

# Australian Hydrological Geospatial Fabric (Geofabric) Tutorial

Create a subset of Geofabric data

Version 2.1 – November 2012



**Australian Government**  
**Bureau of Meteorology**



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## Contents

1	Introduction.....	6
1.1	ArcGIS Version .....	6
1.2	Symbology .....	6
2	Tutorial .....	7
2.1	Download the Surface Network File Geodatabase (FGDB) from the Geofabric ftp site.....	7
2.2	Create a Surface Network FGDB structure to store subset data.....	8
2.2.1	Delete empty Geometric Network .....	12
2.2.2	Delete empty tables .....	13
2.3	Create a subset of the Geofabric Surface Network FGDB feature classes.....	14
2.3.1	Subset AHGFCatchment.....	15
2.3.2	Subset AHGFNetworkStream .....	17
2.3.3	Subset AHGFNetworkNode.....	18
2.3.4	Subset AHGFWaterbody .....	20
2.4	Load subset data .....	21
2.5	Create a subset of the Surface Network FGDB tables .....	24
2.5.1	Add subset feature classes and original tables .....	26
2.5.2	Subset AHGFNetworkConnectivityDown .....	27
2.5.3	Subset AHGFNetworkConnectivityUp.....	31
2.5.4	Subset AHGFNetworkStream_FS .....	32
2.6	Build a Geometric Network .....	35
2.6.1	ArcGIS 10 (SP 3) .....	36
2.6.2	ArcGIS 9.3 .....	38
2.7	Geometric network errors.....	40
2.7.1	Analyse SH_Network_Net_Junctions .....	40
2.7.2	ArcGIS 9.3 .....	40
2.8	Set the flow direction of the network.....	42
2.9	Trace upstream from a node in the network .....	45

## List of tables

Table 1 - Key attributes of the AHGFNetworkConnectivityDown (downstream) table for Surface Network .....	24
Table 2 - Key attributes of the AHGFNetworkConnectivityDown (downstream) table for Surface Network .....	25
Table 3 - Key attributes of the AHGFNetworkSegment_FS table for Surface Network (flow split table for use with ArcHydro tools) .....	25

## **1 Introduction**

Geofabric Surface Network is intended to be used in stream flow tracing operations, thus utilising the product's full topological connection. The product can support the spatial selection of associated hydrological features (such as water bodies and catchments) as inputs for spatial analysis/modelling.

This tutorial describes the steps required to create a subset of Geofabric Surface Network which retains topological relationships and can be used with tooling available in the standard ArcMap Utility Network Analyst toolbar. An example of performing a simple network trace is also provided.

In Version 2 of the Geofabric, geometric networks have been built and are provided as a component of Geofabric products. To select a subset of Geofabric data, or to include your own Nodes in the network, a geometric network needs to be rebuilt to continue to utilise the products' topological connectivity.

### **1.1 ArcGIS Version**

The steps outlined in this tutorial use ArcGIS 10.0 (SP 3).

The tutorial also includes steps for ArcGIS 9.3 in instances where they differ significantly from ArcGIS 10.0.

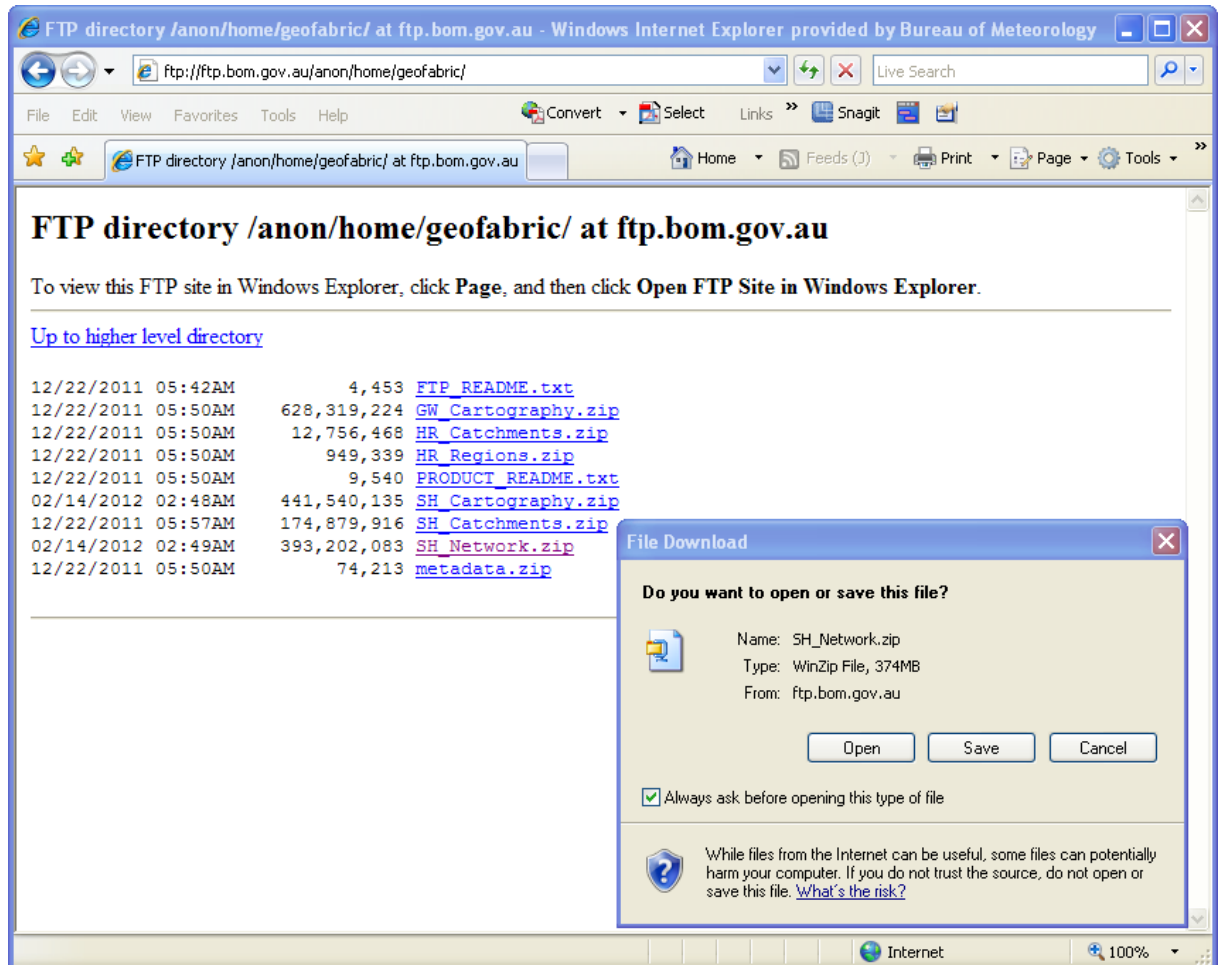
### **1.2 Symbology**

The symbology used in this tutorial is based on the Surface Network LYR file.

## 2 Tutorial

### 2.1 Download the Surface Network File Geodatabase (FGDB) from the Geofabric ftp site

1. From the [Bureau of Meteorology Geofabric](#) website browse to Downloads and select [Download the Geofabric data from the Geofabric FTP site](#). Select Geofabric Surface Network's SH\_Network ZIP file and save this to disk

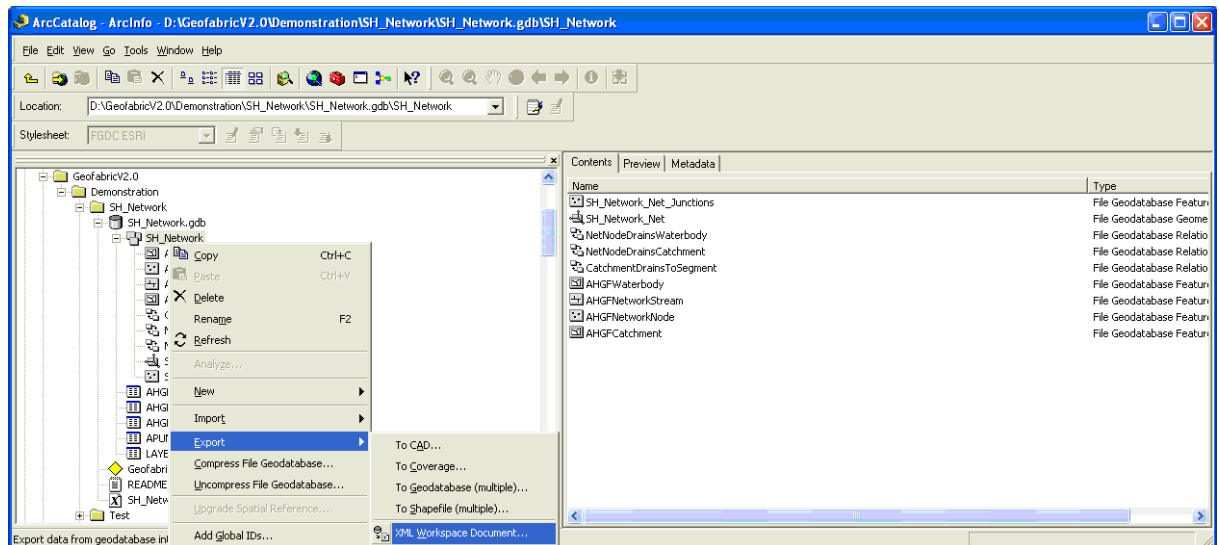


2. Unzip the downloaded file, making sure that the resulting folder ends with gdb (e.g. the contents of the SH\_Network ZIP file should be unzipped to a folder called SH\_Network\_GDB).

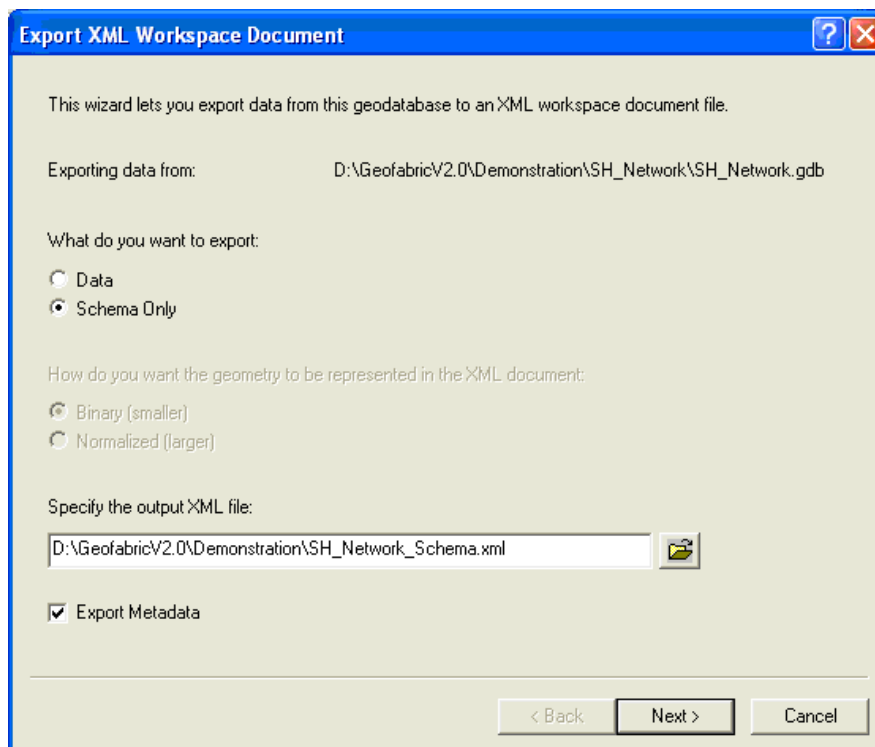
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### 2.2 Create a Surface Network FGDB structure to store subset data.

1. Start ArcCatalog and navigate to SH\_Network.gdb that was downloaded and unzipped in step 2.1.
2. Right click SH\_Network.gdb > Export > XML Workspace Document



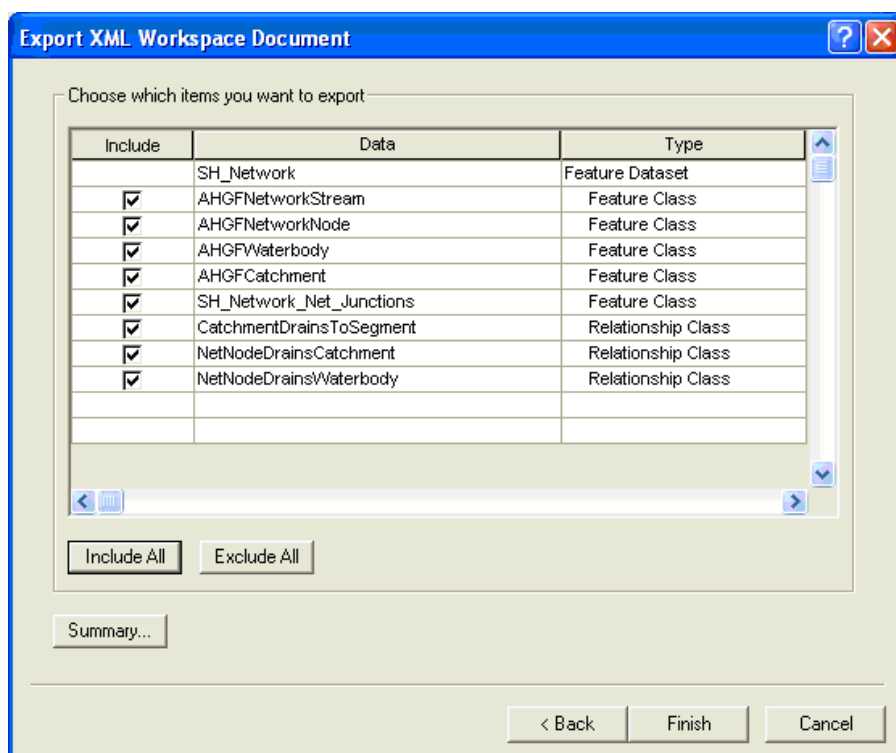
3. Select Schema Only, check Export Metadata and Specify the output XML file: e.g. SH\_Network\_Schema.xml, Choose [Next>].





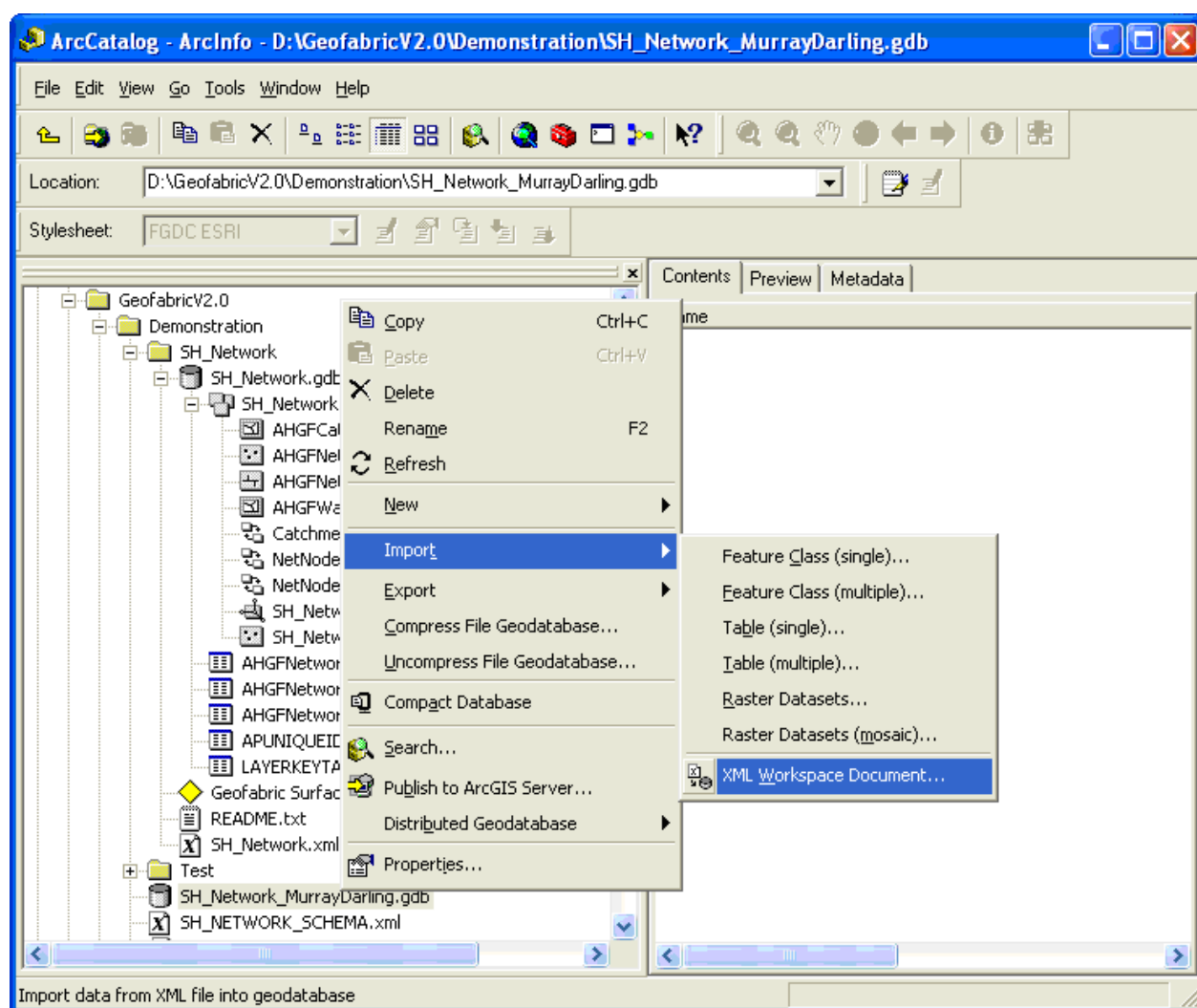
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4. Choose [Include All], Choose [Finish].



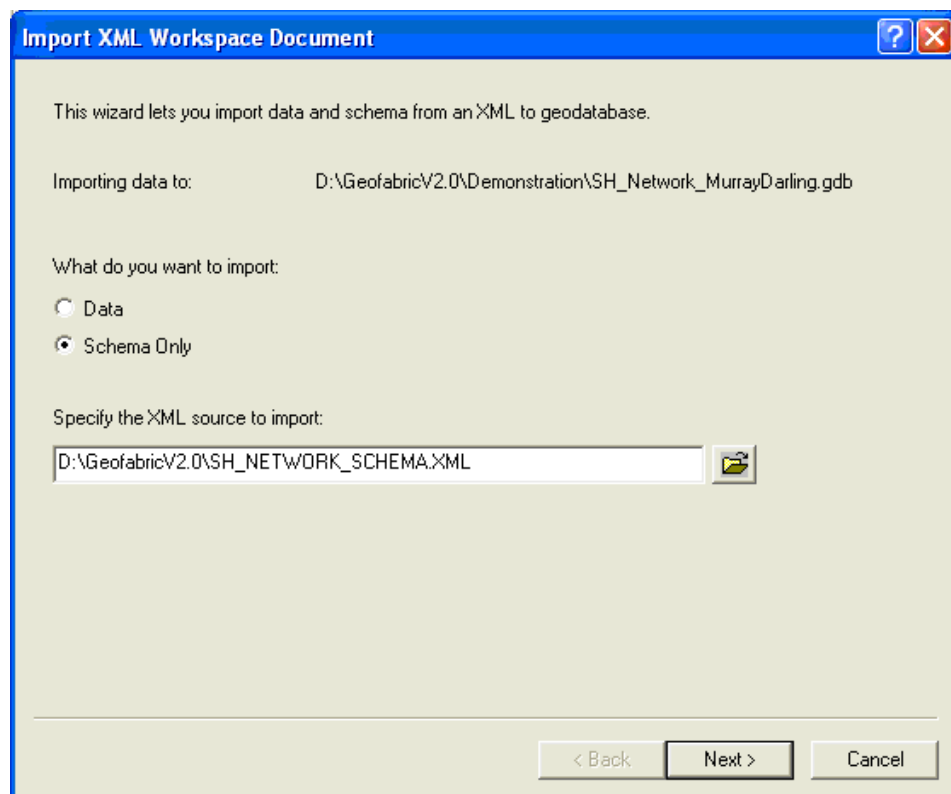
5. In ArcCatalog create a New > File Geodatabase (FGDB) in your chosen directory and rename, e.g. SH\_Network\_MurrayDarling.gdb
6. Right click SH\_Network\_MurrayDarling.gdb Import > XML Workspace Document

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data



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7. In the XML Workspace Document Wizard, select Schema Only, specifying the XML source to import as SH\_Network\_Schema.xml as created in step 2.2. Choose [Next>], then choose [Finish].

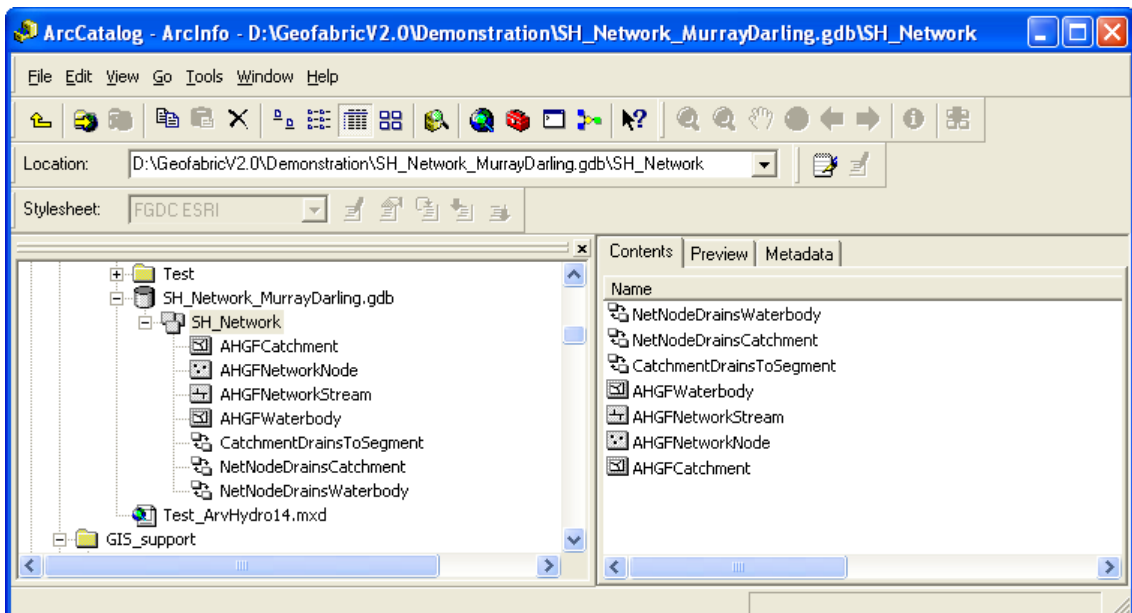
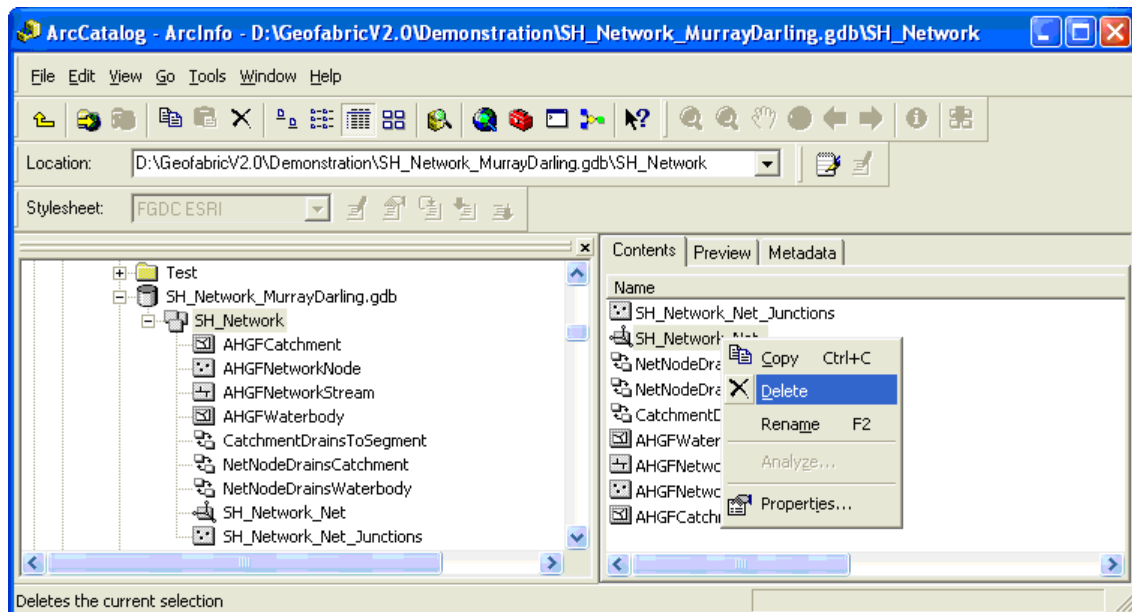


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### 2.2.1 Delete empty Geometric Network

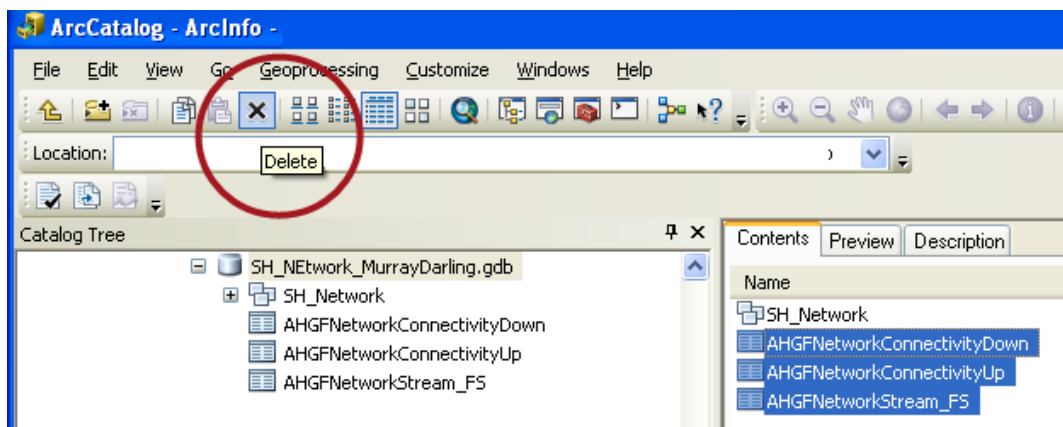
Open the new feature dataset SH\_Network, and delete the Geometric Network's SH\_Network\_Net (SH\_Network\_Net\_Junctions will be automatically deleted).

A new geometric network will be created later on in this tutorial for the data subset.



### 2.2.2 Delete empty tables

1. Delete the original tables which are empty:
  - AHGFNetworkConnectivityDown
  - AHGFNetworkConnectivityUp
  - AHGFNetworkStream\_FS.



2. These tables will be created later on in this tutorial for the data subset.
3. Close ArcCatalog to release any potential table locks

## 2.3 Create a subset of the Geofabric Surface Network FGDB feature classes

1. Start ArcMap and add in the following feature classes from the data that was downloaded in the ZIP file in step 2.1:
  - AHGFCatchment
  - AHGFNetworkNode
  - AHGFNetworkStream
  - AHGFWaterbody.
2. Select a subset of AHGFCatchment features, either:
  - manually
  - through flow tracing
  - by undertaking a Select by Location operation with your own spatial features (e.g. a Catchment Management Authority reporting region)
  - with selected Hydrology Reporting Regions AWRA Drainage Division or RiverRegion features.

3. **IMPORTANT:** Due to artefacts of the stream feature derivation process used to create the features in the AHGFNetworkStream feature class, some stream features will slightly overlap the boundaries of features in AWRA Drainage Division and RiverRegion feature classes.

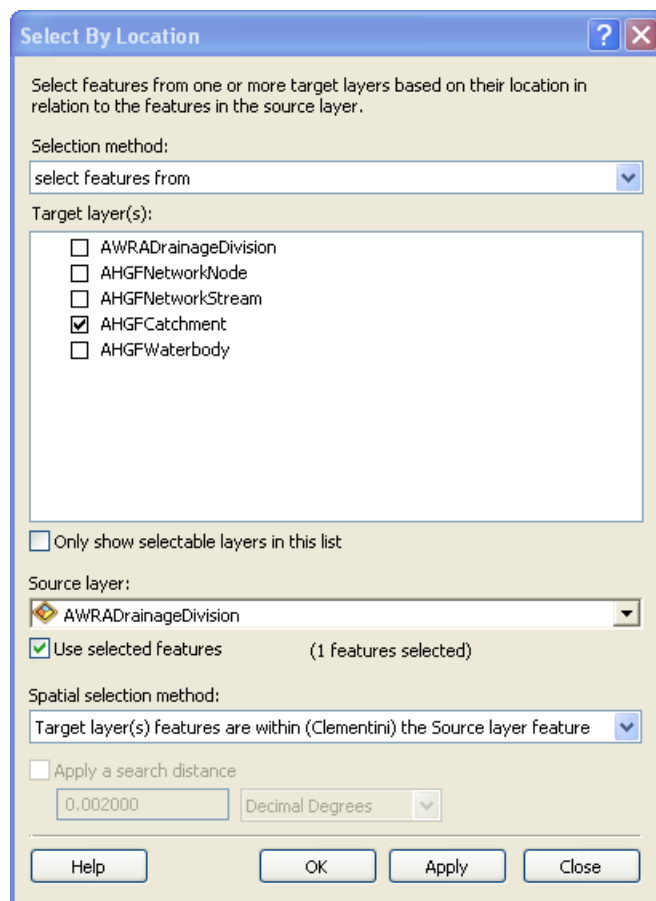
The same is likely when generating stream feature selection sets based on a spatial intersection with your own features. Therefore, if full stream connectivity needs to be preserved, it is strongly advised to follow the methodology described below when subsetting Surface Network features with Hydrology Reporting Regions features.

When subsetting Surface Network with your own spatial boundary features, it is recommended that you utilise stream tracing when creating the feature selection sets for exporting. The same advice is also relevant when subsetting the stream features (AHGFMappedStream and AHGFMappedNode) contained within Surface Cartography.

4. In this example we will select Murray–Darling using the Hydrology Reporting Regions feature class AWRA Drainage Division which can be downloaded from the [Bureau of Meteorology Geofabric](#) website:
  - Browse to Downloads and select [Download the Geofabric data from the Geofabric FTP site](#).
  - Select Hydrology Reporting Regions HR\_Regions ZIP file and save this to disk
  - Unzip the downloaded file, making sure that the resulting folder ends with gdb (e.g. the contents of the HR\_Regions ZIP file should be unzipped to a folder called HR\_Regions\_GDB).

### 2.3.1 Subset AHGFCatchment

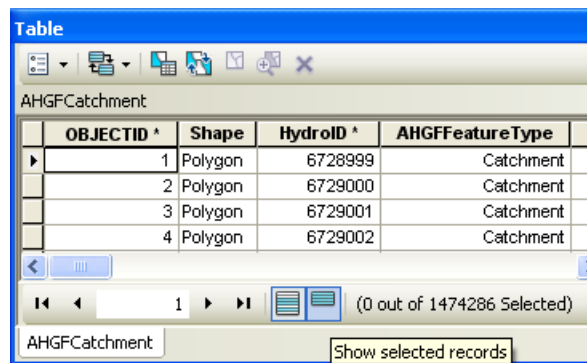
1. From the previously downloaded HR Regions product, add the AWRADrainageDivision feature class and select the record where Division = 'Murray–Darling'
2. Click the Selection Menu > Select By location, and in the Select by Location Wizard:
  - Select features from, Target Layer(s): AHGFCatchment
  - Source Layer: AWRADrainageDivision, Use selected features
  - Use selected features
  - Spatial selection method: Target layer(s) features are within (Clementini) the Source layer feature,
  - Choose [OK].



## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

3. Open Attribute Table of AHGFCatchment which contains the selected features, click on the button Show selected records.

Do not close the table as it is required in the next step.



OBJECTID ^	Shape	Hydroid ^	AHGFFeatureType
1	Polygon	6728999	Catchment
2	Polygon	6729000	Catchment
3	Polygon	6729001	Catchment
4	Polygon	6729002	Catchment

Navigation: (0 out of 1474286 Selected)

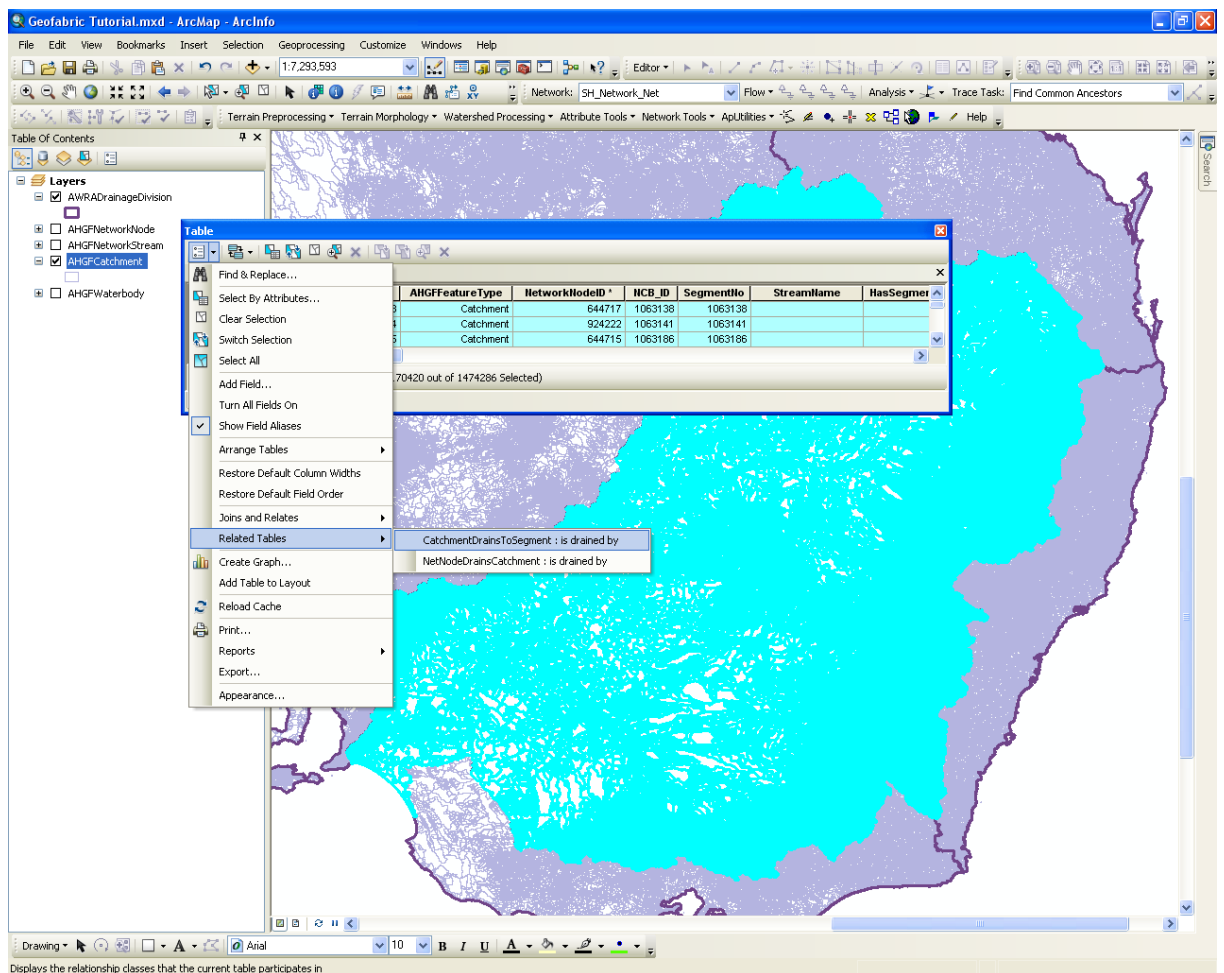
Buttons: Show selected records

4. In the Table of Contents (TOC) right click AHGFCatchment > Data > Export Data. In the Export Data Wizard select Selected features into your newly created FGDB, e.g. SH\_Network\_MurrayDarling.gdb\AHGFCatchment\_Temp.
5. Choose No to Do you want to add the exported data to the map as a layer.
6. Do not deselect the AHGFCatchment features as they are required later on.



### 2.3.2 Subset AHGFNetworkStream

1. In the Attribute Table showing the selected AHGFCatchments from the previous step, select Table Options > Related\_Tables > CatchmentDrainsToSegment : is drained by to select all topologically related Network Streams.



2. The Table Attributes of AHGFNetworkStream is automatically returned with related records selected.
3. In the TOC right click AHGFNetworkStream > Data >Export Data. In the Export Data Wizard, select Selected features into your FGDB, e.g. SH\_Network\_MurrayDarling.gdb\AHGFNetworkStream\_Temp.
4. Choose No to Do you want to add the exported data to the map as a layer.

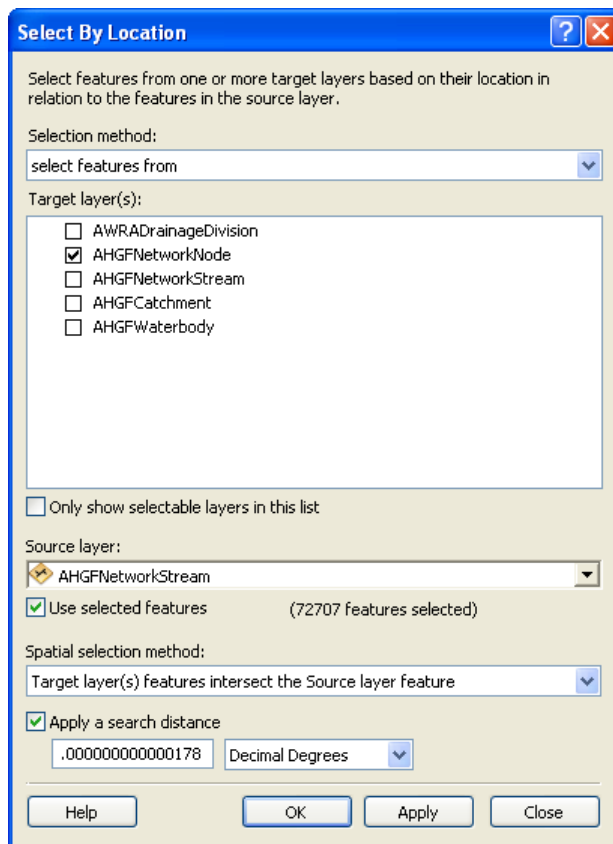
### 2.3.3 Subset AHGFNetworkNode

1. Make sure AHGFNetworkStreams features are still selected. Click the Selection Menu > Select By location, and in the Select by Location Wizard:
  - Select features from, Target layer(s): AHGFNetworkNode
  - Source layer: AHGFNetworkStream
  - Use selected features
  - Spatial selection method: Target layer(s) features intersect the Source layer feature
  - Apply a search distance, or buffer, of 0.000000000000178 Decimal Degrees, which is the SH Network Feature Dataset's tolerance.

When creating a subset of SH Network GDB, it is possible that ArcGIS will otherwise not select all the relevant AHGFNetworkNode features.

Using this tolerance will ensure that all the nodes in AHGFNetworkNode will be selected in ArcGIS, which uses this tolerance when evaluating relationships between features.

  - Choose [OK].

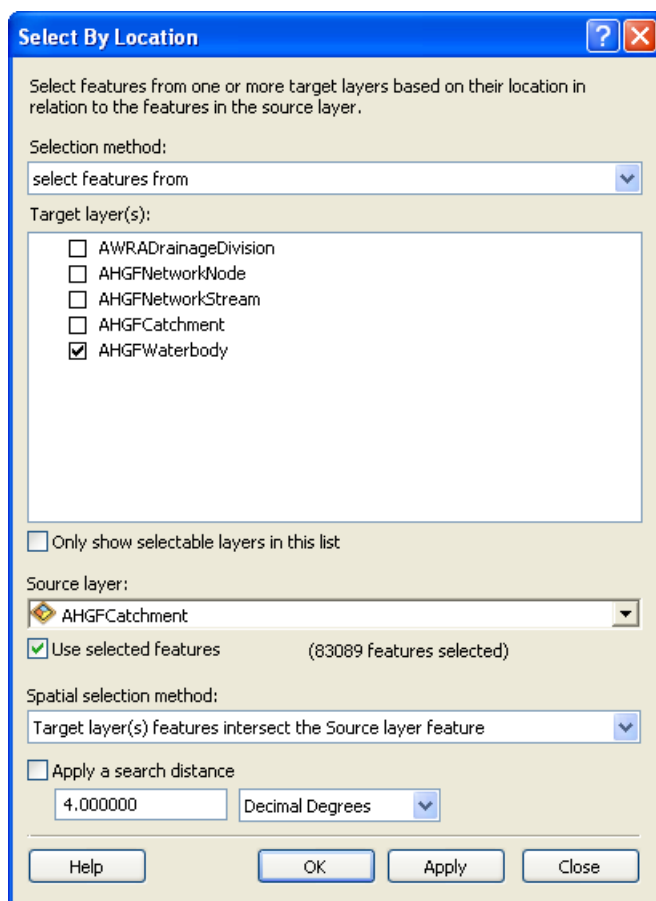


## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

2. Open Attribute Table of AHGFNetworkNode which contains the selected features, and click on the Show selected records button.
3. In the Table of Contents right click AHGFNetworkNode > Data > Export Data. In the Export Data Wizard, select Selected features into your FGDB, e.g. SH\_Network\_MurrayDarling.gdb\AHGFNetworkNode\_Temp.
4. Choose No to Do you want to add the exported data to the map as a layer.

### 2.3.4 Subset AHGFWaterbody

1. Make sure AHGFCatchment features are still selected. Click the Selection Menu > Select By location, and in the Select by Location Wizard:
  - Select features from, Target layer(s): AHGFWaterbody
  - Source layer: AHGFCatchment
  - Use selected feature
  - Spatial selection method: Target layer(s) features intersect the Source layer feature
  - Choose [OK].

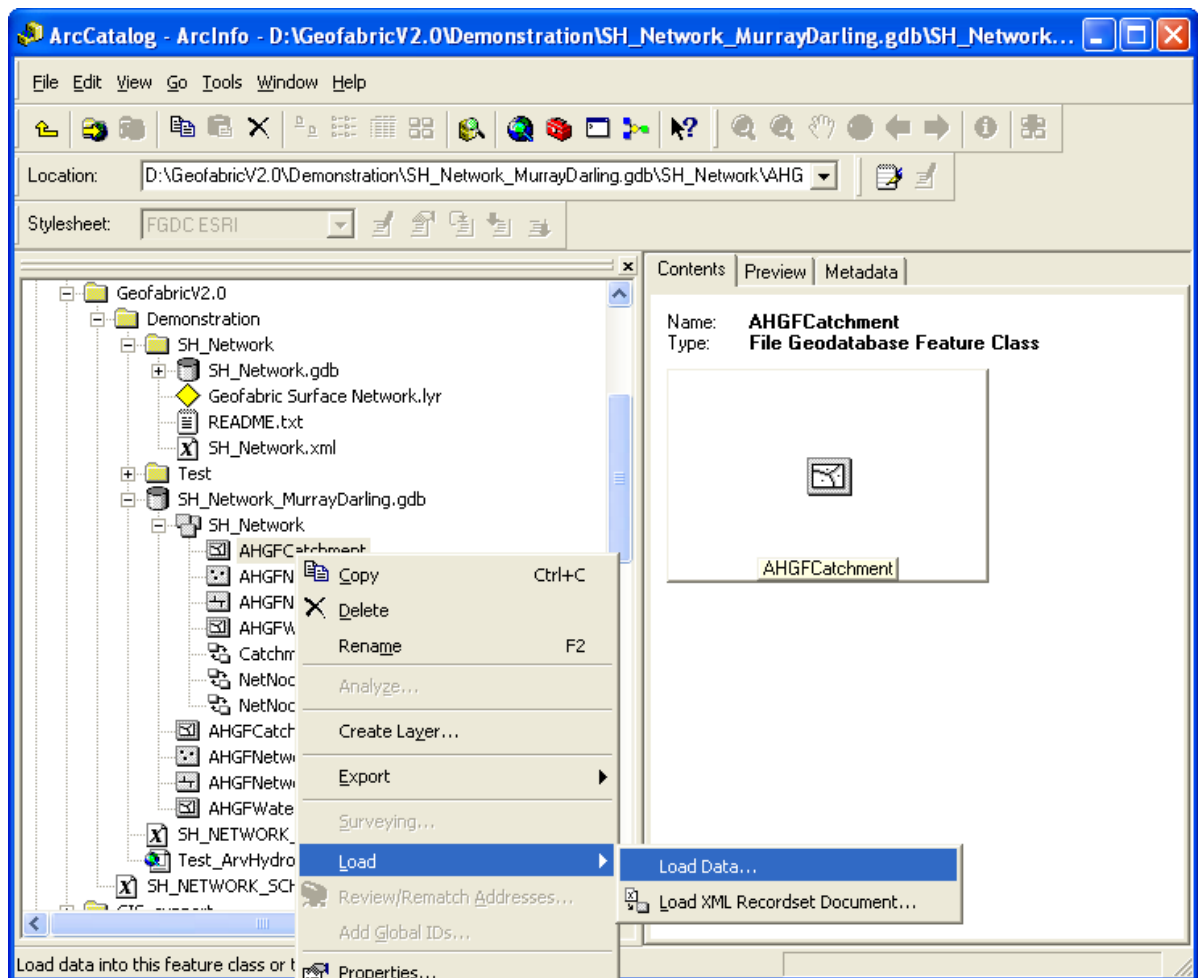


2. Open Attribute Table of AHGFWaterbody which contains the selected features, and click on the button Show selected records.
3. In the Table of Contents right click AHGFWaterbody > Data >Export Data, and in the Export Data Wizard, select Selected features into your FGDB, e.g. SH\_Network\_MurrayDarling.gdb\AHGFWaterbody\_Temp.
4. Choose No to Do you want to add the exported data to the map as a layer.

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

### 2.4 Load subset data

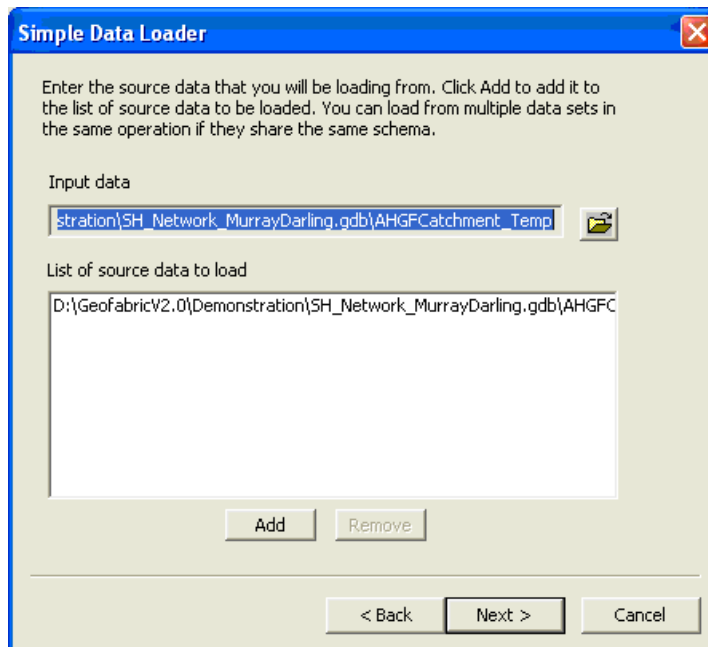
1. Save your ArcMap document and exit, thereby removing any potential table locks when working in ArcCatalog.
2. Open ArcCatalog and navigate to the SH\_Network feature dataset within the file geodatabase SH\_Network\_MurrayDarling.gdb created in step 2.2.
3. Right click AHGFCatchment > Load > Load Data.



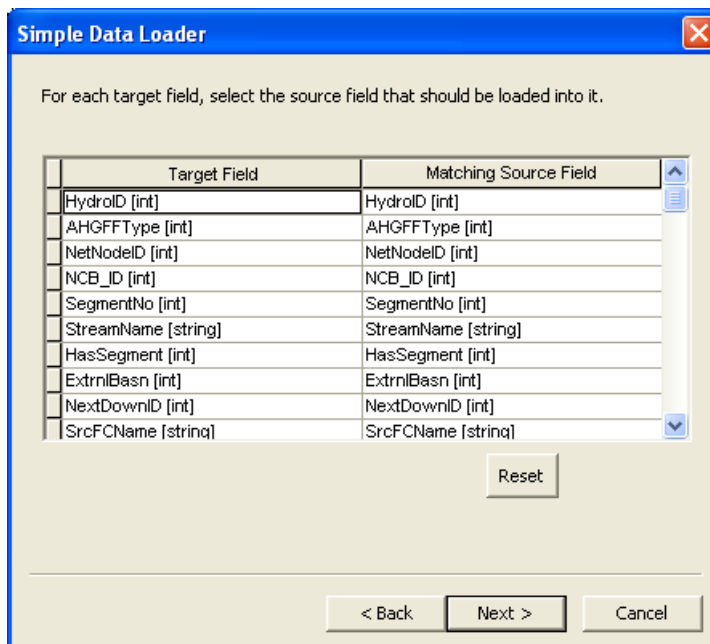
4. In the Simple Data Loader Wizard:
5. Choose [Next>].

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

6. For Input data, browse to AHGFCatchment\_Temp as created in step 2.3.1
  - Select AHGFCatchment and choose [Open]
  - Choose [Add] then [Next>].

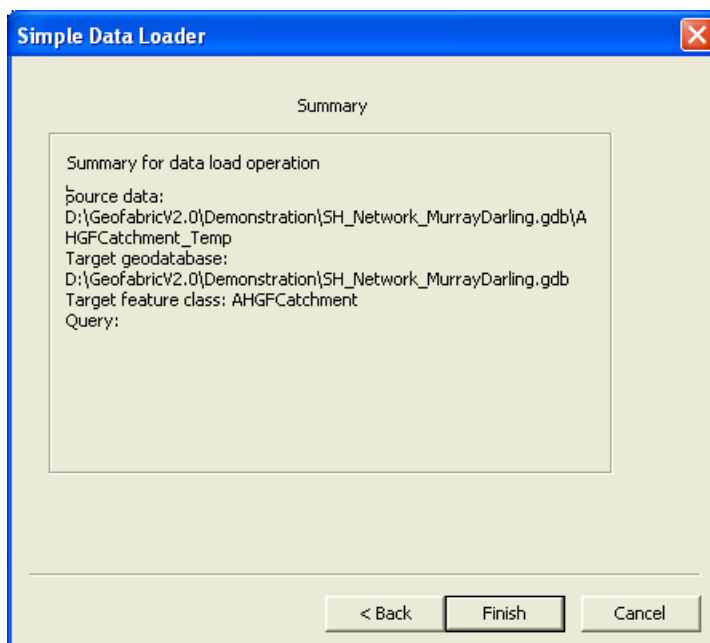
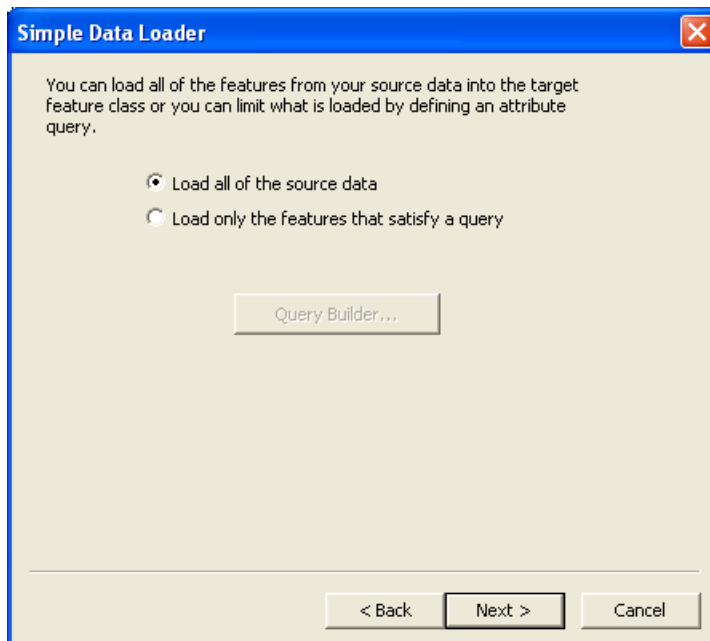


7. Take default I do not want to load all features into a subtype, choose [Next>].
8. Accept default Target Field / Matching Source Field mappings, choose [Next>]



## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

9. Select Load all of the source data. Choose [Next>] and then [Finish].



10. Using the Simple Data Loader Wizard, Load Data into the remaining three feature classes within the SH\_Network feature dataset using the AHGF<Feature Class Name>\_Temp files created in steps 2.3.1 to 2.3.4:
  - AHGFNetworkStream
  - AHGFNetworkNode
  - AHGFWaterbody.

11. Delete all temporary feature classes after they have been loaded.
12. Close ArcCatalog to release any potential table locks when working in ArcMap.

### 2.5 Create a subset of the Surface Network FGDB tables

In the SH Network FGDB downloaded in step 2.1, there are three geodatabase tables which contain topological connectivity information about the AHGFNetworkNode and AHGFNetworkStream features.

When the SH Network XML schema was imported in step 2.2, these tables were empty and deleted in step 2.2.2. They will now be recreated and populated for the subset data in SH\_Network\_MurrayDarling.gdb.

These tables' key attributes are listed below where the descriptive tables are taken from the Geofabric Product Guide which is available to download from:

<http://www.bom.gov.au/water/geofabric/documentation.shtml>

#### AHGFNetworkConnectivityDown

This table contains the topological connectivity of the network when traversing the network with the digitised direction of the stream features i.e. traversing downstream. Each record in the table contains the HydroIDs of a pair of From and To nodes in AHGFNetworkNode feature class and the HydroID of the respective AHGFNetworkStream segment providing the connection. Records are also included, which have To and Segment ID values set to -1, explicitly indicating that the From node stored in that record is a terminus node.

**Table 1 - Key attributes of the AHGFNetworkConnectivityDown (downstream) table for Surface Network**

Key attribute	Alias	Description
From_ID	From_ID	The HydroID for the AHGFNetworkNode
To_ID	To_ID	The HydroID for the next downstream AHGFNetworkNode
Segment_ID	Segment_ID	The HydroID for the corresponding AHGFNetworkStream feature



## AHGFNetworkConnectivityUp

This table contains the topological connectivity of the network when traversing the network against the digitised direction of the stream features i.e. traversing upstream. Each record in the table contains the HydroIDs of a pair of From and To nodes in AHGFNetworkNode feature class and the HydroID of the respective AHGFNetworkStream segment providing the connection. Records are also included, which have To and Segment ID values set to -1, explicitly indicating that the From node stored in that record is a terminal head node.

**Table 2 - Key attributes of the AHGFNetworkConnectivityDown (downstream) table for Surface Network**

Key attribute	Alias	Description
From_ID	From_ID	The HydroID for the AHGFNetworkNode
To_ID	To_ID	The HydroID for the next upstream AHGFNetworkNode
Segment_ID	Segment_ID	The HydroID for the corresponding AHGFNetworkStream feature

## AHGFNetworkStream\_FS

The content of the Flow Split (FS) table together with NextDownID attribution contained within the AHGFNetworkStream feature class jointly make up the same topological downstream connectivity found in the AHGFNetworkConnectivityDown table. This alternate way of serving up the connectivity information is designed to allow the Geofabric to be compatible with tooling included within ESRI's ArcHydro for Surface Water Toolset. The NextDownID attribute, present on each AHGFNetworkStream feature, stores the HydroID of the next downstream feature. For cases where an AHGFNetworkStream feature has multiple downstream features (e.g. at a bifurcation), the HydroID of the first feature gets stored as the stream's NextDownID and all subsequent downstream HydroIDs are stored as separate entries in the AHGFNetworkStream\_FS table.

**Table 3 - Key attributes of the AHGFNetworkSegment\_FS table for Surface Network (flow split table for use with ArcHydro tools)**

Key attribute	Alias	Description
FeatureID	FeatureID	The HydroID for an AHGFNetworkStream segment
NextDownID	NextDownID	The HydroID for the next downstream AHGFNetworkNode

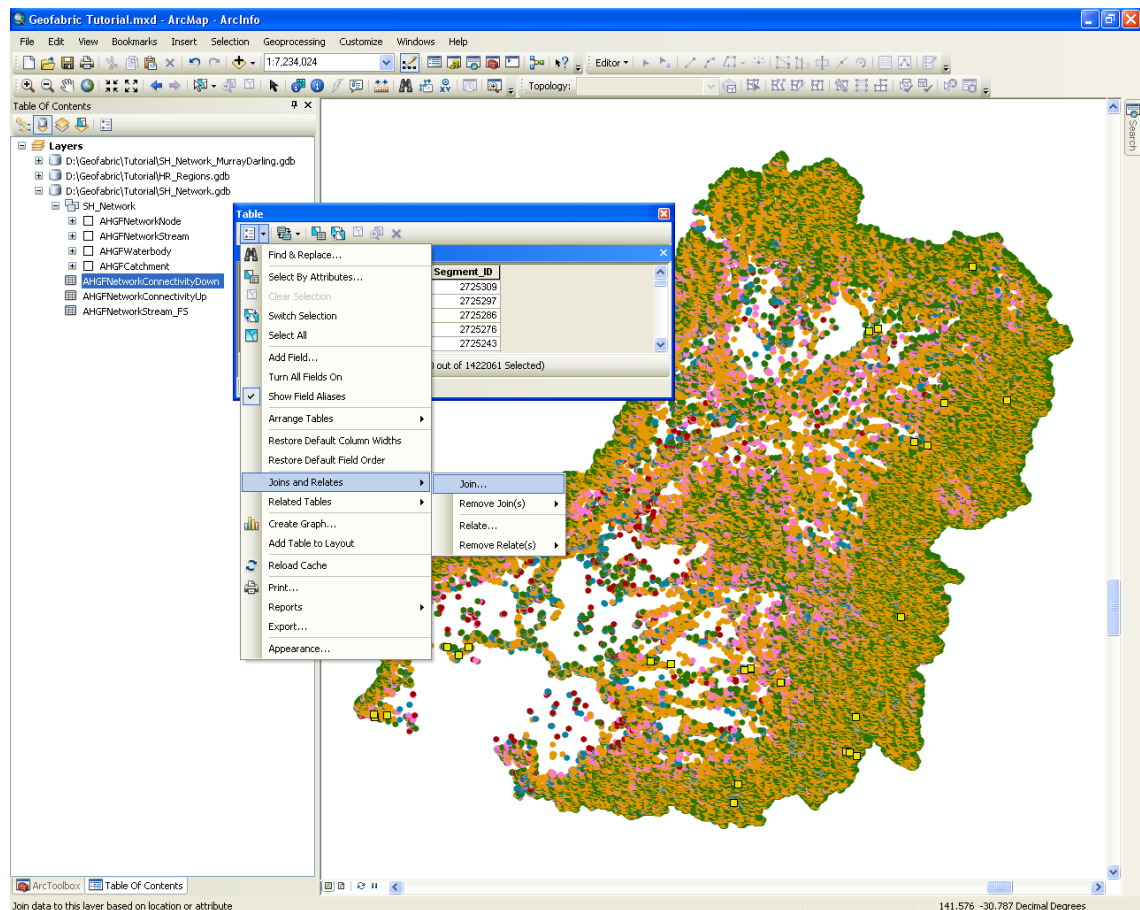
### **2.5.1 Add subset feature classes and original tables**

1. In ArcMap, add the newly created subset feature classes to the MXD:
  - AHGFCatchment
  - AHGFNetworkNode
  - AHGFNetworkStream
  - AHGFWaterbody.
2. Add the following SH\_Network tables that were downloaded in step 2.1:
  - AHGFNetworkConnectivityDown
  - AHGFNetworkConnectivityUp
  - AHGFNetworkStream\_FS.

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

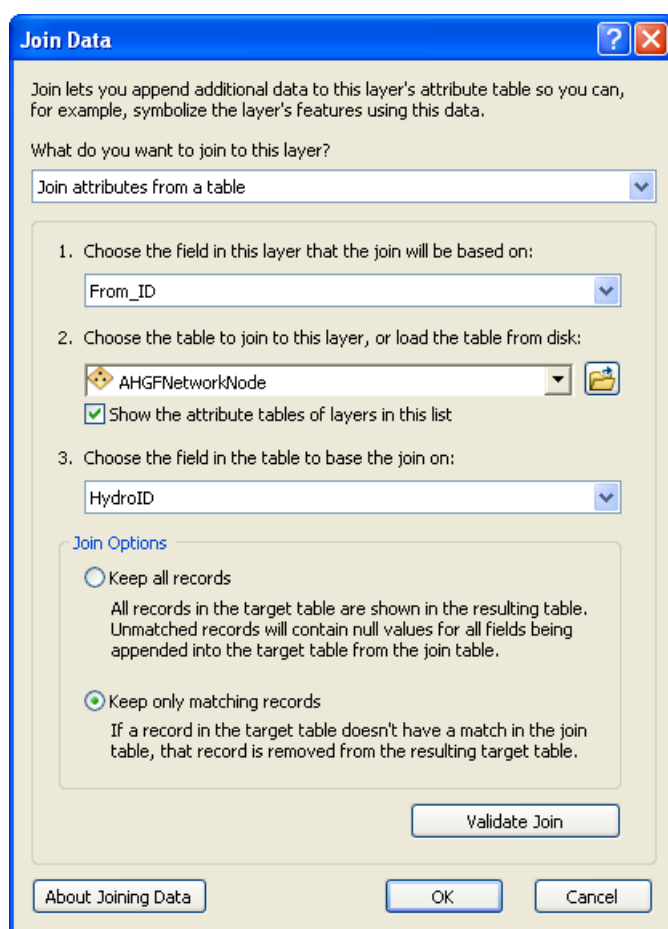
### 2.5.2 Subset AHGFNetworkConnectivityDown

1. In ArcMap, open the AHGFNetworkConnectivityDown table and choose Table Options > Joins and Relates > Join and join it to AHGFNetworkNode.



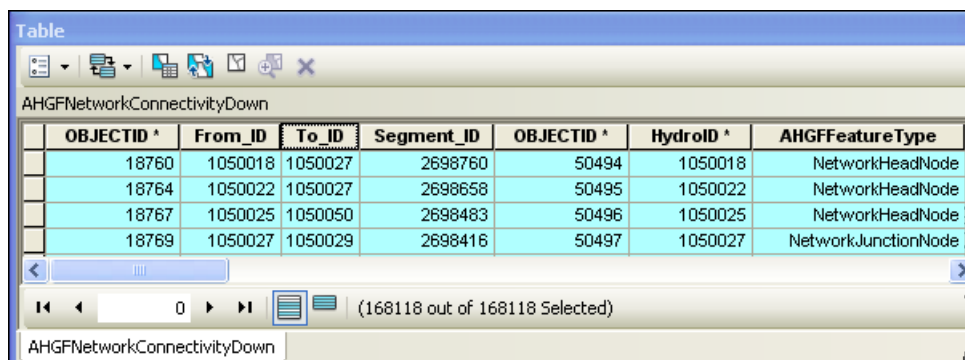
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- Select From\_ID for Choose the field this layer that the join will be based on:
- Select AHGFNetworkNode for Choose the table to join to this layer, or load the table from disk:
- Select HydroID for Choose the field in the table to base the join on:
- Select Join Option Keep only matching records:
- Choose [OK].



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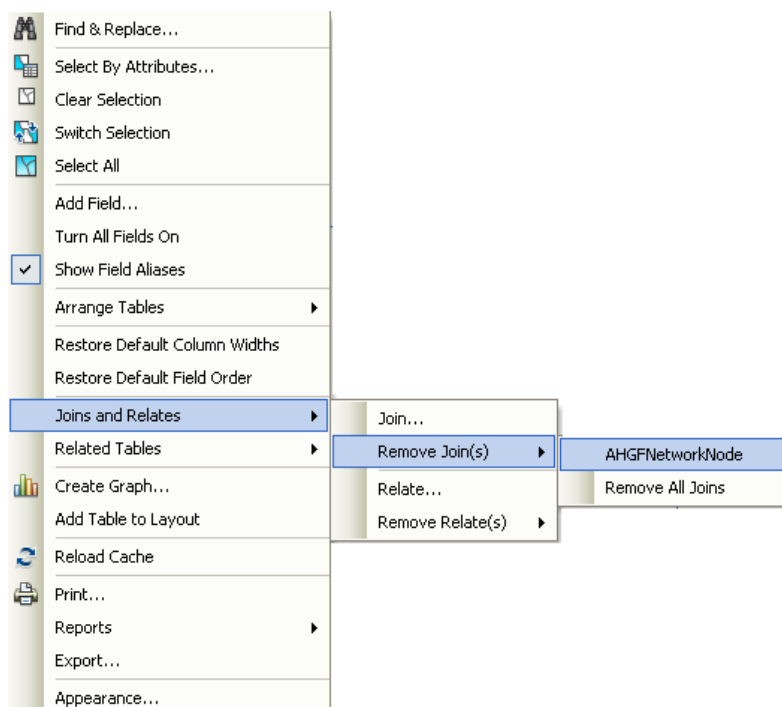
2. Only the attributes for the AHGFNetworkConnectivityDown table are required in the SH-Network\_MurrayDarling.gdb AHGFNetworkConnectivityDown table. This step will select all the joined, matching records and export only the AHGFNetworkConnectivityDown fields to the new AHGFNetworkConnectivityDown table. In the joined table,
  - Go to Table Options and click on Select All. The number of matching records will display at the bottom of the table.
  - Choose [Yes] to This table (potentially) contains a large number of records and the Select All operation could take a long period of time. Do you want to continue?



The screenshot shows the 'Table' window in a GIS application. The title bar is 'Table'. Below the title bar is a toolbar with icons for various table operations. The main area displays the 'AHGFNetworkConnectivityDown' table. The table has the following columns: OBJECTID \*, From\_ID, To\_ID, Segment\_ID, OBJECTID \*, Hydroid \*, and AHGFFeatureType. The first four columns are highlighted in light blue. The table contains four rows of data. Below the table is a status bar showing '(168118 out of 168118 Selected)'.

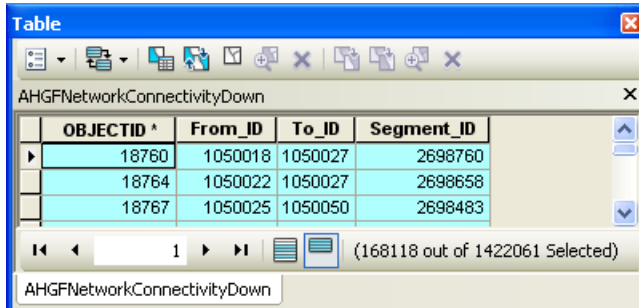
OBJECTID *	From_ID	To_ID	Segment_ID	OBJECTID *	Hydroid *	AHGFFeatureType
18760	1050018	1050027	2698760	50494	1050018	NetworkHeadNode
18764	1050022	1050027	2698658	50495	1050022	NetworkHeadNode
18767	1050025	1050050	2698483	50496	1050025	NetworkHeadNode
18769	1050027	1050029	2698416	50497	1050027	NetworkJunctionNode

- Go to Options > Joins and Relates > Remove Join(s) > AHGFNetworkNode to remove the AHGFNetworkNode table.



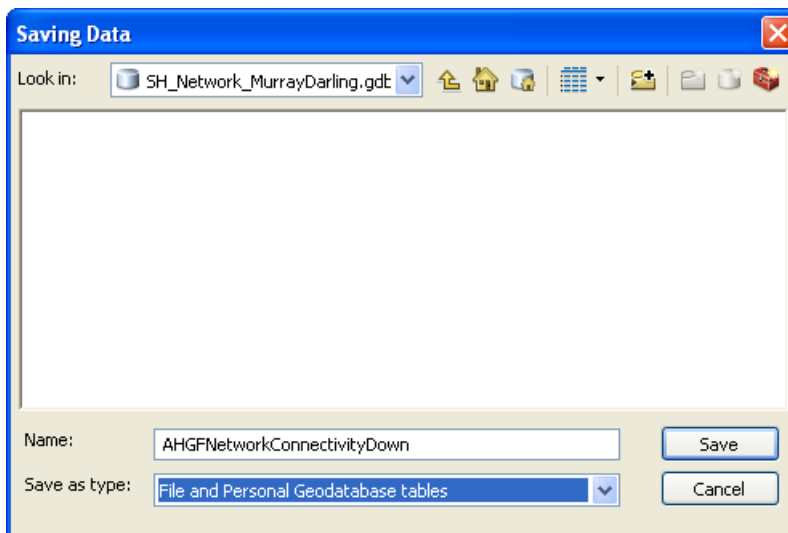
## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

3. In the AHGFNetworkConnectivityDown table, click on the Show selected records button



OBJECTID	From_ID	To_ID	Segment_ID
18760	1050018	1050027	2698760
18764	1050022	1050027	2698658
18767	1050025	1050050	2698483

4. Export the selected records for the AHGFNetworkConnectivityDown table to its own new AHGFNetworkConnectivityDown table in the SH\_Network\_MurrayDarling.gdb.
  - In the AHGFConnectivityDown table go to Table Options and select Export
  - Ensure Export: Selected records is selected
  - Navigate to SH\_Network\_MurrayDarling.gdb
  - Save as type: File and Personal Geodatabase tables
  - Name: AHGFNetworkConnectivityDown
  - Click Save
  - Click OK
  - Click Yes to Do you want to add the new table to the current map?



**Saving Data**

Look in: SH\_Network\_MurrayDarling.gdb

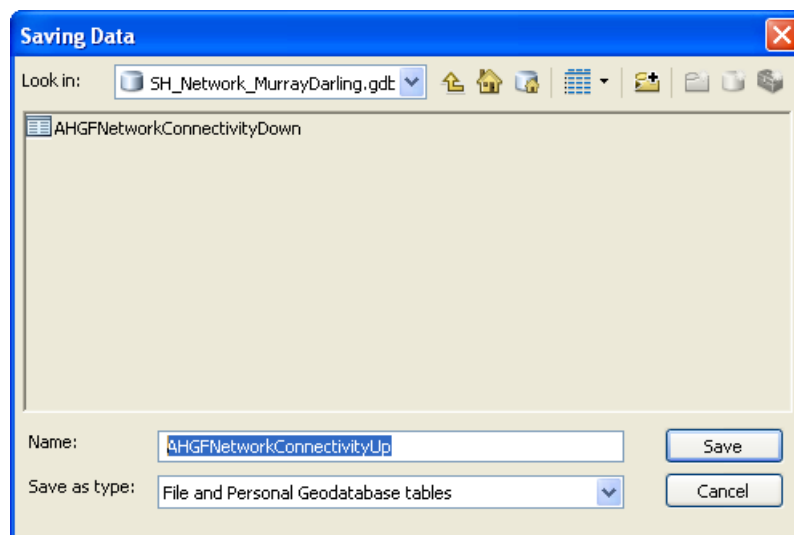
Name: AHGFNetworkConnectivityDown

Save as type: File and Personal Geodatabase tables

Save Cancel

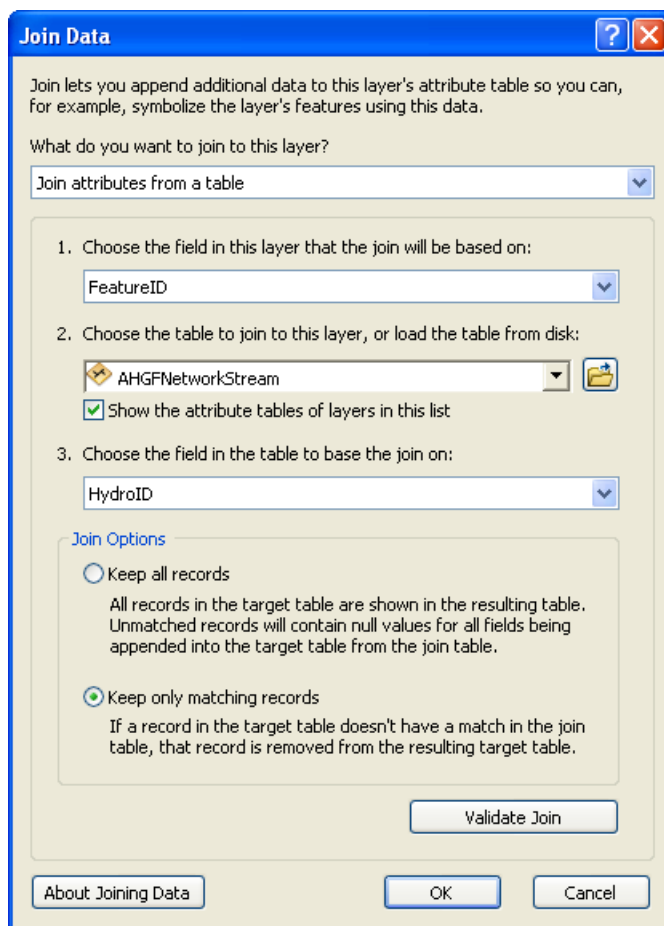
### 2.5.3 Subset AHGFNetworkConnectivityUp

1. Follow the same steps as outlined for Subset AHGFNetworkConnectivityDown.
2. Export the selected records for the AHGFNetworkConnectivityUp table to its own new AHGFNetworkConnectivityUp table in the SH\_Network\_MurrayDarling.gdb.
  - In the AHGFNetworkConnectivityUp table go to Table Options and select Export
  - Ensure Export: Selected records is selected
  - Navigate to SH\_Network\_MurrayDarling.gdb
  - Save as type: File and Personal Geodatabase tables
  - Name: AHGFNetworkConnectivityUp
  - Click Save
  - Click OK
  - Click Yes to Do you want to add the new table to the current map?



#### 2.5.4 Subset AHGFNetworkStream\_FS

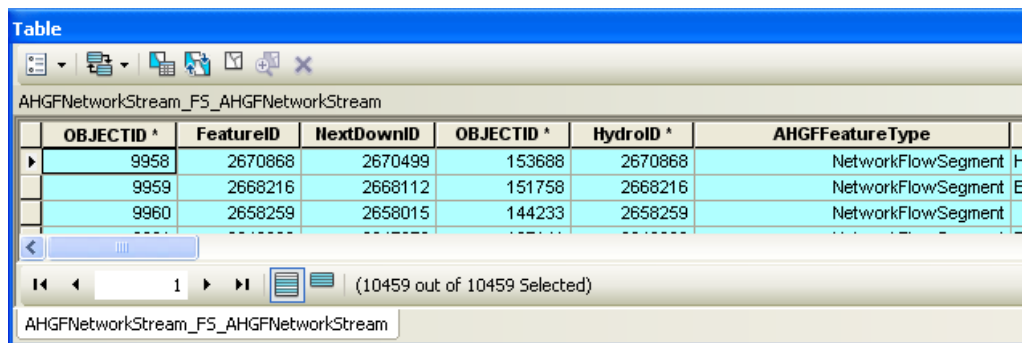
1. In ArcMap, open the AHGFNetworkStream\_FS table and choose Table Options > Joins and Relates > Join and join it to AHGFNetworkStream.
  - Select Feature\_ID for Choose the field this layer that the join will be based on:
  - Select AHGFNetworkStream for Choose the table to join to this layer, or load the table from disk:
  - Select HydroID for Choose the field in the table to base the join on:
  - Select Join Option Keep only matching records:
  - Click OK.





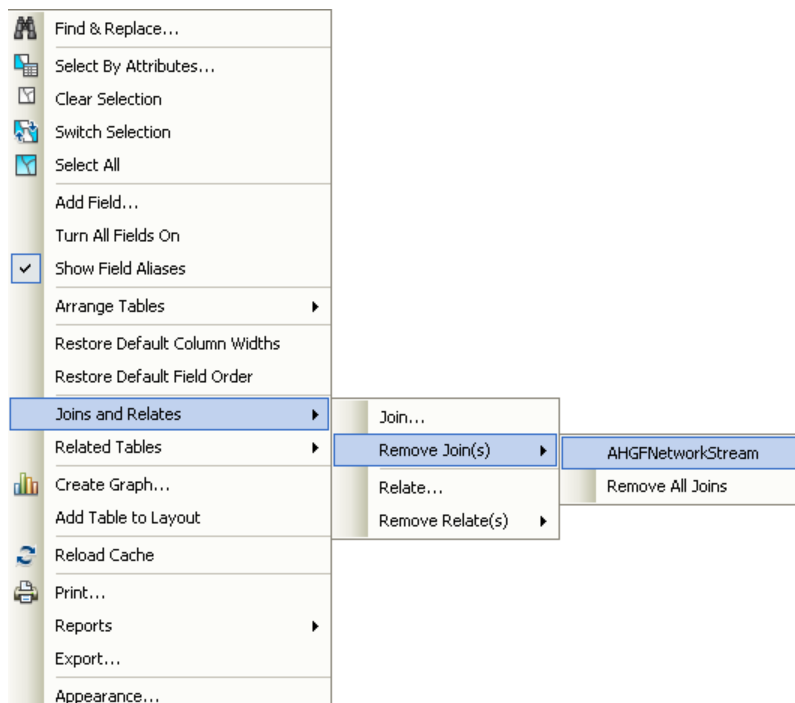
## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

2. Only the attributes for the AHGFNetworkStream\_FS table are required in the SH-Network\_MurrayDarling.gdb AHGFNetworkStream\_FS table. This step will select all the joined, matching records and export only the AHGFNetworkStream\_FS fields to the new AHGFNetworkStream\_FS table. In the joined,
  - Go to Table Options and click on Select All
  - Choose [Yes] to This table (potentially) contains a large number of records and the Select All operation could take a long period of time. Do you want to continue?



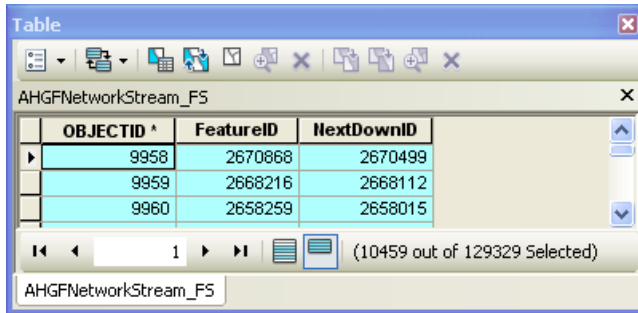
	OBJECTID *	FeatureID	NextDownID	OBJECTID *	Hydroid *	AHGFFeatureType
▶	9958	2670868	2670499	153688	2670868	NetworkFlowSegment
	9959	2668216	2668112	151758	2668216	NetworkFlowSegment
	9960	2658259	2658015	144233	2658259	NetworkFlowSegment

- Go to Options > Joins and Relates > Remove Join(s) > AHGFNetworkStream to remove the AHGFNetworkStream table.



## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

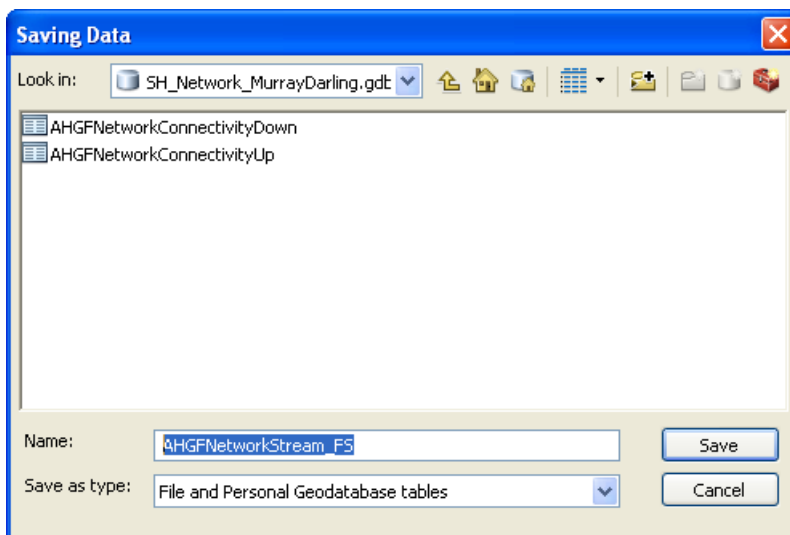
3. In the AHGFNetworkStream\_FS table, go to Table Options and click on the Show selected records button.



The screenshot shows the 'Table' window for the 'AHGFNetworkStream\_FS' table. It displays a table with three columns: 'OBJECTID', 'FeatureID', and 'NextDownID'. Three rows are highlighted in light blue, indicating they are selected. The status bar at the bottom indicates '(10459 out of 129329 Selected)'.

OBJECTID	FeatureID	NextDownID
9958	2670668	2670499
9959	2668216	2668112
9960	2658259	2658015

4. Export the selected records for the AHGFNetworkStream\_FS table to its own new AHGFNetworkStream\_FS table in the SH\_Network\_MurrayDarling.gdb.
  - In the AHGFNetworkStream\_FS table go to Table Options and select Export
  - Ensure Export: Selected records is selected
  - Navigate to SH\_Network\_MurrayDarling.gdb
  - Save as type: File and Personal Geodatabase tables
  - Name: AHGFNetworkStream\_FS
  - Click Save
  - Click OK
  - Click Yes to Do you want to add the new table to the current map?

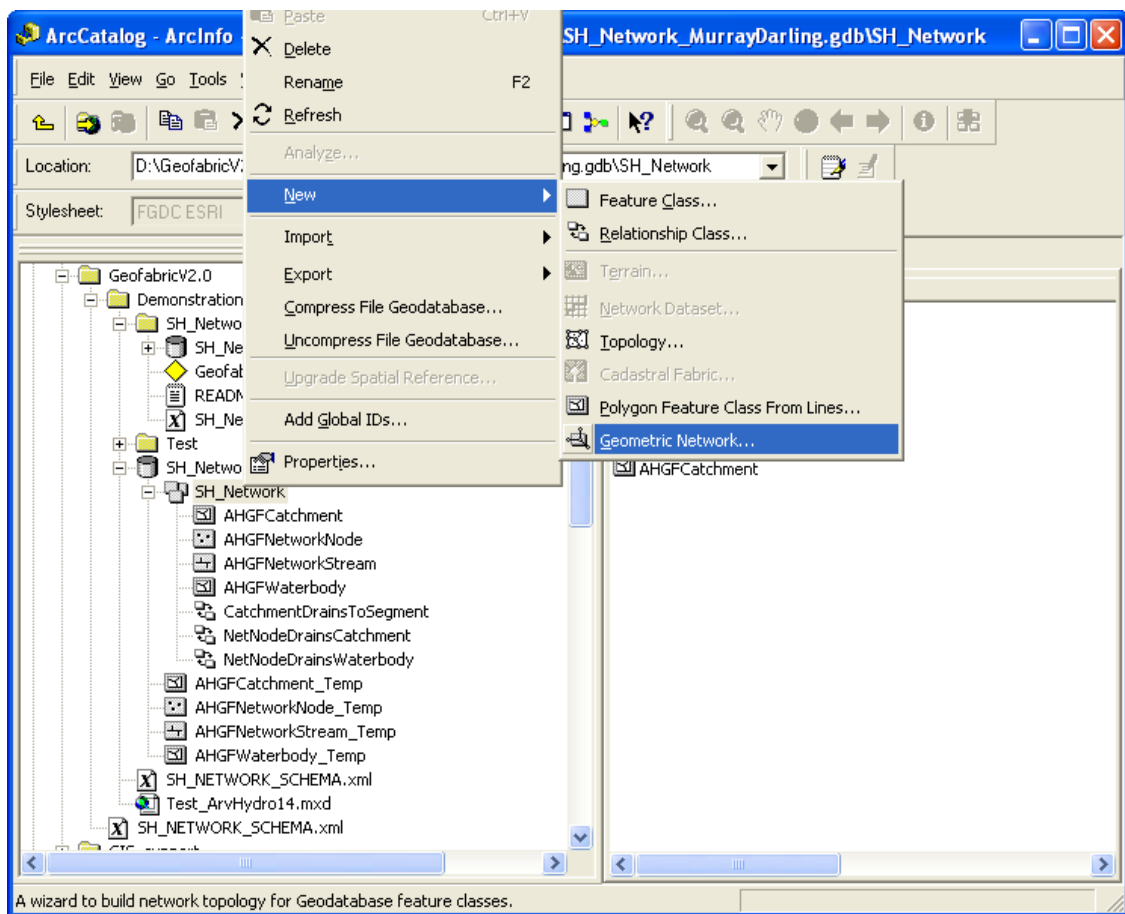


5. Close ArcMap to release any potential table locks when working in ArcCatalog.

## 2.6 Build a Geometric Network

A geometric network is built to enable stream flow tracing.

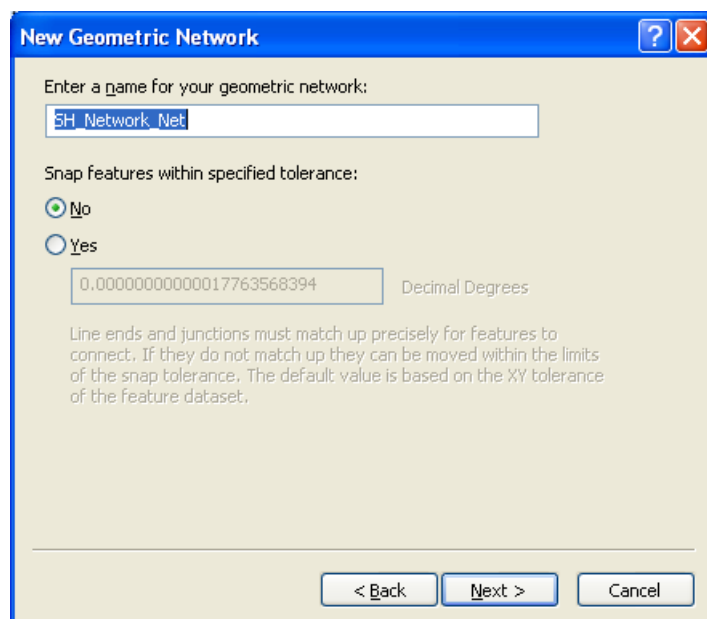
1. In ArcCatalog navigate to the File Geodatabase SH\_Network\_MurrayDarling created in step 2.2.
2. Open the file geodatabase, right-click on the SH\_Network feature dataset and choose New>Geometric Network....



### 2.6.1 ArcGIS 10 (SP 3)

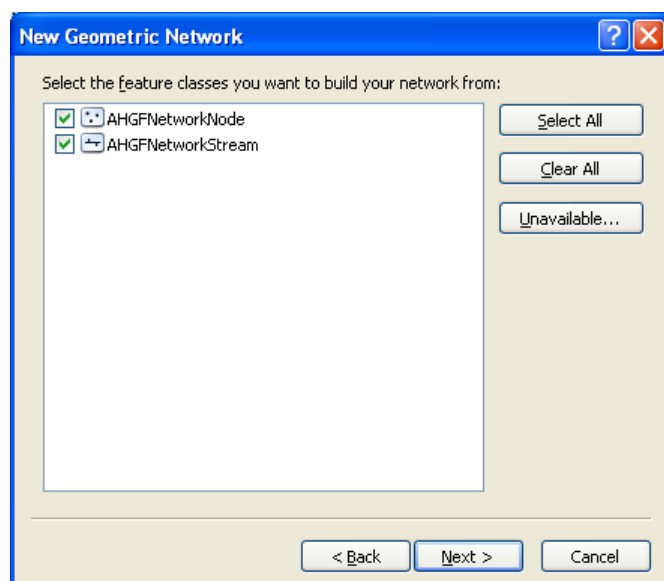
In the Geometric Network Wizard:

1. Choose [Next>].
2. Leave the geometric network name as the default (e.g. SH\_Network\_Net) and choose No to Snap features within specified tolerance. Click [Next>].



The 'New Geometric Network' dialog box in ArcGIS 10 (SP 3) is shown. It has a blue title bar with a question mark and a close button. The main area is light beige. At the top, it says 'Enter a name for your geometric network:' followed by a text box containing 'SH\_Network\_Net'. Below this, it says 'Snap features within specified tolerance:' with two radio buttons: 'No' (selected) and 'Yes'. Under the 'Yes' option is a text box containing '0.00000000000017763568394' and the label 'Decimal Degrees'. A small note below the text box reads: 'Line ends and junctions must match up precisely for features to connect. If they do not match up they can be moved within the limits of the snap tolerance. The default value is based on the XY tolerance of the feature dataset.' At the bottom are three buttons: '< Back', 'Next >', and 'Cancel'.

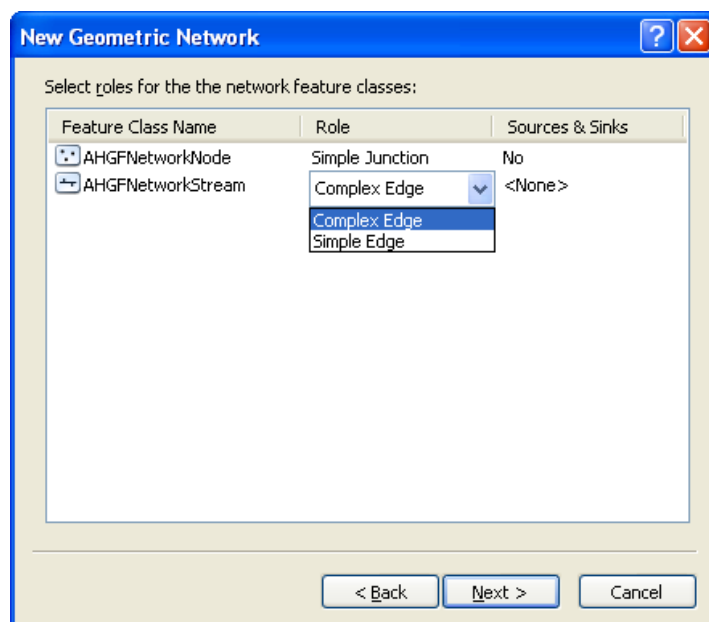
3. Click on Select All or add a check-mark to the AHGFNetworkNode and AHGFNetworkStream feature classes. Click [Next]:



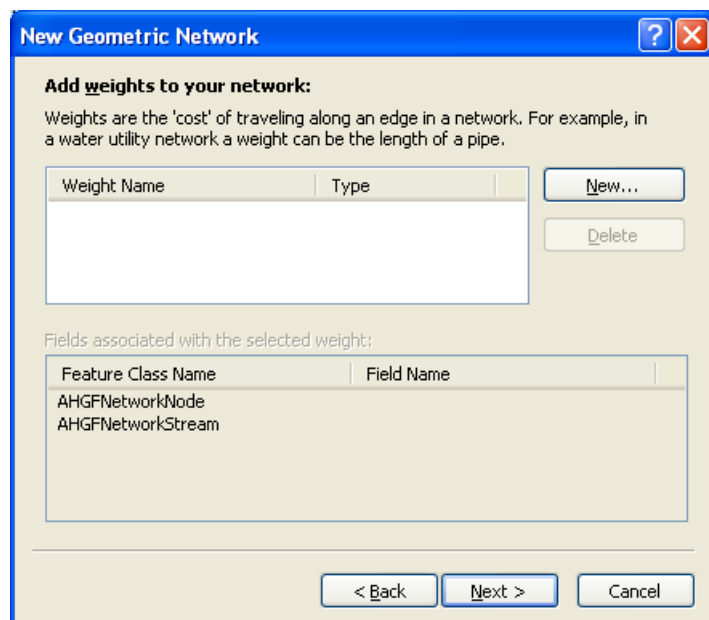
The 'New Geometric Network' dialog box is shown again, but at the 'Select the feature classes you want to build your network from:' step. It has a list box containing two items: 'AHGFNetworkNode' and 'AHGFNetworkStream', both of which have checkmarks in the selection column. To the right of the list box are three buttons: 'Select All', 'Clear All', and 'Unavailable...'. At the bottom are three buttons: '< Back', 'Next >', and 'Cancel'.

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

4. Choose Yes for the question Do you want to preserve existing enabled attribute values?; Click [Next>].
5. Select the Role of Complex Edge for AHGFNetworkStream. Click [Next>].



6. No weights are added to the network. Click [Next>].

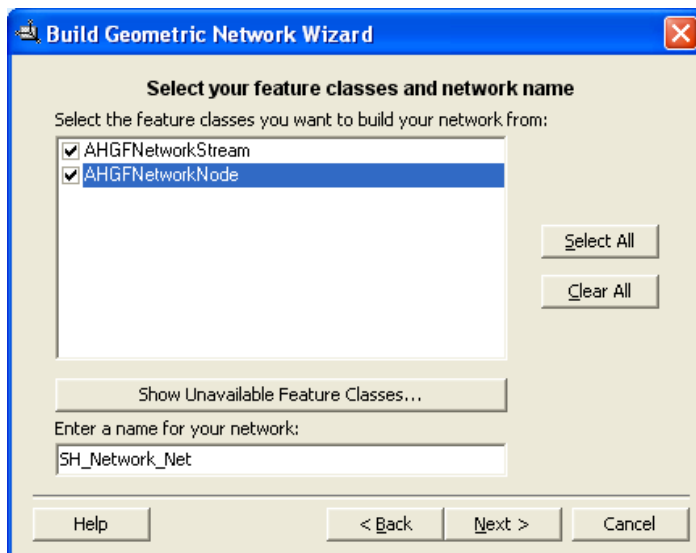


- Click [Finish] and when the network has finished being built there will be a geometric network object (e.g. SH\_Network\_Net) and a Junctions feature class (e.g. SH\_Network\_Net\_Junctions) added to the SH\_Network feature dataset. The Junctions feature class is automatically generated when a geometric network is created, but in this case it will be empty and can be ignored.

## 2.6.2 ArcGIS 9.3

In the Build Geometric Network Wizard:

- Choose [Next>].
- Choose Build a geometric network from existing features for the question How do you want to build your geometric network?; Click [Next>].
- Click to add a check-mark to the AHGFNetworkNode and AHGFNetworkStream feature classes and leave the network name as the default (e.g. SH\_Network\_Net); Click [Next>].

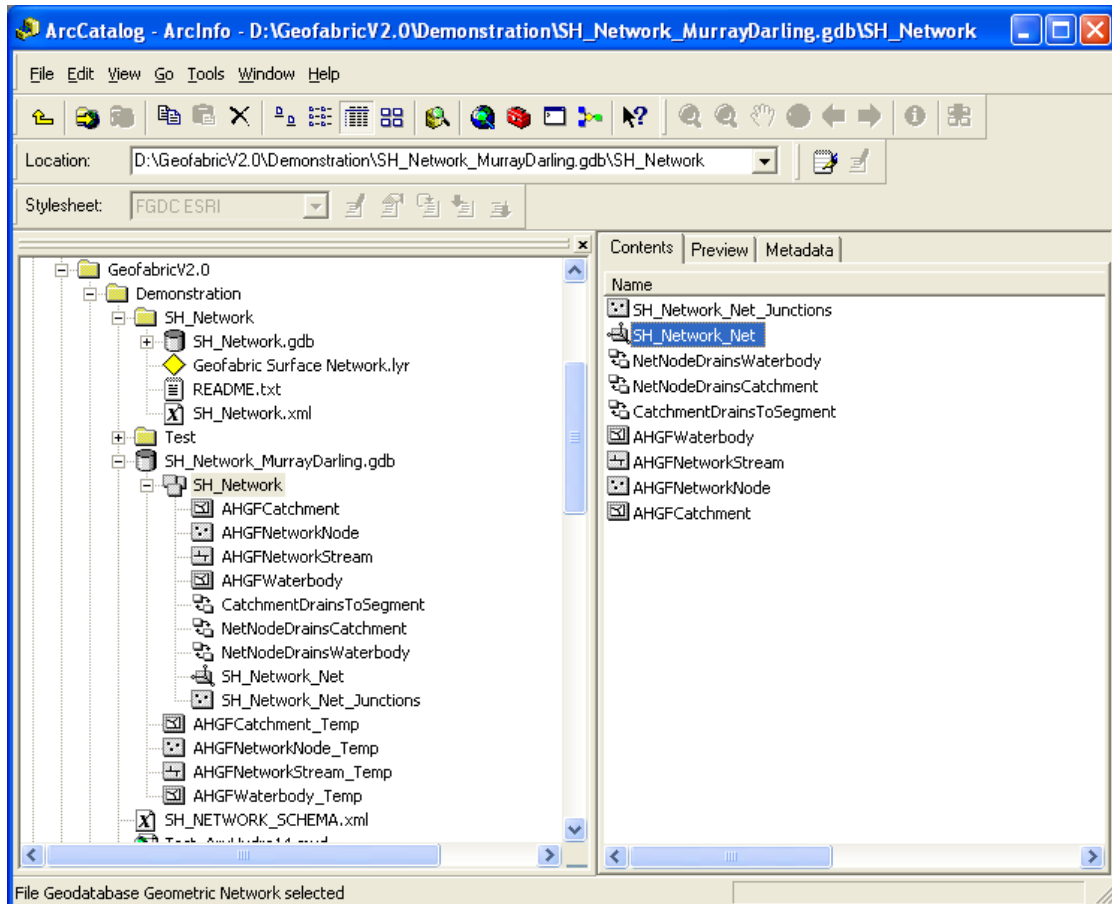


- Choose Yes for the question Do you want to preserve existing enabled attribute values?; Click [Next>].
- Choose Yes as the response for Do you want complex edges in your network? and ensure that AHGFNetworkStream has a check-mark next to it. Click [Next>].
- Choose No for Do your features need to be snapped?; Click [Next>].
- Choose No for Does your network have sources and sinks?; Click [Next>].
- Choose No for Do you want to assign weights to your network?; Click [Next>].

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

- Click [Finish] and when the network has finished being built there will be a geometric network object (e.g. SH\_Network\_Net) and a Junctions feature class (e.g. SH\_Network\_Net\_Junctions) added to the SH\_Network feature dataset. The Junctions feature class is automatically generated when a geometric network is created, but in this case it will be empty and can be ignored.

However, if there are nodes in the SH\_Network\_Net\_Junctions feature class, please refer to the section 2.7 Geometric Network Errors.



## 2.7 Geometric network errors

Surface Network is supplied with a geometric network which has connectivity. Every AHGFNetworkNode feature is connected to a AHGFNetworkStream feature.

However, when creating a subset of Surface Network GDB, it is possible that ArcGIS will not select all the relevant AHGFNetworkNode features. This issue will be evident when a geometric network is built and there are features in the SH\_Network\_Net\_Junctions feature class.

The SH\_Network\_Net\_Junctions features indicate where a network segment, in this instance AHGFNetworkStream, is interpreted by ArcGIS as missing a node at one or more of its ends. In order to create a geometric network, a network segment must have both a To and From node.

### 2.7.1 Analyse SH\_Network\_Net\_Junctions

To analyse the SH\_Network\_Net\_Junctions features:

1. Open the ArcMap MXD which was used earlier in this tutorial.
2. Add the SH\_Network\_Net\_Junctions feature class to ArcMap.
3. Zoom in to the individual features to confirm that nodes exist in the AHGFNetworkNode feature class at the end of the AHGFNetworkStream segments.

### 2.7.2 ArcGIS 9.3

The Geometric Network was created with no snapping. A new Geometric Network will need to be created with snapping.

1. Delete the Geometric Network as described in step 2.2.1
2. Create a Geometric Network. In the Build Geometric Network Wizard:
  - Choose [Next>].
  - Choose Build a geometric network from existing features for the question How do you want to build your geometric network?; Click [Next>].
  - Click to add a check-mark to the AHGFNetworkNode and AHGFNetworkStream feature classes and leave the network name as the default (e.g. SH\_Network\_Net); Click [Next>].
  - Choose Yes for the question Do you want to preserve existing enabled attribute values?; Click [Next>].
  - Choose Yes as the response for Do you want complex edges in your network? and ensure that AHGFNetworkStream has a check-mark next to it. Click [Next>].



## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

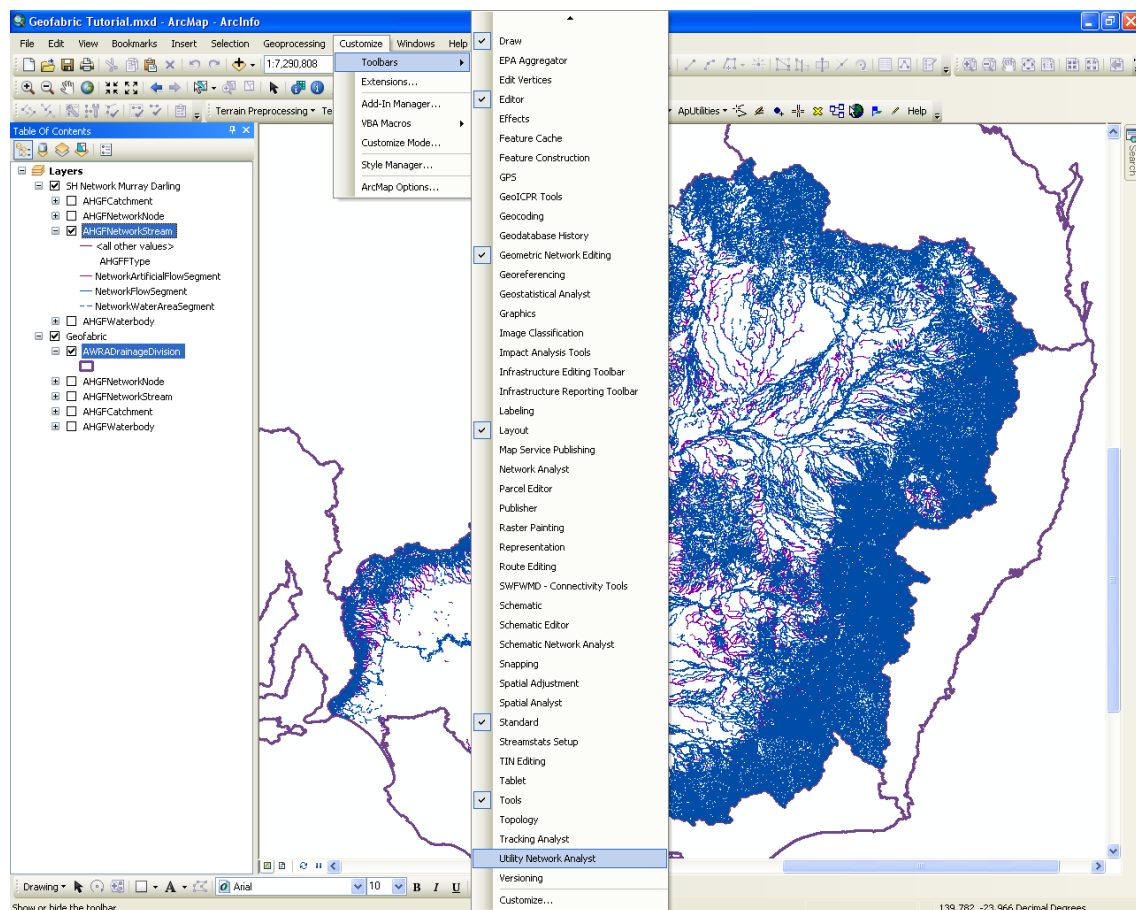
- Choose Yes for Do your features need to be snapped? and select AHGFNetworkNode feature class to be the data which is snapped ; Click [Next>].
- Choose No for Does your network have sources and sinks?; Click [Next>].
- Choose No for Do you want to assign weights to your network?; Click [Next>].
- Click [Finish]

When the geometric network has been created, check that the SH\_Network\_Net\_Junctions feature class is empty.

## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

### 2.8 Set the flow direction of the network

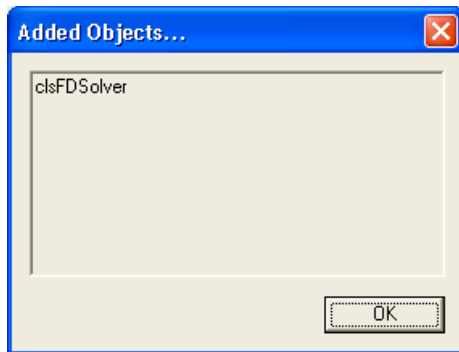
1. Download the Set Flow by Digitized Direction Command from the [ESRI Developer Network ArcObjects Online](#) website.
2. Unzip the contents of the downloaded zip file (SetFlowByDigitizedDirection.zip) to an appropriate directory.
3. Start ArcMap and add in the geometric network created above (SH\_Network\_Net).
4. Add the Utility Network Analyst toolbar
  - In ArcGIS 10 go to Customize>Toolbars>Utility Network Analyst
  - In ArcGIS 9.3 go to View>Toolbars>Utility Network Analyst



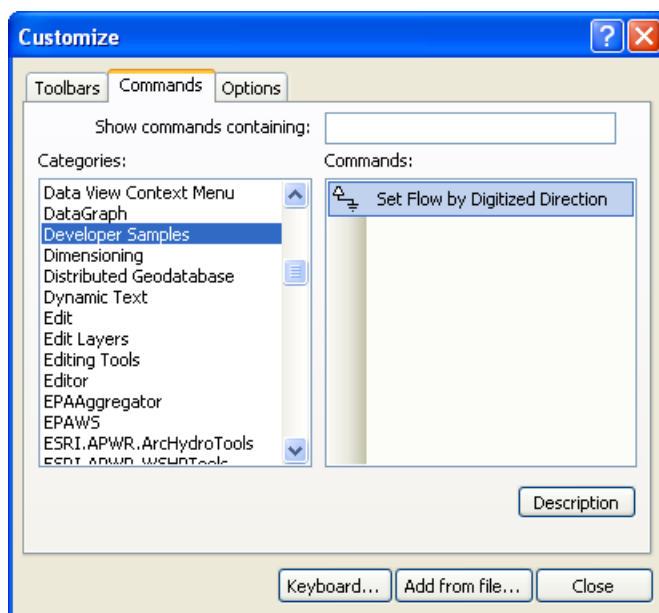
## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data


5. In ArcGIS 10, click on Customize > Customize Mode..., in ArcGIS 9.3, click on Tools > Customize,

Navigate to the MyFlowDirectionSolver.dll using the [Add From File] button on the Customize dialogue (the following message should be displayed). Click [OK].




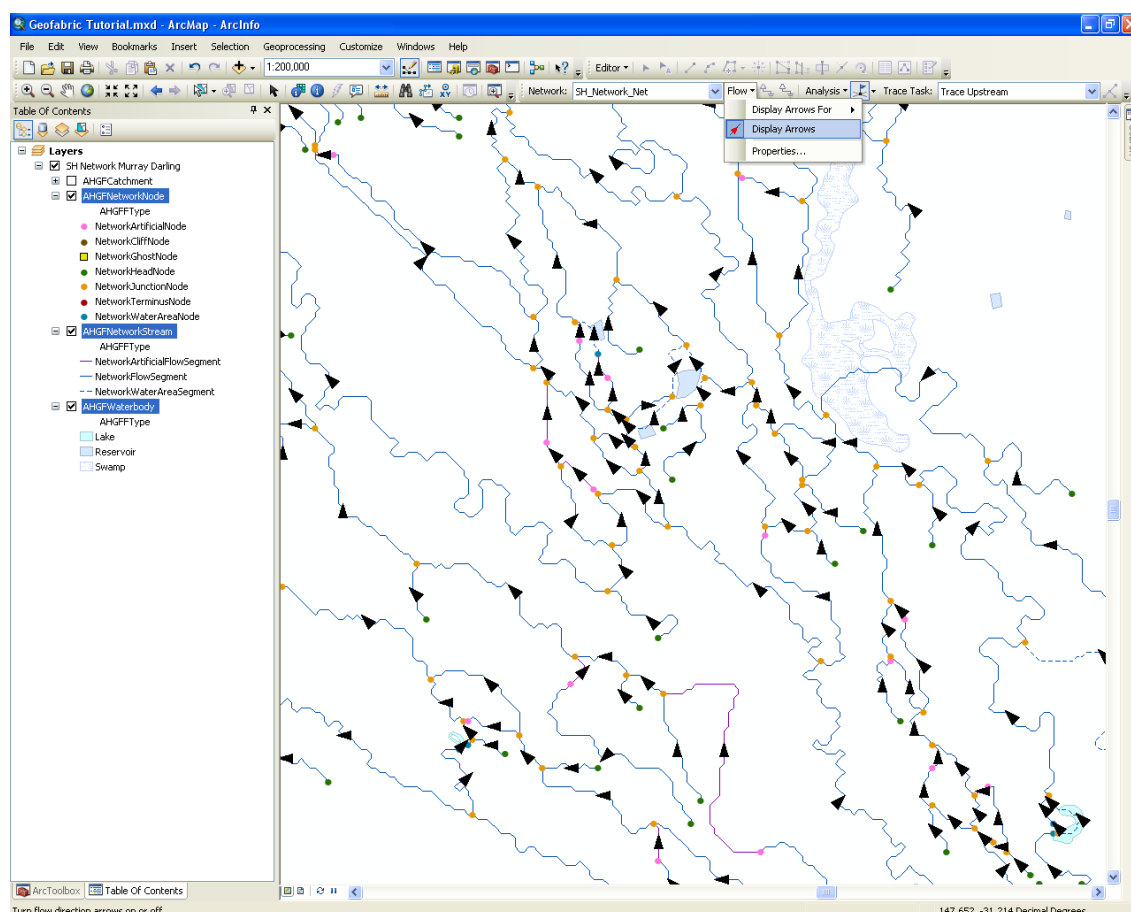
6. Click on the Commands tab of the Customize dialogue, choose the Developer Samples commands category and add (drag-and-drop) the Set Flow by Digitized Direction command to the Utility Network Analyst toolbar.




7. Choose Toolbars from the View menu and add in the Editor toolbar (if necessary) and start editing (Editor>Start Editing), select Network: SH\_Network\_Net from the drop down list.
8. Click on the newly added tool () to set the flow direction according to the digitized direction of the features.

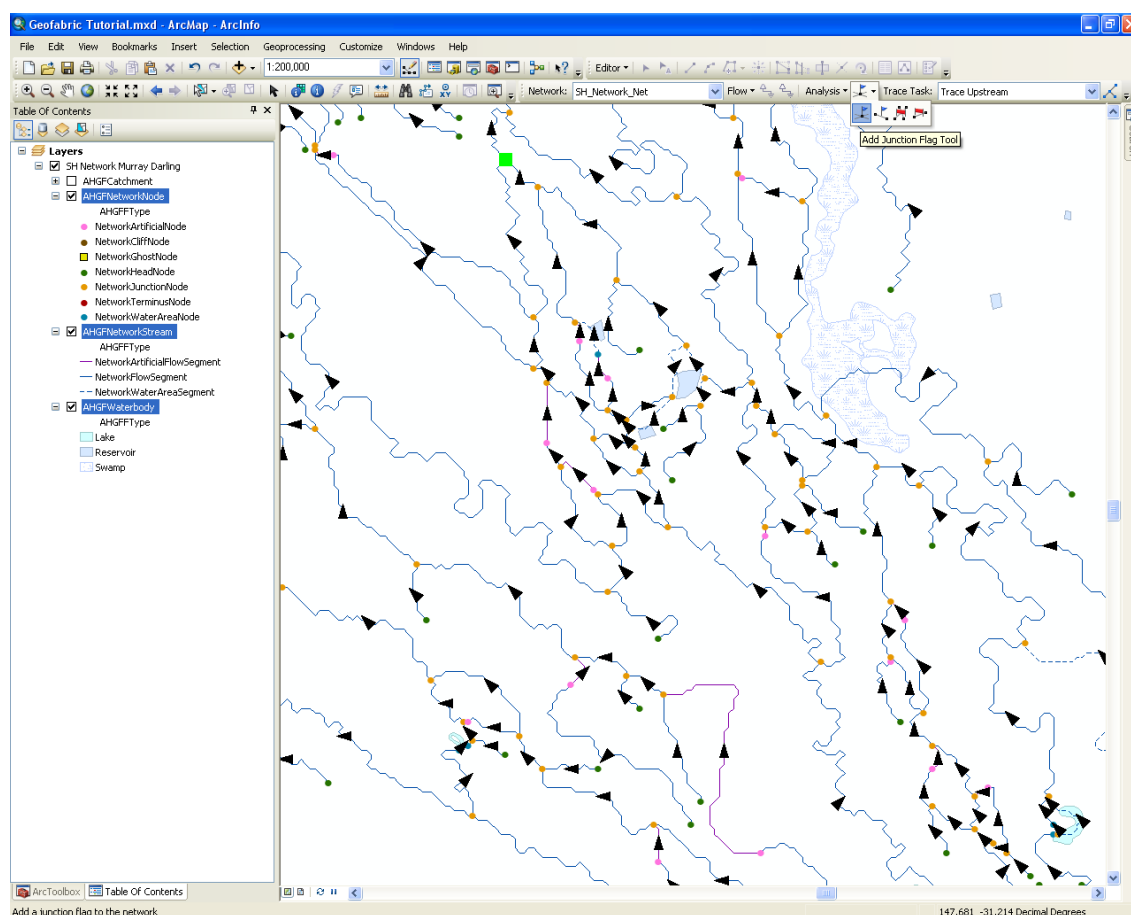
## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

9. Save your edits and finish the edit session (Editor>Save Edits; Editor>Stop Editing).
10. Zoom to an area of interest.
11. From the Utility Network Analyst toolbar, choose Flow>Display Arrows () to turn on flow direction arrows. An arrow should display to indicate that the flow direction has been correctly set.




## 2.9 Trace upstream from a node in the network

1. In ArcMap, Zoom to an area of interest.
2. From the Utility Network Analyst toolbar, choose the Add Junction Flag Tool () and click on a feature from the AHGFNetworkNode feature class to add a flag for network tracing (green box in figure below).

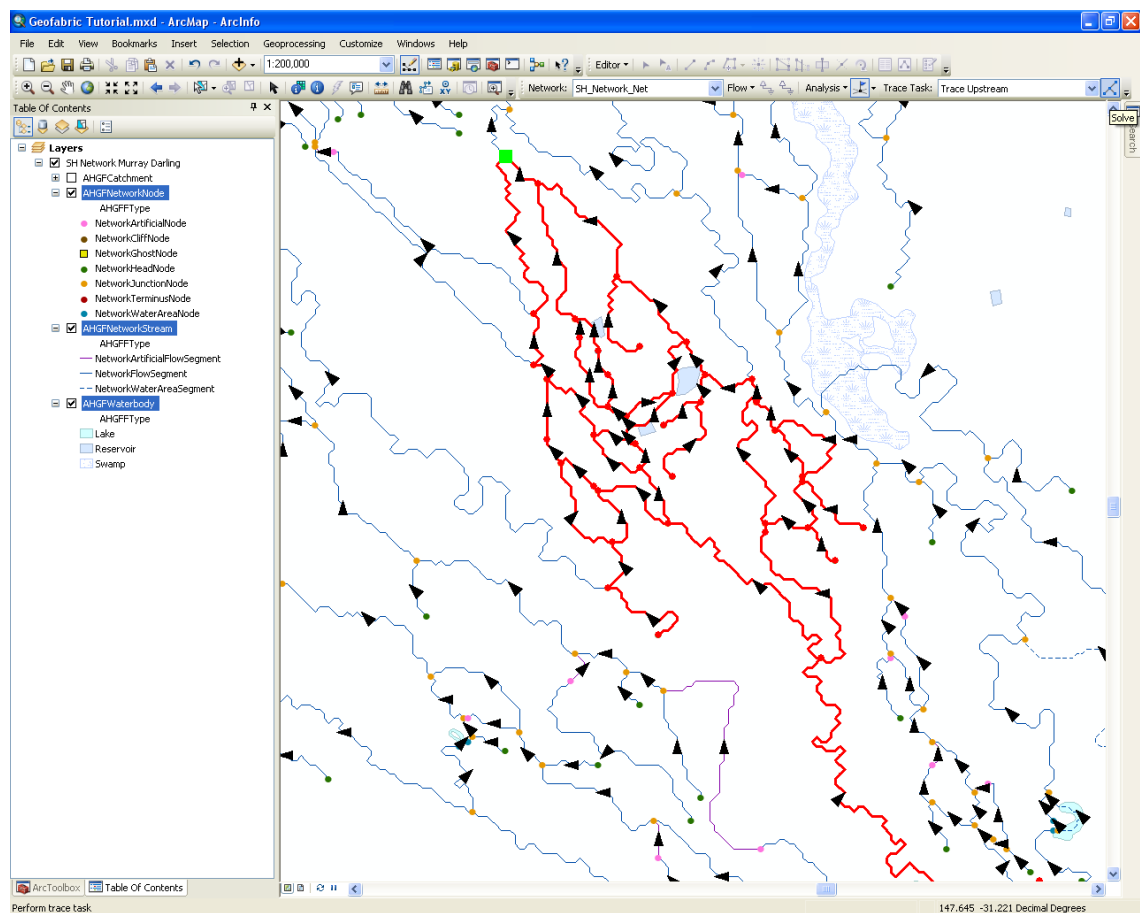


## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

3. Choose Trace Upstream from the Trace Task: menu on the Utility Network Analyst toolbar.
4. Click on the Solve button (  ) on the Utility Network Analyst toolbar in order to perform the network trace.

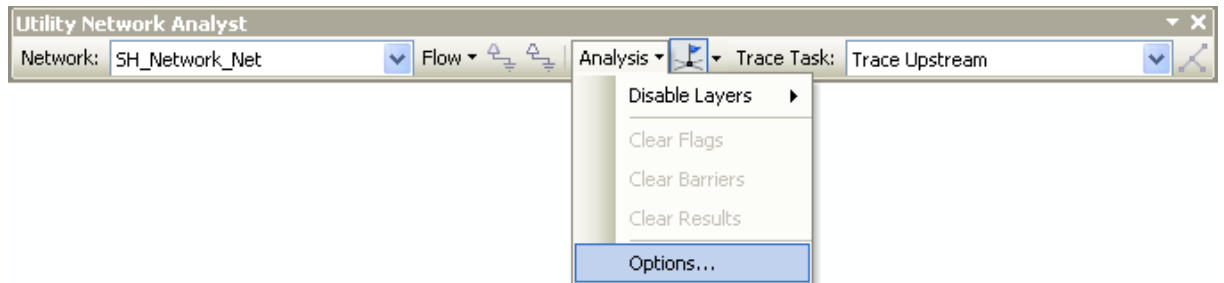
By default, the results of the trace operation will be displayed as red coloured drawing objects (this can be changed in Analysis > Options... on the Utility Network Analyst toolbar).

Similarly, to select features instead of displaying as a different colour, this can be changed in Analysis > Options

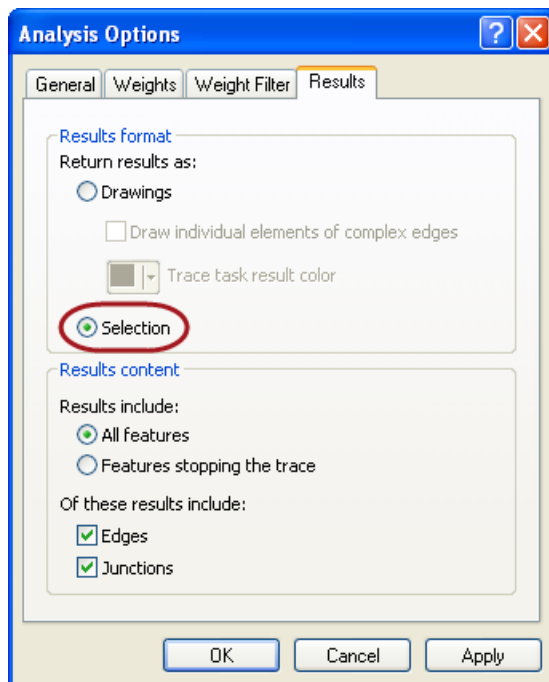


## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data


5. Similarly, to select features instead of displaying as a different colour, this can be changed in Analysis > Options



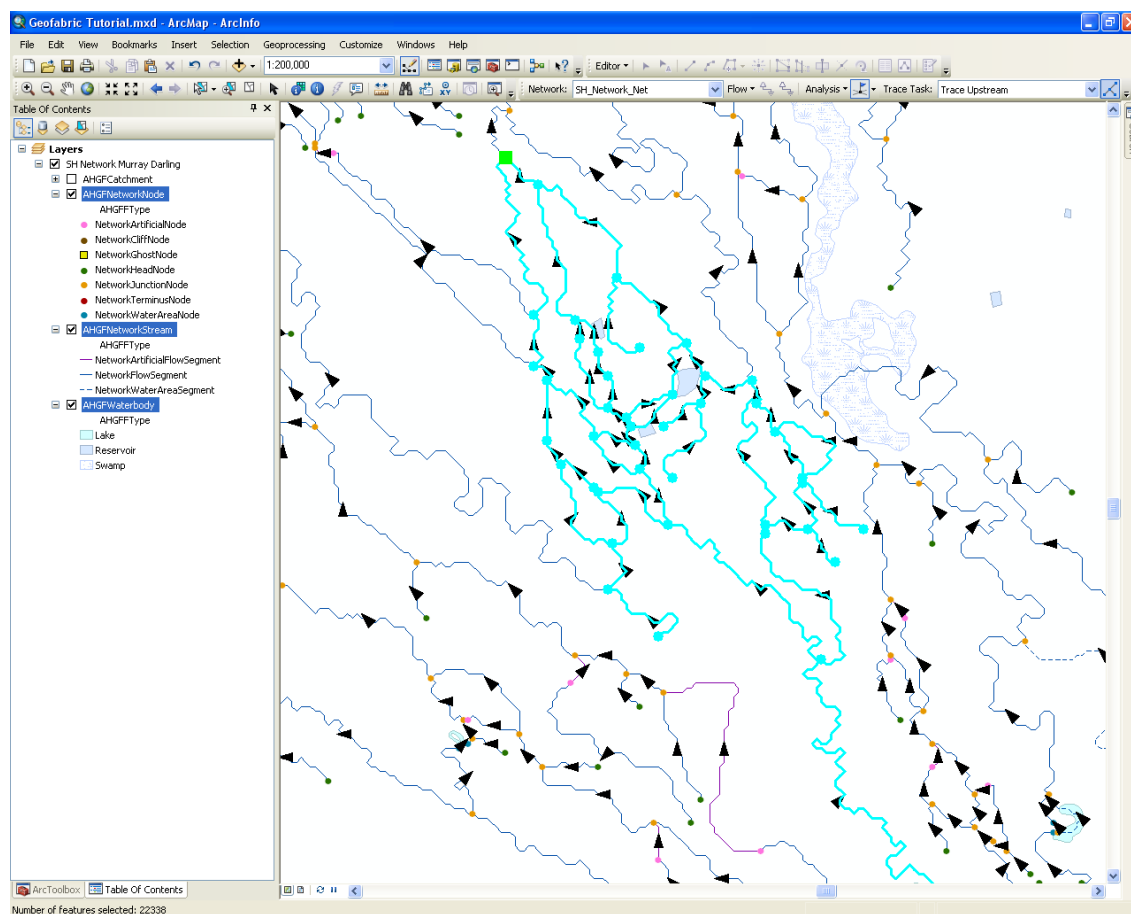
- In Results format, Return results as: Selection
- Click [OK]



## Australian Hydrological Geospatial Fabric (Geofabric) Tutorial – Create a subset of Geofabric data

- Choose Trace Upstream from the Trace Task: menu on the Utility Network Analyst toolbar.
- Click on the Solve button (  ) on the Utility Network Analyst toolbar in order to perform the network trace.

The results of the trace operation will be displayed as selected features.







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