMStrNode.shp
Point Type (optional)
BOTH_ENDS
OK
Cancel
Environments...
Show Help >>

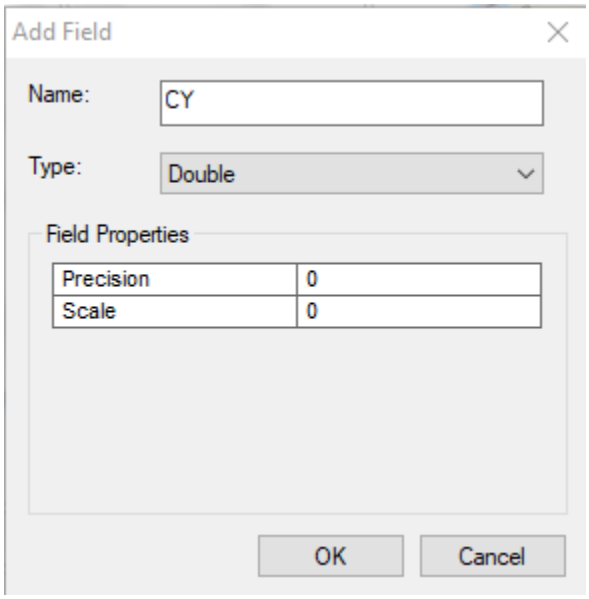

Feature Vertices To Points
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: FeatureVerticesToPoints SRTMStr C:\R.LTWB\.shp\SRTMStrNode.shp
BOTH_ENDS
Start Time: Sat Mar 04 10:41:21 2023
Succeeded at Sat Mar 04 10:41:23 2023 (Elapsed Time: 2.05 seconds)

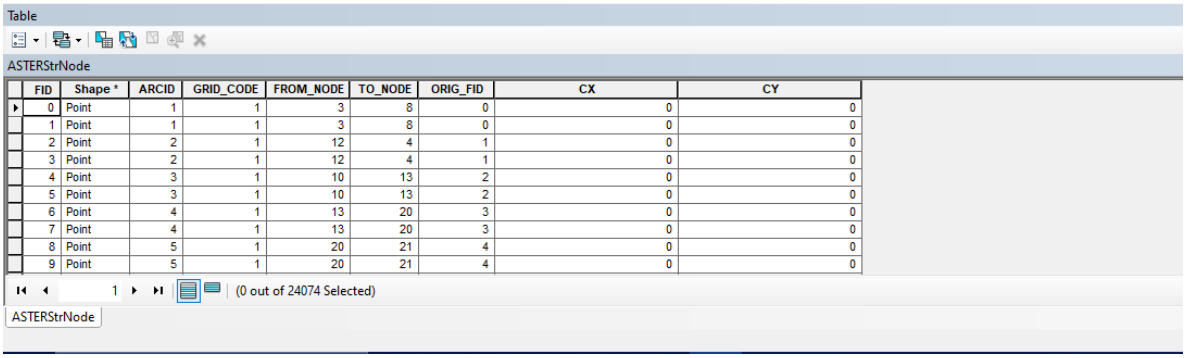

Feature Vertices To Points
Input Features
ALOSStr
Output Feature Class
C:\R.LTWB\.shp\ALOSStrNode.shp
Point Type (optional)
BOTH_ENDS
OK
Cancel
Environments...
Show Help >>


Feature Vertices To Points
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: FeatureVerticesToPoints ALOSStr C:\R.LTWB\.shp\ALOSStrNode.shp BOTH_ENDS
Start Time: Sat Mar 04 10:42:50 2023
Succeeded at Sat Mar 04 10:42:52 2023 (Elapsed Time: 2.15 seconds)

En las tablas de atributos de los shapefile creados, se añaden los campos para las coordenadas X y Y.







Table

ASTERStrNode

FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY
0	Point	1	1	3	8	0	0	0
1	Point	1	1	3	8	0	0	0
2	Point	2	1	12	4	1	0	0
3	Point	2	1	12	4	1	0	0
4	Point	3	1	10	13	2	0	0
5	Point	3	1	10	13	2	0	0
6	Point	4	1	13	20	3	0	0
7	Point	4	1	13	20	3	0	0
8	Point	5	1	20	21	4	0	0
9	Point	5	1	20	21	4	0	0

1 (0 out of 24074 Selected)

ASTERStrNode

Table

SRTMStrNode

FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY
0	Point	1	1	7	34	0	0	0
1	Point	1	1	7	34	0	0	0
2	Point	2	1	4	36	1	0	0
3	Point	2	1	4	36	1	0	0
4	Point	3	1	30	37	2	0	0
5	Point	3	1	30	37	2	0	0
6	Point	4	1	29	38	3	0	0
7	Point	4	1	29	38	3	0	0
8	Point	5	1	1	39	4	0	0
9	Point	5	1	1	39	4	0	0

1 (0 out of 23844 Selected)

ASTERStrNode SRTMStrNode

Table

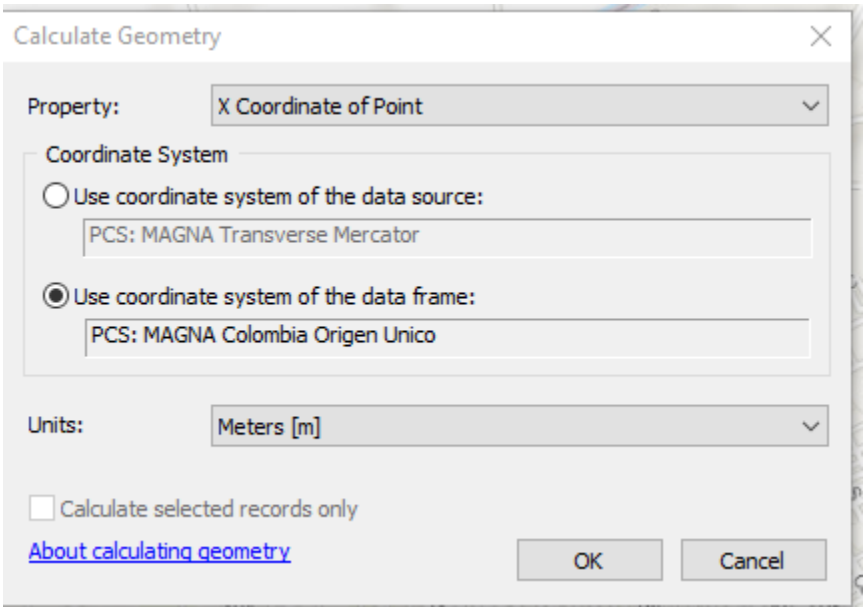
ALOSStrNode

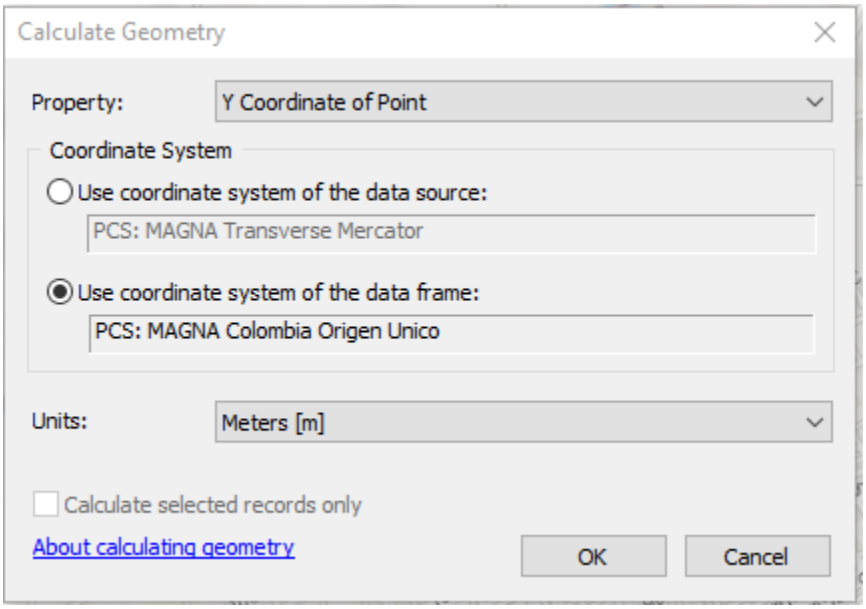
FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY
0	Point	1	1	5	31	0	0	0
1	Point	1	1	5	31	0	0	0
2	Point	2	1	27	32	1	0	0
3	Point	2	1	27	32	1	0	0
4	Point	3	1	3	33	2	0	0
5	Point	3	1	3	33	2	0	0
6	Point	4	1	34	33	3	0	0
7	Point	4	1	34	33	3	0	0
8	Point	5	1	34	35	4	0	0
9	Point	5	1	34	35	4	0	0

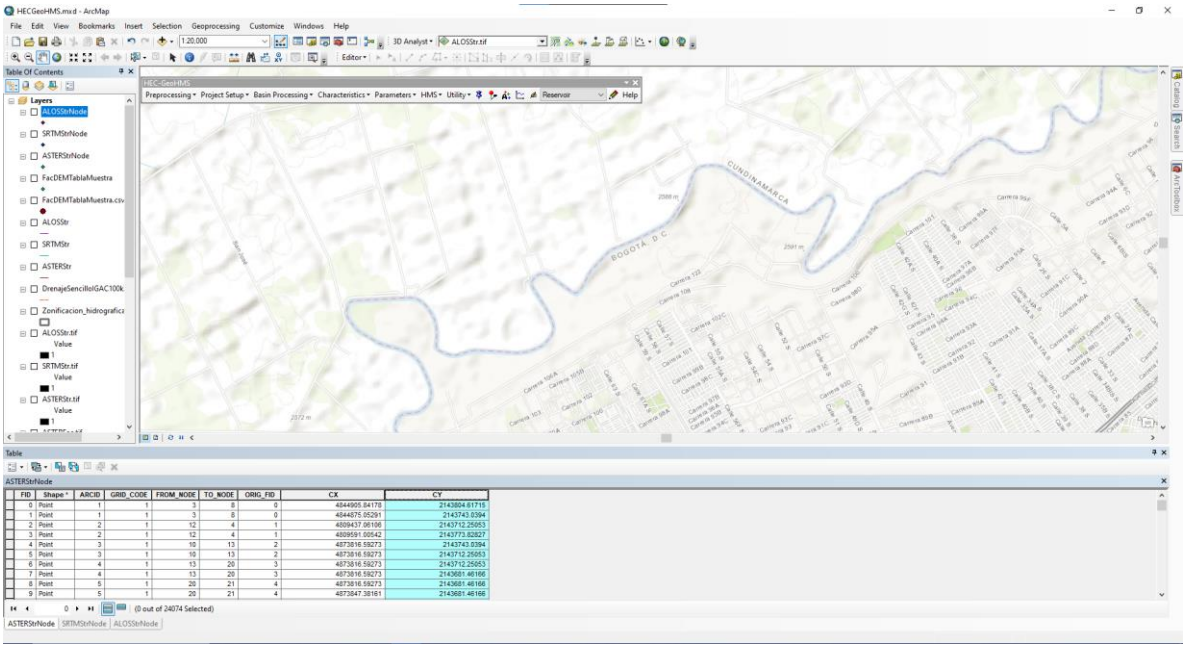
1 (0 out of 24768 Selected)

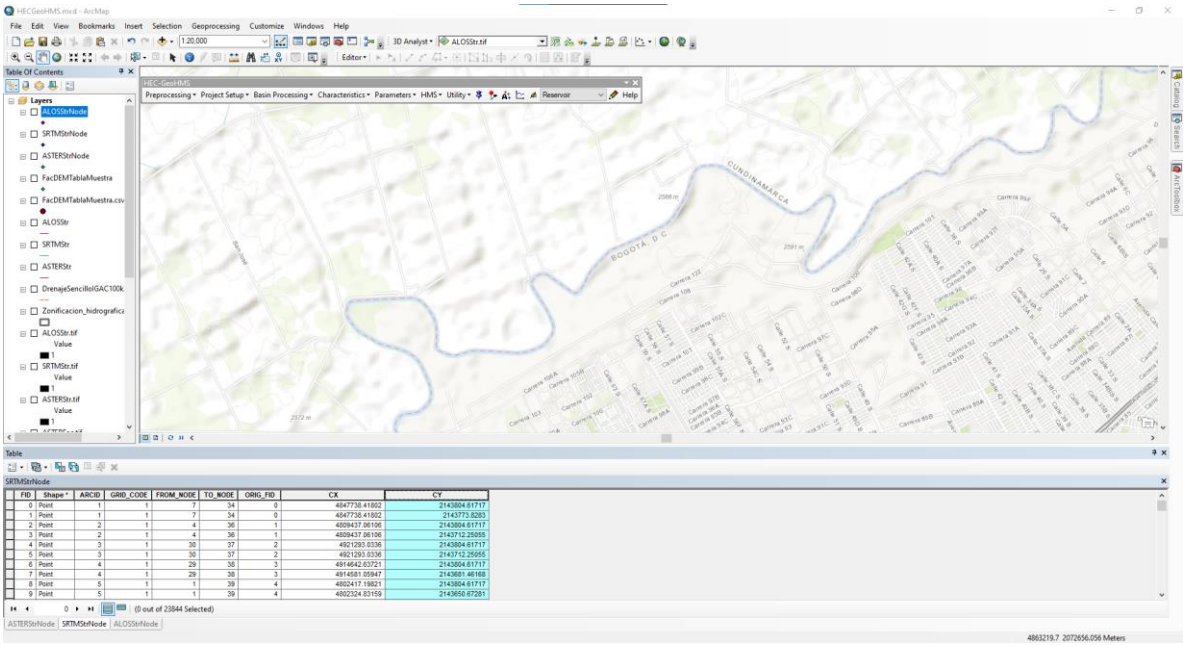
ASTERStrNode SRTMStrNode ALOSStrNode

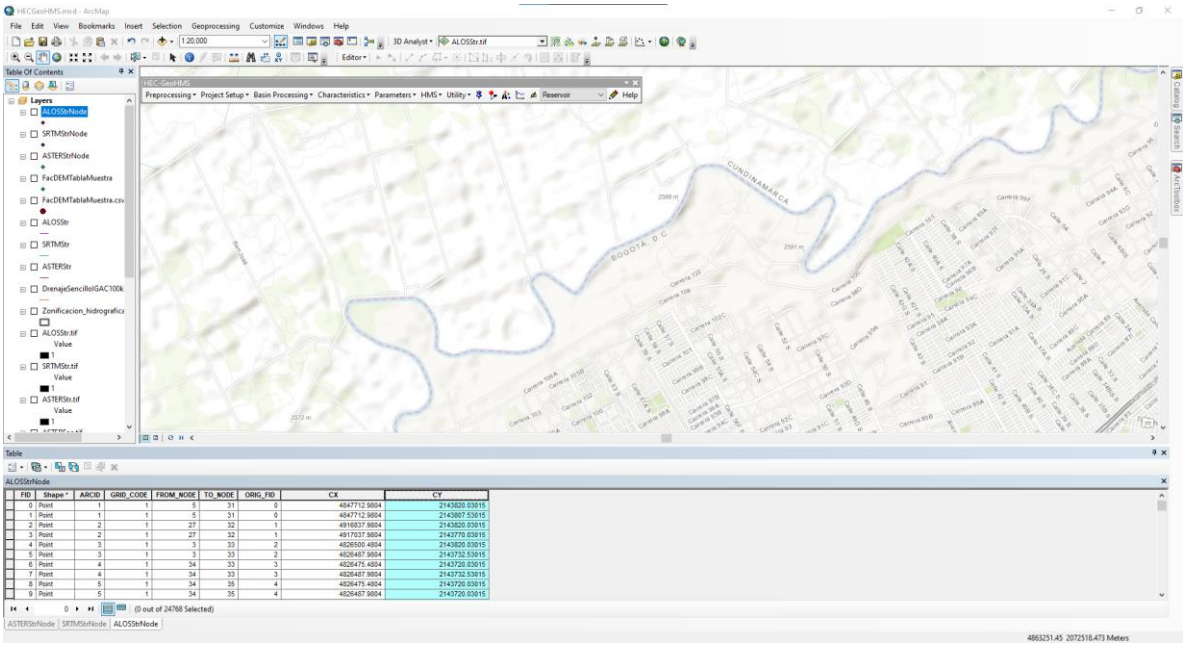
Se usa Calculate Geometry para obtener los valores de las coordenadas




Calculate Geometry
Property:
Y Coordinate of Point
Coordinate System
Use coordinate system of the data source:
PCS: MAGNA Transverse Mercator
Use coordinate system of the data frame:
PCS: MAGNA Colombia Origen Unico
Units:
Meters [m]
Calculate selected records only
About calculating geometry
OK
Cancel




HECGeoHMS.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
Layers
ALOSStrNode
SRTMStrNode
ASTERStrNode
FacDEMTablaMuestra
FacDEMTablaMuestra.csv
ALOSStr
SRTMStr
ASTERStr
DrenajeSencilloIGAC100k
Zonificacion_hidrografica
ALOSStr.tif
SRTMStr.tif
ASTERStr.tif
HEC-GeoHMS
Preprocessing Project Setup Basin Processing Characteristics Parameters HMS Utility Reservoir Help
CUNDINAMARCA
BOGOTÁ, D.C.
Table
SRTMStrNode
FID Shape * ARCID GRID_CODE FROM_NODE TO_NODE ORIG_FID CX CY
0 Point 1 1 7 34 0 4847738.41802 2143804.61717
1 Point 1 1 7 34 0 4847738.41802 2143773.8283
2 Point 2 1 4 36 1 4809437.06106 2143804.61717
3 Point 2 1 4 36 1 4809437.06106 2143712.25055
4 Point 3 1 30 37 2 4921293.0336 2143804.61717
5 Point 3 1 30 37 2 4921293.0336 2143712.25055
6 Point 4 1 29 38 3 4914642.03721 2143804.61717
7 Point 4 1 29 38 3 4914581.05947 2143681.46168
8 Point 5 1 1 39 4 4802417.19821 2143804.61717
9 Point 5 1 1 39 4 4802324.83159 2143650.67281
(0 out of 23844 Selected)
ASTERStrNode SRTMStrNode ALOSStrNode
4863219.7 2072656.056 Meters


HECGeoHMS.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
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Layers
ALOSStrNode
SRTMStrNode
ASTERStrNode
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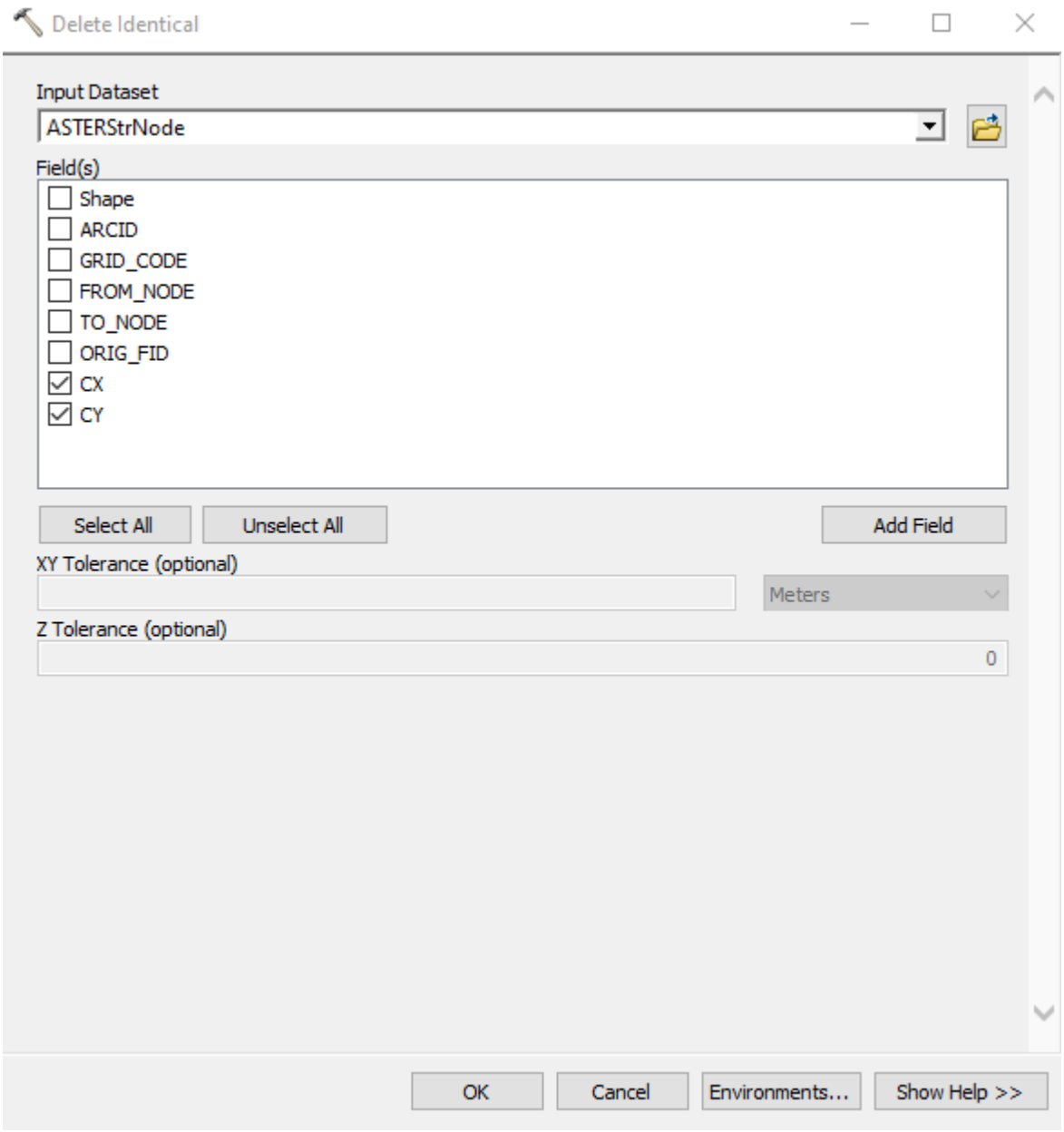
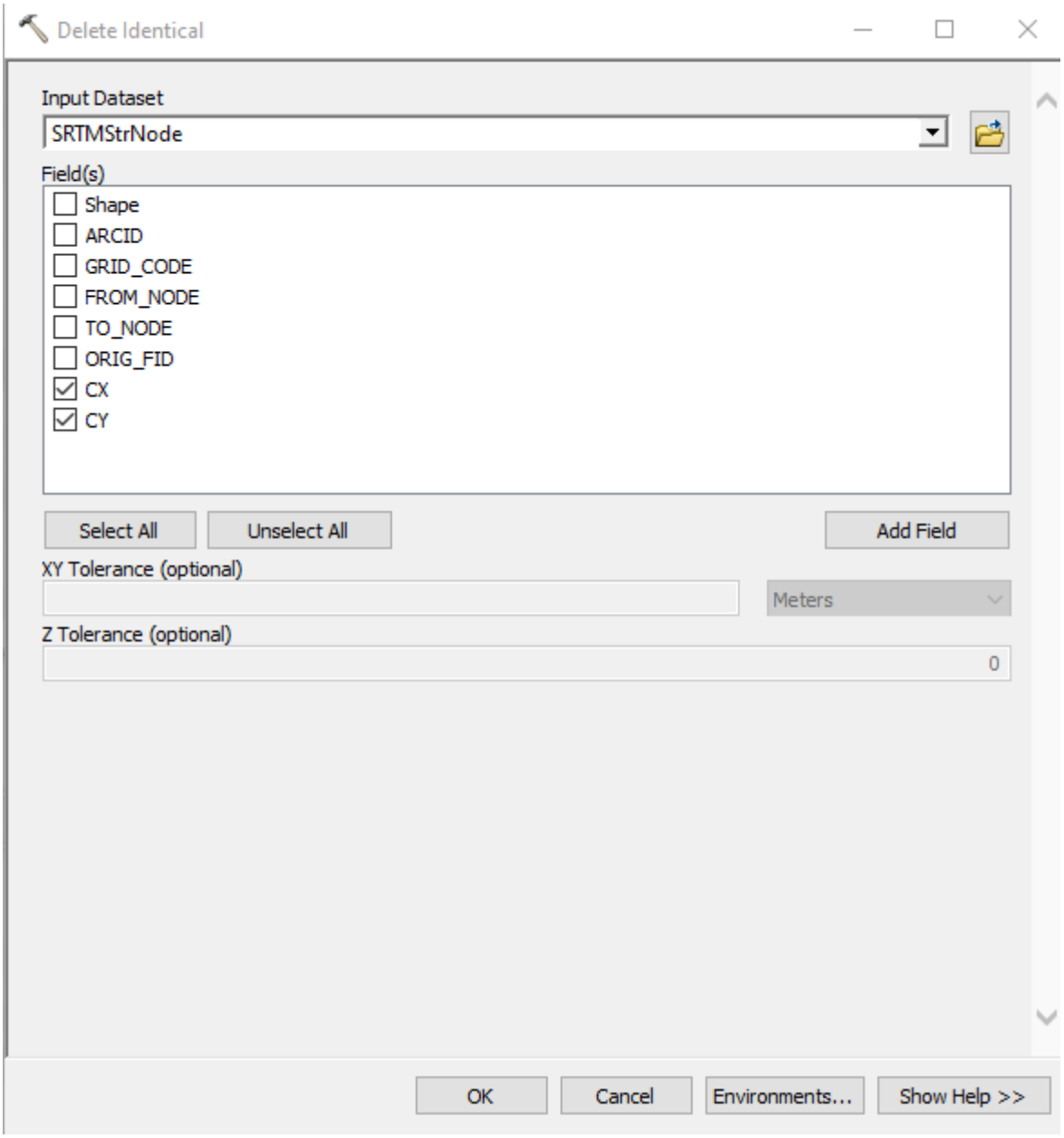
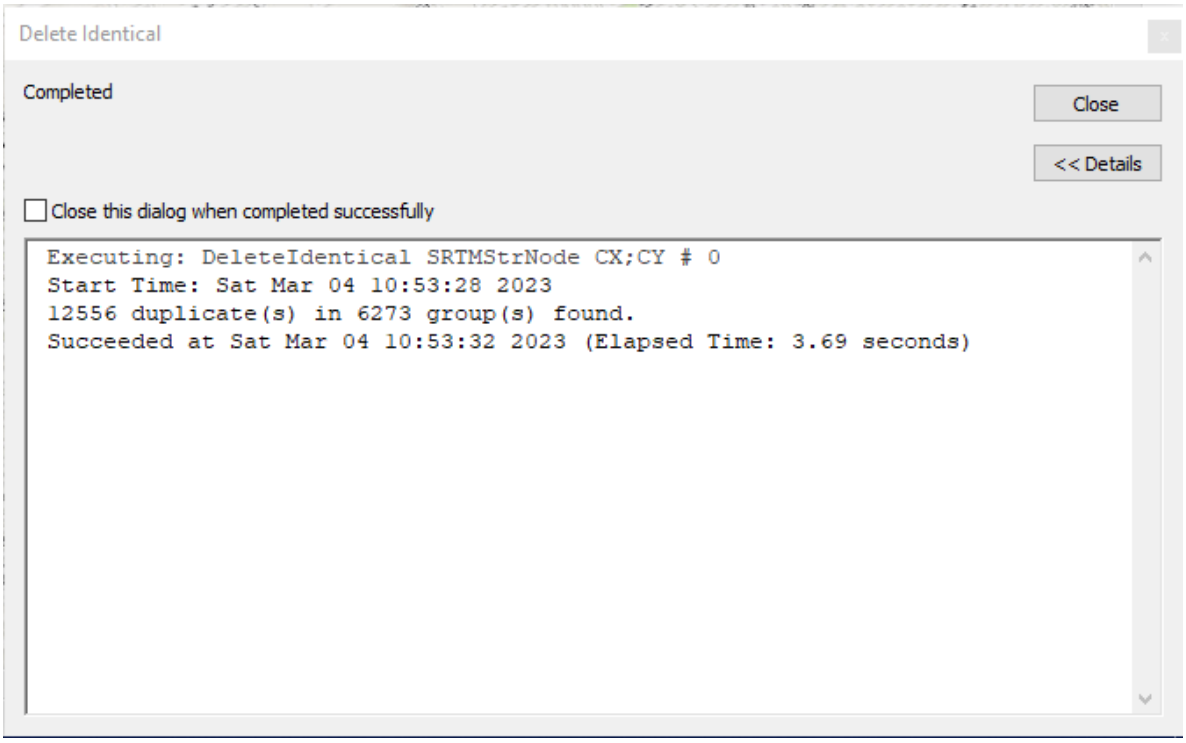
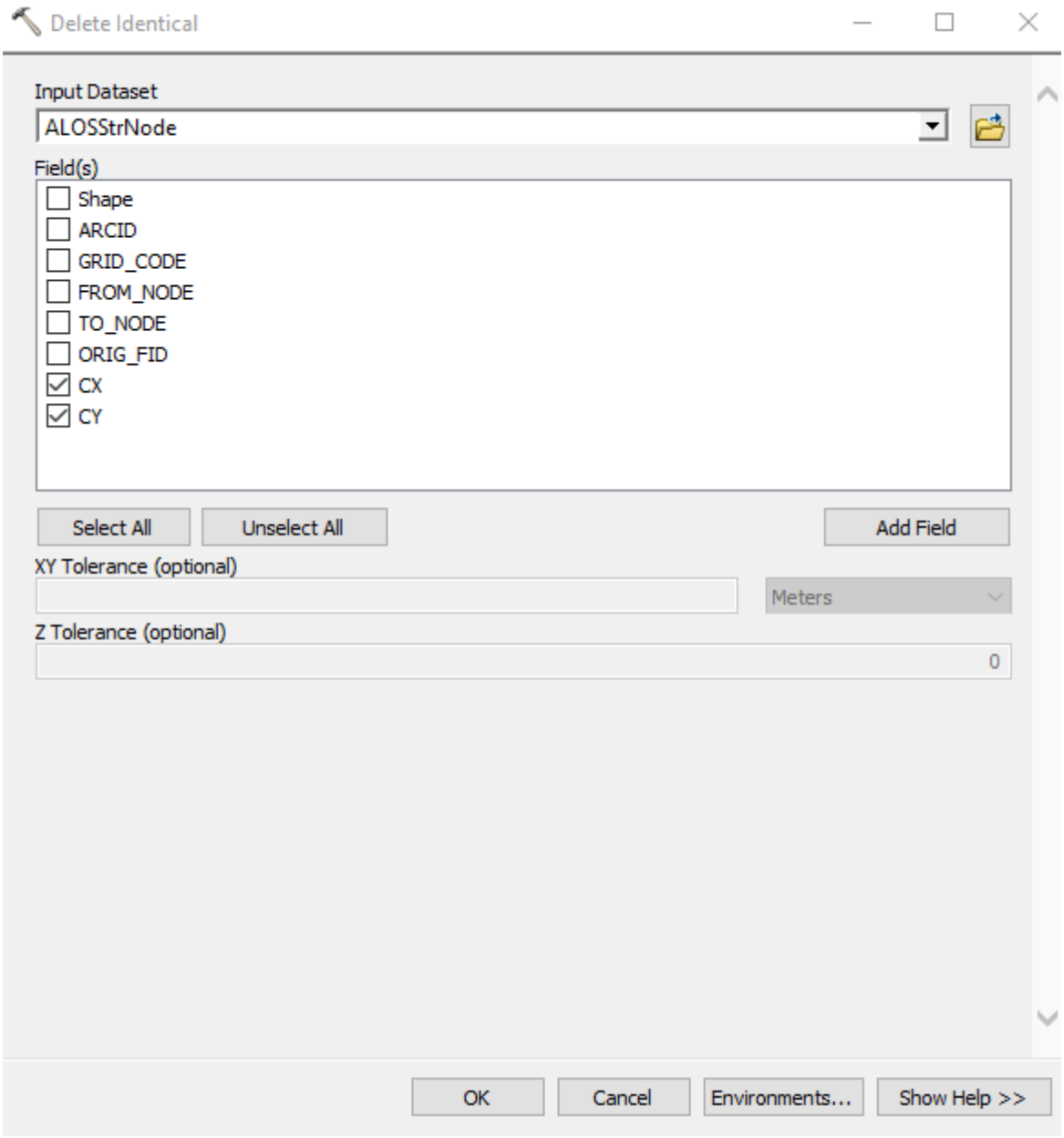
FacDEMTablaMuestra.csv
ALOSStr
SRTMStr
ASTERStr
DrenajeSencilloIGAC100k
Zonificacion_hidrografica
ALOSStr.tif
SRTMStr.tif
ASTERStr.tif
HEC-GeoHMS
Preprocessing Project Setup Basin Processing Characteristics Parameters HMS Utility Reservoir Help
CUNDINAMARCA
BOGOTÁ, D.C.
Table
ALOSStrNode
FID Shape * ARCID GRID_CODE FROM_NODE TO_NODE ORIG_FID CX CY
0 Point 1 1 5 31 0 4847712.9804 2143820.03015
1 Point 1 1 5 31 0 4847712.9804 2143807.53015
2 Point 2 1 27 32 1 4916837.9804 2143820.03015
3 Point 2 1 27 32 1 4916837.9804 2143770.03015
4 Point 3 1 3 33 2 4826500.4804 2143820.03015
5 Point 3 1 3 33 2 4826487.9804 2143732.53015
6 Point 4 1 34 33 3 4826475.4804 2143720.03015
7 Point 4 1 34 33 3 4826487.9804 2143732.53015
8 Point 5 1 34 38 4 4826475.4804 2143720.03015
9 Point 5 1 34 35 4 4826467.9804 2143720.03015
(0 out of 24768 Selected)
ASTERStrNode SRTMStrNode ALOSStrNode
4863251.45 2072518.473 Meters

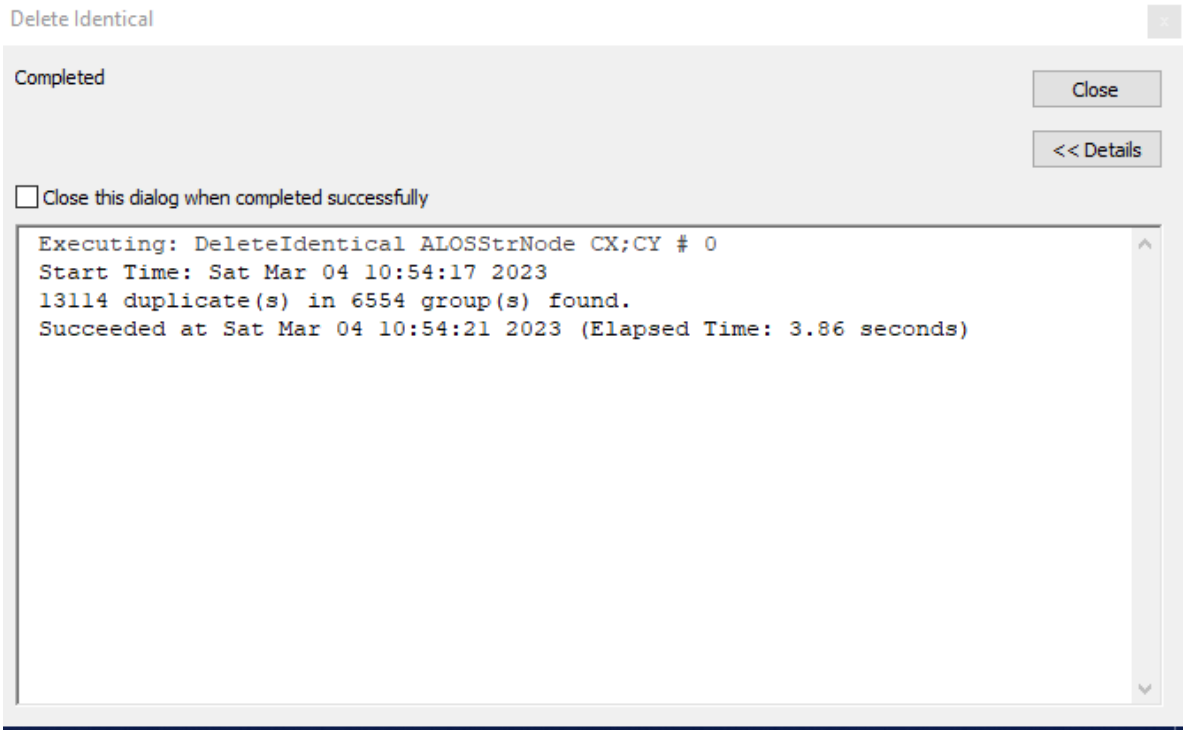
Herramienta Delete Identical



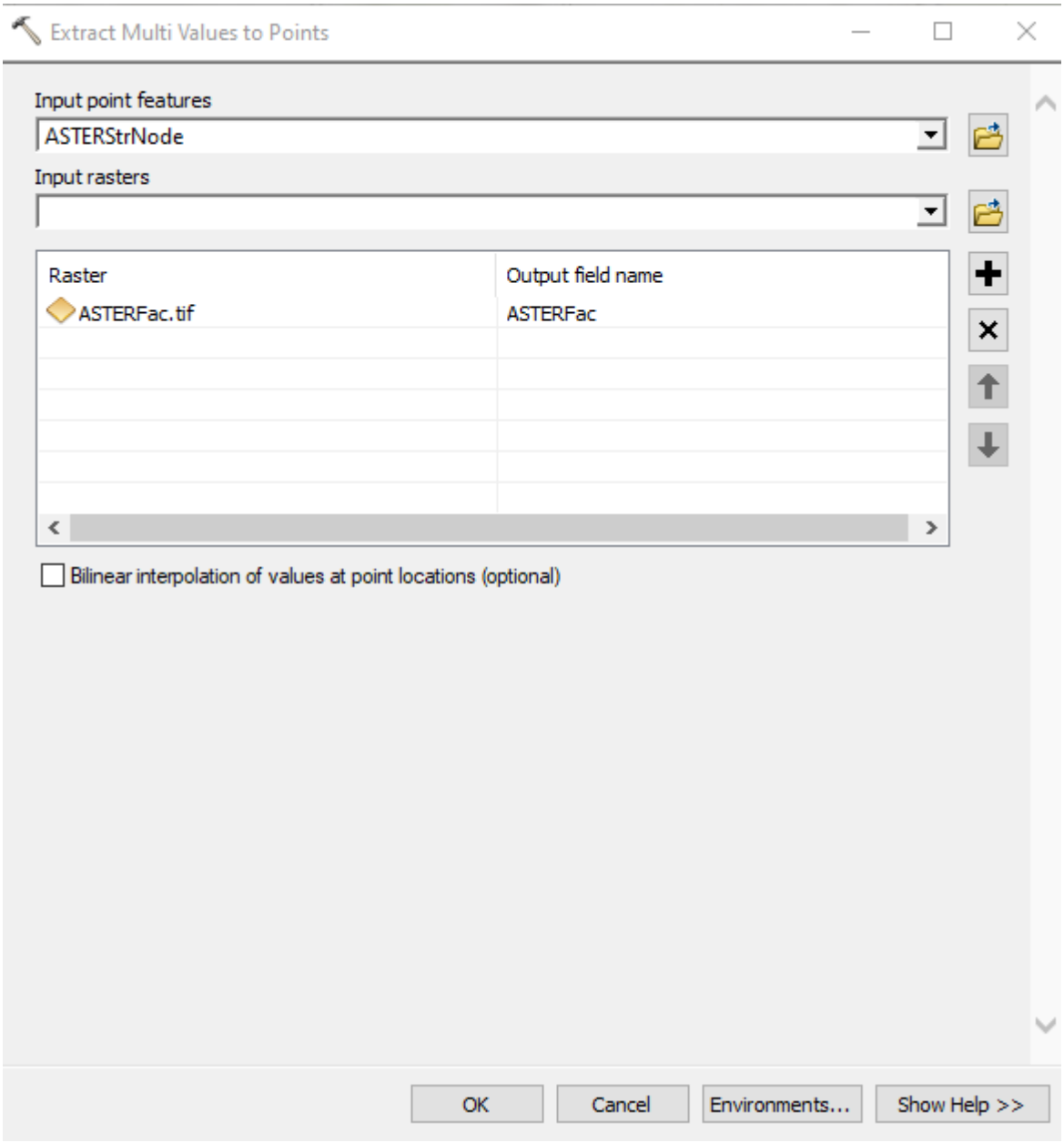

Delete Identical
Input Dataset
SRTMStrNode
Field(s)
Shape
ARCID
GRID_CODE
FROM_NODE
TO_NODE
ORIG_FID
CX
CY
Select All
Unselect All
Add Field
XY Tolerance (optional)
Meters
Z Tolerance (optional)
0
OK
Cancel
Environments...
Show Help >>

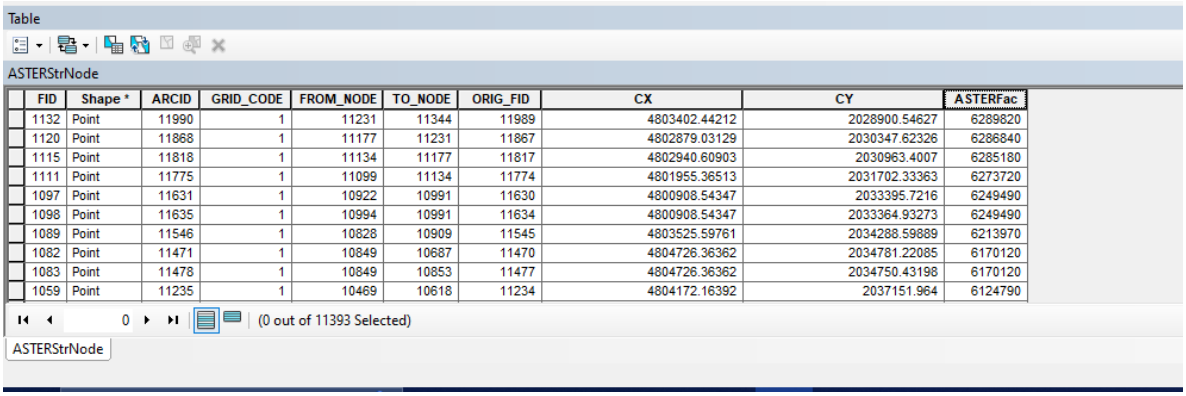

Delete Identical
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: DeleteIdentical SRTMStrNode CX;CY # 0
Start Time: Sat Mar 04 10:53:28 2023
12556 duplicate(s) in 6273 group(s) found.
Succeeded at Sat Mar 04 10:53:32 2023 (Elapsed Time: 3.69 seconds)


Delete Identical
Input Dataset
ALOSStrNode
Field(s)
Shape
ARCID
GRID_CODE
FROM_NODE
TO_NODE
ORIG_FID
CX
CY
Select All
Unselect All
Add Field
XY Tolerance (optional)
Meters
Z Tolerance (optional)
0
OK
Cancel
Environments...
Show Help >>


Delete Identical
Completed
Close
<< Details
Close this dialog when completed successfully
Executing: DeleteIdentical ALOSStrNode CX;CY # 0
Start Time: Sat Mar 04 10:54:17 2023
13114 duplicate(s) in 6554 group(s) found.
Succeeded at Sat Mar 04 10:54:21 2023 (Elapsed Time: 3.86 seconds)

Herramienta Multi Values to Points





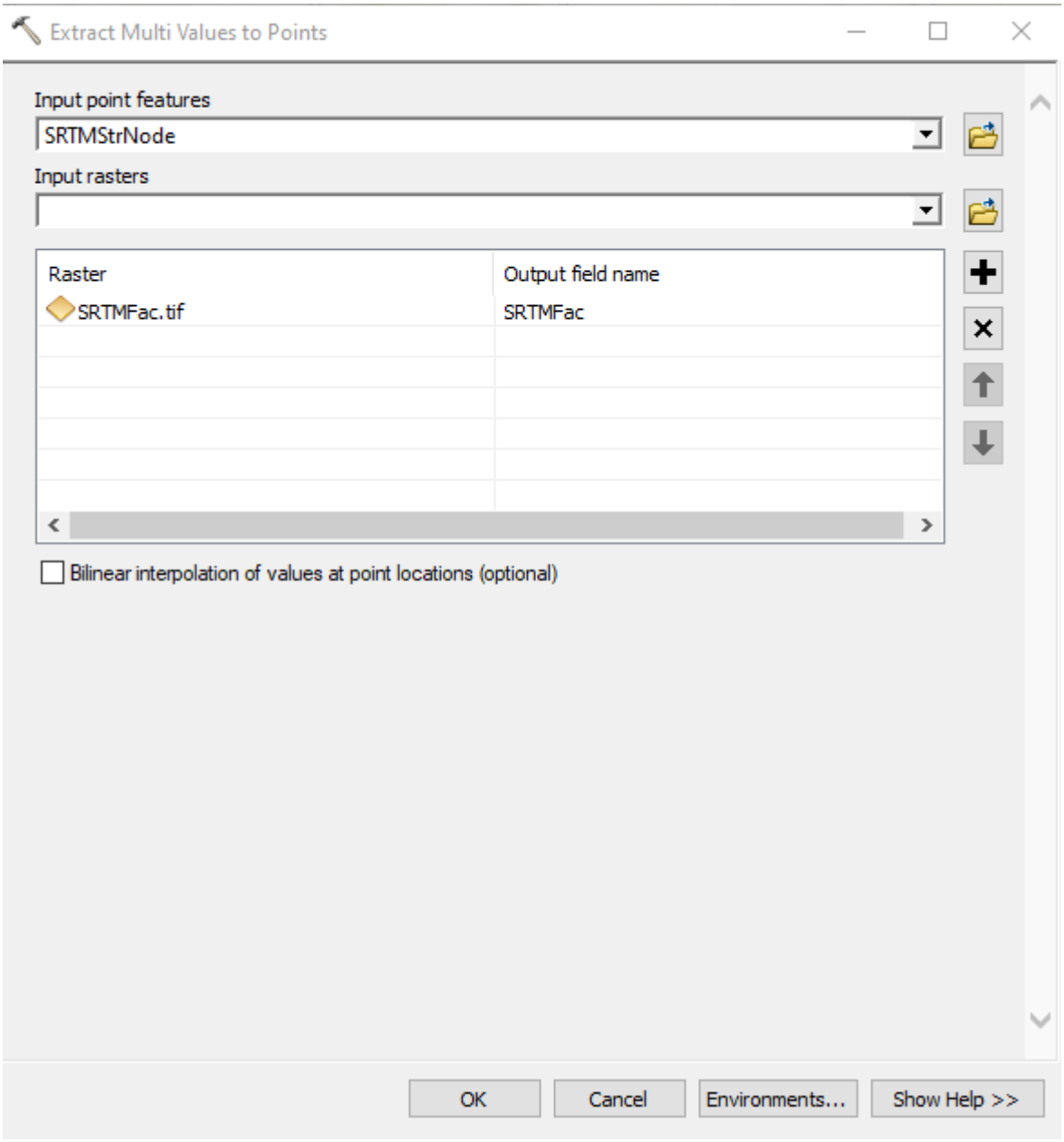
Table

ASTERStrNode

FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY	ASTERFac
1132	Point	11990	1	11231	11344	11989	4803402.44212	2028900.54627	6289820
1120	Point	11868	1	11177	11231	11867	4802879.03129	2030347.62326	6286840
1115	Point	11818	1	11134	11177	11817	4802940.60903	2030963.4007	6285180
1111	Point	11775	1	11099	11134	11774	4801955.36513	2031702.33363	6273720
1097	Point	11631	1	10922	10991	11630	4800908.54347	2033395.7216	6249490
1098	Point	11635	1	10994	10991	11634	4800908.54347	2033364.93273	6249490
1089	Point	11546	1	10828	10909	11545	4803525.59761	2034288.59889	6213970
1082	Point	11471	1	10849	10687	11470	4804726.36362	2034781.22085	6170120
1083	Point	11478	1	10849	10853	11477	4804726.36362	2034750.43198	6170120
1059	Point	11235	1	10469	10618	11234	4804172.16392	2037151.964	6124790

0 (0 out of 11393 Selected)

ASTERStrNode



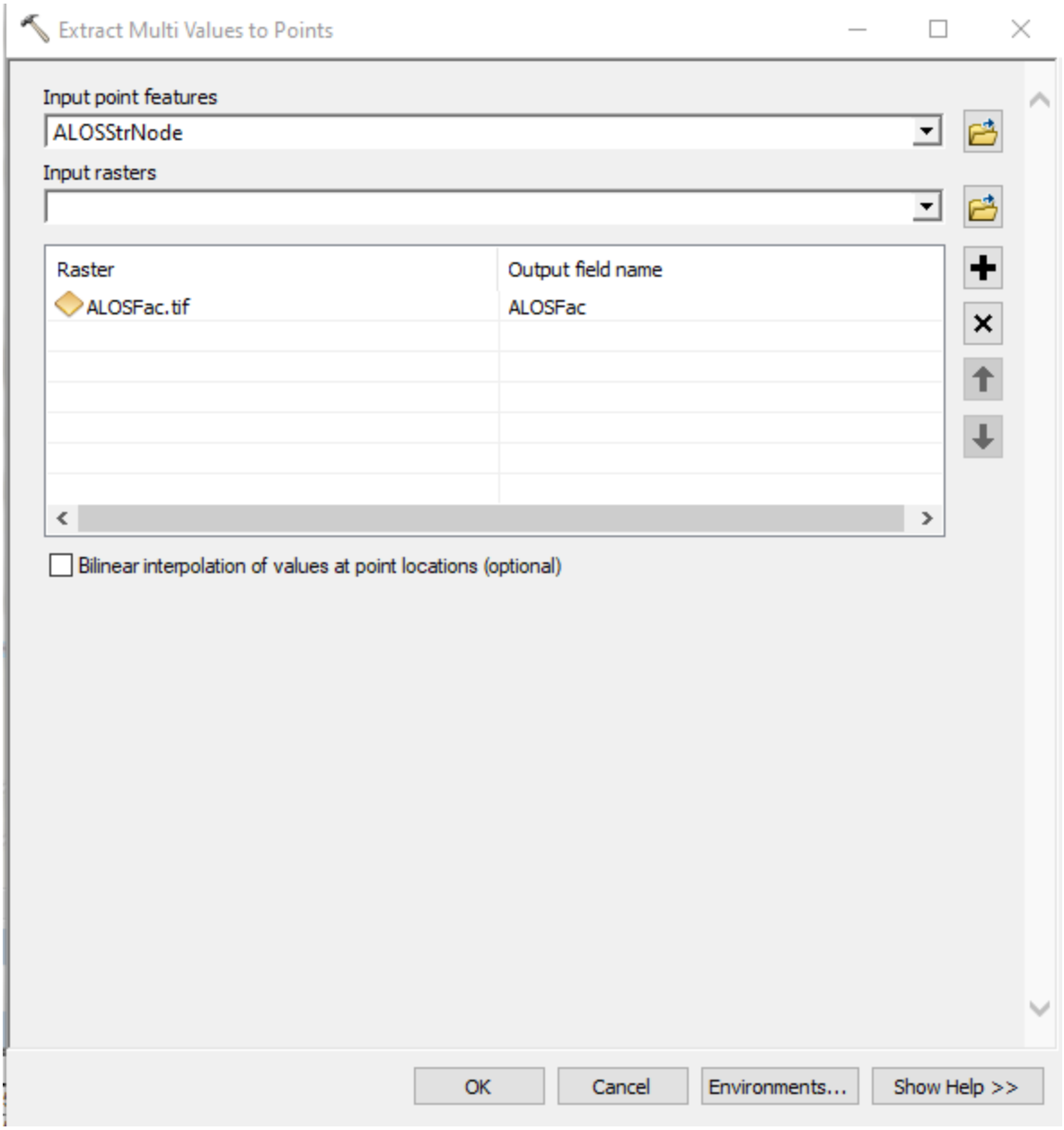
Table

SRTMStrNode

FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY	SRTMFac
1106	Point	11719	1	11091	11013	11718	4796628.89024	2030747.87861	6288680
1096	Point	11606	1	10845	10989	11605	4797891.234	2031979.4335	6285610
1091	Point	11551	1	10934	10931	11550	4798784.11129	2032718.36643	6272490
1091	Point	11552	1	10934	10935	11551	4798814.90017	2032718.36643	6272490
1098	Point	11621	1	10935	11004	11620	4799646.19971	2031794.70027	6268490
1098	Point	11622	1	11004	11005	11621	4799676.98859	2031794.70027	6268490
1098	Point	11623	1	11005	11006	11622	4799707.77746	2031794.70027	6268480
1098	Point	11624	1	11006	11007	11623	4799738.56633	2031794.70027	6268480
1098	Point	11625	1	11007	11008	11624	4799769.3552	2031794.70027	6268480
1098	Point	11626	1	11008	11009	11625	4799800.14408	2031794.70027	6268480

0 (0 out of 11288 Selected)

ASTERStrNode SRTMStrNode



Table

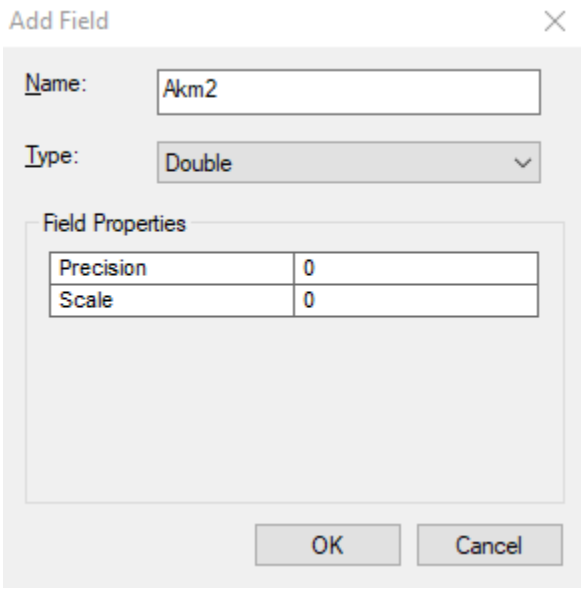
ALOSStrNode

FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY	ALOSFac
1139	Point	12129	1	11419	11323	12128	4796637.9804	2030720.03015	38137500
1129	Point	12012	1	11145	11309	12011	4797900.4804	2031982.53015	38116700
1123	Point	11950	1	11248	11247	11949	4798762.9804	2032720.03015	38036500
1123	Point	11951	1	11248	11249	11950	4798775.4804	2032720.03015	38036500
1130	Point	12028	1	11249	11324	12027	4799587.9804	2031832.53015	38013800
1127	Point	11999	1	11299	11300	11998	4800325.4804	2032007.53015	37926300
1128	Point	11999	1	11299	11300	11998	4800337.9804	2032007.53015	37926300
1128	Point	12000	1	11300	11301	11999	4800350.4804	2032007.53015	37926300
1118	Point	11897	1	11118	11199	11896	4800925.4804	2033295.03015	37917700
1110	Point	11822	1	11118	11123	11821	4801700.4804	2034045.03015	37862200

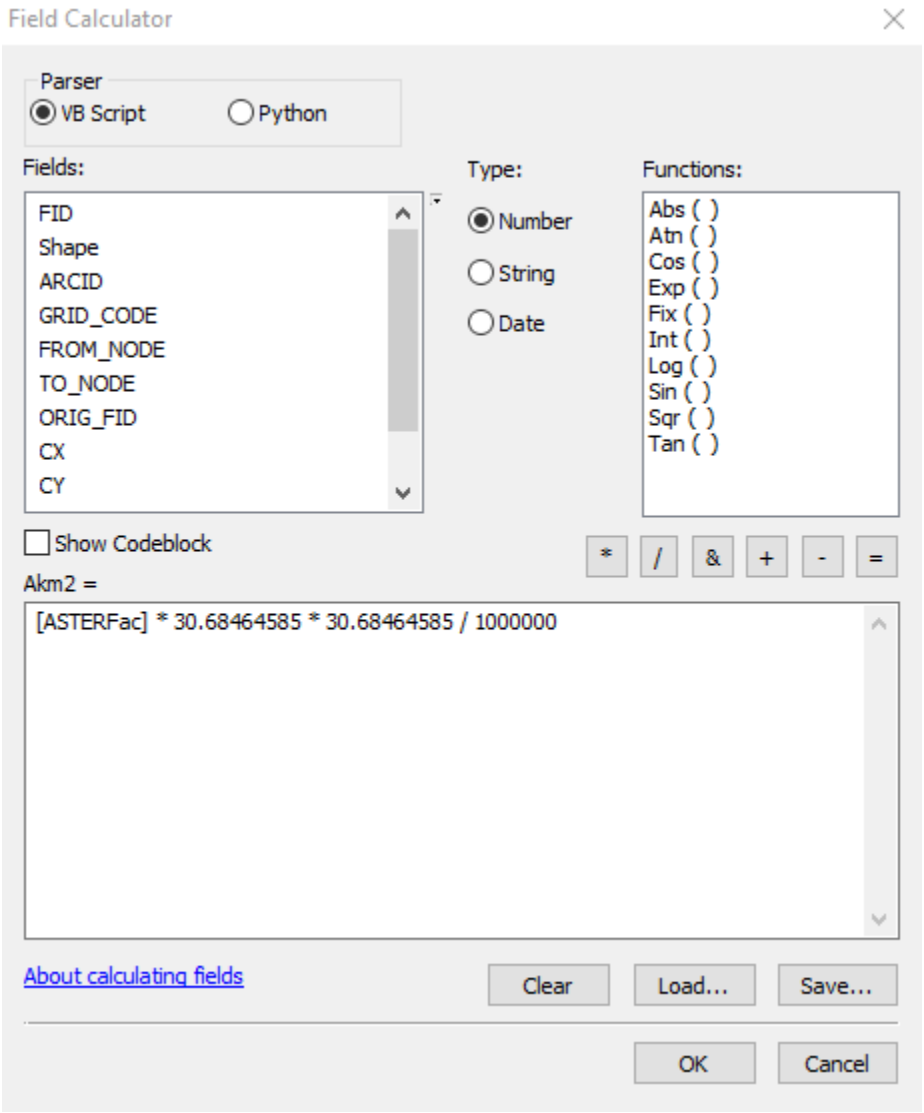
0 (0 out of 11654 Selected)

ASTERStrNode | SRTMStrNode | ALOSStrNode

Se crea un campo nuevo para calcular el área de aportación para cada nodo



Se usa Field Calculator para hallar el área



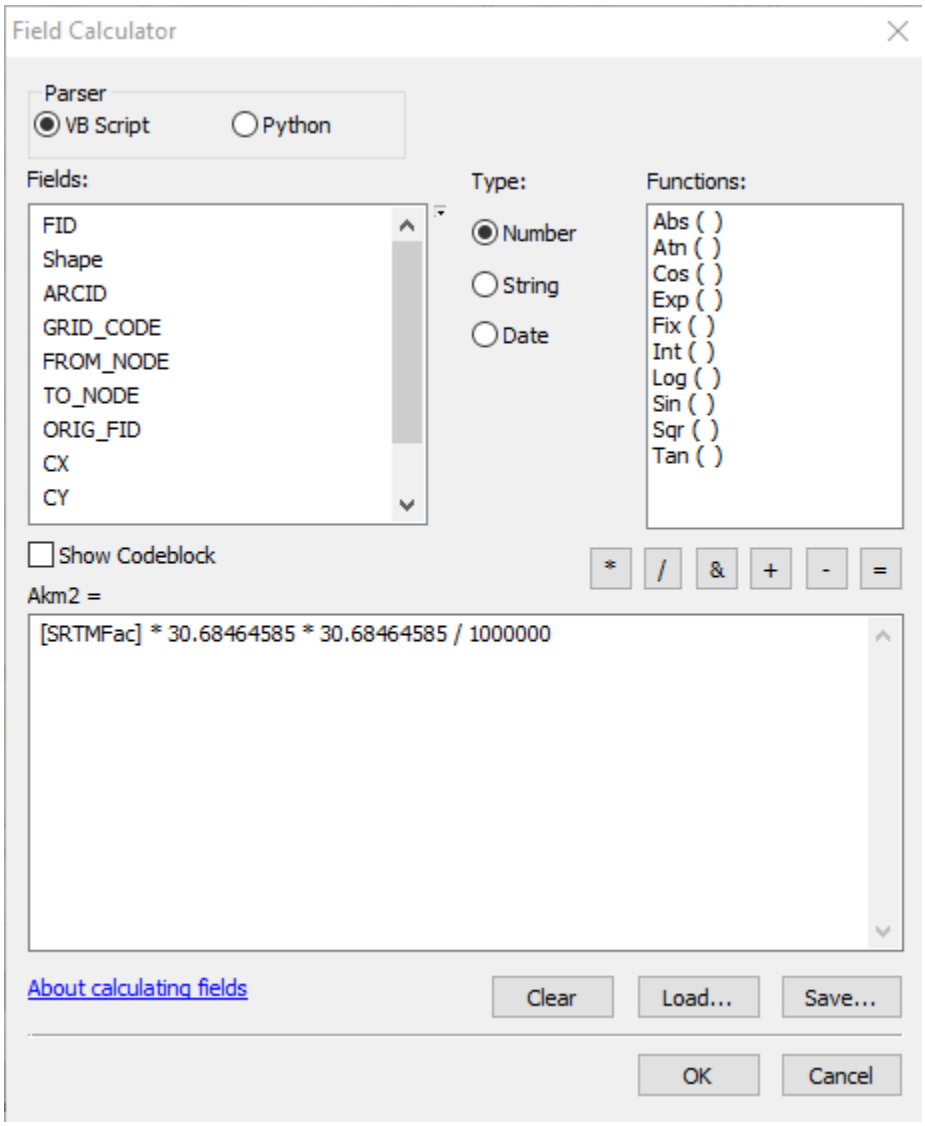
Table

ASTERStrNode

FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY	ASTERFac	Akm2
1132	Point	11990	1	11231	11344	11989	4803402.44212	2028900.54627	6289820	5922.164239
1120	Point	11868	1	11177	11231	11867	4802879.03129	2030347.62326	6286840	5919.358428
1115	Point	11818	1	11134	11177	11817	4802940.60903	2030963.4007	6285180	5917.795459
1111	Point	11775	1	11099	11134	11774	4801955.36513	2031702.33363	6273720	5907.005325
1097	Point	11631	1	10922	10991	11630	4800908.54347	2033395.7216	6249490	5884.191629
1098	Point	11635	1	10994	10991	11634	4800908.54347	2033364.93273	6249490	5884.191629
1089	Point	11546	1	10828	10909	11545	4803525.59761	2034288.59889	6213970	5850.747862
1082	Point	11471	1	10849	10687	11470	4804726.36362	2034781.22085	6170120	5809.461005
1083	Point	11478	1	10849	10853	11477	4804726.36362	2034750.43198	6170120	5809.461005
1059	Point	11235	1	10469	10618	11234	4804172.16392	2037151.964	6124790	5766.780657

0 (0 out of 11393 Selected)

ASTERStrNode | SRTMStrNode | ALOSStrNode



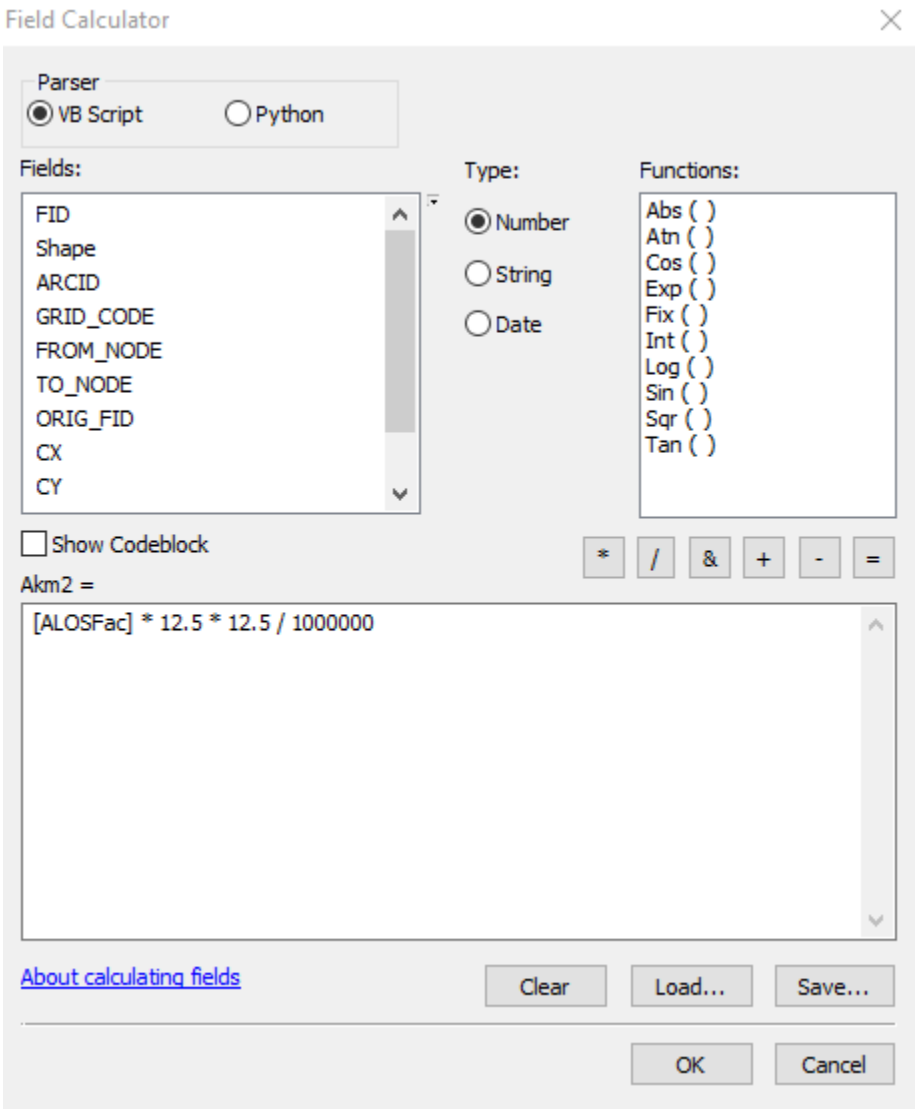
Table

SRTMStrNode

FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY	SRTMFac	Akm2
1106	Point	11719	1	11091	11013	11718	4796628.89024	2030747.87861	6288680	5921.090875
1096	Point	11606	1	10845	10989	11605	4797891.234	2031979.4335	6285610	5918.200325
1091	Point	11551	1	10934	10931	11550	4798784.11129	2032718.36643	6272490	5905.847221
1091	Point	11552	1	10934	10935	11551	4798814.90017	2032718.36643	6272490	5905.847221
1098	Point	11621	1	10935	11004	11620	4799646.19971	2031794.70027	6268490	5902.081031
1098	Point	11622	1	11004	11005	11621	4799676.98859	2031794.70027	6268490	5902.081031
1098	Point	11623	1	11005	11006	11622	4799707.77746	2031794.70027	6268480	5902.071616
1098	Point	11624	1	11006	11007	11623	4799738.56633	2031794.70027	6268480	5902.071616
1098	Point	11625	1	11007	11008	11624	4799769.3552	2031794.70027	6268480	5902.071616
1098	Point	11626	1	11008	11009	11625	4799800.14408	2031794.70027	6268480	5902.071616

0 (0 out of 11288 Selected)

ASTERStrNode | SRTMStrNode | ALOSStrNode



Table

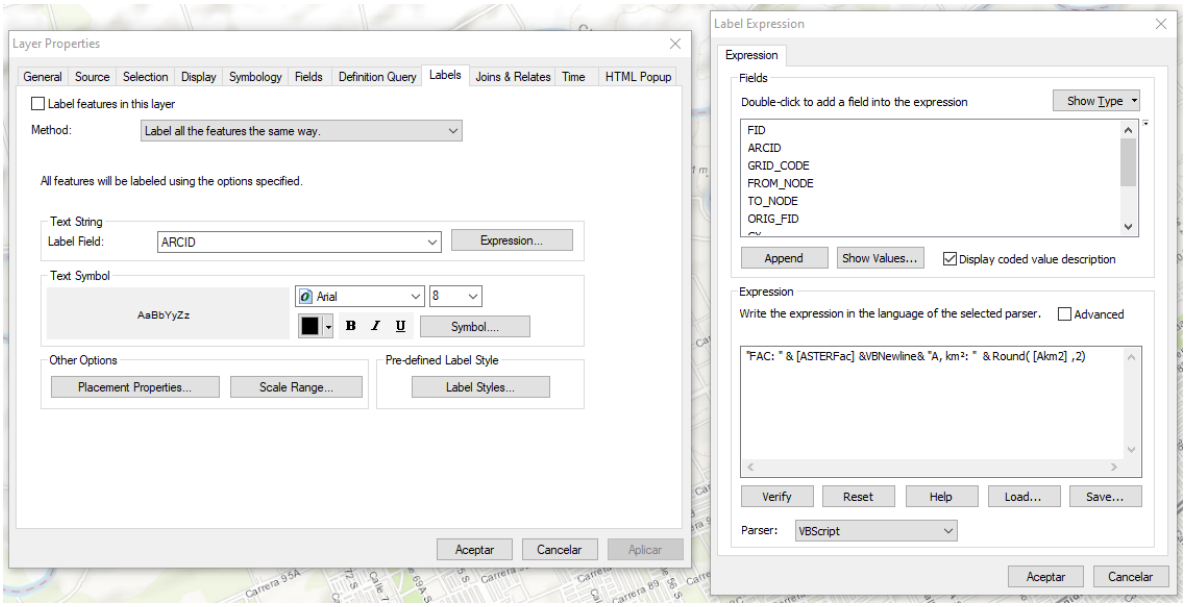
ALOSStrNode

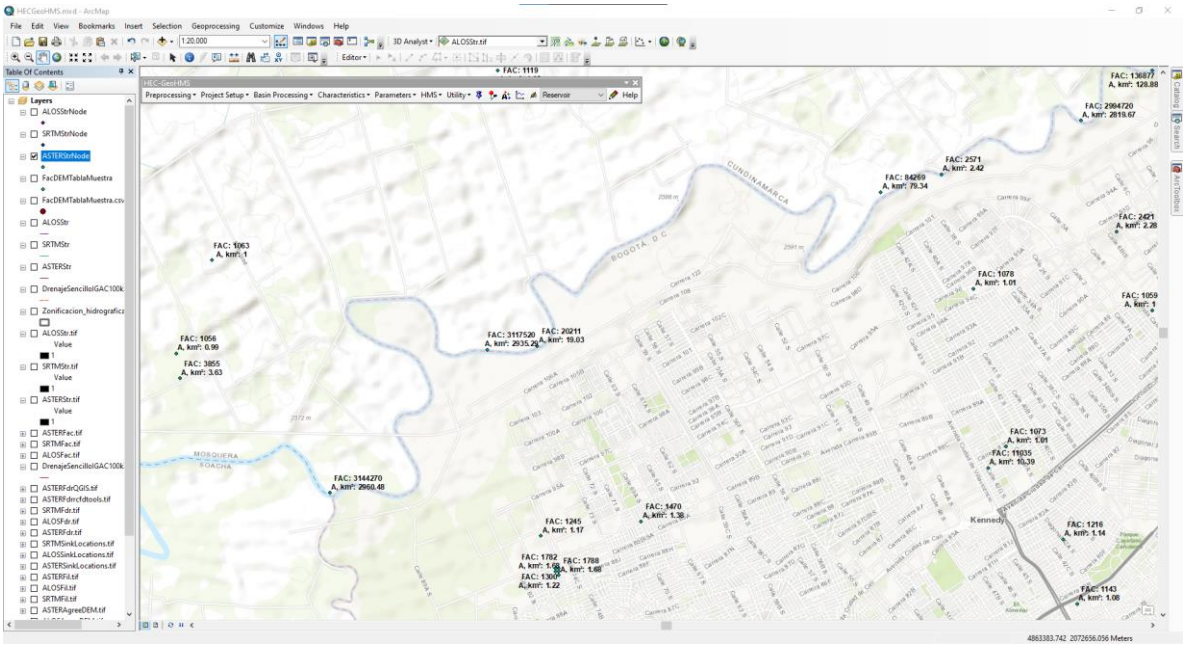
FID	Shape *	ARCID	GRID_CODE	FROM_NODE	TO_NODE	ORIG_FID	CX	CY	ALOSFac	Akm2
1139	Point	12129	1	11419	11323	12128	4796637.9804	2030720.03015	38137500	5958.984375
1129	Point	12012	1	11145	11309	12011	4797900.4804	2031982.53015	38116700	5955.734375
1123	Point	11950	1	11248	11247	11949	4798762.9804	2032720.03015	38036500	5943.203125
1123	Point	11951	1	11248	11249	11950	4798775.4804	2032720.03015	38036500	5943.203125
1130	Point	12028	1	11249	11324	12027	4799587.9804	2031832.53015	38013800	5939.65625
1127	Point	11999	1	11299	11300	11998	4800325.4804	2032007.53015	37926300	5925.984375
1128	Point	11999	1	11299	11300	11998	4800337.9804	2032007.53015	37926300	5925.984375
1128	Point	12000	1	11300	11301	11999	4800350.4804	2032007.53015	37926300	5925.984375
1118	Point	11897	1	11118	11199	11896	4800925.4804	2033295.03015	37917700	5924.640625
1110	Point	11822	1	11118	11123	11821	4801700.4804	2034045.03015	37862200	5915.96875

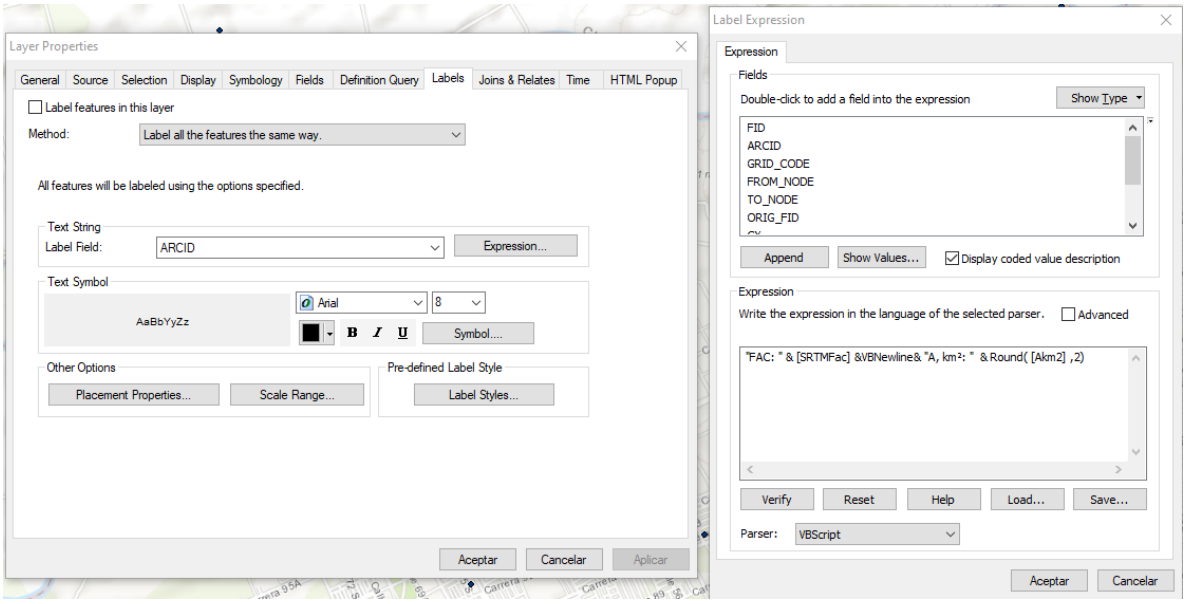
0 (0 out of 11654 Selected)

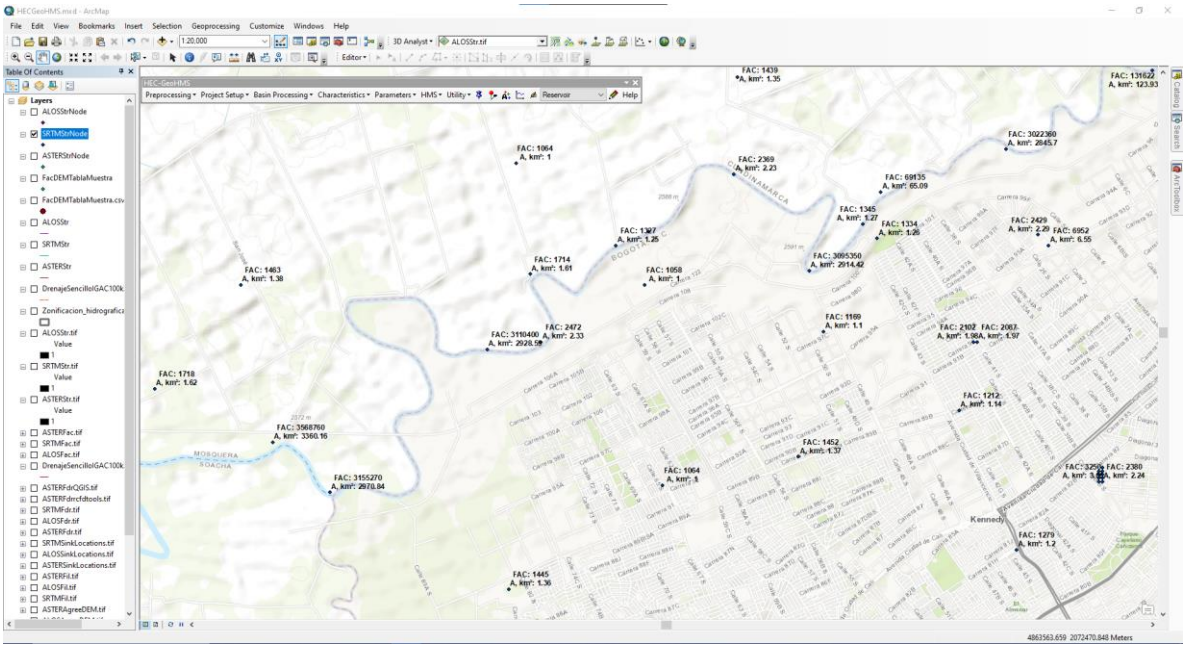
ALOSStrNode

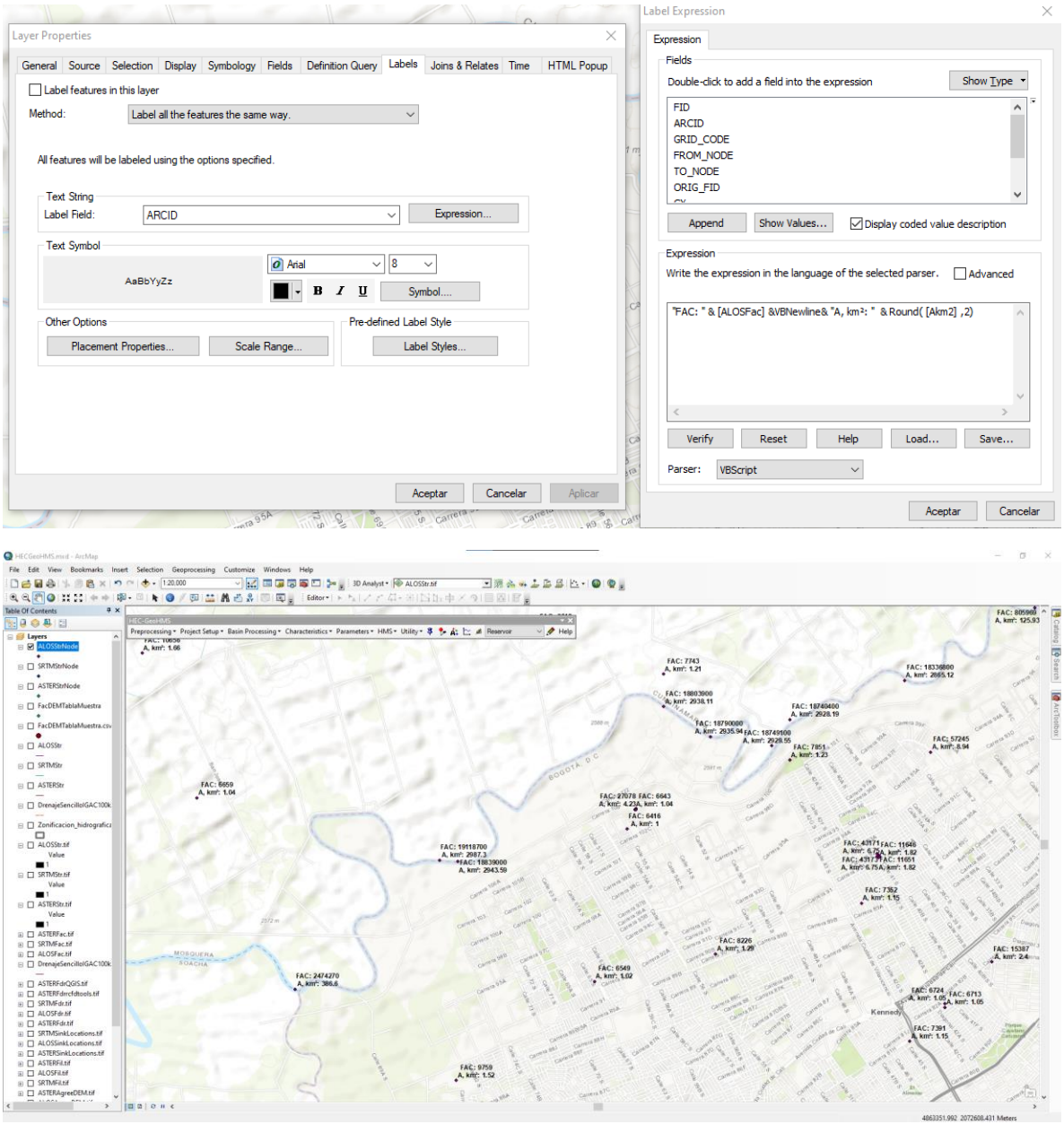
Finalmente, se rotula cada capa






Layer Properties
General
Source
Selection
Display
Symbology
Fields
Definition Query
Labels
Joins & Relates
Time
HTML Popup
Label features in this layer
Method:
Label all the features the same way.
All features will be labeled using the options specified.
Text String
Label Field:
ARCID
Expression...
Text Symbol
AaBbYyZz
Arial
8
Symbol....
Other Options
Placement Properties...
Scale Range...
Pre-defined Label Style
Label Styles...
Aceptar
Cancelar
Aplicar
Label Expression
Expression
Fields
Double-click to add a field into the expression
Show Type
FID
ARCID
GRID_CODE
FROM_NODE
TO_NODE
ORIG_FID
Append
Show Values...
Display coded value description
Expression
Write the expression in the language of the selected parser.
Advanced
"FAC: " & [SRTMFac] &VBNewline& "A, km²: " &Round([Akm2] ,2)
Verify
Reset
Help
Load...
Save...
Parser:
VBScript
Aceptar
Cancelar


HEC-GeoHMS
Table Of Contents
Layers
SRTMStrNode
FAC: 1439
FAC: 1064
FAC: 2369
FAC: 3022360
FAC: 1463
FAC: 1714
FAC: 1058
FAC: 1718
FAC: 3155270
FAC: 1212
FAC: 1279
FAC: 1445



Investigue y documente cual es el área de aportación representativa para obtener tramos de drenaje en función del área total de una cuenca para diferentes tamaños de aportación.

El área de drenaje de la cuenca está definida por el espacio delimitado por la curva del perímetro de la cuenca total aportante. Esta línea se traza normalmente mediante fotointerpretación de fotografías aéreas en las que se aprecia el relieve (y por lo tanto las divisorias de aguas) o sobre un mapa topográfico en función de las curvas de nivel representadas.

La delimitación de una cuenca hidrográfica consiste en definir la línea de divortium aquarum (divisoria de aguas), la cual es una línea curva definida por las altitudes y que tiene su punto de cierre

en la zona más baja de la cuenca. La longitud de la línea divisoria es el perímetro de la cuenca y la superficie que encierra dicha curva es el área. Dicha delimitación implica una demarcación de las áreas de drenaje superficial donde las precipitaciones que caen sobre éstas tienden a ser drenadas hacia un mismo punto de salida (Instituto Nacional de Ecología de México, 2005). La delimitación se puede hacer a partir de un MDE y a través de diversas herramientas que proporcionan los SIG. Una vez establecida dicha delimitación se puede proceder con los métodos para obtener las estimaciones correspondientes. En general, podemos decir que una cuenca hidrográfica constituye un espacio físico delimitado por la propia naturaleza y principalmente por los límites que imponen las zonas de escurrimiento de las aguas superficiales convergiendo hacia un mismo punto de desagüe o punto de cierre (Garcés Durán, 2011).