# Australian Hydrological Geospatial Fabric (Geofabric)

# Data Product Specification

## Surface Network

Version 2.1 – November 2012

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

Water Information
DATA · INFORMATION · INSIGHT

## Contact details

Geospatial Data Unit

Bureau of Meteorology
GPO Box 2334 CANBERRA ACT 2601

Phone: 02 6232 3502
Email: ahgf@bom.gov.au

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## Preface

This document is based upon the AS/NZS ISO 19131:2008 Geographic information - Data product specifications standard[1]. The document provides a framework for the completion of a Data Product Specification for geographic data product produced as part of the Geofabric project.

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[1] AS/NZS, "AS/NZS ISO 19131:2008 Geographic information - Data product specifications" (AS/NZS, July 21, 2008), www.saiglobal.com/online/.

# 1  Overview

## 1.1  Data product specification title

Geofabric Surface Network

## 1.2  Reference date

2012-08

## 1.3  Responsible party

Contact organisation: Bureau of Meteorology

Contact position: Geospatial Data Unit

Mail address:  GPO Box 2334

Locality: Canberra

State: ACT

Country: Australia

Postcode: 2603

Electronic mail address: ahgf@bom.gov.au

## 1.4  Data product specification language

English

## 1.5  Terms and definitions

Please refer to the Glossary on the Geofabric website.

## 1.6  Abbreviations and acronyms

| | |
|---|---|
| AHGF | Australian Hydrological Geospatial Fabric |
| ANZLIC | Australian and New Zealand Land Information Council |
| ANUDEM Streams | Australian National University Digital Elevation Model Derived Streams V1.1.2 |
| Bureau | Bureau of Meteorology |
| CSIRO | Commonwealth Scientific and Industrial Research Organisation |
| DEM | Digital Elevation Model |
| DEM-9S | GEODATA 9 Digital Elevation Model |
| ESRI | Environmental Systems Research Institute Inc. |

| FGDC | Federal Geographic Data Committee |
| GA | Geoscience Australia |
| GDA94 | Geodetic Datum of Australia 1994 |
| ISO | International Organization for Standardization |
| NCB | National Catchment Boundaries |
| SDE | Spatial Database Engine |

## 1.7 Informal description of data product

Geofabric Surface Network is largely based on feature classes extracted from Australian National University Digital Elevation Model Derived Streams V1.1.2 (ANUDEM Streams) as supplied by Geoscience Australia (GA). The GA supplied data products were integrated into the Geofabric Maintenance Geodatabase using a series of scripted procedures that created additional features and unique IDs – HydroIDs – that are generated during the data post-processing load procedures carried out by the Australian Bureau of Meteorology (the Bureau). The data product is delivered as a series of related feature classes, as an ESRI File Geodatabase.

Geofabric Surface Network is intended to be used in stream flow tracing operations, using its full topological connection. The product can support the spatial selection of associated hydrological features as inputs for spatial analysis/modelling.

Geofabric Surface Network vector lines are derived from a regular 9 second grid delineating a fully connected and directed stream network for Australia. The network was derived by tracing the surface flow pathways coded by a multi-flow extension of the GEODATA 9 Second Flow Direction Grid (D8-9S) version 3.1 associated with the GEODATA 9 Second Digital Elevation Model Version 3 2008 (ANZLIC unique identifier: ANZCW0703011541).

The stream network represents the AusHydro V1.7.2 (AusHydro) watercourse line features, generalised to the 9 second grid resolution consistent with the flow pathways defined in the flow direction grid. It adds DEM connectors where there are breaks in the AusHydro watercourse lines to provide a fully connected network suitable for network tracing and other analytical uses. This layer also relates to the National Catchment Boundaries (NCB), renamed Geofabric Surface Catchments through a shared segment identifier. The sub-catchment areas draining to each of the segments (links) in this layer form the lowest level subdivision of the NCB while the topological relationships among the streams provide the basis for assignment of the Pfafstetter reference system associated with each of the NCB units.

The Pfafstetter look-up table is supplied as a separate table, which may be joined by the NCB_ID table field.

The data product extent is Geographic Australia (as defined by *Acts Interpretation Act 1901*). The product will be updated periodically to reflect changed attribution and new data sources.

## 2    Specification scope

### 2.1  Scope identification

Global

### 2.2  Level

Dataset

### 2.3  Level name

Global scope

### 2.4  Level description

This is the default root level global scope used by this data product and relates to all data within the product.

### 2.5  Extent

#### 2.5.1    Description

Data for this scope relates to Australia, excluding external territories - Geographic Australia (as defined by *Acts Interpretation Act 1901*).

#### 2.5.2    Geographic extent

**West bound longitude**

112.8 °

**East bound longitude**

154.1 °

**South bound latitude**

-44.0 °

**North bound latitude**

-8.9 °

### 2.5.3   Temporal extent

**Start date**

1992-01-01

**End date**

Now

## 3    Data product identification

### 3.1  Title

Geofabric Surface Network

### 3.2  Alternate title

Geofabric Surface Hydrology Network 1:250,000 scale 2012

### 3.3  Product ID

ANZCW0503900104

### 3.4  Abstract

Geofabric Surface Network provides a set of related feature classes to be used as the basis for production of consistent hydrological surface stream network analysis. This product contains a topographically consistent representation of the (major) surface water features of Australia (excluding external Territories). Primarily, these are natural surface hydrology features but the product also contains some man-made features (notably reservoirs and other hydrographic features).

Geofabric Surface Network is based upon the input from ANUDEM streams which is the vectorised version of the 9 second ANUDEM derived raster streams product. The product is related to, but distinct from, the stream network contained in Geofabric Surface Cartography. The network product represents the flow direction of streams over the surface of the terrain, based on the GEODATA 9 Second Digital Elevation Model (DEM-9S) Version 3. This product is more generalised than Geofabric Surface Cartography and represents the main channels of the stream, particularly in areas where streams are heavily anabranched or disconnected.

In addition, the stream connectivity represents a stream flow over the terrain, regardless of the presence of a corresponding Geofabric Surface Cartography stream segment. This means the Geofabric Surface Cartography product may represent a stream as an interrupted or intermittent feature, whereas this product represents the same stream as a continuous connected feature. That is, the path a stream would take (according to the terrain model), if sufficient water were available for flow. This product is fully topologically correct which means that all the stream segments flow in the correct direction. It also has full connectivity based on the flow of water across a terrain model.

This product contains six feature types, including: Waterbody, Network Stream, Network Node, Catchment, Network Connectivity (Upstream), and Network Connectivity (Downstream).

## 3.5 Purpose

This product contains a topographic representation of the (major) surface water features of geographic Australia excluding external Territories. It is intended to be used as the basis for production of consistent surface stream network analysis.

Geofabric Surface Network is intended to be used in stream flow tracing operations, using its full topological connection. The product can support the spatial selection of associated hydrological features as inputs for spatial analysis/modelling.

This product is intended to supplement the Geofabric Surface Cartography, Geofabric Surface Catchments and Geofabric Hydrology Reporting Catchments data products. This product is also used to support the definition of the Geofabric Surface Catchments and Geofabric Hydrology Reporting Catchments products, and provides a spatial framework for analysis and assessment of streams and their catchments.

### 3.5.1 Use case

Stream network analysis and surface hydrologic analysis.

## 3.6 Topic category

007 - environment

012 - inland water

013 - location

017 - structure

018 - transportation

## 3.7 Spatial representation

vector

## 3.8 Spatial resolution

### 3.8.1 Spatial denominator

250,000

### 3.8.2 Resolution distance

250 metres

## 3.9 Geographic bounding box

### 3.9.1 West bound longitude

112.8 °

### 3.9.2 East bound longitude

154.1 °

### 3.9.3 South bound latitude

-44 °

### 3.9.4 North bound latitude

-8.9 °

## 3.10 Geographic identifier

### 3.10.1 Identifier authority

ANZLIC - the Spatial Information Council

### 3.10.2 Identifier code

AUS

### 3.10.3 Code space (register URL)

ANZLIC

http://asdd.ga.gov.au/asdd/profileinfo/anzlic-allgens.xml

## 3.11 Reference to specification scope

Global

# 4    Data content and structure

## 4.1   Description

The product consists of the following components, which combine to give a complete data product:

### Vector data

The data is available as an ESRI File Geodatabase: Geofabric Surface Network. The ESRI File Geodatabase reflects the stored environment of the data in a spatial database engine (SDE) export format. In its native ESRI File Geodatabase format, Geofabric Surface Network consists of a single feature dataset/theme – SH_Network – containing six feature classes and three relationship classes. The geodatabase structure provides greater efficiencies in the management and revision of source topographic data, which are now reflected in a more sophisticated data product suitable for a range of hydrological applications.

### Geofabric Product Guide

This guide describes the Geofabric Surface Network, particularly the geodatabase format, with the aim of identifying:

- important and common geospatial data characteristics
- geodatabase components and data concepts
- hierarchy of feature structure and attributes
- accuracy of the data.

### Licence agreement Creative Commons

The licence agreement details the conditions of use for the data including any referencing requirements.

## 4.2 Feature information

### 4.2.1 Application schema

Refer to Geofabric Surface Network – Geodatabase Product Schema V2.1 2012 available from www.bom.gov.au/water/geofabric/documentation.shtml

### 4.2.2 Feature catalogue

The following table lists the feature classes, their geometry and Australian Hydrological Geospatial Fabric (AHGF) feature type number for Geofabric Surface Network.

**Table 1 - Product Feature Type Registry for Geofabric Surface Network**

| SH_Network - Feature Class/TableName.Subtype(Type) | Feature Class Geometry | AHGF Feature Type Number |
|---|---|---|
| AHGFNetworkStream.FlowSegment | line | 1 |
| AHGFNetworkStream.ArtificialFlowSegment | line | 2 |
| AHGFNetworkStream.WaterAreaSegment | line | 3 |
| AHGFNetworkNode.NetworkJunctionNode | points | 4 |
| AHGFNetworkNode.NetworkTerminusNode | points | 5 |
| AHGFNetworkNode.NetworkArtificialNode | points | 6 |
| AHGFNetworkNode.NetworkWaterAreaNode | points | 7 |
| AHGFNetworkNode.NetworkGhostNode | points | 8 |
| AHGFNetworkNode.NetworkHeadNode | points | 9 |
| AHGFNetworkNode.NetworkCliffNode | points | 10 |
| AHGFCatchment | polygon | 21 |
| AHGFContractedCatchment.ContractedArea | polygon | 22 |
| AHGFContractedCatchment.NonContractedArea | polygon | 23 |
| AHGFContractedCatchment.NoFlowArea | polygon | 24 |
| AHGFWaterbody.Reservoir | polygon | 25 |
| AHGFWaterbody.Lake | polygon | 26 |
| AHGFWaterbody.Swamp | polygon | 27 |
| AHGFNetworkStream_FS | na | table |
| NetworkConnectivityUp | na | table |
| NetworkConnectivityDown | na | table |

Highlighted text indicates a Bureau created feature

### 4.2.3 Reference to specification scope

Global

## 5    Reference systems

### 5.1  Spatial reference system

#### 5.1.1   Name

GDA94

#### 5.1.2   Code

4283

#### 5.1.3   Code space

EPSG_v65

### 5.2  Temporal reference system

Gregorian calendar

### 5.3  Vertical reference system

Not applicable

### 5.4  Reference system scope

Global

# 6 Data quality

## 6.1 Data quality scope

### 6.1.1 Scope code

Dataset

### 6.1.2 Extent

Australia (excluding external Territories)

### 6.1.3 Scope description

The data quality metadata relates to the entire dataset comprising this data product.

## 6.2 Data quality lineage

### 6.2.1 Lineage statement

Geofabric Surface Network is part of a suite of Geofabric products produced by the Bureau. The geometry of this product is largely derived from the ANUDEM Streams. It consists of water bodies such as swamps, reservoirs, lakes, etc., as derived from AusHydro V1.7.2 (AusHydro), as well as the stream lines and stream line connectors through these water bodies.

The ANUDEM Streams are firstly vectorised to be usable in vector line feature format and are then informed and modified by the coincident locations of the AHGFMappedStream feature class. The features are organised into specific feature class subtypes, based upon both the inputs from AusHydro and their behaviour within the AHGF Network Stream relationships. All of the AHGFNetworkStream and AHGFWaterbody features participate in the connected stream flow topology.

This product also contains the AHGFCatchment features that are derived from the NCB V1.1.4. The AGHFCatchment feature class consists of the lowest level stream flow catchments based upon the inputs from ANUDEM Streams. The catchment boundaries are based upon a single AHGFNetworkStream extent over GEODATA National 9 Second DEM grid. These catchments form the basis of aggregated catchment boundaries, either by Contracted Nodes or by Pfafstetter ID Levels.

All of these features participate in the connected stream flow topology.

**Processing steps:**

1.  ANUDEM Streams dataset is received and loaded into the Geofabric development GIS environment.

2.  Feature classes from ANUDEM Streams are recomposed into composited Geofabric Feature Dataset Feature Classes in the Geofabric Maintenance Geodatabase.

3.  Re-composited feature classes in the Geofabric Maintenance Geodatabase Feature Dataset are assigned unique Hydro-IDs using ESRI ArcHydro for Surface Water (ArcHydro: 1.4.0.180 and ApFramework: 3.1.0.84).

4.  Feature classes from the Geofabric Maintenance Geodatabase Feature Dataset are extracted and reassigned to the Geofabric Surface Network Feature Dataset within the Geofabric Surface Network Geodatabase.

A complete set of data mappings, from input source data to Geofabric Products, is included in the Geofabric Product Guide, Appendices, which is available at www.bom.gov.au/water/geofabric/documentation.shtml

## 6.3  Quality scope

Global

# 7 Data capture

## 7.1 Data capture statement

This is primarily a derived data product from AusHydro and ANUDEM Streams; however, specific features were created by the Bureau during the data-loading process. Refer to the AusHydro data lineage in the Geofabric Product Guide for information about data capture and processing of source data used to create this product.

The Geofabric Product Guide is available at www.bom.gov.au/water/geofabric/documentation.shtml

The following features are created during the data-loading process into the Geofabric Maintenance Geodatabase:

- AHGFNetworkNodes
- AHGFNetworkSegment_FS
- AHGFNetworkConnectivityUp
- AHGFNetworkConnectivityDown.

## 7.2 Data capture scope

Global

# 8    Data maintenance

## 8.1   Maintenance and update frequency

Irregular

## 8.2   Other maintenance information

The product will be updated periodically, as deemed necessary, to reflect changed attribution and new data sources.

## 8.3   Maintenance scope

Global

# 9      Portrayal information

## 9.1   Portrayal information

Not available.

## 9.2   Portrayal scope

Global

## 10  Data product delivery

### 10.1 Delivery format

#### 10.1.1  Format name

ESRI ArcGIS File Geodatabase

#### 10.1.2  Format version

ArcGIS v9.3

#### 10.1.3  Language used within the dataset

English

#### 10.1.4  Character set coding

Utf8

### 10.2 Delivery medium

#### 10.2.1  Units of delivery

National dataset

#### 10.2.2  Estimated size of a unit in the specified format

SH_Network.gdb = 1.3 GB

#### 10.2.3  Medium name

onLine

#### 10.2.4  Online delivery URL

http://www.bom.gov.au/water/geofabric/download.shtml

### 10.3 Other delivery information

Also supplied as ESRI Shapefiles (requires written request to ahgf@bom.gov.au).

### 10.4 Delivery scope

Global

# 11  Additional information

## 11.1 Additional information

### Licensing and access constraints

Licensed for use under Creative Commons Australia Attribution.

We request attribution as © Commonwealth of Australia (Bureau of Meteorology) 2012.

### Special features of the supplied data product or its component parts

Spatial data in the ESRI File Geodatabase, Geofabric Product Guide, and Geofabric Data Product Specifications.

### Limitation or constraints on product use:

As per Creative Commons Australia Attribution licence.

### Layer files or queries that operate on the data product

Geofabric Surface Network - V2.1.lyr

### Related data products

- Geofabric Surface Cartography
- Geofabric Surface Catchments
- Geofabric Groundwater Cartography
- Geofabric Hydrology Reporting Catchments
- Geofabric Hydrology Reporting Regions.

## 11.2 Additional information scope

Global

## 12  Metadata

### Metadata format requirements

Metadata compliant with ANZLIC Metadata Profile Version 1.1 of AS/NZS ISO 19115 was produced for this data product. The metadata profile is available at dataset level. Feature level metadata is provided within the ArcGIS ArcCatalog FGDC style sheet for all feature types included within this product and describes the lineage of feature.

### Metadata encoding requirements

ArcGIS FGDC and ANZLIC compliant feature metadata.

### References to metadata for data product and component parts

An ISO 19115 compliant XML file of the Geofabric Surface Network metadata statement accompanies the Product (SH_Network.xml) and is viewable using either the ArcGIS ISO 19139 ArcCatalog metadata style sheet or the ANZMet Lite version 1.0.1 metadata creation tool available from http://www.spatial.gov.au

Through the *Water Act 2007*, the Australian Government has given the Bureau of Meteorology responsibility for compiling and delivering comprehensive water information across Australia.

**For more information**
Visit our website at www.bom.gov.au/water
Send an email request to waterinfo@bom.gov.au

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