

Australian Hydrological Geospatial Fabric (Geofabric) Tutorial

Merge the Geofabric
Surface Hydrology products

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Australian Government
Bureau of Meteorology



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1 Introduction

Each product in Geofabric V2 aims to satisfy a different set of use cases. This tutorial highlights the interconnectivity of the three V2 products that focus on surface hydrology: Surface Network, Surface Cartography and Surface Catchments.

The intended focus of Surface Network is for discovery, geoprocessing and hydrological modelling that involves stream flow tracing operations. Such uses can draw on the product's full topological connectivity and its ability to support the spatial selection of associated hydrological features (such as water bodies and catchments) as inputs for spatial analysis or modelling.

The aim of Surface Cartography is to support the production of maps and visualisations which present the results of analyses. This product provides a wealth of hydrographical feature types with origins mainly from topographic mapping.

The central feature class in Surface Catchments, AHGFCatchment, duplicates an identical feature class contained within Surface Network. The decision to develop a separate catchment product was based on a particular set of use cases which called for the supply of the catchments in isolation. More specifically, Surface Catchments with its extended NCB Pfafstetter attribution provides a hook into a suite of related products¹ that are focused around a gridded data model. This related set of products includes a comprehensive set of National Environmental Stream Attributes².

Although Geofabric V2 supplies the surface hydrology product data spread over three separate product Geodatabases, for certain purposes it may be desirable to combine these three products into a single Geodatabase.

This tutorial describes the steps required to load the contents of the three surface hydrology products into a single file geodatabase. Instructions outlining the creation of a number of optional relationship classes are also provided.

For reference purposes, the relationships between the feature classes of the three surface hydrology products are summarised in the following high-level model view:

¹ Geoscience Australia (2011). *National Surface Water Information*: Located at <http://www.ga.gov.au/topographic-mapping/national-surface-water-information.html>

² Geoscience Australia (2011). *National Environmental Stream Attributes v1.1: Metadata statement*: Located at https://www.ga.gov.au/products/servlet/controller?event=GEOCAT_DETAILS&catno=73045

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- Merge the Geofabric Surface Hydrology products

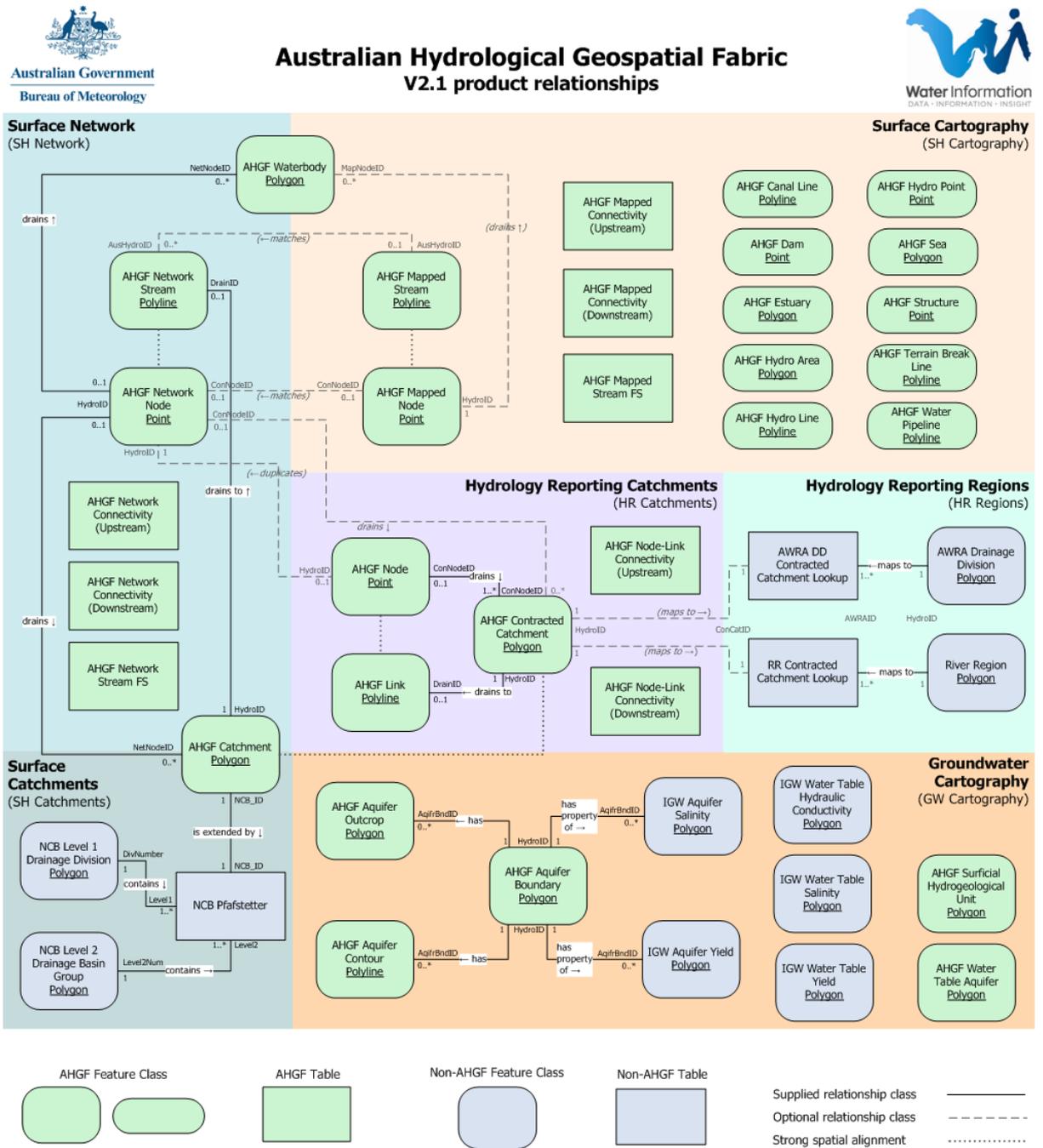


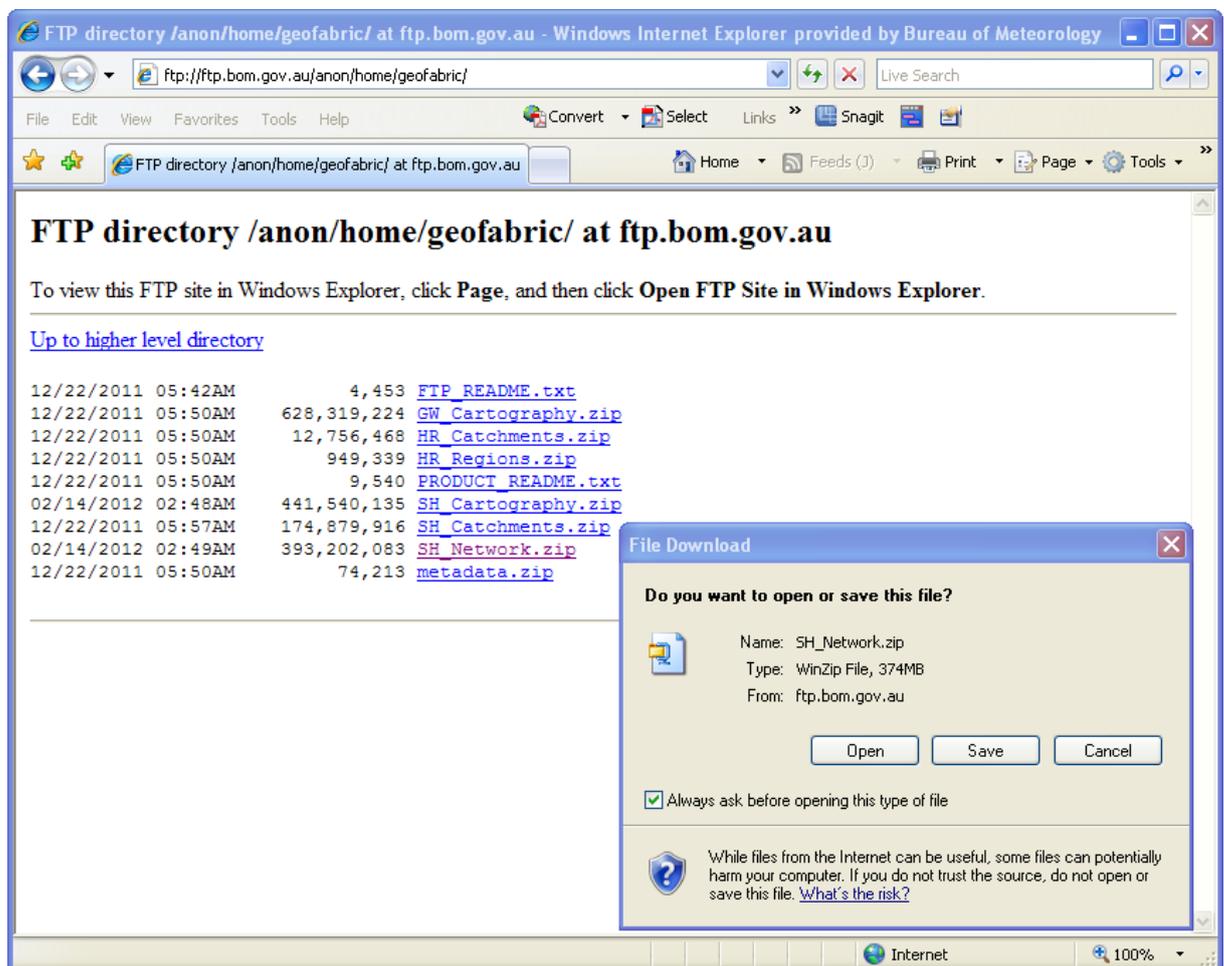
Figure 1 - Geofabric V2.1 product relationships.

Connecting lines between the boxes show various types of relationships between these entities. Relationships should be read in the direction of the arrows e.g. an AHGF Network Node drains zero-to-many AHGF Waterbody features.

2 Tutorial

2.1 Download three Geofabric Surface File Geodatabases 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](#). Download the following File Geodatabases' ZIP file, saving each to disk:
 - Surface Cartography (SH_Cartography ZIP)
 - Surface Network (SH_Network ZIP)
 - Surface Catchments (SH_Catchments ZIP).



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 new empty File Geodatabase

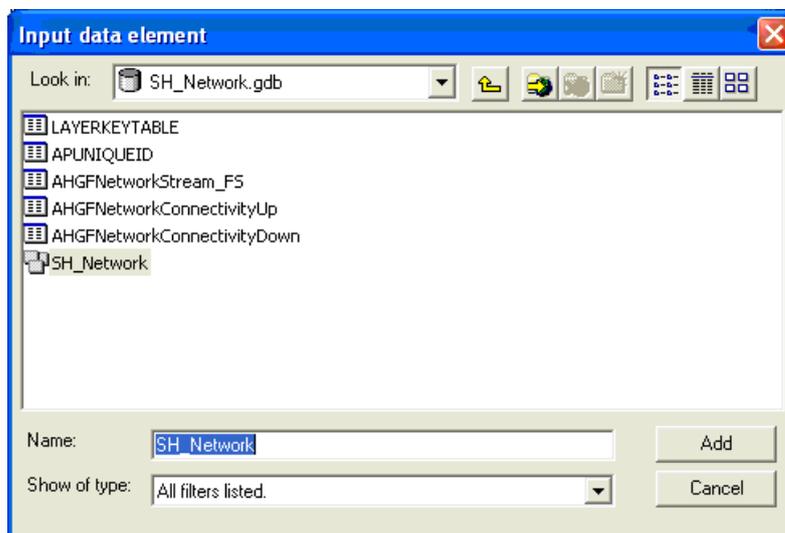
1. Start ArcCatalog and navigate to the workspace containing the three File Geodatabases downloaded in step 2.1.
2. Right-click on the workspace folder and choose New > File Geodatabase.
3. Rename the File Geodatabase to something more appropriate (e.g. Geofabric_SH_All).

2.3 SH_Network File Geodatabase

2.3.1 Copy the content

Copy the content of the downloaded SH_Network File Geodatabase to the new, empty File Geodatabase.

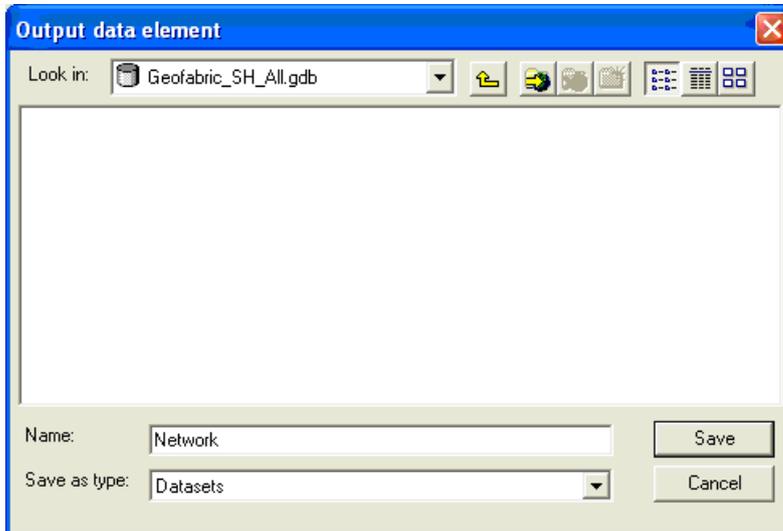
1. In ArcCatalog, activate ArcToolbox and run the Copy tool located under the General Toolset of the Data Management Tools toolbox.
2. Configure the parameters of the Copy tool to copy the SH_Network feature dataset from the SH_Network Geodatabase downloaded in step 2.1, across to the new File Geodatabase created in step 2.2:
3. Browse to and set the Input data element parameter to point to the path of the SH_Network feature dataset. Click [Add].



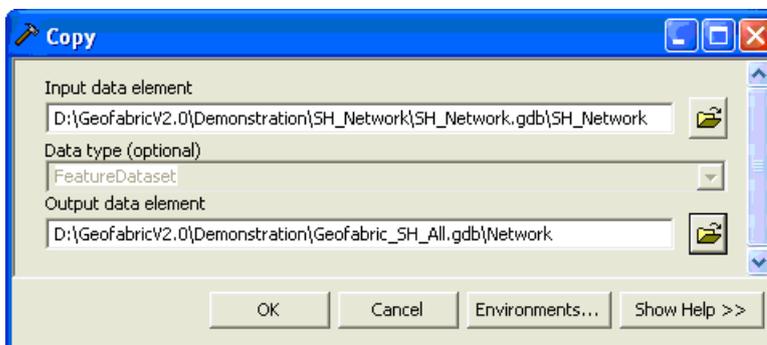
4. Click on the folder browse icon () to open the Output data element dialogue and change the Save as type: option to Datasets.
5. Navigate to and open the File Geodatabase created in step 2.2.

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6. Enter a name for the new copy of the SH_Network feature dataset in the Name: field (e.g. Network). Click [Save].



7. Click [OK] to run the tool. When the copy is complete the SH_Network feature dataset should have been copied over to the new File Geodatabase.
Note: when merging the full version of the Geofabric surface hydrology data products copying each product can take some time due to the large number of features.



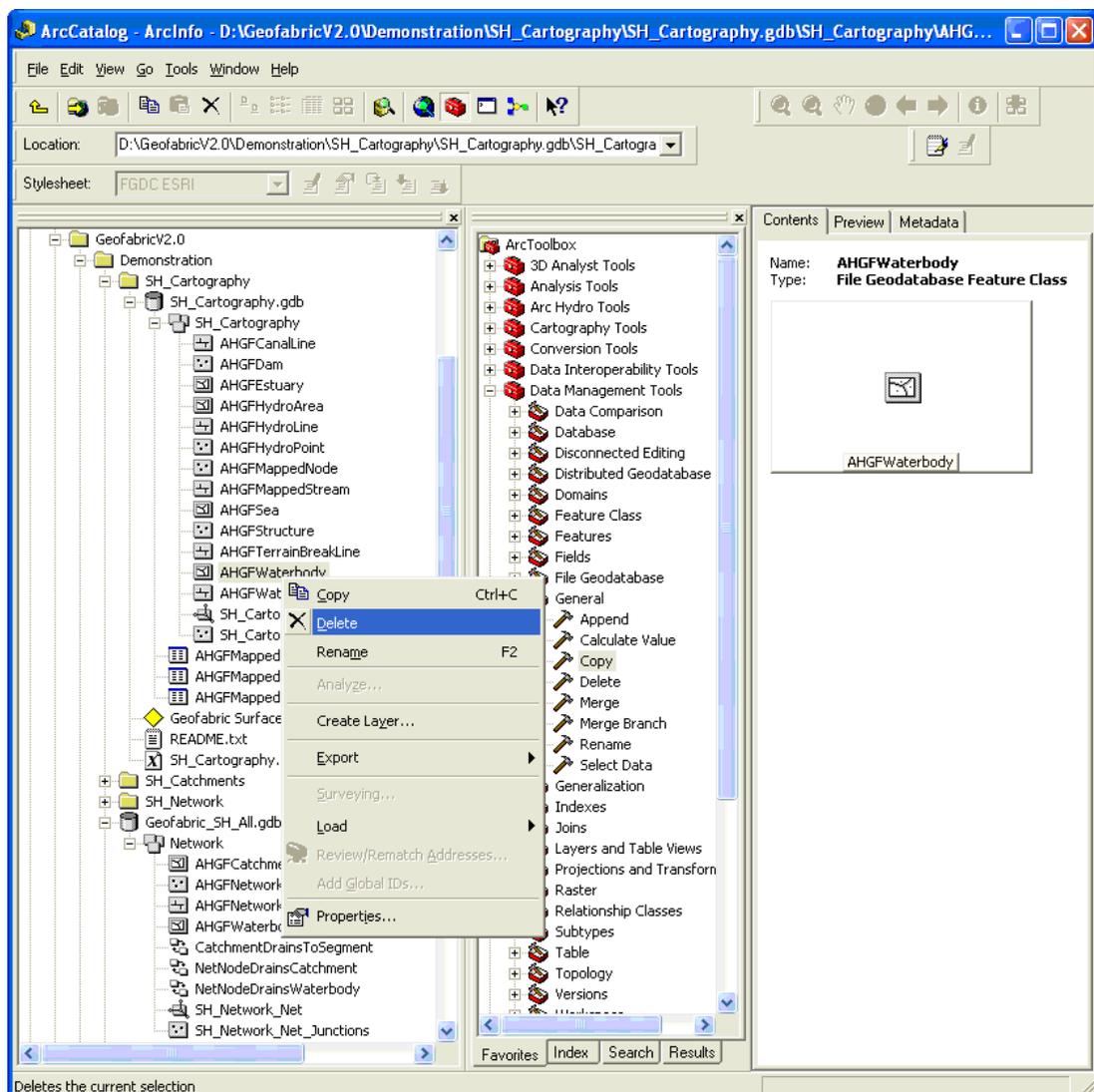
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2.4 SH_Cartography File Geodatabase

2.4.1 Delete the AHGFWaterbody feature class

The AHGFWaterbody feature class appears in both Surface Network and Surface Cartography. This duplication of data is not required, so remove this from Surface Cartography prior to copying its feature dataset over to the new File Geodatabase.

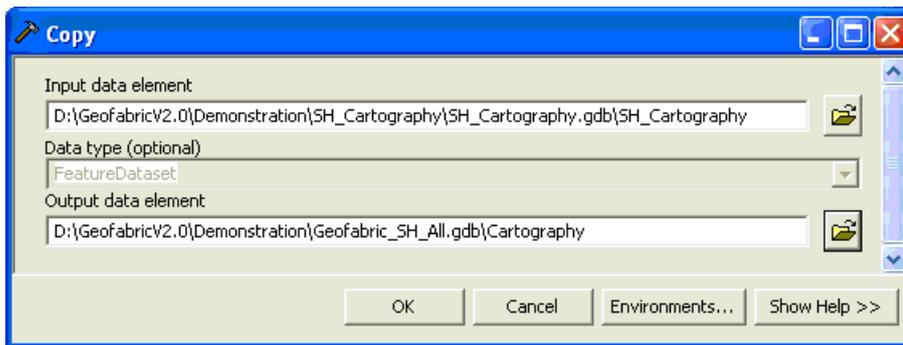
1. In ArcCatalog, browse to the AHGFWaterbody feature class in the SH_Cartography Geodatabase downloaded in step 2.1.
2. Right-click on the feature class and choose Delete. Click [Yes] to confirm.



2.4.2 Copy the content

Copy the content of the downloaded SH_Cartography File Geodatabase to the newly created File Geodatabase.

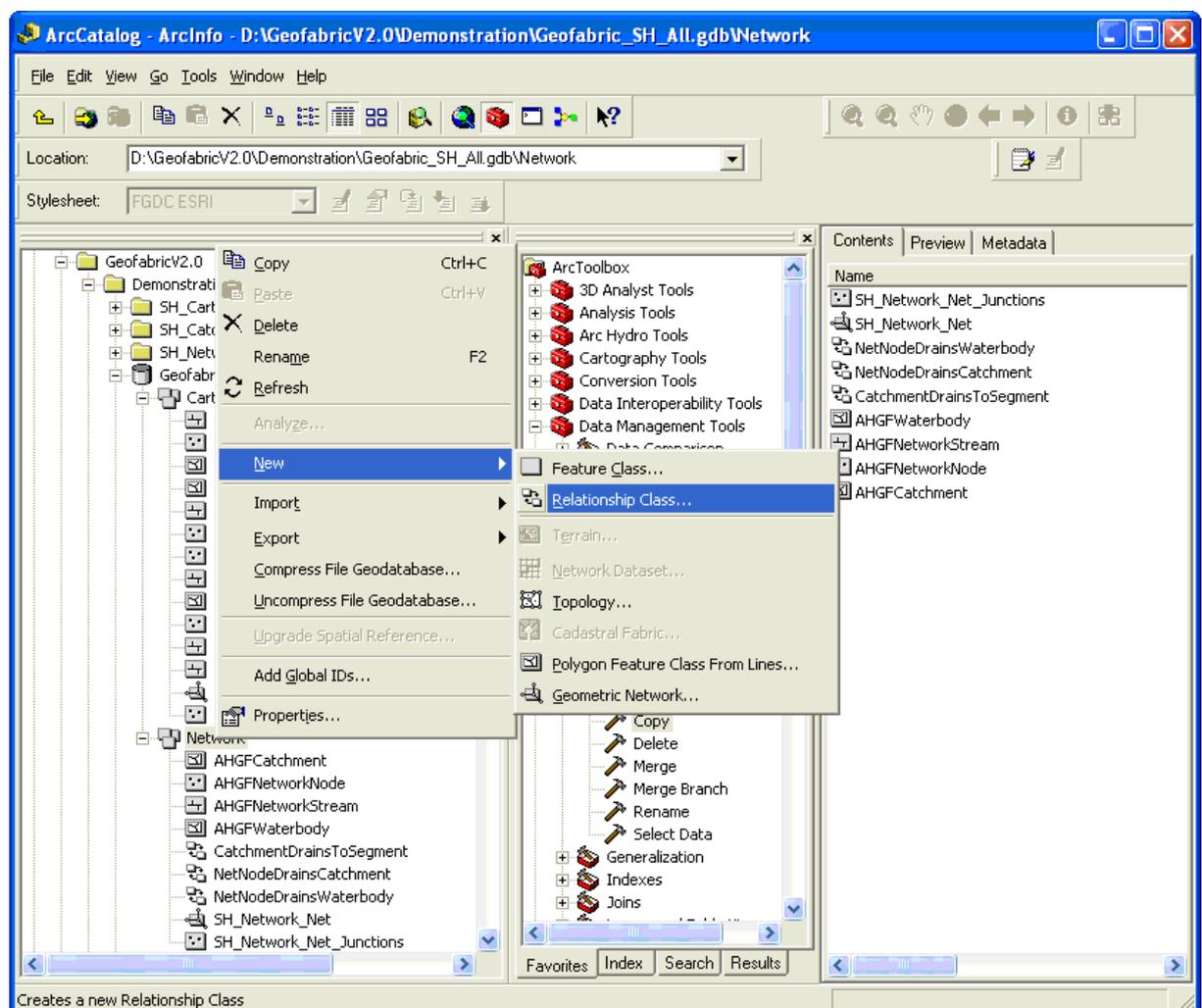
1. Repeat step 2.3 above, this time copying the SH_Cartography feature dataset across to the File Geodatabase created in step 2.2.



2.5 Create optional relationship classes between SH_Network and SH_Cartography features

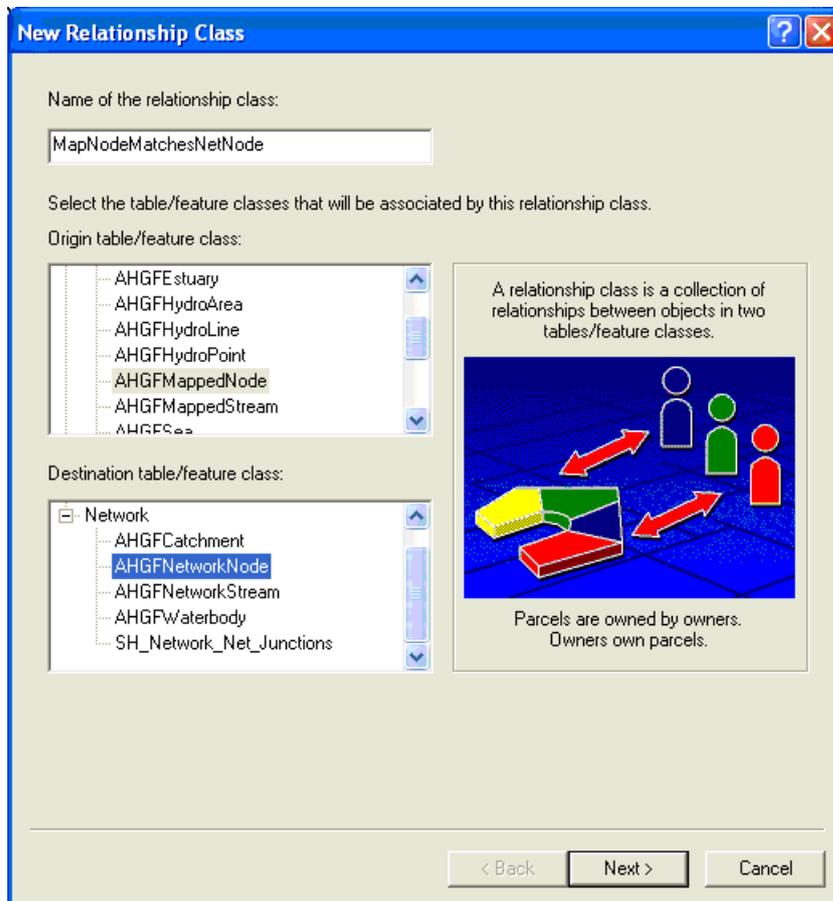
Having merged the SH_Network and SH_Cartography File Geodatabases into a single Geodatabase, it may also be desirable to add in several of the relationship classes marked as being 'optional' in Figure 1. This section shows the steps involved in doing this.

1. To add the relationship between the AHGFMappedNode and AHGFNetworkNode feature classes, do the following:
2. Right-click on the new Network feature dataset created in step 2.3.1 and choose New>Relationship Class....



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3. Enter an appropriate name for the relationship class (e.g. MapNodeMatchesNetNode) and choose the Origin (AHGFMappedNode) and Destination (AHGFNetworkNode) feature classes. Click [Next >].



4. At the next step in the New Relationship Class wizard, choose the option Simple (peer to peer) relationship for the relationship's type. Click [Next >].

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- Specify text labels for the relationship as it is traversed in both directions (i.e. AHGFMappedNode matches AHGFNetworkNode and AHGFNetworkNode is matched by AHGFMappedNode) and choose the None (no messages propagated) option for message propagation. Click [Next >].
Note: If your business processes utilise custom extensions to ArcGIS Desktop that require messaging, choose the level of messaging as required and recreate all other out-of-the-box relationship classes in the same manner.

New Relationship Class

Specify a label for the relationship as it is traversed from the origin table/feature class to the destination table/feature class.

matches

Specify a label for the relationship as it is traversed from the destination table/feature class to the origin table/feature class.

is matched by

Which direction will messages be propagated between the objects related by this relationship class?

Forward (origin to destination)

Backward (destination to origin)

Both

None (no messages propagated)

< Back Next > Cancel

- Select 1 – 1 (one to one) as the cardinality of the relationship. Click [Next >].
- Choose the option No, I do not want to add attributes to this relationship.
- Click [Next >].

9. Set the Primary (ConNodeID) and Foreign (ConNodeID) key fields for the relationship.

New Relationship Class

Select the primary key in the origin table/feature class (generally, this will be the object identifier field). If this is a 1 - M (one to many) relationship, you will also need to select the foreign key in the destination table/feature class.

Select the primary key field in the origin table/feature class:

ConNodeID

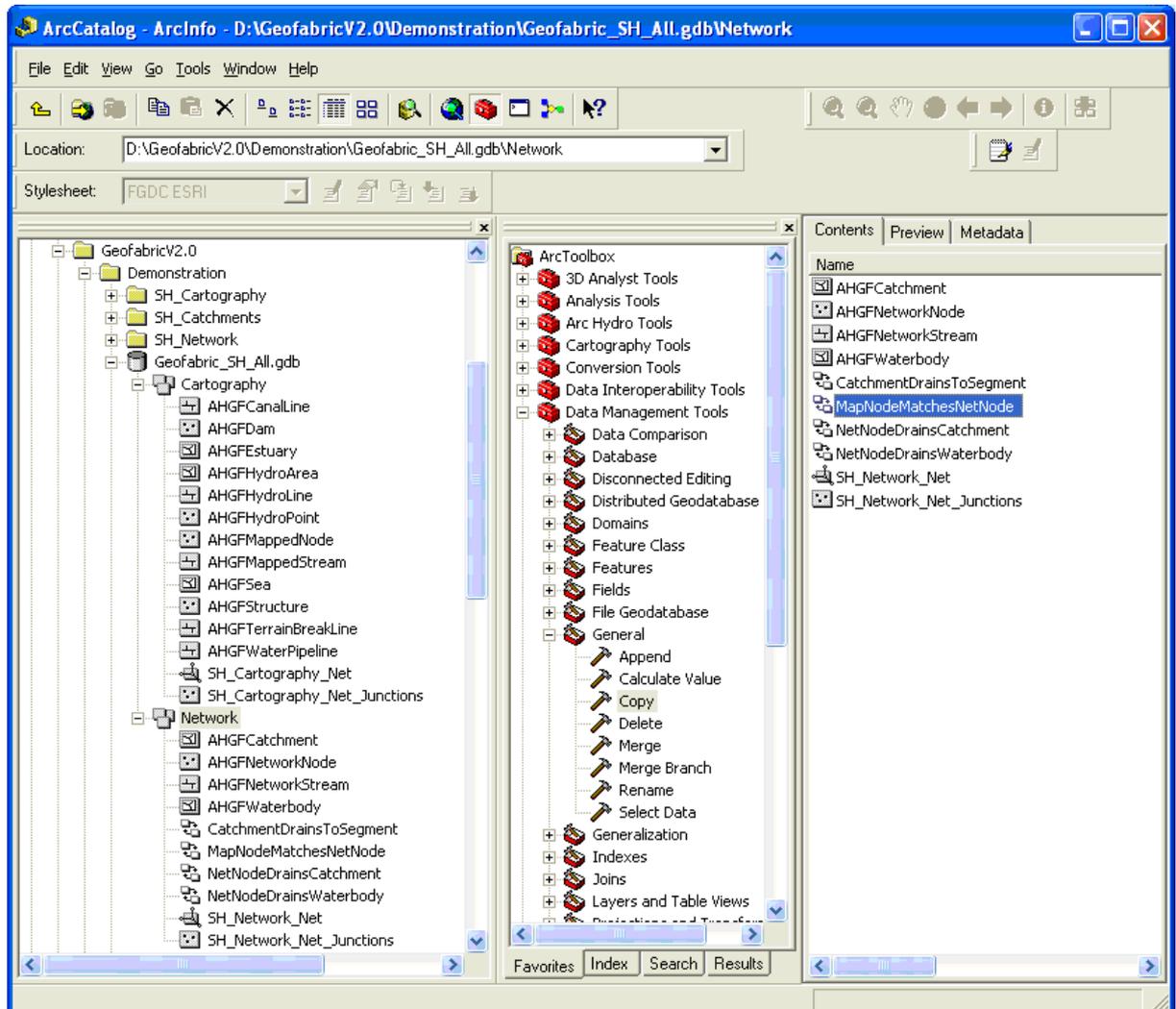
Select the foreign key field in the destination table/feature class that refers to the primary key field in the origin table/feature class:

ConNodeID

< Back Next > Cancel

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10. Click [Next >] and then [Finish] to create the new relationship class.
Note: Only a subset of the total set of AHGFNetworkNode and AHGFMappedNode features (i.e. contracted Junction and Terminus nodes) participate in this relationship.



11. To create the other optional relationship classes shown in Figure 1, repeat the steps above substituting the appropriate information listed below accordingly:

AHGFMappedNode drains AHGFWaterbody

Relationship class name:	MapNodeDrainsWaterbody
Origin feature class:	AHGFMappedNode
Destination feature class:	AHGFWaterbody
Type of relationship:	Simple (peer to peer) relationship
Origin to destination label:	drains
Destination to origin label:	is drained by
Message propagation:	None (no messages propagated)
Cardinality:	1 – M (one to many)
Relationship attributes:	No, I do not want to add attributes to this relationship class
Primary key:	HydroID
Foreign key:	MapNodeID

Note: Only a subset of the total set of AHGFMappedNode features participate in this relationship.

AHGFMappedStream matches AHGFNetworkStream

Relationship class name:	MapStreamMatchesNetStream
Origin feature class:	AHGFMappedStream
Destination feature class:	AHGFNetworkStream
Type of relationship:	Simple (peer to peer) relationship
Origin to destination label:	matches
Destination to origin label:	is matched by
Message propagation:	None (no messages propagated)
Cardinality:	1 – M (one to many)
Relationship attributes:	No, I do not want to add attributes to this relationship class
Primary key:	AusHydroID
Foreign key:	AusHydroID

Note: Due to inherent differences between the two stream networks not all features in AHGFNetworkStream can be mapped to AHGFMappedStream features (and vice versa) and thus not all features participate in this relationship.

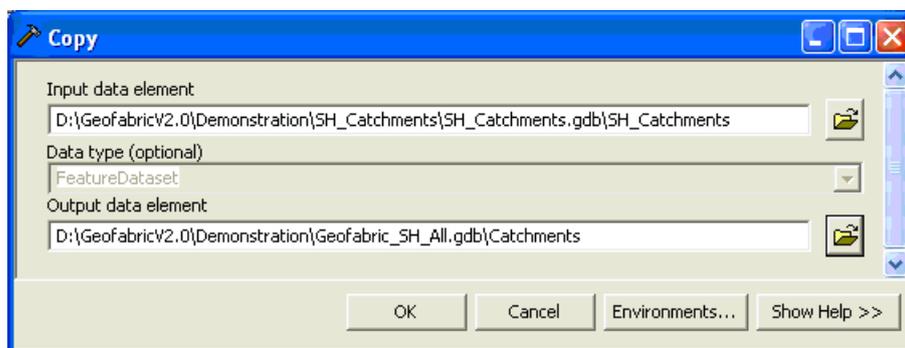
2.6 SH_Catchments File Geodatabase

2.6.1 Delete the duplicate AHGFCatchment feature class

1. As the AHGFCatchment appears in both Surface Network and Surface Catchments, remove the AHGFCatchment feature class from Surface Catchments prior to copying this over to the merge file Geodatabase.
Note: Since the NCBPfafstetter table is in a relationship with AHGFCatchment, the CatchmentIsExtendedByPfafstetter relationship class will also be deleted when the AHGFCatchment feature class is deleted. This is restored in a later step.
2. In ArcCatalog, browse to the AHGFCatchment feature class in the SH_Catchments Geodatabase downloaded in step 2.1.
3. Right-click on the feature class and choose Delete. Click [Yes] to confirm.

2.6.2 Copy the remaining components

1. Repeat the instructions in step 2.3.1, this time copying the SH_Catchments feature dataset (containing NCBLevel1DrainageDivision and NCBLevel2DrainageBasinGroup) and NCBPfafstetter table across to the File Geodatabase created in step 2.2.



2.6.3 Recreate the relationship class between the NCBPfafstetter table and the AHGFCatchment feature class

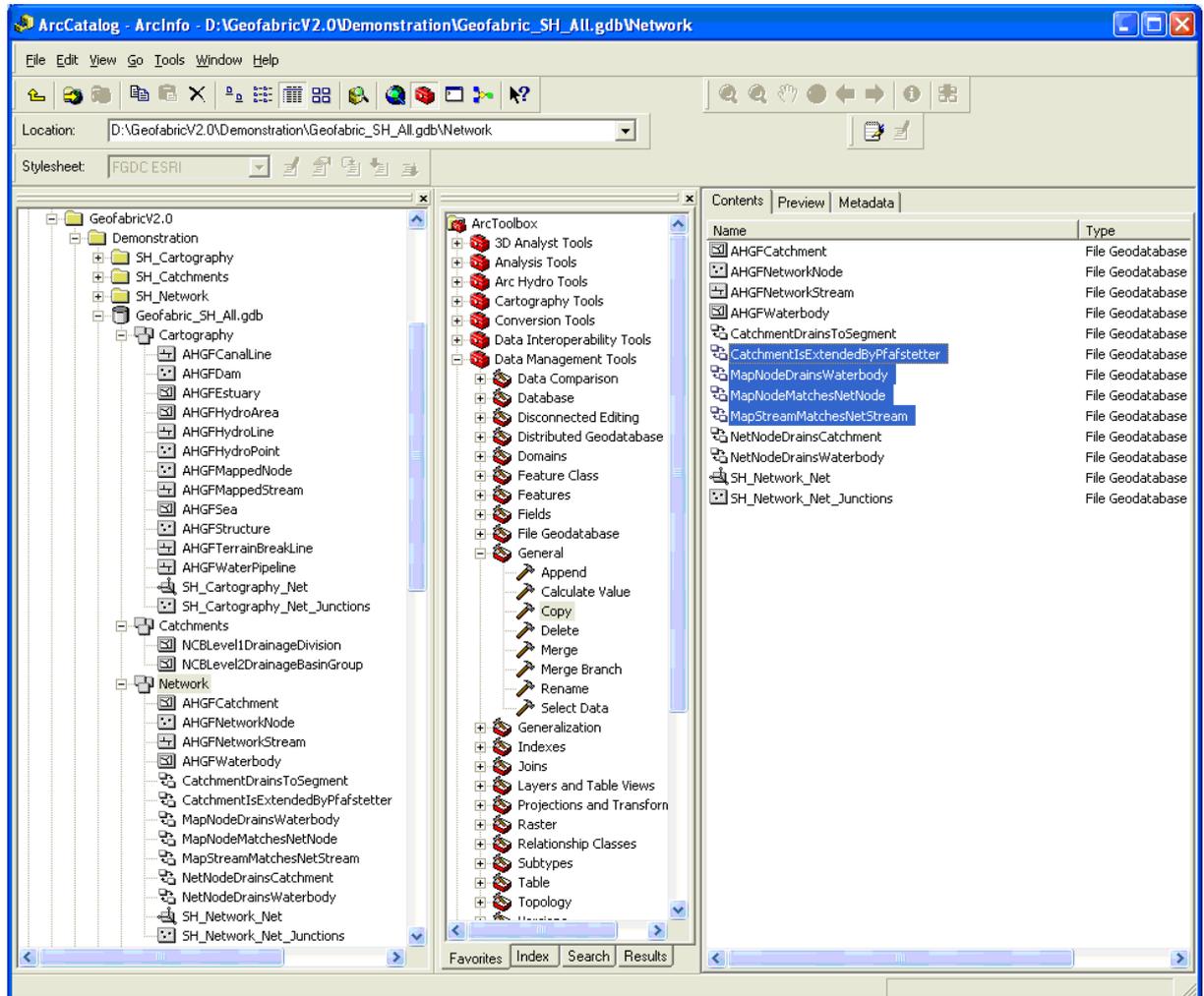
To complete the merging of the three Geofabric products, the final step in this tutorial is to recreate the relationship class that was automatically deleted from the SH_Catchments File Geodatabase during step 2.6.1.

In order to create the CatchmentIsExtendedByPfafstetter relationship class, follow the procedure outlined in step 11 above, substituting the appropriate information listed below accordingly:

AHGFCatchments is extended by NCBPfafstetter

Relationship class name:	CatchmentIsExtendedByPfafstetter
Origin feature class:	AHGFCatchment
Destination feature class:	NCBPfafstetter
Type of relationship:	Simple (peer to peer) relationship
Origin to destination label:	is extended by
Destination to origin label:	extends
Message propagation:	None (no messages propagated)
Cardinality:	1 – 1 (one to one)
Relationship attributes:	No, I do not want to add attributes to this relationship class
Primary key:	NCB_ID
Foreign key:	NCB_ID

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