



DEVELOPERS OF WORLD LEADING GIS SOFTWARE

Cadcorp SIS V6.2 User Guide



Cadcorp, Cadcorp SIS, Spatial Information System, Cadcorp mSIS, mSIS, Cadcorp apSIS, apSIS, and Map Tips are registered trademarks of Computer Aided Development Corporation Ltd, in certain jurisdictions, all rights reserved. Not all Cadcorp registered trademarks may be listed here.

All products in the Cadcorp SIS suite are created and owned by:

Cadcorp Ltd
Sterling Court
Norton Road
Stevenage
Herts
SG1 2JY
UK
Tel: + 44 (0)1438 747996
Fax: + 44 (0)1438 747997
Email: cadcorp@cadcorp.com
Website: www.cadcorp.com

© Copyright 2005 Computer Aided Development Corporation (Cadcorp). All rights reserved. No reproduction, modification, or translation of any of the material herein without the written permission of Cadcorp. The software described in this document is furnished under a licence agreement or non-disclosure agreement. It is against the law to copy the software on any medium except as specifically allowed in the licence or non-disclosure agreement.

Information in this document is subject to change without notice, and does not represent a commitment on the part of Computer Aided Development Corporation Ltd (Cadcorp). No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying or recording, for any purpose without the express written permission of Cadcorp.

Cadcorp SIS ASC, Map Reader, Map Browser, Map Viewer, Map Manager, Map Editor, Map Modeller, GeognoSIS.NET, and Cadcorp SIS Control Development Modules are all Cadcorp Trade Marks, copyright © Computer Aided Development Corporation (Cadcorp) Ltd.

All map extracts in this document displaying the words: **Map extract © Crown copyright** are reproduced from the Ordnance Survey mapping with the permission of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings.

Cadcorp is an Ordnance Survey GB Licensed System Supplier.

Microsoft®, Microsoft® Windows™, Microsoft® Windows NT™, Microsoft® Windows 98™, Microsoft® Windows 2000™, Microsoft® Windows Me™, Microsoft® Windows XP™, Microsoft® Excel for Windows™, Microsoft® Word for Windows™, and Microsoft® Visual Basic™ are registered trademarks of Microsoft Corporation.

Cover image of Heathrow is courtesy of and copyright Cities Revealed, The GeoInformation Group.

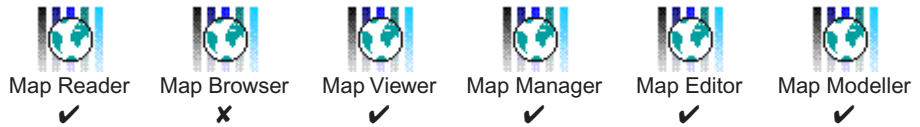
The following are trademarks or registered trademarks of their respective companies or organisations: AutoCAD, ArcInfo, Cities Revealed, GDS, MapInfo, MicroGDS, MicroStation, OS MasterMap, Open Geospatial Consortium.

The names of other companies and products herein are trademarks or registered trademarks of their respective trademark owners.

Contents

QS	Quick start	QS1
1	Introduction	1
2	Installation	25
3	Introducing the interface	33
4	Loading data	45
5	File formats	77
6	Working with map windows	115
7	Finding items: queries	131
8	Scale	143
9	Viewing 3D Data	149
10	Working with GPS	159
11	Cadcorp SIS and the Open Geospatial Consortium	167
12	Querying the data in the map window	195
13	The workspace window	209
14	Properties	219
15	Working with overlays	225
16	Filtering what you see	237
17	Schemas	243
18	Adding your own attribute data	249
19	Thematic mapping	253
20	Databases	275
21	Table windows	331
22	User datasets	337
23	Overlays, levels, and commands	341
24	Constructing line items	343
25	Constructing area items	359

26	Creating points and placing shapes	371
27	Creating text	377
28	Creating collections	387
29	Creating topology: links and nodes	393
30	Creating topology: chains and polygons	399
31	Creating 3D data	407
32	Pens and brushes	423
33	Precision dimensions and locations	431
34	Selecting graphics	447
35	General editing techniques	457
36	Editing line items	469
37	Editing area items	489
38	Editing points and shapes	497
39	Editing text items	501
40	Editing collections	507
41	Editing topology	511
42	Editing TINs	521
43	Editing raster data	527
44	Editing pens and brushes	533
45	Sharing data	545
46	Printing: the Print commands	555
47	Printing: print templates	559
48	Using the clipboard	585
49	Customising your system	591
50	Named object libraries (NOLs)	599
51	Creating your own filters	605
52	Formulae	611
53	Feature tables	631
54	Co-ordinate systems and projections	637
55	Spatial analysis	643
56	Spatial testing: loci	649
57	Grids	661
58	Route-finding	667
59	Map projections	673
60	Glossary	681
	Index	701



Quick start

■ Installation	QS-2
■ Starting with Cadcorp SIS for the first time	QS-2
■ Moving around map windows	QS-3
■ Viewing 3D data (Manager, Editor, Modeller only)	QS-4
■ Adding your own data	QS-4
■ Printing	QS-6

If you are an experienced user of Windows programs and/or Geographic Information Systems (GIS) software, this section contains a few pointers to get you started using Cadcorp Spatial Information System (SIS). It covers:

- installing Cadcorp SIS
- loading maps and other data
- moving around the map base
- adding simple geometry of your own
- producing a print

It does not describe many of the advanced features of Cadcorp SIS products, details of which can be found in the relevant chapter in the main section of the manual, such as:

- the use of scale
- editing graphical items
- using raster image and grid data
- thematic mapping
- using databases
- using properties and formulae
- creating shapes and other collections
- named object libraries
- topology
- projections
- feature tables
- ground modelling
- spatial analysis

The information in this chapter is concise. If you experience any difficulties, consult the main section of the manual or the on-line help for a fuller description of the features.

If you are a new user and require more comprehensive information and a step-by-step guide to installation, ➤Chapter 1: “**Introduction**”.

■ Installation

- 1 Plug the dongle into your computer.
- 2 Have your licence number ready. You can find this on the case of your Cadcorp SIS CD-ROM.
- 3 UK users should set their Regional and Language Options to English (United Kingdom) before installation.
- 4 Put the CD-ROM in the CD-ROM drive. If this is the first time you have used it, the installation will auto-run. Otherwise run SETUP.EXE.
- 5 The installation process creates a Cadcorp SIS Program group which you can access from the **Start>Programs** menu on your Desktop.

■ Starting with Cadcorp SIS for the first time

This user guide describes all the commands provided by products in the Cadcorp SIS suite: Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, Cadcorp SIS Map Manager, Cadcorp SIS Map Editor, and Cadcorp SIS Map Modeller. Depending on the Cadcorp SIS product you are using, some of these commands may not be available on your system. ➤Chapter 1: “Introduction”

◆ The map window

The initial display contains a single map window. Click on the Maximise button on the right of the Title Bar to ensure that this window expands to fill the available space. Map windows contain map graphics and your own graphic data.

◆ The status bar

The status bar at the bottom of the main window shows you useful prompts and feedback.

◆ Create a project workspace



Use the **File>New...** command to start the Create Workspace Wizard. A workspace remembers the default projection, windows, datasets, overlays, and libraries for a project. In subsequent sessions you can just load a workspace to restore all these settings. Workspace files have a *.sis extension.

◆ Select a co-ordinate system



Use the **Map>Co-ordinate systems...** command to select the desired projection. If you are working on UK data, this is most likely to be OSGB 1936.British National Grid. To make this projection the default for all map windows, close the map window first, before selecting the projection.

Cadcorp SIS uses a viewing projection for displaying the maps, and a co-ordinate system projection for storing positions. You can choose either, and Cadcorp SIS will automatically make the other one compatible.

◆ Load your external datasets

Most map data files are supplied in a specific format, such as Ordnance Survey NTF, Map-Info MIF, ESRI Shape, etc. Cadcorp SIS supports the use of many data formats.



To add map data to your map window, use the **New Overlay** wizard (**Map>Add>Overlay...**). Choose the File option. This allows you to choose any of the supported formats that are stored as files on your PC or on a network disk drive. Each file is loaded as an overlay in the Overlays dialog.



You can see which files have been added to your session by selecting the **Map>Overlays...** command. The external data is then available for you to see, select, copy and query, but you cannot edit it.

If you have a lot of data tiles to load, you can create an index dataset, which is one overlay containing all map tiles of a user-defined type. Select one file from the directory that contains all the geo-referenced map tiles. The wizard will prompt with the details for that dataset, the outlines for which will then be displayed on screen.

If you want to make copies of your external data which you can then edit, use the **Imported File** option. The original data then remains unaffected on your disk.

If you wish to load a database, you have a choice of an Editable Geometry dataset, a read-only View Geometry dataset, an SQL92 database, or a points database.

Data can also be downloaded from an FTP site, or via a data source. Cadcorp SIS can read many different file types and new ones are always being added. If you do not see the file type you want to use, check the Cadcorp web site or telephone Cadcorp support for the latest information. ➤ page 6, **Where to get help**



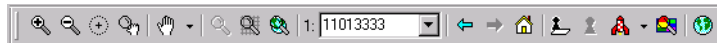
If the data is geo-referenced, Cadcorp automatically places it in its correct location in the world. If it is not, use the **Alter>Move Dataset** command to position it.

■ Moving around map windows

◆ Zooming

You can zoom using:

- the multiplication key on the numeric pad (*) to zoom out
- the plus key on the numeric pad (+) to zoom in
- the wheel on an Intellimouse
- the **Zoom** commands on the **Map** menu
- the Zoom Icons on the View toolbar



◆ Panning

You can pan using:

- the map window scroll bars
- the cursor keys, and the PgUp, PgDn, Home and End keys on the numeric pad
- the **Pan** commands on the **Map** menu
- the Pan icons on the View toolbar

■ Viewing 3D data (Manager, Editor, Modeller only)



If you are using 3D datasets you can view them in three dimensions by opening a 3D window (the **Window>New 3D Window** command).

You cannot edit data in this window, but it is dynamically linked to the map window, and will be updated immediately with any changes made there.

◆ Panning and zooming

You can move around a 3D window using the following features. The way they operate is controlled by the 3D move mode (selected on the 3D menu):

- 3D window scroll bars
- + and * keys
- the 3D toolbar

■ Adding your own data

◆ Create a user dataset



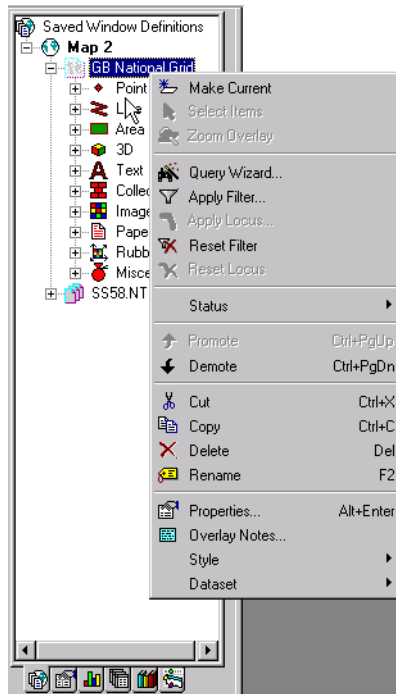
You can use the **Map>Add>Overlay...** command to create either:

- a base dataset. This is a file (*.bds) which is saved to disk and can be shared over a network (in this case it can be read by many users, but edited only by one at a time).
- an internal dataset. This is not stored as a file and cannot be accessed by other users, nor used in a different window.

◆ Make the new user dataset current



In the workspace window, use the Display view tab to see details of the dataset (use the **Tools>Workspace Window** command to display the workspace window if it is not visible). The dataset's local menu (click the secondary mouse button) for the dataset shows a number of commands. Choose Make Current to make the dataset current:



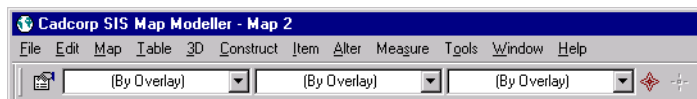
◆ Construct your data

You can use the commands on the **Construct>Geometry 2D** menu to create line items and area items.

Lines can be straight or freehand, orthogonal, drawn in free space or traced over existing data. They can be drawn in any colour and with different styles (eg solid, dotted, dashed, etc). A line's **pen** controls its colour and style.

Area outlines can be curved or straight, or be composed of a mixture of curved and straight segments. They are filled with a colour or pattern. An area's **brush** controls its colour and pattern.

You can select pens and brushes from the Styles toolbar:



Use the commands on the **Construct>Text** menu to add text.



To place symbols, use the **Construct>Geometry 2D>Point** command. As you place points, you can select from one of many libraries which shape (symbol) they should use.

Cadcorp SIS contains a whole range of data construction and editing features, allowing you great scope in adding data. For instance, you can construct 3D geometry, or create a TIN or DTM to carry out ground modelling. You can add and use attribute data, eg to produce a thematic map with bar charts. You can produce intelligent line and area items (topology), which have knowledge of their adjacency and connectivity to other topological items. All these features are described in the main section of this manual.

■ Printing

◆ Printing what you see



You can use the **File>Print...** command to print the view in the current window to any connected printer. You should pan and zoom first so that the view in the map window is the view you want reproduced.

◆ Printing using print templates

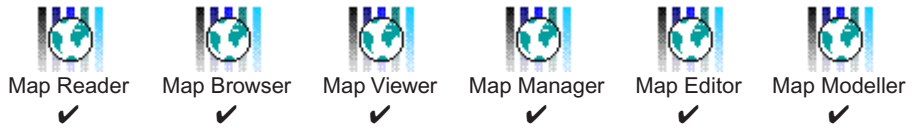


Use the **File>Print Template>Wizard** or **Quick Wizard** to select an area of the map window and print it using a print template. Print templates are like pre-formatted sheets which can contain standard information, such as your company details, logo and title block.

The Quick Wizard allows you to select a template, place it, change the scale and define a view rotation.

The wizard allows you to further customise the template as you use it, adding any or all of the following:

- a title bar
- key map
- legend(s)
- scale bar
- north point
- grids
- graticules



Introduction

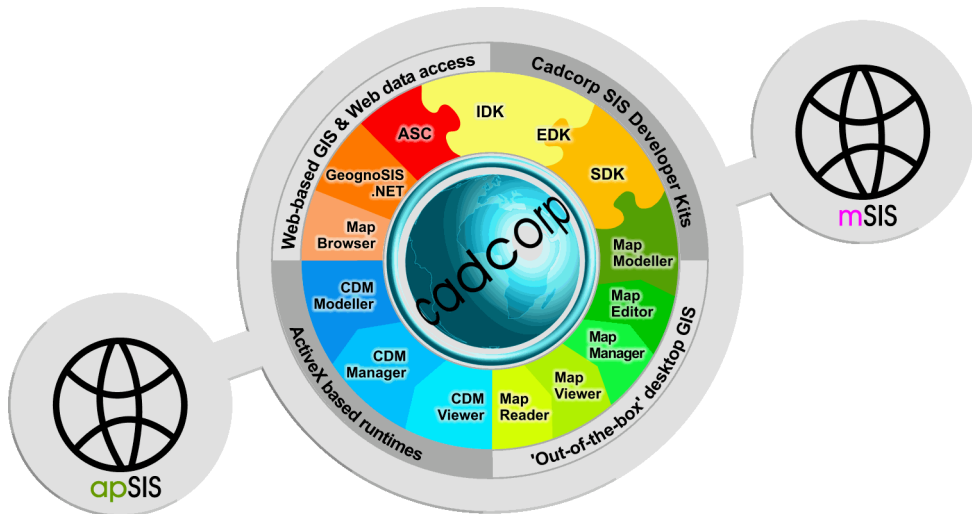
■ About Cadcorp SIS	1
■ The Open Geospatial Consortium (OGC)	5
■ Where to get help	6
■ Product and command availability	12

■ About Cadcorp SIS

Cadcorp's Spatial Information System (Cadcorp SIS) is a suite of products that combine the capabilities of Digital Mapping and Geographical Information Systems (GIS) as well as advanced geometrical data editing typically found in Computer Aided Design (CAD). There are several products in the suite:

- Cadcorp SIS Map Reader
- Cadcorp SIS Map Browser
- Cadcorp SIS Map Viewer
- Cadcorp SIS Map Manager
- Cadcorp SIS Map Editor
- Cadcorp SIS Map Modeller
- Cadcorp SIS Control Development Modules
- Cadcorp SIS Active Server Component
- Cadcorp GeognoSIS.NET
- Cadcorp SIS Map Server
- Cadcorp apSIS
- Cadcorp mSIS

The integrated and interrelated nature of the Cadcorp SIS product suite is emphasised in our product wheel diagram:



Cadcorp SIS is designed specifically for the Microsoft Windows environment, and operates with most versions of Windows, from Windows 2000 onwards.

All our products read vector data in many different formats directly, without recourse to translation. This includes popular GIS and CAD formats like ESRI SHP, MapInfo TAB, MapInfo MIF, AutoCAD DWG, Microstation DGN, and others. UK users can read all Ordnance Survey formats including OS MasterMap. All information contained in the files, such as survey date, accuracy code, etc, is retained and available to the user.

Cadcorp SIS also supports many raster formats, such as Windows BMP, RLC, JPEG, PNG, ECW, MrSID, and TIFF. Data from other GIS, CAD, and other graphics systems can also be read, as well as database files.

You can add your own overlays to the map base, and display and manipulate any combination of base data and your own data. Any part of a map base can be viewed and printed at any scale irrespective of the scale of the base data. These views can be automatically superimposed onto print templates containing titles, date, and so on.

Cadcorp SIS products can be customised using GisLink (see the **Cadcorp SIS Developers Guide**) and Microsoft Visual Studio.NET, enabling tasks to be automated and functionality to be extended.

On a Windows-compatible network (eg Novell or Windows NT), many users are able to share data, viewing the same part of the map base simultaneously if they wish. Data can be stored centrally on a network file server, or individual users can store information on their own computer and control its availability to other users.

◆ Products

Cadcorp SIS Map Reader

Cadcorp SIS Map Reader is a free product that allows you to display and print map documents saved in PWD (Published Window Definition) format. You can create Published Window Definition using the Map Manager, Map Editor or Map Modeller products.

Cadcorp SIS Map Browser

Cadcorp SIS Map Browser is a free product that allows you to access Open Geospatial Consortium implementing Web Map Servers (WMS) and Web Feature Servers (WFS).

Cadcorp SIS Map Viewer

Cadcorp SIS Map Viewer allows you to display and print all the data formats supported by Cadcorp SIS. There are commands for finding specific locations on the map, panning to different areas and zooming in to look at detail. You can use some basic measuring tools. You can also carry out red-lining by adding text and lines, and use thematic maps.

Cadcorp SIS Map Manager

Cadcorp SIS Map Manager lets you display, add information to and print a wide range of vector and raster format files. You can link the maps to any ODBC databases or use a range of direct database drivers. Associated data can be displayed in data tables and displayed as pie charts, bar charts, and other themes.

You can add and edit your own data points, lines, polygons, and text. You can query external map data and your own data in various ways, eg measure distances, lengths, and areas. Also, you can use GPS satellite positioning data within Cadcorp SIS by attaching a suitable GPS device to your computer.

Cadcorp SIS Map Editor

Cadcorp SIS Map Editor extends the capabilities of Cadcorp SIS Map Manager, offering extensive 'advanced geometric' functionality and editing capability, creation and maintenance of topology plus spatial testing and map authoring.

Cadcorp SIS Map Modeller

Cadcorp SIS Map Modeller incorporates all the features of Cadcorp SIS Map Editor. In addition, you can work with 3D maps and, using OpenGL technology, you can quickly visualise your geographical data in real-time dynamic 3D views. You can also drape raster and vector images over 3D ground models for visual impact. Cadcorp SIS Map Modeller also provides tools to let you build and edit your own 3D models, using DTMs, TINs, surfaces, and solids.

You can also carry out Grid Analysis, which is a powerful method of exploring interactions between different map coverages. Buffer zones and Thiessen polygons allow you to create areas of influence.

Cadcorp SIS Control

Cadcorp also provides a 32-bit ActiveX Control (OCX) runtime environment for organisations that develop their own products and applications. The Cadcorp SIS Control can be used with ActiveX programming languages (eg Microsoft Visual Studio.NET, Borland Delphi), and allows you to view maps in your own applications. The Cadcorp SIS commands are initially hidden, so your application is completely user-defined.

The CDM Viewer Level incorporates the functionality of Cadcorp SIS Map Viewer.

The CDM Manager Level contains all the functionality of Cadcorp SIS Map Manager, as well as most of the user interface.

The CDM Modeller Level incorporates most of the functionality of the Cadcorp SIS Map Modeller product.

These applications are developed using the Cadcorp SIS Software Developer Kit (SDK)

Cadcorp SIS Active Server Component

This product provides the facility for you to write internet GIS applications, which users can run with ordinary internet browsers. Your application can use the powerful features of Cadcorp SIS, without end users having to install any browser plug-ins. Cadcorp SIS Active Server Component is a 32-bit COM Server side application. The programmer can create tools that can be used in internet browsers to perform GIS functions such as 'Zoom In', 'Select a record', 'show the nearest' and so on.

ASC applications are developed using the Cadcorp SIS Internet Developer Kit (IDK).

Cadcorp SIS Map Server

Cadcorp SIS Map Server offers the capability to serve SWDs on the web quickly and easily. You can use Cadcorp SIS to create the maps, and these can then be easily distributed around an organisation and its customers. Your web server can display a map in any standard web browser without need for plug-ins. It can also display a map window of an SWD with basic information about the content of the file, such as the list of overlays within it and its scale. The browser can also use basic zoom and pan commands.

Cadcorp GeognoSIS.NET

GeognoSIS.NET, Cadcorp's new solution for developing internet applications, allows embedded spatial data and GIS functionality to be accessed using standard internet web browsers. It provides the functionality of Cadcorp SIS ASC (Active Server Component) for both Microsoft's .NET framework and for non-Microsoft environments.

GeognoSIS.NET allows developers to create applications that allow GIS functionality such as Zoom In, Show Nearest, and Boolean searches to be used from an internet browser or another application that supports SOAP (the Simple Object Access Protocol).

To help you manage your GeognoSIS.NET installation, we supply the GeognoSIS.NET Management Console Snap-in.

GeognoSIS.NET allows graphic and attribute data held in a Saved Window Definition (SWD) to be displayed and queried by an application that supports SOAP or in an internet browser.

GeognoSIS.NET uses a client/server model, but does not require any client software to be downloaded to the user's machine for ASP.NET or similar applications. However, GeognoSIS.NET can be used to develop 'thick' client applications using the GisLink API via

SOAP, if preferred. The server/client model also has the advantage that GeognoSIS.NET can be installed and accessed on a different server to the web server. For example, the web server could be Apache running on Linux using JSP (Java Server Pages). It is no longer necessary to use Microsoft IIS (Internet Information Service) and ASP.NET on the web server, if the programming language in which the web page is written supports the SOAP protocols.

GeognoSIS.NET contains a standalone Development Kit which requires the same components to be installed on both the developer's computer (the development environment) and the server. There are two types of licence: development and deployment. The development licence is used by the developer and the deployment licence by the web server.

For more details refer to the **Cadcorp SIS Developers Guide**.

Cadcorp apSIS

Cadcorp apSIS (applications for SIS) Software Developer Kit (SDK) is a suite of programmable components combining the Microsoft Component Object Model standard with Open Geospatial Consortium standards. These can be used to add GIS functionality to applications written in a variety of programming languages, eg Microsoft Visual Studio.NET. Using these COM objects a programmer can add graphical displays, use data projections and transformations, create, select and manipulate geometry, and carry out spatial querying, for example. apSIS has a low-level API, and is designed to be used with cursor datasets.

For more details refer to the **Cadcorp apSIS User Guide**.

Cadcorp mSIS

Cadcorp mSIS (mobile Spatial Information System) consists of two software applications: Cadcorp mSIS Office which runs on a Windows desktop PC; and Cadcorp mSIS Mobile, which runs on a Pocket PC.

The project administrator uses Cadcorp mSIS Office to create the project, including data schemas, features, and attributes of the data to be captured. This information is transferred to Cadcorp mSIS Mobile to collect the data (with an additional GPS receiver if available). On returning to the office the data is transferred back to Cadcorp mSIS Office for viewing and exporting data.

For more details refer to the **Cadcorp mSIS User Guide**.

■ The Open Geospatial Consortium (OGC)

The Open Geospatial Consortium (OGC) is a diverse group of people involved in many aspects of geographic information systems, who are working towards the integration of geospatial data and geoprocessing resources. This is not merely restricted to data transfer issues but defining the fundamental 'building blocks' of GIS methods and open interoperability. They aim to involve the world's developers and users of geographic information resources towards a common goal of delivering certifiably interoperable products.

Cadcorp is a member of the Technical Committee of the OGC. The OGC Technical Committee produces the Open Geospatial Consortium specification, which provides a common standard for GIS software. The aim is that, by making software compliant with the Open Geospatial Consortium specification, GIS systems and data will become interoperable.

◆ Cadcorp SIS and the OGC

Cadcorp SIS can read and write geographical data in relational databases using the SQL92 table formats. These formats are documented in the Open Geospatial Consortium Simple features Specification. Cadcorp intends to submit Cadcorp SIS for client-side “OGC Simple Features Specification for SQL” conformance testing, when OGC makes such tests available. Such conformance would mean that Cadcorp SIS will be able to read data held by any third-party server software that conforms to this specification and uses the SQL92 table formats.

Cadcorp SIS Version 6 implements all the geometrical functionality of the OGC Simple Features Specification. This includes:

- point, line, and area items
- multi-point, multi-line and multi-area items
- multi-geometry items, for mixing points, lines, and areas
- Boolean operations between all item classes
- all OGC geometrical testing methods
- WKB (well-known-binary) representation of geometry
- WKT (well-known-text) representation of geometry

Cadcorp SIS Version 6 also handles many of the co-ordinate systems, geodetic datums, and ellipsoids listed in the European Petroleum Survey Group Geodesy Parameters (see www.epsg.org).

At the time of writing, Cadcorp SIS V6.2 and related software (apSIS) are OGC® certified compliant for Simple Features (SFO 1.1), Coordinate Transformation (CTO) 1.0, Grid Coverages (GC 1.0), Web Map Server and Web Feature Server (WMS 1.1.1 & WFS 1.0.0) interfaces. Cadcorp SIS also implements WMS 1.0.0, WMC 1.0, WFS 0.0.14 and 0.0.13, Geographic Markup Language (GML 2.1 and 2.0), Gaz 0.8, Filter 1.0.0 and Web Terrain Server (WTS 0.3.2). This means that Cadcorp software supports as standard the open interfaces for vector data, raster data, coordinate systems and transformation, plus standards for serving and browsing geographic web-served raster and vector data.

Cadcorp’s implementation of OGC standards for OGC Web Services means that Cadcorp SIS can now act as server and client to geographic data served on the web. Cadcorp SIS Map Browser is a good example of a dedicated software product that can be used for displaying, querying and printing raster, vector and terrain data on the web. Cadcorp SIS now represents the new direction in serving accessing geographic data holdings - effectively ‘on demand’.

For more details on the OGC Simple Features Specification, see the Cadcorp SIS on-line help, or the OGC website at www.opengeospatial.org.

Visit the Registered Products pages on the OGC website to see which Cadcorp products implement which OGC specifications, and which are certified as conformant.

■ Where to get help

◆ On-line Help

Cadcorp SIS includes comprehensive on-line help:

- 1 Press F1 when you have a command selected to get help on that command.



2 Choose the Contents command from the Help menu (**Help>Contents**) to search for help on any topic or command.



3 In any dialog box which has a question mark button, click on the button then click on the part of the dialog for which you require assistance.



4 The **Help>About...** command displays the user name, company name and product licence number (which are set during installation).

To use the on-line help, the file SIS.CHM must be installed. You can choose whether or not to load the on-line help while installing.

◆ Cadcorp on the web

Visit our website for details on latest developments and for the latest drivers and releases. Our address is www.cadcorp.com.

You can also use the **Help>SIS on the web** commands:



Help>SIS on the web>Cadcorp launches your web browser and connects you to the Cadcorp site, taking you to the Home page.



Help>SIS on the web>Download does the same, except it takes you straight to a page containing software for you to download. (To access this area you must input the correct user name and password.)

◆ This manual

This manual covers all the main areas of the software, being divided up into tasks you are likely to want to do. If you cannot find the feature you want in the manual, refer to the on-line help.

Product coverage

This manual can be used with all Cadcorp SIS products. Some chapters describe features that are not available in every Cadcorp SIS product. On the first page of each chapter, a cross (✕) by the product name indicates that the chapter may contain some information that is not relevant for that product.

Cross-references and hyperlinks

References to other pages in the manual are indicated with an arrow. For example: ➤page 12, **Contacting Cadcorp**. If you are reading the online (Acrobat PDF) version of this manual, you can click on these cross-references to jump straight to the page and location.

Users of customised systems

If your system has been customised (the main menu, local menus and commands are configurable through customisation), its appearance may differ from the standard interface described in this manual. If this is the case, you should refer to the documentation specific to your application, or consult your supplier.

◆ How this manual is organised

The following table lists the sections and chapters in the manual, and also gives an indication of whether a chapter is relevant for the main products in the Cadcorp SIS suite.

(Cadcorp SIS Map Reader and Cadcorp SIS Map Browser are described in separate documents, which can be downloaded from our website.)

□ Sections, Chapters, and Products

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Starting work						
↳ Chapter 1: “Introduction”	✓	✓	✓	✓	✓	✓
↳ Chapter 2: “Installation”	x	x	✓	✓	✓	✓
↳ Chapter 3: “Introducing the interface”	✓	x	✓	✓	✓	✓
Loading and viewing external data						
↳ Chapter 4: “Loading data”	✓	x	✓	✓	✓	✓
↳ Chapter 5: “File formats”	✓	x	✓	✓	✓	✓
↳ Chapter 6: “Working with map windows”	✓	x	✓	✓	✓	✓
↳ Chapter 7: “Finding items: queries”	✓	x	✓	✓	✓	✓
↳ Chapter 8: “Scale”	✓	x	✓	✓	✓	✓
↳ Chapter 9: “Viewing 3D Data”	✓	x	✓	✓	✓	✓
↳ Chapter 10: “Working with GPS”	x	x	x	✓	✓	✓
↳ Chapter 11: “Cadcorp SIS and the Open Geospatial Consortium”	✓	✓	✓	✓	✓	✓
Working with data in the map window						
↳ Chapter 12: “Querying the data in the map window”	✓	x	✓	✓	✓	✓
↳ Chapter 13: “The workspace window”	✓	x	✓	✓	✓	✓
↳ Chapter 14: “Properties”	✓	x	✓	✓	✓	✓
Overlays						
↳ Chapter 15: “Working with overlays”	✓	x	✓	✓	✓	✓
↳ Chapter 16: “Filtering what you see”	✓	x	✓	✓	✓	✓
Using Table Data						
↳ Chapter 17: “Schemas”	✓	x	✓	✓	✓	✓
↳ Chapter 18: “Adding your own attribute data”	✓	x	✓	✓	✓	✓
↳ Chapter 19: “Thematic mapping”	✓	x	✓	✓	✓	✓
↳ Chapter 20: “Databases”	x	x	x	✓	✓	✓
↳ Chapter 21: “Table windows”	✓	x	✓	✓	✓	✓
Adding your own graphical data						
↳ Chapter 22: “User datasets”	x	x	x	✓	✓	✓

❑ Sections, Chapters, and Products

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
↳ Chapter 23: “Overlays, levels, and commands”	X	X	X	✓	✓	✓
↳ Chapter 24: “Constructing line items”	X	X	X	✓	✓	✓
↳ Chapter 25: “Constructing area items”	X	X	X	✓	✓	✓
↳ Chapter 26: “Creating points and placing shapes”	✓	X	✓	✓	✓	✓
↳ Chapter 27: “Creating text”	X	X	X	✓	✓	✓
↳ Chapter 28: “Creating collections”	X	X	X	✓	✓	✓
↳ Chapter 29: “Creating topology: links and nodes”	X	X	X	✓	✓	✓
↳ Chapter 30: “Creating topology: chains and polygons”	X	X	X	✓	✓	✓
↳ Chapter 31: “Creating 3D data”	X	X	X	✓	✓	✓
↳ Chapter 32: “Pens and brushes”	X	X	X	✓	✓	✓
↳ Chapter 33: “Precision dimensions and locations”	X	X	X	✓	✓	✓
Editing graphical data						
↳ Chapter 34: “Selecting graphics”	X	X	X	✓	✓	✓
↳ Chapter 35: “General editing techniques”	X	X	X	✓	✓	✓
↳ Chapter 36: “Editing line items”	X	X	X	✓	✓	✓
↳ Chapter 37: “Editing area items”	X	X	X	✓	✓	✓
↳ Chapter 38: “Editing points and shapes”	X	X	X	✓	✓	✓
↳ Chapter 39: “Editing text items”	X	X	X	✓	✓	✓
↳ Chapter 40: “Editing collections”	X	X	X	✓	✓	✓
↳ Chapter 41: “Editing topology”	X	X	X	✓	✓	✓
↳ Chapter 42: “Editing TINs”	X	X	X	✓	✓	✓
↳ Chapter 43: “Editing raster data”	X	X	X	✓	✓	✓
↳ Chapter 44: “Editing pens and brushes”	X	X	X	✓	✓	✓
Output						
↳ Chapter 45: “Sharing data”	✓	✓	✓	✓	✓	✓
↳ Chapter 46: “Printing: the Print commands”	✓	X	✓	✓	✓	✓
↳ Chapter 47: “Printing: print templates”	✓	X	✓	✓	✓	✓
↳ Chapter 48: “Using the clipboard”	✓	X	✓	✓	✓	✓

□ Sections, Chapters, and Products

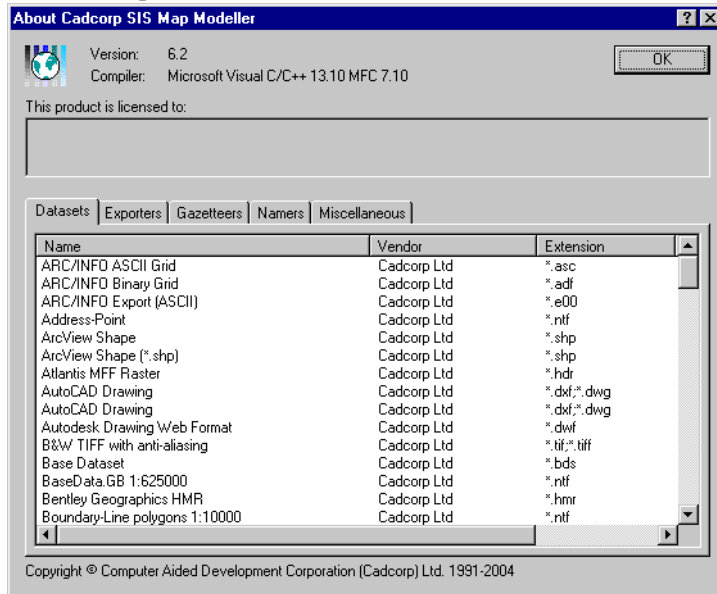
	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Customising						
↳ Chapter 49: “ Customising your system ”	✓	x	✓	✓	✓	✓
↳ Chapter 50: “ Named object libraries (NOLs) ”	x	x	x	✓	✓	✓
↳ Chapter 51: “ Creating your own filters ”	x	x	x	✓	✓	✓
↳ Chapter 52: “ Formulae ”	x	x	x	✓	✓	✓
↳ Chapter 53: “ Feature tables ”	x	x	x	✓	✓	✓
↳ Chapter 54: “ Co-ordinate systems and projections ”	✓	x	✓	✓	✓	✓
Spatial Analysis						
↳ Chapter 55: “ Spatial analysis ”	x	x	x	✓	✓	✓
↳ Chapter 56: “ Spatial testing: loci ”	x	x	x	✓	✓	✓
↳ Chapter 57: “ Grids ”	x	x	x	✓	✓	✓
↳ Chapter 58: “ Route-finding ”	x	x	x	✓	✓	✓
Reference						
↳ Chapter 59: “ Map projections ”	✓	✓	✓	✓	✓	✓
↳ Chapter 60: “ Glossary ”	✓	✓	✓	✓	✓	✓
Index	✓	✓	✓	✓	✓	✓

◆ Cadcorp Technical Support

If you have a maintenance agreement and pay a yearly maintenance fee, you are entitled to unlimited technical support by telephone or email.

When contacting Cadcorp Technical Support be prepared to provide the following information:

- the version and release number eg Desktop MapModeller v6.2.311. To find out these details, use the **Help>About** command:



- your operating system, including any service packs eg Microsoft Windows XP SP2 3.
- a detailed description of the issue, ideally including step to step instructions

If you are calling by telephone, ensure that you are in front of the computer that has the issue.

Technical support emails should be sent to support@cadcorp.com.

◆ Training

Cadcorp offers a number of different training courses which can be tailored in length and content to suit your company's requirements.

◆ Contacting Cadcorp

Our contact details are:

Computer Aided Development
Corporation (Cadcorp) Ltd.
Sterling Court
Norton Road
Stevenage
Herts SG1 2JY
UK
Tel: +44 (0)1438 747996
Fax: +44 (0)1438 747997

Cadcorp Inc.
1420 Boston Providence Highway
Suite #257
Norwood, MA 02062
USA
Tel: +1-781-551-2727
Fax: +1-781-551-3404

Cadcorp Pty Ltd
Suite 907, Level 9
45 Market Street
Sydney NSW 2000
Australia
Tel: + 612 9264 1946
Fax: +612 9264 1948

■ Product and command availability

The following table lists all the menu bar commands in Cadcorp SIS products. A tick (✓) in a column shows that a command is available in the product.

□ Products and commands table

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
❖File						
New...	x	✓	✓	✓	✓	✓
Open...	✓	✓	✓	✓	✓	✓
Close	✓	✓	✓	✓	✓	✓
Open Workspace...	x	x	✓	✓	✓	✓
Save Workspace	x	x	✓	✓	✓	✓
Close Workspace	x	x	✓	✓	✓	✓
Save	x	✓	✓	✓	✓	✓
Save As...	x	✓	✓	✓	✓	✓
Save All	x	✓	✓	✓	✓	✓
Save Copy As...	x	✓	✓	✓	✓	✓
Print...	✓	✓	✓	✓	✓	✓
Print Preview	✓	✓	✓	✓	✓	✓
Print Setup...	✓	✓	✓	✓	✓	✓
Print Template						
Wizard...	x	x	x	✓	✓	✓
Quick Wizard...	✓	✓	✓	✓	✓	✓
Recall...	x	x	x	✓	✓	✓
Store...	x	x	x	✓	✓	✓
Export						
to File...	x	✓	x	✓	✓	✓
to Multiple Tiles...	x	x	x	x	✓	✓
to Server...	x	x	x	x	✓	✓
Send...	x	x	✓	✓	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Exit	✓	✓	✓	✓	✓	✓
❖ Edit						
Undo	x	x	✓	✓	✓	✓
Redo	x	x	✓	✓	✓	✓
Cut	x	x	✓	✓	✓	✓
Copy	x	x	✓	✓	✓	✓
Paste	x	x	✓	✓	✓	✓
Paste From...	x	x	✓	✓	✓	✓
Paste Special...	x	x	✓	✓	✓	✓
Delete	x	x	✓	✓	✓	✓
Replicate	x	x	x	✓	✓	✓
Find...	x	x	x	✓	✓	✓
Query...	x	x	✓	✓	✓	✓
Select	✓	✓	✓	✓	✓	✓
Select All	✓	✓	✓	✓	✓	✓
Deselect All	✓	✓	✓	✓	✓	✓
Fence						
Area	x	x	x	✓	✓	✓
Buffer	x	x	x	x	✓	✓
Circle	x	x	x	✓	✓	✓
Offset...	x	x	x	x	✓	✓
Recall Item...	x	x	x	x	✓	✓
Store Item...	x	x	x	x	✓	✓
Hyperlink						
Open	x	x	x	x	✓	✓
Set	✓	✓	✓	✓	✓	✓
Properties...	✓	✓	x	✓	✓	✓
❖ Map						
Add						
Overlay...	x	x	✓	✓	✓	✓
OGC Overlay...	x	✓	✓	✓	✓	✓
Database Overlay...	x	x	x	✓	✓	✓
Theme...	x	✓	✓	✓	✓	✓
Overlays...	x	x	x	✓	✓	✓
Set Current Overlay...	x	x	✓	✓	✓	✓
Go To						
Back	✓	✓	✓	✓	✓	✓
Forward	✓	✓	✓	✓	✓	✓
Home	✓	✓	✓	✓	✓	✓
Pan						
Drag	✓	✓	✓	✓	✓	✓
Snap	✓	✓	✓	✓	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Continuous	✓	✓	✓	✓	✓	✓
Re-centre	✓	✓	✓	✓	✓	✓
Zoom						
All	✓	✓	✓	✓	✓	✓
Drag	✓	✓	✓	✓	✓	✓
Extent	✓	✓	✓	✓	✓	✓
In	✓	✓	✓	✓	✓	✓
Out	✓	✓	✓	✓	✓	✓
Roamer	✓	✓	✓	✓	✓	✓
Selection	✓	✓	✓	✓	✓	✓
Set Keyhole Overlay...	✓	✓	✓	✓	✓	✓
Keyhole	✓	✓	✓	✓	✓	✓
Gazetteer...	✓	✓	✓	✓	✓	✓
Grid Reference...	✓	✓	✓	✓	✓	✓
Step						
In	✓	✓	✓	✓	✓	✓
Out	✓	✓	✓	✓	✓	✓
Raster	✓	✓	✓	✓	✓	✓
To Scale...	✓	✓	✓	✓	✓	✓
Bungee	✓	✓	✓	✓	✓	✓
Rocket	✓	✓	✓	✓	✓	✓
Redraw	✓	✓	✓	✓	✓	✓
Regenerate	x	x	x	✓	✓	✓
Scale...	x	x	x	✓	✓	✓
Co-ordinate Systems...	x	x	✓	✓	✓	✓
Axes						
Angle...	x	x	x	x	✓	✓
Move	x	x	x	x	✓	✓
Normal	x	x	x	x	✓	✓
Show	x	x	x	x	✓	✓
Spin X...	x	x	x	x	✓	✓
Spin Y...	x	x	x	x	✓	✓
Spin Z...	x	x	x	x	✓	✓
Snap grid...	x	x	x	x	✓	✓
View						
Rotate	x	x	x	✓	✓	✓
Recall...	x	x	x	✓	✓	✓
Store...	x	x	x	✓	✓	✓
❖ Table						
Join...	x	x	✓	✓	✓	✓
Fit to Header	x	x	✓	✓	✓	✓
Fit to Window	x	x	✓	✓	✓	✓
Refill	x	x	✓	✓	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Refill Selected Sort	✗	✗	✓	✓	✓	✓
Ascending	✗	✗	✓	✓	✓	✓
Descending	✗	✗	✓	✓	✓	✓
Advanced...	✗	✗	✓	✓	✓	✓
Scroll Dominant	✗	✗	✓	✓	✓	✓
Fill Column...	✗	✗	✓	✓	✓	✓
Statistics...	✗	✗	✓	✓	✓	✓
❖ 3D						
Move Mode						
Cruise	✗	✗	✗	✓	✓	✓
Eye	✗	✗	✗	✓	✓	✓
Model	✗	✗	✗	✓	✓	✓
Pan	✗	✗	✗	✓	✓	✓
Zoom	✗	✗	✗	✓	✓	✓
Previous View	✗	✗	✗	✓	✓	✓
Reset	✗	✗	✗	✓	✓	✓
Drape						
Save	✗	✗	✗	✗	✗	✓
Drape	✗	✗	✗	✗	✗	✓
Exaggerate Z...	✗	✗	✗	✓	✓	✓
View Details...	✗	✗	✗	✓	✓	✓
❖ Construct						
Geometry 2D						
Point...	✗	✗	✓	✓	✓	✓
Line...	✗	✗	✓	✓	✓	✓
Area	✗	✗	✓	✓	✓	✓
Rectangle	✗	✗	✓	✓	✓	✓
Ellipse	✗	✗	✓	✓	✓	✓
Circle						
2 Points	✗	✗	✗	✗	✓	✓
3 Points	✗	✗	✗	✗	✓	✓
Centre Point	✗	✗	✗	✗	✓	✓
Radius Centre...	✗	✗	✗	✗	✓	✓
Radius Point Point...	✗	✗	✗	✗	✓	✓
Divide						
Distance...	✗	✗	✗	✗	✓	✓
Path...	✗	✗	✗	✗	✓	✓
Freehand	✗	✗	✗	✓	✓	✓
Rule...	✗	✗	✗	✗	✓	✓
Arc						
3 Points	✗	✗	✗	✗	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Angle Centre Point...	X	X	X	X	✓	✓
Angle Point Point...	X	X	X	X	✓	✓
Centre Point Point	X	X	X	X	✓	✓
Radius Centre Point Point...	X	X	X	X	✓	✓
Bezier	X	X	X	X	✓	✓
Geometry 3D						
Extrude	X	X	X	X	X	✓
TIN Fan/Strip	X	X	X	X	X	✓
Triangulate	X	X	X	X	X	✓
Formula Grid...	X	X	X	X	X	✓
Scatter Grid...	X	X	X	X	X	✓
Viewshed...	X	X	X	X	X	✓
Slope and Aspect						
Aspect	X	X	X	X	X	✓
Gradient	X	X	X	X	X	✓
Slope	X	X	X	X	X	✓
Text						
Box...	X	X	X	✓	✓	✓
Label...	X	X	X	✓	✓	✓
Line...	X	X	X	X	✓	✓
Point...	X	X	✓	✓	✓	✓
Topology						
Node	X	X	X	X	✓	✓
Link	X	X	X	X	✓	✓
Chain	X	X	X	X	✓	✓
Polygon	X	X	X	X	✓	✓
Polygons from Area	X	X	X	X	✓	✓
Polygons from Line	X	X	X	X	✓	✓
Polygons from Items	X	X	X	X	✓	✓
Cookie Cut...	X	X	X	X	✓	✓
Array						
Path...	X	X	X	X	✓	✓
Polar...	X	X	X	X	✓	✓
Rectangular...	X	X	X	X	✓	✓
Buffer						
Area	X	X	X	X	✓	✓
Offset...	X	X	X	X	✓	✓
Advanced...	X	X	X	X	✓	✓
QZone...	X	X	X	X	✓	✓
Dimension						
Distance	X	X	X	X	✓	✓
Chain	X	X	X	X	✓	✓
Datum	X	X	X	X	✓	✓
Run	X	X	X	X	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Geodetic						
Buffer	x	x	x	x	✓	✓
Great Circle Line...	x	x	x	x	✓	✓
Miscellaneous						
Assembly	x	x	x	x	x	✓
Iso-route	x	x	x	x	✓	✓
Locus...	x	x	x	x	✓	✓
Displacement	x	x	x	x	✓	✓
Photo	x	x	x	x	✓	✓
Shape...	x	x	x	x	✓	✓
Thiessen Areas	x	x	x	x	x	✓
Block	x	x	x	x	x	✓
Insert Block...	x	x	x	x	x	✓
❖ Item						
3D						
Grid						
Convert to TIN	x	x	x	x	x	✓
Create Shadow...	x	x	x	x	x	✓
Create range QZone	x	x	x	x	x	✓
Explode	x	x	x	x	x	✓
Select Grid items	x	x	x	x	✓	✓
Solid						
Measure Volume	x	x	x	x	x	✓
Select Solid items	x	x	x	x	✓	✓
Surface						
Select Surface items	x	x	x	x	✓	✓
TIN						
Convert to Area	x	x	x	x	x	✓
Drape vector overlay	x	x	x	x	x	✓
Merge TIN items	x	x	x	x	x	✓
Select TIN items	x	x	x	x	✓	✓
Snip	x	x	x	x	x	✓
Subdivide	x	x	x	x	x	✓
Area						
Area						
Convert to 3D Surface	x	x	x	x	x	✓
Convert to Topology	x	x	x	x	✓	✓
Select Area items	x	x	x	x	✓	✓
Set Seed	x	x	x	x	✓	✓
Multi-Area						
Convert to Topology	x	x	x	x	✓	✓
Select Multi-Area items	x	x	x	x	✓	✓
Polygon						

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Convert to Area	X	X	X	X	✓	✓
Divide Polygon	X	X	X	X	✓	✓
Select Adjacent...	X	X	X	X	✓	✓
Select Polygon items	X	X	X	X	✓	✓
Collection						
Assembly						
Edit Members	X	X	X	X	✓	✓
Select Assembly	X	X	X	X	✓	✓
Select Assembly items	X	X	X	X	✓	✓
Group						
Explode	X	X	X	X	✓	✓
Select Group items	X	X	X	X	✓	✓
Insert						
Explode	X	X	X	X	✓	✓
Insert *	X	X	X	X	✓	✓
Select Insert items	X	X	X	X	✓	✓
Multi-Geometry						
Select Multi-Geometry items	X	X	X	X	✓	✓
Image						
Bitmap						
Compress	X	X	X	X	✓	✓
Convert to Grey	X	X	X	X	✓	✓
Copy To...	X	X	X	X	✓	✓
Select Bitmap items	X	X	X	X	✓	✓
Set Transparency...	X	X	X	X	✓	✓
Image						
Select Image items	X	X	X	X	✓	✓
MetaFile						
Select MetaFile items	X	X	X	X	✓	✓
QZone						
Convert to Grid	X	X	X	X	X	✓
Select QZone items	X	X	X	X	✓	✓
Line						
Chain						
Convert to Line	X	X	X	X	✓	✓
Select Chain items	X	X	X	X	✓	✓
Line						
Append Line	X	X	X	X	✓	✓
Convert to Area	X	X	X	X	✓	✓
Convert to Link	X	X	X	X	✓	✓
Convert to Topology	X	X	X	X	✓	✓
Join Lines	X	X	X	X	✓	✓
Select Line items	X	X	X	X	✓	✓
Link						

□ **Products and commands table (Continued)**

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Connection type...	x	x	x	x	✓	✓
Select Connected...	x	x	x	x	✓	✓
Select Link items	x	x	x	x	✓	✓
Multi-Line						
Select Multi-Line items	x	x	x	x	✓	✓
Paper						
Dimension						
Select Dimension items	x	x	x	x	✓	✓
Graticule						
Recall style...	x	x	x	x	✓	✓
Select Graticule items	x	x	x	x	✓	✓
Store style...	x	x	x	x	✓	✓
Key Map						
Select Key Map items	x	x	x	x	✓	✓
North Point						
Select North Point items	x	x	x	x	✓	✓
Photo						
Activate contents	x	x	x	x	✓	✓
Create Graticule	x	x	x	x	✓	✓
Create Key Map...	x	x	x	x	✓	✓
Create North Point...	x	x	x	x	✓	✓
Create Scale Bar...	x	x	x	x	✓	✓
Custom Grid	x	x	x	x	✓	✓
Fill Photo...	x	x	x	x	✓	✓
Legend...	x	x	x	x	✓	✓
Pan Photo	x	x	x	x	✓	✓
Rotate Photo	x	x	x	x	✓	✓
Select Photo items	x	x	x	x	✓	✓
Scale Bar						
Select Scale Bar items	x	x	x	x	✓	✓
Point						
Multi-Point						
Select Multi-Point items	x	x	x	x	✓	✓
Node						
Junction...	x	x	x	x	✓	✓
Select Connected...	x	x	x	x	✓	✓
Select Node items	x	x	x	x	✓	✓
Point						
Explode Shape	x	x	x	x	✓	✓
Select Point items	x	x	x	x	✓	✓
Rubber Sheeting						
Displacement						
Make Rubber Sheet	x	x	x	x	✓	✓
Select Displacement items	x	x	x	x	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Rubber Sheet						
Explode	X	X	X	X	✓	✓
Select Rubber Sheet items	X	X	X	X	✓	✓
Set Rubber Transform	X	X	X	X	✓	✓
Text						
BoxText						
Convert to Point Text	X	X	X	X	✓	✓
Generate Area items	X	X	X	X	✓	✓
Select BoxText items	X	X	X	X	✓	✓
Label						
Select Label items	X	X	X	X	✓	✓
LineText						
Select LineText items	X	X	X	X	✓	✓
Text						
Align Text	X	X	X	X	✓	✓
Convert to Box Text	X	X	X	X	✓	✓
Select Text items	X	X	X	X	✓	✓
Miscellaneous						
Empty						
Select Empty items	X	X	✓	✓	✓	✓
❖Alter						
Move Items	X	X	X	✓	✓	✓
Move Dataset	X	X	X	✓	✓	✓
Reverse	X	X	X	✓	✓	✓
Rotate	X	X	X	✓	✓	✓
Stretch	X	X	X	✓	✓	✓
Add Geometry	X	X	X	✓	✓	✓
Remove Geometry	X	X	X	✓	✓	✓
Decompose	X	X	X	✓	✓	✓
Clean Geometry...	X	X	X	X	✓	✓
Generalise...	X	X	X	X	✓	✓
Reprofile Line	X	X	X	X	✓	✓
Rubber sheet	X	X	X	X	✓	✓
Slice	X	X	X	X	✓	✓
Simplify	X	X	X	X	✓	✓
C.A.D.						
Break Line	X	X	X	X	✓	✓
Join	X	X	X	X	✓	✓
Trim	X	X	X	X	✓	✓
Trim and Join	X	X	X	X	✓	✓
Chamfer...	X	X	X	X	✓	✓
Fillet...	X	X	X	X	✓	✓
Facet...	X	X	X	X	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Smooth						
Midpoint	x	x	x	x	✓	✓
Vertex	x	x	x	x	✓	✓
Align						
To co-ordinates	x	x	x	x	✓	✓
To right-angles	x	x	x	x	✓	✓
Path						
Delete	x	x	x	x	✓	✓
Move	x	x	x	x	✓	✓
Segment						
Delete	x	x	x	x	✓	✓
Move	x	x	x	x	✓	✓
Snip						
Delete Inside	x	x	x	x	✓	✓
Delete Outside	x	x	x	x	✓	✓
Boolean						
Union	x	x	x	x	✓	✓
Exclusive Or	x	x	x	x	✓	✓
Intersect	x	x	x	x	✓	✓
Subtract	x	x	x	x	✓	✓
Dissolve	x	x	x	x	✓	✓
Fill						
Geometry	x	x	x	x	✓	✓
Unfill Geometry	x	x	x	x	✓	✓
Fill Convex Hull	x	x	x	x	✓	✓
Raster						
Align Pixels	x	x	x	x	✓	✓
Compress	x	x	x	x	✓	✓
Convert to Grey	x	x	x	x	✓	✓
Resample...	x	x	x	x	✓	✓
Set Resample Method...	x	x	x	x	✓	✓
Topology						
Clean Links...	x	x	x	x	✓	✓
Copy Links as Lines	x	x	x	x	✓	✓
Delete inconsistent Links	x	x	x	x	✓	✓
Fix up inconsistent Nodes	x	x	x	x	✓	✓
Merge Nodes	x	x	x	x	✓	✓
❖ Measure						
Distance	x	x	✓	✓	✓	✓
Fence	x	x	✓	✓	✓	✓
Route...	x	x	x	x	✓	✓
Area	x	x	x	✓	✓	✓
Length	x	x	x	✓	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Angle	x	x	x	✓	✓	✓
Position	x	x	x	✓	✓	✓
Radius	x	x	x	x	✓	✓
Setup	x	x	x	✓	✓	✓
Linear co-ordinates	x	x	x	✓	✓	✓
Polar co-ordinates	x	x	x	✓	✓	✓
❖Tools						
Workspace Window						
Show	✓	✓	✓	✓	✓	✓
DisplayView	✓	✓	✓	✓	✓	✓
PropertyView	x	x	x	✓	✓	✓
ThemeView	x	x	x	✓	✓	✓
TableView	x	x	x	✓	✓	✓
LibraryView	x	x	x	✓	✓	✓
GPSView	x	x	x	✓	✓	✓
ProgramView	x	x	x	✓	✓	✓
Position Bar	✓	✓	✓	✓	✓	✓
Toolbars...	✓	✓	✓	✓	✓	✓
Calibrate Digitiser	x	x	x	x	✓	✓
GPS						
Connect	x	x	x	x	✓	✓
Status	x	x	x	x	✓	✓
Disconnect	x	x	x	x	✓	✓
Centre in View	x	x	x	x	✓	✓
Show	x	x	x	x	✓	✓
Click	x	x	x	x	✓	✓
Construct						
Point	x	x	x	x	✓	✓
Line	x	x	x	x	✓	✓
Area	x	x	x	x	✓	✓
Close	x	x	x	x	✓	✓
Log						
Replay...	x	x	x	x	✓	✓
Pause	x	x	x	x	✓	✓
Stop	x	x	x	x	✓	✓
Preferences...	x	x	✓	✓	✓	✓
Add-In Manager...	x	x	✓	✓	✓	✓
❖Window						
New Map Window	✓	✓	✓	✓	✓	✓
New Table Window	x	x	✓	✓	✓	✓
New 3D Window	x	x	x	✓	✓	✓
Create by Zooming	✓	✓	✓	✓	✓	✓

❑ Products and commands table (Continued)

	Map Reader	Map Browser	Map Viewer	Map Manager	Map Editor	Map Modeller
Next	✓	✓	✓	✓	✓	✓
Push	✓	✓	✓	✓	✓	✓
Close	✓	✓	✓	✓	✓	✓
Close All	✓	✓	✓	✓	✓	✓
Redraw All	✓	✓	✓	✓	✓	✓
Split Horizontal	✓	✓	✓	✓	✓	✓
Split Vertical	✓	✓	✓	✓	✓	✓
Cascade	✓	✓	✓	✓	✓	✓
Tile Horizontally	✓	✓	✓	✓	✓	✓
Tile Vertically	✓	✓	✓	✓	✓	✓
Arrange Icons	✓	✓	✓	✓	✓	✓
❖ Help						
About...	✓	✓	✓	✓	✓	✓
Contents	✓	✓	✓	✓	✓	✓
SIS on the Web						
Cadcorp	✓	✓	✓	✓	✓	✓
Download	✓	✓	✓	✓	✓	✓



Installation

■ System Requirements	25
■ Installation	26
■ Starting Cadcorp SIS applications	30

■ System Requirements

Before you install Cadcorp SIS, make sure that your computer has at least the following:

- Pentium 1GHz CPU
- 512MB RAM
- 10GB hard drive (1GB free disk space)
- SVGA graphics card, minimum 32MB RAM
- Microsoft-compatible keyboard
- Microsoft-compatible mouse
- Microsoft Windows 2000 or Windows XP operating system
- Internet Explorer 5.5 or above

This is a minimum specification. Map data is often large and requires much processing power. Significant improvements in performance are seen with computers which have more memory and faster processors.

◆ The dongle

Each computer running Cadcorp SIS must either have a dongle connected to a parallel or USB port, or must be on a network which has a valid network dongle.



Network dongles can be used with NetWare, Microsoft Windows NT or DOS. See the README.WRI file in your Cadcorp SIS directory for additional information.

When connecting a dongle, plug it in by the end marked Computer. Please note that trying to connect it by the other end, or trying to connect it to a serial port, may damage it.

Static electricity may harm the dongle, and you should discharge any static charge you may have (by touching a metal desk or door frame) before handling it. If there is excessive static build-up in your office you might consider using an anti-static spray on the carpet or an anti-static pad in front of the computer desk.

If you have a problem with the dongle, contact Cadcorp. Do not attempt to open or dismantle the dongle; this will invalidate your licence.

Servers must have a local dongle for the ASC and ISAPI.

◆ Licence number (Licence key)

During the installation process you must type in the unique licence number with which your dongle is programmed to run. This is displayed on the case of your Cadcorp SIS CD-ROM.

■ Installation

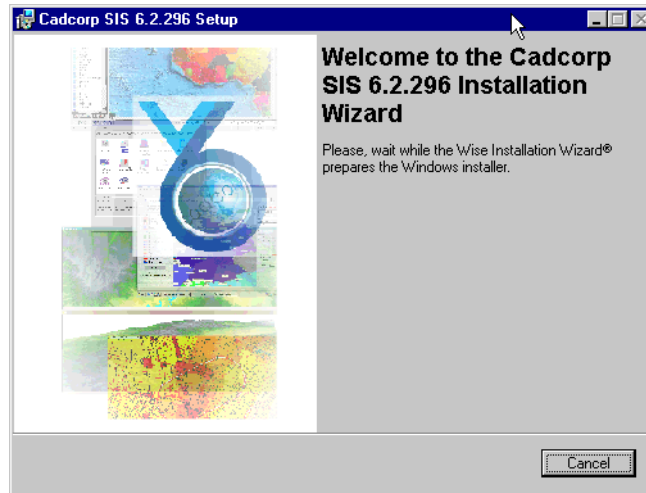
The Cadcorp SIS installation is a simple process with clear on-screen instructions. The following walk-through may help you if you need further information.

We recommend that you close any other programs that are running before you install.

During the installation if you make a wrong selection you can always go back to the previous screen. You can also exit the installation at any time.

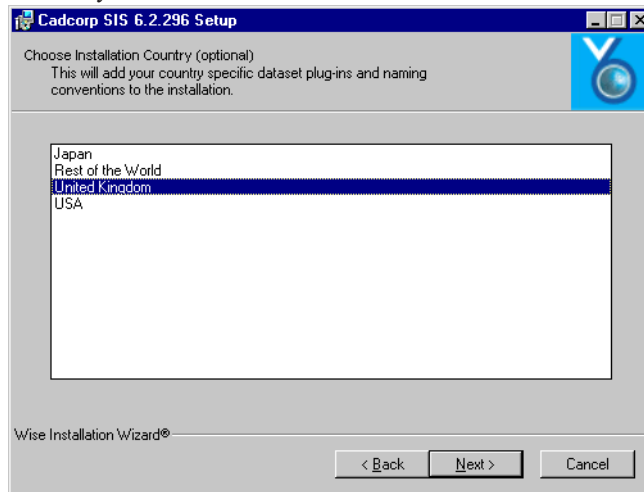
- 1 Put the CD-ROM in the CD-ROM drive. The installation auto-runs (unless you have run it before, in which case you need to run SETUP.EXE from the CD-ROM).

You will see the installation Welcome screens:

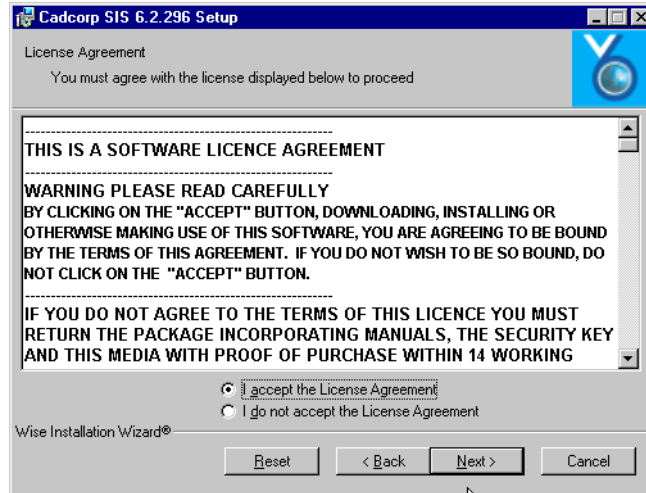




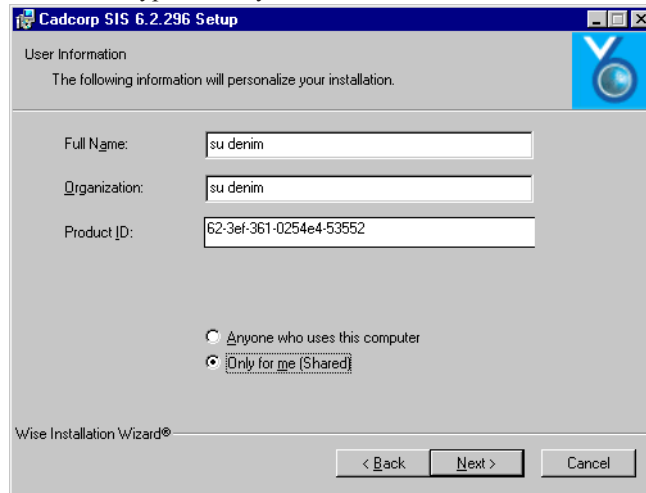
2 Specify the country.



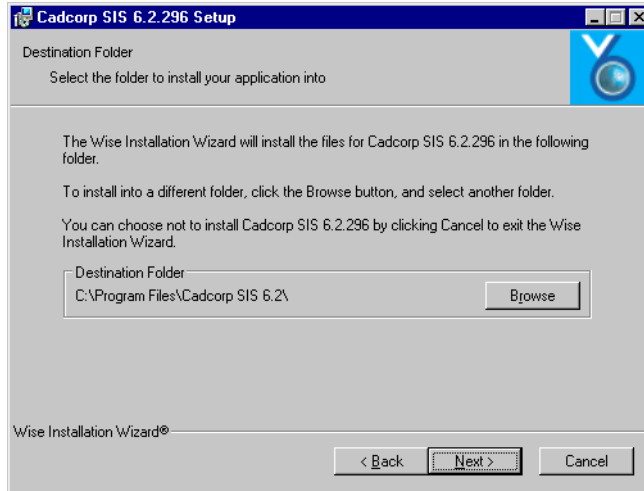
- 3 On the next screen, read the software licence agreement and accept it before continuing.



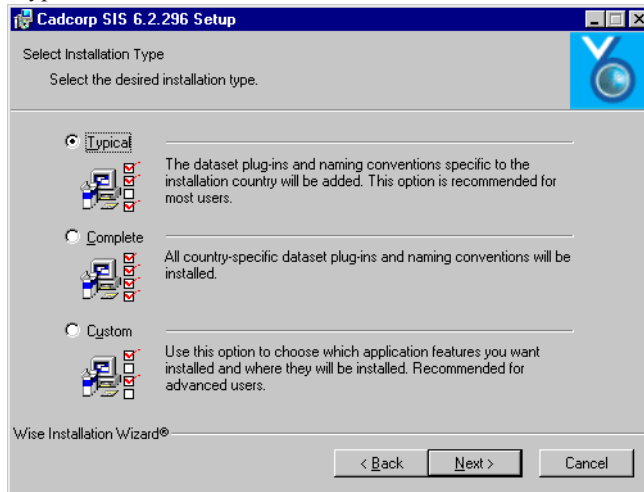
- 4 Next, type your name, organisation, and the licence number for the Cadcorp SIS product(s) you want to install. The licence number can be found on the case of the CD-ROM. It must be typed exactly as it is shown there.



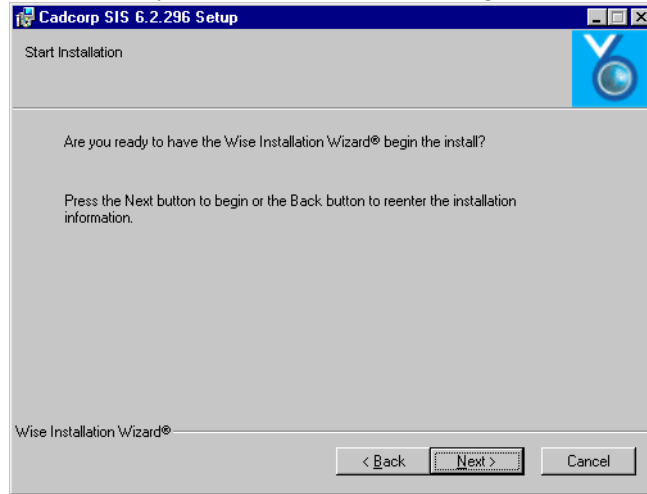
5 Choose a suitable destination folder.



6 Select the type of installation.



- 7 Finally, you can review your selections before continuing with the installation.



◆ Reinstalling and removing products

You can use the Cadcorp SIS installer to add, update, or remove options for your Cadcorp SIS products. You can also reinstall some or all of your Cadcorp SIS products or components.

◆ Installing the Cadcorp Software Development Kit (SDK) or the Internet Development Kit (IDK)

When installing the Cadcorp Software Development Kit (SDK) or the Internet Development Kit (IDK), an extra licence is needed for additional Cadcorp SIS products. Within the Bonus directory on the Cadcorp installation disk is the Cadcorp SIS Licence Editor program. This will allow new Cadcorp products to be licensed without reinstalling the applications.

User notes for the Cadcorp SIS Licence Editor program are also on the Bonus directory, in the document Cadcorp SIS Licence Editor.doc.

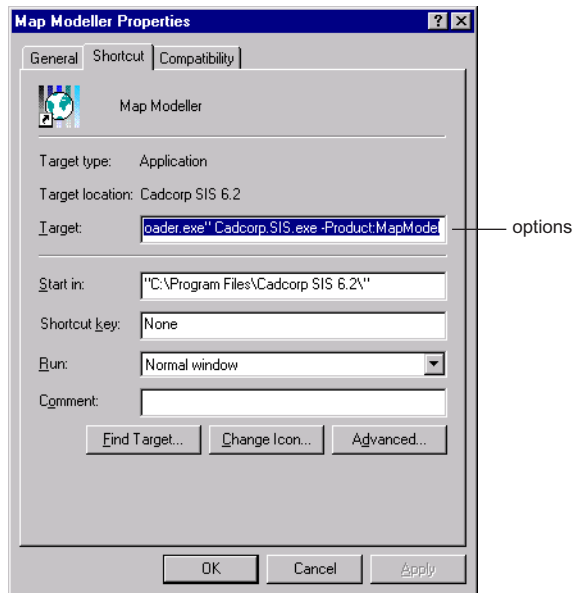
■ Starting Cadcorp SIS applications

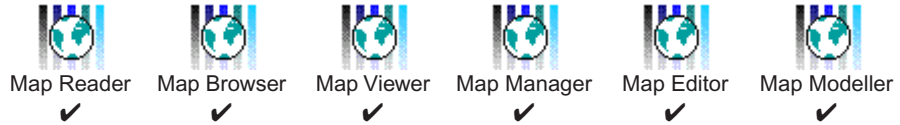
You start a Cadcorp SIS application like any other Windows program (eg from the Programs option on the Start menu, using a shortcut, or running the executable file CADCORP.SIS.EXE).

You can add any of the following command line options:

Option	Action
" <i>filepath</i> "	load the named saved window definition
-country: <i>XXX</i>	overrides the computer's default locale to get the letter code (eg GBR, JPN, etc) which controls country-specific features, eg -country:GBR
-DS: <i>server</i>	set the network dongle server name or IP address
-DT: <i>time in minutes</i>	set the dongle time out. After this time, the dongle will become available for another user.
-Embedding	used by other OLE applications
-Empty	do not load previously loaded SWDs
- <i>foldername</i>	load any programs from the custom directory which are contained in the folder with this name
-INTERNATIONAL	make all country-specific features (eg datasets, index overlay namers) available in the user interface
-LN: <i>licence number</i>	set the licence number
-NoCustom	do not start programs listed in the Custom folder ➤Chapter 49: "Customising your system"
-product	run a particular Cadcorp SIS product. The options are: MapBrowser MapReader MapViewer MapManager MapEditor MapModeller eg -product:MapModeller runs Cadcorp SIS Map Modeller. The Splash screen is displayed by using the CAD-CORP.SIS.LOADER.EXE file (see the example on the next page).
-REGMACHINE	store Registry information (Preferences) by machine (that is, under KEY_LOCAL_MACHINE) instead of by user (under HKEY_CURRENT_USER)
-WS:" <i>filepath.sis</i> "	load the named workspace (*.sis file) at start up

You can modify the properties of the shortcut that runs a Cadcorp SIS application, using the Windows Properties dialog.





Introducing the interface

■ Microsoft Windows conventions	33
■ The main window	33
■ Menus: selecting commands	33
■ Windows	36
■ Toolbars	39
■ Undo and Redo	43

■ Microsoft Windows conventions

Cadcorp SIS uses the standard Windows interface and conventions. Please refer to your Windows documentation if you need any help with re-sizing, moving, or closing windows.

■ The main window

The main window contains the menu bars, toolbars, and different types of windows, including workspace windows, map windows, table windows and 3D windows.

Many windows can be open simultaneously. These can be different map windows or map windows together with their associated table window and/or 3D window.

Windows can be re-sized, moved, maximised or minimised by using the mouse, according to standard Windows conventions.

■ Menus: selecting commands

◆ Main menus

The main window displays a menu bar immediately below the title bar. The main menu headings cascade into sub-menus. Refer to your Windows documentation if you require any help in selecting commands.

◆ Local menus and the item menu

Cadcorp SIS is an object-oriented system. All graphics within it are known as items, and fall into item classes which have certain properties. Examples of item classes are line items, area items, point items, etc. Each class of item has its own set of functions which are applicable to all items of that class.

When an item or items are selected, you can access the functions applicable to those item(s) via either:

- the Item menu

- the item(s) local menu

The Item menu

The commands on the Item menu and its sub-menus are unavailable until you have selected an item. With an item or items selected, the Item menu provides the same commands as the item's local menu, except:

- you do not see the commands common to all items (those commands which appear below the first separator in the local menu)
- there is an additional Select command (eg Select Line items). This appears on the local menu only when there are items of more than one class selected, and it allows you to select items of that class only.

The Local menu

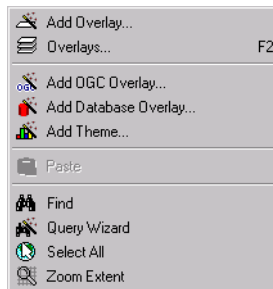
To display a local menu, press the secondary mouse button when the pointer is over the area of interest.

-  If you are right-handed, and have set your mouse up for right-handed use (left button selects, right button displays a context-sensitive menu), the primary mouse button is the left button, and the secondary mouse button is the right button. If you are left-handed, and have set up your computer for left-handed use, the primary mouse button is the right one, which you use for selections, and the secondary (left) mouse button displays the local menus.

The local menu appears next to the cursor. Commands applicable to the selected item class are shown first, above the separator. Below the separator appear other commands which are common to many classes of items.

The technique for calling up the local menu is slightly different depending on whether you are selecting one item, several items, or no items:

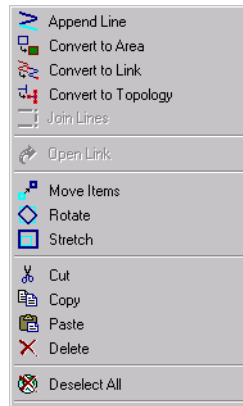
- 1 To see the default local menu, click the secondary mouse button when there is a map on the screen but there are no items selected:



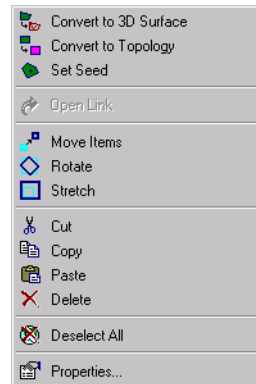
- 2 To see the local menu of a single item, click the secondary mouse button with the pointer over it. (If the pointer is in empty space, Cadcorp SIS displays the local menu for any currently selected items, or the default menu if no items are selected.)

- 3 As you release the mouse button, the menu is displayed. If the item selected is non-editable, all the editing functions are shown as unavailable, leaving only those applicable to non-editable items.

A local menu for an editable line item might look like this:

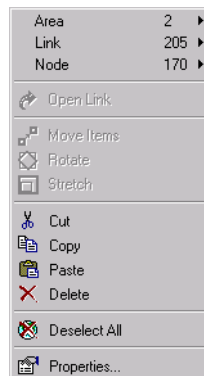


A menu for an area item might look like this:



- 4 To see the local menu of a group of items, first select them, then click the secondary mouse button with the pointer in a blank area of the screen. (This method can also be used with a single item.)

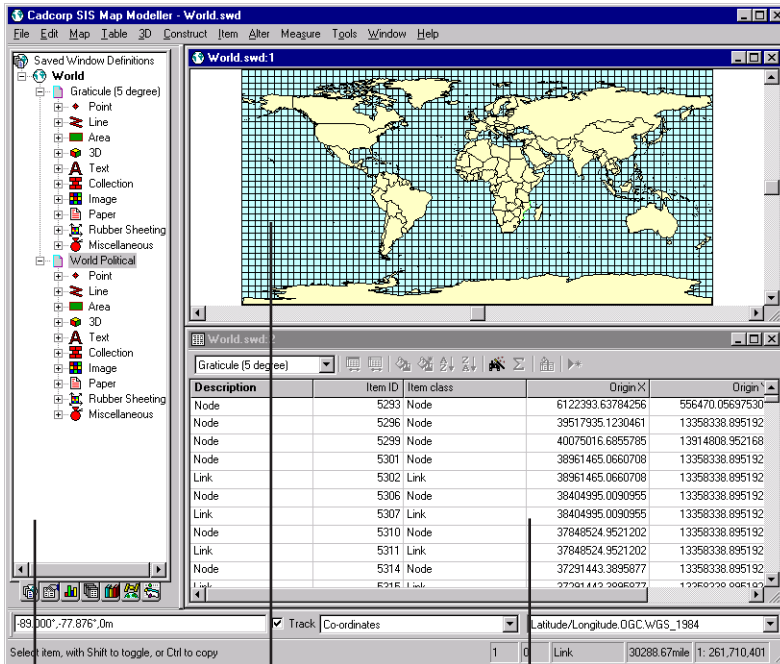
If the items are of different classes, there are sub-menus indicated for each of the classes. A local menu when a number of items are selected might look like this:



■ Windows

◆ The map window

The map window is the window where data is displayed and where you can construct your own data.



workspace window

the current map window

a table window

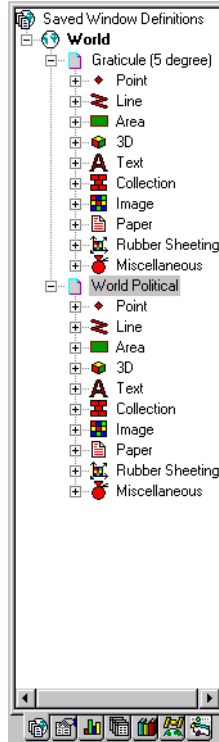
If there are several map windows open, it is within the current map window that graphics are added, edited, deleted or queried. The title bar of the current window is highlighted.

◆ Table windows

You can open a table window when you want to see and use table data. ➤ Chapter 21: "Table windows"

◆ The workspace window

The workspace window allows you to see and change many details of the current session relating to the SWDs, the overlays and their contents, and to themes, properties, tables, and libraries.



You can choose whether or not to display the workspace window, using the **Tools>Work-space Window** command. When displayed, it appears to the left of the current window.
 ➤ Chapter 13: “**The workspace window**”

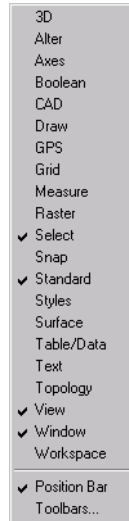
◆ 3D windows

3D windows are used to display three-dimensional graphics. ➤ Chapter 9: “**Viewing 3D Data**”

◆ The position bar



The position bar provides a readout of the position of the cursor, a way of entering co-ordinates using the keyboard, and the currently selected co-ordinate system. You can choose whether or not to display the position bar, using the **Tools>Position Bar** command or the command on the local menu of the toolbars:



The default location for the position bar is at the bottom of the screen, immediately above the status bar. However, you can locate the position bar anywhere on the screen by dragging it with the mouse. Moving it near the upper or lower margin of the main Cadcorp SIS window will cause it to dock. Positioning it elsewhere will place it as a free-floating horizontal bar, with a banner and control box. Use the Ctrl key while dragging to prevent docking.



The first pane on the position bar displays the co-ordinates of the current position. If the Track checkbox is selected, the readout of the cursor position is continuously updated. With the Track box unchecked, the co-ordinate is updated only when the cursor is clicked in the map window. This provides a means of querying positions.

The drop-down list in the middle of the position bar allows you to choose the format for displaying and entering co-ordinates. The drop-down list on the right of the position bar allows you to choose your co-ordinate system. You can also input co-ordinates here. If you type a number on the keyboard while the focus is in the map window, the focus is moved to the position bar for you to type in co-ordinates.

◆ The status bar

At the bottom of the main window is the status bar. It has an area to the left where prompts are displayed, plus five more panes:



The prompt area displays the function of any command while your cursor is pointing to it. Once you have selected the command, it prompts for the next action you are required to do. If you have not invoked a command, the default prompt is Select item, with Shift to toggle, or Ctrl to copy, and is for the default action, which is selecting graphics.

The other panes, from left to right, are as follows:

- the number of items currently selected
- the number of editable items currently selected
- the class of the selected items (as long as only one item class is selected)
- the displayed width (in real world units) of the view in the current window
- the current display scale ➤ Chapter 8: “Scale”

■ Toolbars

Cadcorp SIS provides several toolbars, and you can choose which of these to display.

Toolbars are named objects stored in libraries. ➤ Chapter 50: “Named object libraries (NOLs)” The supplied toolbars are contained in the non-editable (standard) library, and cannot be modified. However, you can use them to create your own customised toolbars in an editable library.

◆ Menus on toolbars

Some of the icons on the toolbars show a small triangle. Click on this to display a menu of related commands.



◆ Choosing which toolbars to display

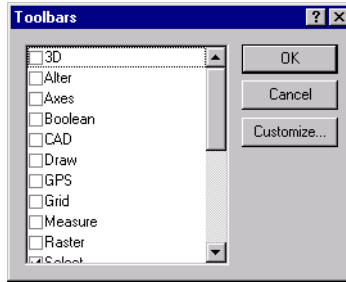
When you first install Cadcorp SIS the Standard, Styles, Text and View toolbars are selected for display. They appear below the main menu bar at the top of the Cadcorp SIS window.

To choose which toolbars to display, either:

- display the local menu by clicking while the pointer is over the grey panel surrounding the toolbars. This shows a list of all toolbars, with ticks beside the toolbars currently displayed. Select or de-select from the list.



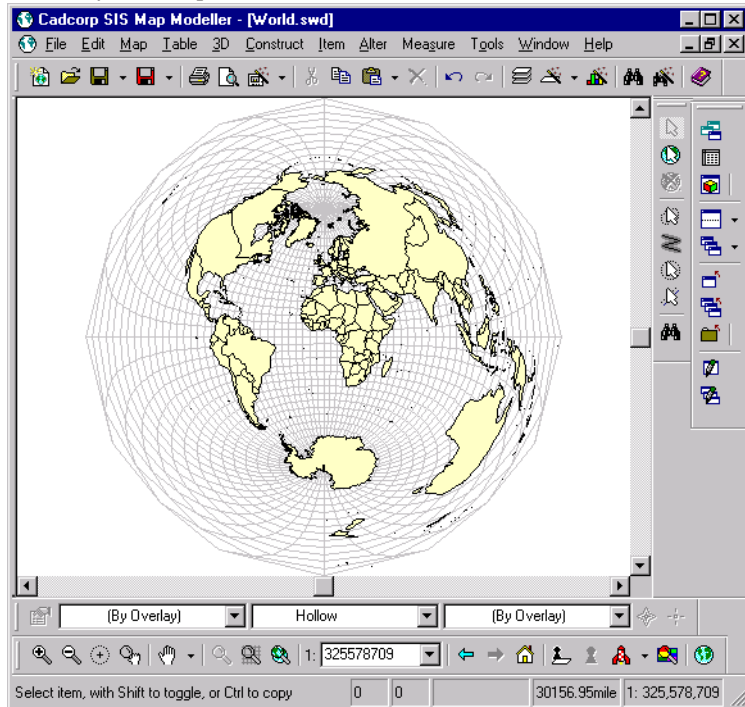
- use the **Tools>Toolbars...** command, and in the toolbars dialog select or de-select toolbars as required:



All toolbars relevant for your Cadcorp SIS product are listed here. They include the non-editable toolbars provided in the (standard) library, plus any you have created yourself.

◆ Moving toolbars

To move a toolbar, click on its grey background then keep the mouse button held down while you drag the toolbar to its new position. Toolbars can be stored at the top, right, or bottom of the main window, although toolbars with text boxes (such as Styles and View) can be placed only at the top or bottom.



If you drag a toolbar away from these areas, it turns into a self-contained window.

◆ Creating your own toolbars

There are two methods of creating your own toolbars:

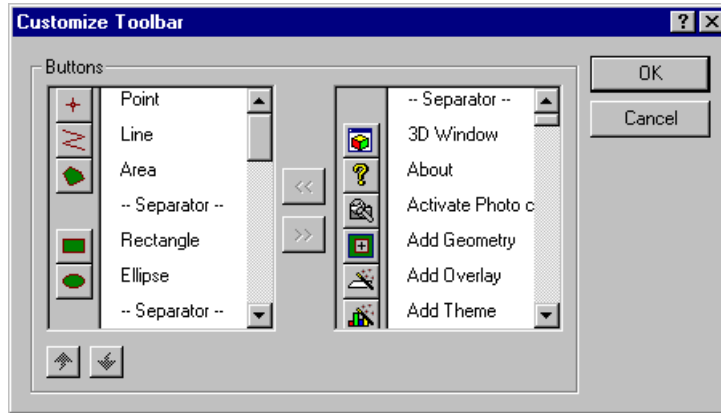


- using the Customize Toolbar dialog (use the **Tools>Toolbars...** command). The new toolbar is stored in the current library.
- using the workspace window's library view tab (in this method you can choose to store the new toolbar in any editable library)

Using the Customize Toolbars dialog

- 1 Choose the **Tools>Toolbars...** command.
- 2 Select a toolbar from the list which you can edit to create your new toolbar.

- Click on the Customize button to see the Customize Toolbar dialog:



- The list on the left shows the tools currently included in the selected toolbar. The list on the right contains all the tools available, plus the -- Separator --.

To remove a tool or separator from the current toolbar, click on it in the included list, then click the right chevrons button.

To add a tool or separator to the current toolbar, select it from the available list and click the left chevrons button (it will be added immediately after the currently selected icon).

Using normal Windows conventions, you can make multiple selections in either list.

- To change the order of tools in a toolbar, select a tool to move, then click the up or down arrow to move the selected tool up or down the list.



Using the workspace window's library view tab

The (standard) library is read-only, so you cannot modify the toolbars in it. However, if you have an editable library open you can either create a new, blank toolbar in it, or copy and paste an existing toolbar from the (standard) library into the editable one.

Either:

- On the library view tab of the workspace window, right-click on the editable library and choose New Object....
- From the New Object pull-down menu, choose Toolbar Definition, and click OK.
A new item will appear in the library. There will be a folder called Toolbar Definition, and an item called ToolbarDefinition.
- If you right-click on the ToolbarDefinition item, you can access its properties and add tools. This will appear in your window.
- If you want this menu to appear in all subsequent sessions, save the workspace.

Or:

- On the library view tab of the workspace window, select and copy a suitable toolbar definition from the (standard) library, using its local command Copy.
- Select your own editable library (remember that the (temporary) library is not saved at the end of a session), and use its local menu to paste in the toolbar definition.
- Use its local command to rename it.

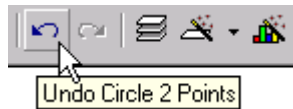
- 4 Double-click on the toolbar definition or select its local command Properties... to see the Customize Toolbar dialog.
- 5 Then add, remove, and reorder tools, as described above.

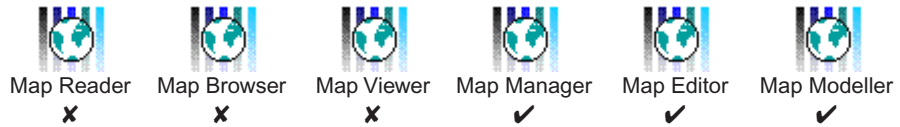
■ Undo and Redo

Use the **Edit>Undo** command to undo the results of the previous command which created, deleted, or modified graphics and text. Changes to graphics and text are held in a buffer, and you can repeatedly use **Undo** to step backwards through your changes, sometimes back to the last time the file was saved.

Use **Edit>Redo** to undo the preceding Undo operation. You can use this command only if you have given no other commands since the undo.

The tips for the Undo and Redo icons on the Standard toolbar show the command that will be undone or redone.





Loading data

■ Assembling a map base	45
■ Starting a new session	45
■ Selecting the co-ordinate system	46
■ Workspaces	47
■ SWD files (saved window definitions)	50
■ Loading maps and other data files	50
■ Saved Window Templates	54
■ Cursor datasets	56
■ Shared dataset (SDS) files	57
■ Index datasets	58
■ Ordnance Survey GB overlays (GB specific)	61
■ Raster data	68
■ Bitmap images and transparency	71
■ DXF data	75
■ EXIF: digital camera images	76

■ Assembling a map base

This chapter deals with the assembly of a map base for the first time. You do not need to know how to assemble a map base if:

- you are working on a map base which has already been defined for you by your system administrator
- you are running an application which is based upon Cadcorp SIS and which has a customised start-up. This could involve an initial keymap being automatically loaded, or you may be prompted for certain information while the system starts. In this case, refer to the documentation specific to your application, or consult your supplier.

■ Starting a new session

When starting work with Cadcorp SIS for the first time, you should carry out the following tasks. Each of these is explained in its own section in this chapter.

- 1 Select the required map co-ordinate system (a co-ordinate system and a viewing projection).
- 2 Create a workspace.
- 3 Create a new SWD file.
- 4 Load up the datasets you require.
- 5 Save the SWD file (**File>Save** command).



In subsequent sessions, not all these tasks are necessary.

■ Selecting the co-ordinate system

You may need to select a viewing projection and a co-ordinate system.

The viewing projection is the means by which the Earth's surface is mathematically transformed to appear on your screen. The viewing projection is like a map projection used to create maps and charts on paper.

The co-ordinate system is the reference used to interpret and report spatial positions in datasets.

◆ Notes on projections

A workspace has a default co-ordinate system (or more precisely, both a viewing projection and a co-ordinate system). ➤page 47, **Workspaces**

Each SWD has a co-ordinate system which it remembers.

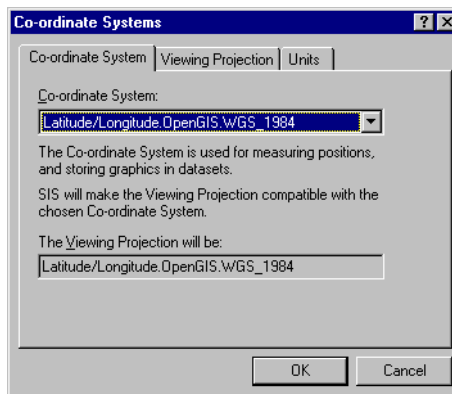
Each window can have a different co-ordinate system. So you can have the same SWD displayed in several different windows, and each SWD can be displayed using a different co-ordinate system in each window.

If you start a Cadcorp SIS session and do not open a workspace, the default co-ordinate system is Latitude/Longitude.OGC.WGS_84. New SWDs adopt this co-ordinate system, but you can change it.

If you open a workspace, any new files created adopt the workspace co-ordinate system, but you can change it later.

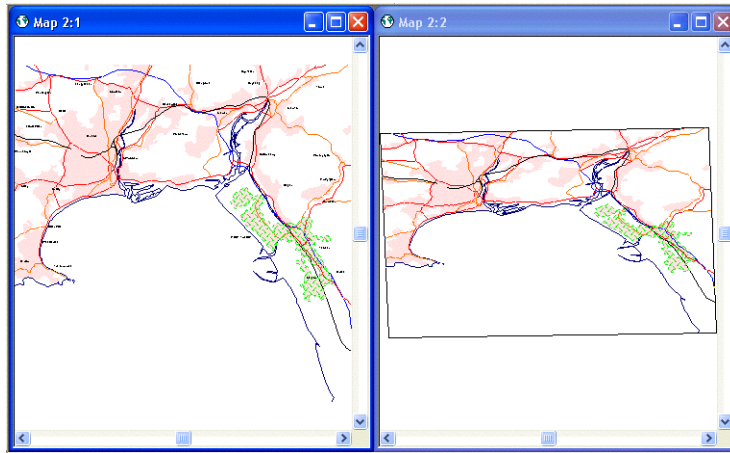
If you open an SWD file, it uses the co-ordinate system it had when it was saved, but you can change it later.

Each map window can use a different co-ordinate system from other windows. You can select either a viewing projection or a co-ordinate system for the current window using the **Map>Co-ordinate systems...** command.



If you choose a viewing projection, Cadcorp SIS makes the co-ordinate system compatible with it. If you choose a co-ordinate system, the viewing projection is made compatible.

The following example shows some Ordnance Survey Meridian data. First it is displayed using its standard viewing projection (OSGB 1936.British National Grid), then using a Latitude/Longitude co-ordinate system:



Map extract © Crown copyright

For more information on the projections available for use in Cadcorp SIS, see Chapter 54: “Co-ordinate systems and projections”.

■ Workspaces

◆ What is a workspace?

Workspaces are files with a *.sis extension. A workspace remembers a setup for a Cadcorp SIS session.

Workspaces contain the following information:

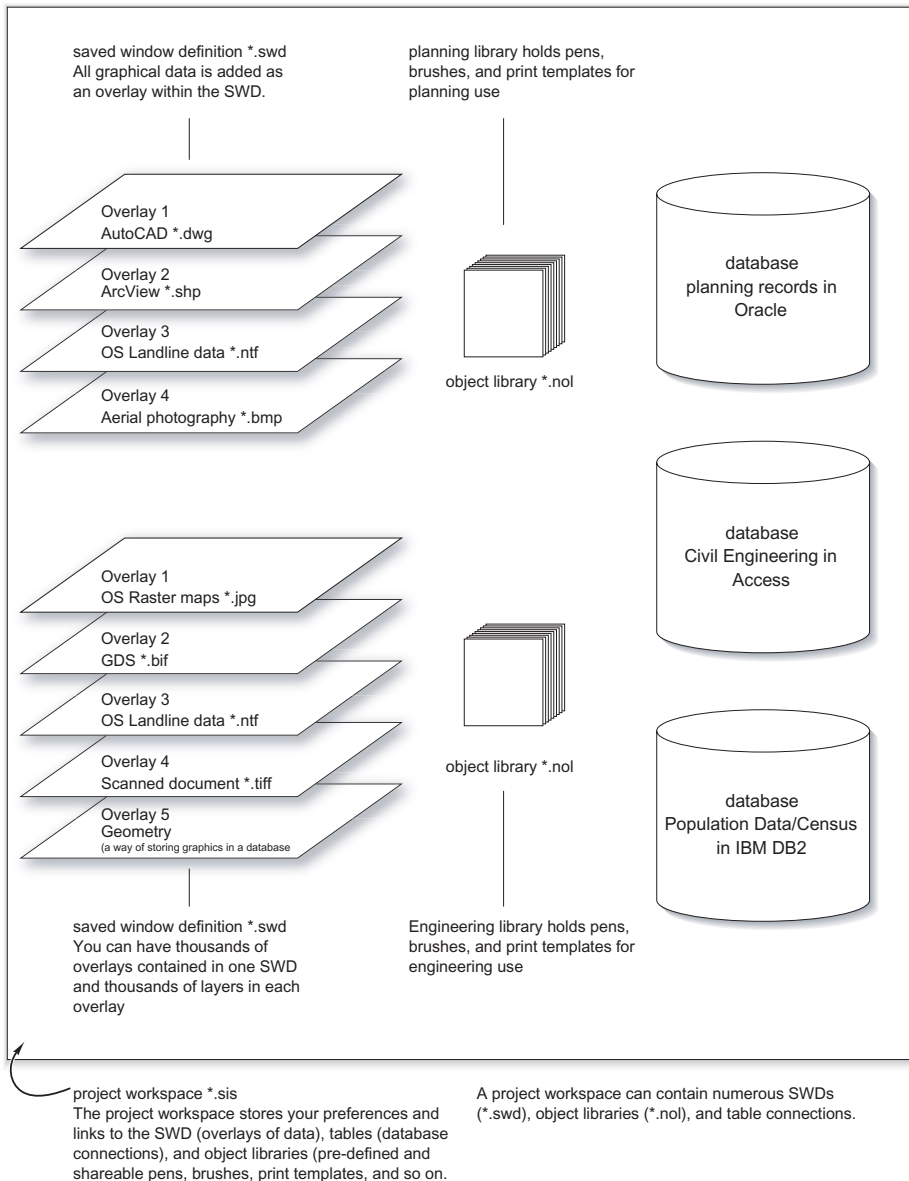
- the default co-ordinate system and viewing projection
- all SWD files and their associated windows
- the workspace-specific library (called (workspace)) and any linked libraries
- named tables from database windows

The workspace default co-ordinate system and viewing projection are applied to all new SWD files created while the workspace is open. However once a map window is open, you can define and save the co-ordinate system co-ordinate system required.

If several people are contributing towards the same project, you might create a workspace for that project, thus ensuring that everyone uses the same basic setup.

If individuals share a computer, each user might have their own workspace. This allows each person to set up their own environment.

The following diagram summarises the Cadcorp SIS program structure, the connections between the workspace, the saved window definitions, the named object libraries, and named tables.



◆ Creating a workspace

Creating a workspace before starting a session



Choose the **File>New** command, choosing Project Workspace from the file types offered. The wizard requires you to choose a directory and file name for the new workspace (*.sis) file.

The workspace is created and its name appears in brackets on the title bar - after the program name and before any SWD file name.



From now on, the settings controlled by a workspace will be saved when you carry out a **File>Save Workspace** or **File>Close Workspace**.

Creating a workspace during a session or at the end of a session

If you do not have a workspace in operation, you can use the **File>Save Workspace** command at any time during a session to save a workspace. The new workspace stores the parameters in force at the time of the save.

◆ Starting with a workspace

You can have Cadcorp SIS start up with a workspace pre-loaded by using the command line option `-WS:filename.SIS`.

Chapter 2: “Installation”, Starting Cadcorp SIS applications

Alternatively you can open a workspace after starting Cadcorp SIS by either:



- selecting the **File>Open Workspace** command and the *.sis file required
- selecting **File>Open**, choosing Project Workspace (*.sis) from the Files of type drop-down, and selecting the file required



When you open a workspace, its (workspace) library appears in the workspace window's library view, and its default projection is loaded. Opening the workspace also opens up the SWD files that were open at the end of the previous session, with all their settings and windows.



Use the **File>Close Workspace** command to end the current workspace before opening another (for instance, when another user takes over the computer, or you start work on another project).

◆ Saving a workspace



Use the **File>Save Workspace** command to save the current workspace, or, if there is no workspace in operation, to create a new workspace with the current parameters.

Workspace files prompt to be saved if they detect changes to the library setup or the named table setup. Chapter 21: “Table windows”, Chapter 50: “Named object libraries (NOLs)”



Selecting the **File>Close Workspace** command also allows you to save the workspace parameters.



A workspace currently in use is saved by **File>Exit**, and also when you open a new workspace.

■ SWD files (saved window definitions)

If you open an existing workspace, the SWD file(s) in use at the end of the last session will automatically be loaded. You can also open other existing SWDs, or create new ones.

An SWD file is an assembled view of one or more datasets. It is normally a small file, containing little actual data, but holding a record of the following:

- a list of all overlays in use, and their status at the time of the last save
- any overrides or filters set. Overrides control the default colours for graphics, fonts for text, etc. Filters govern which items are displayed on screen.
- a view extent

The SWD file links to datasets by remembering their file locations. Be careful when you move SWD files and datasets to different disks. Try to store SWD files on the same disk as the datasets they reference.

If no workspace or SWD was specified on the command line, Cadcorp SIS automatically creates an empty SWD called Map (with no Workspace) on start up.

◆ Creating a new SWD file

A new SWD uses the viewing projection and co-ordinate system projection of the current workspace. If no workspace is open, the default projection Latitude/Longitude WGS 84 is used.



Start the **File>New** wizard, then either:

- select Saved Window Definition from the options. The wizard requires you to choose a directory and file name. A new SWD file is created in the chosen directory with the name you chose, and is displayed in a map window.
- select Blank Map Document if you do not wish to create an SWD file straight away. A map window called Map is opened, but no file is saved. If you wish, you can save the blank document as an SWD at a later stage.

◆ Creating 3D windows and table windows

Once you have a map window open, you may go on to produce a 3D window and/or a table window. ➤Chapter 9: “**Viewing 3D Data**” ➤Chapter 21: “**Table windows**”

◆ Opening an existing SWD file

If you open a workspace, Cadcorp SIS automatically loads the SWD files which were being used when the workspace was last saved.

To open other SWD files either:



- use the **File>Open...** command
- drag and drop an SWD file from the Windows Explorer into the workspace window (display view, table view or theme view tabs)

■ Loading maps and other data files

Having started a new SWD file you are ready to display maps and other data files. You can also load database files.

These files containing maps and other data are called datasets. Datasets are loaded in Cadcorp SIS as overlays. An overlay is a view of a dataset. There is no limit to the number of overlays which can be included, and each one can have a different projection.

New formats are always being added so if the format you wish to use is not supported contact Cadcorp for the latest information, or visit our website (www.cadcorp.com).

All datasets can be loaded into the current session by drag and drop, or using the New Overlay Wizard.

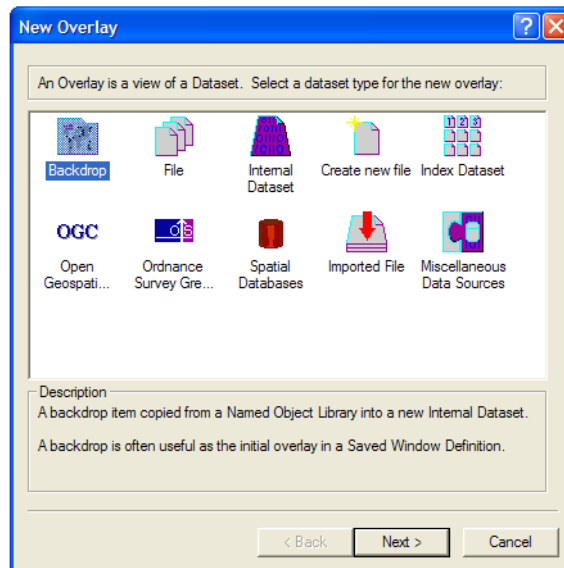
◆ Drag and drop

You can drag and drop datasets on:

- the workspace window (display view, theme view and table view tabs)
- map windows, table windows or 3D windows

If you drag a dataset using the secondary mouse button, you can choose whether it is inserted (loaded as a normal overlay) or imported (an editable copy is made).

◆ New Overlay Wizard



To run the New Overlay Wizard, do one of the following:

- click the Wizard... button in the Add Overlay area on the General tab in the Overlays dialog (you can display the Overlays dialog by pressing function key F2)
- choose the **Map>Add>Overlay...** command from the menu bar
- choose Add Overlay from the SWD's local menu in the workspace window
- click the Add Overlay... icon on the standard toolbar



Select the type of dataset you want to include.

Backdrop

A backdrop depicts the area of the map you are working on. There are several backdrops provided with Cadcorp SIS, and they appear as a grey-filled outline over which your map data is displayed.



Backdrops are named items. ➤Chapter 28: **“Creating collections”**

When you create a backdrop, you are creating a new internal dataset which contains a named item. This internal dataset is normally put first in the overlays list (overlays are drawn in the order in which they appear in the list, and a backdrop must be drawn first). Backdrop overlays can only be made visible or invisible (so that you do not snap to them when clicking with the mouse).

Named items are named objects, stored in libraries. ➤Chapter 50: **“Named object libraries (NOLs)”**

File

Use this option to load any of your datasets (eg Ordnance Survey NTF, Address Point, AutoCAD DXF, BDS, etc) as overlays. These files remain stored on your disk, and a link to them is created in the SWD.

External datasets are loaded as non-editable overlays (if you want to edit such files, use the Imported File option to load copies of them instead). However, BDS files (which contain user data) are loaded as editable overlays.

Internal Dataset

Use this option to create a new internal dataset.

Internal datasets are user datasets which are stored within the SWD (they do not exist as separate files). They cannot be used in other SWDs or accessed by other users. They are often used for data of a temporary or personal nature. ➤Chapter 22: **“User datasets”**

Create New File

This option allows you to create a new shared dataset (*.sds) or base dataset file (*.bds). A dataset is a file saved to disk in which you save the graphical data that you create. You are required to choose a directory and file name for the new file. ➤Chapter 22: “**User datasets**”

To load an existing file, use the File option (see above).

Index Dataset

An index dataset tiles together dataset files in a rectangular grid to make a continuous map base. Any of the supported namers can be indexed. ➤page 58, **Index datasets**

Open Geospatial Consortium

These datasets are created from a variety of Open Geospatial Consortium (OGC) data sources, such as web map services (WMS), web feature services (WFS), web map context (WMC), Geographic Markup Language (GML) files, SQL 92 databases, and so on. ➤Chapter 11: “**Cadcorp SIS and the Open Geospatial Consortium**”

Spatial Databases

Cadcorp SIS can create a dataset from a spatially-enabled database, such as Oracle Spatial/Locator, PostGIS, and OGC SQL92. It can also identify spatial data in a non-spatially-enabled database. The wizard allows you to choose other types of spatial dataset:

Editable Database An editable database stores item geometry as binary objects in a database. Cadcorp SIS can use various formats for the binary objects, including the OGC standards. The structure of the database tables is defined by Cadcorp SIS, and all table management is handled by Cadcorp SIS.

View Geometry This option allows you to use a read-only view of a database table which has a column of item geometry, stored as binary objects. You are required to select the database to use, or you can create a new one.

Cadcorp SIS can use various formats for the objects, including the OGC standards. Each row with a valid object will be an item within the dataset, with attributes from other columns in the table.

View Points This option loads a read-only view of a database table which has columns which specify X, Y, and optional Z co-ordinates. Each row is represented as a point item, with attributes from other columns in the table.

➤Chapter 20: “**Databases**”

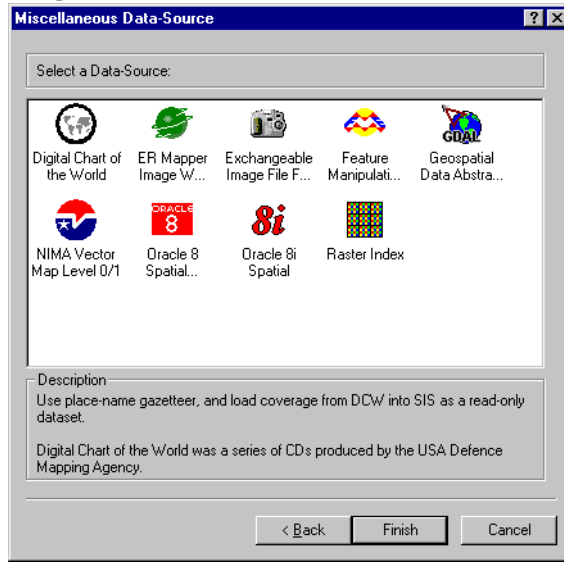
Imported File

Normally external data such as Ordnance Survey NTF, DXF, MicroStation DGN, etc cannot be edited. If you want to edit such datasets, you should use this option, which places a copy of the files onto a new Internal dataset in the SWD. These copies can be edited without affecting the original file on disk.

Any of the supported file formats can be imported as editable overlays.

Miscellaneous Data Sources

This allows you to load a dataset whose contents are read from an external data source, eg a database, or an Internet server. One example is Digital Chart of the World, where a great deal of information is provided on several CDs.



You are required to browse to the location of the data, and select the information required.

■ Saved Window Templates

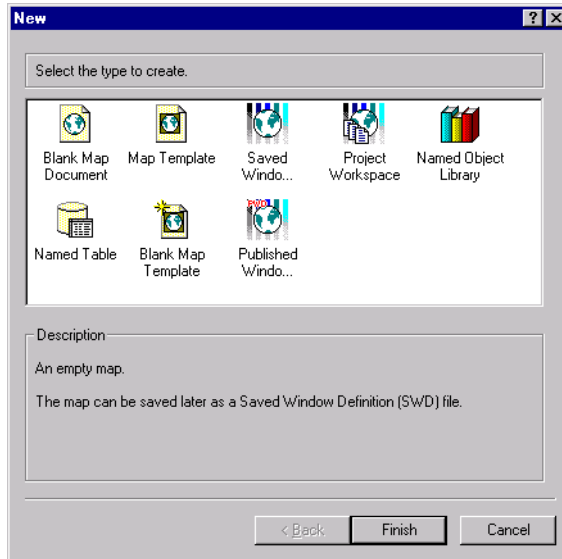
A Saved Window Template (SWT) is a collection of overlays and a view which you can save. This allows you to have one SWT which will act as a basemap, which you can recall, add overlays to, and save as an SWD. For example, there could be one SWT for a council, and individual SWDs based on the SWT for Planning, Environmental Health, and so on.

◆ Creating a new SWT file

- 1 In Windows Explorer, in the Cadcorp SIS folder, create a new folder called Templates. This is where your SWT files will be stored.
- 2 In Cadcorp SIS, either:



- Start the New File Wizard (**File>New**), and choose Blank Map Template. This creates an SWT in the workspace window called Template, suffixed with the number of the SWT in the workspace window.



- Create a new SWD as usual.

3 Add the required overlays to this map document.

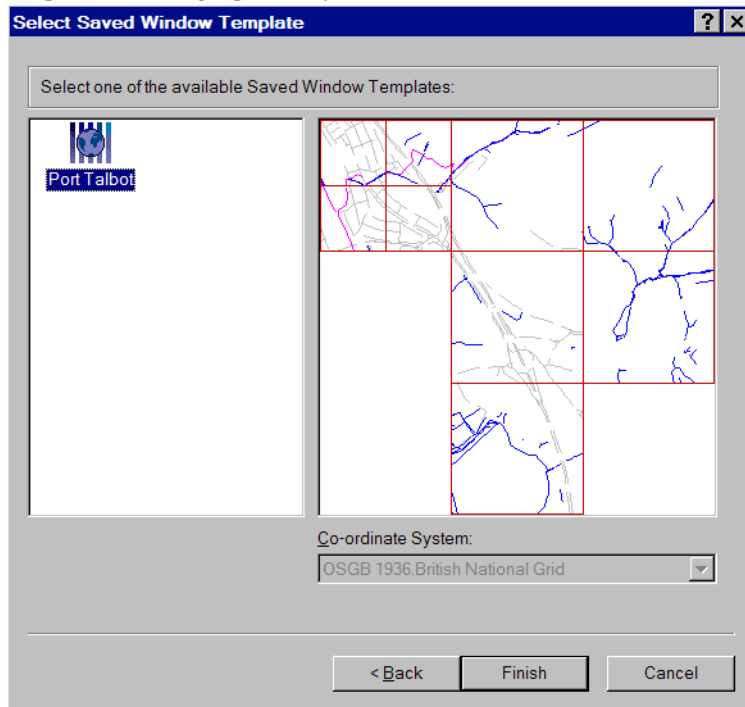


4 Use the **File>Save As...** command to save the SWT. Remember to choose the Save as type Saved Window Template, and to save it in the Templates folder created earlier.

◆ Opening an existing SWT file



- 1 Start the New File Wizard, and choose Map Template. You see thumbnails of all available templates on the right panel as you click on them on the left.



- 2 Click Finish when you have chosen the SWT. This loads the map as an SWD in the map window.
- 3 You can add new overlays to this, and save it as an SWD.



- Use the **Map>Go To>Home** command to go back to the extents of the original SWT.

■ Cursor datasets

Cadcorp SIS can use some types of dataset as a **cursor dataset**. This means that only a small part of a large dataset is loaded into the system at a time, based on the screen extents. As you navigate around the map, the data that is loaded changes to match the view. This form of dynamic indexing is fast, and allows access to large datasets.

◆ Hot snapping

When you select the geometry in a cursor dataset, Cadcorp SIS queries the item selected, rather than storing all the drawn items in memory. This is called 'hot snapping', and is more efficient and uses less memory than loading the entire dataset. Hot Snapping operations with cursor datasets can be changed with the **Tools>Preferences** command.

◆ Transactions: Begin, Commit, and Rollback

When you work on a cursor dataset, you can organise the changes into larger units, called **transactions**.

First, you begin a transaction, by choosing the Begin Transaction command. Now, all the edits and additions you make to the cursor dataset are tracked. At any stage, you can choose to do one of two things to this set of changes:

- commit them all to the dataset, by choosing Commit Transaction
- discard them all, by choosing Rollback Transaction

The Commit Transaction command applies all the changes in the transaction to the dataset, making them permanent. The Rollback Transaction command discards all the changes you made since you gave the Begin Transaction command, returning the dataset to its original state.

The Transaction commands are available on the dataset's local menu in the workspace window, and on the Dataset Details tab on the Overlays dialog. [page 305](#), **Transactions**

■ Shared dataset (SDS) files

A shared dataset file (*.sds) is an editable overlay, used with large datasets, which returns only a user-specified view of the data. They are queried on a need-only basis, which reduces the RAM required for their display. When these are used, the schema can be specified at the time the overlay is created.

SDS files have the following advantages:

- they have a low memory requirement
- they have item-level locking
- they can be shared
- they are current, because the data is being queried continually

SDS files are **cursor datasets**.

SDS files use the Well Known Binary format for geometry, so they are compatible with the OGC Simple Features specification. Note that it is not possible to change the cartographic style for individually selected SDS items, or to change the scale of shape symbols. Topology cannot be stored on SDS files.

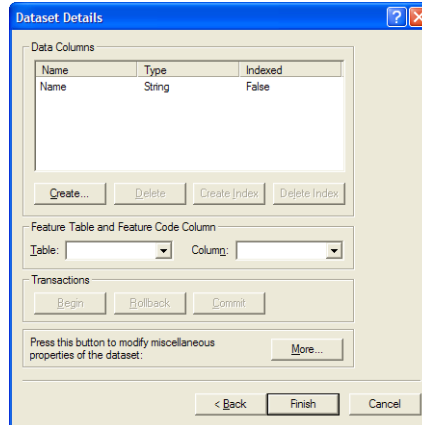
SDS files are also used when working with Cadcorp mSIS.

◆ Creating an SDS



- 1 Start the New Overlay Wizard., and choose the Create New File option.
- 2 Choose a location for your SDS file.

- 3 In the Dataset Details dialog, you can specify the schema columns by clicking the Create... button.



- 4 From the created schema you can choose a feature table column and a feature code column.

■ Index datasets

An index dataset does not contain any data. Instead it is a pointer to all files of selected type(s) which reside in a selected directory or directories. It tiles together these dataset files in a rectangular grid, making a continuous map base.

For instance, if you had 20 LandLine tiles in a directory called C:\DATA\1250\JPW1, and another 12 in a directory called C:\DATA\1250\JPW2, you can create an Index dataset pointing to these files in these directories. Then, whenever you load the index dataset in the Overlays dialog, all the LandLine tiles in both directories are automatically loaded together on screen.

◆ Advantages

Once you have created an index, if you later copy more new files to the indexed directories, the new files are automatically loaded when the Index is used, without any further action being required.

Where you are using a large number of tiles at once, the large volume of map data this represents can easily be greater than can fit into your computer's memory. In this case, some of the tiles cannot be opened and will not be displayed on your screen. When you use an Index, the computer opens map tiles as you pan to them and closes them as you pan away. This gives you seamless mapping as you pan around on screen.

An Index allows you to place a limit on the number of files which can be open on screen at the same time. If your computer does not have large amounts of RAM and you find that performance slows when a lot of tiles are open at once, you can use this feature to counteract the problem. By setting the limit on open tiles option to a lower number (the default is 64), you can guard against this loss of performance.

You may use multiple paths and/or file types. In this way you can access files which are in several different locations (eg some on your computer's hard drive and some on the network server), or which are of different types (eg some raster files in BMP format, and the rest in TIFF).

◆ Creating and using index datasets

To create an index:



- 1 Start the New Overlay Wizard.
- 2 Select Index Dataset from the options, then click Next.
- 3 Select a directory where the files you want to index reside, and click on one of the file names. Click on Next. The Index Dataset dialog opens:

The Tile information area shows the tile width, file naming convention, and the number of files of that type found.

When you have multiple directories indexed, the Matches option shows the number of files of that type found in the currently selected directory. The Total matches option shows the total found in all the directories. This is the number of tiles which will be loaded and displayed in the map base when you use this Index (unless the limit on the number of open tiles is lower than the number of matches found).

The Tiling details area allows you to select a different tile naming convention, to set a limit on the number of tiles to have open at one time (see the later section Limit on Open Tiles), and whether to create a keymap. [page 60](#), **Creating a key map**

Use the Mixed Tile Sizes checkbox to make sure that all larger and smaller files of the same file type are automatically included. For instance, if you used mixed file sizes while indexing on LandLine 1:1250 files, any LandLine 1:2500 files would also be included. You cannot mix file types in the same Index eg LandLine with OSCAR.

In the Tile path(s) area, you will see the name of the directory you just selected. To add further directories to the list:

- click on the folder button, and follow the same procedure as before
- then select a directory followed by a file (the file naming convention must be the same as previously)
- then click Open

The Extension drop-down allows you to select a different type of file to index in the selected directory.



Directories can be removed from the Index by selecting them and clicking on the button containing a cross.

- 4 When all the Index parameters are correct, click on Finish. Cadcorp SIS then creates the index dataset with an appropriate name (eg LandLine 1:1250) and puts it in the Overlays list.
- 5 To rename the index, go to the Overlays dialog, click the index name so that it is highlighted, then type a new name in the Name box.

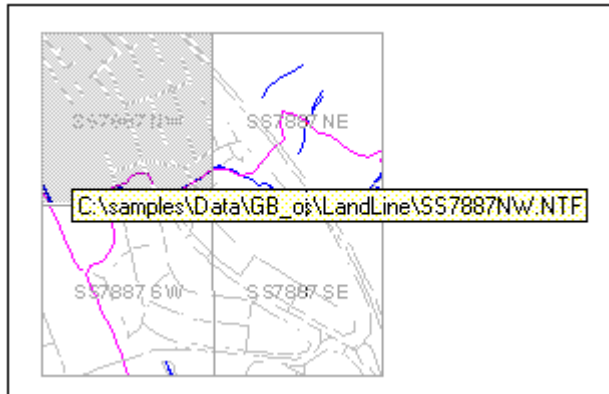


Indexes are stored as part of the SWD when you use the **File>Save** command.

◆ Creating a key map

You may automatically generate a keymap for all the tiles in the index by selecting the Tile outlines option. Selecting Labels will label each tile with its name.

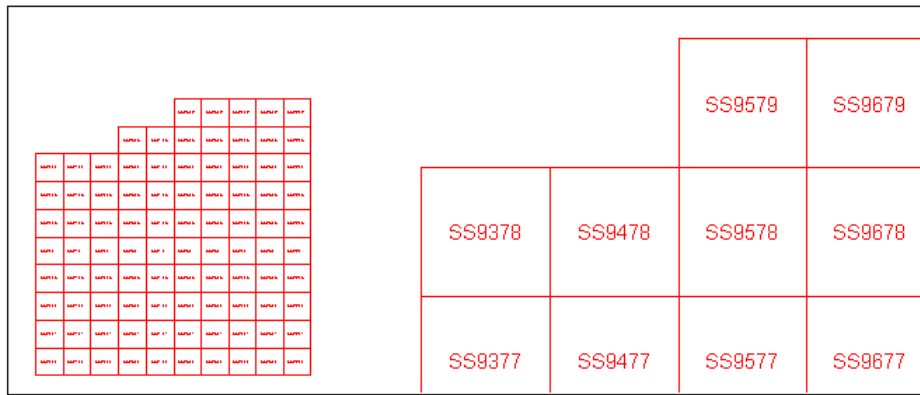
The keymap allows you to see the extent of the datasets referenced by the Index dataset, and the names of the dataset files.



Map extract © Crown copyright

Keymaps are created as a non-editable area item with a label using non-editable box text. The text is placed on level 255 to ensure that labels are always drawn after the tile items. For details on the levels on which graphics are drawn, see Chapter 27: “**Creating text**”.

By setting the value of the Limit on open tiles option to 0, no tiles are opened, but a keymap is still displayed if the Tile outlines option is enabled, and labelled if Labels is checked:



■ Ordnance Survey GB overlays (GB specific)

Cadcorp SIS includes a wide range of options to load Ordnance Survey GB data. All Ordnance Survey file formats are loaded directly by Cadcorp SIS without the need for conversion. Cadcorp SIS includes support for recently introduced OS, such as the OS MasterMap Integrated Transport Network (ITN) layer and the Imagery Layer.

Ordnance Survey data is normally supplied on CD-ROM. To load this data onto your PC or network file server, follow the instructions provided by Ordnance Survey.

Ordnance Survey data can be loaded (using the New Overlay Wizard):

- as a non-editable overlay (File option, or Ordnance Survey CD-ROM option if loading direct from a CD-ROM)
- using an index dataset ➤ page 58, **Index datasets**
- as individual tiles, using the Imported File option to make an editable copy of the data

The New Overlay wizard (**Map>Add>Overlay...**) provides an option for each of the following Ordnance Survey options.



OS MasterMap Topographic Layer Open a view of OS MasterMap data stored in a relational database.

OS MasterMap Imagery Layer Open an OS MasterMap Imagery raster layer and its metadata.

OS MasterMap ITN Layer	Open an OS MasterMap Integrated Transport Network Layer (ITN) which is in GML or GZIP format.
OS MasterMap Index	Open an index view of any OS MasterMap GML or GZIP chunks by directory. This will display the extent of each file, its filename and size.
Ordnance Survey CD-ROM	Automatically loads and displays an Index dataset of OS Land Line stored on a CD-ROM or other mass storage device.

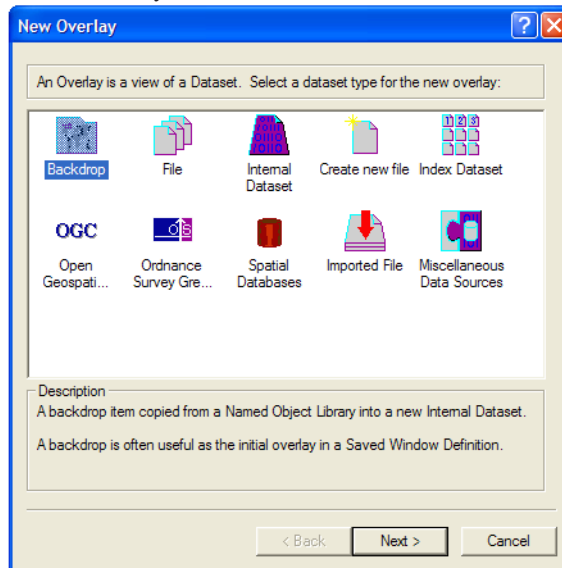
◆ Updating data

In time you will want to include updated map sheets supplied by Ordnance Survey. Before copying new issues to the relevant directory, it is good practice to move the old versions to a separate archive directory, so that you may inspect historical data if required.

If you are operating a customised application, there may be automated procedures for adding updates and archiving data.

◆ Creating an Ordnance Survey overlay

- 1 Start the New Overlay Wizard.
- 2 Choose the Ordnance Survey Great Britain icon.



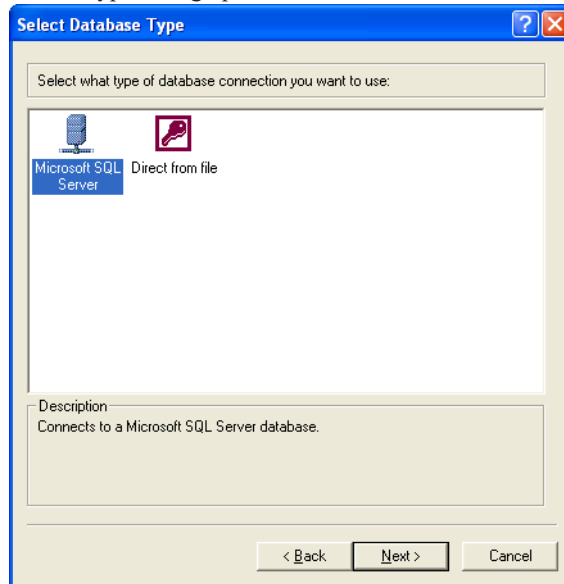
◆ OS MasterMap Topographic Layer

- 1 In the New Overlay dialog, click on the icon:



OS MasterMap
Topographic...

- 2 The Select Database Type dialog opens:



- 3 Choose either the Microsoft SQL Server or Direct from file option, which in this case is a Microsoft Access 2000 database. For more information about OS MasterMap, see the **Cadcorp Guide to Ordnance Survey MasterMap**, Chapter 4 page 25.

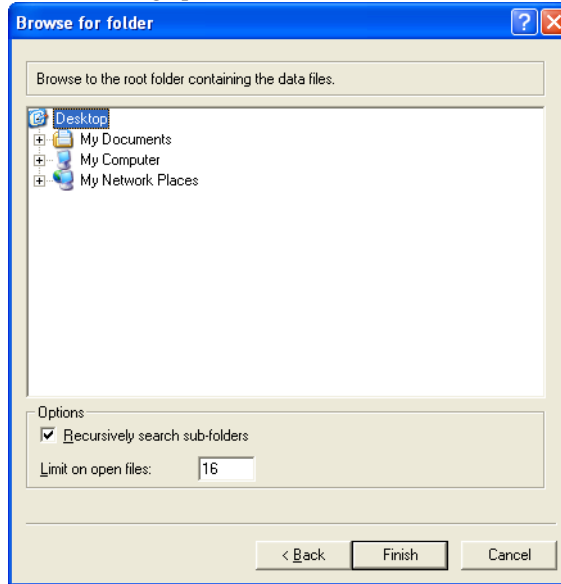
◆ OS MasterMap Imagery Layer

- 1 In the New Overlay dialog, click on the icon:

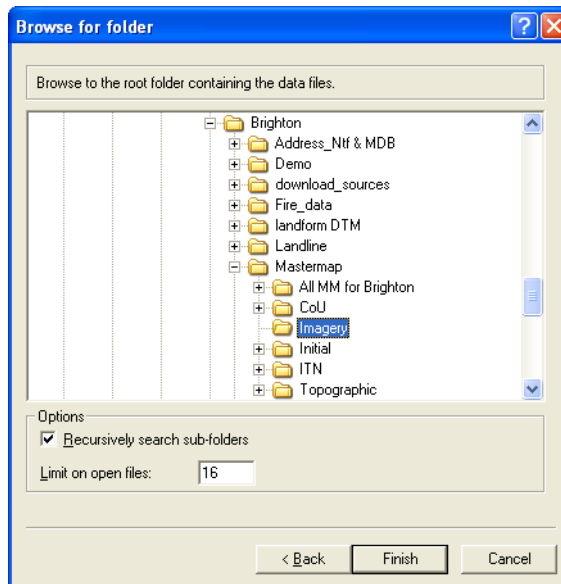


OS MasterMap
Imagery Layer

- 2 The Browse for folder dialog opens:



- 3 Browse to the root folder containing the OS Mastermap Imagery Layer files and click Finish:



- 4 The raster images in the folder are displayed. You can limit the number of files opened. It is also possible to recursively search and thus display images found in sub-folders below the root folder selected.

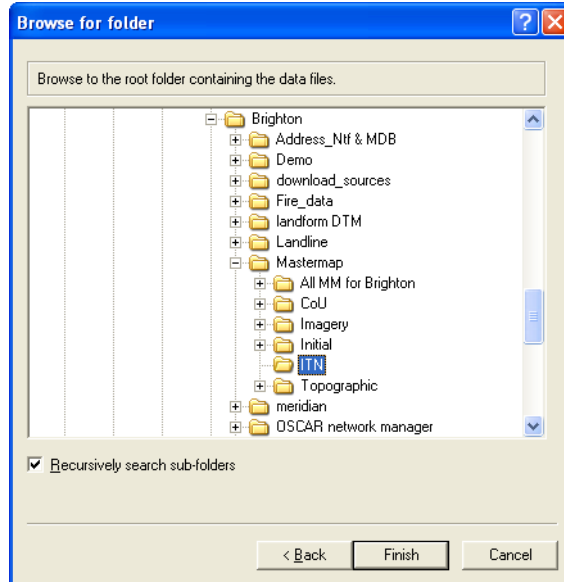
◆ OS MasterMap ITN Layer

- 1 In the New Overlay dialog, click on the icon:



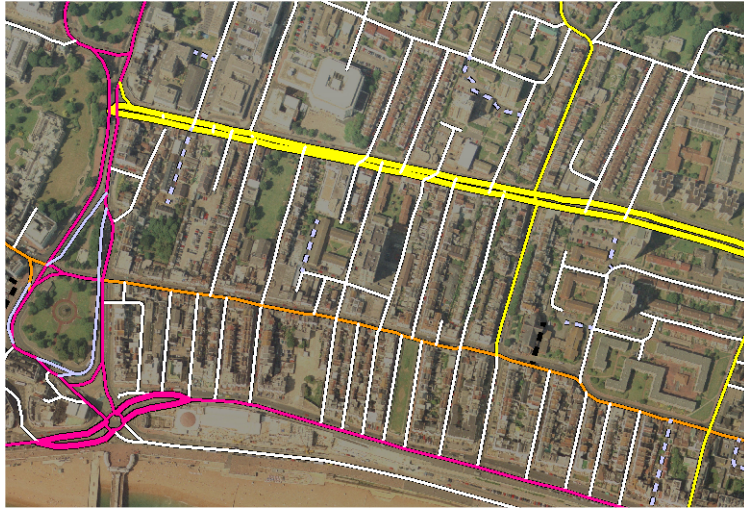
OS MasterMap
ITN Layer

- 2 Use the Browse for folder dialog to find the root folder containing the OS Mastermap ITN Layer files:



- 3 Click Finish. The GML/GZP files are loaded natively and displayed. It is possible to recursively search and thus display ITN files found in sub-folders below the root folder you select.

As with all data types that can be loaded into Cadcorp SIS, there is nothing to stop you opening multiple Ordnance Survey data types together. Here, for example, the Imagery Layer and ITN Layer are overlaid:



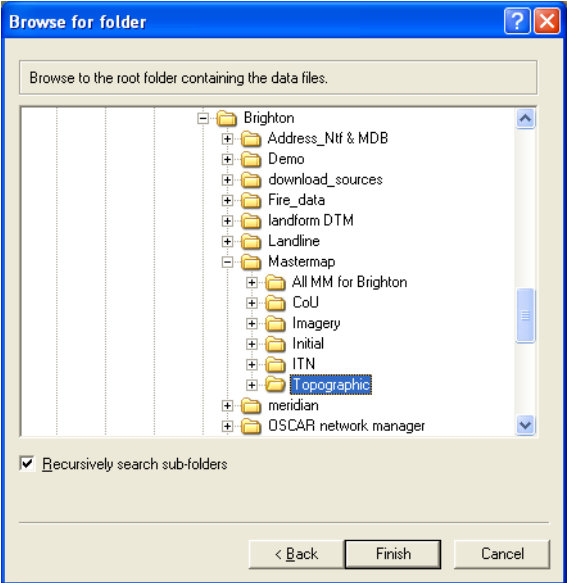
◆ OS MasterMap Index

- 1 In the New Overlay dialog, click on the icon:



OS MasterMap
Index

- 2 Use the Browse for folder dialog to find the root folder containing the OS Mastermap GML/GZIP files.



- 3 Click Finish. The GML/GZP file extents are loaded and displayed. It is possible to recursively search and thus display files found in sub-folders below the root folder you select. The information displayed tells you the extent of the files, the filename, and the size of the file.

743-TQ2010-5c10223.gz 3,019 KB	743-TQ2510-5c9350.gz 2,733 KB	743-TQ3010-5c10212.gz 2,418 KB	743-TQ3510-5c9339.gz 2,237 KB
743-TQ2005-5c3261.gz 9,840 KB	743-TQ2505-5c2388.gz 17,107 KB	743-TQ3005-5c8488.gz 20,006 KB	743-TQ3505-5c7615.gz 3,575 KB
743-TQ2000-5c5007.gz 1,747 KB	743-TQ2500-5c4134.gz 3,359 KB	743-TQ3000-5c10234.gz 9,281 KB	743-TQ3500-5c9361.gz 5,076 KB

◆ Notes on loading individual Ordnance Survey digital data files

Cadcorp SIS supports all OS digital data products in National Transfer Format (including those for Great Britain, Northern Ireland and the Irish Republic) and OS MasterMap GML or GZIP.

To open individual files use the File option in the New Overlay wizard and select from the following OS-related file suffixes:

- GB Ordnance Survey NTF
- OS (GB) MasterMap (*.gml, *.gz)
- OS (GB) PAI Link File (*.csv)
- OS ADDRESS-POINT (*.ap)
- OS ADDRESS-POINT (*.csv)
- OSNI (*.ntf)
- OSI (*.ntf)

■ Raster data

If it is geo-referenced, raster data may be included as overlays like any dataset (using the File, Index Dataset or Imported File options in the New Overlay Wizard, as described above). Index datasets provide a good method for handling large amounts of spatially-referenced raster data, because it makes fewer demands on the computer's memory resources.

If raster data is not spatially-referenced, you can still place it at an exact map location if required. ➤page68, **Geo-referenced raster files which do not use standard OS naming conventions**

Cadcorp SIS automatically detects whether the file is compressed, and what form of compression has been used. Compression types supported are TIFF (Packbits, Huffman, CITT Group 3, CITT Group 4), JPEG, PNG, RLC and MrSID. Cadcorp SIS supports top-left and bottom-right orientation TIFF files.

Overlays should be re-ordered to ensure that overlays containing raster data are drawn first. If raster data is drawn on top, all data underneath is covered. For ordering overlays, ➤Chapter 15: **"Working with overlays"**.

In the case of black and white raster data, the white parts can be made transparent, allowing you to see through it to the data beneath. To achieve this, set the overlay Brush to Hollow, and select the Brush override. You should be aware that the darker a transparent Brush, the less you will see underneath.

Setting a colour override (on the Styles tab of the Overlays dialog) enables you to display the black part of a black and white bitmap in any colour you choose. For setting a colour override, ➤Chapter 15: **"Working with overlays"**.

With reference to manipulating raster data, you should be aware that this is handled in a completely different way from vector data. ➤Chapter 43: **"Editing raster data"**

◆ Geo-referenced raster files which do not use standard OS naming conventions

You might have raster files which are spatially referenced but do not correspond to any of the naming conventions understood by Cadcorp SIS.

There are two methods of putting such files in their correct spatial location:



- by pasting in the raster image and then moving it to its correct spatial location using the **Alter>Move Dataset** command. ➤ Chapter 43: “Editing raster data”
- by creating an editable overlay (BDS file) and then pasting the raster image to its correct positions (by means of gazetteering). When loaded, the BDS file then displays the raster data in its correct location. This method is described below.

1 Create or select a BDS on which to place the bitmap, and ensure that its status is set to Editable. (If there are no editable datasets, Cadcorp SIS creates a new untitled internal dataset where it places the bitmaps.)

2 Zoom to the correct location to paste the raster file.



3 Choose the **Edit>Paste From...** command.

4 In the File Open dialog select the raster file.

In the case of BMP files, JPEG files, RLC files and TIFF there are two options: an ordinary file or a linked file. Choose the linked option, if possible.

The ordinary option copies the contents of the chosen raster file into the current overlay. This copy then remains unchanged even if the original file on disk is edited or even deleted. However, this method has the disadvantage that it can make your overlay very large. It is therefore best used with small bitmaps, such as a logo.

The linked file option has an identical effect visually, but instead of copying the contents of the raster file, it creates a link to the chosen file. If the computer requires memory currently taken up in displaying the raster image, a linked bitmap can be removed from memory to free up some space. This has the advantage of making far less demand on the computer's memory resources, and allowing larger (in file size) bitmaps to be displayed. Disadvantages of linked files are that they cannot be edited (eg rubbersheeted), and if the file is deleted from disk, the image will also be removed from your map window.

5 Repeat steps 2 - 4 if you have several tiles which are to be joined together.

6 Save the BDS file using standard file naming conventions. This file can then be indexed if required.

◆ Raster files which are not geo-referenced

A raster file which is not geo-referenced, or which does not use the standard naming conventions (eg SS7887nw), can either:

- be included in the Overlays dialog in the usual way. In this case it fills the current window, being located so that the centre of the bitmap is at the centre of the window
- be placed in the correct spatial location using either of the two methods described above ➤ page 68, **Geo-referenced raster files which do not use standard OS naming conventions**

◆ JPEG Files (*.jpg)

When loading JPEG multi-level files, four bitmaps are created, each with a different resolution and item scale threshold. The system will then load whichever bitmap has the most appropriate resolution, dependent on how far in or out the view is zoomed. This gives a clearer image at all screen scales, but has the following disadvantages:

- using multi-level datasets is slower than using single resolution jpeg files

- if you want to use overlay scale thresholds with jpeg datasets, then all four bitmaps will be drawn at once

◆ Computer memory requirements for raster data

Raster data files can be very large. If you are making extensive use of raster data, not only do you require plenty of disk space in which to store it, but your computer will also need large amounts of memory (RAM) in order to manipulate it. We recommend that you fit as much memory to your computer as you can.

If you are using large amounts of raster data and experiencing memory problems, Cadcorp SIS provides the following possible solutions:

for geo-referenced data	use indexes. Also, consider using, or converting your data to, a memory-efficient data format, such as ER Mapper's Enhanced Wavelet Compression Wavelet (*.ecw) or LizardTech's MrSID (*.sid).
for data which is not geo-referenced	if you are using bitmaps, JPEG files, RLC files or TIFF format, use the linked option page 68 , Geo-referenced raster files which do not use standard OS naming conventions

◆ Display limits for raster data

Cadcorp SIS automatically switches off the display of raster data if the pixels are magnified above a preset limit, or if the view is zoomed out to a point where the pixels would be closer together than a preset limit.

You may override the preset display limits by setting the Maximum scale and Minimum scale properties of the raster file. ➤Chapter 8: "Scale"

By setting appropriate scale thresholds, you may superimpose colour with black and white raster maps such that, as you zoom in, the display automatically switches from colour to the more detailed black and white map.

◆ Display of rotated/mirrored raster images

Rotated or mirrored bitmaps require a lot of memory in order to display them. If you are having problems displaying rotated or mirrored raster files, you can choose to display them in outline only.



- 1 Choose the **Tools>Preferences...** command.
- 2 Select or de-select the options Draw rotated bitmaps and Print rotated bitmaps as required.

If you have the Draw rotated bitmaps option de-selected (and rotated bitmaps therefore appear only in outline), you can still select any individual raster file and choose to have it displayed:



- 1 Choose the raster image.
- 2 Choose the **Alter>Raster>Align Pixels** command. This aligns the pixels to the screen, causing the bitmap to be visible again.

■ Bitmap images and transparency



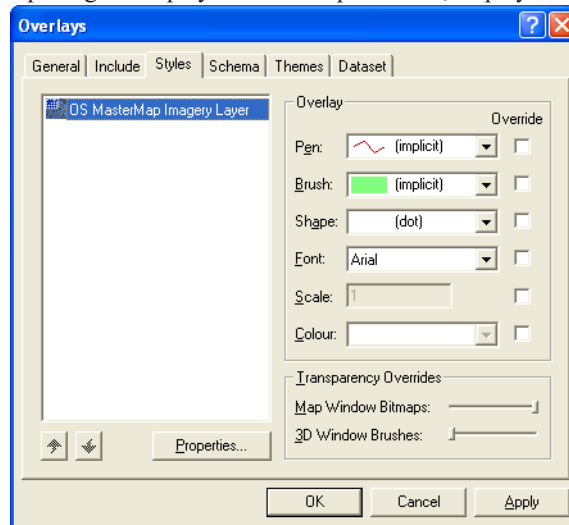
Bitmap images can be made transparent if they are GIF or 8-bit PNG files loaded in as a dataset or by the **Edit>Paste From...** command. The bitmap files are made transparent using the palette-based transparency method.

If you use the transparency command on other bitmap file types, the intensity of the image displayed on the screen is controlled by the **alpha blend factor**.

If you use a GIF or 8-bit PNG file which has been set to become transparent, vector overlays under the bitmap become visible through the bitmap.

◆ How to use it

- 1 Load a bitmap image. For example, use the File option on the **New Overlay** wizard to load an image in one of the many raster formats supported by Cadcorp SIS.
- 2 Once the bitmap image is displayed in the Map Window, display the Overlays dialog.



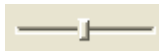
Make sure you have the bitmap overlay selected.

- 3 In the lower right of the Styles tab, there are two Transparency Overrides slider. The Map Window Bitmaps slider bar controls the transparency of the selected bitmap. As you move the slider from left to right, the transparency increases, and the bitmap starts to fade.

no transparency



50% transparency

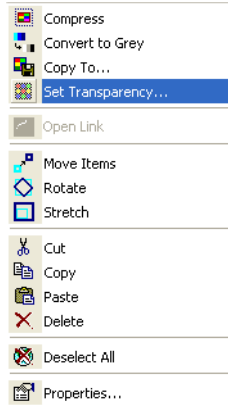


When the slider is at the right, the bitmap is invisible.

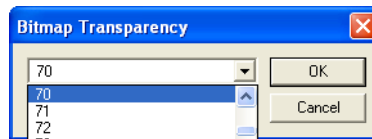
◆ Notes on the transparency of imported bitmaps

You can import bitmap files into Cadcorp SIS using the Imported File option of the New Overlay wizard.

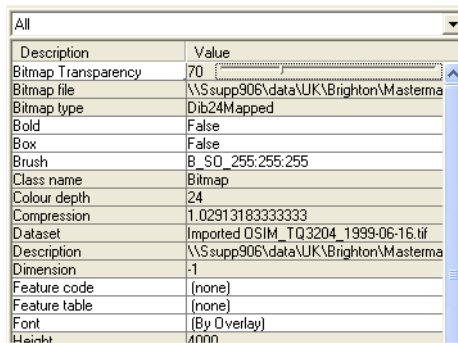
You can use an additional method to set the transparency (or alpha blend factor). Once the image is displayed, use the local command Set Transparency...:



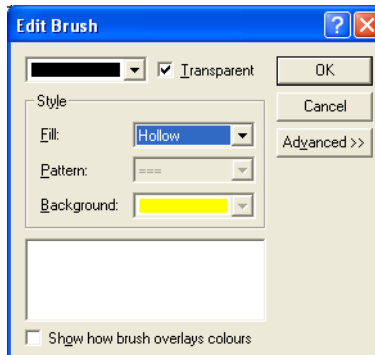
This displays the Bitmap transparency dialog. This allows you to set the transparency to a number between 0 and 255:



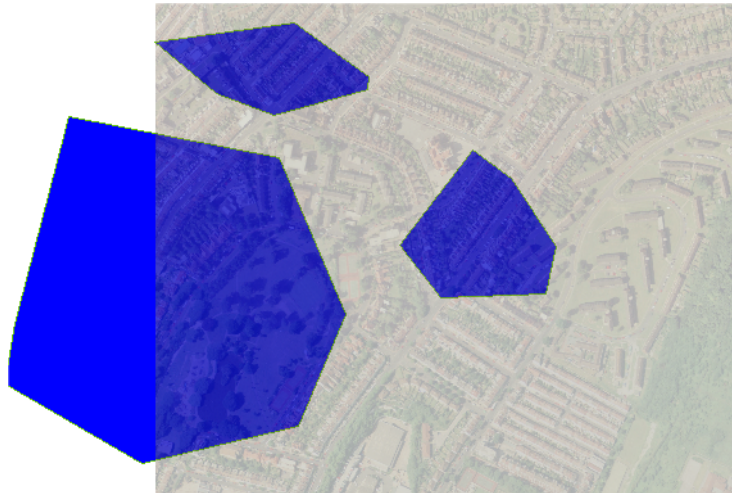
Once you have set the bitmap transparency, you can inspect and set the transparency property of the bitmap item on the Property tab of the workspace window. This is the first property on the list, and appears when the bitmap transparency has been set. You can use the slider to set the value.



If an imported bitmap is an 8-bit TIFF or PNG file, you can make it act as if it was truly transparent by choosing a suitable brush setting. Use the Edit Brush dialog to set the brush to be Hollow:



Now, not only is the bitmap image transparent because of its alpha blend factor, but vectors in separate overlays display through the bitmap, even if they are positioned further down the display order:



Printing

If you want to print the bitmap with the transparency applied, select the preference **Print using a bitmap** (Chapter 49: “Customising your system”, **Preferences**, page 593), using the **Tools>Preferences...** command. This forces a bitmap image of the plot to be sent to the printer with the transparency intact. The resolution of the plot is unaffected.



■ DXF data

DXF (Data Exchange Format) is a widely used standard for transferring graphical data between computer-aided design and drafting (CAD) systems such as AutoCAD. Many architects and surveyors use CAD for the production of building plans, site layouts and survey drawings. Ordnance Survey also supplies many of its products in DXF format.

◆ Geo-referenced DXF files

DXF files may be included as overlays using the New Overlay Wizard in the usual way. If the graphics in the DXF file have been positioned using the National Grid co-ordinate system, and the unit of measurement used is the metre, DXF data appears in the correct geographical position.

◆ DXF files which are not geo-referenced

Architects and engineers who have produced the data without regard to its location in the world may have selected a convenient local position as the origin of the co-ordinate system for the data. In this case Cadcorp SIS provides the ability to move it to its correct geographical position, rotating it as necessary, and defining the units of measurement used.

To display a DXF file which is not correctly geo-referenced, it is important that you know the geographical location of at least one point on the DXF graphics. For instance, if you were using the National Grid co-ordinate system projection, you must establish the National Grid reference of a point on the DXF graphics. You may need to consult the provider of the DXF file to obtain this information.

The following example uses an Ordnance Survey Land-Line DXF file which is to be positioned within the National Grid.

- 1 Use the Imported File option in the New Overlay Wizard to add the DXF file to the Overlays dialog. It is a good idea to remove any other overlays here (select them, then click the Delete button), or make them invisible (select them, then click on Invisible under Status).
- 2 Click the OK button to return to the map window. Do not be surprised if you cannot see any graphics. Remember, the DXF file is not geo-referenced, so the origin of its co-ordinate system (0,0) has been placed at the origin of the current map projection. In the case of the National Grid, this is near the Isles of Scilly off the south west coast of Britain.



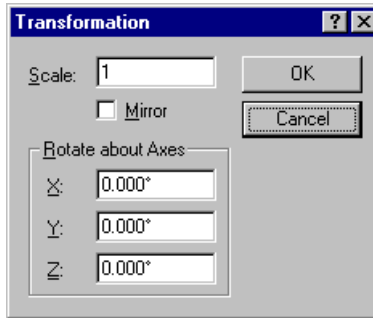
- 3 Make the DXF overlay current, then use the Zoom Overlay local command. This will shift your current view to display the full extent of the current graphics (the DXF file).

- 4 Select any item in the DXF dataset by clicking on it.



- 5 Choose the **Alter>Move Dataset** command.
- 6 For the position to move from, click on a point on the DXF graphics whose co-ordinate position you know.

- 7 If you want to scale or rotate the dataset before placing it, press Enter to see the Transformation dialog:



➤ Chapter 35: “General editing techniques”

- 8 To place the selected point in its correct geographical location, type in its co-ordinates (in the position bar at the bottom of the Cadcorp SIS window), or click on existing graphics which are at the correct location.
- 9 When the DXF dataset is in the correct location, you can save it as a file using the **File>Export>To File** command. Remember to make any other overlays invisible, otherwise you will export them with the DXF. ➤ Chapter 45: “Sharing data”



The details of this transformation are saved in the file, so that when you next load this SWD file (using the **File>Open** command), the DXF dataset will be in the correct location.

■ EXIF: digital camera images

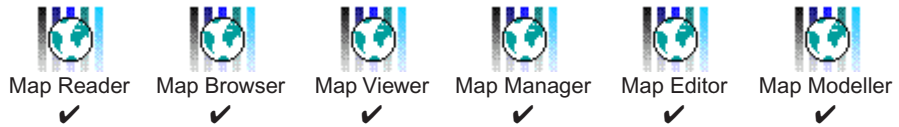
Cadcorp SIS supports the Exchangeable Image Format (EXIF). You can load geo-referenced digital images taken with a camera that supports GPS and EXIF into an overlay.

The location of the camera when the image was taken is shown in the correct geographic location on the overlay, as a camera symbol. You can view the image by selecting the camera icon and choosing Open Link from the symbol's local menu. Cadcorp SIS launches the default image viewing application and displays the image.

To load EXIF images:

- 1 Start the New Overlay Wizard.
- 2 Choose the Exchangeable Image Format data source from Miscellaneous Data Sources.
- 3 Use the Browse dialog to find the folder containing the images, then click OK.

The images in the selected folder will be loaded into a new overlay, located according to the geographical location of the camera when the images were taken.



File formats

■ Introduction	77
■ The Add-In Manager (Tools>Add-In Manager).....	78
■ Cadcorp SIS file types and Cadcorp SIS products.....	78
■ Supported formats.....	80
■ CAD and GIS file formats	82
■ OGC Specified Formats.....	88
■ USA National Datasets	90
■ GB National datasets (Ordnance Survey)	92
■ Other national datasets	96
■ Hydrographic datasets	99
■ Other vector file formats	99
■ Formats from Safe Software's Feature Manipulation Engine (FME)	100
■ Reading and writing graphics in a database or server application	100
■ Database formats.....	101
■ Raster, bitmap, and image formats.....	104
■ Geo-referencing files.....	111
■ Portable Document Format (PDF)	113

■ Introduction

Cadcorp SIS currently reads data from over 100 dataset and database formats, and can export data to over 40 dataset and database formats. Many databases are supported, and Cadcorp SIS can access them by using ODBC, ADO, and DAO drivers, or use direct drivers which are provided for Excel, Lotus 123, FoxPro, Access, SQL Server, and Oracle.

All the graphical dataset/database formats are read directly in their native format. Any combination of dataset/database formats, even with different projections, can be read concurrently and overlaid. The dataset projections are re-projected 'on the fly' to the selected view projection. This means that no external translation processes are required and data does not have to be duplicated to a number of formats. Cadcorp SIS links dynamically with many GIS, CAD, and database formats, which provides maximum interoperability.

Cadcorp SIS can also link to Safe Software's Feature Manipulation Engine (FME), and use FME Translation to read any format supported by FME. ➤page 100, **Formats from Safe Software's Feature Manipulation Engine (FME)**

Support for new and updated formats is always being added, and so other formats may be supported which are not documented here. Visit our website to review the current list (look in the Resources area).



Use the **Help>About** command to find out:

- which formats have been installed

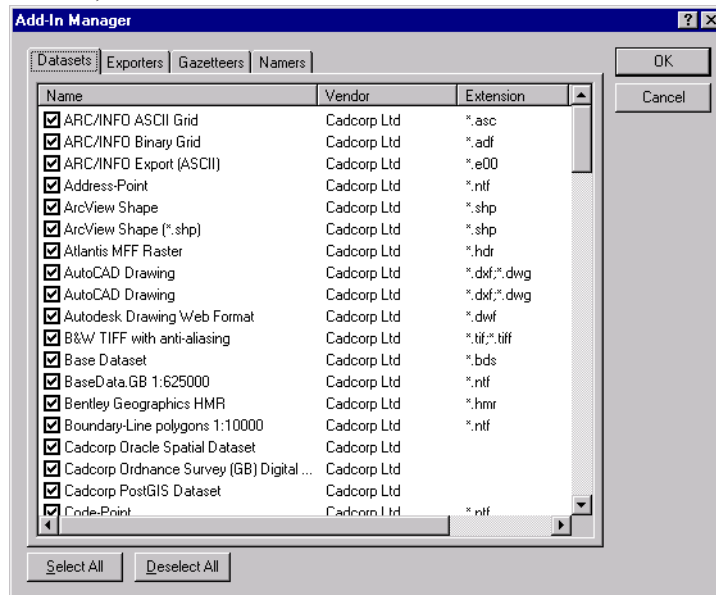
- the software version number of each component

■ The Add-In Manager (Tools>Add-In Manager)

The Add-In Manager gives you control over the file formats that are available in a Cadcorp SIS session. You can use it to allow or disallow the use of particular datasets, exporters, gazetteers, and namers, which are collectively called **add-ins**.



To run the Add-In Manager, choose **Add-In Manager** from the Tools menu. A list of currently installed add-ins are shown, organised into different categories. To make a particular add-in unavailable, deselect its check box and click OK.



■ Cadcorp SIS file types and Cadcorp SIS products

The five major Cadcorp SIS file types are:

- SIS a project workspace file (*.sis), which stores preferences and links to SWDs, tables, and object libraries
- SWD a Saved Window Definition (*.swd), a list of overlays to be included in a view
- SWT a template for the creation of SWDs
- PWD a Published Window Definition (*.pwd), for use with Cadcorp SIS Map Reader
- OWD an Open Window Definition (*.owd), for use with Cadcorp SIS Map Browser

The following table shows the actions available for each Cadcorp SIS product and file type. A tick (✓) indicates that the action is available with the product.

❑ **Cadcorp SIS file types and products**

File type	Action	Map Reader	Map Browser	Map Viewer	Map Manager Map Editor Map Modifier	Map Control
SIS	create	-	-	✓	✓	-
	open	-	-	✓	✓	-
	save	-	-	✓	✓	-
	drag and drop (in workspace window)	-	-	✓	✓	-
SWD	create	-	-	✓	✓	✓
	open	-	-	✓	✓	✓
	save	-	-	✓	✓	✓
	drag and drop (in workspace window)	-	-	✓	✓	-
	drag and drop datasets into	-	-	✓	✓	-
	overlays dialog on	-	-	-	✓	✓
	save as PWD	-	-	-	✓	-
	create from SWT	-	-	✓	✓	-
	overlays cut, copy, and paste (in workspace window)	-	-	✓	✓	-
	themes cut, copy, and paste (in workspace window)	-	-	✓	✓	-
SWT	create	-	-	-	✓	-
	open	-	-	-	✓	-
	save	-	-	-	✓	-
	drag and drop (in workspace window)	-	-	-	✓	-
	drag and drop datasets into	-	-	-	✓	-
	overlays dialog on	-	-	-	✓	-
	overlays cut, copy, and paste (in workspace window)	-	-	-	✓	-
	themes cut, copy, and paste (in workspace window)	-	-	-	✓	-
	create	-	✓	-	✓	-
	open	-	✓	-	✓	-
OWD	save	-	✓	-	✓	-
	drag and drop (in workspace window)	-	✓	-	✓	-
	drag and drop supported datasets into	-	✓	-	✓	-

□ Cadcorp SIS file types and products (Continued)

File type	Action	Map Reader	Map Browser	Map Viewer	Map Manager Map Editor Map Modeler	Map Control
overlays themes	overlays dialog on	-	✗	-	✓	-
	save as SWD	-	✓	-	✓	-
	cut, copy	-	✓	-	✓	-
	cut, copy	-	✓	-	✓	-
PWD	create	-	-	-	✓	-
	open	✓	-	-	✓	-
	save	-	-	-	✓	-
	drag and drop (in workspace window)	✓	-	-	✓	-
	drag and drop datasets into	-	-	-	✓	-
	overlays dialog on	-	-	-	✓	-
overlays	cut, copy, and paste (in workspace window)	✓	-	-	✓	-
themes	cut, copy, and paste (in workspace window)	-	-	-	✓	-

■ Supported formats

The following sections list all Cadcorp SIS readable, writeable, and export datasets and databases. Formats are organised into the following groups:

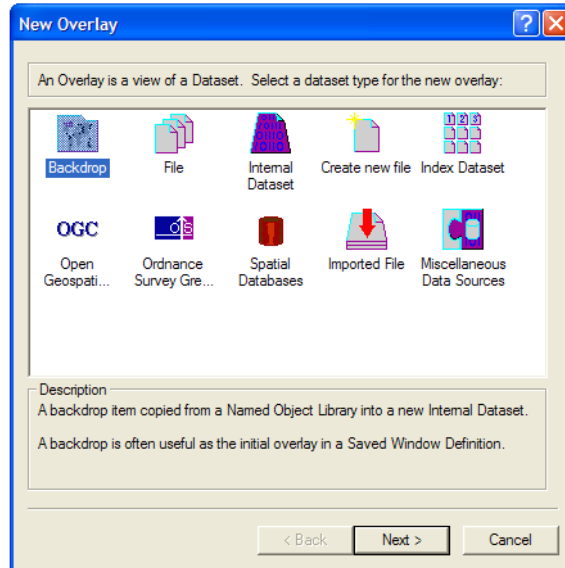
- ↪ page 82, **CAD and GIS file formats**
- ↪ page 88, **OGC Specified Formats**
- ↪ page 90, **USA National Datasets**
- ↪ page 92, **GB National datasets (Ordnance Survey)**
- ↪ page 96, **Other national datasets**
- ↪ page 99, **Hydrographic datasets**
- ↪ page 99, **Other vector file formats**
- ↪ page 100, **Formats from Safe Software's Feature Manipulation Engine (FME)**
- ↪ page 100, **Reading and writing graphics in a database or server application**
- ↪ page 101, **Database formats**
- ↪ page 104, **Raster, bitmap, and image formats**

Readable datasets cannot be edited, and can be given a status of Invisible, Visible, or Hittable.

Writable datasets can be edited directly and can be given a status of Invisible, Visible, Hittable, or Editable.

Files can be exported using **File>Export**, and can be created from any data in Cadcorp SIS. Some export formats (like raster) export what is displayed on the screen, and some export a chosen overlay. Data can also be added to an editable dataset or database by replicating from a hittable overlay into an editable overlay, and then saving.

All the datasets listed here are accessed using the **Map>Add>Overlay...** command.



➤ Chapter 15: “Working with overlays”

Binary formats are generally smaller in file size and faster to load than ASCII formats. If you have a choice of data format, binary is better for use in Cadcorp SIS.

In the following sections, icons indicate how each format is used with Cadcorp SIS:



Cadcorp SIS reads this format



Cadcorp SIS can edit this format



files are in binary format



files are in ASCII format



Cadcorp SIS can export this format

Chargeable

Some formats are chargeable: support for these formats is not part of the core software, and an additional charge is made for their use.

FME

Some formats require purchase of Safe Software’s FME licence

Cursor Datasets

Some data formats are treated as *cursor datasets*. Only the data queried by the user is loaded into memory, not the whole file, so cursor datasets are memory efficient. Cursor datasets also allow editing work to be organised into transactions (Begin, Commit, and Rollback). ➤ Chapter 4: “Loading data”, **Cursor datasets**

Unsupported

These data formats are not part of the Cadcorp SIS core product and will not be supported by Cadcorp Ltd under any licence or support agreement. This does not mean that Cadcorp Ltd will not update or modify them but that any requests will be treated at a lower priority than fully supported products. These can be copied from the directory in the Bonus folder on the Cadcorp SIS Installation CD.

■ CAD and GIS file formats

◆ AutoCAD DXF 12 - 2000 (*.dxf)

The DXF (Data Exchange Format) is specified by AutoDesk and has become the *de facto* format for the transfer of design and drafting data (CAD) between AutoCAD and other (primarily CAD) systems.

DXF files can be ASCII or Binary. The default is ASCII, which means that file sizes can be large.



◆ AutoCAD DWG Drawing File 12 - 2000 (*.dwg)

This is the native geometry format from AutoCAD (CAD system). Cadcorp SIS supports version 12, 13, 14, and 2000 formats.



◆ Autodesk Drawing Web Format (*.dwf)

This is the native (Vector) geometry format specified by AutoDesk and designed for use on the Web.



◆ Bentley Geographics HMR raster

Cadcorp SIS supports Bentley Geographic HMR raster data.



◆ Bentley MicroStation design file (*.dgn)

This is the native geometry format from MicroStation. This is also used as a export format from Intergraph systems (GeoMedia and MGE). You can export version 8 of the DGN format.



◆ Cadcorp SIS Base Dataset (*.bds)

This is a native geometry format within Cadcorp SIS, used for storing and sharing your own graphic information. It supports complex vector, topological geometry, and raster images.



◆ Cadcorp SIS Shared Dataset (*.sds), Cadcorp SIS Cursor Dataset

This is a native geometry format within Cadcorp SIS, used in a multi-user environment for concurrent data editing. It supports complex vector geometry but not topology.



◆ Cadcorp SIS Export Dataset (*.sed)

This Cadcorp SIS export format supports all Cadcorp SIS item types, including complex vector and topological geometry.



◆ ER Mapper's Algorithm file (*.alg)

This is the native Algorithm file for ER Mapper. ALG format is used to display aerial and satellite images with algorithms applied to highlight specific information. It is available as an installation which is separate from Cadcorp.



◆ ER Mapper's ECW (*.ecw)

The Earth Resource Mappings ECW format is used to achieve high compression for image data. In GIS it can be used for satellite imagery and aerial photographs. ECW uses 'wavelet' technology to view part of the image at the required view scale. ECW has no file size limit for reading data but a 500MB limit for export.



◆ ER Mapper Image Web Server

This loads a dynamic image from an ER Mapper Image Web Server.



◆ ESRI ArcInfo Export (ASCII) (*.e00)

This is the export format for topological geometry used in ArcInfo, an ESRI product.



◆ ESRI ArcInfo DTM (*.csv)

Cadcorp SIS supports ESRI ArcInfo DTM files stored in comma-separated value format.



◆ ESRI ArcView Shape (*.shp)

This is the non-topological geometry/data format used in the ArcGIS suite from ESRI.



◆ ESRI Binary Interleave file (*.bil, *.hdr, *.bip, *.raw)

This is the Image and Digital Elevation Model (DEM) format from ESRI. Cadcorp SIS supports 8 bit greyscale, 16 bit, and 3 Band image files. Some remote sensing data products are supplied in this format, such as SPOT, RADARSAT, and LANDSAT.

RAW files are BIP, BIP or BSQ with no HDR file. The user fills in the information normally found in the HDR file, eg width, height, number of bands, layout, and so on.



◆ ESRI ArcIMS Image Service

Cadcorp SIS can display geographical information from an ESRI ArcIMS Image Service. Connections with an ESRI ArcIMS Image Service are dynamic and operate in the same way as if viewing using a web browser.



◆ ESRI ArcSDE

ESRI ArcSDE data stored in an Oracle 8 (or later) database can be loaded directly by Cadcorp SIS.



◆ ESRI Personal Database

ESRI Personal Database files can be loaded directly by Cadcorp SIS.



◆ GDS AIF (*.aif)

This is the native ASCII Interchange Format for GDS CAD/GIS.



◆ GDS BIF (*.bif)

This is the native Binary Interchange Format for GDS CAD/GIS.



◆ GDS Things file (*.thf)

This is the 3D 'Things' dataset for GDS CAD/GIS.



◆ Genasys GenaMap file (*.di)

This is the native geometry format for Genasys GenaMap GIS. (Unsupported)



◆ Geomedia Access Warehouse

Geomedia Access Warehouses can be directly loaded by Cadcorp SIS.



◆ Geospatial Data Abstraction Library (*.gdal)

Cadcorp SIS supports GDAL datasets with multiple bands of depth. This format can be selected with the Miscellaneous Data Sources option of the New Overlay Wizard.



◆ Intergraph CIT image file (*.cit)

This is the native compressed bi-level (CCITT Group IV Fax compression) Raster format for Intergraph GeoMedia, MGE, and Bentley Microstation.



◆ Intergraph RLE image file (*.rle)

This is the native compressed bi-level (Run Length Encoding) raster format for Intergraph GeoMedia, MGE and Bentley Microstation. It is not as efficient as CIT.



◆ MicroGDS file (*.man)

This is the native geometry format for MicroGDS CAD system.



◆ MOSS MX range (*.dpf)

This is the native format for MOSS CAD graphics from the MX range (and the PC-based MX range), Infracorp Corporation (formerly MOSS systems) products.



◆ MOSS MX range (*.dpw)

This is the native format for MOSS CAD graphics from the MX range (and the PC-based MX range), Infracorp Corporation (formerly MOSS systems) products.



◆ MapInfo TAB file (*.tab)

This is the native Table file format for MapInfo GIS which supports geometry and attributes.



◆ MapInfo Interchange format (*.mif)

This is the format used by MapInfo Interchange files, which supports geometry and attributes.



◆ Sysdeco Tfile (*.tfd)

This is the Sysdeco Transfer format, also known as TFILE. It contains all objects including topology for SYSDECO GIS.



◆ Siemens SICAD (*.vc)

This is the native format for SICAD CAD/GIS, which supports geometry and attributes. (Unsupported)



■ OGC Specified Formats

◆ OGC Geography Markup Language (GML) 2 (*.gml + *.gzip)

This is fast becoming a *de facto* standard for data exchange and supply in the GIS market. It is based on XML, and was developed by the Open Geospatial Consortium. It utilises the OGC Simple Features Specification and is designed for geographic data storage and transfer.



◆ OGC Well Known Binary (WKB) (any database)

Cadcorp SIS supports a multi-user environment for concurrent data editing. It conforms to OGC Simple Features specification and OGC WKB (Binary) geometry storage in a RDBMS. Any database can be used and Cadcorp SIS will create the tables and schema for WKB use.



◆ OGC Well Known Text (WKT) (any database)

Cadcorp SIS supports a multi-user environment for concurrent data editing. It conforms to OGC Simple Features specification and OGC WKT (ASCII) geometry storage in a RDBMS. Any database can be used and Cadcorp SIS will create the tables and schema for WKT use.



◆ OGC Geography Markup Language (GML) (any database)

Cadcorp SIS supports a multi-user environment for concurrent data editing. It conforms to OGC Simple Features specification and OGC GML2 geometry storage in a RDBMS. Any database can be used and Cadcorp SIS will create the tables and schema for GML2 use.



◆ OGC SQL92 dataset (any database)

Cadcorp SIS supports a multi-user environment for concurrent data editing. It conforms to OGC Simple Features specification and OGC WKT (ASCII) and WKB (Binary) geometry storage in a RDBMS. Any database can be used and Cadcorp SIS will create the tables and schema for SQL92 use.



◆ OGC Web Map Server WMS (Raster)

Cadcorp SIS ASC and Cadcorp SIS ISAPI can act as an OGC Web Map server. This uses the OGC specification (WMS) to serve raster grids over the internet. Cadcorp SIS desktop (Client) products can read the information as an overlay. Any OGC WMS conformant service (Web Address) may be used as the dataset source.



◆ OGC Web Feature Server WFS (Vector)

Cadcorp SIS ASC and Cadcorp SIS ISAPI can act as an OGC Web Feature server. This uses the OGC specification (WFS) to serve vector geometry and attributes over the internet. Cadcorp SIS desktop (Client) products can read the information as an overlay. Any OGC WFS conformant service (Web Address) may be used as the dataset source.



◆ OGC Web Terrain Server WTS (DEM)

Cadcorp SIS ASC and Cadcorp SIS ISAPI can act as an OGC Web Terrain server. This utilises the OGC specification (WTS) to serve raster Digital Elevation Models over the internet. Cadcorp SIS desktop (Client) products can read the information as an overlay. Any OGC WTS conformant service (Web Address) may be used as the dataset source.



◆ OGC Web Coverage Service

Cadcorp SIS can act as an OGC Web Coverage client, downloading coverage data over the internet from an OGC WCS.



◆ PostGIS database

Cadcorp SIS loads, edits, and exports PostGIS data.



◆ OGC Web Map Context Document

A Web Map Context (WMC) document contains references to one or more OGC Web Map Server layers. Data in WMC documents is served in layered raster images, rather than as a single raster image. For example, one layer could represent cities, another layer could represent province outlines, and so on. Each raster layer can have transparent values, so that layers underneath them are not obscured.



◆ OGC OWS Context Documents

OWS Context documents are related to, but more powerful than, Web Map Context Documents. Web Map Context Documents are limited to referencing OGC Web Map Services (WMS), whereas OWS Context Documents can reference other OGC Web Services, eg Web Feature Services (WFS), Web Coverage Services (WCS), and so on.



■ USA National Datasets

◆ US Census Bureau TIGER/Line (*.bw1, *.rw1)

TIGER/Line files are extracts of selected geographic and cartographic information from the Census TIGER (Topologically Integrated Geographic Encoding and Referencing) database, released by the United States Census Bureau.

Cadcorp SIS reads 1995, 1997, 1998, and 2000 Census TIGER/Line files.



◆ USGS DLG-3 Optional format (ASCII) (*.opt, *.do)

The Digital Line Graph (DLG) format contains topological map graphics. DLG files include information on planimetric base categories, such as transportation, hydrography, and boundaries. It is specified by United States Geological Service (USGS) (ASCII format)



◆ USGS GTOPO30 (*.hdr)

This is the global digital elevation model (DEM) with a horizontal grid spacing of 30 arc seconds (approximately 1 kilometre), specified by United States Geological Service (USGS).



◆ USGS Digital Elevation Model (1 degree) (*.dem)

The Digital Elevation Model (DEM) format consists of a sampled array of elevations for ground positions that are usually, but not always, at regularly spaced intervals, specified by United States Geological Service (USGS). Cadcorp SIS reads 1.0-degree quadrangle coverage DEMs.



◆ Spatial Data Transfer Standard (SDTS) (*.ddf)

The Spatial Data Transfer Standard (SDTS) is a United States Federal Information Processing Standard (FIPS 173) for the non-proprietary, vendor-neutral distribution of geospatial data, and for the exchange of geospatial data between dissimilar digital geographic information systems.

Cadcorp SIS reads SDTS Digital Line Graph (DLG-3) Topological Vector Profiles (TVP).



◆ NIMA Vector Map Level 0, Vmap0 (Edition 3) (*.aft, *.lft, *.pft, *.tft)



Vector Profile Format (VPF) files are used for Vector Map Level 0; a set of CDs with global mapping data issued by the US National Imagery and Mapping Agency (NIMA).



◆ Digital Chart of the World (*.dcw)



DCW is the geographical database developed by the USA Defense Mapping Agency, in accordance with the Vector Product Format (VPF). It is based primarily on the 1:1 000 000 Operational Navigation Charts (ONCs) and 1:2 000 000 Jet Navigation Charts (JNCs) developed by the Defence Mapping Agency (DMA).

DCW has world-wide coverage and is composed of four regions: North America; Europe and Northern Asia; South America, Africa, and Antarctica; and Southern Asia and Australia. It contains a world-wide index by place name, and is designed for the same military, scientific, and educational uses as a small-scale base map. It is supplied as a set of CDs issued by the North American Space Agency (NASA).



■ GB National datasets (Ordnance Survey)

◆ OS MasterMap (*.gml and *.gz)

OS MasterMap Topological polygons (*.gml + *.gz)

OS MasterMap Independent Polygons (*.gml + *.gz)

OS MasterMap Imagery Layer

OS MasterMap Integrated Transport Network (*.gml + *.gz)

OS MasterMap is the latest large-scale mapping available from the British National Mapping Agency, Ordnance Survey.

To load OS MasterMap data into Cadcorp SIS, you can either load it directly in native GML format, or can use the Cadcorp SIS OS MasterMap Manager to upload the data into a database, and then use Cadcorp SIS to view the database tables. The Cadcorp SIS OS MasterMap Manager is used both for batch uploading OS MasterMap data to a database, and for handling the regular 'change-only' updates from Ordnance Survey.

Loading OS MasterMap directly into Cadcorp SIS in its native format is carried out using the New Overlay Wizard and the File option. You are prompted for the location of the data, and a Configure... button becomes available. Click this to display topological and attribute options. If you choose to skip the various types of attributes, these attributes will not appear in the item's schema or properties, and speed of processing will improve. Cadcorp SIS will automatically retain the Configuration settings chosen during this process and use them on any further OS MasterMap data viewed. To change them, choose the Configure option again when opening a MasterMap chunk and change the settings as required.

Reading OS MasterMap data in, once it has been uploaded to a database, is carried out using the Ordnance Survey (GB) DNF option. (This will be available in the New Overlay Wizard if the Windows default Regional and Language Options are set to English United Kingdom.) You are prompted to choose the relevant database type, and then for where your database is, or the database connection parameters. Once you have connected to the database, you are prompted for which specific geometry types and themes you want to upload. You can also create a snapshot view of your data between specified dates.

For more information about the Cadcorp SIS OS MasterMap Manager, refer to the Cadcorp SIS Guide to OS MasterMap document.



◆ OS MasterMap Index



This queries all the OS MasterMap chunks in a folder, displaying their extents, file names, and file sizes. It acts in a similar way to the index dataset tile outlines, allowing you to display the extents of your data in that folder. The files themselves, however, are not loaded into Cadcorp SIS. (To load OS MasterMap data, use the Ordnance Survey (GB) DNF option in the New Overlay Wizard.)

You are prompted for the location of the OS MasterMap data. Either *.gz or *.gml files can be queried.



◆ Land-Line 1:1250, 1:2500, 1:10 000 (*.ntf)

OS Land-Line is in National Transfer Format designed for large scale mapping. It is supplied in tiles, each covering a specific area. The tile is named using an OS naming convention which indicates where and what size the area is. Tiles can be loaded as a seamless map base using the Index option.

500m or 1000m square tiles at 1:1250, 1:2500, and 1:10 000. Typical tile names are SS7887NE.ntf or SS7985.ntf.



◆ OSCAR Traffic Manager (*.ntf)

This is road network data, used by those carrying out vehicle traffic tracking. It is less detailed than OSCAR Asset Manager. Both OSCAR Asset Manager and OSCAR Traffic Manager contain the same road networks. However, OSCAR Traffic Manager shows the flow of traffic and turning restrictions, while OSCAR Asset Manager shows the road junction layout as it is shown on the ground.

5km square tiles at 1:2500. A typical tile name is SS78NE.ntf.



◆ OSCAR Network Manager (*.ntf)

This is road network data, which is less detailed than OSCAR Traffic Manager. Both OSCAR Network Manager and OSCAR Traffic Manager contain the same road networks. However, OSCAR Network Manager shows the road layout as it is shown on the ground, while OSCAR Traffic Manager shows the flow of traffic through junctions. 5km square tiles at 1:2500. A typical tile name is SS78NE.ntf.



◆ OSCAR Asset Manager (*.ntf)

This is road network data, and is more detailed than OSCAR Traffic Manager. Both OSCAR Asset Manager and OSCAR Traffic Manager contain the same road networks. However, OSCAR Asset Manager shows the road layout as it is shown on the ground, while OSCAR Traffic Manager shows the flow of traffic through junctions. 5km square tiles at 1:2500. A typical tile name is SS78NE.ntf.



◆ Land-Form PANORAMA DTM 1:50 000 (*.ntf)

These are Digital Terrain Model Grids (10m resolution). 5km square tiles at 1:10 000. A typical tile name is SU81SW.ntf.



◆ Land-Form PROFILE contours 1:10 000 (*.ntf)

These are Vector Contour Lines (5m and 50m intervals). 5km square tiles at 1:10 000. A typical tile name is SU81SW.ntf.



◆ Data-Point (*.ntf)

The Data-Point information maps postcode units in Great Britain. On average, each postcode unit contains fifteen addresses.



◆ Strategi (*.ntf)

Strategi maps provide medium scale regional overviews. They show geographical features and simplified routing information.

50km square tiles at 1:250 000. A typical tile name is TQSE.ntf.



◆ Meridian (*.ntf)

This is supplied in two themes: communication and topographic. Communication contains road networks, motorways, A roads, B roads, minor roads over 100m, railways, administrative areas, and coastline. The Topographic theme contains administrative areas, coastline areas, developed land use areas, settlement names, hydrology, woodlands and gridded heights.

10km square tiles at 1:10 000. A typical tile name is SS78.ntf.



◆ BaseDataGB (*.ntf)

This is a medium scale Regional overview containing roads, towns, and so on, similar to meridian data.

100km square tiles at 1:625 000. A typical tile name is SS.ntf.



◆ BoundaryLine 96 - 2000 (*.ntf)

These are topological polygons of Electoral wards, Boroughs and Counties for Great Britain.

25km square tiles at 1:10 000. A typical tile name is 2144.ntf.



◆ Address Point (10cm resolution) (*.ntf, *.csv or *.ap)

Address Point is a point dataset containing address attributes.

Organisation Name + Building Number + Sub Building Name + Building Name + Thoroughfare Name.



◆ Code Point (*.csv)

Code-Point information maps postcode units in Great Britain. Each postcode unit contains on average fifteen addresses.



◆ LIDAR (*.dat)

This is high-resolution height data captured using airborne Light Detection And Ranging (LIDAR). It is supplied from Infoterra and the Environment Agency in tiles as digital elevation models (DEMs), digital terrain models (DTMs), and contours.



◆ OS CITF Topo 93 (*.ctf) (Chargeable)

The Central Internal Transfer Format for the Ordnance Survey was used as a data capture format for NTF and OS MasterMap before auto-polygon creation.



◆ OS CITF Topo 96 (*.q1) (Chargeable)

This is a later version of the Central Internal Transfer Format for the OS, used as a data capture format for NTF and OS MasterMap before auto-polygon creation.



◆ Post Office Address File (10m resolution) (*.paf)

In the UK, the Royal Mail produces text files containing the full postal address of every property in the UK. Each entry includes an easting and northing of the location of the address to the nearest 100 metres.



■ Other national datasets

◆ Ordnance Survey Ireland (*.ntf)

This is Ordnance Survey Ireland National Transfer Format.

Scales supported include 1:1000, 1:2500, 1:5000, 1:50 000, and 1:210 000.



◆ **Ordnance Survey Northern Ireland (*.ntf)**

This is Northern Ireland Ordnance Survey National Transfer Format. These are polygon-based large scale maps. The tile naming conventions and scales supported are:

Width	Scale	Typical tile name
600m	1:1250	00609SE1.ntf
1.2km	1:2500	00609SE.ntf
2.4km	1:5000	00609.ntf
9.6km	1:10 000	006.ntf



◆ **EDBS (Germany) (*.edbs)**

This format is determined by the regional surveying authorities in Germany. It contains the geometry and technical data of the Automated Landed Property Map (ALK) and the Official Topographic-Cartographic Information System (ATKIS). The combination of the ALK with the ALB (Automated Landed Property Book) is done by an object key.

The German governmental GIS data are kept in two major formats:

- ATKIS, to store geometrical and usage information in vector format (land use, streets, water, forest, and so on)
- ALK, to store cadastral data

Different states may use slightly different versions of EDBS. For the latest supported states consult Cadcorp.



◆ **KF-85 (Sweden) (*.k85)**

This is a Swedish format from the Swedish Association of Local Authorities. It stores geometry and attributes, both standard and user-defined.



◆ Japanese GSI (*.mem)

This is Japanese Geographical Survey Institute vector data. Cadcorp SIS imports maps at 1:10 000.

**◆ Japanese GSI (*.rst)**

This is Japanese Geographical Survey Institute vector data. Cadcorp SIS imports maps at 1:10 000.

**◆ Zenrin 1/200000**

Japanese National Dataset. Cadcorp SIS imports maps at 1:200 000.

**◆ Zenrin 1/25000**

Japanese National Dataset. Cadcorp SIS imports maps at 1:25 000.

**◆ Zenrin Media MI**

Cadcorp SIS reads the Zenrin Media MI dataset format.



Additional Japanese formats are available through Informatix (Cadcorp SIS distributor for Japan) and Informatix Value Added Resellers (VARs). Consult Cadcorp or Informatix for more information.

■ Hydrographic datasets

◆ S57 Chart (*.030)

This is an electronic chart which can be displayed using an approximation of the S-52 hydrographical display standard. It supports all levels of feature.



◆ S57 Catalogue (*.000)

S57 Catalogue is a Catalogue file for the electronic chart, which can be displayed using an approximation of the S-52 hydrographical display standard. It supports all levels of feature.



◆ EuroNav (*.gxf)

EuroNav used for hydrographical charts. Features include chart rotation, relief rendering of vector charts, and improved weather routing. It is used within the SeaPro software suite.



■ Other vector file formats

◆ Scalable Vector Graphics (*.svg, *.svgz)

This vector-based web format uses lines and co-ordinates rather than pixels. These allow it more flexibility in terms of its viewing media. SVG is non-proprietary and XML-based, and is used mostly in web applications. It can be viewed in web browsers with the help of a browser plug-in. SVGZ files are compressed SVG.



◆ VRML (*.wrl)

The Virtual Reality Modelling Language format is commonly used for 3D vector imagery or models on the web.



◆ Portable Document Format (*.pdf)

Cadcorp SIS can export to Portable Document Format. ➞page 113, **Portable Document Format (PDF)**



■ Formats from Safe Software's Feature Manipulation Engine (FME)



To use the FME for flat files, you must purchase an FME licence. Cadcorp SIS detects the FME capability, and allows data to be read in using the FME translation engine.

You can export to any format supported by the Safe FME Exporter. The FME Exporter exports both geometry and attributes from all visible, hittable, and editable overlays. FME Feature Store Files (*.ffs) are supported as a file type.

At present, FME supports over 100 formats. Check www.safe.com for a current list of supported formats.



■ Reading and writing graphics in a database or server application

◆ Cadcorp SIS ASCII geometry format (any database)

Editable Geometry is a Cadcorp SIS controlled multi-user environment for concurrent data editing. It supports complex geometry, including topology in a RDBMS. Any database can be used and Cadcorp SIS will create the tables and schema for Cadcorp SIS ASCII use.



◆ OS MasterMap for Microsoft Access 2000

Cadcorp SIS OS MasterMap Manager allows OS MasterMap to be loaded into Microsoft Access. Microsoft Access is suitable for small to medium amounts of OS MasterMap. The data can be viewed using the OS DNF option. Cadcorp SIS can support a multi-user environment and change-only updates.



◆ OS MasterMap for Microsoft SQL Server

Cadcorp SIS OS MasterMap Manager allows OS MasterMap to be loaded into SQL Server. SQL Server is suitable for medium to large amounts of OS MasterMap. The data can be accessed through the OS DNF option. Cadcorp SIS can support a multi-user environment and change-only updates.



◆ OS MasterMap for Oracle9i

Cadcorp SIS OS MasterMap Manager allows OS MasterMap to be loaded into Oracle9i Spatial. Oracle9i is suitable for large amounts of OS MasterMap. The data can be accessed through the Oracle9i option. Cadcorp SIS can support a multi-user environment and change-only updates.



◆ OS MasterMap for Oracle10g

Cadcorp SIS OS MasterMap Manager allows OS MasterMap to be loaded into Oracle10g Spatial databases.

Oracle10g is suitable for large amounts of OS MasterMap data. The data can be accessed through the Oracle10g option. Cadcorp SIS can support a multi-user environment and change-only updates.



◆ ER Mappers ECW Image Web Server



This loads a dynamic image from ER Mapper's Image Web Server. You are prompted for the web address of the server and served image name.



■ Database formats

◆ Oracle8 Spatial Cartridge (Relational Model)



This is the old method for storing and accessing data in Oracle8.x which uses OGC co-ordinate transformations and simple feature specifications. It has been superseded by Oracle9i Spatial.



◆ Oracle8i Spatial (Object Relational Model)



Oracle8i Spatial is a method for storing and accessing data in Oracle8i, which uses OGC co-ordinate transformations and simple feature specifications. It has been superseded by Oracle9i spatial.



◆ Oracle9i Locator (Object Relational Model)

Oracle9i Locator is a method for storing, editing, and accessing data in Oracle9i. Cadcorp SIS supports a multi-user environment for concurrent data editing. It conforms to OGC Simple features specifications and OGC Co-ordinate transformations. Locator is part of the Oracle Standard edition.



◆ Oracle9i Spatial (Object Relational Model)

Oracle9i Spatial is a method for storing, editing, and accessing data in Oracle9i. Cadcorp SIS supports a multi-user environment for concurrent data editing. It conforms to OGC Simple features specification and OGC Co-ordinate transformations. Oracle Spatial is part of the Oracle Enterprise edition.



◆ Oracle10g (Network Model)

Cadcorp SIS allows topological data to be loaded into Oracle 10g using the 10g Network Model. The data can be accessed through the Oracle10g Network Model option.



◆ Oracle10g (GeoRaster Client)

Cadcorp SIS allows raster data stored in the Oracle GeoRaster format to be read from Oracle 10g. The data can be accessed through the Oracle10g GeoRaster option.



◆ Informix Spatial Datablade



This is a method for reading data in Informix Spatial Datablade 8.x. Informix uses OGC co-ordinate transformations and Simple Feature Specifications. (Unsupported)



◆ ODB

Cadcorp SIS supports ODB database files - a single file up to a terabyte in size, although at present it can hold only Master Map data. ODB provides Cadcorp SIS users with very fast viewing and processing.



◆ Safe software's Feature Manipulation Engine (FME)



To use FME for databases, you must purchase FME. ➤page 100, **Formats from Safe Software's Feature Manipulation Engine (FME)**



◆ Supported databases for use with database spatial systems.

These spatial technologies can be used with any database:

- Cadcorp SIS ASCII, WKT, WKB, GML2, and OGC SQL92.
- any database with a ODBC, DAO or ADO client driver
- Cadcorp SIS Direct Database Drivers (using these is faster than using ODBC)
- Lotus 123
- Microsoft Excel 97, 2000 and 2002 (XP)
- Microsoft Access 97, 2000 and 2002 (XP)
- SQL Server 7, 2000
- FoxPro
- Paradox
- Dbase III, IV and 5
- Oracle8, 9i, 10g
- Text Files (*.html, *.htm, *.txt, *.csv, *.tab, *.asc)



◆ Time Line

Timelines can be created from ODB, SQL Server, and Microsoft Access databases. You can use a slide bar to go through the changes in the data over time.

■ Raster, bitmap, and image formats

In Cadcorp SIS there is a distinction between a **bitmap** item and an **image** item.

Cadcorp SIS stores all the header and bits of the **bitmap item** in memory (RAM), whereas it asks an image item for this information only when the time comes to draw it on screen.



In versions before V6.2, image items were called plug-in image items.

Most raster formats use different coloured cells to display images. Bitmaps do not use information for each cell, they use information only when a colour changes. Therefore, if there is an image which is mostly one colour, that will be smaller in file size than one that has many colours. The resolution of the image determines the size of the cell and the size of the image determines the coverage.

◆ ARC/INFO ASCII GRID

Cadcorp SIS supports the interchange format developed for ARC/INFO raster files in ASCII format.



◆ ARC/INFO Binary Grid

Cadcorp SIS supports the Binary Grid format developed for ARC/INFO raster files.



◆ ASCII (*.txt)

Cadcorp SIS supports the ASCII raster text format.



◆ Atlantis MFF Raster

Cadcorp SIS supports the Atlantis MFF Raster format.



◆ Atlantis MFF2 (HKV) Raster

Cadcorp SIS supports the Atlantis MFF2 (HKV) Raster format.



◆ BIL ESRI Binary Interleave Format

↳page 84, **ESRI Binary Interleave file (*.bil, *.hdr, *.bip, *.raw)**

◆ BMP (*.bmp)

This is a bitmap image format that uses no compression. Most basic bitmaps can be read by most systems, but the files are large.



BMP dithered (*.bmp)

This is a bitmap image format that uses no compression, but is dithered to allow a clearer image at different view scales. The files are large.



GeoBMP (*.bmp + *.bfw)

This is a geo-referenced bitmap whose origin and size are stored in a 'world' (*.bfw) file.



◆ CIT (Intergraph 1 bit black and white image format)

↳page 86, **Intergraph CIT image file (*.cit)**

◆ Digital Terrain Elevation Model (DTED)

Cadcorp SIS supports the Digital Terrain Elevation Model Raster format.



◆ ECW ER Mapper's Enhanced Compression Wavelet (*.ecw)

↳page 84, **ER Mapper's ECW (*.ecw)**

◆ ER Mapper's Algorithm (*.alg)

↳page 83, **ER Mapper's Algorithm file (*.alg)**

◆ ENVISAT Image Product ENVI (*.hdr)

Cadcorp SIS supports the ENVISAT Image Product raster format.



◆ EOSAT FAST-L7A (Landsat)

Cadcorp SIS supports the EOSAT FAST-L7A format (Landsat data).



◆ Erdas Imagine (*.img)

Cadcorp SIS supports the Erdas Imagine *.img format.



◆ EXIF digital camera images

You can load GPS-coded digital camera images into a Cadcorp SIS overlay. ➤Chapter 4: “Loading data”, **EXIF: digital camera images**



◆ GeoJPEG

➤page 107, **JPEG (*.jpg)**

◆ GeoTIFF

➤page 109, **Tagged Image File Format (TIFF)**

◆ GIF (*.gif)

Graphics Interchange Format is a popular format used on the internet. It uses LZW compression.



◆ Hierarchical Data Format (*.hdf) Release 4

Cadcorp SIS supports the Hierarchical Data Format.



◆ Intergraph CIT image files (*.cit)

▷page 86, Intergraph CIT image file (*.cit)

◆ Intergraph RLE image files (*.rle)

▷page 86, Intergraph RLE image file (*.rle)

◆ JPEG (*.jpg)

Joint Photographic Experts Group is an image standard for a range of compression formats. Cadcorp SIS can export to JPEG 2000 format.



JPEG Multi-Level (4 levels) (*.jpg)

These are four separate images saved within the JPEG file at different resolutions. Each has a different scale threshold. The system will then load whichever bitmap has the most appropriate resolution, dependent on the scale of the SWD. This gives a clearer image at all screen scales, but has the following disadvantages: using multi-level datasets is slower than using single resolution JPEG files; and if you want to use overlay scale thresholds with JPEG datasets, then all four bitmaps will be drawn at once.



GeoJPEG (*.jpg + *.jfw)

This is a geo-referenced JPEG, whose origin and size are stored in a 'world' (*.jfw) file.



◆ National Imagery Transmission Format (NITF)

The National Imagery Transmission Format Standard (NITFS) is a US Department of Defense (DoD) and Federal Intelligence Community suite of standards for the exchange, storage, and transmission of digital-imagery products and image-related products.



◆ NOAA/MAPTECH/NDI/SoftChart BSB

The BSB format is a compressed raster format used for distributing raster nautical charts by various organisations in North America, notably MapTech and NOAA.



◆ PCI (*.aux) Labelled

Cadcorp SIS supports PCI labelled raw files.



◆ Portable Network Graphics (*.png)

The Portable Network Graphic (PNG) format is a compressed image file format, similar to GIF, but with a higher compression ratio, and patent-free. It uses a lossless compression algorithm to maintain image quality.

PNG files with 24-bit RGB plus a single transparent colour, or 8-bit grayscale plus a transparent palette index, are also supported.



PNG Bitmap 256-colour (*.png)

This is similar to the 24-bit PNG format, but it supports a lower resolution (256) and the file sizes are smaller.



◆ Raster Index



This tiles together raster files of a similar type as one single overlay, in an equivalent way to Index Datasets. Each raster image must be geo-referenced, ie have an associated 'world' (*.tfw) file. Select the directory containing the raster images, and the index will be built as one overlay.



◆ RLC Run-length encoded bitmap file (*.rlc)

This is used by some CAD systems for black and white images and scanners.



◆ RLE Intergraph

→page 86, **Intergraph RLE image file (*.rle)**

◆ SID - LizardTech's MrSID format (*.sid)

MrSID (Multi-resolution Seamless Image Database) was created by LizardTech. In GIS it can be used for satellite imagery and aerial photographs. MrSID uses 'wavelet' technology to view part of the image at the required view scale. MrSID has a 2GB file size limit.



◆ Tagged Image File Format (TIFF)

Cadcorp SIS supports most TIFF versions, including 32-bit (4 × 8 bit) TIFF images.

B&W TIFF with anti-aliasing (*.tif, *.tiff)

This is a black and white Tagged Image File Format, which uses anti-aliasing to create a better image on screen. It is slow to draw.



TIFF No compression (*.tif, *.tiff)

Tagged Image File Format with no compression is the most basic TIFF, which can be read by most systems; however, it creates large files.



TIFF Packbits (*.tif, *.tiff)

This is the Tagged Image File Format with Packbits compression. Packbits is an efficient compression algorithm.



TIFF Group 4 fax (*.tif, *.tiff)

This is the Tagged Image File Format with Group 4 compression. Group 4 is a black and white compression algorithm.



TIFF LZW Compression (*.tif, *.tiff)

This is the Tagged Image File Format with LZW compression. LZW is the most efficient compression algorithm for TIFF (it is also used in GIF).

**GeoTIFF (*.tif, *.tiff + *.tfw)**

A GeoTIFF is a geo-referenced TIFF whose origin and size are stored in a 'world' (*.tfw) file

**◆ Targa Image File (*.tga)**

Targa compressed image files are used by TrueVision software and in the remote sensing industry

**◆ USGS Digital Orthophoto Quadrangles (New Style)**

A Digital Orthophoto Quadrangle (DOQ) is a computer-generated image of an aerial photograph in which the image displacement caused by terrain relief and camera tilt has been removed. The format is specified by the United States Geological Service (USGS).

**◆ USGS Digital Orthophoto Quadrangles (Old Style)**

A Digital Orthophoto Quadrangle (DOQ) is a computer-generated image of an aerial photograph in which the image displacement caused by terrain relief and camera tilt has been removed.

**◆ USGS Optional ASCII DEM**

This is the Digital Elevation Model specified by United States Geological Service (USGS) (ASCII format).



◆ USGS SDTS DEM

This is elevation data derived directly from USGS native format DEMs. The spatial content is equivalent to DEM, but the physical format and metadata content are different. The format is specified by the United States Geological Service (USGS).



◆ VRML

➤page99, **VRML (*.wrl)**

◆ Windows MetaFile (*.wmf)

A Windows Metafile is a list of drawing operations which can be 'replayed' onto most Windows graphic devices (eg screen and printer).

A metafile can store a mixture of raster and vector graphics efficiently. Cadcorp SIS can also load and draw metafiles files quickly. The disadvantage of the metafile format is that you cannot snap onto the graphics.

Cadcorp SIS uses the same type of metafiles as the Microsoft Office suite, so you should be able to use metafiles to transfer graphics between Cadcorp SIS and Microsoft Word and other Microsoft Office applications.



■ Geo-referencing files

Some data products (GIS, Digital Mapping and Remote Sensing software) provide data files that are geo-referenced. These can be included as overlays in the normal way, using the New Overlay Wizard. If the graphics in the data file have been positioned using a co-ordinate system, the data appears in the correct geographical position.

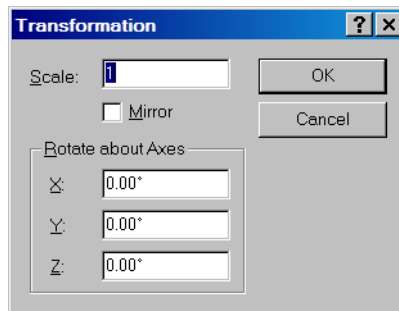
Other data files, mostly created in CAD, or scanned images which have no regard to their location in the world, may have selected a convenient local position as the origin of the co-ordinate system for the data. In this case, Cadcorp SIS provides the ability to move the data to its correct geographical position, rotating it as necessary, and defining the units of measurement used. You can relocate it by selecting any item from the overlay, then using the **Alter>Move Dataset** command, described below.

To display a file which is not correctly geo-referenced, it is important that you know the geographical location of at least one point on the graphics.

For example, if you were using the National Grid co-ordinate system projection, you must establish the National Grid reference of a point on the graphics. (You may need to consult the provider of the data file to obtain this information.)

The following example uses an Ordnance Survey Land-Line DXF file which is to be positioned within the National Grid.

- 1 Use the Imported File option in the New Overlay Wizard to add the DXF file to the SWD. It is a good idea to remove any other overlays (select them, then click the Delete button), or make them invisible (click on the icon in the workspace window).
- 2 Click the OK button to return to the map window. Do not be surprised if you cannot see any graphics. Remember, the DXF file is not geo-referenced, so the origin of its co-ordinate system (0, 0) has been placed at the origin of the current map projection. In the case of the National Grid, this is near the Isles of Scilly which lie off the south west coast of Britain.
- 3 Choose the Zoom Overlay command from the DXF overlay's local menu. This will shift your current view to display the full extent of the chosen overlay (the DXF file).
- 4 Select any item in the DXF dataset by clicking on it.
- 5 Choose the **Alter>Move Dataset** command.
- 6 For the position to move from, click on a point on the DXF graphics whose co-ordinate position you know.
- 7 If you want to scale or rotate the dataset before placing it, press Enter to see the Transformation dialog:



Chapter 35: “General editing techniques”

Using this you can increase the size of the file by scaling it; you can mirror it, or you can rotate it around one of its axes.

- 8 To place the selected point in its correct geographical location, type in its co-ordinates (in the Position bar at the bottom of the Cadcorp SIS window), or click on existing graphics which are at the correct location.
- 9 When the DXF dataset is in the correct location, you can save it as a file using the **File>Export>To File** command. Remember when doing this to make any other overlays invisible, otherwise you will export them with the DXF.



Chapter 45: “Sharing data”

- 10 To view the exported file, use the File option in the New Overlay Wizard.
- 11 If you save the SWD, the details of this transformation will also be saved, so that when you next load this SWD file (using the **File>Open...** command), the DXF dataset will be in the correct location. It is best, though, to export the file for future use.



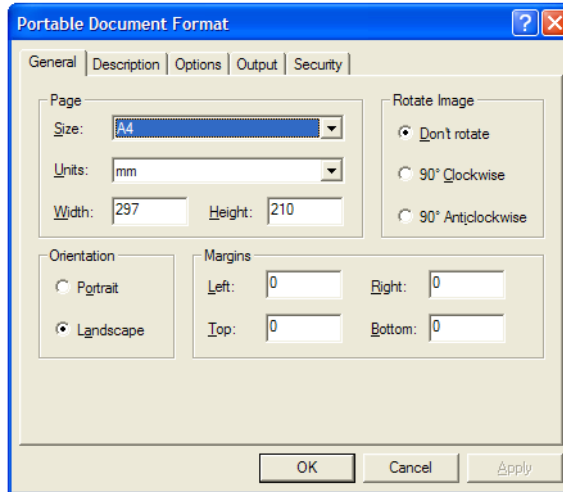
■ Portable Document Format (PDF)

PDF files are widely used for distributing documents, because they retain their original appearance regardless of the hardware, software, and fonts available on different computers. A Portable Document Format file can contain both vector and raster data.

Cadcorp SIS lets you export to a PDF file, or use the Print Template Wizard to save directly to a PDF file.

To export to a PDF file, use the **File>Export>To File** command, and choose the PDF format.

The Portable Document Format dialog offers a number of options, organised into tabs: General, Description, Options, Output, and Security.



The General tab provides general size and orientation options.

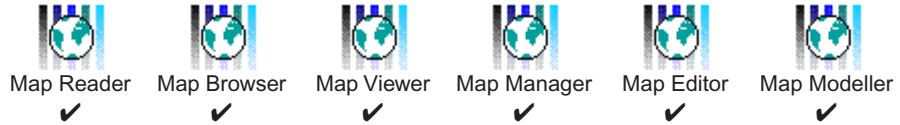
The Description tab lets you supply additional information (title, subject, author, and any number of keywords) that will be stored in the PDF file. Other applications can make use of this information later. For example, Adobe Reader can search your computer for PDF files that have matching information in these fields.

The Options tab lets you control how much compression is used when saving the file, and the output resolution of bitmap images. You can also choose to keep the data organised into layers, suitable for subsequent use in other applications that can open layered PDF files.

The Output tab lets you choose between Colour and Black and White (Monochrome), and the reference device used for the output - Screen or Printer.

The Security tab provides various settings for controlling how the PDF file can be used or modified by other people. For example, you can prevent others from editing, printing, copying, or even opening the PDF file unless they know the relevant passwords.

➤ Chapter 47: “**Printing: print templates**”



Working with map windows

■ Map windows and 3D windows.....	115
■ The current window.....	115
■ The current cursor position.....	115
■ Redraw.....	117
■ Panning and zooming using the keyboard or mouse.....	117
■ The Zoom commands.....	119
■ The Pan commands.....	125
■ Saving and recalling views.....	126
■ Rotating views.....	127
■ Multiple views or windows.....	128
■ 'Transparent' zoom commands.....	130

■ Map windows and 3D windows

This chapter describes the functions available for moving around the map window, which contains 2D views. For details on how to move around in a 3D window, see Chapter 9: “Viewing 3D Data”.

■ The current window

The current window is the one in which all commands and actions are carried out. If you have more than one window open on screen, you must make sure that the window you want to work on is the current window before you carry out any action. Do this by clicking in the required window, or by accessing the SWD local menu on the display view, theme view, or table view tabs in the workspace window.

You can tell immediately which is the current window because its title banner is highlighted.

■ The current cursor position

The position bar displays the position of the cursor.



The current cursor position is given in one of two ways:

- with the Track option checked it is continuously updated as you move the cursor
- with Track unchecked it is updated only when you click a screen position



The units and precision used are those set on the Units tab displayed by the **Map>Co-ordinate Systems...** command.

The first pane allows you to choose the format for the co-ordinate read-out, and is one of the following:

❑ **Co-ordinate formats**

Co-ordinates	displays positions as 3-dimensional co-ordinates, either: • as X,Y,Z distances from the origin if the co-ordinate system is Cartesian (eg National Grid) • in latitude, longitude and height if the co-ordinate system is spherical (eg Latitude/Longitude). Positions rotate if you rotate the axes. When used with a grid, TIN or DTM, the Z height gives the value of the cell of the grid, or the height at that point on a TIN or DTM. eg 241km,596km,15km
Grid Item	displays cell values of cursor position for grid items eg DTMs, DEMs or grids
Irish Grid	displays positions as grid references using the Irish National Grid system: eg IN 5067 6432 The precision used reflects the units set. So if you were using metres with no decimal places, the read-out might be IN 43765 62893. If you are using metres accurate to 3 decimal places, the read-out would reflect this accuracy eg IN 43765801 62893277.
Latitude/Longitude	reports positions in latitude and longitude, plus a geoidal height, using the current co-ordinate system datum eg 51.569°,-3.760°,0km
Linear co-ordinates	used for inputting co-ordinates only Not used for displaying co-ordinates of a position.
National Grid	displays positions as grid references using the Great Britain National Grid system The precision used reflects the units set - see Irish Grid above.

❑ Co-ordinate formats (Continued)

Polar co-ordinates	displays the current cursor location using a polar co-ordinate system. The present position is given as a bearing (using the Angle units set on the Units tab of Map>Co-ordinate Systems...), plus a distance and height (using the Linear set units). Positions are shown relative to a point selected using the Measure>Setup>Polar co-ordinates command. eg 135°, 371m, 0m
Relative polar co-ordinates	gives polar co-ordinates (a bearing and distance, plus optional height) relative to the last snapped position eg 172°, 19m, 0km
WGS84 Latitude, Longitude, Height	displays positions as latitude and longitude co-ordinates, plus their geoidal height eg -4°,-52°,48.3m (meaning 4°S, 52°W, 48.3m)

■ Redraw

There may be times when the screen image appears with bits of graphics missing. This can happen when graphics have been moved or deleted, or after using the cursor keys to pan across the map base.

Text and point items are not always redrawn immediately, and so can appear incomplete. This is because they have only one reference point for locating them on screen, and in some circumstances, if that point is on screen already, Cadcorp SIS cannot know that the rest of the text or point item needs redrawing.



Use the **Map>Redraw** command (F5) to refresh the current window, or the **Window>Redraw All** command to refresh all windows.

During a long redraw you can halt the operation by clicking on the Cancel button which appears on the status bar at the bottom of the screen, or by pressing Ctrl + Break.

There are some preferences which give you more control over the redrawing of map windows. One preference, Full redraw after pan, forces Cadcorp SIS to redraw the map window after a pan operation. Another preference, Redraw after each overlay, forces Cadcorp SIS to redraw the map window after each overlay has been loaded. ➤Chapter 49: “Customising your system”

■ Panning and zooming using the keyboard or mouse

◆ Using the window’s scroll bars

Each map window has slider bars for panning the view horizontally (East/West if the map has not been rotated), and vertically (North/South if the map has not been rotated).

◆ Using an Intellimouse



If you have an Intellimouse, you can use the middle mouse wheel/button to zoom the view in or out. Holding the wheel down starts the **Map>Pan>Drag** command (“sticky hand” panning). Make sure the correct drivers are installed.

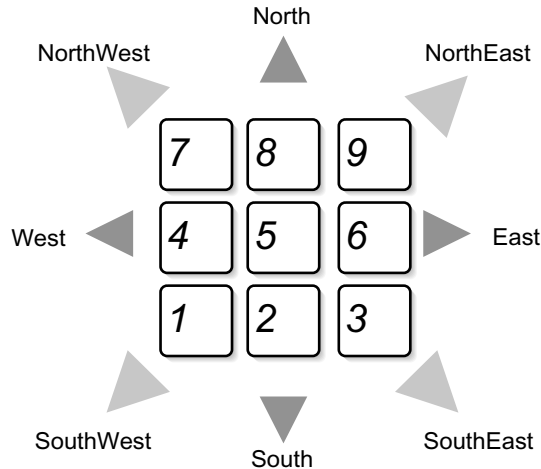
◆ Using a three-button mouse



The middle mouse button automatically starts the **Map>Pan>Drag** command (“sticky hand” panning).

◆ Using the cursor keys

Pressing the cursor keys shifts the view in the direction of the arrow. If you have a full numeric pad the PgUp, PgDn, Home, and End keys can be used to pan north-east, south-east, north-west and south-west (make sure you are operating with NumLock off):



The default scrolling step in all directions is 8 pixels. You can change this by holding down the Shift and/or Ctrl keys in combination with the scrolling keys as follows:

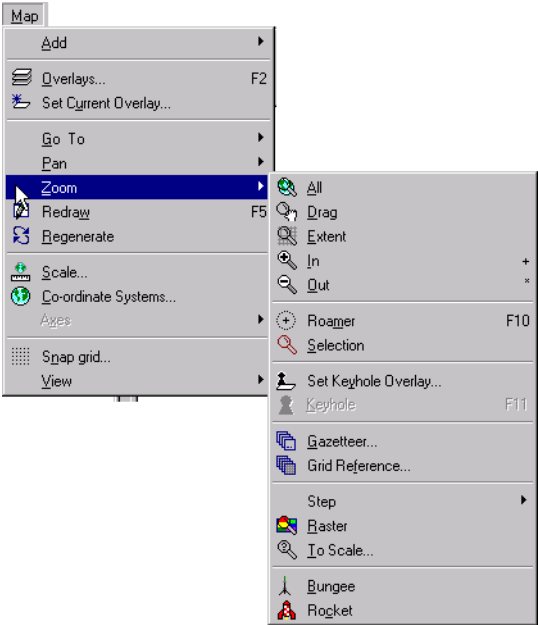
Shift	1 pixel
Ctrl	64 pixels
Shift + Ctrl	half window height and/or width

◆ * and + Keys

Use the multiplication key (*) on the numeric pad to zoom out, and the plus key (+) to zoom in, doubling or halving the area of map displayed. These functions work only on the numeric pad. The * and + keys on the main area of the keyboard do not work in this way.

■ The Zoom commands

The Zoom commands appear on the Map menu, and most of the commands can also be accessed using the icons on the View toolbar. ➤Chapter 3: “Introducing the interface”



Most of the Zoom commands are ‘transparent’, ie you can use them while you are in the middle of another command. ➤page 130, ‘Transparent’ zoom commands

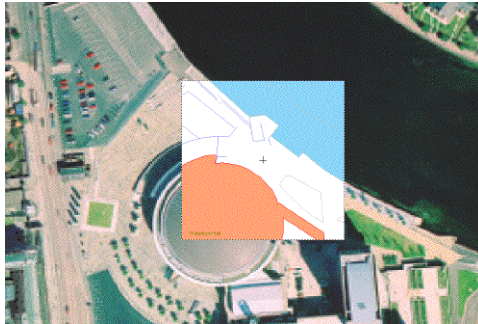
For details of typing co-ordinates, ➤Chapter 33: “Precision dimensions and locations”.

□ Zoom commands

Command	Action
 All	Map>Zoom>All This command zooms out to show the full theoretical extent of the current viewing projection. In the UK, this will be sufficient to show the entire British Isles. It is possible to zoom out further than this, but you will then be operating outside the extent of the current map projection.
 Drag	Map>Zoom>Drag This command lets you zoom in or out by moving the mouse forwards or backwards (moving the pointer up and down the screen) while holding down the primary mouse button.
 Extent	Map>Zoom>Extent This command zooms in or out to display the full extents of all graphics on all overlays in the SWD. Backdrop overlays are ignored, unless there are no other graphics to zoom to.

□ Zoom commands (Continued)

Command	Action
 In/Out	Map>Zoom>In/Out This command zooms the map window in or out to a rectangular area defined by two screen positions. These positions describe the opposing corners of a box which defines the area you wish to zoom to or from.
 Keyhole	Map>Zoom>Keyhole Map>Zoom>Set Keyhole Overlay These commands let you view an area of a lower 'keyhole' overlay through a hole in an overlay above.
	



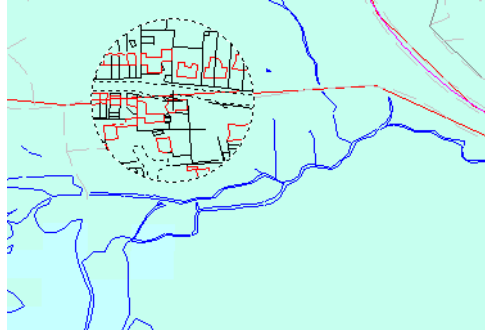
Use the Set Keyhole Overlay command to define the overlay that you want to see through the keyhole. The Keyhole command creates the hole in the top overlay and shows an area of the keyhole overlay through it.

➤page 123, **Keyhole zooming**

 Previous view	Map>Zoom>Previous View This command recalls the previous view to the screen.

☐ Zoom commands (Continued)

Command	Action
 Roamer	Map>Zoom>Roamer (F10) This command gives you a magnifying glass (the Roamer) on your cursor. The Roamer magnifies the graphics underneath it as you move the pointer around:



While using the Roamer, you can increase the magnification by pressing the plus key (+) on the numeric key pad, or decrease the magnification by pressing the asterisk key (*).

You can snap to zoomed graphics while using the Roamer.

The Roamer is a 'transparent' command.

➤page 130, '**Transparent**' zoom commands

You can select a square or circular Roamer, using the **Tools>Preferences...** command.

➤page 592, **User interface and commands**

 Selection	Map>Zoom>Selection (red icon) This command zooms so that the currently selected graphics fill the view. If no graphics are selected this command is unavailable.

 Gazetteer	Map>Zoom>Gazetteer... This command lets you zoom in to a pre-defined location, using a gazetteer.

➤page 124, **Additional gazetteers**

 Grid Reference...	Map>Zoom>Grid Reference... This command displays the Grid Reference dialog. It allows you to type in a Grid Reference and pan the map window to that location. The dialog box remembers previously used grid references.

➤Chapter 12: "**Querying the data in the map window**", **Finding grid references**, page 206

 Step In/Out	Map>Zoom>Step In/Out Zooms into or out of the current window. The centre of the view remains the same, and the zoom factor is changed by a factor of 2. You don't need to give any screen positions.

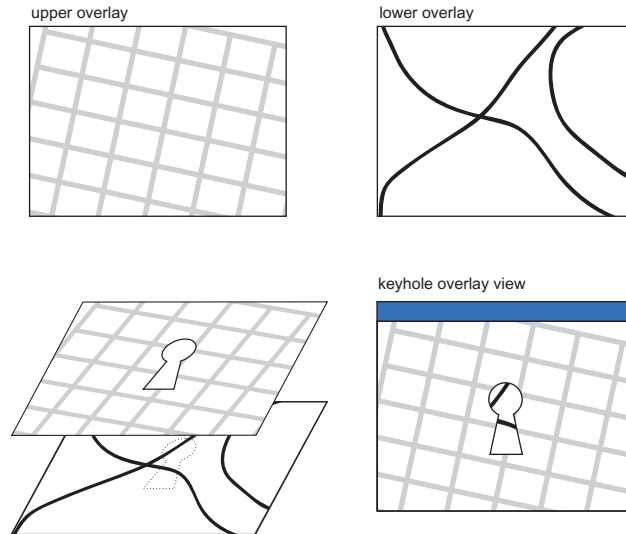
□ Zoom commands (Continued)

Command	Action
 Raster	The Map>Zoom>Raster command sets the view scale so that one pixel in the bitmap or grid item equals one pixel on the screen, to achieve the perfect resolution. To do this, the view is zoomed in or out, using the centre of the screen as the centre of the zoom. 1 Select the bitmap or grid item. 2 Choose the Map>Zoom>Selection command, to centre the raster image on the screen. 3 Choose the Map>Zoom>Raster command. The width (X dimension) will always be correct, and if the bitmap's pixels are square then the height will be correct too. This command also operates without a bitmap or grid item being selected. In this case, Cadcorp SIS searches for a bitmap or grid item and zooms to it.
 To Scale	Map>Zoom>To Scale This command allows you to input a scale at which to display the graphics on screen (eg 1250, 500 etc). The Zoom to Scale dialog also shows the co-ordinates of the centre of the view. You can input a different value for the centre. When you zoom in or out in the map window, this scale changes. This feature allows you to visualise your graphics at your chosen scale which can be useful for checking print displays.
 Zoom Box	Zoom Box Click two positions on the map to define opposite corners of a rectangular area. This area will be enlarged to fit the current window size. This is similar to the operation of Map>Zoom>In.
Rocket and Bungee	The Rocket and Bungee zoom commands are useful when you need to quickly zoom out and back in again, either to 'get your bearings' or to quickly look at the map in more detail. Rocket gives you the impression that you are looking down at the ground from a rocket which takes off rapidly, rises to a certain height, zooming out, and then lands again, zooming back in. Bungee gives you the opposite impression, that you are standing high above the ground, then bungee-jump towards the ground (zooming in), and bounce quickly up again just (before you hit the ground).
 Zoom Overlay	Zoom Overlay This local command zooms the current view in or out so that an overlay fills the window. Select the overlay in the workspace window and choose the Zoom Overlay command from the overlay's local menu.

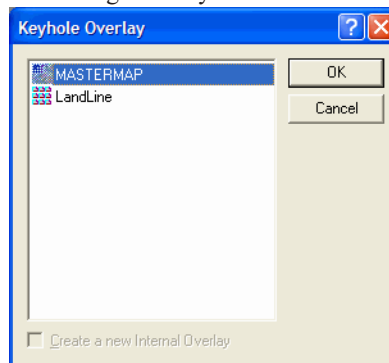
◆ Keyhole zooming

Keyhole zooming is a useful technique for viewing an area of an overlay that lies below another overlay. For example, if you have a vector map of a region and a raster bitmap of the same region lying on top of it, you can use keyhole zooming to make a temporary hole in the raster bitmap to see the vectors below it, ‘through the keyhole’.

The following diagram shows how the lower overlay, which is called the **keyhole overlay**, can be seen through the hole in the upper overlay, even though the rest of the lower overlay is hidden by the opaque bitmap above it.



To use this technique, first choose the **Set Keyhole Overlay** command (**Map>Zoom>Set Keyhole Overlay**) to set the keyhole overlay. The Keyhole Overlay dialog lets you specify which overlay is to be viewed through the keyhole.



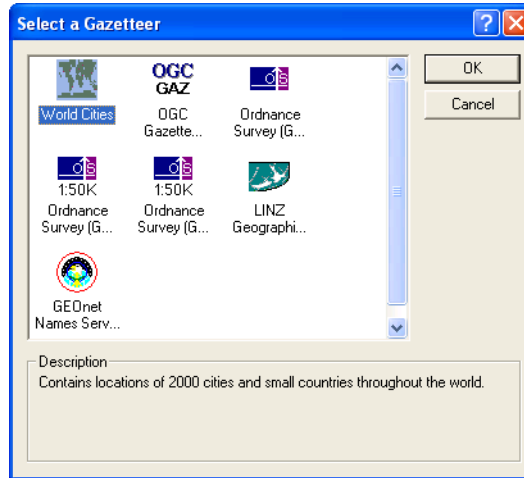
Once the keyhole overlay has been set, choose the **Map>Zoom>Keyhole** command to view the result.

You can change the shape of the keyhole to a square or circle, using the Keyhole shape preference. ➤Chapter 49: “Customising your system”

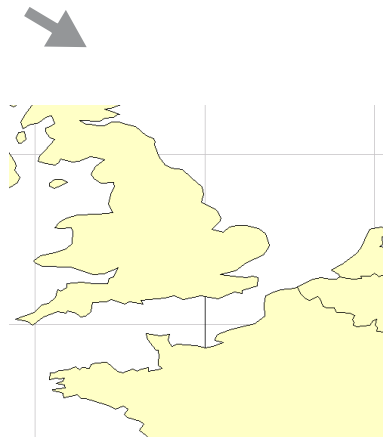
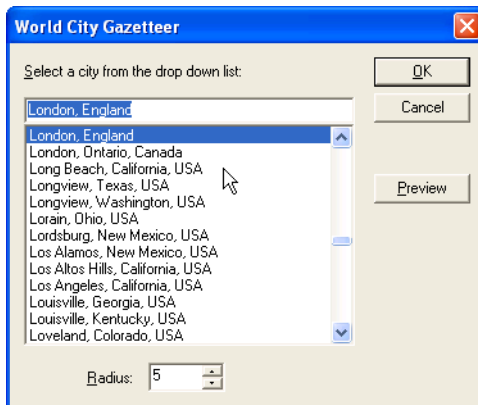
While using the keyhole, you can vary the blending of the overlays within the keyhole by using the scroll wheel on the mouse.

◆ Additional gazetteers

A **gazetteer** lets you find a named location and zoom to it on the map. The **Map>Zoom>Gazetteer...** command lets you select a gazetteer:



Then you can choose a named location, and Cadcorp SIS zooms to it:



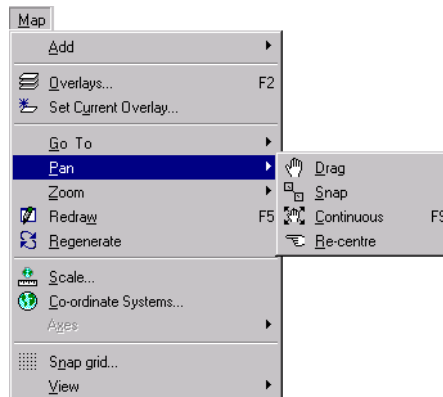
The following additional gazetteers are available for use with Cadcorp SIS. More might be available in the future, from Cadcorp or Cadcorp VARs.

Gazetteer name	Function
World Cities	stores the locations of 2000 cities and small countries throughout the world
OGC Gazetteer Client	a client of an OGC Gazetteer Service, querying locations over the internet
Cadcorp OS MasterMap Gazetteer	contains gazetteers of TOIDs or Cartographic text from a Cadcorp SIS OS MasterMap database ➤Chapter 4: “ Loading data ”
GEOnet Names Server (GNS)	a gazetteer from the US National Imagery and Mapping Agency (NIMA)
LINZ Geographic Place Names Database	the Land Information of New Zealand (LINZ) Geographic Place Name Database
Ordnance Survey 1:50K	a gazetteer directly from an Ordnance Survey (GB) 1:50 000 gazetteer tile
Ordnance Survey GB Locator	a gazetteer from an Ordnance Survey (GB) locator gazetteer file

You can use the Add-In Manager to control which gazetteers are available. ➤Chapter 5: “**File formats**”, **The Add-In Manager (Tools>Add-In Manager)** The **Help>About** command lists all loaded gazetteers.

■ The Pan commands

The Pan commands let you change the visible area of the current map window without changing the zoom factor.



For details of typing co-ordinates, ➤Chapter 33: “**Precision dimensions and locations**”.

◆ **Map>Pan>Drag (“sticky hand panning”)**

- 1 With your cursor at a useful reference point, click and hold. The current view becomes attached to the cursor and remains attached while you move the cursor around, as long as you keep the mouse button held down.
- 2 Drag the graphics in the window as required.
- 3 Press Esc to exit “sticky hand” panning, or select another command.

◆ **Map>Pan>Snap**

- 1 Choose the **Map>Pan>Snap** command.
- 2 Click a position on the map which you want to move to a new location in the view. Alternatively type in the co-ordinates of this position.
- 3 Either:
 - click a second position (or type in its co-ordinates), to which the first point you chose will be moved.
- 4 press Enter to place the first position you chose at the centre of the view.

◆ **Map>Pan>Continuous**

This command dynamically pans over the current map window.

- 1 Click in the window.
- 2 Hold down the mouse button and slide the mouse in the direction of movement.
- 3 Release the mouse when you have moved to the relevant view.
- 4 Press Esc to finish, or select another command.

◆ **Map>Pan>Re-centre**

This command changes the current map window so that it is centred on a snapped position. You can indicate a position in another map window to define the centre.



- 1 Choose the **Map>Pan>Re-centre** command, or press the F11 function key.
- 2 Click on a position in any map window.
- 3 The map window changes so that it is centred on the position you provided.

◆ **Full redraw after pan**

There is a preference which forces Cadcorp SIS to redraw the map window after a pan operation. ➤ Chapter 49: “**Customising your system**”

■ **Saving and recalling views**

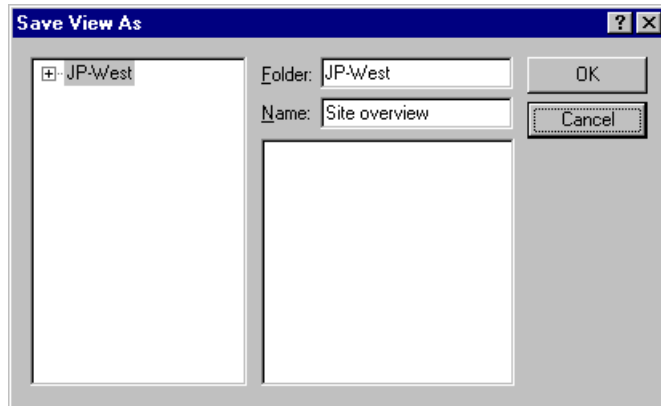
You may store any view which is currently on screen, giving it a name by which to recall it later. Views are named objects, and newly-created ones are stored in the current library.

➤ Chapter 50: “**Named object libraries (NOLs)**”

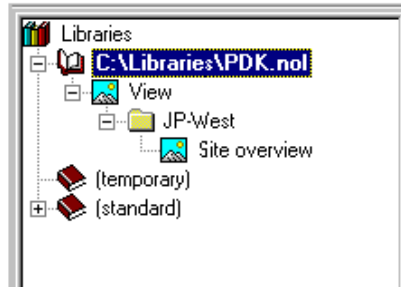
- 1 Zoom and/or pan until the view you have on screen is the view you want to store.
- 2 Make sure the library where you want to place the view is the current library.



- 3 Choose the **Map>View>Store** command. In the Save View As dialog, type in a folder name if you want to create a new folder (you will need to do this if there are no other views in the enabled libraries), or select an existing folder name if appropriate. All view folders in all enabled libraries are listed.
- 4 Enter a name for the view.



- 5 The view is then stored in the current library.



◆ Recalling stored views



Once a view has been stored it can be recalled using the **Map>View>Recall** command. A zoom and pan are automatically carried out so that the stored view fills the current window.

◆ Deleting, copying, and renaming views

A view's local menu on the libraries tab in the workspace window allows you to delete or rename the view, copy it to the clipboard (for pasting into other libraries), or see its properties (its projection and scale).

■ Rotating views



- 1 If you have several windows, click in the window you wish to rotate.
- 2 Choose the **Map>View>Rotate** command.
- 3 Either:

- click two points on the screen. The view will then be rotated so that an imaginary line connecting these points becomes horizontal on the screen.
- press Enter and type in an angle by which to rotate the view in a clockwise direction. If you want to return a rotated view to its original rotation, accept the angle you are prompted with here.

◆ Making point text remain horizontal in rotated windows

Point text with the Horizontal property set to True will always remain horizontal, even when the view is rotated.

This feature only works with point text.

■ Multiple views or windows

◆ Splitting the current window into two



With the **Window>Split Horizontal** and **Window>Split Vertical** commands you can obtain two views of the same map window. If you use both commands, you obtain four views.

If you split the current window in this way, you can zoom and pan in each new view independently (see below), but you cannot resize the views or make further views.

Clicking the command a second time restores the single view.

◆ Creating a new window from a current window



The **Window>New Map Window** command creates a new window containing a view identical to the current one.



The **Window>Create by Zooming** command allows you to select an area of the current view to be shown in a new window.

Whichever command is used, the original window is retained, and another window is created with the same title but suffixed :1, :2, etc.

You can zoom in and out and pan across these windows independently (see below).

These windows may be resized and moved individually, and may be tiled or cascaded using the Tile Horizontally, Tile Vertically or Cascade commands on the Window menu. They can also be split into two using the **Window>Split Horizontal** and **Window>Split Vertical** commands.



◆ Pushing windows and recalling windows

If you are displaying several windows at the same time, the window you want may be obscured by others.



- Using the **Window>Push** command, you can push any window to the bottom of the pile, while still retaining its status as the current window.
- Any window can be brought to the front by selecting its name from the list at the bottom of the main Window menu, or by clicking anywhere within it.

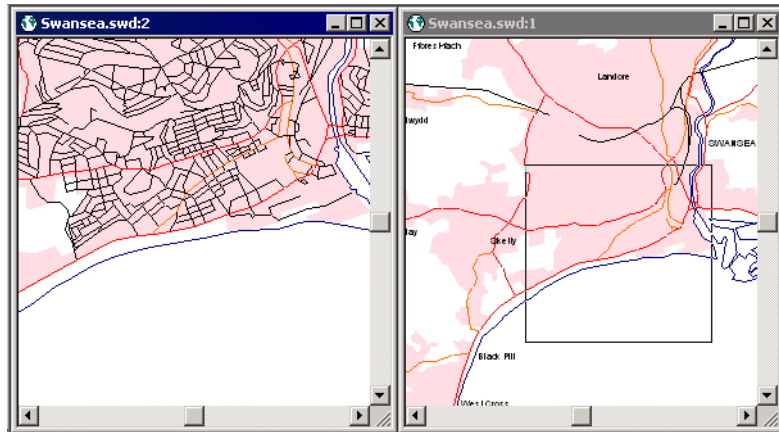


- The **Window>Next** command (Ctrl + F6) makes the next window the current window. ('Next' in this context refers to the window that was created immediately after the current window.)

◆ Zooming and panning in multiple windows

When working with multiple windows, you may zoom or pan in each single window independently, but you may have to select the window you require before carrying out the operation.

In each of the windows except the current window, an outline is drawn to show the extents of the current window (as long as the current window's extents lie within that window):



The outline will normally be a rectangle (as shown above), but it could be a distorted quadrilateral if the view projections are different, or a cone if the current window is 3D.

◆ Using one window as an aid to zooming/panning in another window

You can use one window as a reference view for another when zooming or panning.

Example

Suppose Window 1 displays a large part of a residential area at small scale, while Window 2 is zoomed in to look at just a few of the houses. You now want to change the view in Window 2 to look at a few houses in a different part of the same residential area. Use Window 1 as a reference view in which to select the new area to be viewed in Window 2:

- 1 Click anywhere in Window 2 to make it the current window (the zoom and pan functions operate on the current window).
- 2 Choose the **Map>Pan>Snap** command.
- 3 In Window 1 click on the house you wish to pan to be displayed in Window 2.
- 4 Click in the centre of Window 2 to place the house at the centre of the view.

This technique can also be used with other **Map>Zoom** commands, where you have different SWD files on screen, and use one as a reference view for the other.



The **Map>Pan>Re-centre** command allows you to specify the centre of one map window by clicking in another map window. ➤page 126, **Map>Pan>Re-centre**

■ ‘Transparent’ zoom commands

The zoom commands are transparent commands. You can use any transparent command while you are in the middle of another command, without the need to cancel or complete the command.



To select this feature, choose the ‘Transparent’ Zoom Commands option in the Preferences dialog (**Tools>Preferences...**).

For example, suppose you want to measure the distance between two points that are far apart on the map. You could zoom out so that you can see both points on the screen at the same time, but then you might find it difficult to select them accurately if the display scale is small. Using transparent commands, you could follow this procedure:

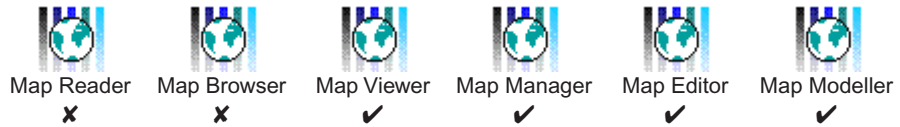


- 1 Choose the **Measure>Distance** command.
- 2 Choose the **Map>Zoom>In** command.
- 3 Zoom in on the first point.
- 4 Select the first point.
- 5 Zoom and/or pan until the second point is easy to select.
- 6 Select the second point, completing the **Measure>Distance** command.

Similarly, you can use the transparent Zoom commands while you are in the middle of constructing graphics, such as lines.



You can use the Roamer (**Map>Roamer**), another transparent command, while you are in the middle of a measure or construction command. The Roamer gives you a magnified view of the graphics immediately beneath the pointer. ➤page 119, **The Zoom commands**



Finding items: queries

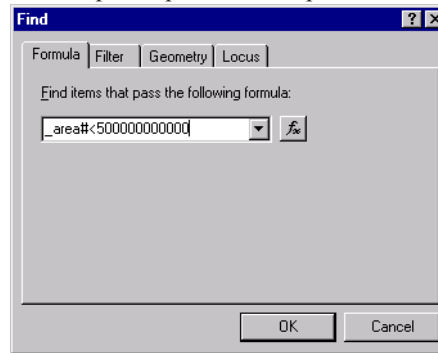
■ Introduction	131
■ Query Wizard	132
■ Spatial tests	135

■ Introduction

◆ How to find items

Cadcorp SIS provides a number of tools for finding items. Two main ones are Find and Query.

The Find command (**Edit>Find**) looks for matching items on all layers and selects them. You can combine attribute and spatial queries. ➤Chapter 34: “Selecting graphics”



The Query command (**Edit>Query**) is a wizard that lets you search one overlay at a time. The results of the query can either be filtered or phased. A filter excludes the items that do not meet the query’s criteria. A phased overlay is a new overlay that draws the matching items again.

Other techniques for finding items



If you want to find grid references, use the **Map>Zoom>Grid Reference...** command. ➤Chapter 12: “Querying the data in the map window”, Finding grid references, page206

For fast queries against Oracle and PostGIS databases, use the Database Query Wizard. ➤Chapter 20: “Databases”, Database Query Wizard

■ Query Wizard

The Query Wizard helps you look for items on an overlay. You can look for:

- items with specific values for one or more attributes (eg house numbers in a certain range, or only those items which are Road Centerlines) ↪ Chapter 14: “**Properties**”
- items whose shape or location has a spatial relationship with the currently selected items (eg inside or overlapping)
- a combination of the above

When it has found matching items, the Query Wizard can either:

- create a new overlay showing the results of the query (↪ Chapter 15: “**Working with overlays**”)
- set the overlay filter or locus so that items matching the query are included

You can also have the query set a filter or locus, so that you can use the items found by the query as the basis for further operations. ↪ Chapter 16: “**Filtering what you see**”, ↪ Chapter 56: “**Spatial testing: loci**”

The Query Wizard is primarily designed for use with memory datasets, such as BDS files. Spatial and attribute queries started by the Query Wizard and run against Oracle, PostGIS, and other cursor-based datasets will take a long time to complete if the datasets are large. For fast queries against Oracle and PostGIS databases, use the Database Query Wizard. ↪ Chapter 20: “**Databases**”, **Database Query Wizard**

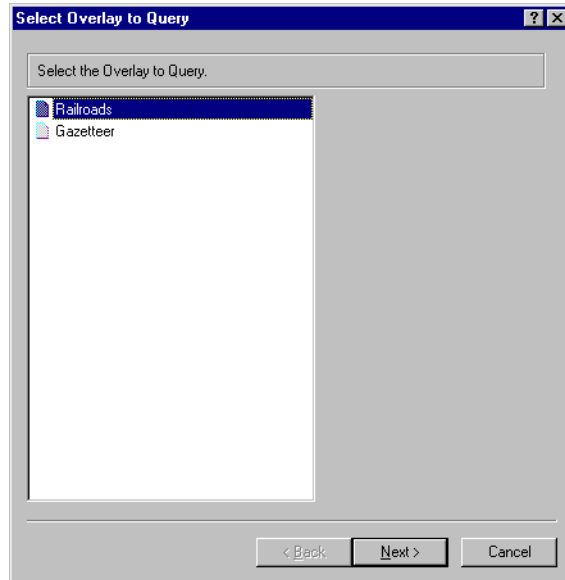
Before you start the Query Wizard, select an item or items if you want to look for other spatially-related items.

1 To start the Query Wizard, do one of the following:



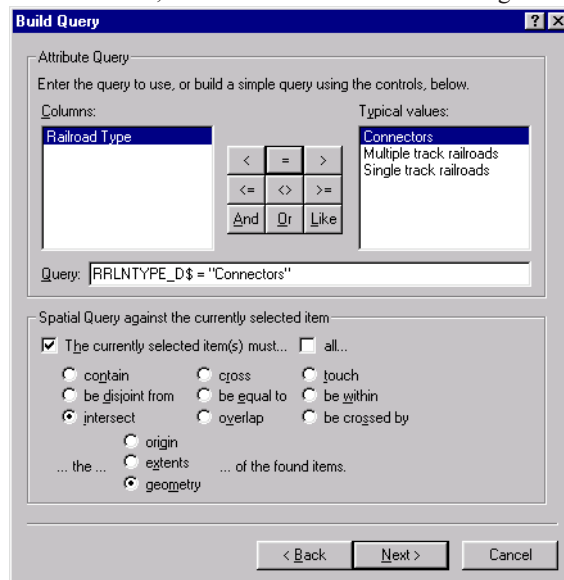
- choose **Edit>Query...**
- choose Query Wizard... from the local menu in the display view tab in the workspace window
- click the Query Wizard icon on a toolbar

- 2 If you have not indicated the overlay, choose the overlay you want to query. (If you use an overlay's local menu, or you have only one overlay open, this step is not required.)



Then click the Next button.

- 3 Construct an attribute query by selecting a column from the list on the left, an operator from the icons in the middle, and a value from the list at the right.



The Typical Values list shows some (but not all) of the values for the column you have selected. Notice that your selection from the Columns list is converted into the correct form for the query.

For information about how the operators work, ➤Chapter 52: “Formulae”.

You can also type a query directly into the Query field.

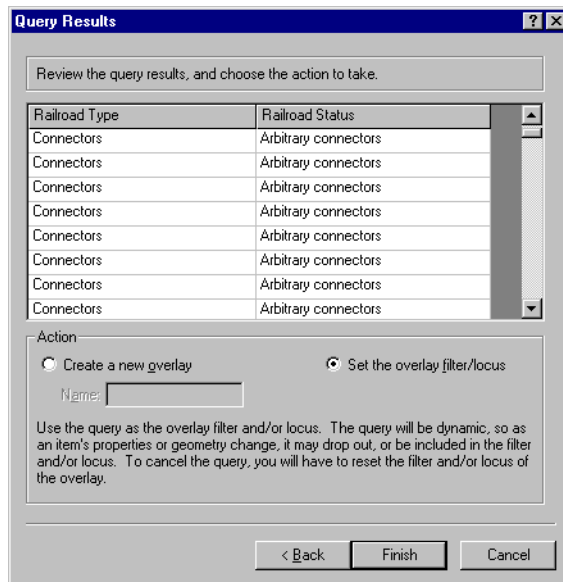
If you selected an item or items before starting the query, you can create a spatial query using the selection. Tick the checkbox next to The currently selected item must... and then choose the test required. ➤table on page 135, **Geometry tests for finding items**.

Choose also whether you want to test against the origin, extents, or geometry of the found items. The geometry of an item is, for an area item, its area; for a line item, its length; for a point item, its x and y co-ordinates. Some of the spatial tests operate differently depending on which of the origin, extents, or geometry is used.

Select the all... checkbox if all the selected items must pass the test, or leave it blank if at least one selected item must pass.

Click the Next> button.

- 4 Review the results of the query, and decide how you want to use the results.



Choose the Create a new overlay radio button to create an overlay using the query as the overlay filter and/or locus. The data will not be copied, just drawn again in another overlay, whose name you supply in the text box.

Or choose the Set the overlay filter/locus option, to use the query as the overlay filter and/or locus.

- 5 Click the Finish button to continue.

If you choose the Set the overlay filter/locus option, the query is dynamic: if an item's properties or geometry changes, it can drop out of, or become included in, the filter and/or locus. To cancel the query, you will have to reset the filter and/or locus of the overlay.

■ Spatial tests

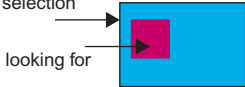
Use the following tests for finding items.

❑ Geometry tests for finding items

Test	Finds items if
contain	their interior is completely inside the selected item
be disjoint from	they are completely separate from the selected item and their boundaries do not touch
intersect	if they have a point in common with the selected item (they must not be disjoint)
cross	line items will be found if they intersect the selected item without being tangential. Other items will be found if their interior intersects with the interior of the selected item and the selected item goes outside the found item.
be equal to	if their geometry is the same as that of the selected item
overlap	If the selected item is a line item, another line item will be found only if the two line items are tangential, and if neither contains the other. With other item classes, an item will be found only if its interior intersects with that of the selected item and neither contains the other.
touch	if its interior is disjoint from that of the selected item and if their boundaries intersect
be within	if the interior of the selected item falls completely within it
be crossed by	line items will be found if they intersect the selected item without being tangential. Other items will be found if their interior intersects with the interior of the selected item and the found item goes outside the selected item.

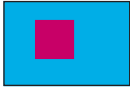
The following tables describe the spatial tests used in Cadcorp SIS.

For example, in the first row, you have selected the rectangular area item, and you want to find the square area item which lies inside it. You can use the Contain, Cross, and Intersect tests. In these tables, the double arrow (↔) at the top of a column indicates that the test item is also returned in the results. So, if you use Contain or Intersect, the test item (a rectangle in this example) is returned.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
selection → 	✓	✓	.	.	.	✓	.	.	.

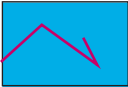
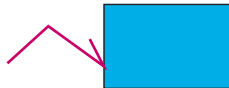
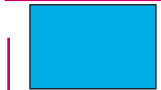
Selected item: area - candidates to find: areas

In this table, the selected item is an area item, and the tests are looking for area items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	.	✓	.	.	.	✓	✓	✓	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	✓	.	.	.	.	.
	.	.	.	.	.	✓	.	.	✓

Selected item: area – candidates to find: lines

In this table, the selected item is an area item, and the tests are looking for line items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	.	✓	.	.	.	✓	✓	✓	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	✓	.	.	.	.	.
	.	.	.	✓	.	.	.	.	.

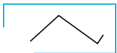
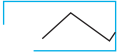
Selected item: area – candidates to find: points

In this table, the selected item is an area item, and the tests are looking for point items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	✓	✓	.	.	.	✓	.	.	.
	.	✓	✓	.	.	✓	.	.	.
	.	.	.	✓	.	.	.	.	.

Selected item: line – candidates to find: lines

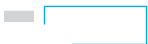
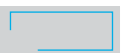
In this table, the selected item is a line item, and the tests are looking for line items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	.	.	.	✓	.	.	.	.	.
	.	✓	.	.	.	✓	.	✓	.
	.	.	✓	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	✓	.	.	.	✓	.	✓	.
	.	.	.	✓	.	.	.	.	.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
	.	✓	.	.	.	✓	.	✓	.
	.	.	.	.	.	✓	✓	.	.
	✓	.	.	.	.	✓	.	.	.

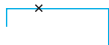
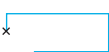
Selected item: line – candidates to find: areas

In this table, the selected item is a line item, and the tests are looking for area items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
	.	.	.	✓	.	.	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	✓	.	.	.	✓	✓	✓	.
	.	.	.	✓	.	.	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	.	.	✓	.	✓	✓

Selected item: line – candidates to find: points

In this table, the selected item is a line item, and the tests are looking for point items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	.	.	.	✓	.	.	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.

Selected item: point – candidates to find: areas

In this table, the selected item is a point item, and the tests are looking for area items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	.	.	.	.	.	✓	.	✓	✓
	.	.	✓	.	.	✓	.	.	.
	.	.	.	✓	.	.	.	.	.

Selected item: point – candidates to find: lines

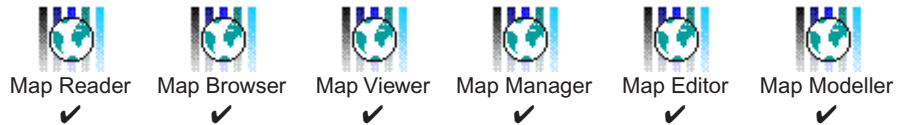
In this table, the selected item is a point item, and the tests are looking for line items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	.	.	.	✓	.	.	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	.	.	✓	.	✓	✓
	.	.	.	✓	.	.	.	.	.

Selected item: point – candidates to find: points

In this table, the selected item is a point item, and the tests are looking for point items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
x	✓	.	.	.	✓	✓	.	.	✓
x x	.	.	.	✓	.	.	.	.	.



Scale

■ What is scale?	143
■ Display scale	143
■ Map scale	147
■ Dataset scale	148
■ Print scale	148

■ What is scale?

The concept of scale appears in several different areas of Cadcorp SIS:

- display scale the reduction factor currently applied to display the maps on your screen
- map scale the factor by which real world items (buildings, roads etc) are scaled to fit on a sheet of paper
- dataset scale relevant to items which do not have real world sizes on the map eg text, symbols and line thicknesses
- print scale scale applied to the maps when they are printed

Display scale, map scale and dataset scale are explained in this chapter. For more about print scale, see Chapter 46: “**Printing: the Print commands**”.

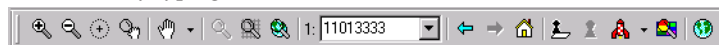
■ Display scale

The display scale is the reduction factor currently applied in order to display the maps on your screen. The current display scale is always shown on the status bar:



The value changes as you zoom in and out.

You can set the scale by typing the value into the Scale box on the View toolbar.



You can also use the **Map>Zoom>To Scale...** command and type in the required scale. The Zoom to Scale dialog also lets you set the centre of the view.

◆ Scale thresholds

You will have seen that, when zoomed in closely on some datasets, all graphics are visible. As you zoom out, smaller details progressively disappear. This is designed to speed up the display of very complex maps.

For example, if you are examining OS LandLine data, when zoomed out Cadcorp SIS might display only road centrelines, water features, railways and administrative boundaries. Zooming in could show building outlines, water features, pecked road metalling, etc (but road centrelines are no longer displayed). Zooming in further will reveal road names, house numbers and other smaller details.

The Cadcorp SIS user interface now uses real numbers for scale thresholds throughout.

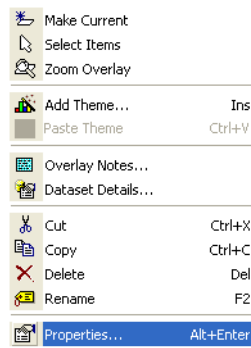
Each map overlay displayed in a map window has minimum and maximum settings, and the overlay is displayed on the screen only when the display scale is between these two settings.

Previous versions of Cadcorp SIS used scale thresholds based upon a logarithmic scale. Although this was efficient for the computer, it was possibly confusing for the user. By default, Cadcorp SIS now uses real numbers typical of mapping scales. However, you can also input any scale value you want.

Setting scale thresholds

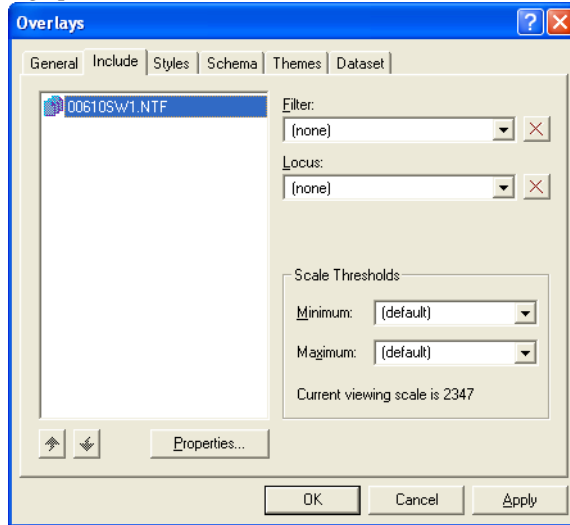
The display scale at which certain data is filtered out is controlled by default settings. However, you can override these settings, either for an entire overlay or for different features in the dataset.

- 1 To display the Overlays dialog, do one of the following:
 - click on the overlay in the workspace window with the secondary mouse button. Choose Properties from the local menu:

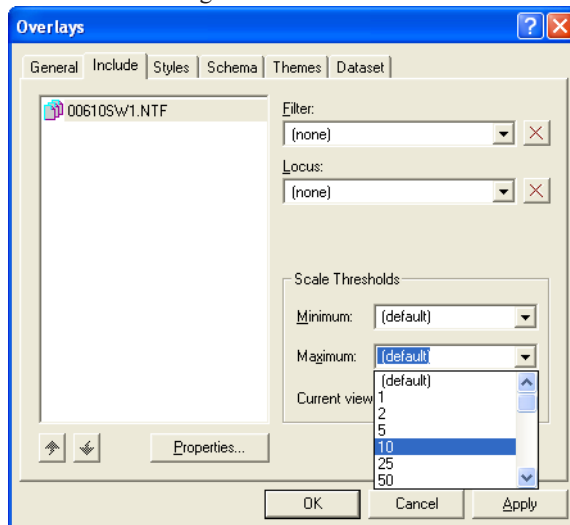


- choose Overlays... from the **Map** menu
- press the F2 key

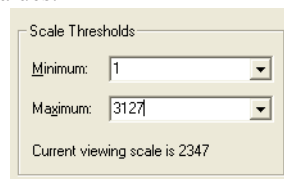
The Overlays dialog opens:



- On the Include tab, click on the Minimum and/or Maximum menus to select from the standard real number scale listing:



Or you can type in your own values:



The Minimum value indicates the lowest number (the largest scale) at which graphics should appear, while the Maximum value indicates the highest number (the smallest scale) at which graphics will be displayed. ➤page 147, **Minimum and Maximum scales**

When you set such an override, all data on the overlay is displayed or not displayed according to the values you gave. This means that different display scales are no longer applied to the different features such as Road Centrelines, Building Outlines, etc.

Using different scale thresholds with different overlays

By setting different display scale thresholds for different overlays, you can build window definitions (SWD files) in which the degree of detail or type of information displayed changes as you zoom in or out.

For example, if you had overlaid architectural plans of certain buildings (in a DXF file) onto your map base. By setting a Maximum scale of 200 on the DXF overlay, you would ensure that this detail would be displayed only when the view was zoomed in to a display scale larger than 1:200. As you zoomed out to a scale smaller than 1:200, the DXF architectural data would no longer appear and the map base would not be cluttered by detail which is too fine to be of use.

Overriding the scale thresholds on features

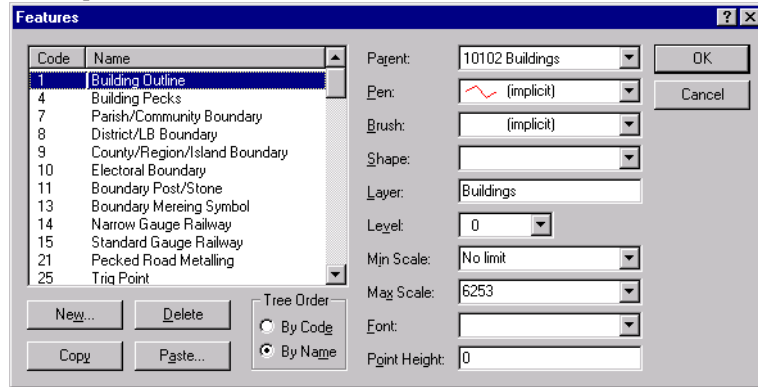
Use this process to set the display scale of individual feature types. An example might be setting the display scale of Road Centre Lines so that they are shown at all scales.

- 1 If you do not know the code of a feature, you can find out by clicking on it and inspecting the properties tab in the workspace window:

Description	Value
Brush	(By Overlay)
Class name	Line
Closed	False
Dataset	S:\NTF\LANDLINE\TALBOT\Ss7E
Description	CENTRE LINE OF ROAD
Feature code	98
Feature table	Land-Line
Geometry class	PtChain<WORD,2,65535> (indexed
Item class	Line
Item ID	10
Layer	Roads
Length	324.608396771687

- 2 Select the feature table you require, eg LandLine, in the workspace window, library view, in the (standard) library.
- 3 Copy and paste the feature table into an editable library.

- 4 Choose Properties from the local menu of this feature table.



- 5 Select the feature code to which you want this filter to apply.
For instance, if you want to change the display scales at which Buildings appear, select feature code 1 from the drop-down list; if you want to change the display scale of Road Centre Lines, select feature code 98 etc.
- 6 Change the Min Scale and/or the Max Scale as required.
- 7 If you have a currently active dataset to which the new limits apply, you may need to redraw the map window to see the changes.
These changes to the properties of this feature code are stored in the current library. From now on you can edit the feature code again by selecting it with a double-click on the libraries tab of the workspace window.

◆ Minimum and Maximum scales

The Minimum scale is the scale below which the data will not be displayed. The Maximum scale is the scale above which the data does not appear. The data to which these scales apply is visible only when the display scale is between these two numbers.

For instance, if you had a Minimum scale of 1000 set for Buildings, and a Maximum scale of 5000, Buildings would be displayed as long as the display scale (as shown on the Status bar) indicated a number between 1000 and 5000.

When setting the Minimum scale and Maximum scale, you select a value from the drop-down list. Possible scales are within the range 1 to 100 000 000. To save storage space, these scales are stored as logarithmic values between 0 and 255. It is not possible to specify certain scale numbers precisely in numbers we normally use. For example, the nearest scale to 1250 is 1276. As this is solely the screen magnification scale, and has no bearing on the actual scale at which data is printed, these approximations are not important.

■ Map scale

Each map window has a map scale. The map scale is the factor by which real world items (such as buildings, roads etc) are scaled to fit on a sheet of paper.



You can change the map scale by selecting the **Map>Scale...** command and typing in a new value. This has no effect on the graphics on screen, but is relevant when you come to print, and is shown as the map window scale in the Print Template Wizard. ➤Chapter 46: “**Printing: the Print commands**”

■ Dataset scale

Items which do not have real world sizes on the map (such as text, shapes and line thicknesses) need to be scaled differently from real world items (roads, buildings, etc). To deal with this, each dataset has a **dataset scale**.

Text, shapes, and line thicknesses will appear the correct size on the screen when the **display scale** is the same as the dataset scale. They will be printed the correct size when the **print scale** is the same as the dataset scale.

Different datasets in an SWD can have different scales, therefore you could overlay maps at a scale of 1:1250 with maps at 1:10 000. External datasets know their dataset scales (eg Land-Line tiles use 1250).

When you create a base dataset file or an internal dataset, they take their dataset scale from the first overlay that has been opened. If there are no overlays open (ie it is a new SWD), the dataset scale will be set to 1. If you wish to alter the dataset scale, you can do this in the Overlay dialog, Dataset tab.

◆ Changing a dataset's scale (editable datasets)

- 1 In the Overlays dialog, select the Dataset tab, and click on the overlay required.
- 2 Type in a new scale in the Scale box.

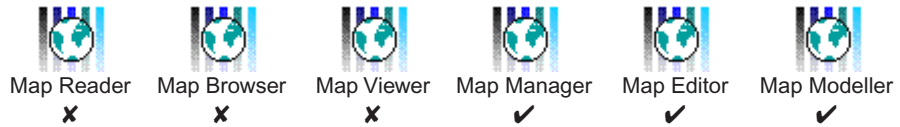
◆ Overriding a dataset's scale

The scale of any dataset can be overridden using the following method:

- 1 In the Overlays dialog, select the Styles tab, and click on the overlay required.
- 2 Click in the Override checkbox against Scale. You can then type in a new scale.

■ Print scale

You can print your maps at any scale. ➤Chapter 46: “**Printing: the Print commands**”



Viewing 3D Data

■ 3D features	149
■ OpenGL	149
■ 3D windows	149
■ Working in a 3D window	150
■ Enhancing 3D views	156
■ Draping bitmap images over 3D data	157

■ 3D features

Cadcorp SIS can:

- display 3D map data, such as Ordnance Survey LandForm Panorama, and drape bitmap images over it
- drape vector or raster data over TINs and DTMs
- display 3D data in a 3D window (which has special 3D viewing capability)

See the following chapters on 3D data:

- ➤Chapter 31: “**Creating 3D data**” for details on constructing 3D geometry, and creating the 3D items surfaces, solids, DTMs and TINs
- ➤Chapter 42: “**Editing TINs**”

■ OpenGL

Cadcorp SIS uses OpenGL, an industry standard 3D software library, to draw 3D data. OpenGL is also a software interface to hardware. This allows graphics card vendors to build OpenGL functionality into their graphics cards, thus increasing 3D performance. Cadcorp SIS does not require any special graphics card because OpenGL is available in the Microsoft Windows operating system. However, adding an OpenGL graphics card can dramatically increase OpenGL performance.

If you find that the 3D window does not open, or crashes Cadcorp SIS, make sure that the hardware acceleration for the display of the operating system is set to None.

■ 3D windows

A 3D window allows you to view and move around 3D data (➤page 150, **Working in a 3D window**).

You cannot edit the graphics in the 3D window, nor can you add new graphics (a 3D window effectively has a status of Visible). Such work must still be carried out in the map window.

3D windows, like map windows, support drag and drop of datasets from the Windows Explorer.

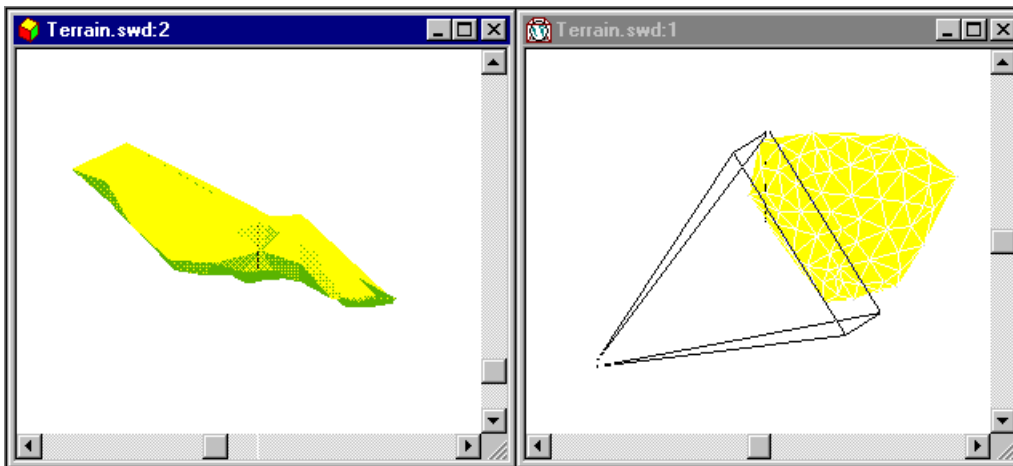
3D windows can be printed either directly using the Print command, or using a print template.

◆ Opening a 3D window

- 1 Make sure that the current window contains the view you wish to see in 3D.
- 2 Choose the **Window>New 3D Window** command.
- 3 Either:
 - click on the screen to select an eye position, then click again to select a look-at position
 - or press the Enter key to see the default view. In this case the XY extents are taken from the view in the map window, and the Z extent is calculated from the items in the visible overlays.

A new 3D window opens. It takes the name of the original SWD, suffixed with the sequential number of this view. To indicate that this is a 3D window, there is a cube symbol in the top left-hand corner in front of the name.

The original map window displays a frustrum, or viewing cone, which indicates the “view from” point and direction used to create the 3D view.



When you next save the SWD, both the map window and the 3D window will be saved.

■ Working in a 3D window

◆ Moving around a 3D window

Scroll bars

3D views have their own scroll bars for controlling angular viewing parameters. The way the scroll bars work depends on which 3D move mode is currently selected.

+ and * zoom keys

You can use the + and * zooming keys in a 3D window to zoom in and out respectively. You must use the keys on the numeric keypad.

Mouse

You can change the viewing parameters dynamically by clicking and holding in the 3D window while moving the cursor.

3D toolbar

The 3D toolbar contains icons for accessing the 3D commands including those associated with moving around the 3D window. In addition it provides the Left, Up, Down, Right, In, and Out buttons for moving around a 3D view:



The way in which the Left, Up, Down, and Right buttons operate depends upon which move mode you are using.

◆ 3D window move modes

There are 5 different modes which can be used when moving around a 3D window. They are selected using the **3D>Move Mode** commands, and affect the way the scroll bars and buttons on the 3D toolbar operate.

**Cruise**

In the cruise mode, you can use the mouse inside the window to move parallel to the ground. This is similar to cruising in a helicopter. It allows advance, retreat and swivelling of the eye left and right, while keeping the height and inclination of line of sight constant.

- Left rotates the view in a horizontal plane around the eye position, moving only the look position. This is like the viewer turning to the left.
- Up moves the eye and look position forwards
- Down moves the eye and look position backwards
- Right rotates the view in a horizontal plane around the eye position, moving only the look position. This is like the viewer turning to the right.

**Eye**

In the eye mode you stay in the same place, but swivel your eyes in different directions.

- Left rotates the view in a horizontal plane around the eye position, moving only the look position. This is like the viewer turning to the left.
- Up moves the eye and look position in the vertical plane. This is like the viewer flying upwards while keeping the eye and view positions.
- Down moves the eye and look position in the vertical plane. This is like the viewer flying downwards while keeping the eye and view positions.
- Right rotates the view in a horizontal plane around the eye position, moving only the look position. This is like the viewer turning to the right.

**Model**

Your position orbits the centre of the 3D items. This is like a sphere: the look position is the centre of the sphere, and the eye position can be anywhere on the surface of the sphere. The Left and Right movements are like tracking along lines of equal latitude. The Up and Down movements are like tracking along lines of equal longitude. This mode is most useful when your eye position is outside the model.

Left rotates the view in a horizontal plane around the original look position, moving only the eye position. This is like the viewer flying clockwise around the look position, keeping the same distance from the look position, while all the time looking at the look position.

Up rotates the view in a vertical plane around the original look position, moving only the eye position. This is like the viewer flying up around the look position, keeping the same distance from the look position, while all the time looking at the look position.

Down the opposite of Up

Right the opposite of Left

**Pan**

Your eye position tracks up/down and left/right. You continue to look in the same direction (but not at the same point in space).

Left moves both the eye and look position perpendicular to the view direction, to the viewer's left

Up moves both the eye and look position perpendicular to the view direction, up towards the viewer's head

Down moves both the eye and look position perpendicular to the view direction, down towards the viewer's feet

Right moves both the eye and look position perpendicular to the view direction, to the viewer's right

**Zoom**

Your eye position moves forwards and backwards. You continue to look in the same direction.

Left widens the angle of vision, which enlarges the image (similar to using a zoom lens)

Up moves the eye and look positions forwards

Down moves the eye and look positions backwards

Right narrows the angle of vision, which reduces the image (similar to using a zoom lens)

◆ If you get lost in a 3D view

Recalling the previous 3D view



The **3D>Previous View** command allows you to get back to the previous view. This is particularly useful if you accidentally move to a location where you cannot see anything.

Resetting the view

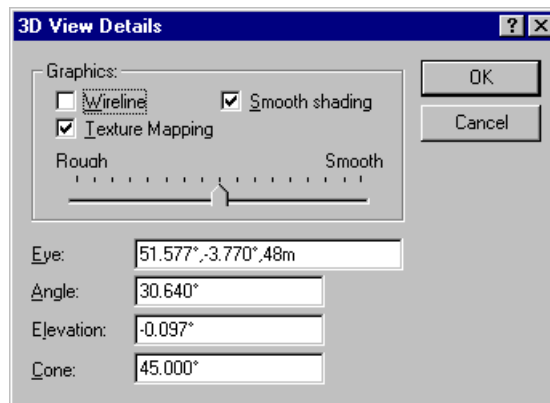


The **3D>Reset** command changes the view of the current 3D window back to its initial state, and therefore to a known position.

◆ Changing the viewing details



The **3D>View Details** command allows you to see and change how the graphics are drawn, and also the viewing parameters (eye location, direction you are looking, and cone of vision).



Eye

This is the position of the eye in 3D space.

Angle and elevation

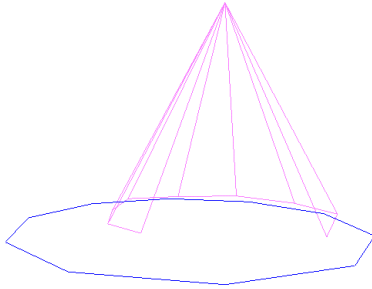
Together these parameters give the direction in which you are looking.

Cone

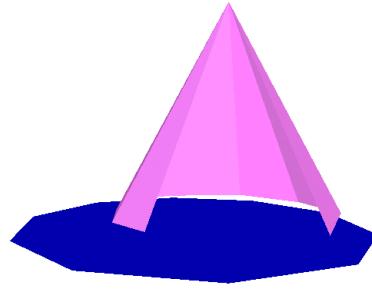
This is the perspective angle, or cone of view.

Wireline

Tick the Wireline checkbox to make any drape present invisible. This allows you to view your data using a wireline model. Deselect the checkbox to make the drape visible and your model displayed with solid colour.



wireline on

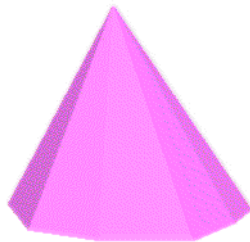


wireline off

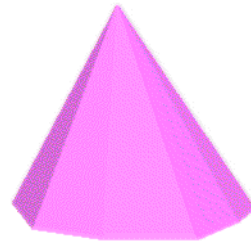
Smooth shading

The following diagram shows the different combinations of the Smooth property and the Smooth shading options for the display of TINs.

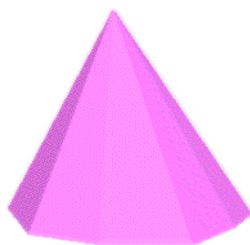
Smooth False, Smooth shading Off



Smooth False, Smooth shading On



Smooth True, Smooth shading Off



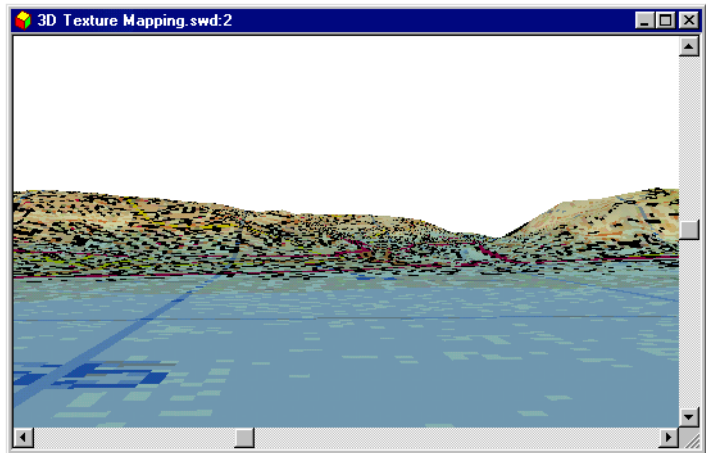
Smooth True, Smooth shading On



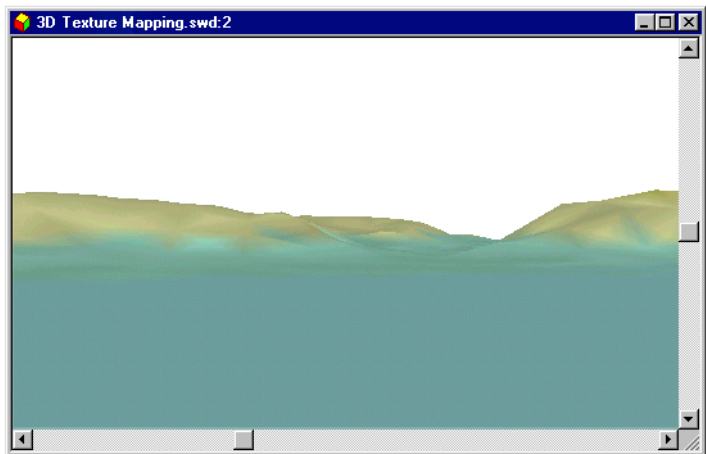
Texture mapping

Texture mapping allows you to make a draped image invisible and to view your model with solid colour.

texture mapping on

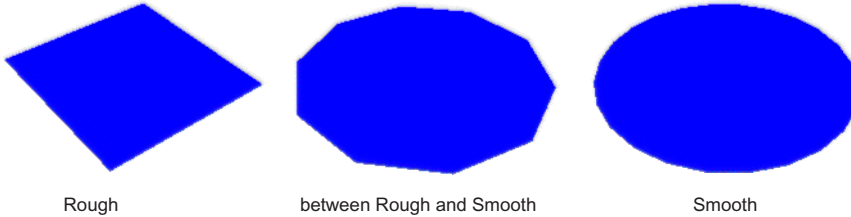


texture mapping off



The Rough to Smooth slider controls the level of faceting for curves, eg for drawing circular Areas in a 3D window.

The faceting is also sensitive to other parameters such as model extents, and the distance from the Eye point to the Look point.



◆ Transparency

Use the Styles tab on the Overlays dialog to control the transparency of 3D objects.
 ➤page233, **Transparency**

◆ The display of 2D items in 3D views



Use the **Tools>Preferences...** command to choose whether 2D items (such as area items) should be filled when displayed in 3D views.

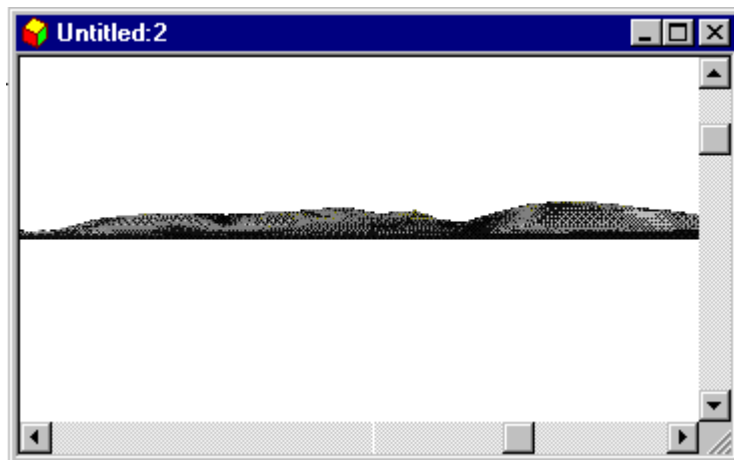
There is also an option for controlling the display of 3D items in 2D views.

■ Enhancing 3D views



By default true heights are displayed in the 3D view. If you wish to increase the height, eg for flat landscapes, you can use the **3D>Exaggerate Z...** command.

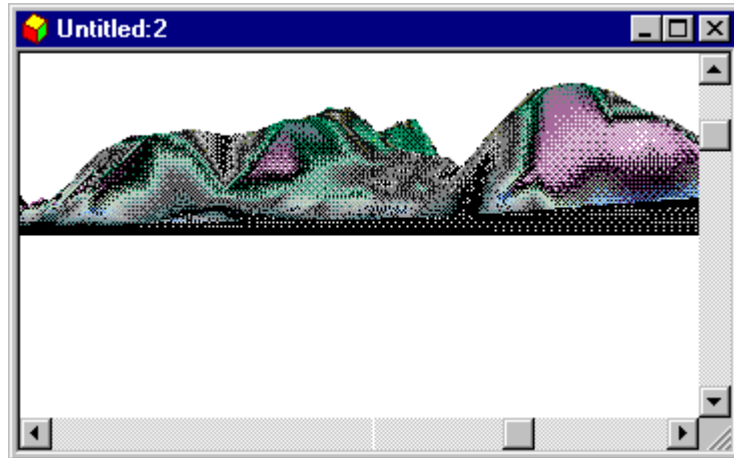
- 1 Make sure the 3D window is the current window.



- 2 Choose the **3D>Exaggerate Z...** command.
- 3 Type in an exaggeration factor.

Map extract © Crown copyright

A factor of greater than 1.0 will make 3D geometry stretch in Z; a factor of less than 1.0 will make 3D geometry shrink in Z. The exaggeration factor is closely related to the scale used. If the scale is large (eg 1:100 000), an exaggeration factor of 10 will not make a visible difference.



Map extract © Crown copyright

■ Draping bitmap images over 3D data

Draping bitmap images is easily achieved using Cadcorp SIS, but it requires a lot of memory. You must have an appropriate image to drape before starting this process.

- 1 Open an image to drape in the current map window. The draping process will use the extents of the map window, so you can adjust the view scale to alter the resolution of your drape.



- 2 Create an image to drape using the **3D>Drape>Save** command. This process saves a named item in the current library called Drape.



- 3 Make the current 2D window display the 3D data. Create a 3D window of the area you wish to drape using **Window>New 3D Window** command. Make sure that in the 3D View Details the graphics have Smooth Shading and Texture Mapping on and Wireline off.



- 4 Choose the **3D>Drape>Drape** command.

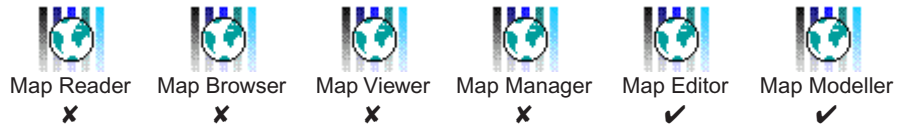
Only one drape image can be recalled at any one time. If another image is draped, that will become the image in the “memory” (similar to the clipboard). However once one image has been draped another can be created for a different drape command.

◆ Colour depth and resolution of the drape image



When you create a drape using the **3D>Drape>Save** command, the colour depth of the drape image will match your screen settings. This means that you may be able to choose between speed and image quality by changing your screen properties.

The resolution of the drape image is determined by your OpenGL driver. In most systems the drape image will be 1024 by 1024 pixels, but if you have hardware-assisted 3D graphics, then you may get a higher resolution drape image.



Working with GPS

■ Cadcorp SIS and GPS	159
■ Connecting to a GPS device	160
■ Working with GPS	162
■ Using GPS log files	165

■ Cadcorp SIS and GPS

This chapter describes how to use GPS devices and data with Cadcorp SIS Map Editor and Map Modeller.

◆ Cadcorp SIS and GPS

Cadcorp SIS provides built-in support for GPS devices. You can:

- connect to a GPS device attached to the computer
- construct graphical data based on GPS positions
- insert the GPS position into any command that is waiting for a position
- control the GPS device using the GPS view tab in the workspace window
- replay saved logs of GPS data

◆ About GPS

The Global Positioning System (GPS) is a network of satellites and earth-based stations built by the US Department of Defense for providing precise location and time details to GPS receivers. A GPS receiver can determine its location on the Earth's surface to accuracies from tens of metres down to millimetres, depending on the type of receiver used. It operates 24 hours a day and can be used in any weather. The GPS signal is provided free of charge. The signals travel by line of sight, meaning they will pass through clouds, glass and plastic but will not go through most solid objects such as buildings or mountains.

A GPS receiver must lock on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track the receiver's movement. With four or more satellites in view, the receiver can determine its 3D position (latitude, longitude, and altitude).

GPS satellites transmit two low power radio signals, designated L1 and L2. Civilian GPS uses the L1 frequency of 1575.42 MHz in the UHF band.

A GPS signal contains three different pieces of information: a pseudorandom code, ephemeris data, and almanac data. The pseudorandom code is an ID code that identifies which satellite is transmitting information. Ephemeris data, which is constantly transmitted by each satellite, contains important information about the status of the satellite (healthy or unhealthy), current date and time. This part of the signal is essential for determining a posi-

tion. The almanac data tells the GPS receiver where each GPS satellite should be at any time throughout the day. Each satellite transmits almanac data showing the orbital information for that satellite and for every other satellite in the system.

An autonomous GPS receiver that observes the L1 code typically gives a horizontal accuracy of around 10 to 20 metres, with altitude accuracy about 35 metres. Higher accuracies of 2 to 5 metres can be obtained by using real-time differential GPS (DGPS), if the GPS receiver is capable of receiving RTCM corrections differential corrections from a local base station.

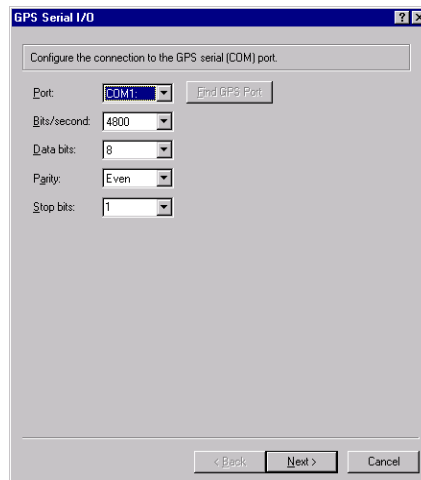
The most widely used standards for GPS data transmission are defined by the NMEA (National Marine Electronics Association). All GPS receivers can output data using the NMEA protocol, and most mapping programs can use it.

■ Connecting to a GPS device

Once you have set up the GPS device and connected it to your computer, you can configure it for use with Cadcorp SIS.

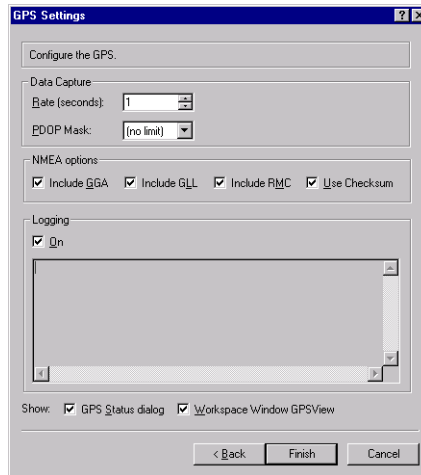
To configure a GPS device:

- 1 Choose **Connect** from the **Tools>GPS** menu. The GPS Serial I/O dialog opens.



- 2 Configure the connection. Refer to the GPS device's documentation for information about connecting the GPS device, and which settings to use. Click Next.

- 3 On the GPS Settings dialog, configure the GPS device.

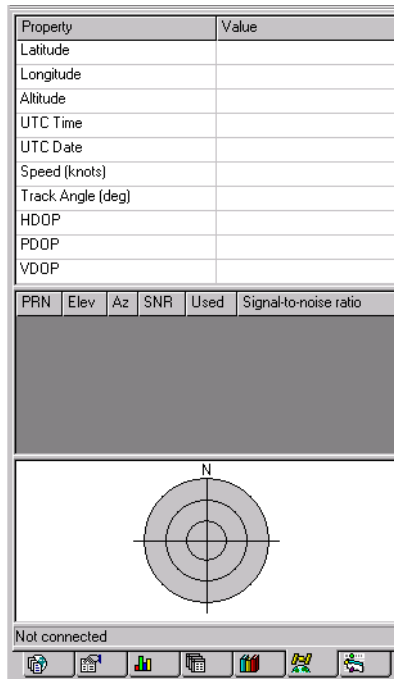


The data capture rate is the time between each GPS fix, in seconds. You can also choose whether to display the GPS status in the GPS dialog box, and whether to display the GPS view tab in the workspace window. Click Finish to complete the task.

■ Working with GPS

◆ The GPS view tab in the workspace window

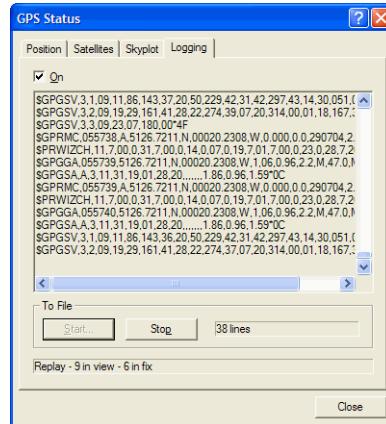
To control and monitor GPS activity, you can display the GPS View tab in the workspace window.



➤ Chapter 13: “The workspace window”

◆ Current GPS status (Tools>GPS>Status)

The GPS Status dialog shows information about the current GPS connection.



On the four tabs you can view:

- the current GPS location
- the satellites
- the skyplot
- the data being logged

You can also view the position, satellites, and skyplot on the GPS view tab in the workspace window.

Satellites

You can display the satellites currently in range, Dilution of Precision (DOP) values, and signal strengths.

To view the satellite information:



- 1 Choose **Status** from the **Tools>GPS** menu.
- 2 Choose the **Satellite** tab.

A Dilution of Precision value is an indicator of satellite geometry for a unique constellation of satellites used to determine a position. Positions tagged with a higher DOP value generally constitute poorer measurement results than those tagged with lower DOP. There are a variety of DOP indicators, such as GDOP (Geometric DOP), PDOP (Position DOP),

HDOP (Horizontal DOP), VDOP (Vertical DOP), and so on. Satellites spread over the sky give lower DOP values, which give positions of lower accuracy, while satellites clustered together give higher values.

PRN	each satellite can be identified by its PRN number, eg PRN10, PRN24. The Satellite information tab shows the satellites that are used in the position fix.
Signal Strength	shows the Signal to Noise Ratio (C/No). The range is from 0 to 99dB. A higher value is always better.
Horizontal Dilution of Precision (HDOP)	an indicator of the geometrical strength of a GPS constellation used for a 3D position solution
Position Dilution of Precision (PDOP)	an indicator of the geometrical strength of a GPS constellation used for a position solution
Vertical Dilution of Precision (VDOP)	an indicator of the geometrical strength of a GPS constellation used for a vertical position solution

Skyplot

The skyplot shows the satellites that are visible in the sky. It shows the azimuth and elevation angle of each satellite. Satellites near the horizon are shown near the edge of the skyplot, while satellites directly overhead are shown near the centre of the skyplot.

The outer ring denotes 0° elevation, the next ring 30° elevation, then 60°, with the middle of the circle showing the point overhead. As the GPS receiver locks onto each satellite, the icon is highlighted, showing you which satellites are going to be used for a position fix.

To view the skyplot:

- 1 Choose **Status** from the **Tools>GPS** menu.
- 2 Choose the Skyplot tab.

Logging

This tab displays the data being logged by the GPS device.

To save the data to a text file, click the Start button. ➤page 165, **Using GPS log files**

◆ Disconnect from GPS (Tools>GPS>Disconnect)



Use the **Tools>GPS>Disconnect** command to disconnect Cadcorp SIS from the GPS device. Remember to close any graphics currently being constructed in Cadcorp SIS from points supplied by the GPS device.

◆ Centre in view (Tools>GPS>Centre in View)

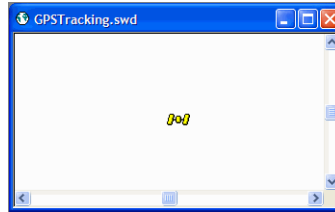


Choose the **Centre in View** command from the **Tools>GPS** menu to pan the map window so that the current GPS location is at the centre of the current map window.

◆ Show (Tools>GPS>Show)



The **Show** command displays a small icon of a satellite in the current map window, showing the current location reported by the GPS device.



◆ Creating graphics using GPS positions (Tools>GPS>Click/Construct)



You can use GPS positions to create graphic items.



Choose **Click** (**Tools>GPS>Click**) to force a mouse click at the current GPS location. This click can either start the construction of a new item or place a point in an existing item.

Choose **Point**, **Line**, or **Polygon** from the **Tools>GPS>Construct** menu to construct new graphic items. Each GPS point adds a vertex to the item.

If you are constructing an item that can be closed, such as an area, close it using the **Close** command (**Tools>GPS>Construct>Close**) before disconnecting from the GPS device.

◆ Display options

You can control the way GPS information is displayed. ➤Chapter 49: “Customising your system”, GPS, page 594

■ Using GPS log files

A GPS device can generate a log file containing a record of the positions that it registers. You can use a GPS log file in Cadcorp SIS even if you don't have a GPS device connected to your computer. For example, you can 'record' data logged during a GPS expedition in the field and 'replay' the expedition on your computer later, when you're back in the office. This allows you to construct graphics from GPS data points, display GPS locations in Cadcorp SIS map windows, and so on, as if you were connected to a real GPS device.

To replay a GPS log file:



- 1 Choose **Log>Replay** from the **Tools>GPS** menu.
- 2 Browse for the log file.

You can choose to replay the log file in real time, so that the data points are output at the same speed as the GPS device originally recorded them. Or you can replay the log file slower or faster. This is useful if, for example, the original GPS log had been created by someone walking. You can increase or decrease the replay speed by changing the Replay rate (milliseconds) value. Valid values are between 50 and 5000 milliseconds. To replay the log faster, choose a smaller value.

Control the replay using the following icons:



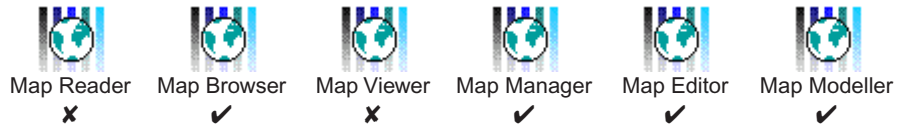
stop



pause



replay



Cadcorp SIS and the Open Geospatial Consortium

■ Open Geospatial Consortium data	167
■ Adding an OGC overlay	169
■ OWD (Open Window Definition) files	193

■ Open Geospatial Consortium data

Cadcorp SIS includes a wide range of OGC-certified compliant interfaces to Web Map Services (WMS), Web Feature Services (WFS), Web Map Context Documents, Geographic Markup Language (GML) and SQL 92 Databases. Cadcorp SIS products allow you to use geographic data stored on web servers. You can:

- download and browse raster images from Web Map Servers and via Web Map Context XML data sources
- download and browse vector data (in Geographic Markup Language format) from Web Feature Servers
- download, browse, and open GML 2.1.2 files
- save the definitions in an Open Window Definition (OWD) file for easy access at a later date

You can add GML files, which can also be themed.

The free Cadcorp SIS Map Browser lets you browse standard geographic data served on the web, and save views of the data in OWD (Open Window Definition) files. ➤page 193, **OWD (Open Window Definition) files**

Cadcorp SIS Map Manager, Map Editor, and Map Modeller products let you create and open OWD files, and save them as SWD files.

➤Chapter 1: “Introduction”, **The Open Geospatial Consortium (OGC)**

◆ Web servers

A Web Map Server (WMS) is a web server that serves raster versions of maps to clients. A Web Feature Server (WFS) serves vector versions of maps to clients. It is possible for the same web server to be configured to serve both WMS and WFS. The data format(s) which expresses and controls the transaction between server and client is GML and/or XML.

◆ Why would you use it?

The importance of OGC standards is growing internationally, as the demand for open systems interoperability in GIS increases. Of great interest worldwide has been the development of web interface standards to allow common access to disparate geographic

information served across the world wide web. The free Map Browser product enables anyone to access WMS or WFS data, view it, query its properties, create thematic maps, and print and save maps for future browsing as an Open Window Definition (OWD).

Your organisation can now set up its own OGC Web Servers using Cadcorp software and then provide Cadcorp SIS Map Browser to access this from outside the organisation with ease.

Cadcorp SIS lets you access different types of OGC dataset, including:

Web Map Server (WMS) datasets

WMS datasets consist of raster images of data. The Web Map Server generates the raster image and sends it to the browser. The original data can be vector or raster, but it is served and rendered as raster on the client side.

Web Feature Server (WFS) datasets

The Web Feature Server (WFS) datasets consist of vector data. The WFS service supplies the geometry and attribute definitions that the Cadcorp SIS Map Browser requests, and sends it in GML form. Because the data consists of feature definitions rather than raster images, you can select features, query their properties, and apply spatial and attribute filters to them. You can also apply themes to the data once it has been downloaded.

Web Map Context (WMC) documents

A Web Map Context (WMC) document contains references to one or more OGC Web Map Server layers. Data in WMC documents is served in layered raster images, rather than as a single raster image. For example, one layer could represent cities, another layer could represent province outlines, and so on. Each raster layer can have transparent values, so that layers underneath them are not obscured.

Geography Markup Language (GML) documents

GML, developed by the Open Geospatial Consortium and based on XML, is a standard language for describing vector-based geographical data. Cadcorp SIS products can read both uncompressed (*.gml) and compressed (*.gzip) GML files.

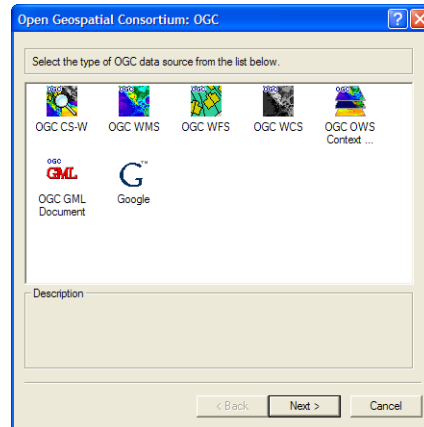
Cadcorp SIS can also act as a client for OGC Catalog Services for the Web (CS-W), querying available OGC services from an OGC CS-W service, and can load data from Google's OGC Web Service search engine.

■ Adding an OGC overlay

◆ To add an OGC overlay

To help you choose the type and source of the data, the Add OGC Overlay wizard takes you through the process of selecting a dataset.

- 1 To start the wizard, choose the **Add OGC Overlay** command from the Map menu. The first dialog of the wizard offers the choice of seven data sources.

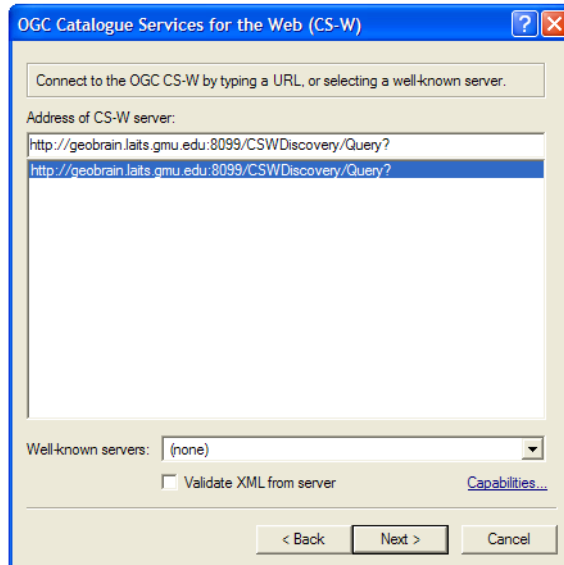


OGC CS-W Catalog Services for the web	This acts as an OGC Catalog Services for the Web (CS-W) client, querying available OGC services from an OGC CS-W service. ➤page 170, To open Catalog Services for the Web (CS-W)
OGC WMS	This acts as an OGC WMS client, downloading raster maps over the web from an OGC WMS. ➤page 173, To open a WMS overlay
OGC WFS	This acts as an OGC WFS client, downloading vector map geometry over the web from an OGC WFS. ➤page 178, To open a WFS overlay
OGC WCS	This acts as an OGC WCS client, downloading coverage data from an OGC WCS. ➤page 188, To open a WCS overlay
OGC OWS Context Document	This opens an OGC Web Services (OWS) or Web Map Context (WMC) Document. A WMC Document contains references to one or more OGC web services, eg WFS, WMS, etc; a WMC document to one or more WMS layers. ➤page 183, To open an OWS or WMS Context Document

OGC GML Document	This opens a GML document. The document can be accessed by an HTTP URL or by file name on a local area network. ➤page 185, To open a GML document
Google	This loads data from Google OGC Web Service search engine. ➤page 191, To load data from the Google OGC Web Service Search Engine

◆ To open Catalog Services for the Web (CS-W)

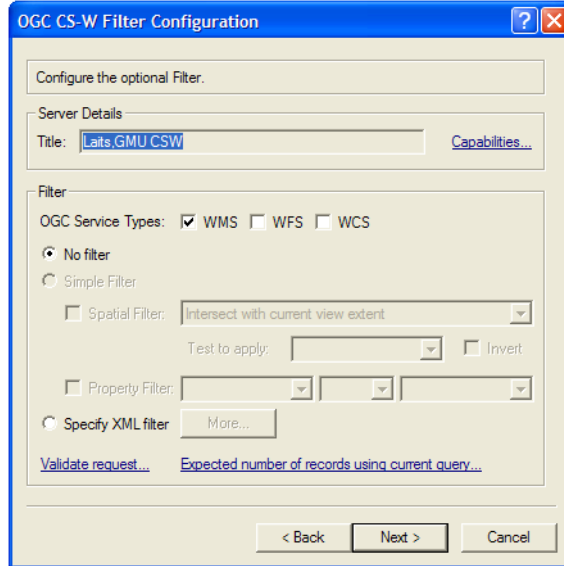
- 1 Choose CS-W overlay on the first step of the Add OGC Overlay wizard.
- 2 Choose the address (the URL) of the Web Map Server from the list of previously accessed sites or from the drop-down menu of well known servers, or type one in the Address field.



The drop-down list contains a number of pre-defined servers. After you have visited a CS-W, its location is stored in this list for future use.

Select the Validate XML from server checkbox if you want to enable validation of the GetCapabilities XML; for WFS, all returned XML is validated, including the final GML. You can also click Capabilities... to display a window that shows the XML file provided by the server, listing its various OGC-related capabilities.

- 3 The next dialog lets you choose optional filters.

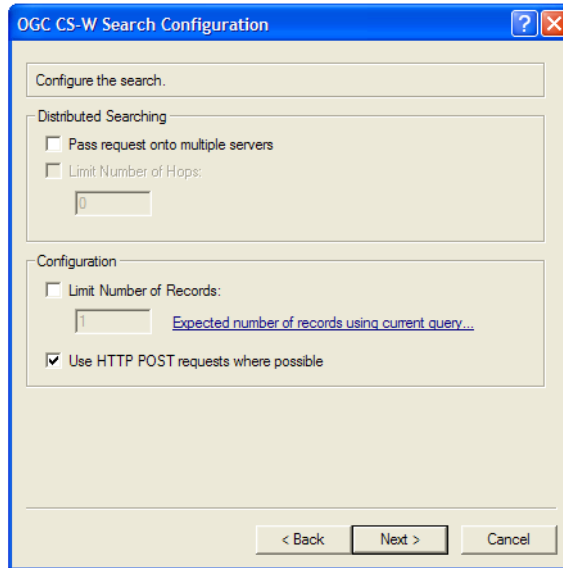


The image shows a dialog box titled "OGC CS-W Filter Configuration". It has a blue title bar with a question mark icon and a close button. The dialog is divided into several sections. At the top, it says "Configure the optional Filter." Below this is a "Server Details" section with a "Title:" label and a text box containing "Laits.GMU CSW". To the right of the text box is a link labeled "Capabilities...". Below the "Server Details" section is a "Filter" section. It starts with "OGC Service Types:" followed by three checkboxes: "WMS" (checked), "WFS", and "WCS". Below this are three radio buttons: "No filter" (selected), "Simple Filter", and "Specify XML filter". Under "Simple Filter", there is a "Spatial Filter:" checkbox and a dropdown menu showing "Intersect with current view extent". Below the dropdown is a "Test to apply:" dropdown and an "Invert" checkbox. Under "Specify XML filter", there are three empty dropdown menus and a "More..." button. At the bottom of the "Filter" section are two links: "Validate request..." and "Expected number of records using current query...". At the very bottom of the dialog are three buttons: "< Back", "Next >", and "Cancel".

Choose if you want WMS, WFS, or WCS data, then click Next.

The **Validate request** option checks that the request you made is valid. The **Expected number of records using current query** option returns the number of records that match the query.

- 4 The next dialog allows further configuration of the search query, allowing you to limit the number of records returned, to pass requests onto multiple servers, and to use HTTP POST requests where possible. Click Next after setting the options.



OGC CS-W Search Configuration

Configure the search.

Distributed Searching

☐ Pass request onto multiple servers

☐ Limit Number of Hops:

0

Configuration

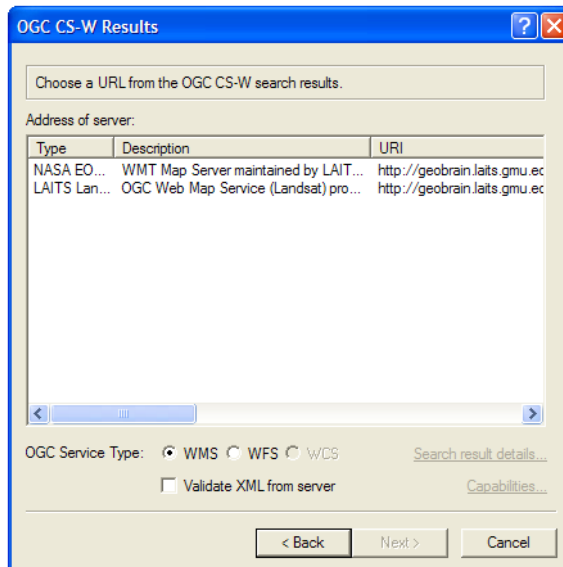
☐ Limit Number of Records:

1 [Expected number of records using current query...](#)

☒ Use HTTP POST requests where possible

< Back Next > Cancel

- 5 On the next dialog, choose a URL from the list of OGC CS-W search results and choose what type of service to use: WMS, WFS or, if available, WCS. Follow the previous instructions (➤page 178, **To open a WFS overlay**, ➤page 183, **To open an OWS or WMS Context Document**, ➤page 188, **To open a WCS overlay**) to continue loading from the CS-W servers.



OGC CS-W Results

Choose a URL from the OGC CS-W search results.

Address of server:

Type	Description	URI
NASA EO...	WMT Map Server maintained by LAIT...	http://geobrain.laits.gmu.ec
LAITS Lan...	OGC Web Map Service (Landsat) pro...	http://geobrain.laits.gmu.ec

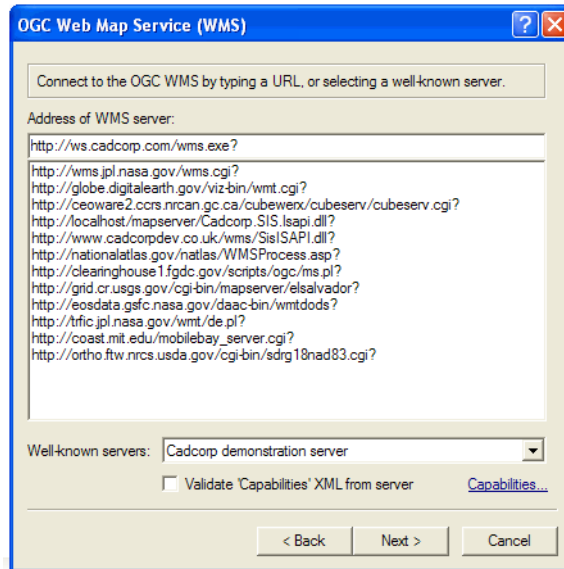
OGC Service Type: ☒ WMS ☐ WFS ☐ WCS [Search result details...](#)

☐ Validate XML from server [Capabilities...](#)

< Back Next > Cancel

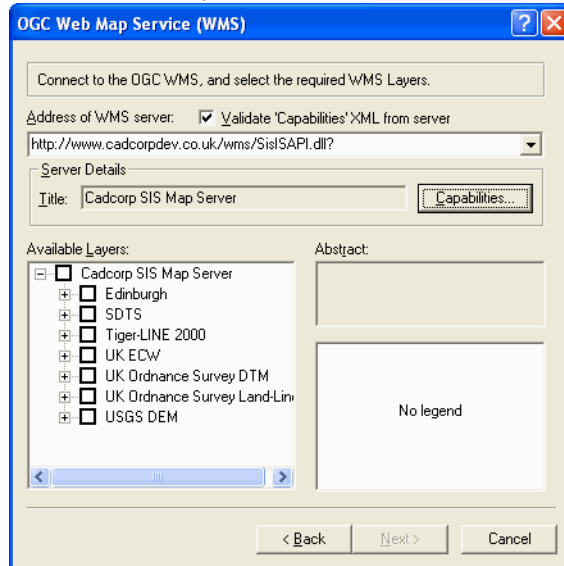
◆ To open a WMS overlay

- 1 Choose the address (the URL) of the Web Map Server from the list of previously accessed sites or from the drop-down menu of well known servers, or type one in the Address field.

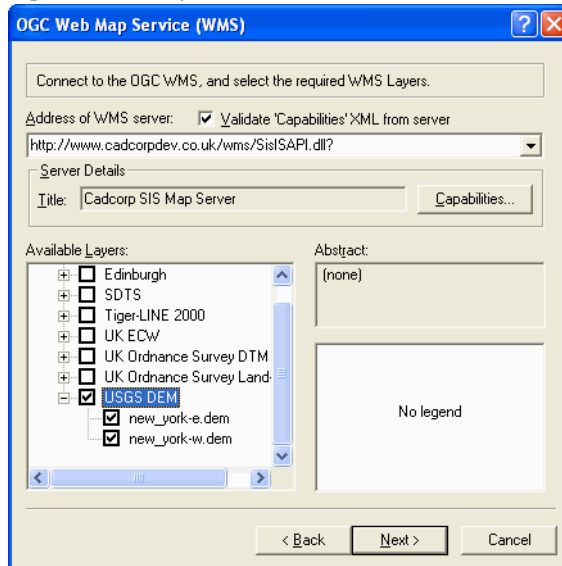


We have included a number of existing WMS servers on this menu.

- 2 The WMS server may provide a list of available layers. Use the Arrow Buttons to select the layers you want to download. Click the > arrow to download one overlay or the >> arrow to download all the overlays from the current selection.

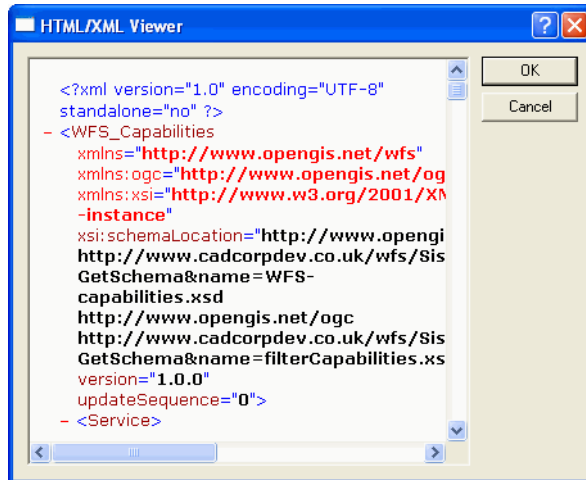


You can also explore the sublayers of some files.

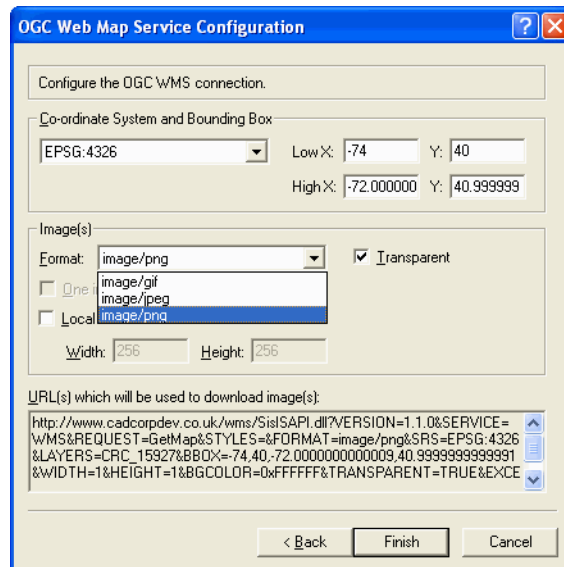


Some servers also provide an abstract and a legend for the data. Otherwise, these areas are blank.

- 3 You can click Capabilities... to display a window that shows the XML file provided by the server, listing its various OGC-related capabilities.



- 4 The next step of the wizard lets you configure the connection. You can select the co-ordinate system and choose a bounding box that defines the extent of the map image.



The Local cache check box lets you control whether Cadcorp SIS maintains a temporary cache of the raster data on your machine. You can use a local cache if you want to choose faster performance at the expense of image quality:

	Local cache	No local cache
speed of zooming in or out	faster: Cadcorp SIS keeps images in memory and re-samples them without querying the server	slower: Cadcorp SIS queries the server after actions such as zooming in
quality of image when zooming in	grainier: Cadcorp SIS uses the first image it received	sharper: Cadcorp SIS receives a higher quality image

➤ page 176, **Resolution**

To select the co-ordinate system, taken from the OGC standard EPSG (European Petroleum Survey Group) code, choose options from the drop-down list. To use a bounding box, type values into the X and Y boxes. If you specify an inappropriate bounding box, the URL string at the bottom of this dialog shows an error (<<invalid bounding box>>).

You can also select the raster formats you wish to render, such as GIF, JPEG, and PNG, and some of these offer a Transparent option. If a specific colour is marked as transparent, data beneath it is not obscured. Options and formats vary according to the facilities offered by the WMS server.

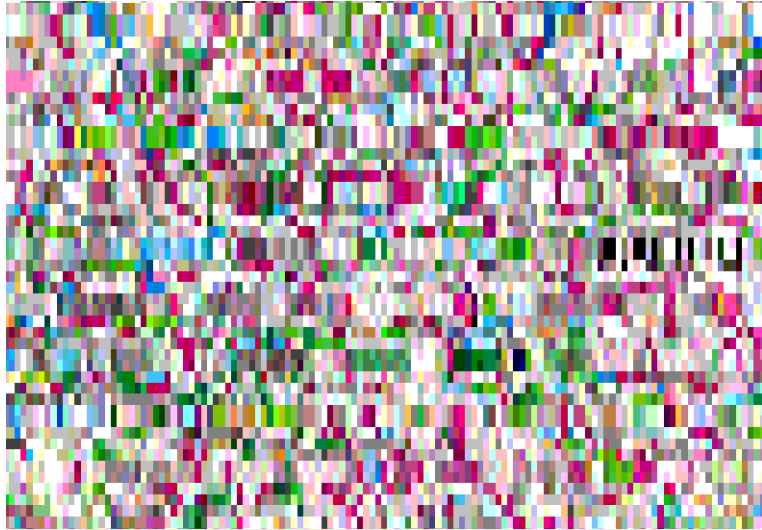
- 5 Click Finish to start downloading the dataset. The overlay opens in a new window, and is added to the display view tab.

◆ Resolution

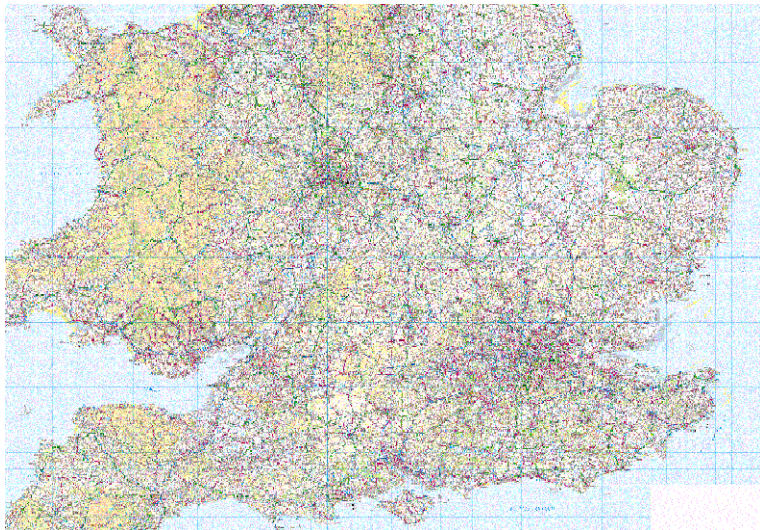
Here is an example map served at the default resolution set by a WMS Server:



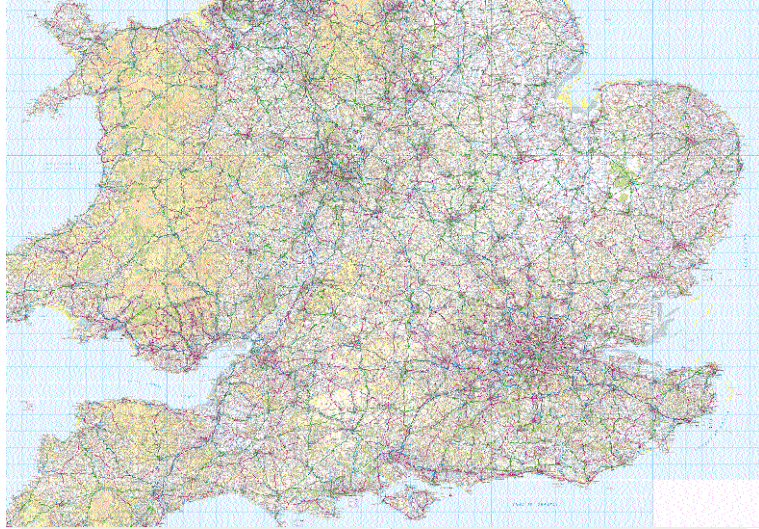
Compare this with the following, which is the same extent of map held in the local cache and at 2560 by 2560 resolution:



Although the previous image isn't useful, it displays like this when you zoom out:

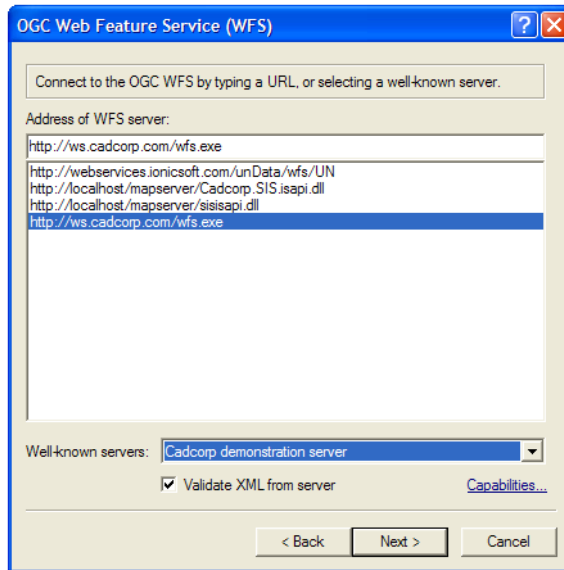


Compare this with the default resolution display:



◆ To open a WFS overlay

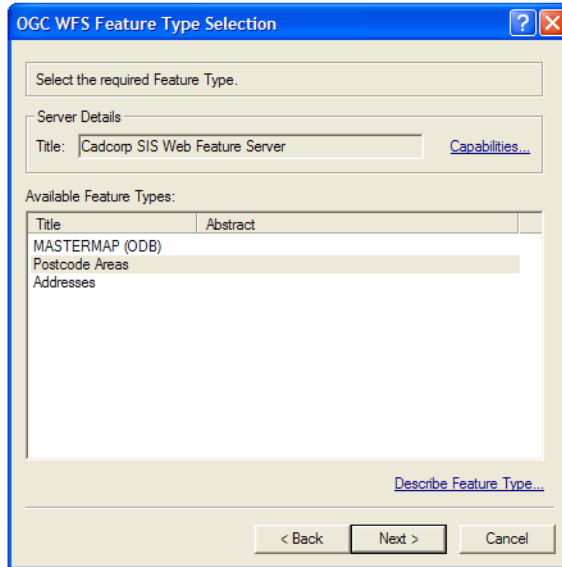
- 1 Choose WFS overlay on the first step of the Add OGC Overlay wizard.
- 2 Choose the address (the URL) of the Web Map Server from the list of previously accessed sites or from the drop-down menu of well known servers, or type one in the Address field.



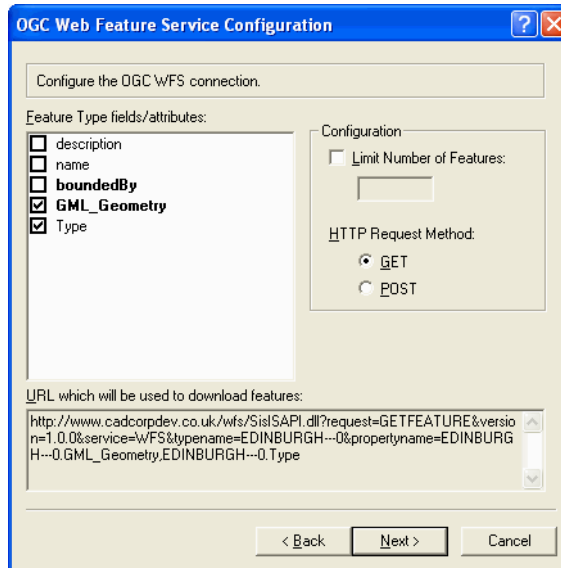
The drop-down list contains a number of pre-defined servers. After you have visited a WFS, its location is stored in this list for future use.

Select the Validate XML from server option if you want to enable validation of the GetCapabilities XML; for WFS, all returned XML is validated, including the final GML. You can also click the Capabilities... button to display a window that shows the XML file provided by the server, listing its various OGC-related capabilities.

- 3 The next dialog lets you choose the feature types that you want to download.



- 4 After selecting the Feature type, you can configure the connection, and change the defaults that are offered by the server. If you want to download only part of the data, type a number into the Limit Number of Features field. Cadcorp SIS retrieves the specified number of features from the remote server.



OGC Web Feature Service Configuration

Configure the OGC WFS connection.

Feature Type fields/attributes:

- ☐ description
- ☐ name
- ☒ boundedBy
- ☒ GML_Geometry
- ☒ Type

Configuration

☐ Limit Number of Features:

HTTP Request Method:

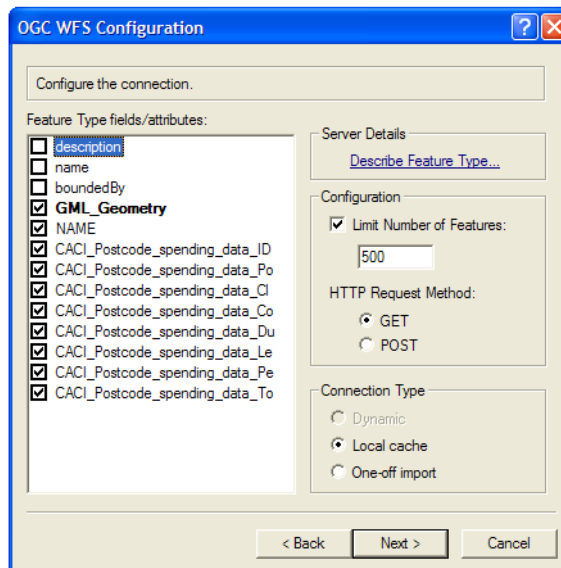
☒ GET

☐ POST

URL which will be used to download features:

`http://www.cadcorpdev.co.uk/wfs/SisAPI.dll?request=GETFEATURE&version=1.0.0&service=WFS&typename=EDINBURGH---0&propertyName=EDINBURGH---0.GML_Geometry.EDINBURGH---0.Type`

< Back Next > Cancel



OGC WFS Configuration

Configure the connection.

Feature Type fields/attributes:

- ☒ description
- ☐ name
- ☐ boundedBy
- ☒ GML_Geometry
- ☒ NAME
- ☒ CACI_Postcode_spending_data_ID
- ☒ CACI_Postcode_spending_data_Po
- ☒ CACI_Postcode_spending_data_Cl
- ☒ CACI_Postcode_spending_data_Co
- ☒ CACI_Postcode_spending_data_Du
- ☒ CACI_Postcode_spending_data_Le
- ☒ CACI_Postcode_spending_data_Pe
- ☒ CACI_Postcode_spending_data_To

Server Details

[Describe Feature Type...](#)

Configuration

☒ Limit Number of Features:

500

HTTP Request Method:

☒ GET

☐ POST

Connection Type

☐ Dynamic

☒ Local cache

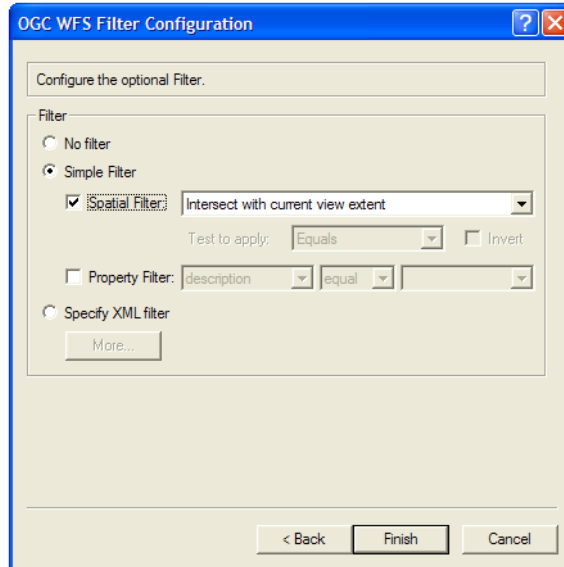
☐ One-off import

< Back Next > Cancel

The HTTP Request Method lets you choose between the GET and POST methods for the request. The GET method uses HTTP query strings, the POST method uses XML queries to request the data. ➤page 182, **HTTP GET and POST query strings**

Click Next.

- 5** On the final dialog, you can filter the features to be downloaded.

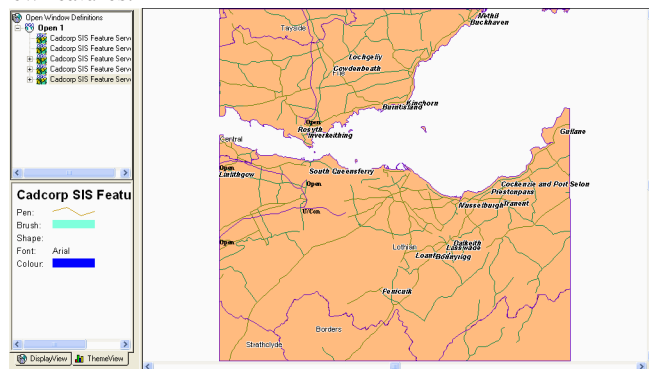


If you choose the No filter option, all features in the extent are downloaded.

The Simple Filter option lets you specify a spatial filter, which returns features only if they satisfy a spatial test, or a property filter, that lets you specify values for a property: only those features that have these property values are downloaded. In this example, a spatial filter downloads only those features that lie within the extent of the current map window.

You can also define your own XML filter for the same purpose.

- 6 Click Finish to start downloading the dataset. The overlay opens in a new window, and is added to the display view tab. You can build up a map by repeating these steps to bring in new features.



HTTP GET and POST query strings

These do not have a fixed maximum length, but Cadcorp SIS imposes a limit of 1024 characters to ensure maximum inter-operability with all HTTP servers and HTTP proxies. If the query is longer than 1024 characters, use the HTTP POST method instead.

HTTP GET is offered because some servers impose a limit on the length of URL that can be processed. These long URLs can also become very hard to read, because so many characters (such as spaces) need to be encoded.

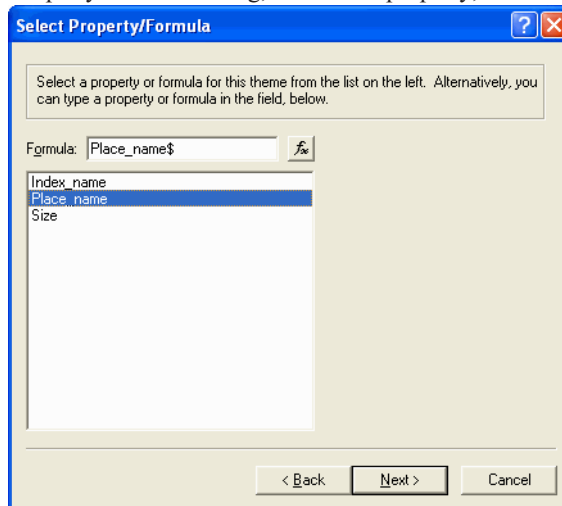
On the other hand, HTTP POST separates the URL and the ‘body’, so that, in this case, an XML encoding of the request is sent to the URL as the body. This allows the body to be longer, because the HTTP server can just keep reading the XML until there isn’t any more. As a rule of thumb, we advise that you use POST wherever possible (some servers do not support it), but you can use GET for debugging. For example, you can paste the URL into a web browser to see what the result is.

◆ Adding a theme to a WFS feature overlay

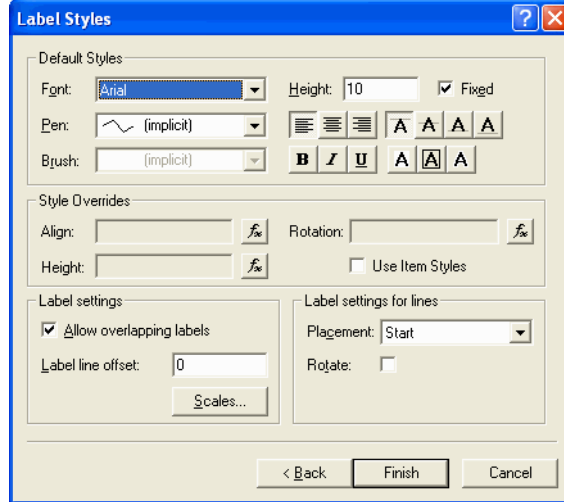
WFS feature overlays are composed of vector geometry items and can be themed in association with any GML attributes that are downloaded with the geometry from the server. For information about creating themes, ➤Chapter 19: “**Thematic mapping**”.

Here is an example showing how to define a Label theme with the Theme Wizard.

- 1 To start the Theme Wizard, choose **Add>Theme...** from the Map menu, or choose Add Theme from the overlay’s local menu.
- 2 On the New Theme dialog, choose Labels.
- 3 On the Select Property/Formula dialog, choose the property, such as Place_name.



- 4 On the Label Styles dialog, make your selections for text and label styles.



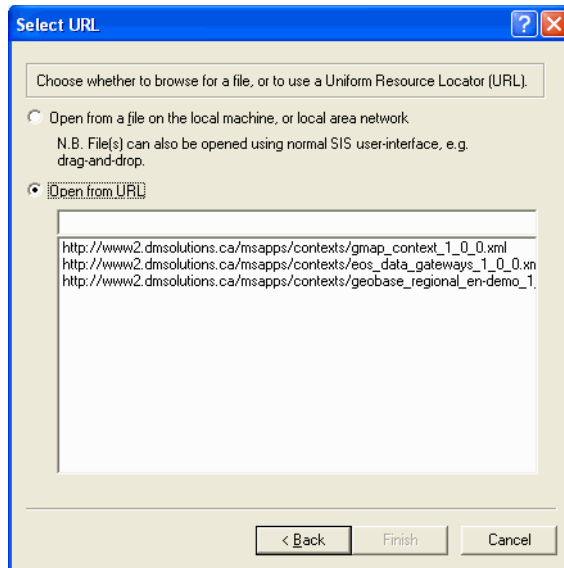
- 5 When you finish, Cadcorp SIS displays the map using your theme.



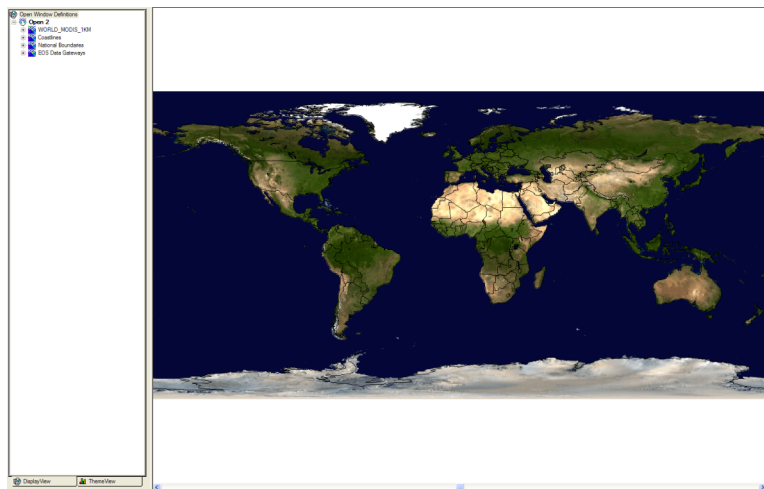
◆ To open an OWS or WMS Context Document

- 1 Choose OGC OWS Context document on the first step of the Add OGC Overlay wizard.

- 2 On the Select URL dialog, choose the URL of the server from the drop-down menu, or type one in the Address field. You can also open a context file that is available on your local machine or network.



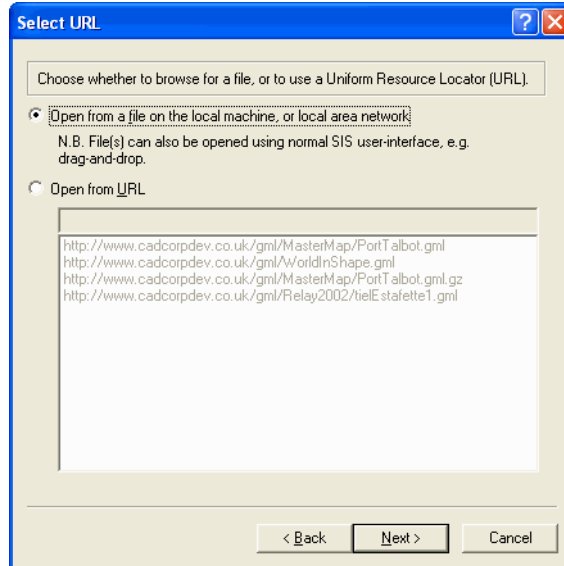
- 3 Click Finish to start downloading data. The overlay opens in a new window, and is added to the display view tab.



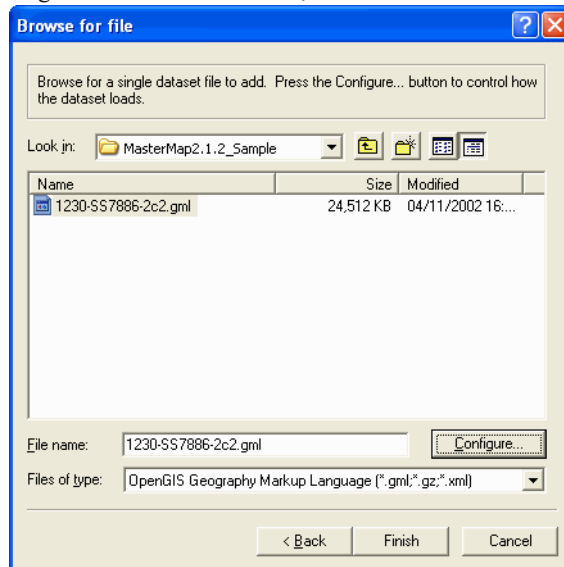
If the document contained references to more than one OGC dataset, Cadcorp SIS creates multiple OGC WMS or WFS Overlays. You can view these overlays in the workspace window. You can hide or display different overlays by clicking the icons in the display view.

◆ To open a GML document

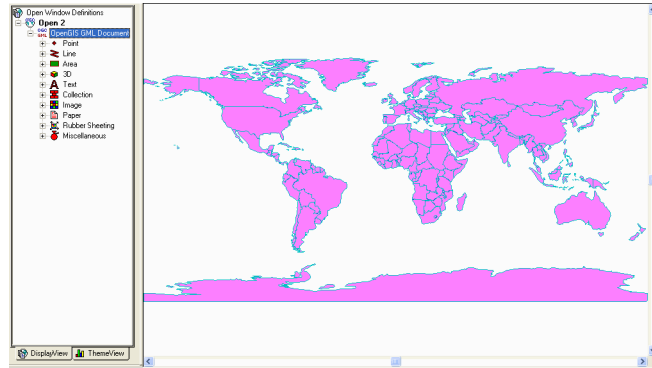
- 1 Choose GML overlay on the first step of the Add OGC Overlay wizard.
- 2 On the Select URL dialog, choose the location of the GML file. Select the top radio button to look for GML files on your local machine or network. Select the bottom radio button to download GML data from a server.



If you are looking for a file on the network, locate it with the Browse for file dialog.

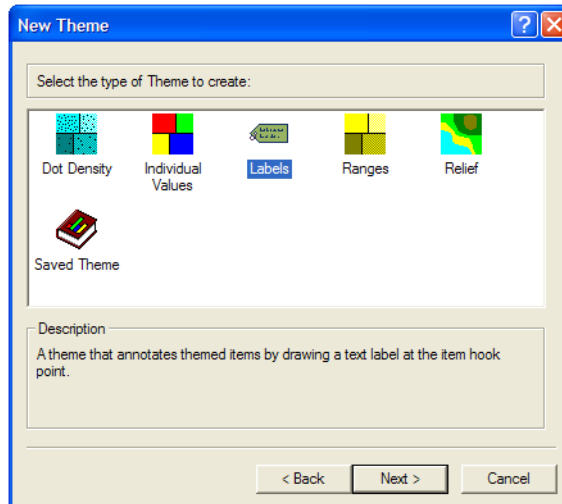


- 3 Click Finish to start loading the GML data. The overlay opens in a new window, and is added to the display view tab.

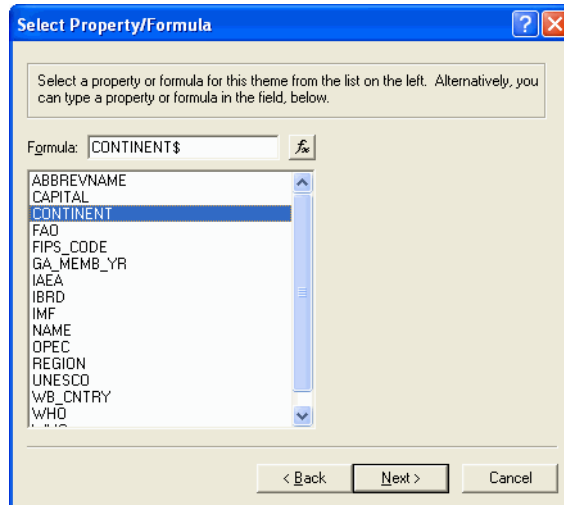


Because the GML file is a vector file with attributes, you can apply themes to GML files as you can to WFS feature overlays. ➤page 182, **Adding a theme to a WFS feature overlay** For example, you could use the Individual Values theme to apply colours to continents on the world map.

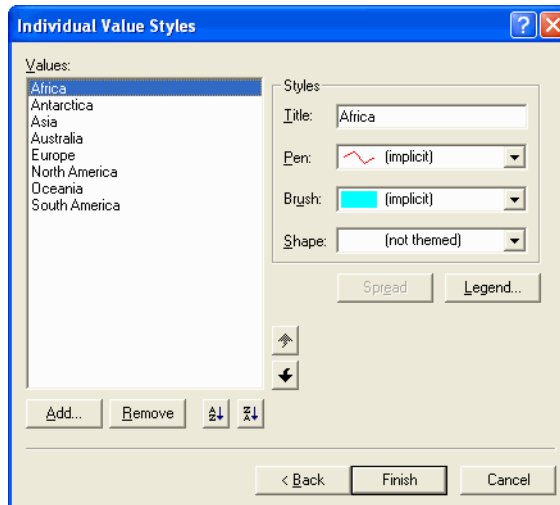
- 4 Choose the Individual Values theme icon in the New Theme wizard.



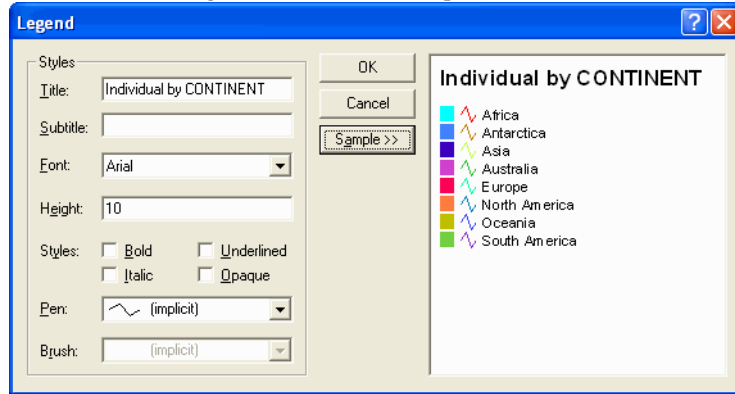
- 5 Select the property to be themed. For world continents, we choose CONTINENT\$.



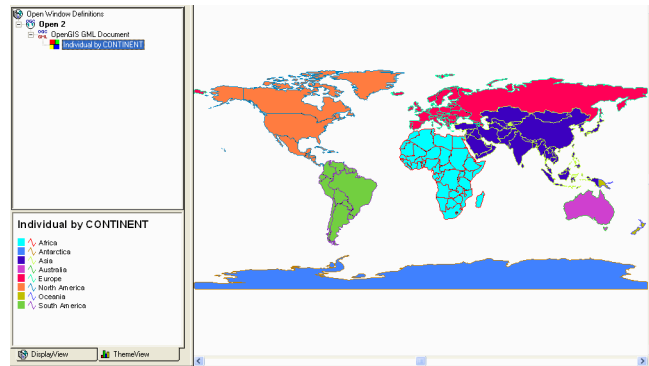
- 6 Choose styles and colours for each value.



- 7 You can also define a Legend for the themed map.



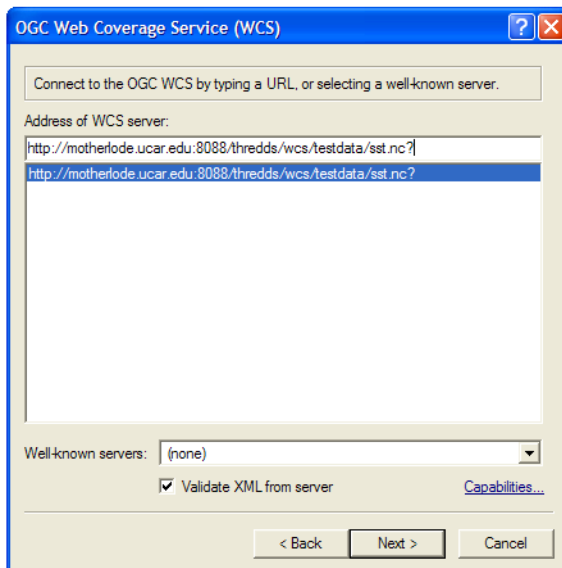
The themed map looks like this:



◆ To open a WCS overlay

- 1 Choose WCS Overlay on the first step of the Add OGC Overlay wizard.

- 2 Choose the address (the URL) of the Web Coverage Service from the list of previously accessed sites or from the drop-down menu of well known servers, or type one in the Address field.



OGC Web Coverage Service (WCS)

Connect to the OGC WCS by typing a URL, or selecting a well-known server.

Address of WCS server:

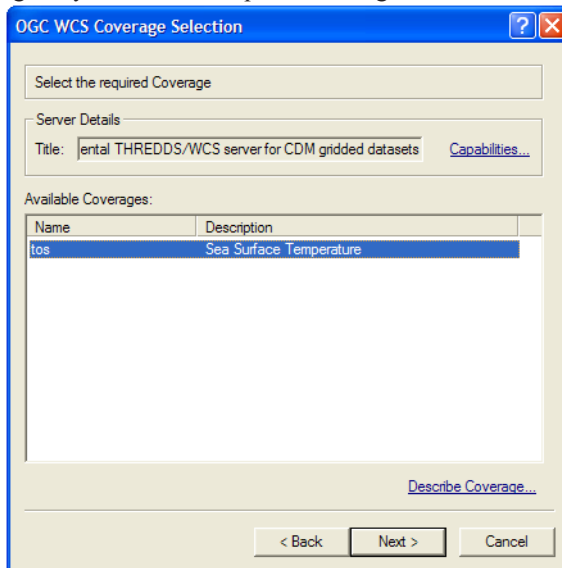
<http://motherlode.ucar.edu:8088/thredds/wcs/testdata/sst.nc?>

Well-known servers: (none)

☒ Validate XML from server [Capabilities...](#)

< Back Next > Cancel

- 3 The next dialog lets you select the required coverage. Click Next.



OGC WCS Coverage Selection

Select the required Coverage

Server Details

Title: [ental THREDDS/WCS server for CDM gridded datasets](#) [Capabilities...](#)

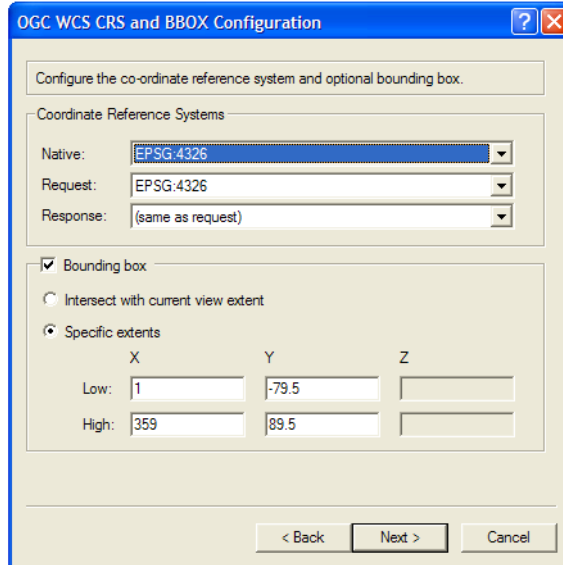
Available Coverages:

Name	Description
tos	Sea Surface Temperature

[Describe Coverage...](#)

< Back Next > Cancel

- 4 This dialog lets you configure the connection. You can select the co-ordinate system and choose a bounding box that defines the extent of the map image. Click Next.



OGC WCS CRS and BBOX Configuration

Configure the co-ordinate reference system and optional bounding box.

Coordinate Reference Systems

Native:

Request:

Response:

☒ Bounding box

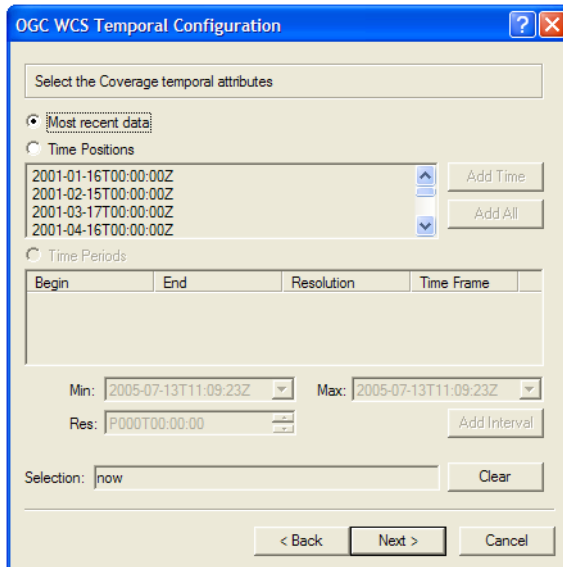
☐ Intersect with current view extent

☒ Specific extents

	X	Y	Z
Low:	1	-79.5	
High:	359	89.5	

< Back Next > Cancel

- 5 You can now choose the option of loading one particular time position to view. Click Next.



OGC WCS Temporal Configuration

Select the Coverage temporal attributes

☒ Most recent data

☐ Time Positions

2001-01-16T00:00:00Z	Add Time
2001-02-15T00:00:00Z	Add All
2001-03-17T00:00:00Z	
2001-04-16T00:00:00Z	

☐ Time Periods

Begin	End	Resolution	Time Frame

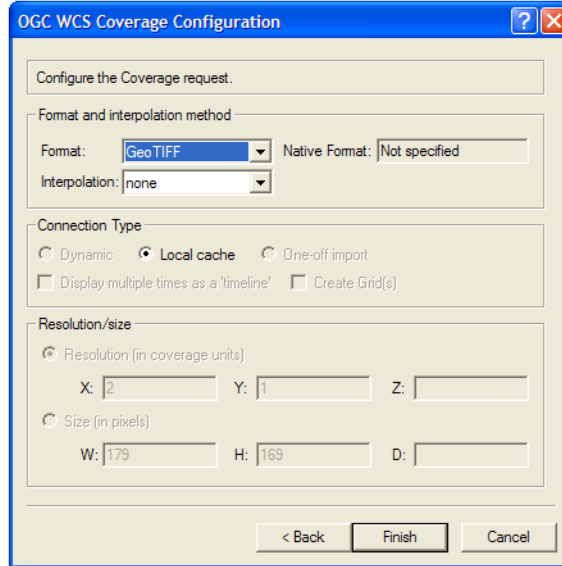
Min: Max:

Res:

Selection:

< Back Next > Cancel

- 6 On the final dialog, you can select what raster format you wish to render. Click Finish.



The image shows the 'OGC WCS Coverage Configuration' dialog box. It has a blue title bar with a question mark and a close button. The dialog is divided into several sections. The first section is 'Configure the Coverage request.' followed by a text input field. The second section is 'Format and interpolation method' containing a 'Format:' dropdown menu set to 'GeoTIFF', a 'Native Format:' text input field set to 'Not specified', and an 'Interpolation:' dropdown menu set to 'none'. The third section is 'Connection Type' with three radio buttons: 'Dynamic', 'Local cache' (which is selected), and 'One-off import'. Below these are two checkboxes: 'Display multiple times as a 'timeline'' and 'Create Grid(s)'. The fourth section is 'Resolution/size' with two radio buttons: 'Resolution (in coverage units)' (selected) and 'Size (in pixels)'. Under 'Resolution' are three text input fields for 'X:', 'Y:', and 'Z:'. Under 'Size' are three text input fields for 'W:', 'H:', and 'D:'. At the bottom are three buttons: '< Back', 'Finish', and 'Cancel'.

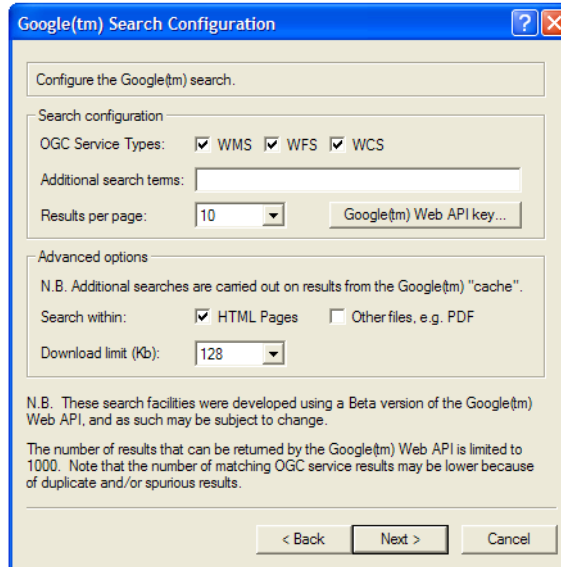
◆ To load data from the Google OGC Web Service Search Engine

- 1 Choose the Google icon on the first step of the Add OGC Overlay wizard.



The search facilities were developed using a Beta version of the Google web API, and as such may be subject to change.

- 2 Choose the type of OGC service you wish to search for by selecting the appropriate checkbox. Add in any additional search terms if required.



Google(tm) Search Configuration

Configure the Google(tm) search.

Search configuration

OGC Service Types: ☒ WMS ☒ WFS ☒ WCS

Additional search terms:

Results per page: [Google\(tm\) Web API key...](#)

Advanced options

N.B. Additional searches are carried out on results from the Google(tm) "cache".

Search within: ☒ HTML Pages ☐ Other files, e.g. PDF

Download limit (Kb):

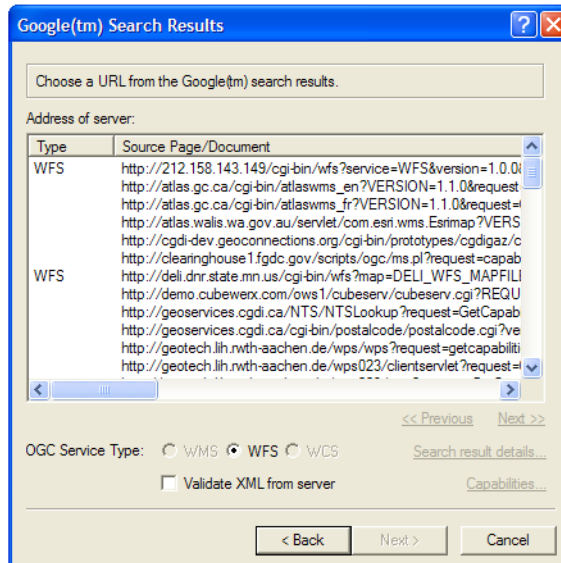
N.B. These search facilities were developed using a Beta version of the Google(tm) Web API, and as such may be subject to change.

The number of results that can be returned by the Google(tm) Web API is limited to 1000. Note that the number of matching OGC service results may be lower because of duplicate and/or spurious results.

< Back Next > Cancel

The Advanced options section allows you to search within HTML pages and other files such as PDF, from the Google cache. Click Next.

- 3 From the list of returned URLs, choose the one you would like to download data from.



Google(tm) Search Results

Choose a URL from the Google(tm) search results.

Address of server:

Type	Source Page/Document
WFS	http://212.158.143.149/cgi-bin/wfs?service=WFS&version=1.0.0
	http://atlas.gc.ca/cgi-bin/atlaswms_en?VERSION=1.1.0&request=
	http://atlas.gc.ca/cgi-bin/atlaswms_fr?VERSION=1.1.0&request=
	http://atlas.walls.wa.gov.au/servlet/com.esri.wms.Esrimap?VERS
	http://cgdi-dev.geoconnections.org/cgi-bin/prototypes/cgdi-gaz/c
	http://clearinghouse1.fgdc.gov/scripts/ogc/ms.pl?request=capab
WFS	http://deli.dnr.state.mn.us/cgi-bin/wfs?map=DELI_WFS_MAPFIL
	http://demo.cubewerx.com/ows1/cubeserv/cubeserv.cgi?REQU
	http://geoservices.cgdi.ca/NTS/NTSLookup?request=GetCapab
	http://geoservices.cgdi.ca/cgi-bin/postalcode/postalcode.cgi?ve
	http://geotech.lhn.rwth-aachen.de/wps/wps?request=getcapabili
	http://geotech.lhn.rwth-aachen.de/wps023/clientervlet?request=

< Previous Next >>

OGC Service Type: ☐ WMS ☒ WFS ☐ WCS [Search result details...](#)

☐ Validate XML from server [Capabilities...](#)

< Back Next > Cancel

- 4 Depending on the type of dataset you select, follow the previous instructions (➤page 178, **To open a WFS overlay**, ➤page 183, **To open an OWS or WMS Context Document**, ➤page 188, **To open a WCS overlay**) to continue loading from list of URLs provided by Google.

■ OWD (Open Window Definition) files

◆ OWD (Open Window Definition) files

An OWD file is an assembled view of one or more datasets. It is normally a small file, containing little actual data, but holding a record of the following:

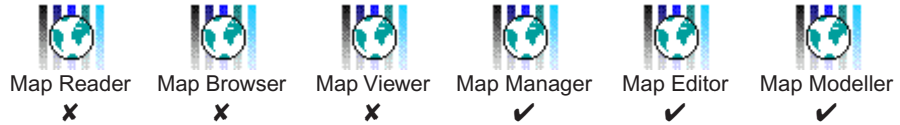
- a list of all overlays in use, and their status at the time of the last save
- any overrides or filters set. Overrides control the default colours for graphics, fonts for text, etc
- filters to control which items are displayed on screen
- a view extent

The OWD file links to datasets by remembering their locations.

Cadcorp Map Browser, Map Modeller, Map Editor, and Map Manager let you save the current datasets as an OWD file.

Drag and drop

You can also drag and drop OWD files. Drag them from Windows Explorer folders and drop them into the Cadcorp SIS workspace window or a map window.



Querying the data in the map window

■ What information does the data provide?	195
■ Querying datasets	195
■ Querying graphical items	198
■ Finding grid references	206

■ What information does the data provide?

With external or user data displayed on screen, you can access information on:

- the dataset file (eg the date it was created and amended, its scale and projection, etc)
- individual items within the files (eg their feature code, item class, length if they are a line item, etc)

This chapter tells you how to access this information.

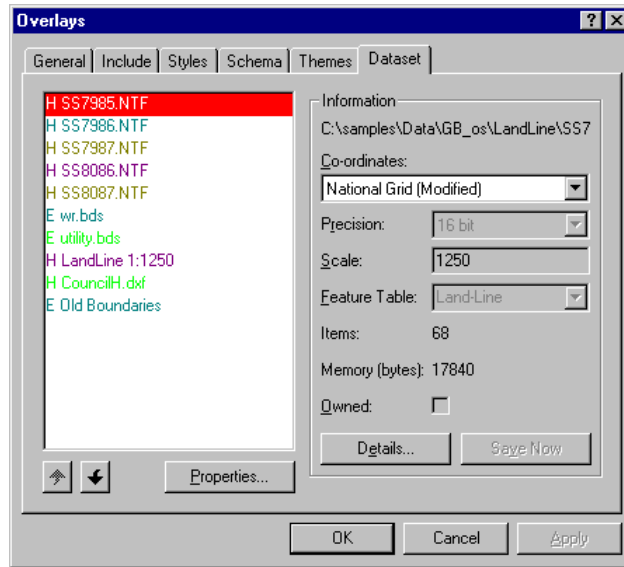
■ Querying datasets

◆ The Dataset tab in the Overlays dialog

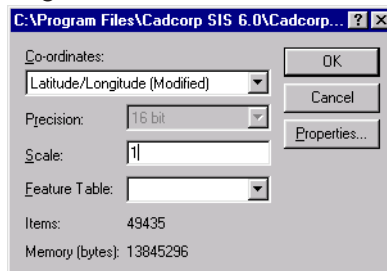
The Dataset page in the Overlays dialog contains information about the datasets included as overlays in the current SWD. Some of these settings can be changed from here.

The page displays:

- the name of the dataset to which the overlay refers
- the co-ordinate system projection (this can be changed)
- its precision (which can be changed if this is a user dataset)
- the dataset scale (this can be changed)
- feature table it uses (which can be changed if this is a user dataset)
- the number of graphical items it contains
- the amount of computer memory it takes up
- the Owned status (if this is a BDS file) ➤ Chapter 22: “User datasets”
- properties of the overlay, such as its pen and brush, its status, at what scales it is drawn, and so on ➤ Chapter 15: “Working with overlays”
- the dataset’s details



A typical dataset details dialog looks like this:



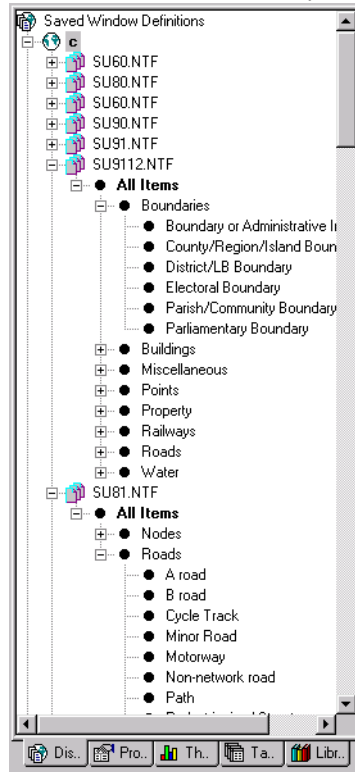
In the case of a BDS, you will see and can change the co-ordinate system projection, the dataset precision (which you can change only if you are the owner) and the scale. Other information is shown, and you can also access the overlay's properties.



This same information is also accessed in the workspace window (display view and theme view tabs), and from an overlay's local command Dataset Details....

◆ Display view tab in the workspace window

On this tab you can view a tree structure for all the SWDs in the current session, showing the overlays they contain and the contents of those overlays.

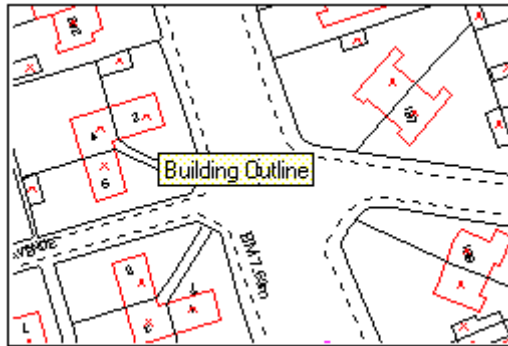


The local menu for each overlay includes the **Dataset Details...** command which gives you information on the dataset to which the overlay refers. ➤page 195, **The Dataset tab in the Overlays dialog**

■ Querying graphical items

◆ Map Tips

As you move the cursor around the map window, wherever you stop the cursor and it finds a hot snap (on hittable or editable data), Cadcorp SIS shows the snapped item's Map Tip:



The information contained in the Map Tip is user-definable, and contain one or more lines of information. You can also choose not to display Map Tips.

By default, Map Tips show the value of the Description property, but they can display any property or formula.

Defining a Map Tip

- 1 Display the Overlays dialog and the Schema tab.
- 2 Select the overlay required.
- 3 In the Columns area, select the property or properties to be shown as the Map Tip, and click in the checkbox next to the property.
- 4 Click the Map Tip checkbox.
- 5 Make sure that the Hidden checkbox is not ticked.
- 6 You can choose any number of Map Tips columns. They are displayed in the map window in the same order as on the schema.

Turning off the display of Map Tips throughout the SWD



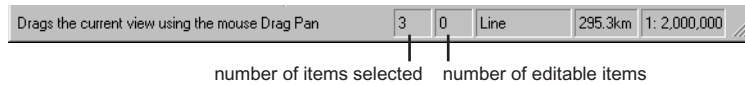
Uncheck the Show Map Tips option in **Tools>Preferences...**

Turning off the display of Map Tips for an individual overlay

- 1 Display the Overlays dialog and the Schema tab.
- 2 Select the overlay required.
- 3 Select the column.
- 4 Click in the Hidden checkbox.

◆ Status bar

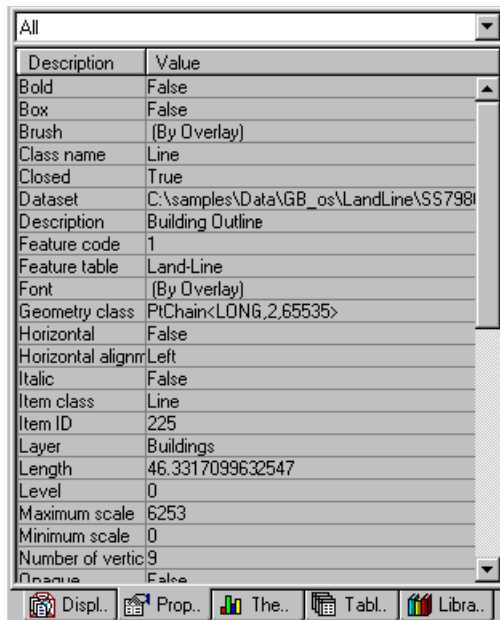
Whenever you have items selected in the map window, the status bar displays the total number of items selected, the number of editable items, and (if the items are all of the same class) the class of items.



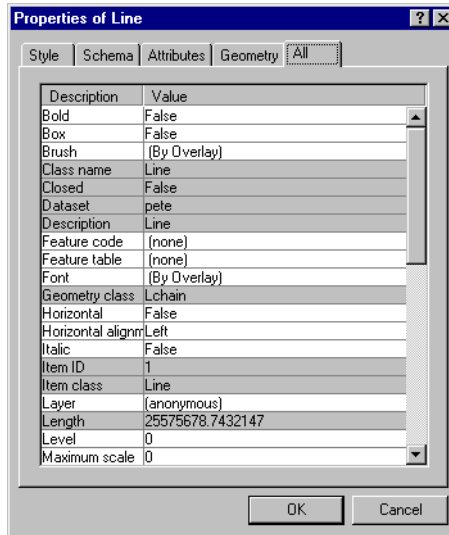
◆ Item properties

You can inspect an item's properties in two different places:

- if you have the Property View tab selected in the workspace window, the selected item(s) properties are shown here. Using the drop-down at the top of the window, you can choose whether to see all the item's properties, or just a selected category of properties.



- if you use the item's local command Properties, you see a temporary dialog. Again the properties can be viewed in categories, by selecting the required tab:



For a non-editable dataset, these properties are for information only. With an editable dataset, you can change some of the properties.

◆ Measuring distances



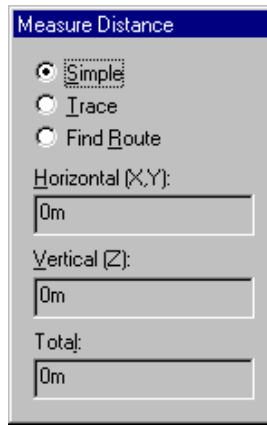
The **Measure>Distance** command measures the distance between any two positions, or alternatively the cumulative distance from one position, through a series of subsequent positions, to the last position chosen. The positions can be three-dimensional.

In Cadcorp SIS Map Viewer and Cadcorp SIS Map Reader, the route-finding option is not available.

After clicking a position to measure from, as you move your cursor, the Horizontal (X,Y) and Vertical (Z) panes give a constant read-out of these distances from the first point. The horizontal distance is the direct distance between the points on the XY plane. The vertical distance is the Z height.

When you click the point to measure to, the distance between them is given in the Total pane. You can keep clicking positions to measure to, until you double-click or press the Enter key to end. The Total pane then shows the cumulative total from the first position to the last.

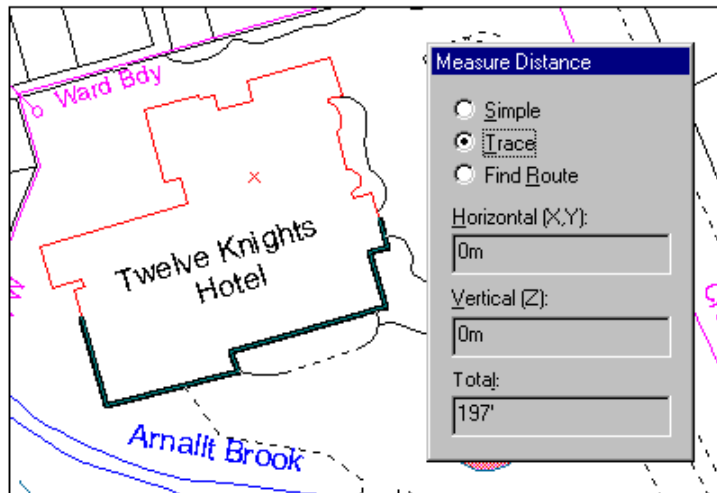
Distances are reported in the current set units and with the set precision.



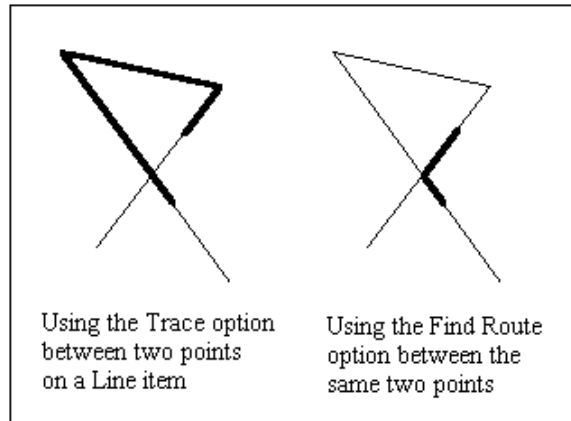
The 'Measure Distance' dialog box has a title bar 'Measure Distance'. It contains three radio buttons: 'Simple' (selected), 'Trace', and 'Find Route'. Below these are three text input fields: 'Horizontal (X,Y):' with '0m', 'Vertical (Z):' with '0m', and 'Total:' with '0m'.

Use the Simple option to measure the direct distance between any positions in the map window, pressing Enter or double-clicking to finish.

Use the Trace option to measure the distance between two positions on a linear feature. This could be a line, a closed line or a link item, or the perimeter of an area or polygon item. If you are measuring a closed item (line, area, or polygon), the shortest path between the two points is taken.



Use the Find Route option to carry out the same operations but on multiple items, if they are intersecting. If used on a single item which self-intersects, it does not trace the item, but uses intersections as turning points.



How Distances are Calculated

If the current co-ordinate system is spherical, this command calculates the Great Circle distance. The Great Circle distance is calculated accurately in radians using the haversine formula. The angular distance is then converted to metres using an approximation for the local radius of curvature of the Earth.

If the current co-ordinate system is Cartesian, the 3D straight line distance is measured. If the co-ordinate system projection is Transverse Mercator, the measuring is done within the projections, so the answer will not take account of the projection distortions.

◆ Measure Fence



Use the **Measure>Fence** command to define a temporary area and measure it. Click on the screen to define the area. The area is shown in the current area units (to set these, use the **Map>Co-ordinate Systems...** command). The value can be copied to the clipboard and pasted as a text item at the centre of the current map window, or in the text dialog box, as appropriate.

◆ Route Finding



Using the **Measure>Route** command you can find the distance between two points on line and link items and the perimeter of area or polygon items. You see a route drawn between the points. The items must intersect and must be on an editable or hittable overlay for this command to operate.

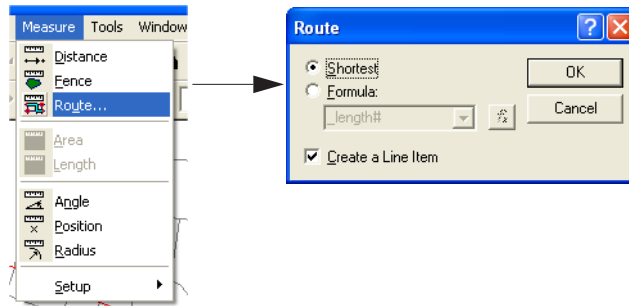
The Measure Route dialog also gives you the option of creating a line item along the found route. You can therefore store the geometry of the route as a permanent item for future use. This command is available only in Cadcorp SIS Map Editor and Cadcorp SIS Map Modeller.

Route-finding can be carried out on Line items on hittable and editable overlays:

- Routes can be measured on external data such as Ordnance Survey LandLine (although due to the way it was digitised, you will often find that what appears to be a single Line item is in fact made up of several shorter Line items).
- You can also route find on the following 2D geometry: line items created with the **Line...** and **Freehand Line** commands, and on the outlines of closed area items.

Route-finding is especially powerful with topology, where routes can be found across a link and node network. The route can also be based on a chosen formula.

- 1 Choose the **Measure>Route...** command. The Route dialog opens.



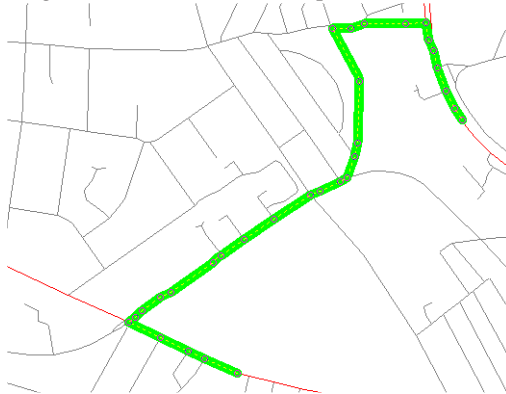
- 2 Select how the route should be measured.

The Shortest option can be used to route-find on any line items (in which case Cadcorp SIS uses the Length property of the items along the route). Formulae can only be used with link and node topology, when the route is worked out using the “cost” of each link/chain using a formula.

The formula could look for a simple property, eg the shortest length, or an attribute such as Time (if such a property existed on each item on the route). Alternatively, the formula could be a calculation. ➤Chapter 52: “Formulae”

If you want to create a new line item along the found route, select the Create a Line item check box.

- 3 Define a route on a vector network from point A to point B. Cadcorp SIS finds a route across the network, generates the line item and places it in an editable overlay:



In these cases the line item's length is expressed as an attribute:

Geometry	
Description	Value
Closed	False
Length	1778.96066360782
Number of vertices	34
Origin Latitude	50.8343294386769
Origin Longitude	-0.156483287450431
Origin X	529802
Origin Y	105548
Origin Z	0
Simple	True
Size in X	801.930424185586
Size in Y	841
Size in Z	0
Straight	True
Thin in X	False
Thin in Y	False
Thin in Z	True

◆ Finding an area value



To find the area value of one or more area items, first select the item(s), then the **Measure>Area** command.

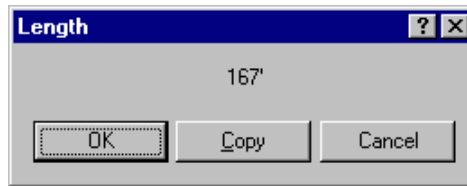
The area value is shown in the current area units. The value can be copied to the clipboard and pasted as a text item at the centre of the current map window, or in the text dialog box, as appropriate.

◆ Measuring the lengths of items



Select the item or items whose length you need to know, then the **Measure>Length** command.

The result given is the length of one item selected, or the total length if more than one item is selected, and is in the current linear units.



To set the units, use the **Map>Co-ordinate systems...** command.

You can copy the value to the clipboard. When pasted back, it is placed as a text item at the centre of the current map window or in the text dialog box, as appropriate.

The length of an item is also a property, and can be inspected:



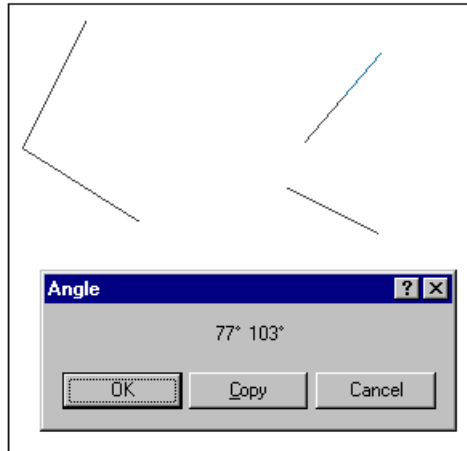
- in the property view tab of the workspace window
- by using the local command **Item Properties...**
- by using the **Edit>Properties...** command

The value of the Length property is reported in metres.

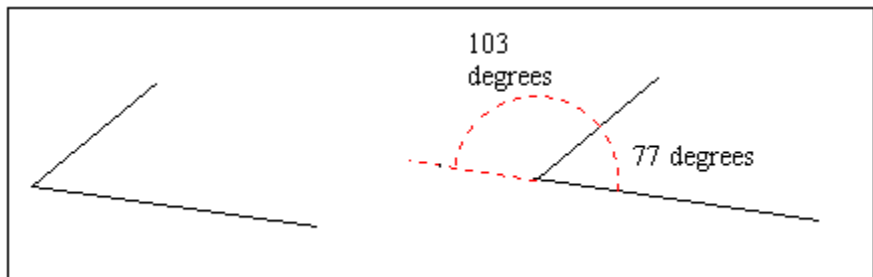
◆ Measuring angles



Using the **Measure>Angle** command you can measure the angle formed between two line items or line segments. If the lines are not connected, you are given the angle which would be formed if they were extended to meet:



You are given the two angles formed by the lines (the inside and the outside):



The result can be copied to the clipboard. It can then be pasted into a text dialog box, or into the map window, where it is placed in the centre of the window as a text item.

◆ Finding a position



Using the **Measure>Position** command you can find the co-ordinates of any position you click on the screen. The co-ordinates can be copied to the clipboard. When pasted back, they are placed as a text item at the centre of the current map window or in the text dialog box, as appropriate.

◆ Measuring a radius



Use the **Measure>Radius** command to find the radius of any circle, arc or curve.

First select the command, then click on the curve to measure. The value shown is in the current set linear units, and can be copied to the clipboard. When pasted back, it is placed as a point text item at the centre of the current map window.

■ Finding grid references



To find a grid reference, use the **Map>Zoom>Grid Reference** command. This displays a dialog into which you can type a grid reference. Cadcorp SIS zooms the map window to show the position, if it exists.

◆ Zooming using grid references (UK specific)

National Grid references specify an extent on the map base. They can be used to find and zoom into any area of your map base, whether you are viewing Ordnance Survey data or any other.



- 1 Choose the **Map>Zoom>Grid Reference...** command.
- 2 Type in the National Grid reference in the input box.
- 3 Click the OK button.

Cadcorp SIS zooms the map window to show the position, if it exists. The area shown depends on how precisely you specified the position (see below).

About National Grid references

The National Grid referencing system is based upon the division of Great Britain into 100km squares, each assigned a two-letter code, eg, TQ, SS, NY, etc. References to positions within any square may be made by means of the eastings and northings in metres from the bottom left hand corner of the square.

For example, SS 78382 87596 refers to a point 78382 metres east and 87596 metres north of the bottom left of the SS square.

When using National Grid references, the reference you give not only specifies a position, but also the extent of the map to be displayed (the precision).

Precision of National Grid references

The number of digits in the easting and northing give the precision.

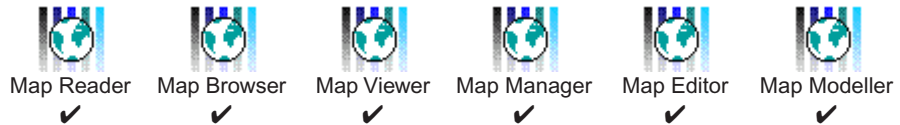
The position used in the example above (SS 78382 87596) could be approximated to the nearest kilometre as: SS 78 88.

Alternatively it could be specified to the nearest millimetre by adding three further digits:
SS 78382452 87596584

SS	78	382	452	87	596	584
100km square	km	m	mm	km	m	mm

Precision of National Grid references

SS	zooms to show a 100km square
SS 7 8	zooms to show a 10km square
SS 78 88	zooms to show a 1km square
SS 784 876	zooms to show a 100m square
SS 7838 8760	zooms to show a 10m square
SS 78382 87596	zooms to show a 1m square



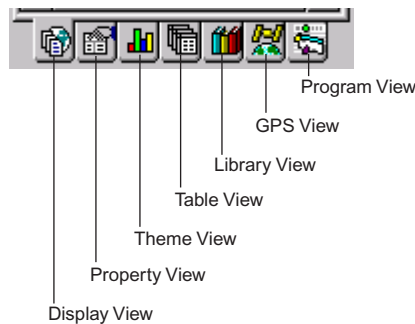
The workspace window

■ What is the workspace window?	209
■ Displaying the workspace window	211
■ Display view tab	212
■ Property view tab	213
■ Theme view tab	215
■ Table view tab	216
■ Library view tab	216
■ GPS view tab	217
■ Program view tab	217

■ What is the workspace window?

The workspace window displays information about the current session. It also allows you to change settings and properties, and it provides access to many commands and operations.

Each tab on the workspace window allows access to different functions:



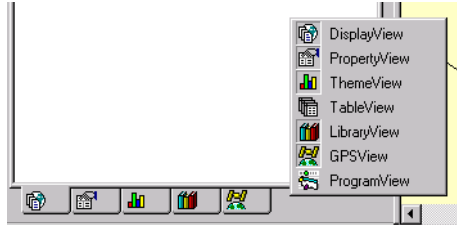
- the display view controls the map window's display
- the property view displays the properties of the item or items currently selected in the map window
- the theme view allows you to add themes to an overlay and provides access to many of the theme operations
- the table view allows you to connect to databases
- the library view lets you work with libraries
- the GPS view gives you access to a connected GPS receiver
- the program view shows details of interest to developers

In Cadcorp SIS Map Viewer, Cadcorp SIS Map Reader, and Cadcorp SIS Map Browser, only the display view and theme view tabs are available.

The workspace window views work in the same way. They are modelled on Windows Explorer, and provide a ‘tree’ structure. Click on the plus sign next to each entry to extend the tree, and click on the minus sign to minimise the tree. You can toggle entries between visible and invisible by clicking on the icon for the overlay. To rename the overlay, either press F2 when an overlay is selected, or click once on the overlay to select it and then click once again (two clicks rather than a double-click).

◆ Hiding and showing tabs

You can control the display of each tab by using the workspace window’s local menu.



◆ Using the workspace window with the map window

Keyboard commands in Cadcorp SIS work differently depending on whether the focus is on the workspace window or on the map window.

To get the focus on the relevant window you need to click somewhere on that window.

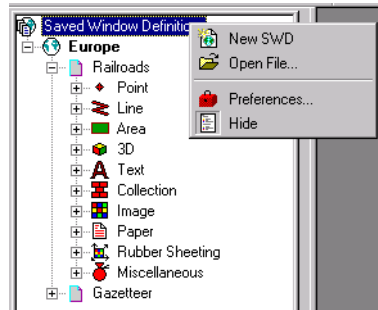
For example, the F2 button renames an overlay in the workspace window, but in the map window it displays the Overlays dialog. If you press the asterisk key (*), this zooms out when the focus is in the map window, but maximises all the overlays from the selected overlay downwards on the workspace window (there is no minimise button to undo this).

◆ Local menus

Every object in each workspace window has a local menu. ↗page33, **Local menus and the item menu**

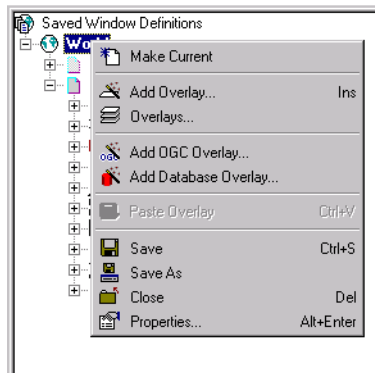
Some of these local menus are standard, and are the same on all workspace windows (the local menu for SWDs, the local menu for Map 1 (overlay name), for example). Some are specific to different views (for example, the local menu for overlays).

The local menu for the Saved Window Definition allows you to open or close SWDs, add overlays to the SWD, change the system preferences, and hide the workspace window entirely.



The local menu of individual SWDs allows you to do the following:

- choose that particular SWD from many to be current (ie the one being examined)
- access the New Overlay Wizard
- paste copied overlays
- access the Overlays dialog
- save the SWD (including saving with a new name)
- close the SWD
- display the SWD's properties



Further down the tree, the overlay's local menu gives you access to many of the functions found on the Overlays dialog.

■ Displaying the workspace window

You can choose not to have the workspace window open. This allows you to see more of the map window. When used, the workspace window appears to the left of the map window.

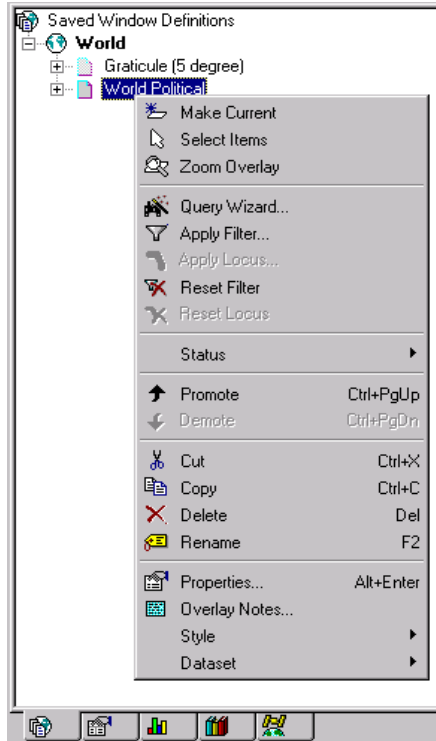


The **Tools>Workspace Window** command controls whether or not the workspace window is displayed. The command toggles the window on and off.

You can hide the workspace window using the Hide command on the Saved Window Definitions' local menu (which is visible on the display, theme, and library tabs).

■ Display view tab

In the display view of the workspace window you can alter how you display the map. The local menu for an overlay in the display view is as shown:



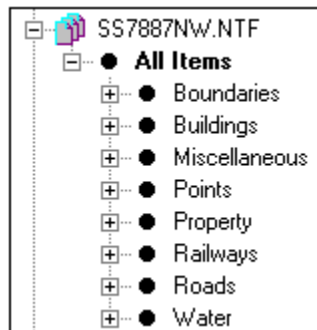
Many of these commands are duplicated in the Overlays dialog.

If you click on the plus sign next to the name of the overlay, you see the contents.

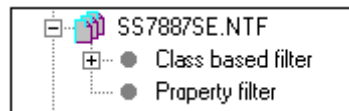
If there is no feature table applied to the overlay, or, if there is a class-based filter in use, you see the item classes shown as below. You can click on the class icon to make the classes and its subclasses visible or invisible.



If there is a feature table applied to the overlay, or if there is a feature filter in use, you see the feature types shown as below. You can click on the type icon to make the classes and its subclasses visible or invisible.



If there is a compound filter applied to the overlay, you see details of the filter.



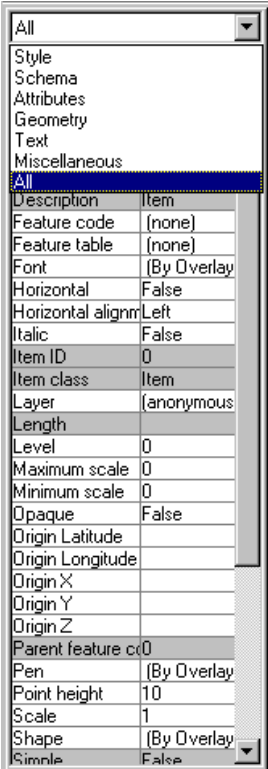
With a property filter you will see no further tree structure.

The local menu on the display view allows you to control the status of the overlay; whether it is editable, hittable, visible, or invisible. You can also change filters and loci.

■ Property view tab

This tab displays the properties of the item or items currently selected in the map window. If no items are selected, the overlay's default properties are shown.

The properties are divided into several categories. Using the drop-down list at the top of the window, you can choose to display any of these categories, or all properties.



You can change editable properties here. Properties on a grey background cannot be edited, because they are derived from other data.

➤ Chapter 14: “**Properties**”

■ Theme view tab

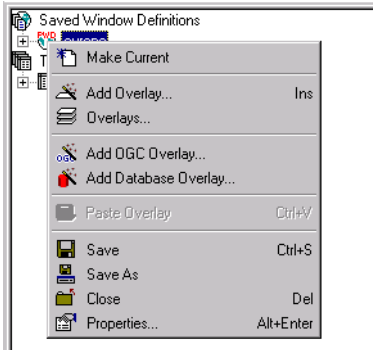
The main function of the theme view tab is to allow you to add themes to an overlay, and you can use the local menu of a theme to access many of the theme operations (which are also found on the Themes tab of the Overlays dialog).



The theme view tab includes a legend area where the theme(s) of the selected overlay are displayed. If the selected overlay has no themes, the overlay displays a legend based on the overlay's feature table, if available; otherwise the overlay styles are shown (pen, brush, shape, font, and colour). ➤Chapter 19: “Thematic mapping”

■ Table view tab

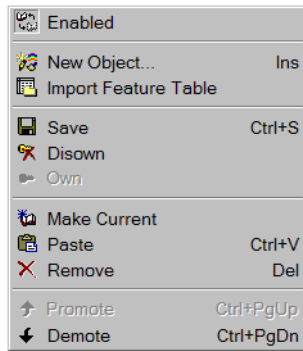
The table view tab allows you to connect to databases. Using X and Y co-ordinates, Cadcorp SIS can view database data as an overlay. However, when an overlay has no X and Y co-ordinates, a table can be brought into Cadcorp SIS and joined to an overlay. You can do this in the table view tab. ➤Chapter 21: “Table windows”



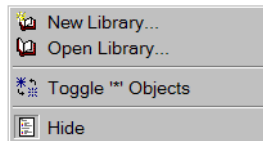
■ Library view tab

You can create new named object libraries using the local menu of the library view tab. You can also connect to existing libraries. Use the New Object command on the local menu of an individual library to create a brush, colour-set, feature table, pen, or toolbar definition.

➤Chapter 50: “Named object libraries (NOLs)”



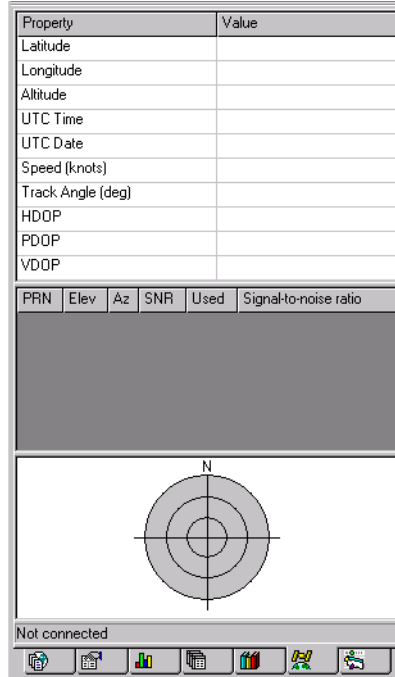
On the local menu of the library workspace window (on the word Libraries), there is a command Toggle “*” Objects.



This allows you to control the visibility of all the objects in the libraries which are prefixed by an asterisk. Items prefixed like this are usually used in wizards, such as the Print Wizard.

■ GPS view tab

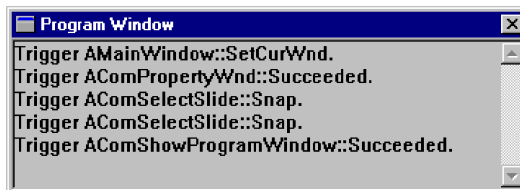
The GPS view tab displays information about any GPS receiver attached to your computer.



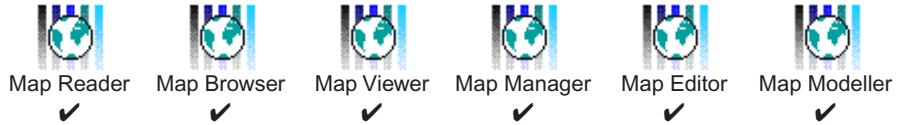
This tab is available only in Cadcorp SIS Map Editor and Cadcorp SIS Map Modeller.
 ➤ Chapter 10: “Working with GPS”

■ Program view tab

The Program view tab is useful for debugging when you are writing programs. It lists the names of all commands recently executed, and whether they have succeeded or failed. See the **Cadcorp SIS Developers Guide** for more information.



This tab is not available in Cadcorp SIS Map Browser, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Reader.



Properties

■ What are properties?	219
■ How properties are displayed	220
■ Editing properties	222

■ What are properties?

The properties of an item contain information that describes that item. Every item in Cadcorp SIS has properties that are shown in the workspace window property view when you select an item.

Every property has a name, a description, and a value.

Name

The name of a property follows the rules used for computer language variables. The property name always ends in a special character indicating its type: either “\$” (string property), “#” (floating point property), or “&” (integer property).

Description

The property description is a word or phrase that indicates its meaning in normal language. When you use the Cadcorp SIS user interface you are shown the property description, but if you are programming, you must use the property names to avoid ambiguities.

◆ System properties

The system automatically supplies properties for every item. These properties are called system properties and you can recognise them because their names always start with an underscore character.

These properties hold such information as the pen to draw the item with, the length of a line item, and the point height of text items.

Properties, both system and user-defined, are used when building formulae. ➤Chapter 52: “Formulae”

◆ Creating and editing properties

You can also add your own properties to any editable item as attribute data. To avoid confusion you cannot use the underscore character as your property name’s first character. ➤Chapter 18: “Adding your own attribute data”

Some system properties can be edited, eg an item’s pen. If the property is editable it will appear with a white background on the Property dialog (if using standard Windows colour schemes). If not editable it will appear on a grey background.



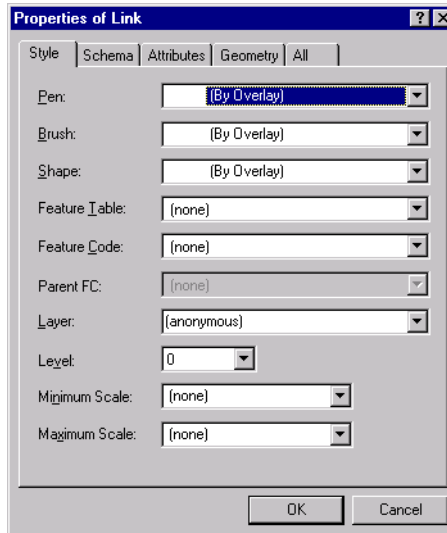
The **Edit>Properties...** command shows a tabbed dialog with advanced controls for editing Item properties.

■ How properties are displayed

To display the Properties dialog, select the item(s), and then do one of the following:

- choose Properties... from the local menu
- choose the **Edit>Properties** command
- click the Properties button in the Styles toolbar

The Properties dialog usually shows five tabs (except for some objects such as photo items and text): Style, Schema, Attributes, Geometry, and All.



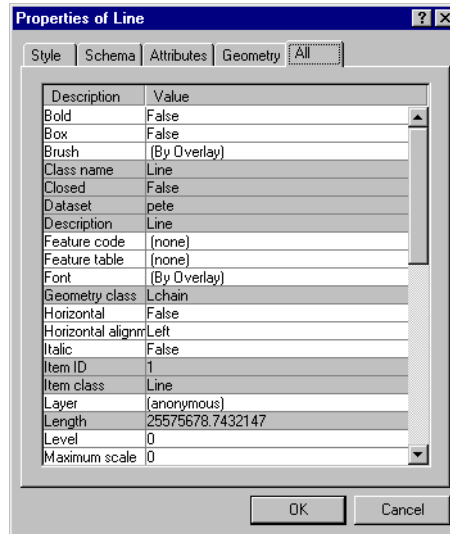
The Style tab details the pen, brush and shape styles, if there are any feature tables associated with the data, and the feature code **Chapter 53: “Feature tables”**. It lists the layers present, their level and the minimum and maximum scale.

The Schema tab consists of a list of columns. Each of these will appear in the table window and each has a formula that is used to evaluate values on items. The formula is listed in the Property column.

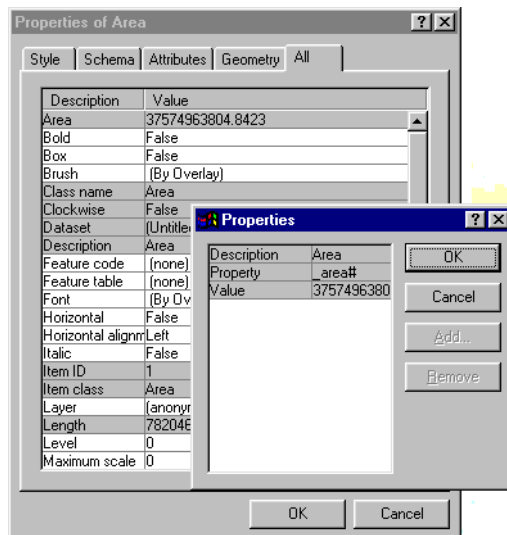
The Attributes tab provides additional data to the system properties. Attribute data is non-graphical data attached to graphical items. Attribute data can be added only to unlinked datasets or copies of linked datasets. Original data cannot be altered. **Chapter 18: “Adding your own attribute data”**

The Geometry tab provides information relating to the geometry of the selected item.

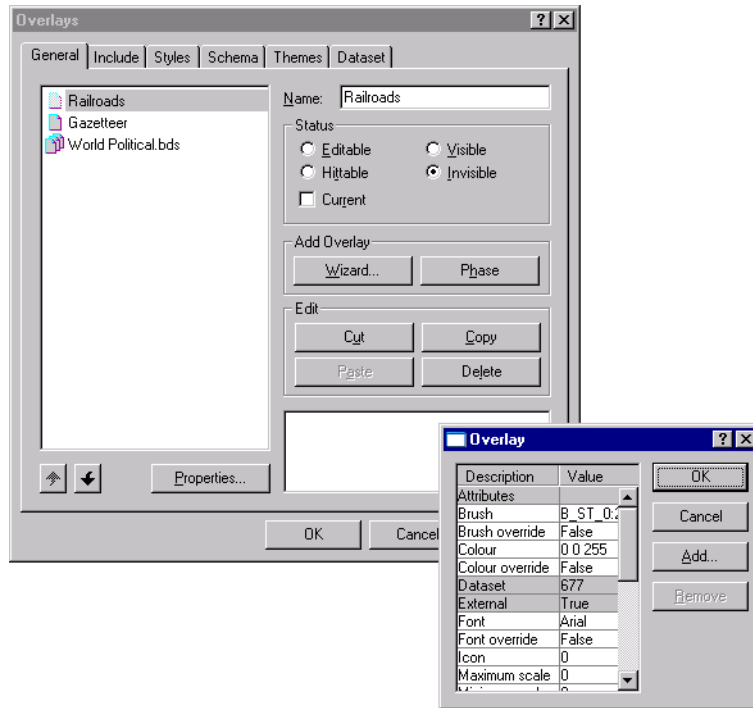
The All tab lists all the information available on the item(s) selected including the information given in the Style, Schema, Attributes and Geometry tabs.



On the Schema, Attributes, Geometry, or All tabs, the property description and value are listed. To see the name of the property, select the property description, and choose Properties from the local menu. A dialog shows the property's description, property, and value, which you can copy for other uses (eg when using formulae).



You can access the properties of the overlay from the Overlays dialog:



This operates in the same way as the Attributes tab of the Properties of Item dialog.

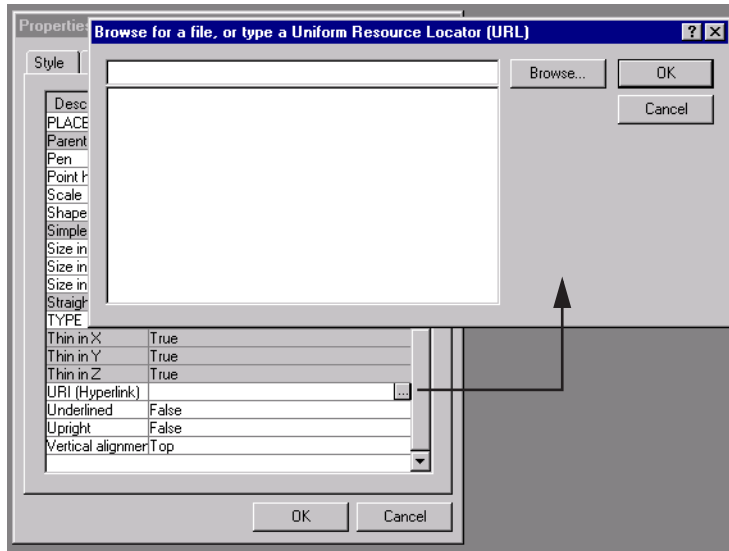
■ Editing properties

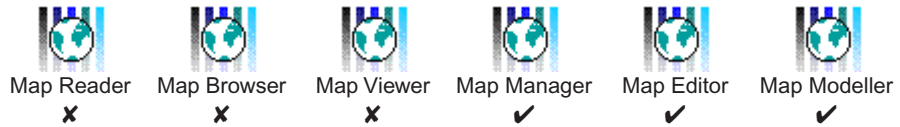
You can edit properties in the Value column using the following methods:

- double click. This is available where there are two options (eg True/False).
- click, then type in a value (eg the Maximum scale property)
- click, then click on the More button which appears, then select an option from the drop-down list (eg the brush property)



You can edit the URI (Universal Resource Indicator) property of an item using the Browse dialog.





Working with overlays

■ What is an overlay?	225
■ The Overlays dialog	225
■ Overlay functions	227

■ What is an overlay?

The term **overlay** is used to describe a view of a dataset. A dataset can be:

- a read-only graphical file (eg an NTF, DXF, or BMP file)
- a user dataset (BDS file)
- stored within the SWD file (internal dataset or index dataset)
- graphics stored in an ODBC database
- an internal binary geometry dataset

For a full list of datasets which can be included as overlays, ➤ Chapter 4: “Loading data”.

■ The Overlays dialog

You can use the Overlays dialog to:

- select which datasets are used in the current SWD
- add further overlays to those used in the current SWD
- set up and control the properties of overlays, eg to assign overlay pens and brushes, to rename overlays, to assign notes to them, to control the display of items on the overlay, etc
- create user overlays
- create schemas and themes

Some functions of the Overlays dialog can also be accessed from the Overlay local menu on the display view, theme view, or table view tabs in the workspace window.

◆ Accessing the Overlays dialog

To display the Overlays dialog, do one of the following:

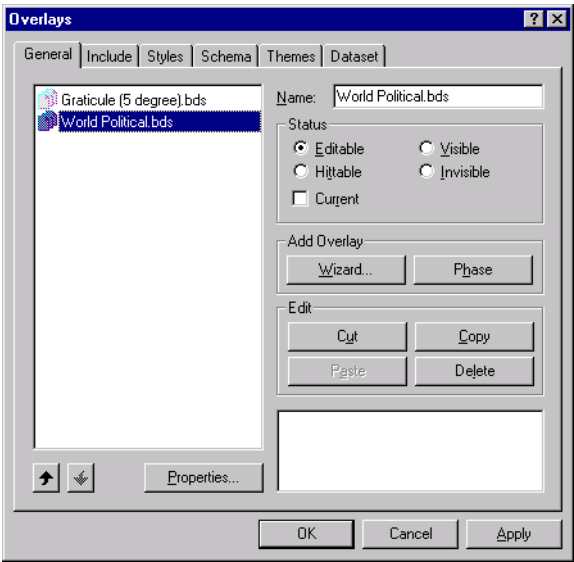


- click on the Overlays icon in the Standard toolbar
- choose the **Map>Overlays...** command
- press F2 when the focus is in the map window
- choose the **Overlays...** command from the default local menu (click the secondary mouse button in the map window with no items)

- select **Overlays...** from the local menu of an SWD on the display view tab in the workspace window
- The **Map>Overlays...** command is not available in Cadcorp SIS Map Viewer or Cadcorp SIS Map Reader.

◆ **The Overlays dialog for a typical session**

The Overlays dialog shows all the overlays in the current SWD and these are listed in the panel on the left hand side. ➤Chapter 4: “Loading data”



This panel is shown on all six of the tabs on the Overlays dialog: General, Include, Styles, Schema, Themes and Dataset. When applying changes using the Overlays dialog, you must select the relevant overlay prior to changing it. You can also access the properties of the SWD from the left hand panel. Use the Up and Down arrows to change the ordering of the SWD. This can be important, depending on what types of datasets are being displayed.

Tab	Function
General	controls common functions such as renaming overlays, deleting overlays, cutting, copying, and pasting overlays, changing the status of an overlay, and so on ➤page228, Overlay status
Include	controls what is included on the map, ie whether there are filters or loci in place, or whether item(s) have a scale threshold applied to keep certain ones visible, and certain others invisible ➤Chapter 16: “ Filtering what you see ” ➤Chapter 56: “ Spatial testing: loci ” ➤Chapter 8: “ Scale ”
Styles	controls styles for the whole overlay, and if you tick the Override tick box it will force the whole overlay (including any themes) to the colour selected. You can also override the dataset scale here. ➤Chapter 32: “ Pens and brushes ”

Tab	Function
Schema	allows you to add columns to the overlay schema, to access the Formulae dialog box which allows you to carry out complex calculations based on your existing data. You can also store schemas to be used on other overlays. ☞Chapter 17: “ Schemas ”
Themes	allows you to access the Add Theme Wizard; it allows you to edit themes; and to remove themes ☞Chapter 19: “ Thematic mapping ”
Dataset	shows information regarding the dataset, its projection, its dataset scale, any feature tables associated with it, and the number of items open on that overlay ☞Chapter 8: “ Scale ” ☞Chapter 53: “ Feature tables ”

The Overlays dialog shows the various different datasets that have been loaded. ☞Chapter 4: “**Loading data**”

■ Overlay functions

◆ Including datasets as overlays

You use the New Overlay Wizard to add more datasets as overlays to your SWD. To access the New Overlay Wizard:



- click the Wizard... button in the Add Overlay area in the Overlays dialog
- choose the **Overlay...** command from the **Map>Add** menu
- choose Add Overlay... from the default local menu in a map window, with no items selected
- choose Add Overlay... from an SWD's local menu in the workspace window (display view, theme view and table view tabs)

☞Chapter 4: “**Loading data**”

◆ Creating user datasets



Use the New Overlay Wizard to create user datasets (internal datasets and BDS files), index datasets and internal geometry datasets.

For more information, see ☞Chapter 22: “**User datasets**”, ☞Chapter 4: “**Loading data**”, ☞Chapter 20: “**Databases**”.

◆ Copying overlays

There are two different methods of producing multiple copies of an overlay:

Copying overlays from one SWD to another

You can drag and drop overlays in the workspace window. To move an overlay from one SWD to another, drag it to the required location. To copy it, hold down the Control key while dragging.

You can access the Overlays dialog for the source SWD, select the overlay and use the Copy/Cut buttons on the General page. Then access the Overlays dialog for the destination SWD and use the Paste button.

You can use the display view tab in the workspace window. Use the overlay's local commands to cut or copy the overlay, and the SWD local command to paste.

Creating multiple references to an overlay in a single SWD (Phasing)

Selecting an overlay then clicking the Phase button (General page of the Overlays dialog) creates a second reference to it, causing it to be drawn twice. Where you create multiple copies of a dataset in this way, it is called “phasing”.

Each phase of the dataset can have different criteria set. For instance, one phase of the dataset could contain a filter so that only building outlines are shown, whereas another might display only roads. By making the different phases visible or invisible, this gives a fast method of looking at certain details in a dataset.

Each phase can be given a descriptive name to distinguish it from another phase, by renaming it in the Name box.

When you are using phases of editable overlays, if you edit any of the phases, this updates the original dataset.

◆ Overlay status

The status of an overlay governs whether the data on it can be edited, selected but not edited, or simply viewed. The status options appear on the General tab of the Overlays dialog, and on the overlay's local menu on the display view tab of the workspace window.



editable full access to add, modify and delete information. This option applies only to user datasets (SDS and BDS files, internal datasets and editable geometry overlays).

In the case of BDS files (which can be shared via a network), only one user at a time can have Editable access to them.

In the case of editable geometry overlays (which can be shared via a network), individual item locking is used.



hittable the ability to snap the cursor onto graphics to measure, query, trace and copy data

You cannot move, delete or add data.



visible graphics appear on screen but cannot be queried (snapped to). The image is purely a backdrop.



invisible no graphics appear on screen. This is useful for temporarily excluding information from the view.

An Overlay's status can be changed using the display view's local menu. You can also click on the overlay icon in the workspace window (display view, theme view, or table view) to toggle its status between its minimum (invisible) and its maximum (set by the user).

External datasets such as Ordnance Survey NTF cannot be edited (unless a copy has been made by using the Imported File option) and therefore can only have a maximum status of hittable.

User overlays can have any status. However, in the case of BDS files, which can be shared, only one user may have editable access at any one time. Other users will find access limited to hittable until the first user releases ownership. ➤Chapter 22: “User datasets”

◆ The order of the overlays

The order in which the overlays appear in the Overlays dialog is important in the following circumstances:

- Data is drawn on the screen in the order in which the overlays appear in the Overlays dialog. You may want to control this. For example, if you are using raster data, you will normally want to ensure that this gets drawn first, with the vector data over the top (if it were the other way round the raster data would obliterate everything that was previously drawn).
- If you have more than one user overlay, and none of them is currently selected, new data that you create or import is put on the first editable user overlay in the list.

To change the order of the overlays

On the display view tab of the workspace window, either:

- select the overlay name, and drag it to the new position, or
- select an overlay to move in the list, and use its local commands Promote and Demote

Alternatively, use the Overlays dialog:

- 1 Display the Overlays dialog (overlays can be re-ordered on any tab).
- 2 Select an overlay to be moved.
- 3 Click the up arrow or down arrow as required to move the selected overlay up or down one place in the list.



◆ Making an overlay current

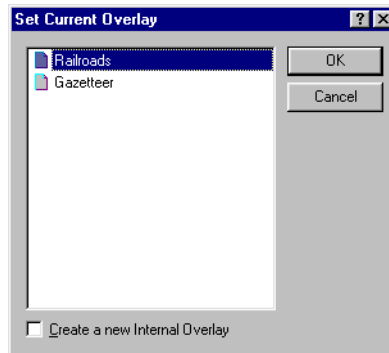
The current overlay is the one to which changes are made when you carry out operations in the Overlays dialog, such as changing the overlay pen or setting the status.

When you create your own data, you should make sure it is put on the overlay you require by first making that overlay current.

You can make an overlay current by doing one of the following:



- choose the **Map>Set Current Overlay...** command, then select an overlay from the dialog





- click on it in the Overlays dialog, or use its local command Make Current (display view, theme view, or table view tab in the workspace window). In the Overlays dialog, the current overlay is the one in which new data is stored. Its name is displayed in bold type in the workspace window.

◆ Renaming overlays

You can rename an overlay by doing one of the following:

- select it in the display view, theme view, or table view tabs in the workspace window, click on the name (or press F2), and type a new name
- select it on the General page of the Overlays dialog and type a new name in the Columns box
- use the overlay's local Rename command in the display view, theme view, or table view tabs in the workspace window

This facility is particularly useful when you are using phased overlays, when it allows you to give a different name or number to each occurrence of the dataset.

When renaming BDS files and other datasets stored on your disk (eg Ordnance Survey data, DXF files, PAF files) in the workspace window, Cadcorp SIS changes only their name shown in Cadcorp SIS; the name of the file on the disk is not affected.

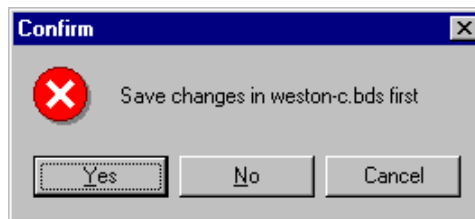
◆ Removing overlays from the SWD

The Delete button on the General page of the Overlays dialog removes the selected overlay or overlays from the SWD.



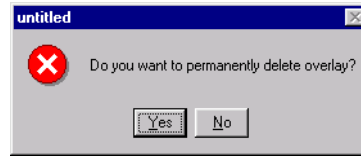
Alternatively, use the overlay's local command Delete (on the display view tab or theme view tab in the workspace window).

- removing external datasets has no effect on the existence of the file or on the data within it
- removing a BDS file does not affect the existence of the file on the disk. However, all changes made to the BDS during this session will be lost. You are therefore given the choice of saving changes to the file before you remove it:





- data created on an internal dataset is saved only when you use the **File>Save** command. (An internal dataset is saved as part of the SWD file.) Therefore, if you remove an internal dataset, all data on it will be lost. You will be reminded of this by the following prompt:



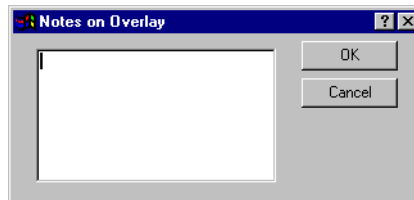
◆ Adding notes to an overlay

Each overlay can have some descriptive text associated with it.

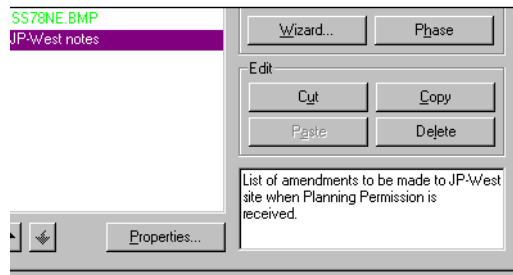
You can create notes for an overlay, or edit existing ones, by either of these methods:



- on the display view, theme view, or table view tabs of the workspace window, choose the **Overlay Notes...** command from the overlay's local menu. You can then type the notes required:



- select the overlay on the General tab of the Overlays dialog. Type the required text in the box at the bottom of the tab:



The overlay notes are saved with the SWD and are not attached to the dataset itself.

Each time you select the overlay on the General tab of the Overlays dialog, you will see the notes displayed.

◆ Restricting the display of items on the overlay

Use the Include page of the Overlays dialog to carry out the following tasks.

Filter

Filters control which items on the overlay are displayed and which are not, based on criteria you have chosen. For example, you can exclude certain classes of items from the display, or choose to display only selected features, or only those items which have a certain property. ➤Chapter 16: “**Filtering what you see**”

Once applied to an overlay, a filter stays in force until you clear it. To clear a filter, use either:



- the overlay local command Reset Filter in the display view tab of the workspace window



- the delete button next to Filter on the Include tab of the Overlays dialog

Locus

You can select a locus to use on the overlay. A locus is an item used to carry out a variety of spatial tests. Items on the selected overlay will be displayed only if they pass the locus test.

➤Chapter 56: “**Spatial testing: loci**”

For instance, if the locus were an area item or closed line item, it could exclude from the display all items which lie outside it; if it were an open line item, it could display only those items which intersect with it; if it were a point item, it could display only those items which contain it; and so on.

Loci can be used once, or stored for later use as named Objects in libraries. Loci are also used to restrict which items may be selected for editing.

Once you have applied a locus to an overlay it stays in force until you clear it. You can do this on the Include tab of the Overlays dialog, or by using the overlay local command Reset Locus in the display view tab of the workspace window.



Scale thresholds

Each overlay has minimum and maximum scale settings, and the overlay is displayed on screen only when the display scale is between these two settings.

➤Chapter 8: “**Scale**”

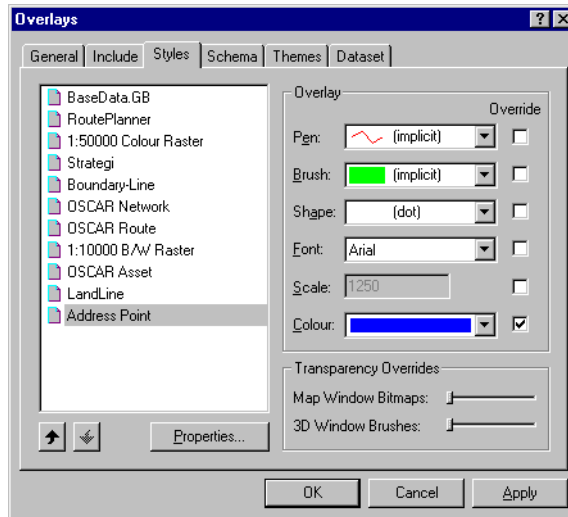
◆ Ownership of BDS files

When you create a BDS file, or are the first person to open an existing one, you are given ownership of it. The owner of a BDS is the only user who can edit it, although other users may have simultaneous read-only access.

If you are the owner of the overlay, clearing the Owned checkbox on the Dataset page of the Overlays dialog allows you to disown it. If you are not the owner, clicking this box allows you to become the owner, as long as no-one else owns it at the time. ➤Chapter 22: “**User datasets**”

◆ Default overlay styles

Each overlay has a default pen, brush, shape (symbol), and font, which are set on the Styles tab of the Overlays dialog.



These are the pens, brushes, and shapes used by graphical items whose values are set to (By Overlay).

When an overlay is created, either using an internal dataset, a BDS file, or an SDS file, it is automatically assigned a pen and brush which are different from those assigned to other overlays. This is to differentiate it from other overlays, but you can change the pen and brush of any overlay whenever you wish. Likewise the default shape, called (dot) and the default font (Arial) can also be changed.

You can also define the default overlay pen, brush, and shape by selecting the overlay name within the workspace window, and choosing Style from the local menu.

For information on using these options, ↗Chapter 32: “Pens and brushes”, ↗Chapter 26: “Creating points and placing shapes”, ↗Chapter 27: “Creating text”.

You can force all items on the overlay to display in the selected colour, while leaving their other characteristics (linestyle and line thickness) to be determined by their assigned pen. To do this, check the override checkbox next to the Colour setting, then select a colour.

A scale can also be set for the overlay here. ↗Chapter 8: “Scale”

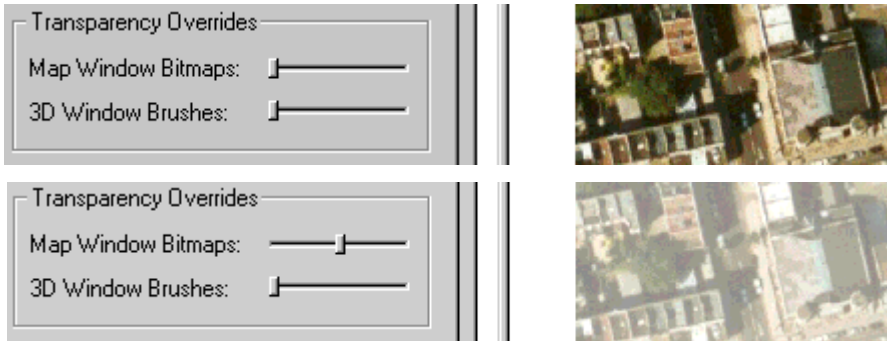
◆ Transparency

The Styles tab of the Overlays dialog also lets you control the transparency of:

- a bitmap overlay in a map window
- 3D objects in a 3D window

Bitmap overlays

Use the top slider to change the transparency of a raster image in a map window. Slide the slider to the right to increase the transparency.



3D objects in a 3D window

Use the bottom slider to change the transparency of 3D objects in a 3D window.

◆ Dataset information

The Dataset page of the Overlays dialog allows you to see and sometimes change various features of the dataset to which the overlay refers. For example, it contains a Co-ordinates button allowing you to see details of the dataset's co-ordinate system (and change it if it is an editable dataset).

The Details button gives access to other parameters of the dataset, such as its scale, precision, etc. Further information shown depends on the type of dataset. For example, for an index dataset, the indexing details will be shown; for a database, such details as its record-set are shown. This information can also be displayed using the **Dataset Details...** command on the overlay's local menu on the display view tab or theme view tab in the workspace window. ➤ Chapter 12: "Querying the data in the map window"

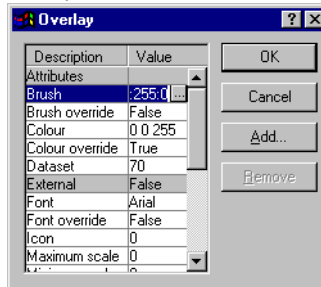
◆ Feature table (user overlays)

When using user-owned overlays, you can assign a feature table, using the Feature Table option on the Dataset tab.

When using non-editable datasets, this option is for information only.

◆ Overlay properties

Most of the properties you assign to overlays in the Overlays dialog can also be changed in a Property Window in the usual way.



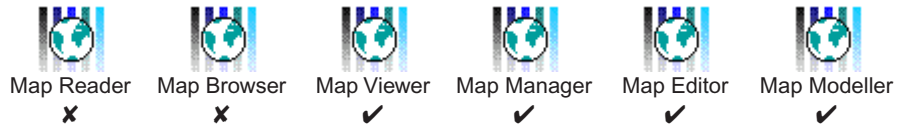
The overlay properties can be accessed from any tab in the Overlays dialog, and from the overlay's local menu on the display view, theme view, and table view tabs in the workspace window.

◆ Using data: creating schemas

A schema defines a sub-set of data, and is used to control the display of the data-oriented parts of the user interface, notably the table window, themes and Map Tips. A schema consists of a list of the data columns for the overlay. ➤Chapter 17: “**Schemas**”

◆ Using data: thematic mapping

Thematic mapping is the use of symbols, shading, labels, dot density, or graphics such as bar charts, pie charts, graduated colours etc, to indicate visually on the map various types of information. This could be the distribution of data (eg population information), height of contours, or flow directions, and so on. ➤Chapter 19: “**Thematic mapping**”



Filtering what you see

■ Filtering the display of information	237
■ Overlay filters	237
■ About filters	237
■ The filters in the (standard) library	238
■ Applying overlay filters	239
■ Clearing a filter in use	241
■ Creating your own filters	241

■ Filtering the display of information

You can filter the information in an overlay, to exclude certain items from the display, or to view selected items only. There are several ways to do this:

- scale thresholds can be set for overlays and features. These determine the display scales between which the overlay or feature type is displayed. ↗Chapter 8: “**Scale**”
- a locus can be used to apply spatial tests to items to determine whether or not they are displayed ↗Chapter 56: “**Spatial testing: loci**”

This chapter tells you how to use overlay filters to choose which items should be displayed.

■ Overlay filters

Overlay filters are used to control which items are displayed in the map window while the filter is in force, and which are not. The filtering can be carried out on the basis of item classes, features, properties or using a combination of filters.

When you have an overlay filter in force, items excluded by the filter are not displayed (and so cannot be edited either). If you create items which are excluded by the filter, these will be drawn but not shown.

■ About filters

Filters are named objects, stored in libraries, and so can be accessed on the library view tab of the workspace window. Cadcorp SIS comes supplied with many read-only filters which are stored in the (standard) library. You can also create your own filters. ↗Chapter 51: “**Creating your own filters**”

These same filters can also be applied to the selection of items. ↗Chapter 34: “**Selecting graphics**”

There are several different types of filter, and they are used as follows.

To include or exclude entire classes of items

If you want to exclude an entire item class or limit the display to an item class (such as all text items, or all area items), use the class based filter.

To include or exclude certain feature types

To exclude an entire feature type, or limit the display to one feature type only, use the feature filter. This filter can be based on the feature types of many different datasets (eg LandLine, TIGER/Line95, Meridian, etc).

Feature filters can also include or exclude items with no feature code.

To include or exclude items based on their properties

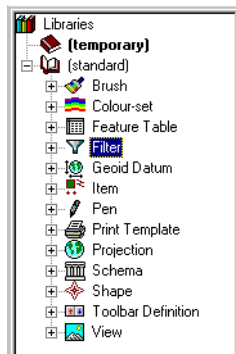
If you want to include or exclude items on the basis of a property value, use the property filter. For instance, you could limit the display to just those items whose pen is Green. Properties can also be combined in formulae.

To include or exclude items by combining filters

Use the compound filter option to combine other filters.

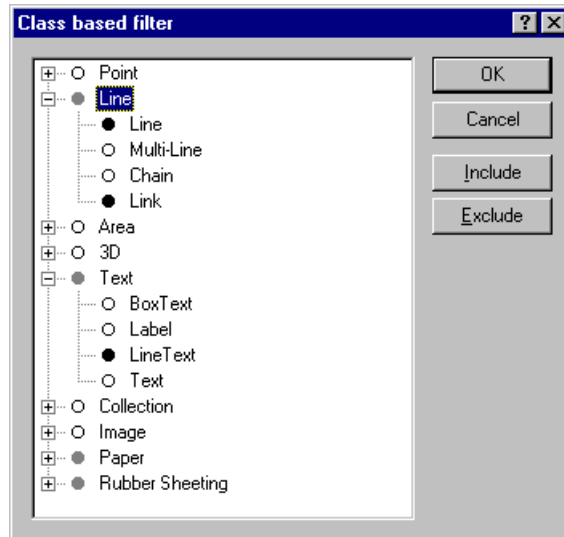
■ The filters in the (standard) library

Cadcorp SIS comes supplied with many filters already created. These are stored in the (standard) library and are read-only. You can see them listed in the library view tab of the workspace window.





Using their local command Properties... you can see exactly what each filter includes or excludes. The following shows the details of the Property filter called Line. Only line items, link items, line text items and some paper and rubber sheeting items are included. All other items are excluded:

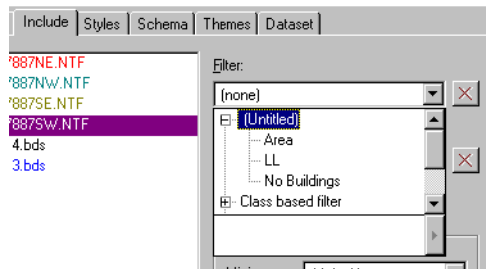


■ Applying overlay filters

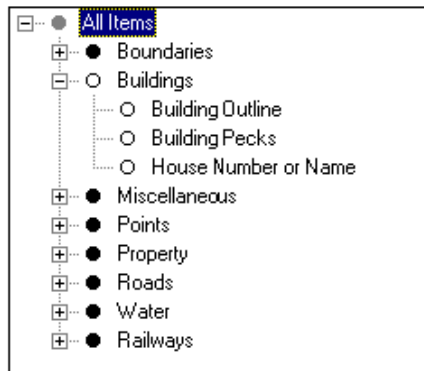
You can apply any of the filters supplied in the (standard) library, or any you have created yourself and stored in an editable library. The libraries must be enabled in order to be searched.

- 1 On the Overlays dialog Include tab, select the overlay to apply the filter to.
- 2 In the Filter drop-down, select the filter to use.

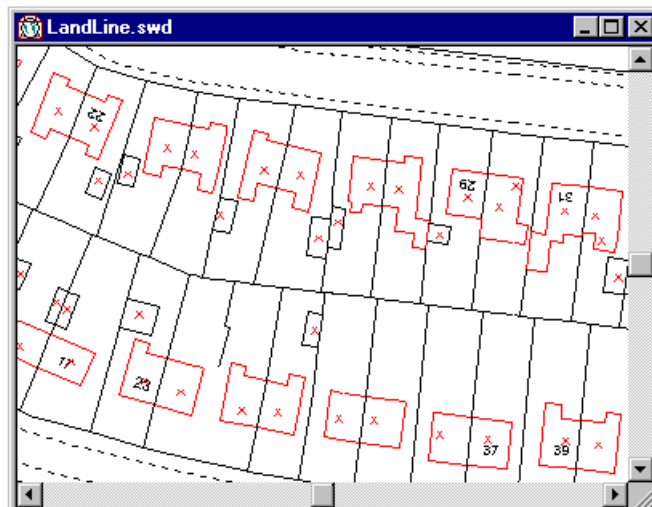
In this example we will select a user-created filter called No Buildings:



This filter excludes all data relating to buildings:

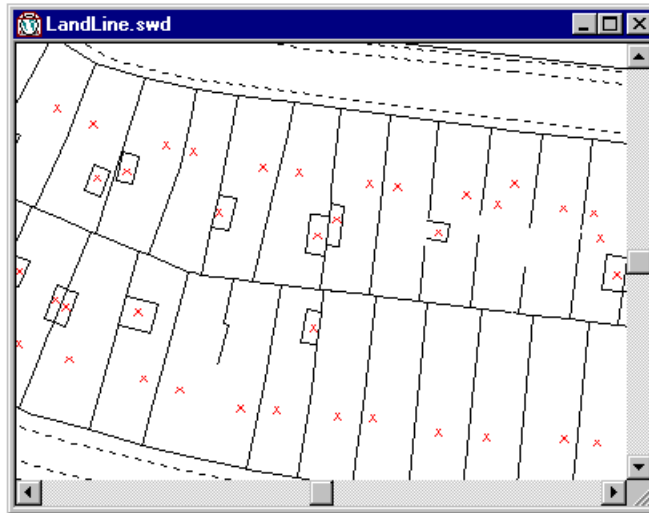


This is the view before the overlay filter is applied:



Map extract © Crown copyright

This is the view with the overlay filter applied:



Map extract © Crown copyright

■ Clearing a filter in use

An overlay filter remains in force until you clear it.



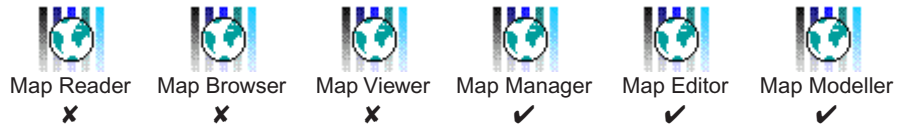
The Reset Filter command on the overlay's local menu (on the display view tab in the workspace window) removes the filter from use. In doing so, it makes all items on the overlay visible, and re-sets the filter tree.



Alternatively, on the Overlays dialog Include tab, click on the cross adjacent to filter.

■ Creating your own filters

You can create your own filters. ➤Chapter 51: “Creating your own filters”



Schemas

■ What are schemas?	243
■ Creating a schema	244
■ Schemas and item properties	245
■ Schemas and table windows	246
■ Schemas and databases	247

■ What are schemas?

Each overlay has a schema, which is a list of the data columns you wish to appear in the table window and in other parts of the user interface where data is used.

Each data column has a formula and a description. A formula can simply be an item's property, or it can be more complicated, involving mathematical operators, spatial searching functions and database-joins onto named tables. The description can be related to the formula, but can be more meaningful to the user (eg Unique ID Number).

The data does not have to exist at the time the schema column is created. If the data does not exist, the table window displays the columns with empty values.

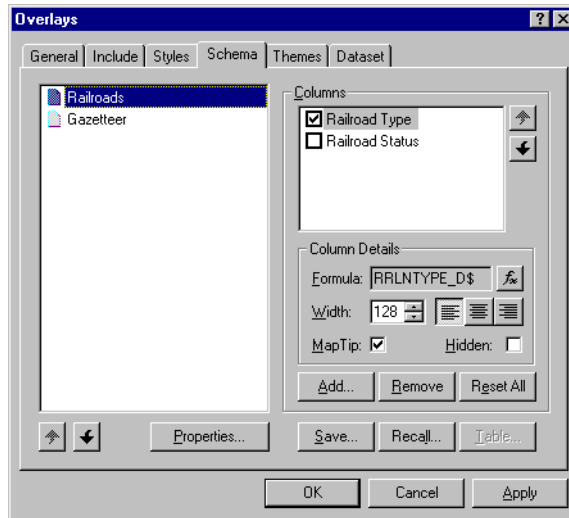
Schemas are also used for:

- Map Tips: any number of the data columns can be defined as Map Tips ↗page 244, **Creating a schema**, ↗Chapter 12: **"Querying the data in the map window"**
- themes: when you choose a property or formula on which to base the theme, the list you see consists of the data columns of the schema
↗Chapter 19: **"Thematic mapping"**
- Item Properties dialogs: there is a Schema tab which shows the schema of the selected item's overlay

Schemas are named objects and can be saved in libraries. These can be accessed using the library view tab of the workspace window. There is also a schema tab in the Overlays dialog where you can create and edit a schema for each overlay.

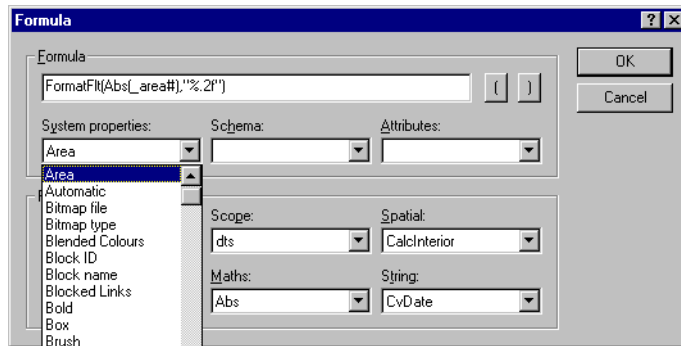
■ Creating a schema

- 1 In the Overlays dialog, select the overlay and the schema tab.



In the first box of the Columns area you will see a list of properties available with this overlay. This list varies according to the type of dataset.

- 2 To remove a property from the column list, select it and click on the Remove button.
- 3 To add a property or formula to the list of columns, click the Add button and type in a property or formula in the Formula dialog:



The example shown gets the area value of items, rounding it to two decimal places.



- 4 To change the order of the columns, click on one to be moved, then use the up and down arrows to move it in the list.
- 5 To change the property or formula of a column, select it in the list, then in the Formula field do one of the following:



- type in a new property or formula
- select a property from the drop-down list
- add a new formula by clicking on the Formula button and creating a new formula

- 6 You can select each of the columns, and change its description by clicking twice (not double-clicking), or by pressing F2.

It is the contents of this description field which is used for the heading of the column in the table window.

The Initial width is the width of a field (in pixels) in the table window. When a table window is created, or the displayed overlay is changed, then the table window columns will be created from the overlay schema using this value as the initial column width.

Alignment is the alignment of the column header in its cell, and each value in this column within its cell. The default alignment for string values is left, and the default for numerical values is right.

By selecting the Map Tip checkbox, the currently selected property is used when Map Tips are displayed. ↗page 198, **Map Tips**

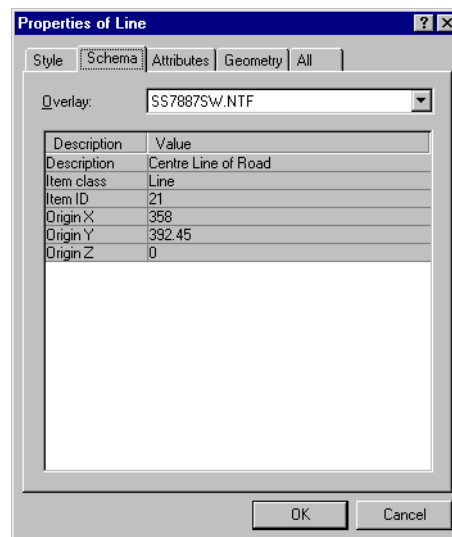
- 7 Use Reset All to remove all columns from the schema, and re-add the default columns. The default columns are dependent on the dataset of the overlay.

A schema can be saved either to use on another overlay or for use in a later session. schemas are named objects, and are stored in libraries. You can store a schema in a library by clicking on the Save button of the Schema tab in the Overlays dialog. You can recall them by clicking the Recall button. ↗Chapter 50: “**Named object libraries (NOLs)**”

If you are linked to an external database, with data associated with the overlay, you can use the Table button to access that database, and add columns to the overlay schema from the table. For more information, ↗page 246, **Schemas and table windows**, ↗Chapter 20: “**Databases**”, and ↗Chapter 21: “**Table windows**”.

■ Schemas and item properties

The columns of the overlay schema are used on the Schema tab of Properties dialogs:



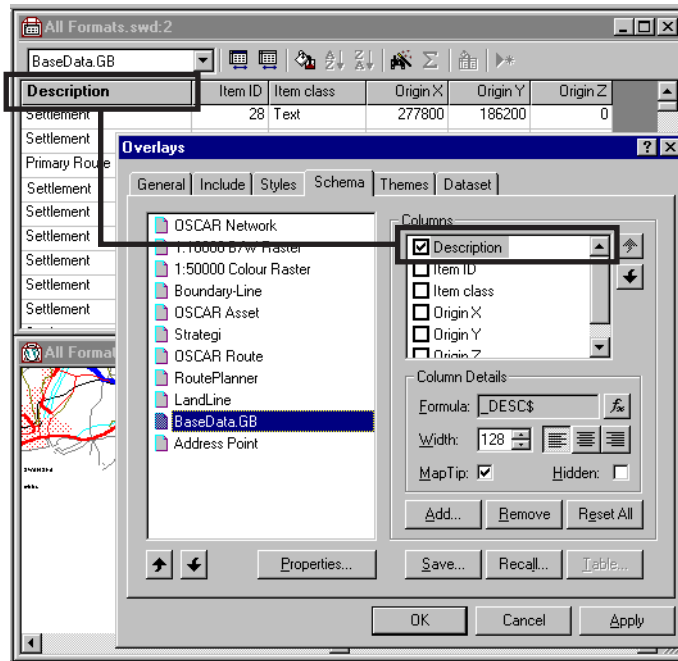
If a single item is selected, the schema of its overlay is shown. If the overlay is phased, all phases are listed, and you can select one from the drop-down list.

If several items are selected, the Properties of the Item dialog displays the schema of the overlay of the dominant item.

■ Schemas and table windows

Table windows get their column setup from the schema of the overlay being viewed.

In the table window, each row is equivalent to an item, and each column comes from the overlay schema. The value in a cell is calculated by evaluating the column formula on the row item.



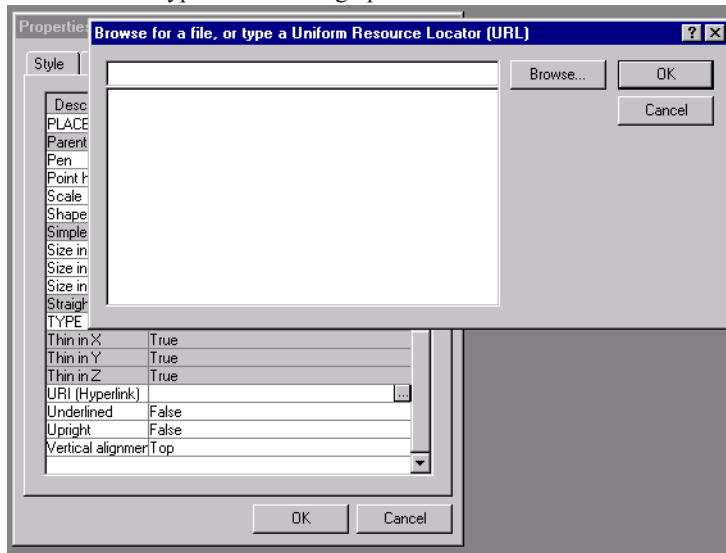
If the overlay schema does not contain any columns, the table window does not display any rows. ➤Chapter 21: “Table windows”

■ Hyperlinks to external objects

A hyperlink is a link between an item and another object outside Cadcorp SIS, which could be a file on your network, or a resource located somewhere on the internet.



To link a Cadcorp SIS item to an external object, use the **Edit>Hyperlink>Set...** command, or click on the button next to the URI (Hyperlink) property in a properties dialog. The Browse for a file or type a URL dialog opens.



Click Browse... to browse for the file, or type in the name of a resource in the form of a URL (a Uniform Resource Locator, such as <http://www.cadcorp.com>).

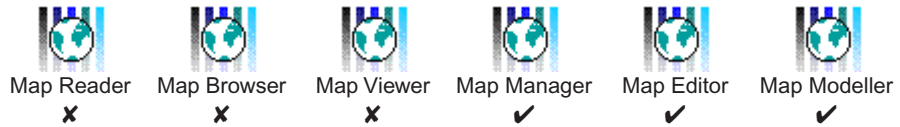


To jump from a Cadcorp SIS item to its linked file or resource, choose Open Link from the item's local menu, or select the item and choose Open... from the **Edit>Hyperlink** menu. The file or resource will be opened by the application on your computer which usually handles that type of file or resource. For example, if you open a hyperlink which is a web address, Cadcorp SIS will launch your system's default web browser and switch to it while the web site is loading.

■ Schemas and databases

Schemas used by Oracle, PostGIS, and other cursor datasets do not allow the schema to be altered on the Overlays dialog. You must edit them directly inside the database, or use the Dataset>Properties local command (on the Oracle or PostGIS overlay's local menu).

➤page312, **Spatial queries**



Adding your own attribute data

■ What is attribute data?	249
■ Adding attributes to items.	249
■ Adding attributes to an SWD	250
■ Adding attributes to an overlay	250
■ Display of attributes.	251
■ Modifying user attributes	251
■ Editing items which have attribute data	251

■ What is attribute data?

Attribute data is non-graphical information assigned to editable graphical items, SWDs, overlays and datasets. An attribute is a type of property which gives extra information about the graphical item, SWD, dataset or overlay. It is different from a system property which is an integral part of the item, SWD, dataset or overlay.

Some external datasets, such as the Ordnance Survey ADDRESS-POINT, use attributes. You can also add your own attributes to editable data.

Attributes may be used in formulae, like other properties (➤Chapter 52: “**Formulae**”). They can also be analysed and viewed in tables (➤Chapter 21: “**Table windows**”) and interrogated using customisations written in Visual Basic.

Once you have assigned attributes to an item, SWD, overlay or dataset, they are listed with the rest of their properties.

In addition, with all Cadcorp SIS programs (with the exception of Cadcorp SIS Map Viewer and Cadcorp SIS Map Reader), you can use Microsoft Visual Basic customisations to add, modify, and remove attribute data, and the Cadcorp SIS OLE DB Provider to view attribute data in a tabular, read-only format. For further information about customising Cadcorp SIS, see the **Cadcorp SIS Developers Guide**.

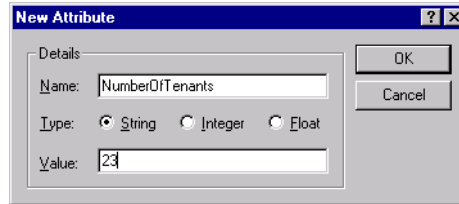
For further information on using alphanumeric data in Cadcorp SIS, ➤Chapter 20: “**Data-bases**”, and ➤Chapter 21: “**Table windows**”.

■ Adding attributes to items

- 1 Select the item or items to which you wish to assign attribute data.
- 2 Choose Properties from the local menu.



- 3 On the Attributes tab, click on the Add... button. The New Attribute dialog opens.



- 4 Type the name of the attribute (this is what will appear in the properties Description column). The name may consist of any alphabetic or numeric characters (without spaces), but the first character must not be a number or an underscore.
- 5 Select the attribute type.

■ Attribute types

string string attributes consist of text, or a mixture of text, numbers and punctuation. In the example above, Usage is a string attribute.

integer integer attributes hold whole number values. These can be positive or negative whole numbers between -2 147 483 648 and 2 147 483 647. In the example above, NumberOfTenants is an integer attribute.

float float attributes hold a decimal value (double precision floating point number). This can be any positive or negative value in the approximate range of plus or minus one followed by 300 zeros. In the example above, CostPerSqMetre is a Float attribute.

- 6 Optionally you can input a value. However, this can be added at any future time.

- 7 Click on OK.

A typical attribute looks like this:

Style Schema Attributes Geometry All	
Description	Value
CostPerSqMetre	12.5
NumberOfTenants	23
Usage	Business

■ Adding attributes to an SWD



- 1 Choose the SWD's local command Properties... in the workspace window (display view tab, theme view tab, or table view tab).
- 2 In the dialog that follows, click on the Add... button.
- 3 Add the attribute in the New Attribute dialog. ➤page 249, **Adding attributes to items**

■ Adding attributes to an overlay

- 1 In the Overlays dialog, select the overlay, then click on the Properties... button.
- 2 In the following dialog, click on the Add... button.

3 Add the attribute in the New Attribute dialog. ➤page 249, **Adding attributes to items**

■ Display of attributes

Once you have added attributes to an item, SWD, overlay or dataset, they are shown as properties in the Properties dialog. To see this dialog:

- for an SWD, overlay or dataset, select the Properties... command from its local menu in the workspace window
- for a graphical item, select it in the map window and use its local command Properties... or the **Edit>Properties...** command



For an item, its properties are also shown on the property view tab in the workspace window when the item is selected. In both locations, attributes appear in both the Attributes category and the All category. You can also view and edit user-defined attributes in the table window.

■ Modifying user attributes

You can modify the attributes of an item, SWD, overlay or dataset in their Properties window. You can delete the value to leave it blank, or type in a new value.

For items, the attribute can be removed completely using the Remove button on the Attributes tab on the item's Properties window.

Item attributes can also be modified in the property view tab of the workspace window. If you intend to modify the properties of several different items one after the other, it is more convenient to do so here.

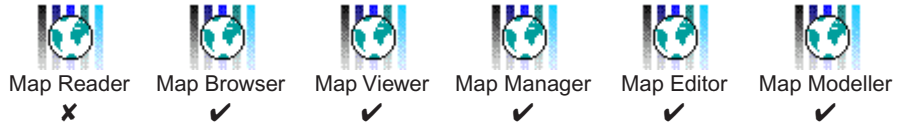
■ Editing items which have attribute data

When an item is edited, Cadcorp SIS generally tries to retain its user-defined attribute data where possible. Some guidelines are given below:

- If a line item is converted to an area or vice versa, attribute data is retained.
- If two line items are joined, the resulting line item retains the attributes from the dominant item. The dominant item is the last item selected. However, you can make any selected item dominant, by clicking on it with the Ctrl key held down.
- If a line item is split in two using the **Alter>C.A.D.>Path>Delete** command, both resulting lines will hold identical data.



However, some operations can result in the loss of attributes. Examples are converting line and area items to topology, converting text items to area items and creating shapes.



Thematic mapping

■ What are themes?	253
■ The New Theme Wizard	254
■ Using formulae	255
■ Bar charts	255
■ Pie charts	257
■ Dot density	260
■ Extrude 2D items in 3D views	261
■ Graduated	262
■ Labels	263
■ Individual values	266
■ Ranges	268
■ Legends	271
■ Saving and recalling themes	272
■ Using your themes	273

■ What are themes?

Themes use graphic techniques to indicate visually on the map base the distribution of data. These techniques include bar charts, pie charts, labels, colours, and symbols to show population information, size of housing, residential or commercial properties, and so on. If the data includes height information, the theme might show direction of flow, or ground relief.

Themes in Cadcorp SIS use information taken from item attributes or properties, or from formulae that use items or properties. When these attributes or properties change, the themes show the change.

The different types of theme are listed below and described later in this chapter. Except where indicated, the themes are annotation themes, ie they annotate, or add graphics to, items.

- Themes which illustrate the value of a single property value (eg their size).
 - dot density
 - extrude 2D items in 3D views
 - graduated
 - individual values (a styling theme)
 - labels
 - ranges (a styling theme)
- Themes which compare multiple attributes (such as the male population against the female population).
 - bar charts

- pie charts
- Themes which are specialised for use with certain item classes. See the indicated chapter for details.
 - Contour (creates contour lines over TIN items) ↪ Chapter 42: “Editing TINs”
 - Flow (draws flow arrows over TIN items) ↪ Chapter 42: “Editing TINs”
 - Relief (a styling theme used to indicate ground relief on grid and/or TIN items) ↪ Chapter 31: “Creating 3D data”
- Feature code. Cadcorp SIS can create a Feature Code theme. This theme styles items using feature codes from a Feature Table. The Feature Code theme is useful when a legend is required on a map showing feature codes. The legend can be added when using the Print Wizard. ↪ Chapter 53: “Feature tables”
- Topology (shows the structure of topology, including flow directions and turning rules at junctions) ↪ Chapter 29: “Creating topology: links and nodes”

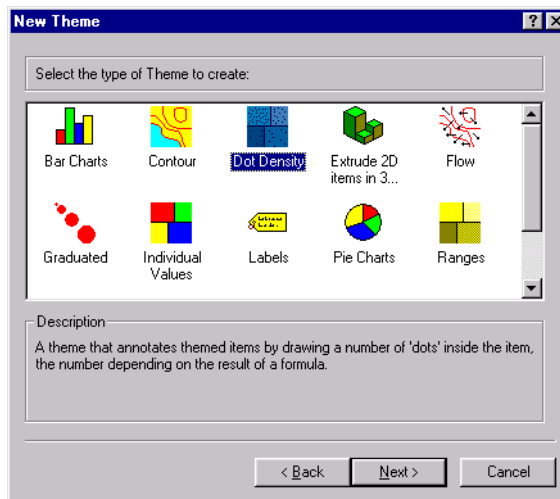
■ The New Theme Wizard

The New Theme Wizard is accessed by:



- the **Map>Add>Theme...** command, or its icon
- the Add... button on the Themes tab in the Overlays dialog (select the required overlay first)
- the Add Theme... command on the default local menu (accessed by right-clicking in the map window when no items are selected)
- the Add Theme... command, found on the SWD local menu and the overlay's local menu on the theme view tab of the workspace window

In the New Theme Wizard you should select an overlay to theme, then select the type of theme to use.



The different types of theme are described in the following sections.
Each overlay can have an unlimited number of themes.

■ Using formulae

Themes use the properties of items to annotate those items. Sometimes just the value of a single property is used, but often you will want to base your theme on a formula which combines properties or carries out a calculation on the properties.

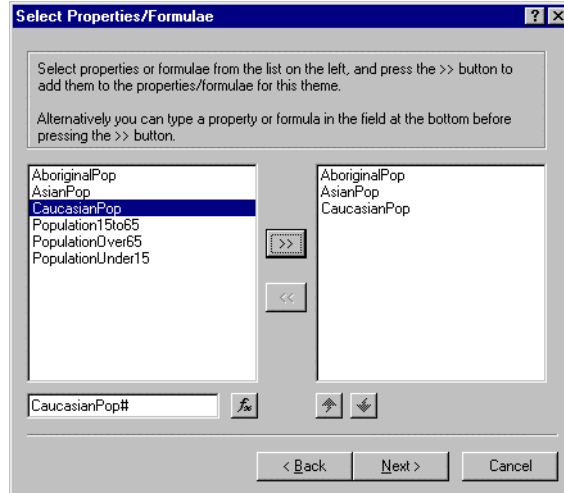
You will be offered a choice from the properties or formulae contained in the overlay schema, but you can also create your own formulae. ➤Chapter 17: “**Schemas**” ➤Chapter 52: “**Formulae**”

■ Bar charts

This theme uses bar charts to compare the values of several properties. The height of the bar chart blocks are proportional to the value of a chosen property or formula.

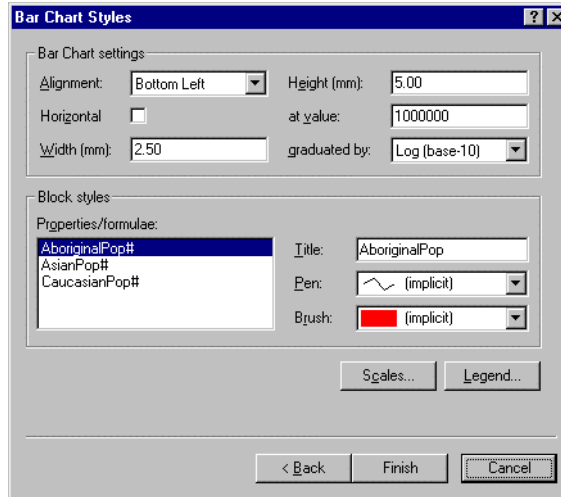
The following example uses some Australian census data to compare the numbers of different ethnic groups in each state.

- 1 Start the New Theme wizard using one of the methods described in the earlier section, and select the theme type Bar Charts.
- 2 In the Select Properties/Formulae dialog, either:
 - from the list on the left, select the properties to compare, clicking on the right chevrons button to add them to the list on the right
 - in the field at the bottom left, type in a property or formula (using the Formula button to access the Formula dialog if required). Click on the right chevrons to add this to the box on the right.



In this case we have chosen to compare the number of Aboriginal, Asian, and Caucasian people in the population.

- 3 In the Bar Chart Styles dialog, choose the parameters for the bar chart's appearance and placing:



- 4 The Alignment option allows you to choose where the bar chart should be placed in relation to the item's centre, or hook point (the default is Middle Centre). Use the Horizontal checkbox to align the blocks horizontally.
- 5 Choose a width for the bars in millimetres (all bars use this same width), and a method by which their height, in millimetres, is determined.

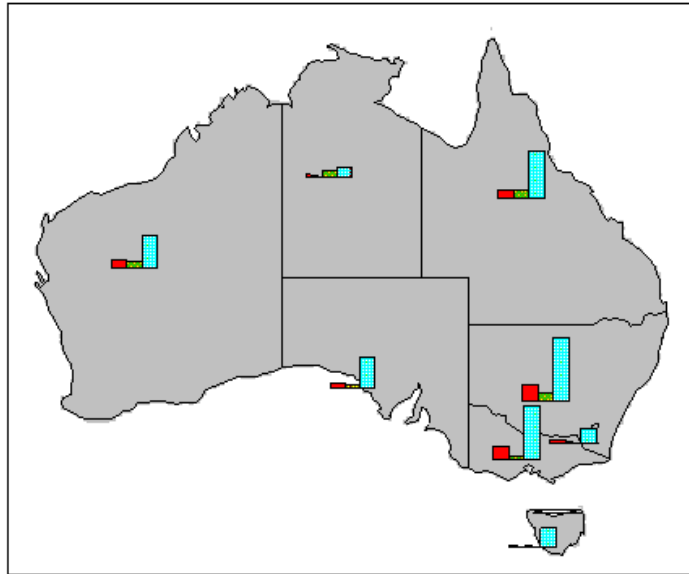
At Value This is the base value around which the block is scaled up or down. So if an item has this value, it will be represented by a block of the height shown in the Height field. If the value is less than this, the block will be shorter; if greater, the block will be taller. The means of scaling the block height is determined by the chosen Graduated by option.

Graduated by

- **Square root** The block height is proportional to the square root of the ratio (this is the ratio of the evaluated block value to the At Value).
- **Linear** The block height is proportional to the ratio.
- **Log (base 10)** The block height is proportional to the log (base 10) of the ratio when the value is greater than or equal to the value given in at value, and is proportional to the ratio when the value is less than the value given in At Value.

- 6 In the Block styles area, choose a title for this entry in the Legend (Title option), and the pen and brush to be used for displaying each selected block.
- 7 The Scales... button allows you to choose the scale thresholds between which the theme is displayed.

- 8 If you are using a legend,  page 271, **Legends**.



■ Pie charts

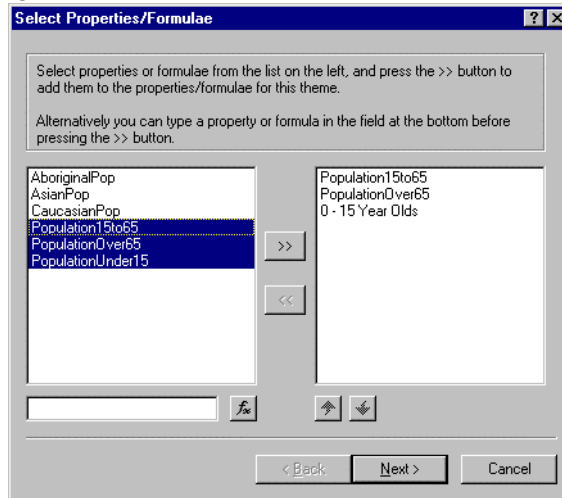
This theme uses pie charts to compare the values of several properties. The size of the pie chart slices are proportional to the value of a chosen property or formula.

The following example uses some Australian census data to compare the number of people of employable age with those above and below this age. The comparison is carried out for each state.

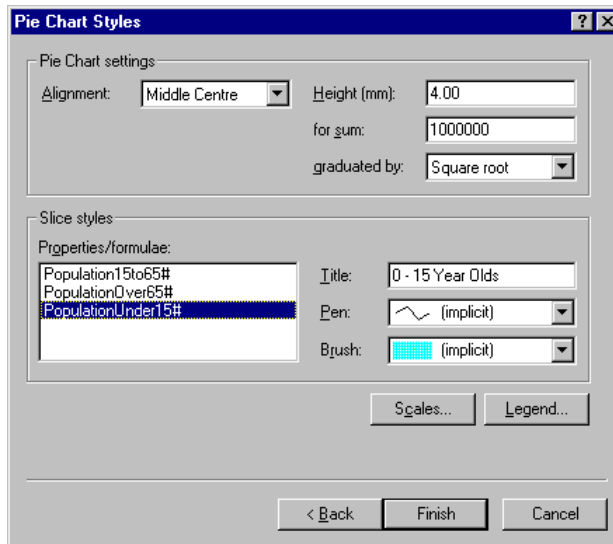
- 1 Start the New Theme wizard and select the theme type Pie Charts.
- 2 In the Select Properties/Formulae dialog, either:
 - from the list on the left, select the properties to compare, clicking on the right chevrons button to add them to the list on the right.



- in the field at the bottom left, type in a property or formula (using the Formula button to access the Formula dialog if required). Click on the right chevrons to add this to the box on the right.



- 3 In the Pie Chart Styles dialog, choose the parameters for the pie chart's appearance and placing:



- 4 The Alignment option allows you to choose where the pie chart should be placed in relation to the item's centre, or hook point (the default is Middle Centre).

5 Choose a diameter for each pie (Height) in millimetres on the screen and the paper.

For Sum

The For Sum value is the base value around which the pie is scaled up or down. So if the pie has this value, it will be represented by a symbol of the diameter shown in the Height field. If the value is less than this, the pie will be smaller, and if greater, the pie will be larger. The means of scaling the pie is determined by the chosen Graduated by option.

Graduated by

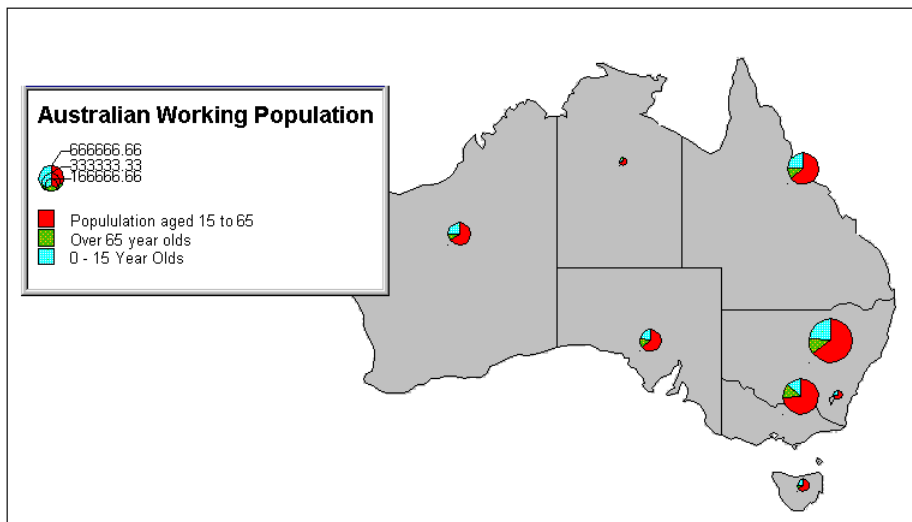
- **Constant** All pies are the same size, that is, the size in the Height field.
- **Square root** The pie size is proportional to the square-root of the ratio (this is the ratio of the evaluated slice value to For Sum).
- **Linear** The pie size is proportional to the ratio.
- **Log (base 10)** The pie size is:
 - proportional to the log (base 10) of the ratio when the value is greater than or equal to the value given in For Sum
 - proportional to the ratio when the value is less than the value given in For Sum.

6 In the Slice styles area, use the Title option to choose a title for this entry (slice) in the Legend. You can also select a different Pen and Brush to be used for displaying the slice.

7 The Scales... button allows you to choose the scale thresholds between which the Theme is displayed.

8 If you are using a legend, page 271, **Legends**.

The following illustration also shows a legend (which appears in the workspace window), and can be added to the final print using the Print Template Wizard.



➤ Chapter 47: “Printing: print templates”

■ Dot density

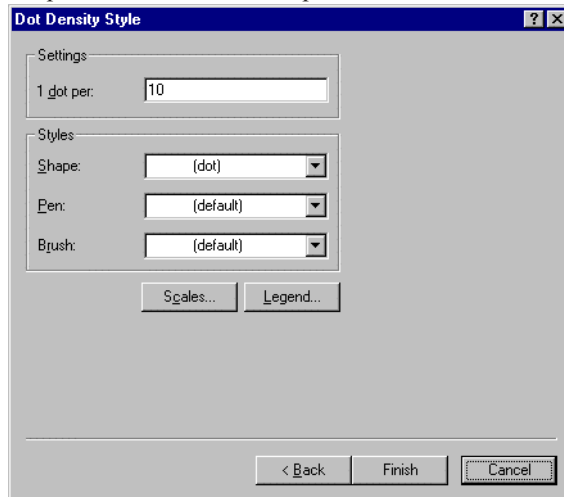
This theme is an example of choropleth mapping. It fills areas with dots to show the value of a property or formula. The density of the dots in the different areas gives an immediate visual indication of the spread of data.



If you explode a dot density theme, multi-points are created. If required, you can then decompose the multi-points to get point items. The Explode command is on the local menu of the theme in the theme view. Any exploded theme will become an Internal overlay.

In this example we create a theme that shows the number of people in each ward in Medway. Each dot represents 10 people.

- 1 Start the New Theme Wizard and select the theme type Dot Density.
- 2 In the Dot Density Style dialog, you can choose a shape to be used if you do not want just dots, and the pen and brush for the shape.



- 3 Choose the value that each dot or shape will represent. In this case we have chosen to have one dot placed per 10 people.

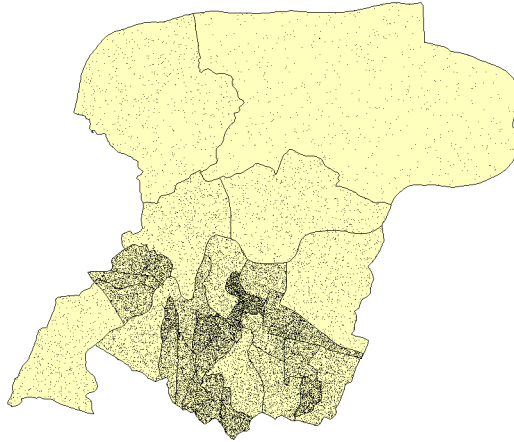


Image courtesy of Medway Council

- 4 The Scales... button allows you to choose the scale thresholds between which the theme is displayed.
- 5 If you are using a legend,  page 271, **Legends**.

■ Extrude 2D items in 3D views

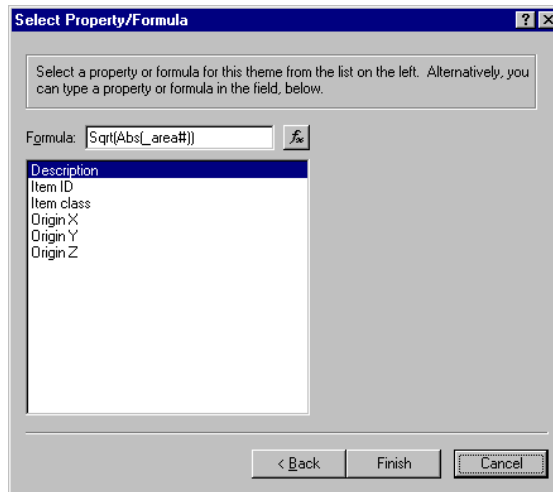
This theme extrudes 2D graphical items, such as lines and areas, to a height calculated from a formula. The extruded items can be seen only in a 3D window.

In this example we are going to extrude area items proportionally by their area value. Area items with larger areas will appear taller than those with smaller areas.

- 1 Start the New Theme Wizard and select the theme type Extrude 2D Items in 3D Views.
- 2 In the Select Properties/Formulae dialog, put in either:
 - a property name (typing it in or selecting from those offered in the box below)
 - a formula (using the Formula button to access the Formula dialog if required)



In this case we are using the formula $\text{Sqrt}(\text{Abs}(\text{\_area\#}))$, which maps the square root of the area to the extruded height:



Chapter 52: “**Formulae**”



- 3 Back in the map window you will need to open a 3D window (**Window>New 3D Window** command) to see the results. If you need help with viewing 3D windows, Chapter 9: “**Viewing 3D Data**”.

■ Graduated

This theme uses shape items, graduating their size to indicate the value of a given property or formula - the higher the value, the larger the shape.

The properties of any class of item can be used to create a Graduated theme. If the items are point items, the shapes are placed at the point. If the items are not point items, the shapes are placed at the item's origins.

As with the worked example for the Extrude 2D items in 3D views theme, we are going to use the area value of some buildings. This time, the area value will be indicated by the size of the shape - the larger the area value, the larger the shape.

- 1 Start the New Theme Wizard and select the theme type Graduated.
- 2 In the Select Properties/Formulas dialog, put in either:
 - a property name (typing it in or selecting from those offered in the box below)
 - a formula (using the Formula button to access the Formula dialog if required)



In this case we are using the formula $\text{Sqrt}(\text{Abs}(\text{\_area\#}))$.

- 3 In the Graduated Style dialog, choose a shape to represent the area value, and the pen and brush to be used for it.

- 4 Use the Settings section to determine how large the shape will appear. The options are:

For value This value is the base value around which the shape is scaled up or down. So if an item has this value, it will be represented by the shape at its normal size. If the value is less than this, the shape will be smaller; if greater, the shape will be larger. The means of scaling the shape is determined by the chosen Graduated by option.

Graduated by

- Constant All shapes are the same size, ie, the size of the shape itself.
- Square root The shape size is proportional to the square root of the ratio (this is the ratio of the evaluated formula value to the For value).
- Log (base 10) The shape size is:
 - proportional to the log (base 10) of the ratio when the value is greater than or equal to the value given in For value
 - proportional to the ratio when the value is less than the value given in For value.

- 5 If required, use the Scales... button to set the scale thresholds between which the theme will be displayed.

- 6 If you are using a legend,  page 271, **Legends**.

■ Labels

The Label theme attaches a text label to all themed items. The text of the label is the value of a property or formula.

When labelling line items, you can choose where on the line item to place the label, and whether or not the label should be rotated (either the complete label, or each individual character). In this way you can label contour lines.



If you explode a label theme, you can edit each label individually. The Explode command is on the local menu of the theme in the theme view. Any exploded theme will become an internal overlay.

In this example Ordnance Survey Address Point data is used. A label will be put against every business address on the map base, using the property Organisation Name, or ONS (residential properties do not have an Organisation Name).

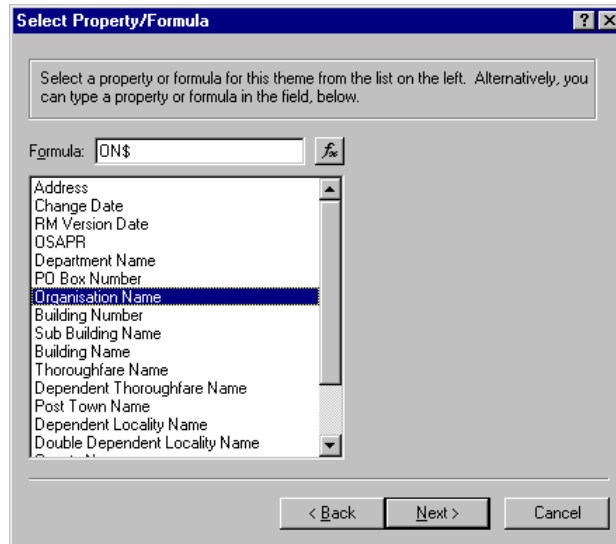
- 1 Start the New Theme and select the theme type Labels.

- 2 In the Select Properties/Formulae dialog, put in either:

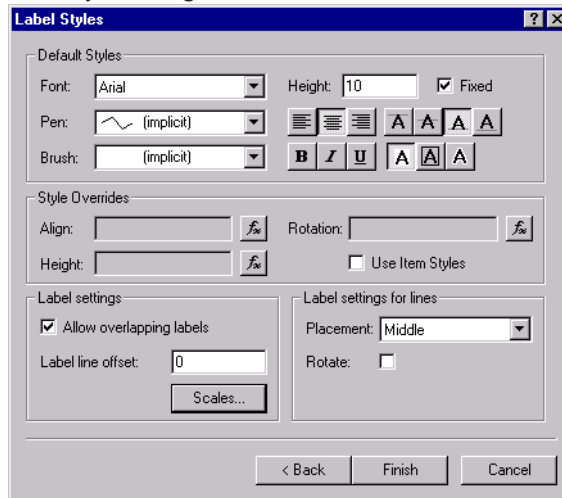
- a property name (typing it in or selecting from those offered in the box below)
- a formula (using the Formula button to access the Formula dialog if required)



In this case we select Organisation Name from the list:

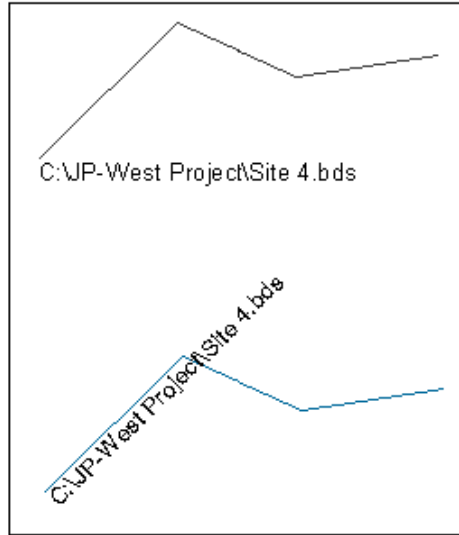


You will see the Label Styles dialog, which defines how the labels will look:



- 3 In the Default Styles area, select the properties of the text. If you choose opaque text, you can select a brush for the background. You can also make the text fixed height (ie it always appears the same size on screen no matter how much you are zoomed in and out). ➤Chapter 27: “Creating text”, Styles, page379
- 4 In the Style Overrides area, you can use simple properties or formulae to control the labels’ height, alignment, and orientation.
- 5 Select the Item Styles check box if you want to use the style settings of the item being labelled, rather than the Label Theme styles.

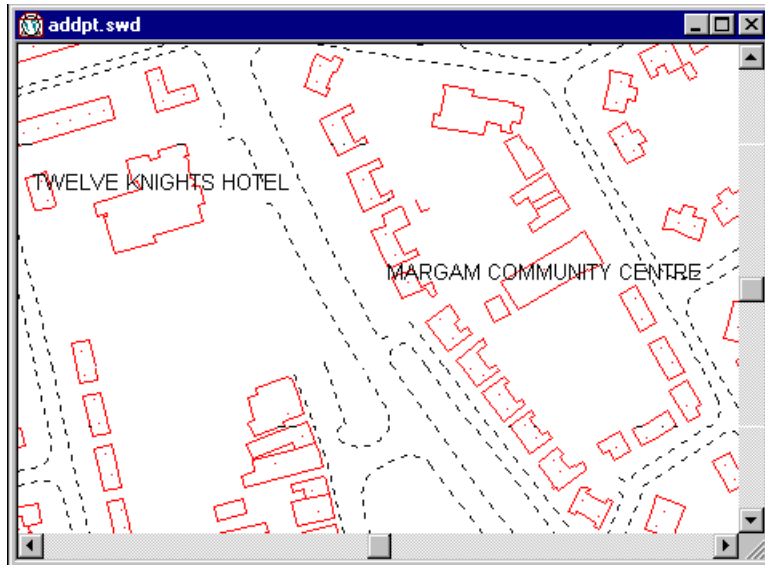
- 6 In the Label settings area, give an offset (in text points) to offset the label from the item. A connecting line is drawn from the label to the item. You can also choose whether or not labels may be allowed to overlap.
- 7 When labelling line items, set the parameters in the Label settings for lines area. You can choose where on the line the label should appear, and whether the label should be rotated to follow the line.
- 8 In the following example, the line item's `_dataset$` property is placed at the start of each line. In the second case the label is also rotated:



If you choose the Along option, each individual character in the label is rotated as it is placed along the line (as it is with line text).

- 9 If required, use the Scales... button to determine the scales between which this theme will be displayed.

The theme shows that all buildings with an Organisation Name property have a label showing that name.



Map extract © Crown copyright

■ Individual values

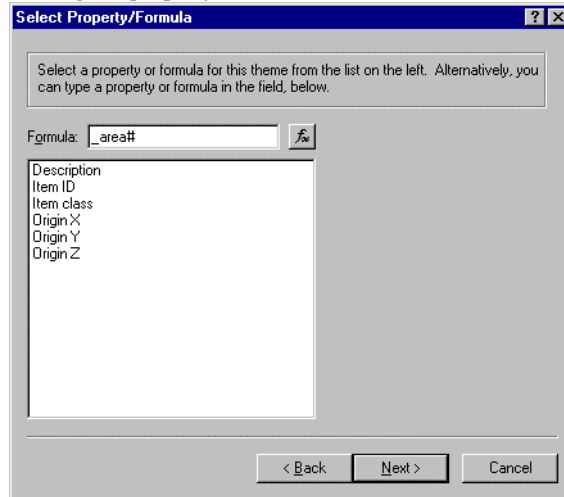
This theme assigns different styles (pen, brush and shape) to every different value it finds. This theme type is normally more appropriate to highlighting just a few options, for instance, the counties on a UK map.

In this example, the area value of some buildings on an estate are themed. This provides an instant visual indication of which properties, if any, have the same area value.

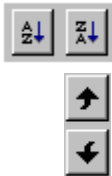
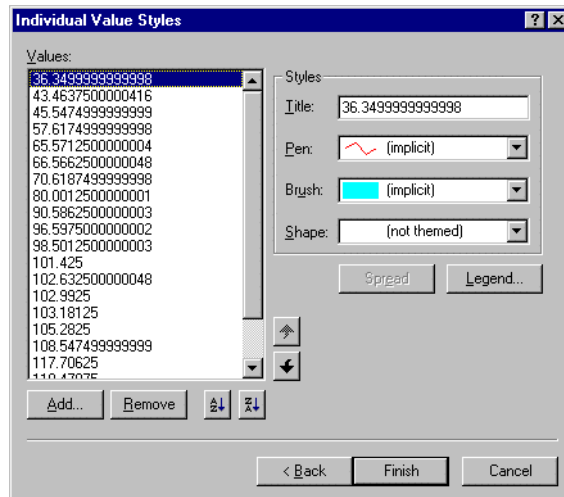
- 1 Start the New Theme wizard and select the theme type Individual Values.
- 2 In the Formula box of the Select Property/Formula dialog, put in either:
 - a property name (typing it in or selecting from those offered in the box below)
 - a formula (using the Formula button to access the Formula dialog if required)



In this case we are using the property `_area#`.



- 3 In the Individual Value Styles dialog you will see the value listed of every item with the property `_area#`.



You can reverse the current sort order using the sort order buttons., and you can change the order of each value using the up and down buttons.

You can select a title for each value to appear in the legend. You can also select a pen, brush and shape, if required, for each value. Alternatively, you can accept the defaults decided by Cadcorp SIS.

If you want to use graduated colour across several values, select the first value and assign its pen a colour, eg yellow, then select the last colour and assign its pen and brush a colour, eg red. Then highlight all the values between and including the first

and last values and select Spread. The spread runs from the colours of the pen and brush of the first value selected (yellow) to the colours of the pen and brush of the last value selected (red).

- 4 If you want to get rid of a value, select it then click on the Remove button. To add extra values, click on Add, then type in the new value. Use the Legend... button to edit the legend. ➤page 271, **Legends**



Map extract © Crown copyright

■ Ranges

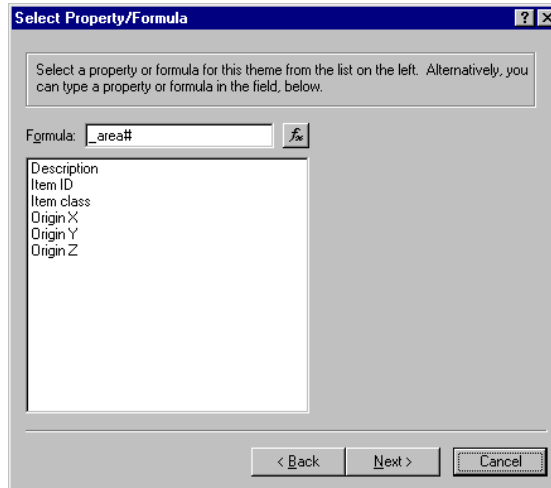
This theme takes ranges of values and uses a different pen, brush (and shape if appropriate) to illustrate each range. The overall range is calculated from the values of all included items in the overlay. You can then adjust the number and type of ranges by which the overall range is divided.

The following example uses the floor area value of buildings on an estate. We are going to assign different brushes to the following ranges of buildings: those with a floor area of less than 50m², those with a floor area of between 50 and 100m², 100 - 150m², and so on.

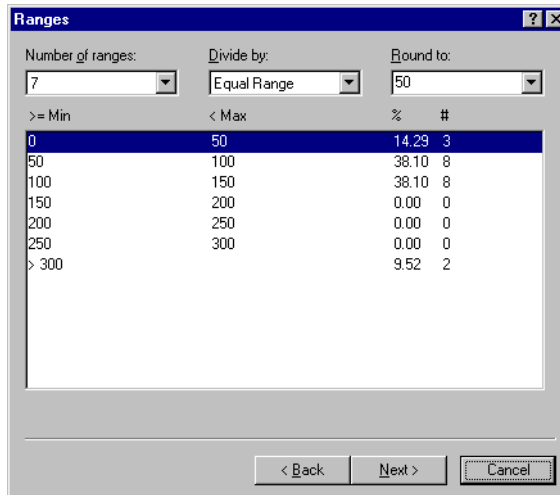
- 1 Start the New Theme Wizard and select the theme type Ranges.
- 2 In the Formula box of the Select Property/Formula dialog, put in either:
 - a property name (typing it in or selecting from those offered in the box below)
 - a formula (using the Formula button to access the Formula dialog if required)



In this case we are using the property `_area#`:



- 3 In the Ranges dialog, choose the number of ranges and their extent:



Number of ranges This value selects the number of ranges for the theme.

Divide by This value chooses how these ranges are distributed:

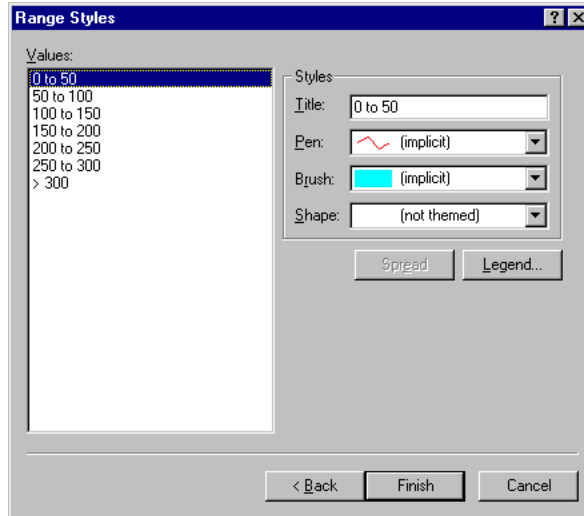
- Equal Range to make the ranges equal
- Equal Count to make each range contain the same number of items

Round to This value forces the ranges to be rounded up or down to multiples of this figure.

To edit the minimum and maximum values select the value which you wish to edit, single click on the minimum number (or press F2), and enter the value which you require. This will change the maximum value for the previous value pair.

If you alter the number of ranges after this change, the ranges you changed will reset and you will have to edit them again.

- 4 In the Range Styles dialog you can determine how each range will be displayed.



Choose a pen and brush for each range. You can use a shape placed at the items' hook points to illustrate into which range they fall. The Title is used in the legend.

Alternatively, to use graduated colour across several ranges, select the first range pair, assign a brush and pen, select the last range pair, assign a brush and pen, hold the Shift key down and select all the range pairs, then click on Spread.

5 If you wish to edit the legend,  page 271, **Legends**.



Map extract © Crown copyright

■ Legends

A legend can be created with the following theme types:

- Bar Charts
- Contour
- Dot Density
- Flow
- Graduated
- Individual Values
- Pie Charts
- Ranges
- Relief
- Topology

◆ Where you use a legend

A legend is shown at the bottom of the theme view tab in the workspace window. It can be placed on a print template which contains overlays that are themed.  Chapter 47: “**Printing: print templates**”

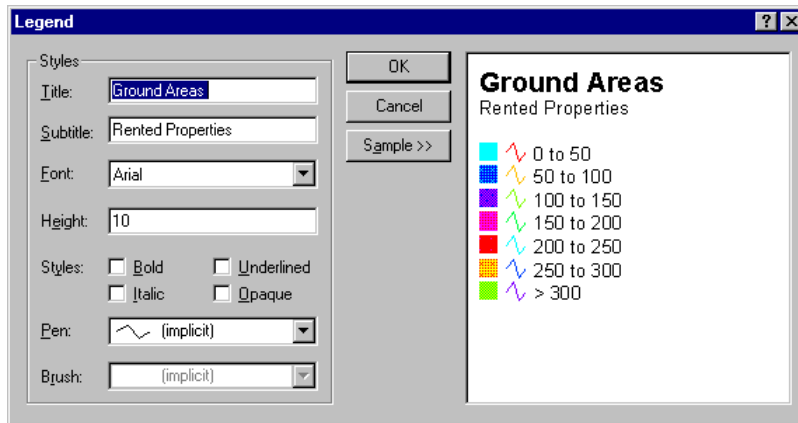
Overlays and data formats that use the Cadcorp SIS feature tables automatically display the attributes as a theme legend on the overlay. The theme legend based on the overlay’s feature table can also be added to a print template, using the Print Wizard.

◆ Styling a legend

Legends are created automatically for the theme types listed above. Use the Legend button as you create or edit a theme to specify how the legend will look.

In the Legend dialog you can create a title and subtitle for the legend, and define how the text throughout the legend will look (font, height and styles). Use Pen to define the colour of the legend text, and if you are using the Opaque style, use Brush to determine the background colour for the legend backdrop.

All print template ‘furniture’ (scale bars, legends, north points, and so on) has a default Level value of 1. The photo item in the print template has a default Level of 0. This means that, by default, any items you add to the print template should appear on top of it when you print. Therefore, when you are styling a legend to add to a print template, if you leave this as (implicit), it means that the Legend box should always be drawn on top of the map graphics. ➤Chapter 23: “Overlays, levels, and commands”

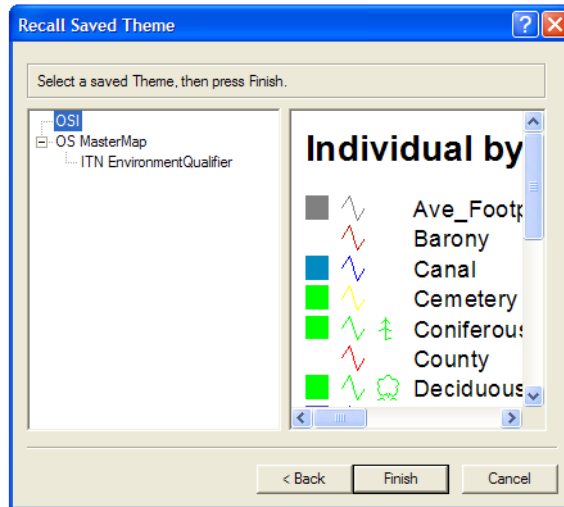


■ Saving and recalling themes



You can save themes by using the local menu on the theme view tab. You are prompted for a folder and name for your theme and it is saved as a named theme in the current library. Once saved, its properties can be edited and it can be applied to other overlays using the

New Theme Wizard. You can see the Saved Theme icon if you scroll down to the bottom of the Select Theme options. Double-click on the Saved Theme icon to access all the themes that you have created.



Choose the theme that you want, and click Finish to apply the theme to the dataset.

■ Using your themes

Themes can be manipulated on the Themes page of the Overlays dialog (first select the overlay and the theme concerned), or on the theme view tab in the workspace window.

◆ Viewing a theme



Use the local command Visible in the workspace window, or the Disabled option on the Overlays dialog, to determine whether or not the selected theme is displayed. Alternatively, click on the theme icon in the theme view to turn it on and off.

◆ Editing a theme



To edit a theme, use the Properties... local command in the workspace window, double-click on the theme in the workspace window, or use the Edit... button in the Overlays dialog.

◆ Deleting a theme



To delete a theme, use the local command Delete in the workspace window, or the Remove button on the Overlays dialog.

If it has been saved, you can recall it later.

◆ Changing the order of themes on an overlay



Use the Promote and Demote local commands in the workspace window, or the up and down arrow buttons on the Overlays dialog.

The order of themes is important because, when Cadcorp SIS decides which pen, brush and shape to use when drawing an item, the themes are checked in order. So you could, for example, theme polygon items using a Range Theme for the brush (which does not change the shape) and use an Individual Value theme to set the shape.

◆ Converting a theme to editable items



The local command Explode in the workspace window, or the Explode button in the Overlays dialog, can both be used to convert Bar Charts, Pie Charts, Labels and Graduated themes into editable items. These items are put on a new internal dataset.

Bar Chart and Pie Chart Themes form group items, Label themes are converted to label text items, and the Graduated theme forms point items. These items are no longer linked to the overlay, and will not update if the data is changed.

◆ Copying and pasting themes

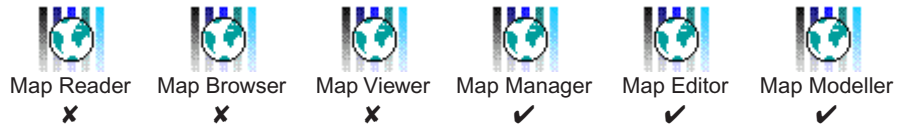


Themes displayed on the theme view tab can be copied and pasted from one overlay to another using the commands on the local menu. To do this, choose Copy from the theme's local menu, then choose Paste Theme from the target overlay's local menu.

◆ Save colour-set



For themes which use colour-sets (the Relief Theme) you can save the colour-set for use on another occasion. Use the Save Colour-set command on the local menu. It will be saved as a named theme in the current library. Once saved, its properties can be edited, and it can be applied to other overlays using their properties.



Databases

■ Introduction	275
■ Connecting to databases	276
■ Linking table data to overlays	284
■ Storing spatial features in databases	286
■ Database data formats	288
■ OGC SQL92	293
■ OGC SQL92 database schema	298
■ View Points	298
■ Location-based services for Oracle: Spatial and Locator	301
■ Editing Oracle data	305
■ Generating overlays from spatial data stored in Oracle	307
■ Database Query Wizard	311
■ Loading spatial data into Oracle	314
■ Oracle 10g GeoRaster	323
■ Oracle Network Data Model	325

■ Introduction

◆ Flat file storage

Traditionally, ‘flat files’ were used to store geographical data. The lack of an agreed industry standard for flat file storage allowed GIS vendors to develop their own mutually-exclusive formats. Over time, some of these formats became more popular than others and were accepted as *de facto* standards for transferring geographical data within the GIS community. As the use of GIS and data volumes increased, the flat file formats were pushed to their limits.

The inherent drawback with flat files is that they are not scalable, impede data sharing in a multi-user environment, and usually have a size limit. The flat file structure is not suited to allowing users to access part of the data; the entire file has to be opened. This aspect does not allow for efficient memory use on the computer that is used to open the file. Some of these problems have been partially alleviated with the introduction of *hybrid* flat files. These are flat files which behave in a way similar to databases, in that they allow multi-user access and multi-user editing, but they cannot match databases for performance and scalability and general enterprise-level capability.

◆ Databases

Databases were the answer to the data-sharing problems and size limitations of the flat file. Data is stored in a centrally-managed repository known as a *relational database management system* (RDBMS). The RDBMS manages multi-user access to the data and allows many users to manipulate data at the same time. Client machines retrieve only the portion of data that is actually required.

◆ Databases and spatial data

Databases have advanced significantly over the previous decade, and are now capable of managing complex data such as spatial data. Most databases are now capable of storing spatial data in a data type commonly referred to as a *Binary Large Object*. This allows GIS vendors to develop ways of storing spatial data in an editable dataset data type, with each feature occupying a single row in the database table. The database can then manage the rows in the table as if they were ordinary data.

Some databases have advanced further and can store spatial data in an ‘intelligent’ manner. The intelligence lies in the database’s ability to understand the spatial nature of the data, thus allowing the database to carry out some spatial analysis.

Oracle and PostGIS are databases with spatial capabilities. Data can be indexed (allowing for efficient data retrieval, which is essential for tables containing large volumes of spatial data). Oracle can also calculate distances taking into account the curvature of the earth.

◆ Cadcorp SIS and databases

Cadcorp SIS provides you with the ability to store, retrieve, and manipulate geographical data stored in a variety of industry-standard databases such as Oracle, Microsoft SQL Server, Microsoft Access, Informix, and so on. This ability brings the added power and security of a RDBMS to GIS. Cadcorp SIS can also read non-spatial data and optionally associate it with spatial data.

Attribute data associated with geographical data can be stored within the feature itself or as a separate column within the same database table row. Storing the attribute data in a separate field allows the data to be interrogated using any ODBC/SQL compliant application.

■ Connecting to databases

◆ Overview

Cadcorp SIS offers a number of formats for storing graphical data in relational Database Management Systems (RDBMS). This allows organisations to choose a format that best suits their business requirements. Some formats are generic and can be stored in any RDBMS. Others are specific to particular RDBMS vendors, such as Oracle (Spatial and Locator), or PostGIS. Cadcorp SIS also provides an advanced proprietary storage model that allows topological datasets to be stored in databases which support ODBC.

When choosing a data storage format, you should evaluate your GIS business requirements and make a choice in the light of the database technology that is available in your organisation. If the business case is strong enough, you should consider purchasing the database technology that suits your requirements, remembering to take into account hidden costs such as training.

This section contains a brief overview of the database connectivity methods used by Cadcorp SIS. This is followed by a discussion of each of the spatial data storage formats for databases supported by SIS.

◆ Connectivity methods

Database access technology has been going through a process of refinement for many years. The current accepted standards, all of which are supported by Cadcorp SIS, include the following.

- ODBC Open Database Connectivity is an internationally-recognised standard that allows applications to access databases. All ODBC-compliant database vendors will have an ODBC driver for their database. ODBC drivers are available for all commercial databases such as Informix, Ingres, DB2, and Sybase. Drivers are also available for Excel spreadsheets and CSV (comma-separated values) files.
- DAO Data Access Objects was developed by Microsoft to allow efficient access to Microsoft databases such as Access and, more recently, to data files such as Excel spreadsheets.
- ADO Active X Data Objects is designed for high-performance data access. ADO uses the latest generation of database drivers called OLE DB drivers. They provide high performance access to any data source including relational and non-relational databases. ADO have a relatively smaller footprint and generate minimum network traffic, thus making them more efficient than ODBC drivers. ADO drivers are available for all commercial databases and must be loaded on the client.

The Cadcorp SIS installation loads the Microsoft data access technologies MDAC 2.5 and DAO 3.51.

Before you create a dataset using the Cadcorp SIS software, make sure that the appropriate drivers for the database you wish to connect to have been installed.

◆ Cadcorp SIS Direct Connectivity

Direct Connectivity has been added to simplify the database connection process. Direct connections are available for the following databases, if their drivers have been loaded on the client machines:

- Oracle8i /9i
- Oracle9i Spatial and Locator Only
- Oracle 10g
- Microsoft SQL Server 7/2000
- Microsoft Access 2002/2000/97
- Microsoft FoxPro
- Lotus 1-2-3

Direct connectivity provides rapid and efficient access to remote databases. It also removes the requirement to set up a Data Source Name (DSN) which is normally a step required when connecting via ODBC/ADO.

◆ Viewing non-spatial data

Cadcorp SIS can read non-spatial data from any database that supports ODBC. Check with your database administrator to ascertain which database your data is stored in, and whether the appropriate database connectivity software has been loaded onto your machine.

Data is made available to Cadcorp SIS as a read-only object called a **named table**. For ease of use, data in a named table is displayed in a spreadsheet format called a **table view**.

Cadcorp SIS uses a wizard-style interface to guide you through the process of creating a named table. You can create a named table from complete, partial, or multiple database tables. The wizard allows you to specify an optional SQL WHERE clause: this clause is incorporated into the underlying SQL generated to retrieve the desired data. The SQL WHERE clause can be used as a mechanism for filtering data. This reduces the amount of data read from the database and ultimately transferred across the network to the client. The SQL WHERE clause also facilitates the retrieval of data from multiple tables; a table join has to be specified to enforce relational integrity between the database tables.

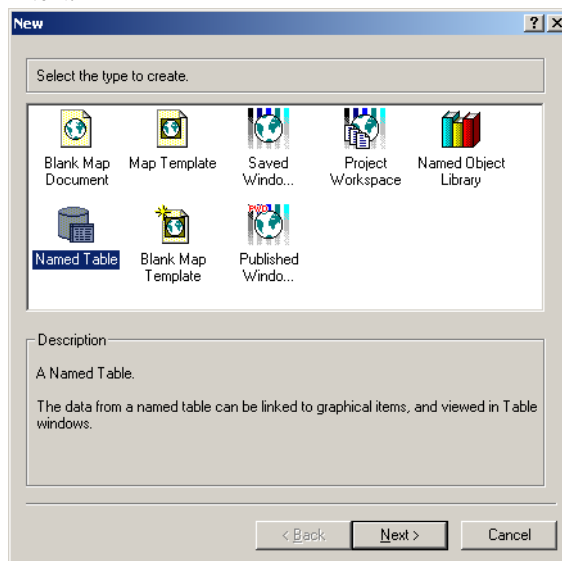
If you have to create named tables from multiple tables, you should consult your database administrator to ascertain whether it would be efficient to create a database view for the tables on the database.

◆ Creating a table view

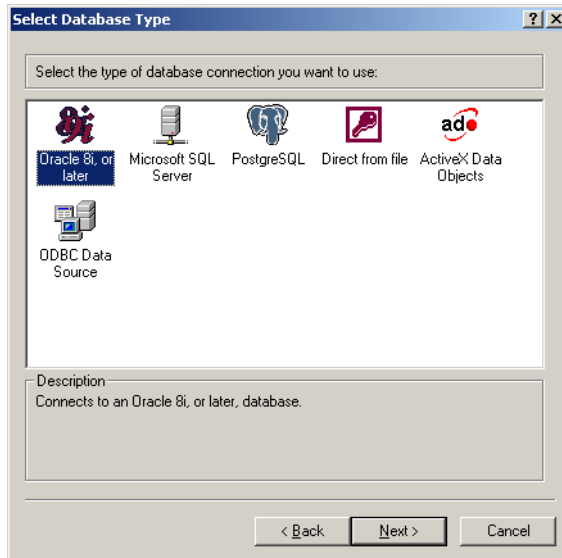
To create a table view:



- 1 Choose the New command from the File menu. Select named table from the New dialog, then click Next.

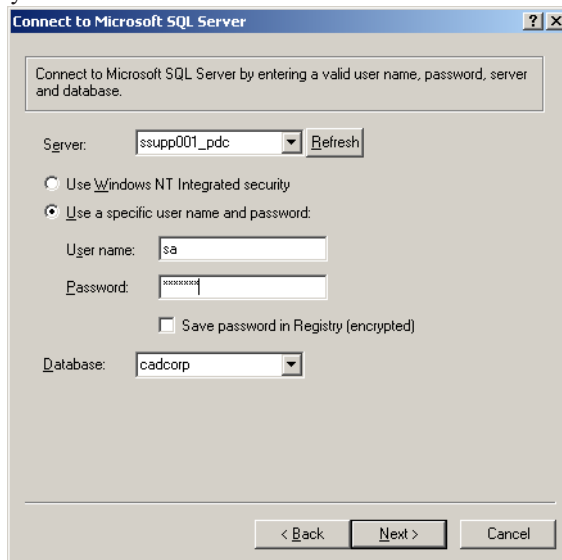


- 2 On the Select Database Type dialog, select the appropriate type of database connection and click Next.

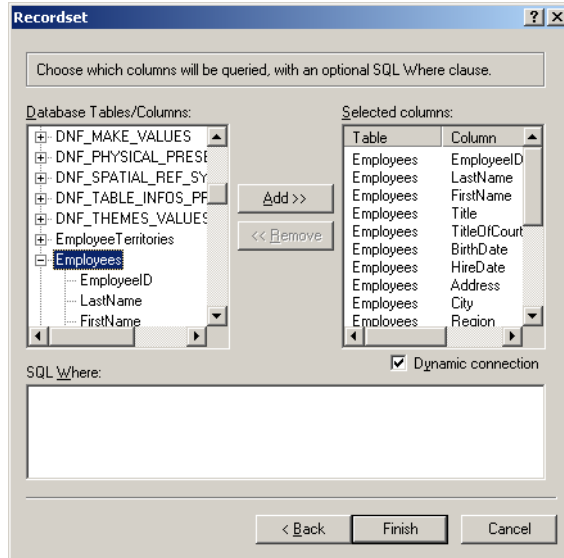


In this example we are creating a direct connection to a SQL Server database.

- 3 Enter the appropriate information to connect to your database and click Next. If in doubt contact your database administrator.



- 4 You will be presented with the Recordset dialog, which displays all the tables that are available to you.



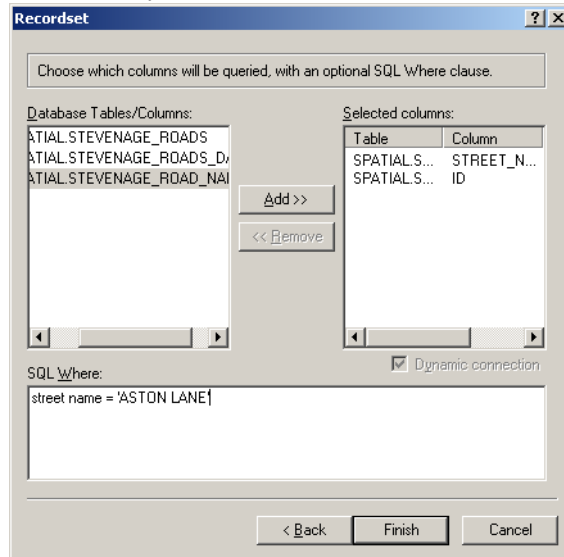
Select the desired table from the Database Table/Columns list and click the Add button. This creates a named table from all the columns in the table.

To create a named table from a limited number of columns, click the plus (+) sign on the left hand side of the table name, then select the desired column and add it to the Selected Columns section. We recommend that a column containing a unique identifier for the data is included in the named table.

- 5 Click Finish to generate the named table. Cadcorp SIS displays the named table in a table window.

◆ Restricting data

A SQL Where clause can be specified, to filter the data displayed in the named table. For example, if you wanted to create a named table containing information about a particular street, a Where clause can be specified to return a particular street from a table containing street information for the county:



The use of a SQL WHERE clause ensures that system resources are used efficiently and that the impact on the database is kept to a minimum. You do not have to use the SQL key-word WHERE or a SQL terminator such as a semi-colon (;). Your DBA will be able to assist you in constructing the SQL required to perform a particular task.

◆ Joining Tables

You can create a named table by joining two or more named tables. When multiple tables are selected, Cadcorp SIS will join the tables by looking for an attribute common to all the tables. The join condition can be adjusted to suit your requirements.

Consult your DBA to ascertain which attributes tables should be joined on. Named tables should not be created from multiple tables that cannot be joined via a common attribute.

The Recordset dialog box is used to configure a query. It includes a title bar with a question mark and a close button. Below the title bar is a text box for an optional SQL Where clause. The main area is divided into two panes: 'Database Tables/Columns' on the left and 'Selected columns' on the right. The left pane shows a tree view of database tables, with 'SPATIAL.STEVENAGE' expanded to show its columns: 'STREET_NAME' and 'ID'. The right pane shows a table with two columns, 'Table' and 'Column', listing the selected columns: 'SPATIAL.S...', 'ID', 'SPATIAL.S...', 'LINK_NAME', 'SPATIAL.S...', 'UNIQUE_LI...', and 'SPATIAL.S...', 'STREET_N...'. Between the panes are 'Add >>' and '<< Remove' buttons. At the bottom, there is a 'SQL Where:' label, a 'Dynamic connection' checkbox, and a text box containing the SQL Where clause: 'SPATIAL.STEVENAGE_ROADS_DATA.ID = SPATIAL.STEVENAGE_ROAD_NAME'. The dialog box has '< Back', 'Finish', and 'Cancel' buttons at the bottom.

Recordset

Choose which columns will be queried, with an optional SQL Where clause.

Database Tables/Columns:

- LINK_NAME
- NODE_NAME
- NODE_TYPE
- SETTLEMENT_NAME
- SOURCE_SCALE_ID
- UNIQUE_LINK_ID
- SPATIAL.STEVENAGE
 - STREET_NAME
 - ID

Add >>

<< Remove

Selected columns:

Table	Column
SPATIAL.S...	ID
SPATIAL.S...	LINK_NAME
SPATIAL.S...	UNIQUE_LI...
SPATIAL.S...	STREET_N...

SQL Where:

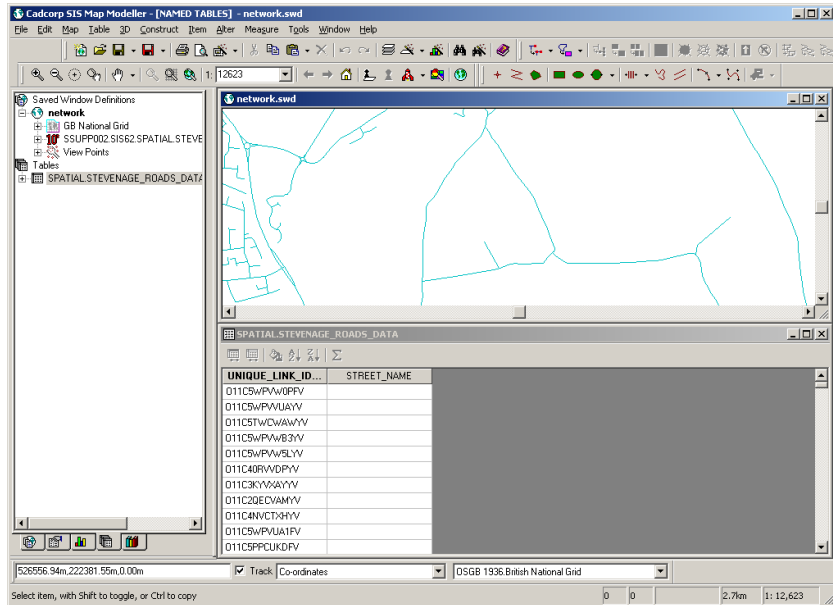
☒ Dynamic connection

SPATIAL.STEVENAGE_ROADS_DATA.ID = SPATIAL.STEVENAGE_ROAD_NAME

< Back Finish Cancel

◆ Displaying multiple windows

By default the named table is displayed in its own window in the main window. To view the map data and the named table together, use the **Window>Tile Horizontally** to display both windows:



◆ Closing a named table temporarily

The named table window can be minimised or closed using the icons in the top right hand corner. Closing the named table does not remove it from the Cadcorp SIS session.

◆ Other commands

The following functions are available on a named table's local menu. To display this menu, point to the named table in the workspace window and click the secondary mouse button:

Closing a named table permanently

To remove a named table permanently from your session, display the table view tab in the workspace window, and display the named table's local menu. Choose Delete to remove the table from the session.

Adjusting the construct of a named table

Attributes can be added and removed from the named table by choosing Properties. The Recordset dialog opens. Table columns can be added or removed as desired.

Creating a copy of a named table

To make a copy of the named table, choose Copy, then paste the named table using the main Table menu.

Listing all named tables

To display a list of all named tables currently available in the session, display the table view tab in the workspace window.

Hiding attributes temporarily

Attributes (columns) within a named table can be hidden by making them invisible. Expand the named table to reveal a list of all the attributes, then click on the icon next to the column name to toggle between visible and invisible.

Displaying a named table

To display the contents of an existing named table, choose View from the named table's local menu.

◆ Saving named tables

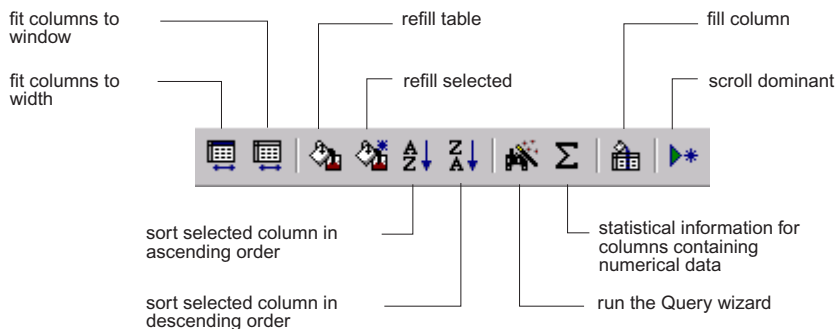
Named tables are stored as a part of the workspace. When the workspace is opened Cadcorp SIS recreates the named table by connecting to the data source again. This makes sure that the latest version of the data is retrieved.

◆ Refreshing named tables

To make sure that the latest version of the data is displayed in a named table, refresh it using the command **Map>Regenerate**.

◆ Commands for named tables

The following commands are available within a named table window display. Some of the commands work on the current column, so put your cursor in the required column first.

**■ Linking table data to overlays**

Data from an external source can be joined to a Cadcorp SIS overlay. This is particularly useful if the data comes from different databases. This mechanism allows data from multiple tables to be joined together within Cadcorp SIS and linked to spatial features. However, it is sometimes better to join the data in the database by creating a view or a new table, rather than by joining it in Cadcorp SIS.

In Cadcorp SIS, you can link named tables to overlays. The unique column in the named table should be linked to the corresponding unique attribute for the spatial features in the overlay. You should check with your database administrator to find out which columns in the two sets of data should be used to create a link that maintains the relational integrity of the data.

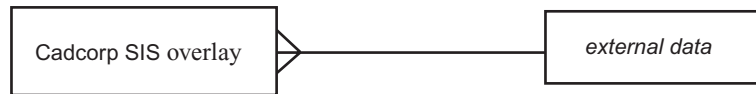
Once the data has been linked, the name table can be refreshed to ensure that you are viewing the current data.

◆ Benefits of linking data to overlays

When a named table is linked to overlay items, the data from the named table is copied into the overlay schema. The data from the linked table becomes attributes of the spatial features in the overlay. This means that the new data can be used for analysis, ie for creating thematic maps.

Relationships between data

When joining data from an external source to an overlay in Cadcorp SIS, the following rules apply:



The external data must contain unique values in the key being used as the joining column. The overlay in Cadcorp SIS does not need to contain unique values in the key being used as the joining key. Consult your database administrator to understand the implication of joining two sets of data together, to make sure that the desired results are achieved, and that the correct joining keys are selected.

To link named tables to overlay graphics

- 1 Before starting this process, make sure that your named table is open (but not necessarily displayed). You must have focus on the table window of the target overlay.
- 2  Display the attribute data for the overlay you want to link to as a table view, using the **Window>New Table Window** command. Select the overlay containing the data from the drop-down list.
You can view the map window and table view at the same time by tiling them horizontally (using the **Window>Tile Horizontally** command).
- 3 Choose the **Table>Join** command, which shows the Join Table Data to Overlay Graphics dialog.

If you have more than one named table open, select the desired named table from the Table drop-down list. The left-hand column of the dialog displays all the columns that are available in the named table. By default all the columns are checked. This means that all the columns will be copied across to the overlay schema. Un-check columns that are not required. You also have the option to either append the named table or replace the existing attribute data in the overlay schema.

The right-hand section of the dialog handles the creation of links. In the Join Column section, select the named table column that will be used for the link. In the To Property section, select the overlay attribute column that will be used for the join (the drop-down list can be expanded).

The joining columns from the two datasets can be of any data type (integer, decimal, or text); however, both columns must be of the same data type.

- 4 Click OK to complete the linking process.

The columns from the named table will be added to the overlay schema.

■ Storing spatial features in databases

◆ Introduction

Cadcorp SIS offers users various formats for storing spatial features in relational databases management systems (RDBMS). Each format is referred to as a dataset type.

Dataset type	Database support
Oracle Spatial/Locator (SDO_Geometry)	Oracle 8i, 9i release 2, 10g
Oracle Raster 10g (Spatial only)	Oracle 10g
Oracle Network 10g (Spatial only)	Oracle 10g
Oracle8 Relational spatial model	Oracle 8.1.7
ESRI SDE	Oracle 9i onwards
PostGIS	Post GIS
Editable Database	Any Database
OpenGIS SQL92	
View Geometry	
View Points	
OS MasterMap	Oracle9i, SQL Server 2000, and MS Access 2000

Support for storing spatial data in databases can be divided into two categories:

- formats specific to spatial databases
- formats generic to all databases

◆ Formats specific to spatial databases

Cadcorp SIS supports the following spatial databases:

- Oracle (Locator/Spatial)
- PostGIS/PostgreSQL

Formats specific to spatial databases are stored in a manner prescribed by the database vendor. The format is not proprietary to Cadcorp so may be supported by other GIS vendors. Database-specific formats promote interoperability between GIS, and are suitable for an enterprise solution.

The following spatial formats supported by Cadcorp SIS are database specific:

- Oracle Spatial
This format reads and writes vector data stored in Oracle, using Oracle's native SDO_Geometry data type.
- Oracle 10g Geo Raster
This format reads raster data stored in Oracle's SDO_Georaster data type.
- Oracle 10g Network Model
This provides read and export capability for data stored in Oracle 10g Network Model.
- PostGIS
This format reads and writes vector data using the native spatial data type provided by PostGIS.

◆ **Formats generic to all databases:**

- Editable Database
This format stores spatial in either Oracle, SQL Server, Access or any ODBC-compliant database.
- OpenGIS SQL92
This format stores data in a manner prescribed by the Open GIS Consortium. Data can be stored in Oracle, SQL Server, Access or any ODBC-compliant database.
- View Geometry
This format allows data stored using the Editable Database format to be opened in view only mode.
- View Points
This format creates a view-only points dataset from data which has an easting and northing value associated with it. Data can be read from Oracle, SQL Server, Access or any ODBC-compliant database.
- OS MasterMap (UK specific)
OS MasterMap data holdings are created using the Cadcorp OS MasterMap Manager. Data holdings can be created in Oracle (SDO_Geometry), PostGIS (using the native spatial data type), SQL Server or MS Access (SIS proprietary format)

Database tips

Microsoft Access may not be suitable for storing large volumes of data and may not 'scale' throughout an organisation. Multi-user access to Microsoft Access databases larger than 1Gb can decrease the processing speed. Microsoft Access databases cannot be larger than 2Gb.

You should also be aware of the performance implications of running multiple applications in the same RDBMS system. The bigger the demand on an RDBMS, the worse its performance becomes. The consensus of industry experts is that corporate GIS data should be stored on an independent RDBMS. However, this may not be suitable for some organisations. GIS systems today have expanded into many new areas and need to be integrated

with existing systems. You are advised to run pilot schemes when creating corporate-level GIS storage repositories in an RDBMS. This will help to answer important questions such as the storage requirements, hardware requirements, and network architecture.

◆ Spatial indexing and controlling data retrieval

With the exception of View Points, all the formats mentioned above use spatial indexing to control data retrieval. However, this is used in conjunction with the map window view extents. When a spatially-indexed dataset is opened, Cadcorp SIS returns data that corresponds to the map window view extents. You should set the view extents before retrieving data. If the view extents are set to include the whole of the UK and an overlay is created, Cadcorp SIS will select as much information as it can to fill the map window. A potentially large volume of data may be selected from the database, with the following negative effects:

- database performance degrades if many users have large spatial extents set in their map windows
- large volumes of network traffic are generated, which could impact other areas of the business
- the data returned to the client may be greater than the client machine's memory can handle

One way to control data retrieval is to apply a view scale threshold to the overlays. Users can use raster-based maps to pan around geographical areas, and can then 'zoom' into areas of interest. When the view extents match the overlay threshold, the overlay containing data from a database can be switched on. At this point Cadcorp SIS selects data from the database.

■ Database data formats

◆ Editable Database

This is a flexible format which allows spatial data to be stored in relational databases. The geometry of a spatial feature is stored a data type known as Binary Large Object. The Editable Database allows spatial data to be stored in any database. This means that GIS capability can be added to an existing RDBMS application without disrupting it.

The object created by Cadcorp SIS cannot be read by normal ODBC/SQL compliant applications. If the ASCII format is used, only Cadcorp SIS can read the data. However, binary object data can be stored as Well Known Binary or Well Known Text formats. These are open formats which could read by other GIS applications.

◆ Multi-user access

The Editable Database dataset supports multi-user access and editing. Multiple users can edit different features at the same time or the same feature at different times. Cadcorp SIS does not allow users to edit a feature that another user has edited. Users should regenerate their overlay to ensure that they have the latest version of a feature displayed in the map window (using the **Map>Regenerate** command).

Cadcorp SIS supports database row locking. Features in the database are locked only for the duration of the edit. This ensures that two users cannot edit features at the same time.

◆ Spatial indexing

The Editable Database format supports spatial indexing. Indexing for spatial data ensures rapid retrieval and display of information while making efficient use of system and database resources. When an editable Database dataset is opened, Cadcorp SIS retrieves only the geographical data that falls within the current view extents of the map window. By adjusting the view extent within Cadcorp SIS, users can control how much data will be retrieved. For example, if you are zoomed out on a particular overlay, the view extents will be relatively large. This means more data will be returned from the database, thus impacting network, client, and database resources. Conversely, zooming in over an area of interest and then opening the Editable Database dataset allows a relatively small amount of data to be returned from the database.

◆ Dataset size

The size of an Editable Database dataset is limited only by the storage capacity of the database. When working with large datasets, you should ensure that the view extents within Cadcorp SIS are set before the data is retrieved. Failure to do this could result in volumes of data being returned from the database that are greater than the client machine's memory can handle.

◆ Editable Database formats

Editable Databases can be created with spatial data stored as binary objects in one of three formats:

Cadcorp SIS ASCII

This is the default storage format, and the most versatile. It supports topological structures.

OGC Well Known Binary (WKB) and OGC Well Known Text (WKT)

Neither of these formats supports topological structures. However, they comply with the OGC Simple Features specifications.

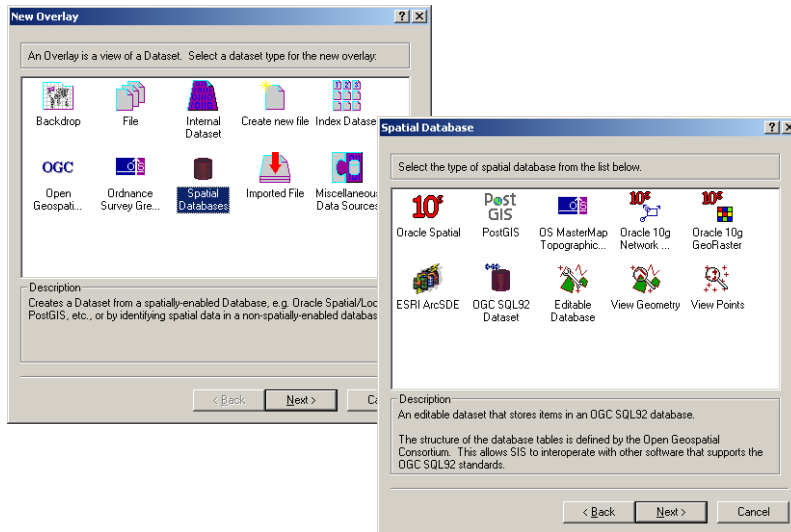
OGC Geography Mark-up Language (GML)

The wide acceptance of Extensible Mark-up Language (XML) as a universal format for structured documents has led to the development of this new common format for geographic data. GML is an extension of XML and will improve the storage and transport of geographical features and their attributes. GML is a *de jure*, ratified, OGC standard for encoding spatial data. OGC Simple Features does not include topology support.

◆ Creating an Editable Database dataset



- 1 Start the New Overlay Wizard by choosing the **Map>Add>Overlay...** command or by clicking the Add Overlay icon on the tool bar. Click the Spatial Databases icon. You



can also jump straight to this dialog by choosing **Map>Add>Database Overlay**.

- 2 Choose Editable Databases, then click Next.
- 3 Select the database connection type you want to make and click Next. In this example we will make an Editable Database overlay using a direct connection to Oracle9i.
- 4 Fill in the connection details for your particular database and click Next. Contact your database administrator if in doubt.
- 5 Cadcorp SIS now establishes a connection with the database. The Editable Database dialog opens.
- 6 Enter the name for the overlay in the Table input box. An overlay corresponds to a table in the database, so you should follow the naming convention for database tables. If in doubt, consult your database administrator.

You can select the format for Editable Database. The default, Cadcorp SIS ASCII, is the most flexible and versatile.

The default value for the span covers the entire area of the projection being used. This should be adjusted only if you are certain that the stored map features do not lie outside the span entered.

The Use Transactions for Edits checkbox is checked by default. This means that a group of processing steps will be treated as a single activity to perform a desired result. This might entail all the steps necessary to modify values in or add records to a table during the creation of an Editable Database feature. Most databases will perform some kind of row locking during a transaction.

- 7 Click the More... button to adjust the overlay properties.

The co-ordinate system to be used with the overlay defaults to the current viewing projection set for the SWD. To change this you can select an alternative from the drop-down list. If in doubt, accept the default values.

The precision setting dictates the accuracy of each item drawn in the overlay. 16 bit precision is accurate to +/- 30m, 32 bit precision is accurate to +/- 1mm, and 64 bit precision is accurate to a fraction of a millimetre. If in doubt, accept the default values.

You can also choose the dataset scale and optional Feature Table.

Click OK to continue.

- 8 Click Finish to create the Editable Database overlay in the database. If you entered the name of a table in lower case, you will be asked to confirm whether you want to use lower case or have the name converted into uppercase. Use upper case names for database consistency.
- 9 You are now asked to confirm the SQL syntax for creating the table in your chosen database.
- 10 The CREATE TABLE statement can be qualified to suit a particular database setup. For Oracle, you can change the data type of the Editable Database from Long Raw to the Oracle recommended Database data type. Consult your database administrator before attempting to change any of the SQL syntax.
- 11 Click OK to confirm the syntax. Cadcorp SIS creates the relevant tables in Oracle to support the overlay. You can start adding items to the overlay; each item drawn corresponds to a row in the Oracle table.

◆ Opening an existing Editable Database overlay

To open an Editable Database overlay follow steps 1 - 4 as above. Instead of typing the name of a new overlay, select one from the list and click Finish.

If the original overlay was created using a non-default setting, such as 32-bit precision or the WKB format, you also have to select this to open the overlay.

◆ Editable Database schema

The following tables are generated when an editable dataset overlay is created in an RDBMS.

Table name	Description
CADCORP KEY	catalogue table for all Editable Database overlays
Overlay	geometry table corresponding to the overlay name

Do not edit or remove these tables from your database.

◆ View Geometry

View Geometry gives you the ability to open a read-only version of an Editable Database dataset. Within an enterprise, anyone who is not required to have editable access to data can be given access to Editable Database datasets as non-editable overlays via the View Geometry. This circumvents the requirement of having to involve database administrators to set the appropriate database privileges.

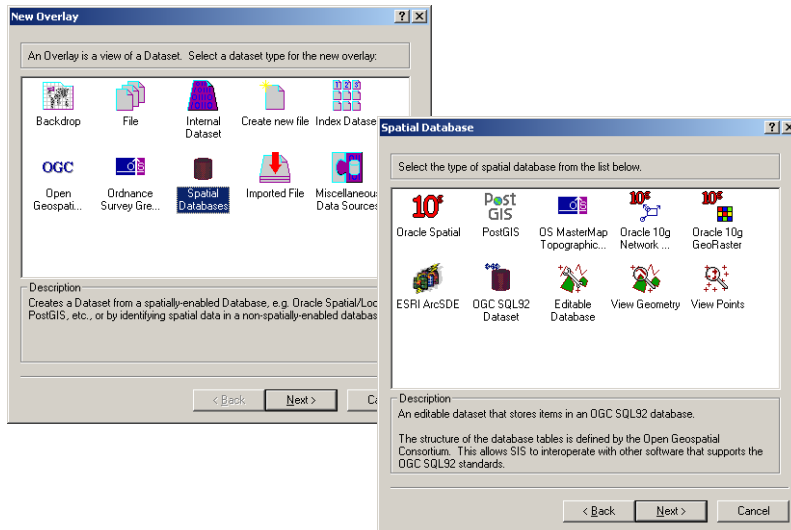
As well as the Cadcorp SIS ASCII format, Cadcorp SIS supports the following open formats for reading editable dataset data:

- OGC Well Known Text
- OGC Well Known Binary
- OGC Geography Mark-up Language

In theory, it should be possible for Cadcorp SIS to read editable dataset data generated by other GIS vendors if they have used one of the open formats.

◆ Creating a View Geometry overlay

- 1 Start the New Overlay Wizard by choosing the **Map>Add>Overlay...** command or by clicking the Add Overlay icon on the tool bar, and choose Spatial Databases.



- 2 Choose the database connection type. In this example we will make a direct connection to Oracle.
- 3 Enter the connection information for your database and click Next. If in doubt, consult your database administrator.

The Recordset dialog opens.

The left hand side of the dialog (Database Tables/Columns) contains a list of tables you have access to. To see a list of all the columns associated with a table, expand the table by clicking on the plus (+) icon. Columns have to be selected before Cadcorp SIS can use them to build the View Geometry layer. Selected columns are displayed in the right hand side of the dialog (Selected columns). To add a column or a complete table, highlight the table name or column and click the Add button.

You can select columns from multiple tables if there is a relational link between the tables. To maintain relational integrity, you should enter an appropriate SQL table join in the SQL Where text box (the keyword WHERE or a SQL terminator are not required).

Select the desired table columns, make sure the column has been included, and click Next.

- 4 Complete the View Geometry dialog:

Blob Field Select the column containing the data.

Format Choose the correct format for the data.

ID Select the optional unique identifier for the dataset.

Spatial Reference Choose the optional Spatial Reference column from the database.

- 5 Click More to change the overlay properties.
- 6 Choose the co-ordinate system, precision and scale that is relevant for the dataset. Click OK, then click Finish.

■ OGC SQL92

The OGC has defined a set of standards for storing and retrieving geographical data from relational database management systems. Cadcorp SIS has created the OGC SQL92 dataset as an implementation of this specification. This specification is documented in the OGC Simple Features Specification for SQL (www.opengeospatial.org).

Spatial features are stored in the database in Well-Known-Binary format. The column type used for this is usually referred to as 'blob'.

The main benefit of this format is that it is not proprietary and is therefore vendor-independent. This means that Cadcorp SIS should be able to read data sets generated by other GIS vendors who conform to the specification, and vice-versa.

At present, the OGC Simple Features Specification has no definition for storing cartographic text labels or topological data structures. This limitation should be considered when choosing this method of geographical data storage.

◆ Multi-user Access and Editing

The OGC SQL92 dataset supports a multi-user environment. See below for details on how to activate this.

◆ Spatial Index

The OGC SQL92 dataset supports spatial indexing for efficient data retrieval. Cadcorp SIS will retrieve only the data required to fill the current map window.

◆ Creating an OGC SQL92 Dataset

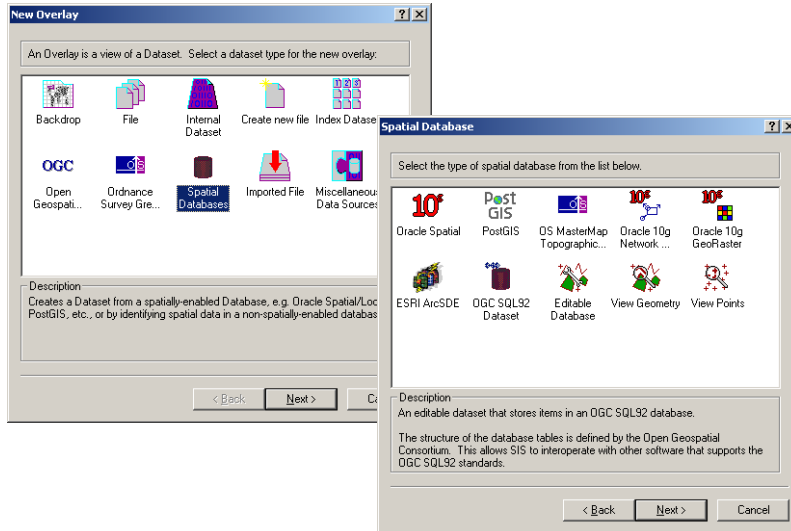
You can create OGC SQL92 datasets in one of two ways.

The first method creates an empty overlay ready to have data added to it. The second creates a new overlay out of an existing overlay containing spatial data. In both cases the necessary tables are created in the database behind the scenes.

Follow these steps to create an empty OGC SQL92 overlay in Oracle9i.

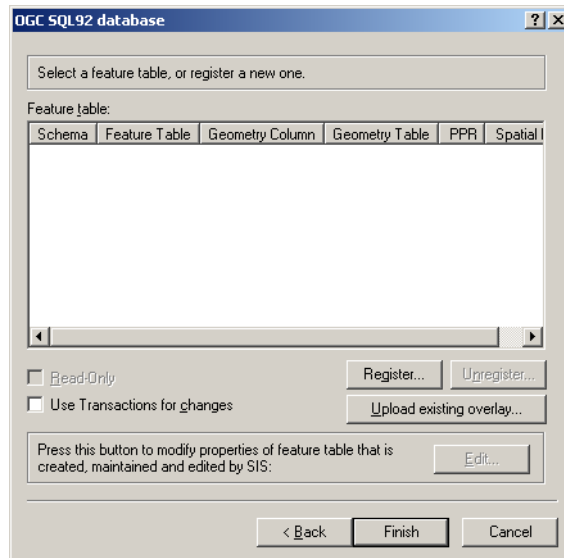
- 1 Create a table for storing attributes for the geometries. This table must include an integer column which will form the unique identifier. If necessary, contact your database administrator for assistance.

- 2 Start the New Overlay wizard (choose **Map>Add>Overlay...** or click the Add Overlay icon on the toolbar), and choose Spatial Databases.

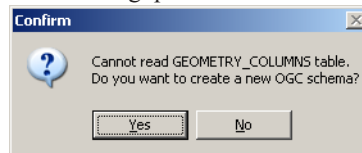


- 3 Select the OGC SQL92 Dataset icon and click Next.
- 4 On the OGC Consortium dialog, select the OGC SQL92 icon and click the Next button.
- 5 In the Select Database Type dialog select the appropriate connection type for the database you wish to connect to. In this example a connection to SQL Server database will be made.
- 6 Enter the logon information for your server.

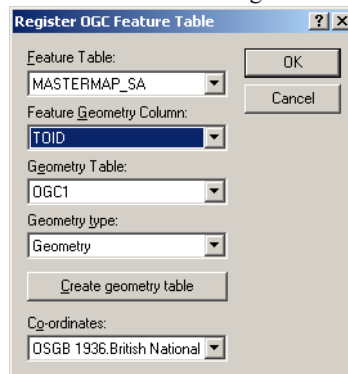
- 7 Click the Register button to create a new OGC SQL92 dataset. To register a new overlay you must create an empty table in the database that will contain the attribute data for your new dataset.



- 8 If this is the first time an OGC SQL92 dataset has been created in your particular schema, answer Yes to the following question:



- 9 Complete the Register OGC Feature Table dialog:



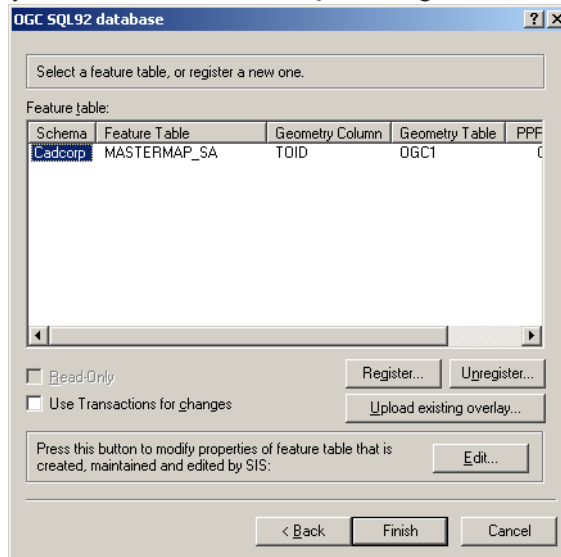
Select the attribute table you created earlier in the Feature Table drop-down list. Select the column that will form the unique identifier for the feature table from the Feature Geometry Column drop-down list.

Create a new geometry table by clicking Create Geometry Table. Enter a name for the geometry table and select the type of storage you want. Both Well Known Binary (WKB) and Multi-row co-ordinates are OGC standards. Multi-row co-ordinate arrays store normalised data and require more disk space than WKB.

The Geometry Type allows you to store specific types of geometry, line strings, points, curves, and so on, which is particularly important for interoperability with other GIS systems which may be able to read only certain types of geometry. If you want to store a mixture of geometry types, leave this option set to Geometry.

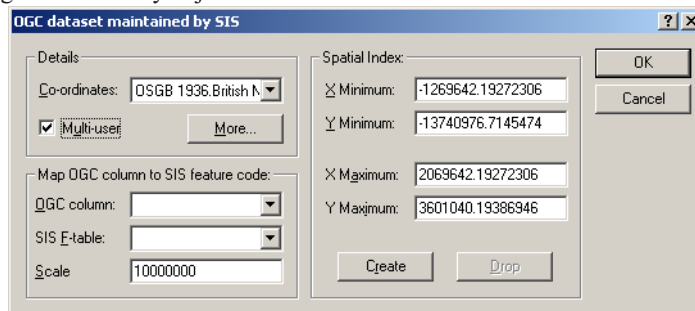
Select the co-ordinate system relevant for your data.

Click OK when you have completed the registration dialog. Once the tables have been registered, they will be listed in the OGC SQL92 dialog.



10 At this point you can enable database transactions by ticking the checkbox. Transactions allow efficient database communication. ➤page305, **Transactions**

11 Highlight the dataset you just created from the list and click Edit.



12 You can make the following optional adjustments:

Multi-user access To enable multi-user access to the dataset, select the Multi-User checkbox. Enabling this functionality generates a management table in the database schema.

Feature coding (map representation) If you wish to use a Feature table with your dataset, you must make sure that a Feature code column with valid data exists in the feature table. You must then select this feature code from the OGC Column drop-down list. Select the appropriate Feature Table and set the dataset scale for the overlay.

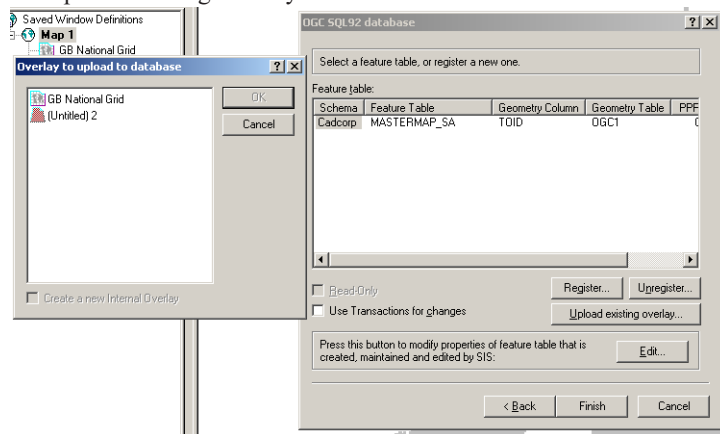
Spatial Index Cadcorp SIS supports spatial indexing for the OGC SQL92 dataset. This makes data retrieval efficient and allows large datasets to be created in the database. Click the Create button to generate a spatial index. The index will be created for the extents specified. This process generates two new tables in the database schema.

- 13 Click OK to build the overlay.

The tables generated by this dataset in the database should not be deleted or edited.

◆ Creating an OGC SQL92 dataset in Oracle9i from an existing overlay.

- 1 Open the data you want to export to the OGC SQL92 format.
- 2 Follows steps 1 to 5 as above, choosing Oracle as the destination database.
- 3 Click the Upload Existing Overlay button.



If this is the first time that an OGC SQL92 dataset, you are asked if you want to create an OGC schema. Click Yes to continue. This process creates tables in the database that support the OGC specification.

- 4 Select the overlay you want to upload to the OGC SQL92 dataset.
- 5 Click Yes to confirm the SQL code that will create the database tables. Cadcorp SIS then starts exporting the data from the chosen overlay to the OGC SQL92 dataset.
- 6 When data loading has completed, the new dataset is listed in the OGC SQL92 dialog.
- 7 Highlight the overlay and click Edit if you want to: enable multi-user access; change the co-ordinate system; build a spatial index; or associate a feature table.
- 8 Click OK to continue.
- 9 Click the Finish button to open the dataset as an overlay.

■ OGC SQL92 database schema

The OGC SQL92 dataset consists of the following database tables:

Table Name	Description
<code>geometry_columns</code>	catalogue for tables containing OGC SQL92 datasets
<code>spatial_reference_systems</code>	co-ordinate and projection information
<code>Cadcorpkey</code>	counter for geometry ID value (a database table view is also created)
<code>cadcorpspatialindex</code>	catalogue table for all indices belonging to OGC SQL92 datasets
<i>dataset-name</i>	attribute data associated with geometries
<i>dataset-name_geometry</i>	geometry table
<i>dataset-name_mu</i>	multi-user support table
<i>dataset-name_si</i>	spatial index for the dataset

The tables beginning with *dataset* are generated for every dataset/overlay created in the database schema. The other tables will be created only once per database schema.

You should not edit or remove these tables.

■ View Points

View Points datasets can be generated from any database, spreadsheet or comma-separated values file containing co-ordinate data representing a geographical position on the earth. Unlike other spatial geometries, which have to be stored in special data types (such as Binary Large Object data type), the co-ordinate information can be stored in a numeric data type. The format of the co-ordinate information should match any of the co-ordinate systems supported in Cadcorp SIS, such as OSGB National Grid x and y pairs, or WGS 1984 Latitude, Longitude pairs.

Points can be used to represent geographical points of interest such as road traffic accidents, street lamps, addresses, and so on. Attribute data associated with a point (columns in the same table) are read into the overlay schema.

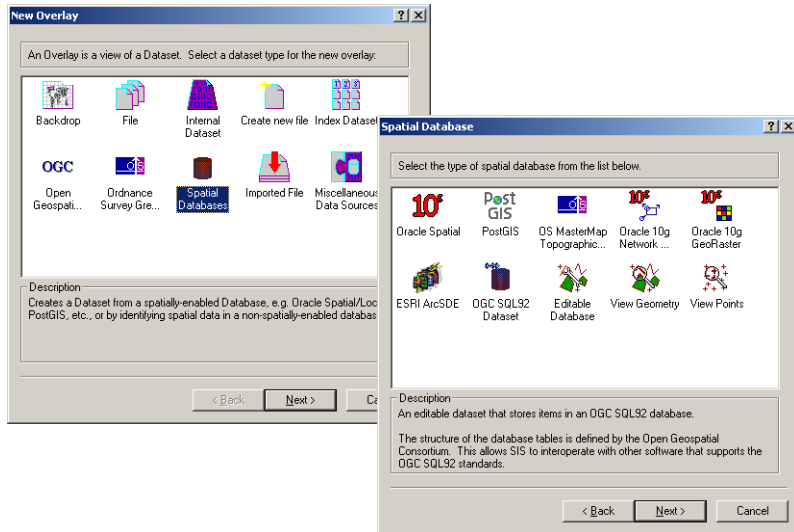
View Points datasets work efficiently with data derived from global positioning systems (GPS). Organisations can use hand held GPS systems to collect spatial data, which can then be read by Cadcorp SIS using the View Points dataset.

◆ Creating a View Points overlay

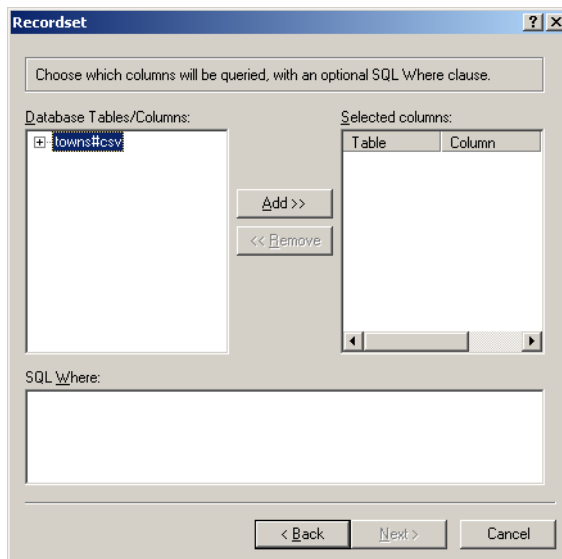
In this example we create a View Points dataset by establishing a direct connection to a CSV (comma-separated values) file.

- 1 Start the New Overlay Wizard (choose **Map>Add>Overlay** or click the Add Overlay icon on the tool bar). Choose Spatial Databases.

- 2 Choose the View Points icon and click Next.



- 3 Highlight the View Points icon and click Next. To connect to CSV and other flat files, use the Direct from file database connection type, which uses data drivers to read files.
- 4 In the Look in drop-down list, browse to the directory containing the data file. From the File of type drop-down list, select the driver that will be used to read the file. Click Next.
- 5 The Recordset dialog displays all the CSV files that are available. Select the desired file from the Database Table/Columns list and click the Add button.



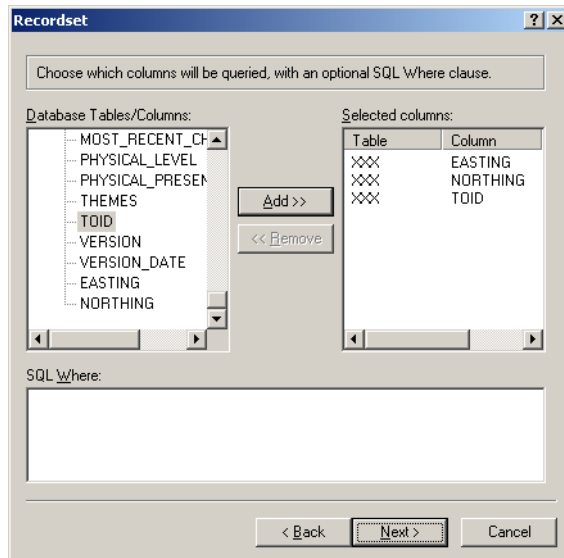
You can create a View Points overlay from complete, partial, or multiple database tables. The wizard allows an optional SQL WHERE clause to be specified. You are not required to use the SQL keyword WHERE or a SQL terminator such as a semi-colon. This SQL WHERE clause is incorporated into the underlying SQL generated to retrieve the desired data. The SQL WHERE clause can be used as a mechanism to filter data and reduce the amount of data retrieved from the data source to the client. In the example above, you may want to restrict the data displayed to those accidents that involve motorcycles. You can use the following SQL WHERE clause:

```
description = 'Motorcycles'
```

Using a SQL WHERE clause to restrict the quantity of data being returned ensures that system resources are used efficiently and the impact on the database is kept to a minimum.

The SQL WHERE clause also facilitates the retrieval of data from multiple CSV files or database tables. In this case, you need to specify an appropriate SQL JOIN clause. Consult your database administrator to find out whether it would be useful to create database view for tables that need to be joined.

To create a View Points overlay using some of the columns in a table or CSV file, click the plus sign (+) on the left hand side of the file name, select the desired column, and add it to the Selected columns section.



Make sure that the columns containing the x and y co-ordinates have been selected, then click Next.

6 Now configure the View Points dialog:

ID Field Select the unique identifier for the View Points dataset from the drop-down list.

X Field Select the x (eastings/longitude) co-ordinate value from the drop-down list

Y Field Select the y (northing/latitude) co-ordinate value from the drop-down list.

Units If the co-ordinate system for the dataset is Cartesian, select Linear, and set the units for measurements from the drop-down list.

If the co-ordinate system for the dataset is spherical, select Angular, and set the units for measurements from the drop-down list.

Click More... to display a dialog on which the dataset scale and co-ordinate system for the dataset can be changed. You can view the properties of the overlay being created by clicking Properties...

Click Finish to create the View Points dataset.

7 To make the View Points overlay easier to use, apply a symbol to the point and give the dataset a scale.

■ Location-based services for Oracle: Spatial and Locator

Oracle has addressed the growing need for storing spatial data in a corporate database by developing a new data type, SDO_Geometry. Database designers can create database tables or modify existing ones to include a column to hold spatial information.

Oracle has the ability to index spatial data and to do the following types of spatial analysis:

- spatial interaction analysis (within, overlap, and so on)
- measuring distances
- calculating areas

Oracle offers two products for storing spatial data:

- Locator: spatial data storage plus basic spatial analysis capability
- Spatial: spatial storage plus advanced spatial analysis capability, Geo-Raster, network topology

◆ Data modelling

Relational databases organise data into tables. A table is a logical representation of the information that makes up a particular thing or entity in the real world.

Example

A business that monitors the condition of street lamp posts treats the lamppost as an entity. The lamp post is an identifiable object with attribute information associated with it. The logical representation of lampposts in a database would be as a `Lamp_Posts` table. The spatial object is stored in a column of type `SDO_Geometry`, and the attribute information associated with each lamp post (ie type, age, height, ID) would be contained in normal alphanumeric columns. Each lamp post becomes a row (record) in the table.

Database developers can incorporate spatial storage into their data model by simply adding a new column of type `SDO_Geometry` to an existing table or by creating a new table to store the data.

◆ Spatially-enabling new tables

A spatial layer in Oracle is synonymous with a database table containing a column of type `SDO_Geometry`. New tables can be defined with one of the columns is defined as the `SDO_Geometry` type.

Creating a new spatial table

The following SQL creates a new spatial table:

```
CREATE TABLE employees (  
  id NUMBER(10),  
  name VARCHAR2(20),  
  job_title VARCHAR2(20),  
  address MDSYS.SDO_Geometry);
```

◆ Spatially-enabling existing tables

The `Employees` table can be modified to include a column called `Address` of type `SDO_Geometry`.

```
ALTER TABLE employees ADD (  
  Address MDSYS.SDO_Geometry);
```

Users can choose a name for the spatial column subject to Oracle's naming convention.

The table containing the spatial data can be relationally linked to other tables in the database under the normal rules for referential integrity.

◆ Benefits of Oracle Spatial

The benefits of using Oracle for storing spatial data include:

- proprietary spatial storage solutions can be avoided
- GIS information is available at the enterprise level

- better management of data, particular in areas such as disaster recovery, data sharing, security access, and version control
- SQL interface allows relatively open access from GIS and non-GIS applications
- existing systems and GIS applications can use the same Oracle tables
- server-side GIS capabilities allows large volume spatial analysis

◆ Oracle Spatial formats

Oracle supports two spatial models for representing geometries:

- Object relational - uses the SDO_Geometry type to store spatial data
- Relational - before the creation of the SDO_Geometry type, Oracle stored spatial geometries in a collection of linked tables. Oracle recommends that users should migrate from this model to the object relational model (see the **Oracle Spatial User Guide** for details on how to migrate data to the SDO_Geometry). Cadcorp SIS supports this format for backward compatibility.

◆ Spatial indexing: R-trees and Quadtrees

Oracle supports two types of spatial indexing methods to enable the fast retrieval of information: R-Tree and Quad-Tree. Cadcorp SIS provides the ability for R-Tree spatial indexes to be created when uploading data to Oracle from Cadcorp SIS and other utilities such as the Cadcorp SIS MasterMap Manager.

These indexes are used by Cadcorp SIS to facilitate the efficient retrieval of spatial data from Oracle.

◆ Projections and geodetic co-ordinate systems

Oracle Spatial supports Geodetic Co-ordinate systems. The curvature of the earth is taken into account when using Oracle spatial functions, ie when calculating distances.

Cadcorp SIS supports all the coordinate systems supported by Oracle.

◆ Oracle Locator and Oracle Spatial

Oracle offer two levels of functionality for storing spatial data. Both include the ability to store and analyse spatial data. Oracle Spatial includes advanced server-side spatial analysis capabilities, support for raster data storage (GeoRaster), and support for Network Data Model (see <http://otn.oracle.com/products/spatial/index.html>).

Oracle Locator is supplied with both the Oracle Standard Edition and the Oracle Enterprise Edition. Oracle Spatial is an extra cost option available only for Oracle Enterprise Edition.

◆ Connection types

You can view data stored in Oracle in Cadcorp SIS by using an Oracle10g dataset type overlay. You can log on to the Oracle database and select a spatial layer from the list.

Overlay can be generated in one of three modes:

- dynamic
- cached
- one-off

Dynamic (editable)

Data is retrieved from Oracle according to the geographical extents of the current map window. If the spatial extents of the map window are relatively large, more data is retrieved from the database. You should set the spatial extents of the map window before attempting to retrieve spatial data. You can pan around the map base as if it was seamless. Behind the scenes, Cadcorp SIS behind the scenes refreshes the map and selects the required data from Oracle. This mechanism allows data to be retrieved efficiently from Oracle by limiting the rows selected to those required in the map window (via the spatial index) and thus keeping network traffic to a minimum.

By default, the status of the overlay is set to editable if the overlay is generated from an Oracle table owned by the user or if the user who logged in to the database has the following database base privileges for the table:

- Select
- Insert
- Update
- Delete

Dynamic mode makes sure that the latest version of the data is displayed to users. Changes made to the data displayed in the map window will be reflected in the Oracle database immediately.

Dynamic overlays can be generated only if the table has been spatially indexed. If no spatial index exists for the table, the dynamic option will be greyed out.

If users log on to the database with view-only privileges for table, the dynamic overlay generated will have a maximum status of Hittable.

Cached

Overlays are generated by caching data from the Oracle database into memory on the client machine. Data can never be editable in this mode and the status of the overlay is set to hittable. Data displayed in this mode is only current up to the time the overlay was generated.

You should specify a spatial extent when using this mode, otherwise Cadcorp SIS will attempt to cache the entire table.

Data is not dynamically displayed, so users cannot pan beyond their specified spatial extent.

Cached data allows efficient data interrogation and analysis.

One-off import

Overlays created as a one-off import generate a copy of the data in an internal overlay. The overlay is disconnected from the database, and the status of the overlay is editable. Edits made to the data are stored in the internal overlay, not in the database.

The overlay generated by a one-off import should be considered as a snap-shot of the database. It allows you to create 'what if' scenarios, without affecting the original data.

Setting map extents

Users should set the map extents of their Cadcorp SIS session before attempting to read data from Oracle. This improves performance and ensures that network traffic is kept to a minimum.

Scale thresholds

Users should set a maximum scale threshold on dynamic overlays. This ensures that, in the event of zooming out too far in the map window, a request to retrieve data is not made.

■ Editing Oracle data

Data held in an Oracle database can be edited in Cadcorp SIS only if the following conditions are all true:

- the overlay has been opened in dynamic mode
- the user logging on to Oracle is the owner of the data
- the user logging on to Oracle has the following privileges for the spatial table: Select, Insert, Update and Delete
- a Where clause has not been specified in Cadcorp SIS for the overlay. (We advise you to use database views to fine tune your requirements.)

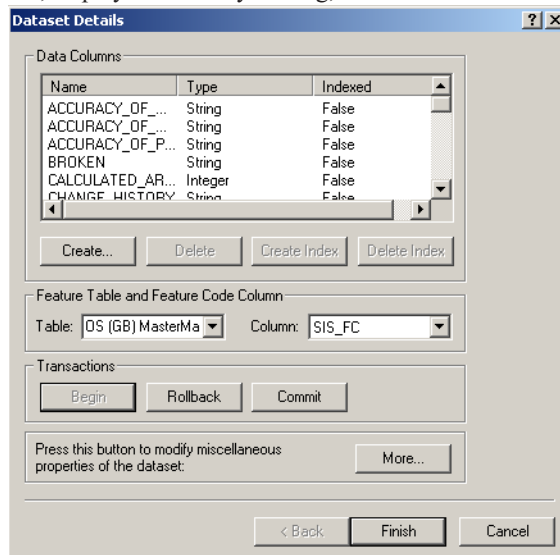
You can edit the graphics and attributes of spatial features in the usual way. Changes are committed to the database when you complete the command. You can undo and redo operations as well.

◆ Transactions

If you want to make changes to an Oracle overlay, but do not want the edited data to be committed to the database immediately (and therefore not seen by other users), use the Transaction facility to delay the commit process until you are ready.

Start transaction

To start a transaction, display the Overlays dialog, and choose the Dataset Details dialog.



Click the Begin button to start a transaction.

Any changes made to the Oracle overlay will not be committed to the database until you click the Commit button.

During a transaction you can use the Undo and Redo commands.

Changes made to the data during a transaction will not be visible to other users, who will see only a read-only version of the data before the transaction started.

Other users cannot edit features that are part of an uncommitted transaction.

End transaction

Once you have finished editing, you have two choices:

- Rollback: this will release the transaction and allow other users to obtain editable access to the data. The changes you made will not be applied to the dataset.
- Commit: this will commit the changes permanently to the Oracle dataset and release the transaction. All users will now be able to view the data.

The Transaction commands are also available on the dataset's local menu in the workspace window.

◆ Adding new attributes

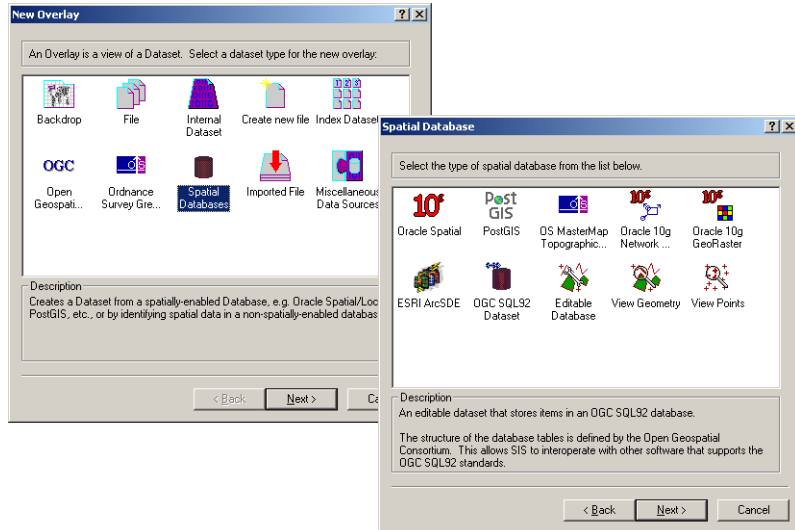
Adding a new attribute to an Oracle overlay is the equivalent of adding a new column to the Oracle table. You can add a new attribute using the Dataset Details tab on the Overlays dialog. Click the Create... button and define the new field. Cadcorp SIS will create a new column in the database table.

■ Generating overlays from spatial data stored in Oracle

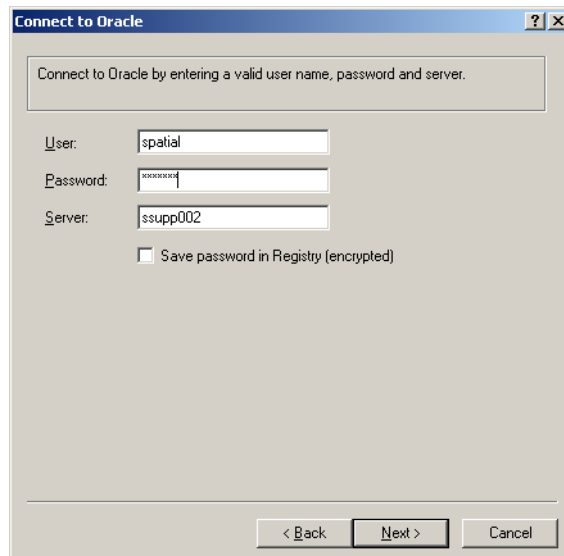
Spatial data stored in the SDO_GEOMETRY type of an Oracle database table can be read into Cadcorp SIS in the following way:



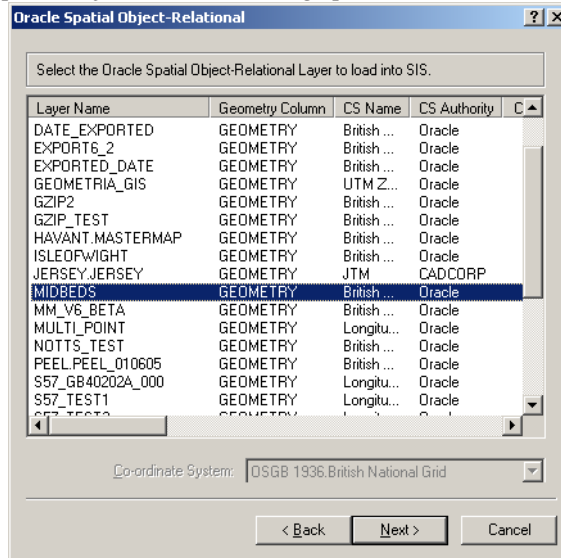
- 1 Start the New Overlay Wizard by choosing **Map>Add>Overlay...** or by clicking the Add Overlay icon on the tool bar, and choose Spatial Databases.



- 2 Choose Oracle Spatial.
- 3 Complete the connection dialog and click Next. If in doubt, consult your database administrator.

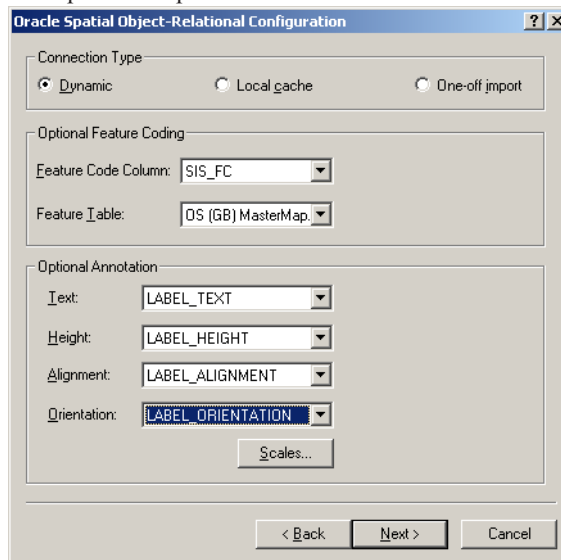


- 4 The Oracle Spatial Object-Relational dialog opens:



From the list highlight the Oracle spatial layer you wish to open as a Cadcorp SIS overlay, then click Next.

- 5 The Oracle Spatial Object-Relational Configuration dialog lets you configure how the overlay should be opened and presented.



- 6 Select the connection type best suited for you requirements.

Optional Feature Coding

If you intend to use a feature table with your overlay, you must ensure that the Oracle table contains the appropriate feature code attribute as well as the SDO_GEOMETRY type containing the spatial data. If your data was loaded using the Cadcorp SIS OS MasterMap Manager, the feature code is exported for you. If you created your dataset using the export utility in Cadcorp SIS, you must ensure that the feature code column is listed in the overlay schema before exporting the overlay.

Alternatively if there is no feature code attribute, you can generate one manually using one of the Oracle database interfaces such as SQL Plus.

Applying a feature table

- 1 On the Oracle Spatial Object-Relational Configuration dialog, select the feature code attribute from the Feature Code Column drop-down list.
The feature code attribute must be in the Oracle table in a column of a number type.
- 2 Select the appropriate feature table from the Feature Table drop-down list.

Optional Annotation

Oracles SDO_GEOMETRY type does not support the storage of text items (cartographic text). To circumvent this limitation, the Annotation functionality can be used to display cartographic text as a Label theme.

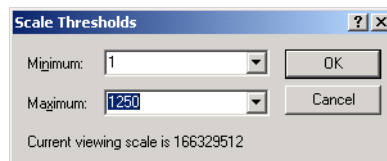
You can store the text value, font size, text rotation, and text alignment as attributes of a geometry point within an Oracle table. Cadcorp SIS will generate a label theme displaying the cartographic text at the correct location, rotation, alignment and font size.

Display thresholds can be set for the annotations, causing them to switch on and off according to the view scale in the map window. We recommend that the thresholds are set to avoid the drawing of cartographic text at view scales that would make it difficult read the text.

To take advantage of this capability, the data for the annotation must be stored in the Oracle table. If the Cadcorp SIS OS MasterMap Manager has been used to upload data into an Oracle spatial layer, cartographic text is automatically converted to a text point with the text, height, rotation, and alignment values added to the table as attributes of the point. If the dataset was created using the export utility within Cadcorp SIS, you must ensure that the Text column is listed in the overlay schema before exporting the data to Oracle.

To apply annotations:

- 1 On the Oracle Spatial Object-Relational Configuration dialog, select the attribute (table column) that contains the text, height, alignment and orientation attributes respectively.
- 2 Click the Scale button to reveal the Scale Thresholds dialog. The defaults for the view scale threshold are set to No Limit, which means that the annotations will be displayed at all view scales.



- 3 You can adjust the annotations from the overlay at a later stage by editing the corresponding Label Theme.

Optional WHERE clause

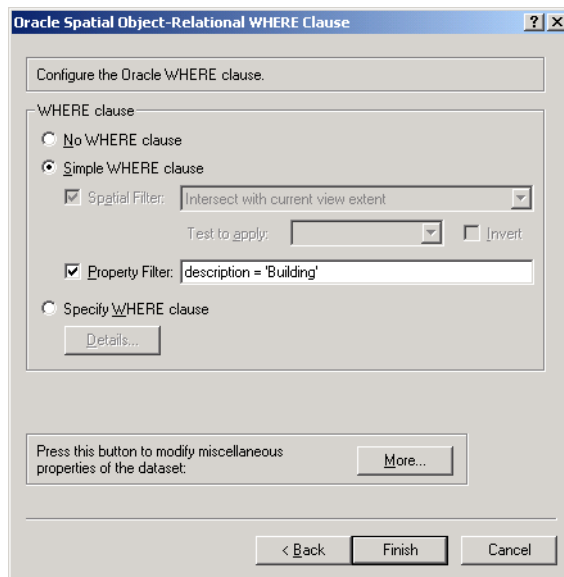
A condition can be applied in the form of a WHERE clause to filter data being selected from an Oracle database table. The syntax for the WHERE clause is standard Oracle SQL, except that the keyword WHERE and SQL terminator should not be used.

Data can be filtered by any table column by entering the WHERE clause in the property filter section. For example, you may want to select all the spatial geometries for a given area, where the description of the spatial feature is building. You would enter the following WHERE clause:

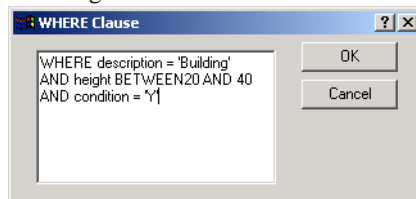
```
description = 'Building'
```

You have three options for the WHERE clause:

- no WHERE clause
- a simple WHERE clause where you can set a spatial filter or a property filter
- your own WHERE clause. Click the Details button to display the WHERE clause dialog.



You can specify more complex WHERE clauses. Choose the Specify WHERE clause option, and click the Details button to display the WHERE Clause dialog box. Type the SQL in the WHERE clause dialog:

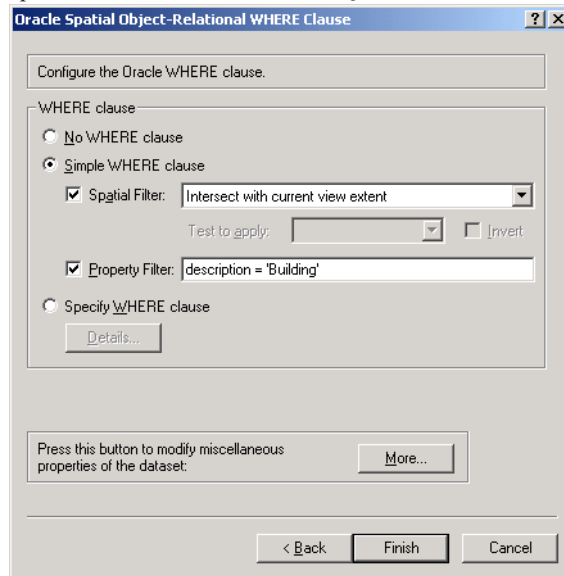


Spatial Filter

You can optionally apply a spatial filter when creating an overlay in either local cached or one-off import modes. This option restricts the data selected to correspond to the geographical area represented in the map window. Without the spatial filter, Cadcorp SIS creates an overlay by selecting all the data from the table. This is not desirable if the source table is very large.

For efficient retrieval of data, the view scale of the map window should be set before the overlay is generated.

The Spatial filter option can be combined with a SQL WHERE clause.



4 Click Finish to generate the overlay.

■ Database Query Wizard

Filtering data in an overlay allows you to remove data from an overlay, leaving behind data that fulfils particular criteria. For example, an overlay can be filtered to display houses that are located in a particular geographical area: this is known as a spatial query. Alternatively, an overlay can be filtered to display spatial features with a particular attribute value such as house number between 10 and 20: this is known as an attribute query.

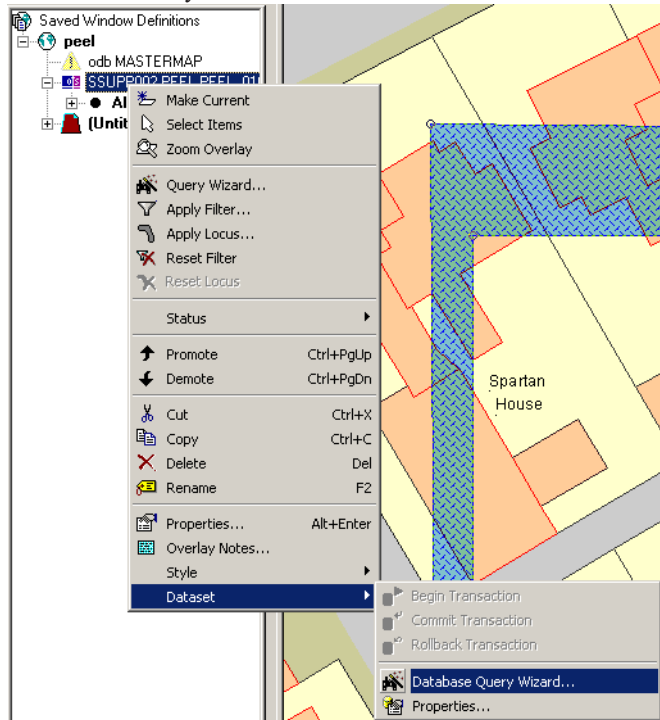
Dynamic Oracle overlays can be filtered using the Database Query Wizard. The wizard works on the same principles as the standard Query wizard, except that the Oracle queries (both spatial and non-spatial) are run on the Oracle server. The resulting data can then be viewed as a new overlay. Alternatively, the original overlay can be modified to show as a filter (Locus) applied to the current Oracle overlay.

Server-side processing allows queries to be processed faster and allows very large datasets to be queried.

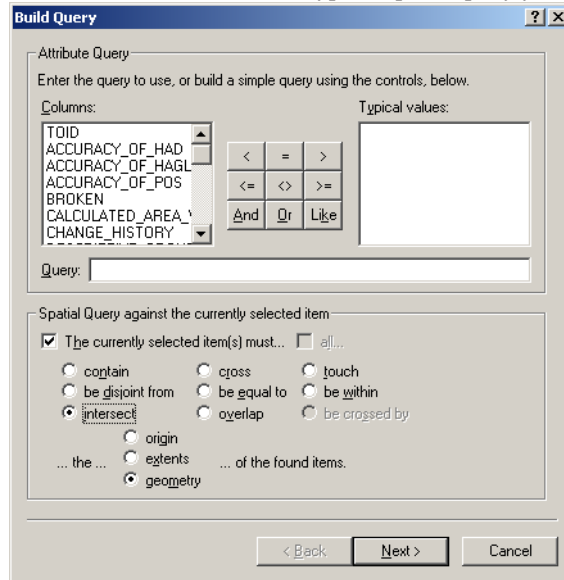
◆ Spatial queries

The Oracle Query Wizard can be run only against overlays that have not already been filtered.

- 1 To run a spatial query against an Oracle dynamic layer, make sure that a test geometry has been selected.
- 2 Start the Database Query Wizard. Choose Database Query Wizard from the Dataset menu on the Oracle overlay's local menu.



- 3 For spatial searches fill in the details of the type of spatial query you want to perform.



Build Query

Attribute Query

Enter the query to use, or build a simple query using the controls, below.

Columns: TOID, ACCURACY_OF_HAD, ACCURACY_OF_HAGL, ACCURACY_OF_POS, BROKEN, CALCULATED_AREA, CHANGE_HISTORY

Typical values:

Query:

Spatial Query against the currently selected item

☒ The currently selected item(s) must... ☐ all...

☐ contain ☐ cross ☐ touch

☐ be disjoint from ☐ be equal to ☐ be within

☒ intersect ☐ overlap ☐ be crossed by

☐ origin

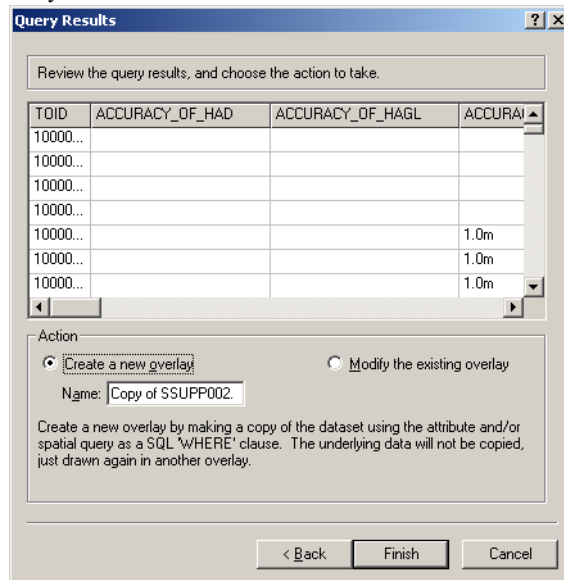
... the ... ☐ extents ... of the found items.

☐ geometry

< Back Next > Cancel

In this example, a query will be built that filters the overlay to display data that intersects the current selected item.

- 4 You can choose whether to create a new dynamic Oracle overlay or apply the filter to the current overlay.



Query Results

Review the query results, and choose the action to take.

TOID	ACCURACY_OF_HAD	ACCURACY_OF_HAGL	ACCURACY_OF_POS
10000...			
10000...			
10000...			
10000...			
10000...			1.0m
10000...			1.0m
10000...			1.0m

Action

☒ Create a new overlay ☐ Modify the existing overlay

Name: Copy of SSUPP002

Create a new overlay by making a copy of the dataset using the attribute and/or spatial query as a SQL 'WHERE' clause. The underlying data will not be copied, just drawn again in another overlay.

< Back Finish Cancel

◆ Filtering a cached or one-off import

To filter a cached or one-off imported Oracle overlay, use the standard query wizard.

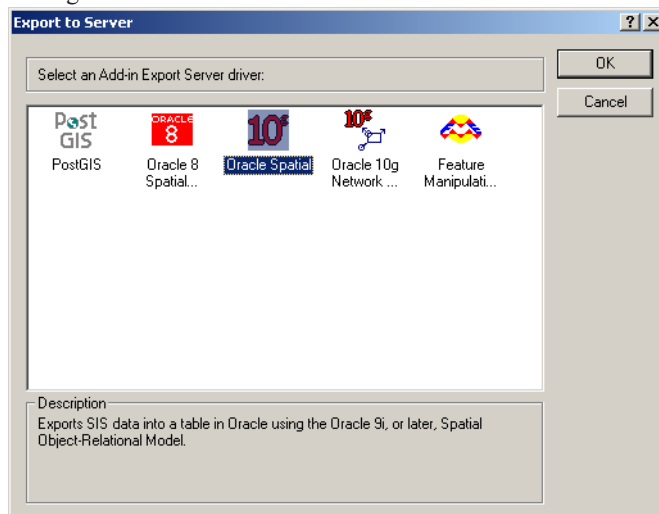
■ Loading spatial data into Oracle

Cadcorp SIS has an export utility that allows spatial data, along with its attributes, to be exported to Oracle. Data from any overlay opened in Cadcorp SIS can be exported, regardless of its original format (eg *.shp or *.dxf).

◆ Exporting Spatial Data to Oracle 9i



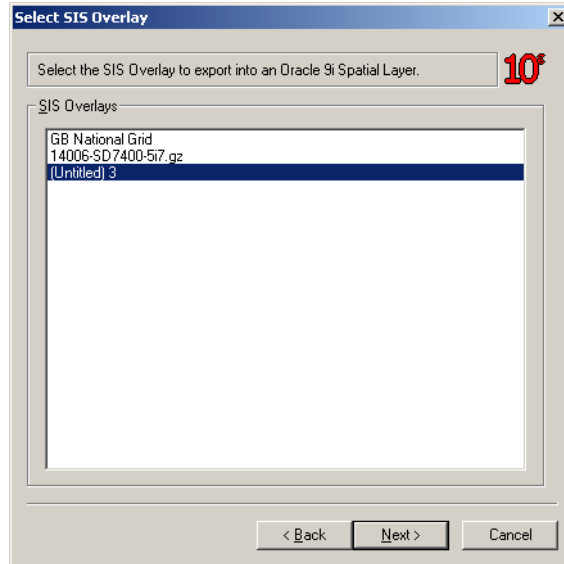
- 1 Choose the **File>Export>Server** command and click the Oracle10g icon on the Export to Server dialog.



The export utility works with a 10g database, and is backwards-compatible with a 9i database.

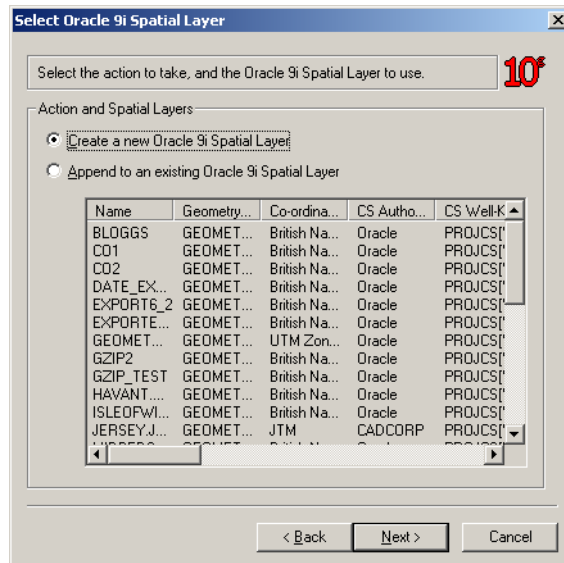
- 2 Fill in the appropriate connection information for your Oracle server. Check with your database administrator if in doubt.

- 3 Select the appropriate overlay for exporting to Oracle.



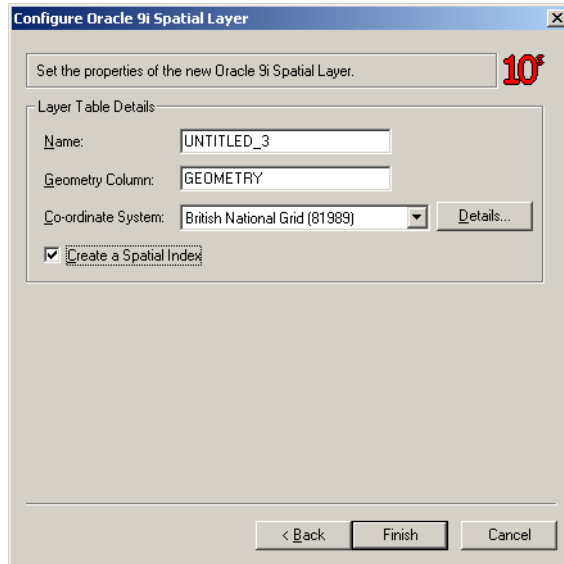
Click Next.

- 4 Choose whether you want to create a new Oracle spatial layer or append data to an existing layer.



To create a new Oracle Spatial Layer choose the Create a new Oracle 9i Spatial Layer option and click Next.

- 5 Fill in the Oracle Spatial Layer information.



Name The name of the Oracle spatial layer defaults to the overlay name. You can change this to any Oracle-compliant table name.

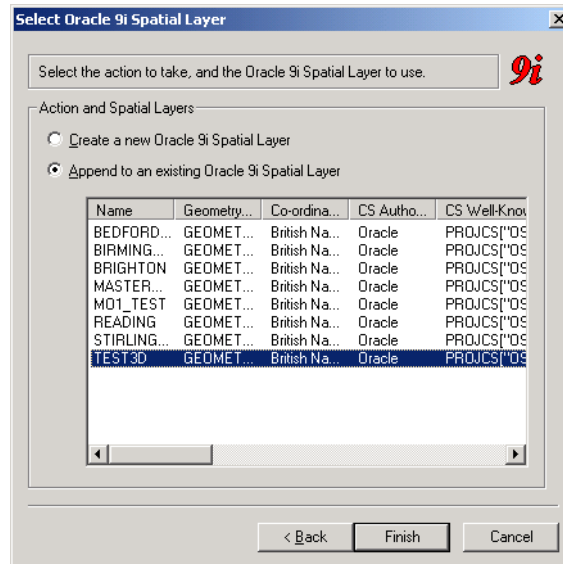
Geometry Column The name for the column containing the spatial data in the Oracle table defaults to GEOMETRY. This can be changed to any name that conforms to Oracle's naming convention for database columns.

Co-ordinate System The co-ordinate system associated with the spatial layer defaults to the co-ordinate system for the map window view.

Create Spatial Index To allow Cadcorp SIS to create dynamic overlays from Oracle tables, a spatial index must be created.

- 6 Click Finish to complete the loading process.

- 7 To append data to an existing Oracle Spatial layer, choose Append in step 4 and select the Oracle spatial layer you wish to append data to.



When you append large volumes of data, Oracle recommends that you drop a spatial index on the target Oracle spatial layer, and recreate it after the append process has completed. This allows for faster uploading, and ensures that the spatial index does not degrade. Contact your database administrator for details.

Attributes must match on both the data being exported and the table being appended to. If there is a mismatch, you could lose data.

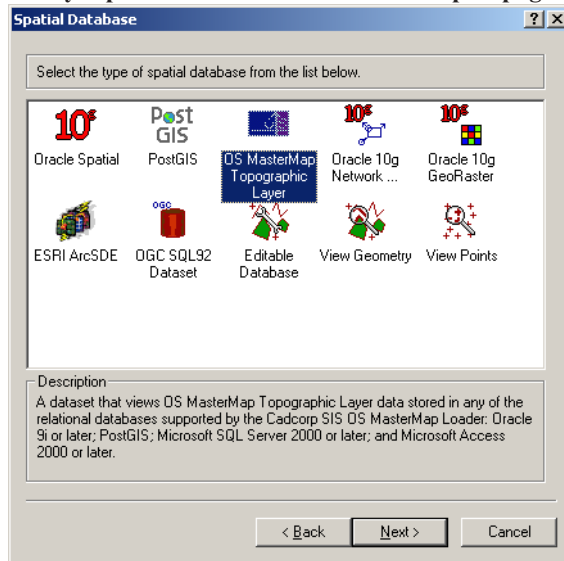
◆ Loading OS MasterMap Data into Oracle Spatial (UK only)

Cadcorp have developed a special utility, the Cadcorp SIS OS MasterMap Manager, to allow OS MasterMap data to be loaded directly into an Oracle database. This application has been designed to facilitate large-scale loading of spatial data. Once the data is in Oracle it can be read into Cadcorp SIS using the methods described in this chapter. For more information, refer to the **Cadcorp SIS Guide to Ordnance Survey MasterMap** document.

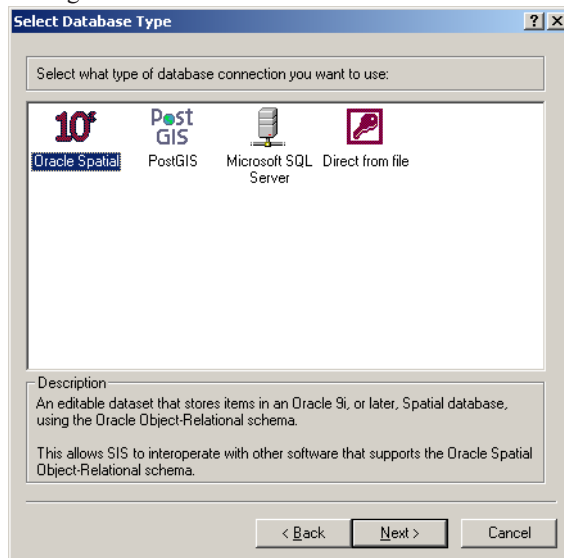
Opening OS MasterMap Data

To open an OS MasterMap overlay that was loaded using the Cadcorp OS MasterMap Manager:

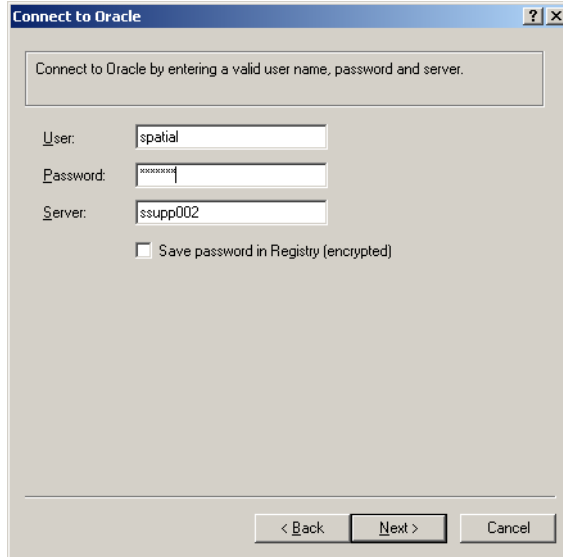
- 1 Select **Add Overlay>Spatial Databases>OS MasterMap Topographic Layer**:



- 2 Select the Oracle10g database icon:



3 Connect to the Oracle database:



Connect to Oracle by entering a valid user name, password and server.

User:

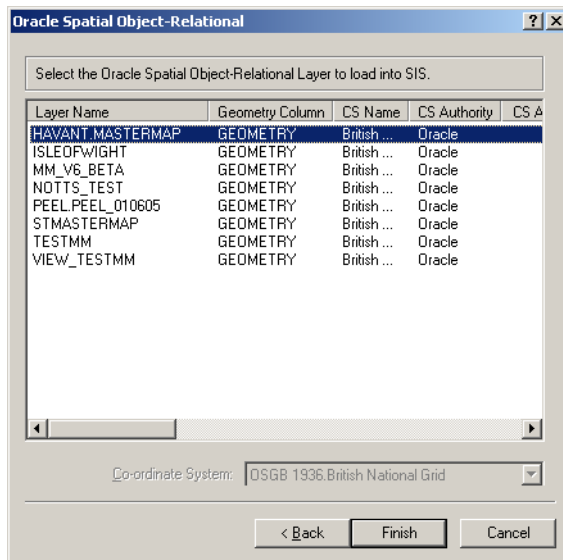
Password:

Server:

☐ Save password in Registry (encrypted)

< Back Next > Cancel

4 Select the OS MasterMap spatial layer you wish to open:



Select the Oracle Spatial Object-Relational Layer to load into SIS.

Layer Name	Geometry Column	CS Name	CS Authority	CS A
HAVANT_MASTERMAP	GEOMETRY	British ...	Oracle	
ISLEOFWIGHT	GEOMETRY	British ...	Oracle	
MM_V6_BETA	GEOMETRY	British ...	Oracle	
NOTTS_TEST	GEOMETRY	British ...	Oracle	
PEEL.PEEL_010605	GEOMETRY	British ...	Oracle	
STMASTERMAP	GEOMETRY	British ...	Oracle	
TESTMM	GEOMETRY	British ...	Oracle	
VIEW_TESTMM	GEOMETRY	British ...	Oracle	

Co-ordinate System:

< Back Finish Cancel

The data will be displayed with the correct feature table and setting applied.

SQL Loader

Oracle's built-in data loading utility can also be used to load data into Oracle spatial layers. (see the **Oracle Spatial User Guide**)

Third-party tools

Cadcorp SIS can read data from Oracle spatial layers that have been loaded using third-party tools such as the Feature Manipulation Engine (FME) from Safe Software.

Spatial Data Stored in Oracle 8i - Object Relation model

Spatial data stored in Oracle8i Object Relational Model can be read into Cadcorp SIS using data source technology. Spatial data is loaded as read-only overlays.

◆ Reading Oracle8i data

- 1 Start the New Overlay Wizard by choosing **Map>Add>Overlay...** or by clicking the Add Overlay icon on the tool bar. Select the Data Source option, and click Next.
- 2 Select the Oracle8i Spatial data source driver and click Finish.
- 3 Fill in the appropriate connection details for your database and click Next. If in doubt, consult your database administrator.
- 4 Select the Oracle Spatial Layer you want to open, and specify the unique identifier for the Layer, then click Next.
- 5 Use the next dialog to filter the data being retrieved from the Oracle Spatial layer.

Optional WHERE Clause To control the quantity of data being selected from the database by Cadcorp SIS, you can supply an optional SQL WHERE clause. The syntax for this is standard Oracle SQL, except that the keyword WHERE and SQL terminator should not be used.

Data can be filtered by any database table column. For example, you may want to select all the spatial geometries for a given area where the description of the spatial feature is that of a house. You would use the following:

```
description = 'HOUSE'
```

Optional Spatial Extents Spatial extents can be used for Oracle spatial layers that have been indexed. Spatial extents allow Cadcorp SIS to query Oracle spatial layers efficiently by returning only data that lies within the spatial extents specified. If spatial extents are not specified, all the data will be selected from the Oracle Spatial Layer.

To specify spatial extents, tick the checkbox and enter the co-ordinate values for the spatial extent.

You can request data that falls outside the specified spatial extents. Tick the Load Geometries Outside Spatial Extents checkbox to enable this facility. Remember that if a relatively large spatial extent is specified, a relatively large quantity of data will be selected from the database.

- 6 Click Finish.

◆ Exporting to Oracle8/8i

There is no utility to export overlays directly to Oracle8/8i Spatial Object-Relational Model. You can make use of the export utility for Oracle8, which exports spatial data to the Oracle Relational Model. Oracle's migration utilities can be used to convert the Relational Model into an Object Relational Model.

SQL Loader

Oracle's built-in data loading utility can also be used to bulk load data into Oracle spatial layers.

Third-party tools

Cadcorp SIS can read data from Oracle spatial layers that have been loaded using third party tools such as the Feature Manipulation Engine (FME) from Safe Software.

Oracle8/i – Relational Model

Oracle has dropped support for the Relational Model for storing spatial data. Oracle has recommended that users migrate their data to the Object-Relational Model using Oracle's built-in utilities. However, for backwards compatibility, it is possible to load data into Oracle spatial layers using the Relational Model.

◆ Opening an Oracle Spatial Layer relational model

The Relational Model for storing data in Oracle Spatial uses four tables to store the geometry information and one for the attribute data. The attributes table exists only if the Oracle spatial layer was created by the Cadcorp SIS export utility; Oracle8 Spatial Cartridge. Collectively these tables are known as an Oracle spatial layer.

- 1 Start the New Overlay dialog by choosing **Map>Add>Overlay...** or by clicking the Add Overlay icon on the tool bar. Select the Data Source option, and click Next.
- 2 Select the Oracle Spatial Cartridge dataset and click Finish.
- 3 Log on to the Oracle Server by supplying the appropriate details. If in doubt, contact your database administrator.
- 4 The Oracle Spatial Cartridge dialog opens:

Oracle Layer to Load into Cadcorp SIS Select the Oracle Layer you wish to open from the drop-down list.

Feature table The feature table in this context refers to the table that contains the attribute data for this particular Oracle Overlay. This feature table will be selected by default if the Oracle Spatial Layer was created by the Cadcorp SIS export utility. If attribute data was associated with the layer using other means, this table should be selected from the drop-down list. The feature table is associated with the layer via a unique key.

GID column Select the appropriate table column from the drop-down list to link the feature table with the geometry table in the Oracle Spatial Layer.

Layer records to load If the Oracle Spatial Layer has been spatially indexed, you can filter the data by specifying a spatial extent. This allows for the efficient retrieval of data by limiting it to a quantity that falls within your geographic area of interest. If no spatial extents are specified, all the data will be selected from the Oracle Spatial layer.

- 5 Click OK to accept the values entered.

◆ Exporting to Oracle Spatial Relational model

- 1 Display the Export to Server dialog by selecting the **File>Export>Server** command. Choose the Oracle Spatial Cartridge option and click OK.
- 2 Log on to the Oracle Server by supplying the appropriate log-on details. If in doubt, contact your database administrator.

- 3 The Export to Oracle Spatial Cartridge dialog opens. Select the overlay you want to export.
The name assigned to the new Oracle spatial layer defaults to the name of the overlay selected. You can change this to any name consistent with Oracle's naming convention for database tables.
Action You can either create a new Oracle Spatial Layer, append to an existing one, or modify existing Oracle Layers. Choose one.
Create new Oracle Layer This is the default option. After entering a name for the Oracle layer, click OK.
- 4 Specify spatial extents large enough to include new data that may be appended to the Oracle spatial layer.
Tolerance Oracle uses this value to determine the tolerance in metres within which adjacent points are considered to be coincident. Use the tolerance setting to avoid rounding errors.
Ordinate Type This is the Oracle data type and precision for storing geometry.
Tile Level This value is required by Oracle Spatial. The number corresponds to the number of times the tiles that interact with a geometry should be decomposed when a quad tree (fixed tiling) is created.
- 5 After entering all the appropriate data, click OK.
The export utility starts to export the data. When it has finished you see the following message:
The Oracle export utility does not create a spatial index for the layer exported. This has to be done manually by the database administrator.

Append to Oracle layer

To append geometries to an existing Oracle spatial layer, select the target layer from the Oracle layer drop-down list shown in step 3 above. Select Append to Oracle Layer and click OK.

Cadcorp SIS will insert the geometries from the chosen overlay into the chosen Oracle spatial layer. Attribute data is not copied because the existing Oracle spatial layer may not contain the same set of attributes. To avoid this limitation, you should export the overlay schema, including the unique identifier, to a CSV file and load the data into Oracle using the SQL Loader utility.

Modify an existing Oracle layer

When a Oracle Spatial database is opened, the Cadcorp SIS overlay is not editable. However, it is possible to modify the spatial data. The items that need to be edited should be replicated to an internal overlay, where the edits can then be made. The internal overlay is then exported back to the Oracle spatial layer it came from.

To do this, follow these steps:

- 1 Open an Oracle spatial layer.
- 2 Select the relevant items, and replicate them into an internal overlay.
- 3 Edit the items in the internal overlay.
- 4 To cause items to be deleted from the Oracle spatial layer, display the properties for the item and enter the value 1 in the Delete Pending property.

- 5 To add to items to the Oracle spatial layer, construct the item in the internal overlay.
- 6 Display the Export to Oracle Spatial Cartridge dialog (steps 1 to 3 above).
- 7 Select the internal overlay for export.
- 8 Select the Oracle spatial layer to be modified.
- 9 Select Modify Existing Oracle Layer and click OK.
- 10 Click OK again. A message displays the changes that were made.



It is not possible to edit attributes of the spatial objects. Do this through the SQL interface for Oracle or via a third party tool.

For more details on all of the above issues relating to Oracle spatial data, refer to: Oracle Spatial User's Guide & Reference Release 9.2 (March 2002 Part No. A96630-01).

■ Oracle 10g GeoRaster

◆ Introduction

Oracle 10g GeoRaster allows users to store geo-referenced raster data in an Oracle database. Users can take advantage of the database security and data management capabilities for their raster data.

Licensing

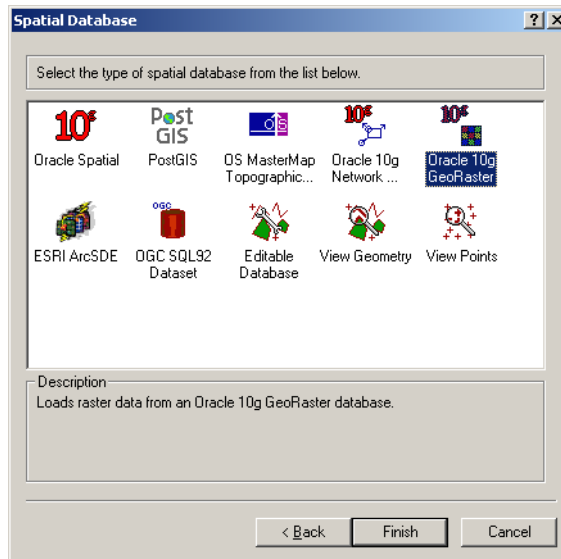
Oracle GeoRaster is a part of the Spatial option, available only with Oracle Enterprise Edition.

◆ Loading Oracle GeoRaster data

Use the Oracle tools for loading raster data. Refer to the following Oracle documentation:
http://www.oracle.com/technology/products/spatial/spatial_10g_doc_index.html

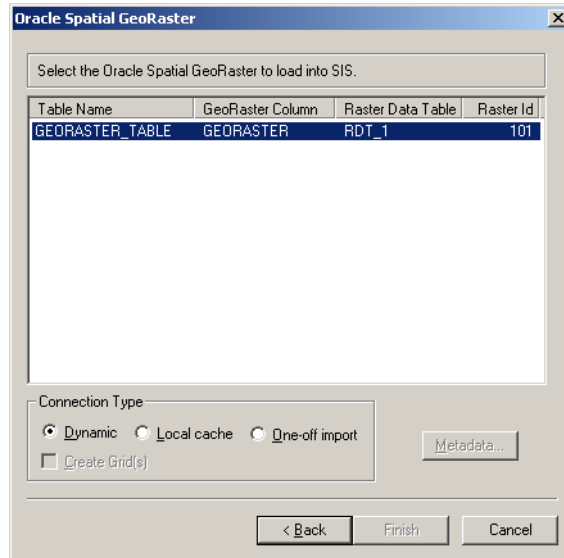
◆ Creating a GeoRaster Overlay

- 1 On the New Overlay dialog select Spatial Database, and then choose the Oracle 10g GeoRaster option:



- 2 Connect to the Oracle database.

- 3 Select the Georaster image from the list and choose the type of connection you wish to make.



- Dynamic** This connection type is available if the GeoRaster data has been spatially indexed. This connection type minimises the amount of client-side memory required to display the relevant data, but will make calls to the server as data is required (ie as the user pans around the map).
- Local Cache** This connection type caches the image on the local client. The amount of memory used depends on the size of the image. Once the data is on the client Cadcorp SIS does not need to communicate with the server. If the overlay is saved as a part of the SWD, data will be retrieved from the server when the SWD is first opened.
- One-off-import** This connection type caches the image on the client as a copy of the data. The SWD will not retrieve the data from the server when the SWD is subsequently opened. This connection type allows users to create a local snapshot of the data. If the data changes on the server, the user will still have a copy of the data as it was before the change was made.

■ Oracle Network Data Model

◆ Introduction

The Oracle 10g Spatial Network Model allows users to store network data models in an Oracle 10g database. Users can take advantage of the database security and data management capabilities offered by Oracle for their network data.

Licensing

Oracle Spatial Network Data Model is a part of the Spatial option, available only with Oracle Enterprise edition.

◆ Loading Network data into Oracle Spatial Network Data Model

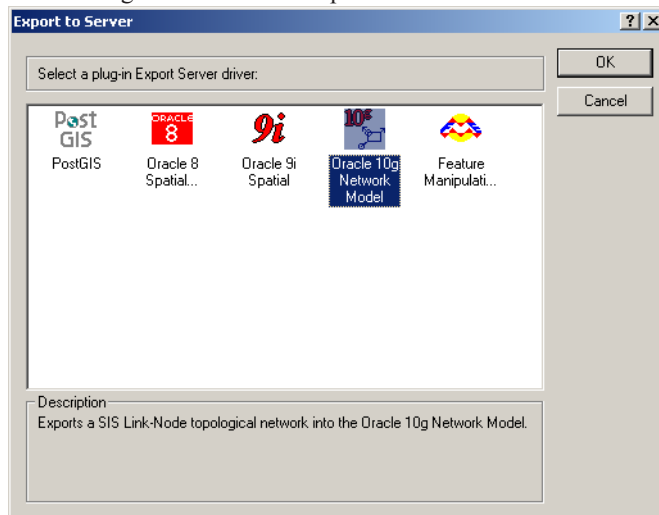
Create an overlay in Cadcorp SIS containing the network model you wish to store in Oracle. ➤Chapter 29: “**Creating topology: links and nodes**”

- ✎ The Oracle Network Model is limited in its use of topology. It is intended to be used for network analysis, and stores only link directions and connectivity items loaded into Oracle. Turning restrictions set on nodes are not transferred to the Oracle model.

Exporting Data to Oracle Network Model

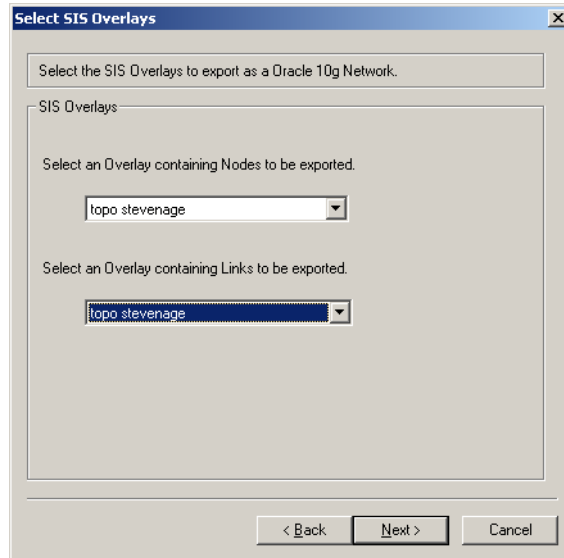


- 1 Choose the **File>Export>Server** command.
- 2 Select the Oracle 10g Network Model export driver:



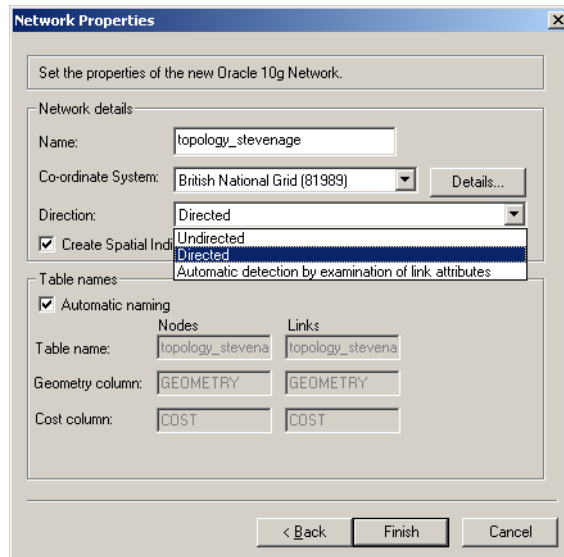
- 3 Connect to the Oracle server. Contact your database administrator for connection details.

- 4 Select the overlay that contains the nodes and the one that contains the links. This may be the same overlay.



The 'Select SIS Overlays' dialog box is shown. It has a title bar with a close button. Inside, there's a label 'Select the SIS Overlays to export as a Oracle 10g Network.' Below this is a section titled 'SIS Overlays'. It contains two instructions: 'Select an Overlay containing Nodes to be exported.' and 'Select an Overlay containing Links to be exported.' Each instruction has a dropdown menu below it, both of which currently show 'topo stevenage'. At the bottom of the dialog are three buttons: '< Back', 'Next >', and 'Cancel'.

- 5 Fill in the Network Properties dialog box:



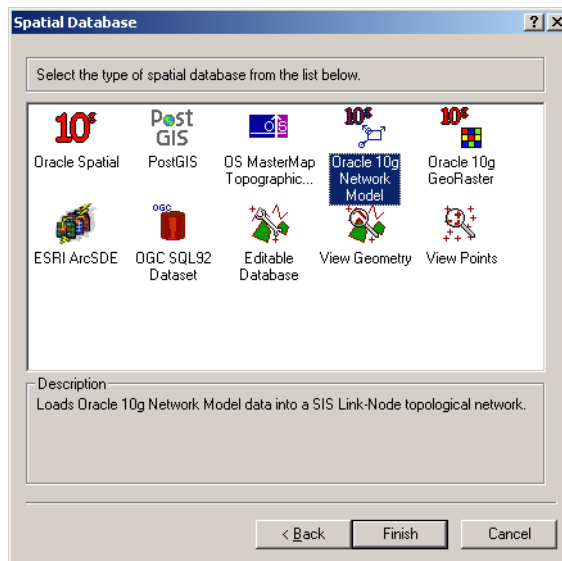
The 'Network Properties' dialog box is shown. It has a title bar with a close button. Inside, there's a label 'Set the properties of the new Oracle 10g Network.' Below this is a section titled 'Network details'. It contains several fields: 'Name:' with the text 'topology_stevenage'; 'Co-ordinate System:' with a dropdown showing 'British National Grid (81989)' and a 'Details...' button; 'Direction:' with a dropdown showing 'Directed'; a checked checkbox 'Create Spatial Index' with a dropdown showing 'Directed'; and a 'Table names' section. The 'Table names' section has a checked checkbox 'Automatic naming' and two columns: 'Nodes' and 'Links'. Each column has three fields: 'Table name:', 'Geometry column:', and 'Cost column:'. The 'Nodes' column fields contain 'topology_stevena', 'GEOMETRY', and 'COST' respectively. The 'Links' column fields contain 'topology_stevena', 'GEOMETRY', and 'COST' respectively. At the bottom of the dialog are three buttons: '< Back', 'Finish', and 'Cancel'.

- Name Enter a name for the spatial layer being created in Oracle.
- Coordinate System Cadcorp SIS will automatically detect the coordinate system of the overlay being exported.

- Direction Automatic Detection (leave the default setting)
- Create spatial index Leave this box ticked.
- Automatic naming Leave the default settings.
- 6 Click Finish to start loading data into Oracle.

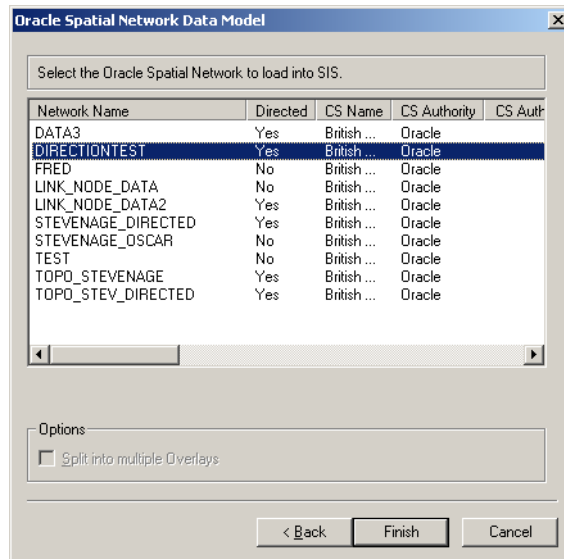
◆ Creating an Overlay from Oracle Network Data

- 1 Choose the Spatial Databases option from the New Overlay dialog.
- 2 Select the Oracle Network Model.



- 3 Connect to Oracle.

- 4 Select the Oracle Network Model from the list.



- 5 Click Finish to create the overlay.

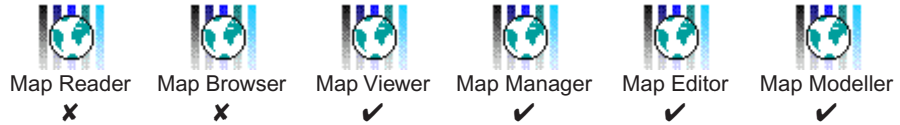
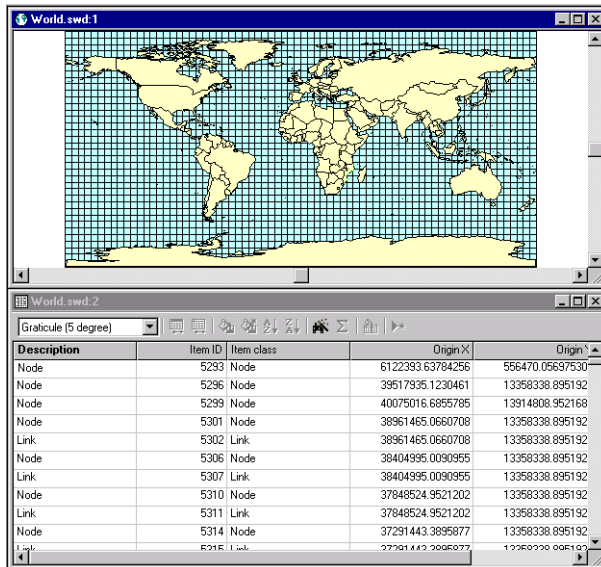


Table windows

■ What are table windows?	331
■ Viewing tables	332
■ Table window commands	332
■ Other useful tools	333
■ Creating and viewing named tables	333
■ Joining table rows and graphical items	334

■ What are table windows?

Table windows display properties, graphical attributes, and data from a database, in tabular form.



The table window and the map window are dynamically linked. If you select an item's attributes and properties in the table window, the item is automatically selected in the map window. Similarly, selecting an item in the map window selects the row in the table window. You can select more than one row by holding the Shift or Ctrl key down and clicking. To select a column, click the heading cell, or a value in that column. The header changes to bold to indicate the column is selected.

■ Viewing tables



To view these tables select the **Window>New table window** command. This command creates a tabular view of the current SWD. The drop-down box at the top left corner of the table window contains a list of overlays which you can select for displaying in the table window.

■ Table window commands

The Table menu contains commands specifically for use with a table window. These commands can also be accessed via the Table/Data toolbar.

◆ Table>Join



This command creates a link between a graphical item and tabular data. ➤Chapter 21: “Table windows”, **Joining table rows and graphical items**, page334

◆ Table>Fit To Header



This command sets each column to be the same width as the heading of the column.

◆ Table>Fit To Window



This command compresses or extends the column widths so that every column is visible within the current window. If there are too many columns then the column names may be difficult to identify.

◆ Table>Refill



This command refills a table window from the overlay of the table being viewed. This command is also useful after sorting (to go back to the default sorting).

◆ Table>Refill Selected



This command refills a table window to show just the selected rows. To see all the rows again, choose the **Table>Refill** command.

◆ Table>Sort>Ascending



This command sorts the rows of the table based on the contents of the selected column. The order is ascending alphanumeric: “1” before “9” before “A” before “Z”.

◆ Table>Sort>Descending



This command sorts the rows of the table based on the contents of the selected column. The order is descending alphanumeric: “Z” before “A” before “9” before “1”.

◆ Table>Sort>Advanced



This command displays the Sort dialog, which allows you to sort the table based on two columns rather than just one.

◆ Table>Statistics



This command displays a dialog containing statistics for the selected column, including the number of rows, the minimum and maximum values, the range, mean, median, variance, and standard deviation of the values in the column. The command is unavailable if you haven't selected a column containing numbers.

◆ Table>Fill Column



A new column from an editable table can be filled with values from an existing column on the same table if the data type in both columns is the same (floating point, integer or string). New columns can also be populated using a formula. To do this, press the Formula button on the Fill Column dialog. This option provides a useful method of adding attributes to multiple items. Additional columns can be added using the Schema.

For example, using the Schema an integer column could be created called "Totals" and this could be populated using the contents of two columns added together using **Table>Fill Column... Formula**.

◆ Table>Scroll Dominant



This command scrolls the table window to ensure that the table window containing the dominant or selected item in the current selection is visible. This icon is greyed out until the dominant or highlighted selected item is no longer visible within the table window.

■ Other useful tools

◆ Query



You can use the Query Wizard to find an entry in a column (and the item on an overlay).
 ➤ Chapter 7: "Finding items: queries"

◆ Zoom to selection

The map window and corresponding table window are dynamically linked. Therefore by displaying both windows simultaneously you can highlight a row or rows from the table window, then use **Map>Zoom Selection** command to zoom the map window to the extent of the selected item or items.



Similarly if you select an item in the map window, the corresponding row in the table window will become highlighted (you may need to use the **Table>Scroll Dominant** command to see it). Additionally, if Flicker Selection is on (see the Options page of **Tools>Preferences...**), the selected item flickers on the screen until deselected.



■ Creating and viewing named tables

To create a named table, either:



- Choose the **File>New** command, then select the Named Table icon which displays the Select Database Type dialog.

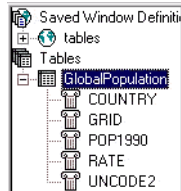
or

- Go to the table view of the workspace window. From the local menu of the Tables entry, choose the New Table... command.

The method of selecting a database is exactly the same as explained in Chapter 20: “Databases”.

When completed the named table will be displayed.

The window looks exactly the same as a graphical table window except that there is no drop-down box in the top left hand corner. To work with named tables, use the Table View tab in the workspace window and add the Table/Data toolbar.



As you add more named tables they appear in the list. If you highlight the table name and display the local menu, you can view that table, and cut, copy, and view the properties of the table.

A click on individual column names toggles the column visible or invisible.

If you save the project workspace it will automatically reconnect next time the workspace is opened.

■ Joining table rows and graphical items

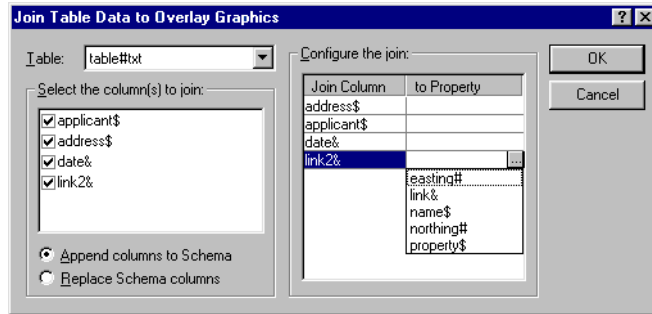


The **Table>Join** command allows you to create links between graphical items and tabular data. You do this by linking columns in different datasets which have identical values. If your datasets do not already have identical values, you will have to create a column in one dataset and add column values which will provide links to the other. If your datasets do have identical values, you can simply link the tables.

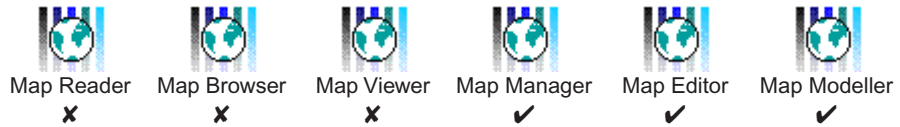
To join external table rows to graphical items:

- 1 Open the external table so that it is displayed as a table window in Cadcorp SIS.
- 2 Display the table window of the geographic items which are to be joined. Make sure that it is the current selected window.

- 3 Choose the **Table>Join** command. The Join Table Data to Overlay Graphics dialog opens.



- 4 Select the table to join from the pull-down menu and select the columns to add.
- 5 Configure the join by selecting the row which contains the unique attribute and linking it to the corresponding column on the graphical overlay on the drop-down menu.
- 6 Click OK to configure the join. The graphical overlay should now include the columns from the external table.



User datasets

■ What is a user dataset?	337
■ Internal datasets	337
■ Base dataset (BDS file)	338
■ Overlay status	339
■ Where your data is put	340

■ What is a user dataset?

Cadcorp SIS allows you to add your own information to maps, and this data is placed onto a user dataset. When you create your own graphics (lines, points, polygons, and so on) they are stored in one of the following:

- a base dataset file (BDS)
- an internal dataset
- an Editable Geometry dataset
- a Shared Dataset (SDS) file

When you have several user datasets, there are rules as to which one is used for your data.

➞page 340, **Where your data is put**

BDS files and Internal datasets are created in the New Overlay Wizard.

■ Internal datasets



An Internal dataset is saved as part of the view (SWD file) when you carry out a **File>Save**. It does not exist as a file in its own right. If you do not save, the data on an Internal dataset is lost when you finish the session.

Internal datasets are useful for temporary data, or data which does not need to be accessed by other users.

◆ Creating an internal dataset



- 1 Start the New Overlay Wizard.
- 2 Select the Internal Dataset option.
- 3 Type in a name for the new internal dataset. There is no limit on the length of the name, and it can include spaces and punctuation.
- 4 If you want to change the co-ordinate system projection, the precision (only if you do not need high accuracy), the dataset scale, or the properties of the internal dataset, click the More... button.

- 5 Click on Finish. The new internal dataset is listed in the Overlays dialog. It is assigned its own pens and brushes to differentiate it from other overlays (you can change these if required).

◆ Automatically created internal datasets

If you begin constructing your own data without first creating a user overlay, Cadcorp SIS automatically adds an internal dataset called (Untitled), suffixed with the number of this dataset in the overlays list. You can give this internal dataset a more meaningful name later. As with all overlays, you can also add a paragraph of notes giving information on the internal dataset. ➤Chapter 15: “**Working with overlays**”, **Overlay functions**

To remove an internal dataset, select it on the General page of the Overlays dialog, and click on the Delete button. This will permanently remove the overlay and its data.

◆ Saving and exporting internal datasets

If you want to save an internal dataset which you have created for re-use, saving the SWD will save the internal dataset although no one else will be able to access it. If you wish other people to access this data it is helpful to create first a base dataset file and put your graphics in that. If, however, you forget to do this, and you want your data to be accessed by others, then you can export your internal dataset using the **File>Export>To File** command and the base dataset option.



■ Base dataset (BDS file)

A base dataset (BDS file) is a file you create where you can store your own data. It is a normal file, and can be placed anywhere on your computer or on a network, and may therefore be accessed by other users if required. It provides a permanent and separate storage facility for the data you put in it.

◆ Creating a BDS



- 1 Start the New Overlay Wizard.
- 2 Select the Create new file option. Select a directory and supply a file name.

◆ Opening a BDS

To open an existing BDS, start the New Overlay Wizard, select the File option, and then choosing BDS from the Files of type drop-down.

◆ Constructing graphics on the BDS overlay

As you construct graphical items, they are placed on the current overlay. To make the BDS current use its local command in the workspace window (display view, theme view, or table view tabs).

The BDS must also be editable. ➤page 339, **Overlay status**

◆ Saving data in a BDS file

As soon as you create the BDS file as described above, it exists on disk in the location where you created it. However, the graphics you construct on this BDS are not saved until you either:



- save the SWD (**File>Save**, **File>Save As** or **File>Save All** commands)
- click the Save Now button with the BDS selected on the Datasets tab of the Overlays dialog

◆ Ownership of BDS Files

A BDS file which is kept on a network can be used by several people at once.

The owner of a BDS

When you create a new BDS or if you are the first person to open it, you become its owner and have editable access to it. With the BDS selected you will see the Owned box checked (on the Dataset tab of the Overlays dialog). If you choose to disown the file, you will be asked whether or not your changes should be saved first.

If the owner of a BDS relinquishes ownership (by clearing the Owned box), another user may then become the owner by checking the Owned checkbox on their own system. The new owner then gets editable access to the BDS.

Other users of the BDS

Other users may also call up the BDS into their Overlays dialog, but with a maximum status of hittable. This means they can view it, but they cannot edit it. ➤page 339, **Overlay status**

The version of the BDS viewed by non-owners is always the most recent version saved to disk. Therefore, if relinquishing ownership, or before a non-owner can receive updates made in the current session, the owner must first save it.

If a non-owner of a BDS wishes to see the latest amendments made and saved by the owner in a current session, they should either:



- use the **Map>Regenerate** command. This gets the latest saved version of all referenced datasets, including BDS files which have been updated by other users.



- have the Automatically refresh BDS datasets option selected under Options (the **Tools>Preferences...** command). Cadcorp SIS looks across the network every few seconds to check whether the BDS file has been updated since it last looked.

■ Overlay status

All overlays have a status, which defines whether the data on that overlay is editable, hittable, visible or invisible.

editable	data can be edited and deleted
hittable	data can be selected and copied, but not edited or deleted
visible	data is displayed but cannot be selected (or edited)
invisible	data is not displayed

For a fuller description of overlay status, ➤page228, **Overlay status**.

A user overlay can have any status. It must be editable for new data to be added.

■ Where your data is put

◆ If there are no editable user datasets in the SWD

If there is no user dataset in the SWD, an internal dataset called (Untitled) is automatically created when you start to construct data. This internal dataset can be renamed later.

◆ If there is one editable user dataset in the SWD

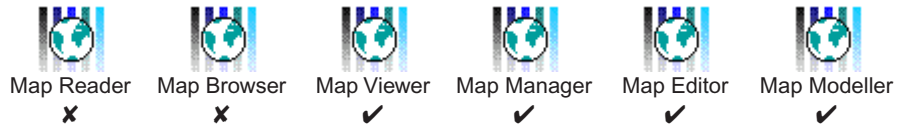
If there is only one editable user dataset in the SWD, any data you construct or import is put in this dataset, whether it is an internal dataset or a BDS file.

◆ If there is more than one editable user dataset in the Overlays dialog

If one of the user datasets is the current overlay, any data you construct is put here (the current overlay is highlighted in the Overlays dialog, and indicated in bold on the display view tab or theme view tab in the workspace window).

If none of the user datasets is the current overlay, the new data is put on the first editable user dataset listed.

If you need to, you can change the order of overlays in the list. ➤Chapter 15: “**Working with overlays**”



Overlays, levels, and commands

■ User datasets	341
■ Levels	341
■ Which pens and brushes are used.....	341
■ Notes on the Geometry 2D commands	342

■ User datasets

As you construct your own data it is placed in a user dataset. A user dataset is an internal dataset, a BDS file, or an internal editable geometry dataset.

Before creating graphics you should select the user dataset where you want to save them, or alternatively, create one. Having created or selected the dataset, you can then add data of your own. For more details on creating and selecting user overlays, ➤Chapter 22: “**User datasets**”.

■ Levels

Each overlay has 256 levels, numbered between 0 and 255. Each graphical item within the overlay is assigned to one of these levels. When drawing items on the screen, Cadcorp SIS starts with the first overlay listed and draws all items on its level 0, then its level 1, then its level 2, etc. It then draws the second overlay, starting with level 0, then level 1, and so on. This sequence is followed for all visible overlays. This means that items with an opaque fill on higher levels can obliterate other items already drawn on lower levels. To avoid this, you can change the level of an item.

When you create an item it is first placed on level 0. To change this, use the Level property. Pens can also be multi-level, which further affects the sequence of drawing on the screen. For details, ➤Chapter 44: “**Editing pens and brushes**”, **Levels and the order in which graphics are drawn**, page 540.

■ Which pens and brushes are used

Pens are used to draw line items and text items, and the outlines of area items. A pen defines the style in which the items are drawn, having a colour, a thickness, a linestyle and several other optional properties. Brushes are used to fill area items, and have a colour, an opaque/transparent property and may use hatch patterns or other graphical fill patterns.



When you start to draw, the new item uses the pen and brush shown in the Styles toolbar. If you cannot see the Styles toolbar, select it by using **Tools>Toolbars...** or from the local menu in the toolbars area of the screen. If you want to use a different pen or brush, select it here before starting to draw (although you can also change these properties later if you wish). ↗Chapter 32: “**Pens and brushes**”

Pens and brushes are named objects, stored in libraries ↗Chapter 50: “**Named object libraries (NOLs)**”. Cadcorp SIS comes supplied with a number of pens and brushes, and you can also create your own. ↗Chapter 44: “**Editing pens and brushes**”

■ Notes on the Geometry 2D commands

The Geometry 2D commands on the Construct menu provide typical CAD functionality for drawing basic lines and shapes. ↗Chapter 24: “**Constructing line items**”, ↗Chapter 25: “**Constructing area items**”, ↗Chapter 26: “**Creating points and placing shapes**”

◆ Using the Draw toolbar

The Geometry 2D commands are also on the Draw toolbar:



You might find using the Draw toolbar faster than using the main menu. (If the Draw toolbar is not displayed, select it either by using **Tools>Toolbars...**, or from the local menu of the toolbar area of the screen).

◆ Using the Geometry 2D commands



When you have one of these commands selected, you will notice that the cursor changes to an arrow with a spanner beside it (indicating a toolbox operation). When you have finished drawing an item the cursor continues to display the spanner icon. The command is still active, and you can go on to draw further items of the same type without re-selecting the command.

◆ Ending a Geometry 2D command



Some commands, such as the **Construct>Geometry>2D>Line...** command, require use of the Enter key to complete the operation. Details are given in the sections on the commands concerned.

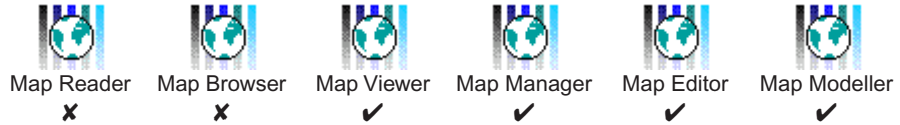
To finish any of the Geometry 2D commands, press the Esc (escape) key, or select another command. The use of Esc throws away any constructions still in progress.

◆ Precision drawing

For information on drawing to accurate dimensions, ↗Chapter 33: “**Precision dimensions and locations**”.

◆ ‘Transparent’ commands

On the Options tab of Preferences dialog (**Tools>Preferences...**) you can select the ‘Transparent’ Zoom commands option. With this selected you can use the Zoom commands in the middle of Geometry 2D commands. ↗Chapter 49: “**Customising your system**”

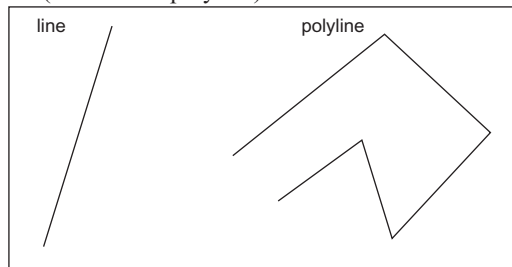


Constructing line items

■ What are line items?	343
■ Using the Freehand command	348
■ Drawing arcs.	349
■ Drawing Bezier curves.	351
■ Dividing a distance into equal parts	352
■ Placing division lines along a path	352
■ Ruling straight lines across the map window.	353
■ Constructing dimensions	354

■ What are line items?

A line item is made up of vectors (line segments), each vector having a vertex point at its beginning and its end. Line items can consist either of just a single segment, or of a series of connected segments (known as a polyline).



A line item can have curved segments, and it can be open or closed. Straight lines, arcs and curves are all examples of line items.

Line items can be 3D lines, ie their co-ordinates can lie in three-dimensional space.

➤Chapter 31: “**Creating 3D data**”

◆ Simple lines

In Cadcorp SIS Map Viewer and Map Manager you can draw simple lines and polylines using the **Construct>Geometry 2D>Line...** command.

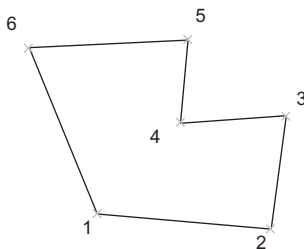
◆ Using the Line... command



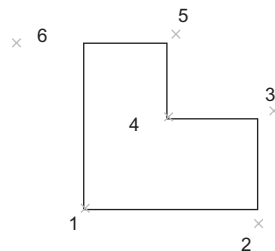
In Cadcorp SIS Map Viewer and Map Manager, the **Construct>Geometry 2D>Line...** command can be used for drawing many types of line and polyline. With all line types, the procedure for creating lines is as follows:

- 1 Type in offsets if required and, if constructing multiple lines, select the Cap Ends option if you require closed ends.
- 2 Click a point on the screen where you want the line to begin. You will see a line starting at the point you clicked, the other end being attached to the cursor.
- 3 Click a point on the screen to fix the other end of the line. Notice that a “rubber band” line is still attached to the cursor, allowing you to input further points if required.
- 4 If you wish to delete a point you have just input, press the Backspace key.
- 5 When at least two line segments have been drawn, it is possible to join the first point to the last to form a closed line item. Press the Ctrl and Enter keys together to close the shape.
- 6 Otherwise, continue to click positions to create a chain of line segments, called a polyline.
- 7 Press the Enter key or double-click at any time to finish.

◆ Simple, orthogonal, and right-angled lines



line constructed as a simple line



same line constructed as an orthogonal line

(Ctrl + Enter to close)

Orthogonal lines are drawn parallel to the current axes. You can draw orthogonal lines at angles other than 0°, 90°, 180° and 270°, by changing the orientation of the axes before you construct the line segment(s). ➤Chapter 33: “**Precision dimensions and locations**”, **The axes**, page 439

Right-angled lines are constructed so that each line segment is 90° to the previous line segment.

◆ Trace

This option creates a new line traced over any part of an existing line or outline on an editable or hittable overlay. Alternatively, the new line can be offset from the traced data.

- 1 Click a point to start tracing. This can be a point on the graphics to be traced, or a point in free space.
- 2 Click the next point to be traced to. Cadcorp SIS searches for a continuous path between the first and second point. If no continuous path is found, you must try again.
- 3 Continue clicking points to be traced to. If you want to delete the last point clicked, press the Backspace key. While clicking points you may use the following key combinations:

Shift + snap to draw to the snap point, even if it is not on the graphics (this is called jumping)

Ctrl + snap to trace to the end of the line on which you snap, rather than to the snapped position

Shift + Backspace to go back to the last vertex point on the traced data, even if you jumped over it

- 4 Press Enter to finish tracing, or Ctrl + Enter to close by drawing to the first point snapped.

Difficulties you may encounter when tracing external map data

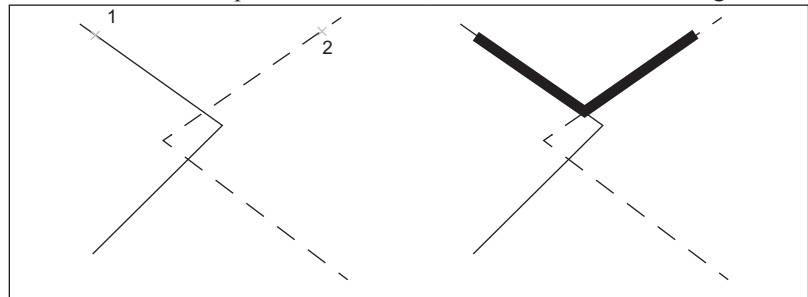
Vector-based maps such as those supplied by Ordnance Survey have been created by digitising existing paper maps. These paper maps are supplied in tiles. Where a feature such as a road centreline or road edge comes to the edge of one of these map tiles, the graphics stop, starting again on the adjacent map. The digitised line will therefore stop at an unexpected place.

The person digitising the original data may have stopped the line at a position which seemed appropriate, but does not suit you.

Graphics may have been digitised using lots of points, which will have resulted in many vertices.

◆ Find route

By clicking on two points on an existing line item or on two overlying line items, the shortest route between these two points is calculated, and a line constructed along this route.

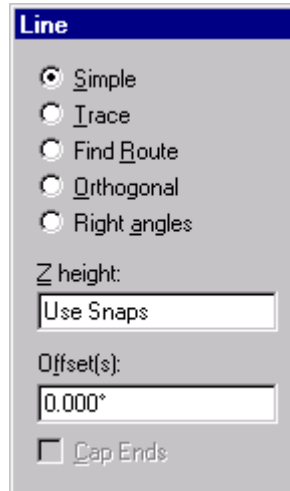


This feature is useful when used with link and node networks, when it will respect flow directions assigned to links, and turning rules applied at nodes (junctions).

You can also use the **Measure Route** command to create new line items that follow routes.

◆ Changing line parameters during the command

When you select this command, the Line dialog is displayed. It remains displayed while the Line command is in force, allowing you to change line parameters at any time, even while drawing a line item.



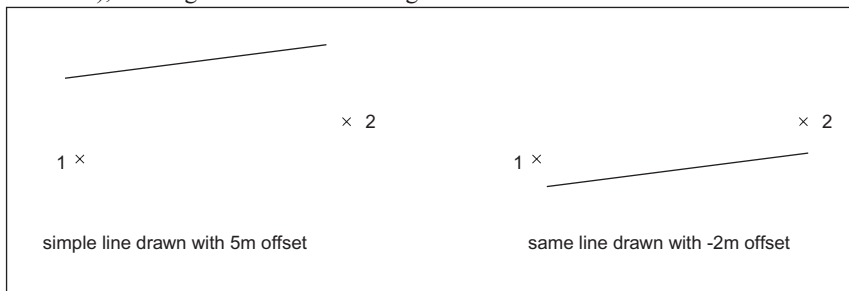
This dialog is not available in Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Manager.

◆ Offset lines

You can draw lines either directly between the positions chosen (with an offset of zero), or between positions offset (by specified distance) from the points chosen.

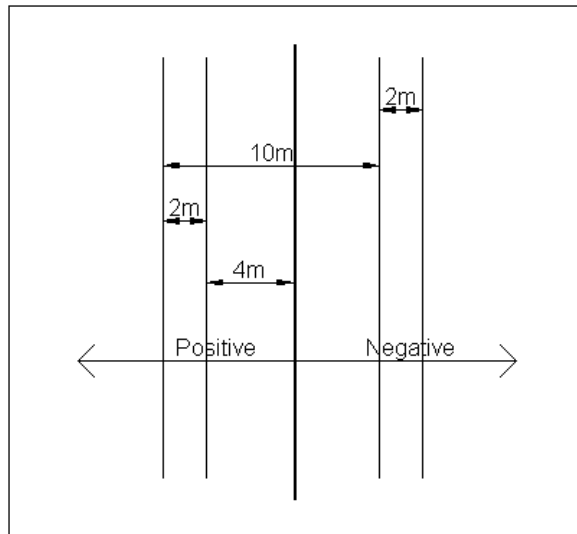
- 1 To create a single offset line, type in the offset distance and press Enter.

Positive offsets are placed to the left (looking along the line in the direction in which it is drawn), and negative offsets to the right.



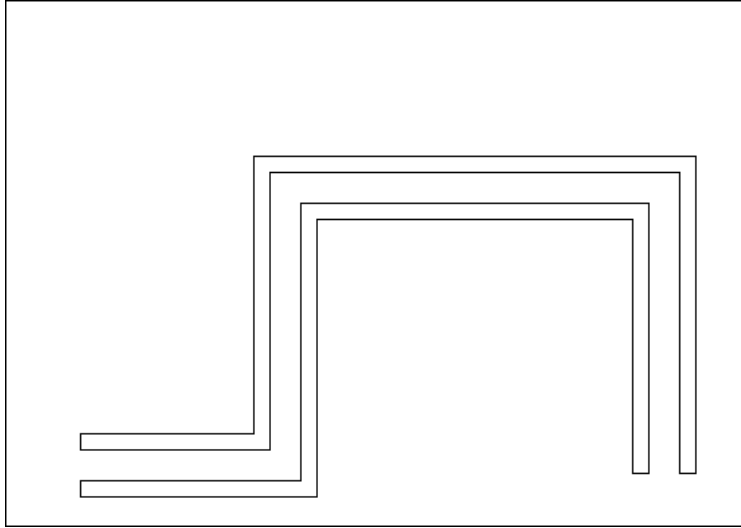
- 2 To create multiple offset lines, type in a series of offsets (separated by a space), then press Enter.

Each subsequent offset is measured relative to the previous one. For example, if you drew a simple line from the bottom of the screen to the top, using the offsets 0m 4m 2m -10m -2m, the result would be:



If constructing multiple lines with regular spacing, you can use REP, R or r to repeat an offset. For example, to draw a simple line, then create 6 further copies 10 metres apart, enter 0 10 R 6.

With multiple offset lines, you can choose whether or not to cap the ends. If you do, pairs of lines are joined:



◆ Defining the heights of vertices

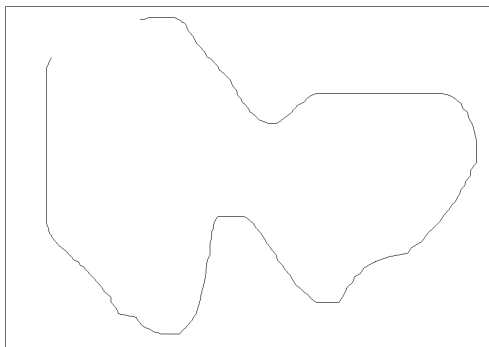
The Line dialog has a Z height field. You can enter a value here to override the height of each snap with a fixed value.

■ Using the Freehand command

A freehand line is created by placing vertices at short time intervals. Slow movements of the cursor places more closely spaced vertices than fast movements and therefore produces smoother curves.



- 1 Select the **Construct>Geometry 2D>Freehand** command.
- 2 Hold down the left-hand mouse button down while dragging the cursor along the path you want. A line will be constructed which follows the path of the cursor.



This line may appear curved, but it is actually made up of many small line segments. A single click creates a point item.

■ Drawing arcs

Using the **Construct>Geometry 2D>Arc** commands you can construct arcs using one of five methods. These commands are not available in Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Manager.

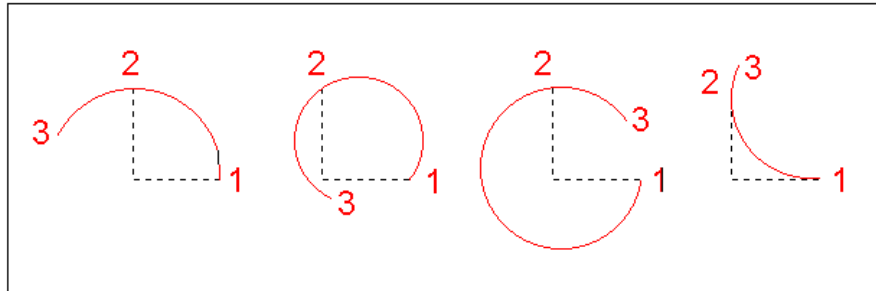
◆ Arc>3 Points



This command enables you to construct an arc starting at a given point, passing through a known point and ending at a known point.

- 1 Select the command.
- 2 Click the position where the arc is to start.
- 3 Click a position anywhere on the arc.
- 4 Click the position for the end of the arc.

The following diagram shows four arcs constructed using the **Arc>3 Points** command. In all cases, points 1 (start of arc) and 2 (point on the arc) are the same. Point 3 (end of arc) then fixes the radius and length of the arc:



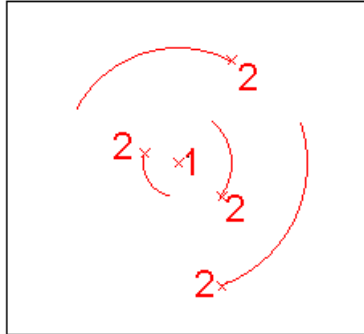
◆ Arc>Angle Centre Point



Use this option to construct an arc of a given angle which is centred on a known point.

- 1 Select the command.
- 2 Type in the angle of the arc. A positive number draws an arc anticlockwise; a negative number draws in a clockwise direction.
- 3 Click the position for the centre of the arc (point 1 in the diagram below). Now you will see an arc of the specified length rotating around this centre point as you move the cursor.
- 4 Click the point at which the arc starts (point 2 in the diagram below). This fixes the location and radius of the arc.

The following diagram shows four arcs, each with the same angle (90 degrees) and centre:

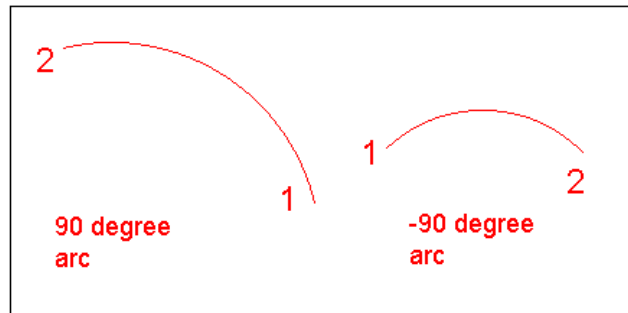


◆ Arc>Angle Point Point



This option is used to construct an arc of a known angle by giving its start and end points.

- 1 Select the command.
- 2 Type in the angle of the arc. A positive number will draw an arc anticlockwise; a negative number will draw in a clockwise direction.
- 3 Click the position for the start of the arc (point 1 in the diagram).
- 4 Click the position for the end of the arc (point 2 in the diagram).



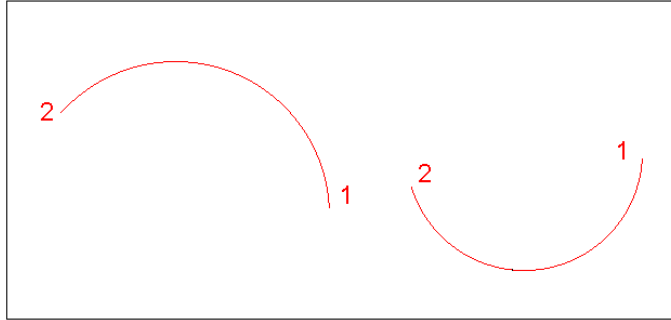
◆ Arc>Centre Point Point



This command enables you to construct a circular arc of maximum 180°, with a known centre point, start point and end point.

- 1 Select the command.
- 2 Click a point for the centre of the arc.
- 3 Click a point for the start of the arc (point 1 in the diagram below).

- 4 Click a point for the end of the arc (point 2 in the diagram below). The arc is drawn using the shortest route between the start and end points, and therefore has a maximum angle of 180 degrees. The position of the end point relative to the start therefore governs whether the arc is drawn clockwise or anti-clockwise:



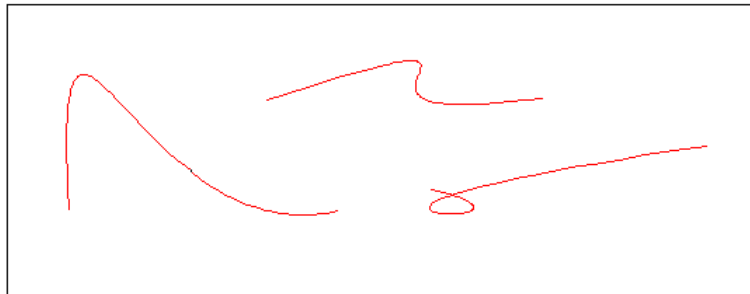
◆ Arc>Radius Centre Point Point



- 1 Select the command.
- 2 Type in the radius of the arc.
- 3 Click a position on screen where the arc will start.
- 4 Click a position near the end of the arc. The end position is in fact determined by the radius you have entered; this point is used to indicate the direction in which the end point lies from the first point.

■ Drawing Bezier curves

A Bezier is a curve whose slope varies along its length according to the position of control points. Beziers are useful for smooth shapes. The Bezier command is not available in Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Manager.



- 1 Select the **Construct>Geometry 2D>Bezier** command.
- 2 Click a position for the start of the Bezier. One end of the curve is then anchored at that point.
- 3 Click a position for the end of the Bezier. The opposite end of the curve is then anchored at that point.

As you move the cursor, you will now see the curve being dragged into different shapes, the line following the cursor as if it were a magnet. You are required to enter two control points, which define the tangent of the line at its start and end.

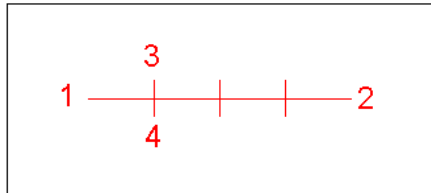
- 4 Click a position for the first control point.
- 5 Click a position for the second control point.

■ Dividing a distance into equal parts



The **Divide>Distance...** command enables you to divide a chosen distance into a selected number of equal divisions. Division lines of the specified length are drawn to demarcate the divisions. An example might be to divide a rectangle with gridlines for a map extract. This command is not available in Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Manager.

- 1 Select the **Divide>Distance...** command.
- 2 Type in the number of divisions you wish to make. For example, to divide a 250 metre line into 25 metre divisions, you would enter 10 (divisions).
- 3 Click one end of the line to divide (point 1 in the following diagram). You will see a set of division lines spanning between the point given and the cursor. The spacing between the divisions expands and contracts as you move the cursor.
- 4 Click the other end of the line to divide (point 2 in the following diagram).
- 5 Click to fix one end of the new division lines (point 3 in the following diagram). Notice that, as you move the cursor, these new division lines lengthen and shorten.
- 6 Click to fix the other end of the division lines (point 4 in the following diagram).



A division line is not placed at the beginning or the end of the path (so the number of division lines is one less than the number of divisions).

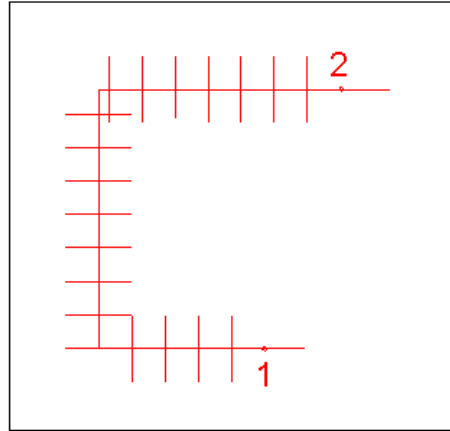
■ Placing division lines along a path



Divide>Path... divides a chosen path into a given number of equal divisions. A path is the shortest route between two given points on a line item. This command is not available in Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Manager.

- 1 Select the **Divide>Path...** command.
- 2 Type in the number of divisions you wish to make.
- 3 Click one end of the path which is to be divided (point 1 in the following diagram).

- 4** Click the other end of the path to be divided (point 2 in the following diagram).



Division lines are then automatically placed along the path, dividing it into the number of divisions you specified. Unlike the **Divide>Distance...** command, you do not click positions to specify the length of the division lines.

If the line item being divided is closed, the path for the division lines is the shortest route between the two points clicked.

A division line is not placed at the beginning or the end of the path, so the number of division lines is one less than the number of divisions (there are 20 divisions above).

■ Ruling straight lines across the map window



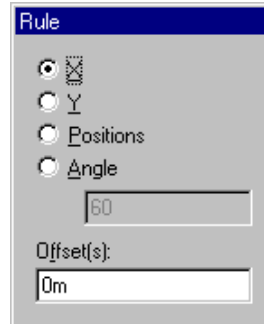
The **Rule...** command is used to rule multiple straight lines across the extent of the current view.

You may rule lines parallel to the X axis, parallel to the Y axis, at a specified angle, or through positions chosen by clicking points in the map window.

Rule lines may not be ruled right across the map window. This is because they are actually drawn across the full extent of the view you chose with the most recent zoom command. This may not coincide with the extent of the view you have on screen. If the box you described with the zoom command did not have the same aspect ratio as the current window, additional graphics are displayed in order to fill the window. In this case, the ruled lines only extend across the area you chose, not across this additional data. This command is not available in Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Manager.

- 1 Select the command.

- 2 Select one of the options:



- X rules lines parallel to the X axis (normally East-West) passing through a selected position.
 - Y rules lines parallel to the Y axis (normally North-South), passing through a selected position
 - Positions rules a line passing through two positions which you will click in the map window
 - Angle rules lines at the specified angle, passing through a selected position
- 3 Input the offset(s) for the line(s). The offset is the distance the line(s) will be placed from the position you will click next. Type:
- 0 to rule a line through the cursor position
 - a positive value to rule a line above the cursor position (to the left if ruling parallel to the Y axis)
 - a negative value to rule a line below the cursor position (to the right if ruling parallel to the Y axis)
 - multiple offsets, separated by a space, to rule multiple lines. Each offset is measured from the previous one.
- 4 Alternatively, if the lines are to be spaced regularly, you can use REP, R or r to repeat an offset. For example, to rule a line through a selected position, then 6 further lines 10 metres apart, enter 0 10 R 6.
- 5 A horizontal line (or lines if you used multiple offsets) will be seen attached to the cursor, spanning the current view.
- If using the X, Y or Angle options, click the position relative to which the line(s) will be ruled.
- If you are using the Positions option, click two positions through which the line(s) are ruled (the second determines the angle of the line).

■ Constructing dimensions

Dimensions are constructed on the current overlay or, if there is no current overlay, on the first editable overlay (creating one if necessary). Once created, dimensions can be edited.

➤ Chapter 36: “Editing line items”

The dimensioning commands offer four ways of dimensioning graphics automatically. You can dimension any graphics as long as they have a status of hittable or editable.



With the exception of the **Construct>Dimension>Distance** command, these commands create their dimensions so that the dimension line is parallel to the X axis. If you want dimension lines at a different angle, rotate the axes first. ➤ Chapter 33: “**Precision dimensions and locations**”

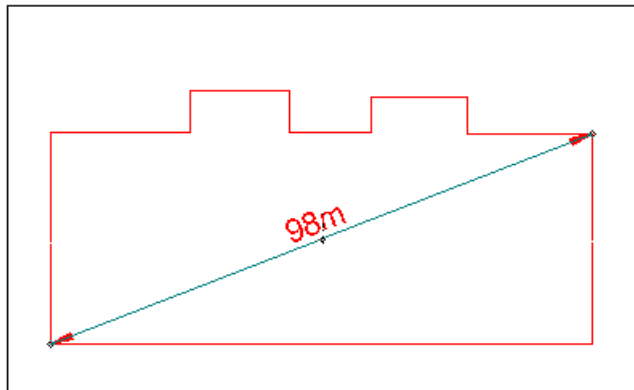
Dimension can be edited, once drawn, by selecting the dimension item and accessing its properties.

These commands are not available in Cadcorp SIS Map Reader, Cadcorp SIS Map Viewer, or Cadcorp SIS Map Manager.

◆ **Construct>Dimension>Distance**



This command creates a single dimension between two points. The dimension line takes no account of the current X axis, but is drawn directly between the two points chosen.

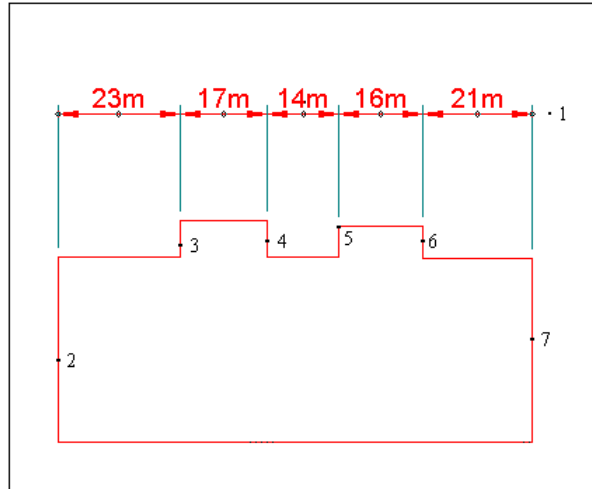


- 1 Select the command.
- 2 In the Distance Dimension dialog, select the units to be used, precision required and whether to display the units on the dimensions.
- 3 Click the two points between which you want to dimension. If you make a mistake inputting a point, remove it using the Backspace key.

◆ Construct>Dimension>Chain



This command allows you to dimension between any number of points, the distance to each point being measured relative to the last.

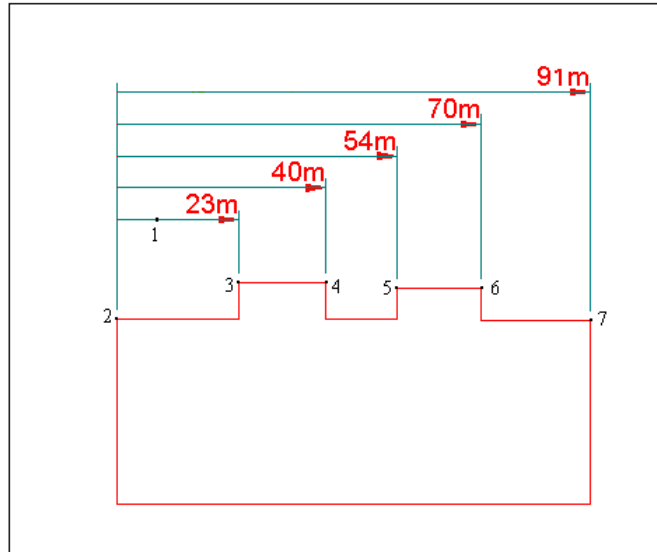


- 1 Select the command.
- 2 In the Chain Dimension dialog select the units to be used, precision required, and whether to display the units on the dimensions.
- 3 Click a position on screen through which the dimension line, or an imaginary extension of the dimension line, will run (point 1 on the diagram above).
- 4 Click a point on the graphics to start dimensioning from (point 2 on the diagram above). Use snaps to make sure you pick exact positions.
- 5 Click a point on the graphics to dimension to (point 3 on the diagram above).
- 6 Keep clicking on further points to dimension to (points 4 to 7 in the diagram above). Each new point is measured relative to the last. If you make a mistake inputting a point, remove it using the Backspace key.
- 7 Press Enter when you have finished selecting points.

◆ Construct>Dimension>Datum



This command constructs a series of single dimensions, which are automatically spaced by Cadcorp SIS (the dataset scale affects the spacing). Each dimension is measured from a common datum to the point selected.

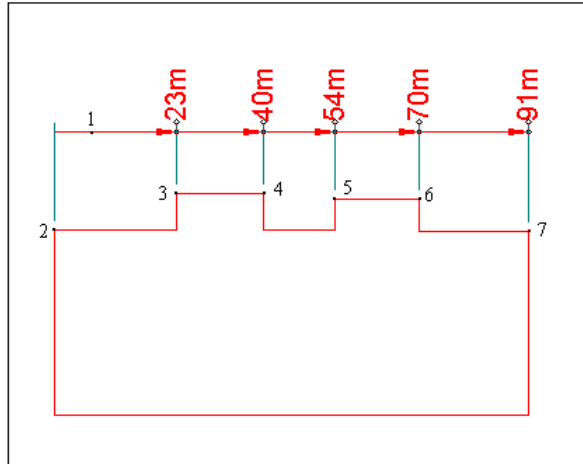


- 1 Select the command.
- 2 In the Datum Dimension dialog select the units to be used, precision required, and whether to display the units on the dimensions.
- 3 Click a position on screen through which the first dimension line, or an imaginary extension of the dimension line, will run (point 1 on the diagram above). The other dimension lines will automatically be spaced relative to the first one.
- 4 Click a point on the graphics to start dimensioning from (point 2 on the diagram above). Use snapcodes to make sure you pick exact positions.
- 5 Click a point on the graphics to dimension to (point 3 on the diagram above).
- 6 Keep clicking on further points to dimension to (points 4 to 7 in the diagram above). Each new point is measured relative to the first point. If you make a mistake inputting a point, remove it using the Backspace key.
- 7 Press Enter when you have finished selecting points.

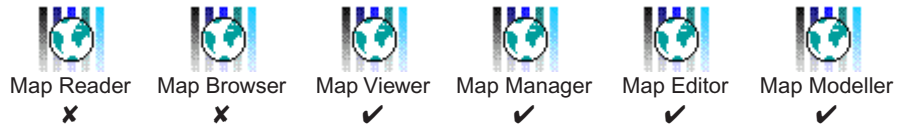
◆ Construct>Dimension>Run



Like **Construct>Dimension>Datum**, this command calculates dimensions on a cumulative basis from the first point input. However it displays the dimensions using a different style:



- 1 Select the command.
- 2 In the Run Dimension dialog select the units to be used, precision required, and whether to display the units on the dimensions.
- 3 Click a position on screen through which the dimension line, or an imaginary extension of the dimension line, will run (point 1 on the diagram above).
- 4 Click a point on the graphics to start dimensioning from (point 2 on the diagram above). Use snapcodes to make sure you pick exact positions.
- 5 Click a point on the graphics to dimension to (point 3 on the diagram above).
- 6 Keep clicking on further points to dimension to (points 4 to 7 in the diagram above). Each new point is measured relative to the from point (point 2 on the diagram above). If you make a mistake inputting a point, remove it using the Backspace key.
- 7 Press Enter when you have finished selecting points.



Constructing area items

■ What are area items?	359
■ The Construct>Geometry 2D>Area command	359
■ Drawing circles	360
■ Drawing rectangles	362
■ Drawing ellipses	365
■ Creating area items from line items	366
■ Areas with offset pens	367
■ Editing area items	368
■ Multi-areas	368
■ Using area items to select other items	369
■ Buffers: areas of influence	369
■ Making large areas more efficient: QZones	370
■ Topological polygons	370

■ What are area items?

An area item is a distinct class of item with its own set of properties. Area items include:

simple areas	described in this chapter
multi-areas	described in this chapter
photos	⇒ Chapter 46: “ Printing: the Print commands ”
topological polygons	⇒ Chapter 30: “ Creating topology: chains and polygons ”
QZones	described in this chapter
buffer zones	⇒ Chapter 55: “ Spatial analysis ”



Closed line items created with the **Construct>Geometry 2D>Line** and **Freehand Line** commands are not area items. However, any line item, whether it is closed or not, can be converted into a simple area using the line item command **Convert to Area**, or the main menu command **Alter>Fill>Geometry**.



Simple areas can be created using the **Area**, **Circle**, **Ellipse** and **Rectangle** commands. (They can subsequently be converted to line items using the **Alter>Fill>Unfill** command.)



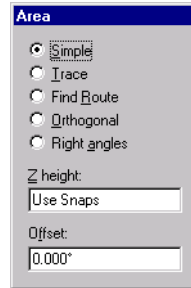
■ The Construct>Geometry 2D>Area command



The operation of the **Construct>Geometry 2D>Area...** command is similar to that of the **Line** command.

- 1 Select the **Construct>Geometry 2D>Area...** command.

- 2 In the Area dialog, choose one of the options for drawing the area's outline:



For details on how to use these options, ➤ Chapter 24: “Constructing line items”.

- 3 Input points to construct the boundary of the area. Press Enter when you have finished.
This dialog is not available in Cadcorp SIS Map Viewer and Cadcorp SIS Map Manager.

■ Drawing circles



With the **Construct>Geometry 2D>Circle** commands you can construct circular area items using any of five methods.



To create a circular line item, first create the circular area item, then select it and use the **Alter>Unfill** command.

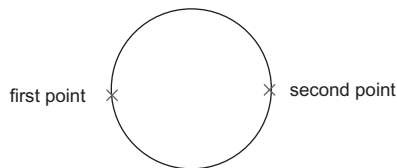
These commands are not available in Cadcorp SIS Map Viewer and Cadcorp SIS Map Manager.

◆ Circle>2 Points



This command enables you to draw a circle by giving two points on the circumference, and can be used when you know two points through which the circumference of the circle must pass.

- 1 Select the command.
- 2 Click one point through which the circumference must pass.
- 3 Click a second point through which the circumference must pass.



◆ Circle>3 Points

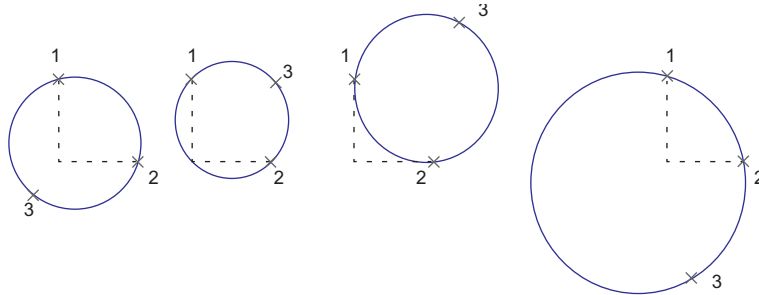


The **Circle>3 Points** command enables you to construct a circle by giving three points anywhere on the circumference of the circle. It can be used to create a circle which passes through three known points.

- 1 Select the command.
- 2 Click the first point through which the circumference will pass.

- 3 Click the second point through which the circumference will pass. As you move the cursor around you will now see a circle which is attached to the cursor and fixed to the first two points you clicked.
- 4 Click a position for the third point on the circumference. This point determines the size and the location of the circle.

The following diagram shows four circles constructed using the **Circle>3 Points** command. In all cases, points 1 and 2 are the same. Point 3 then fixes the size and location of the circle.

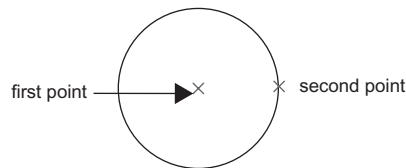


◆ Circle>Centre Point



Use this command when you know the position of the circle's centre, and a point through which the circumference passes.

- 1 Select the command.
- 2 Click the position of the centre of the circle. You will now see a circle centred at this point. This circle changes size as you move the cursor.
- 3 Click a point on the circumference (this fixes the radius of the circle).



◆ Circle>Radius Centre



Use this command when you know the radius of the circle and where its centre is. It can also be used to create concentric circles.

- 1 Select the command.
- 2 On the prompt bar, type in the radius of the circle. A circle of this radius is then attached to the cursor.
- 3 Click a position for the centre of the circle.

To draw concentric circles

- 1 Select the **Circle>Radius Centre** command.

- 2 On the prompt bar, type in the radius of the smallest circle, followed by a space, followed by the distance to the next circle, followed by a space, followed by the distance to the next circle, and so on.
- 3 Click a position to locate the centre of the circles.

Example To draw concentric circles of radii 100m, 200m, 300m, 400m and 500m, enter 100 100 100 100 100.

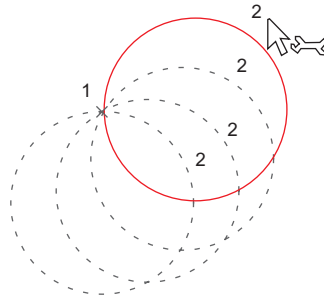
A shortcut to this is to use the repeat facility. The above circles could be constructed by entering 100 r 5 or 100 REP 5.

◆ Circle>Radius Point Point

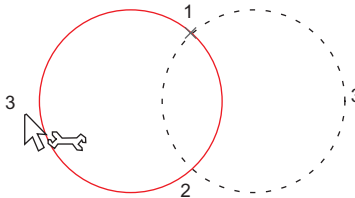


Use this command when you know the circle's radius and two points on its circumference.

- 1 Select the command.
- 2 Type in the radius of the circle.
- 3 Click a point on screen through which the circumference will pass. A circle of the required size is attached to the point given. As you move the cursor, you see the potential circle rotating around the fixed point.
- 4 Click a second point to fix the location of the circle. The diagram shows such a circle, with other circles indicated which could have been created with a different second point:



- 5 As there are still two possible locations for the new circle, click close to where the circle's centre will be to finally fix it (this third point could be either of the positions shown here):



■ Drawing rectangles



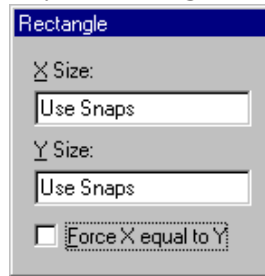
The **Construct>Geometry 2D>Rectangle** command creates a rectangular area item.



To construct a rectangular Line item, first create the rectangular area item, then select it and use the **Alter>Unfill** command. Alternatively, use the Line or Line Ortho command to draw a rectangular line item.

Rectangles are constructed orthogonal to the current axes. If you have rotated the axes, you will find that the rectangle is rotated as well. ➤Chapter 33: “**Precision dimensions and locations**”

- 1 Select the **Construct>Geometry 2D>Rectangle** command.



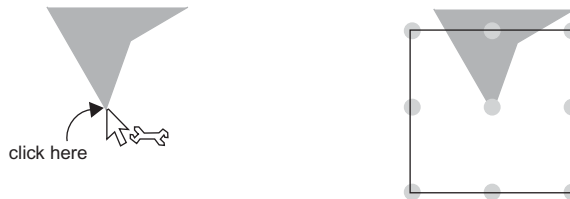
- 2 If you want to draw a square, click the Force X equal to Y checkbox, or hold down the Shift key when you define the second point (step 4).
- 3 Click a position on the screen to locate any one of the rectangle's four corners. You will now see a rectangle rubber-banding on the cursor from the point you started.
- 4 Click the cursor to fix the location of the opposite corner.

◆ To draw a rectangle of a specific size

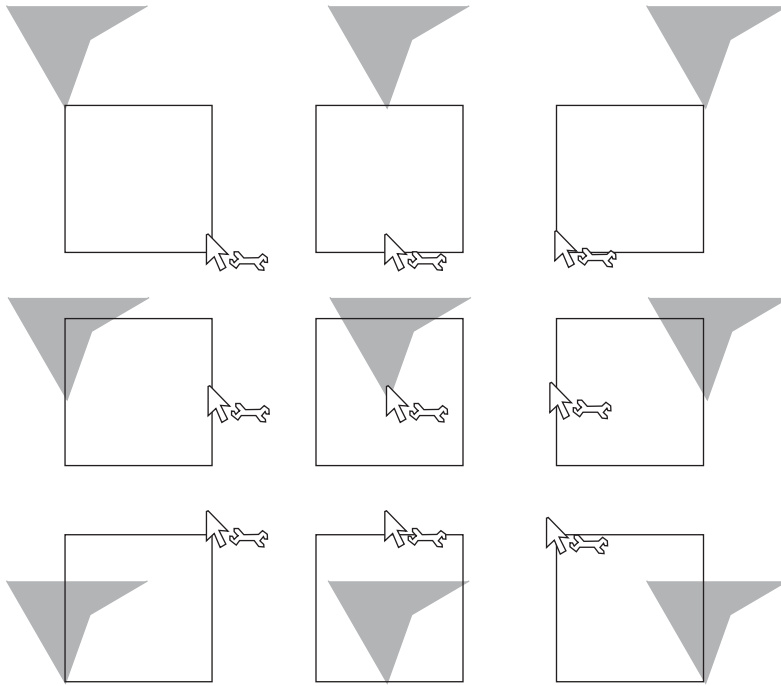
You can either input one value (X or Y), and use a screen snap for the other, or you can define both the X and Y values, as described here:



- 1 Select the **Construct>Geometry 2D>Rectangle** command.
- 2 Type in the sizes for the X dimension and the Y dimension.
- 3 You will see a rectangle of the chosen size centred on the cursor. Click a position on screen. One of the nine points on the rectangle will be placed at that position:



- 4 As you move the cursor towards the second point, before clicking it, you see alternative locations for the rectangle. Click a second screen position. The direction of this position from the first determines which rectangle you choose.



- 5 If you proceed to draw further rectangles in the current session, the sizes you entered will be remembered.
- If you want to change the rectangle size, click in the Rectangle dialog and change the X and Y dimensions. If you want to create a rectangle using snapped positions, remove the X and Y entries to leave them blank.

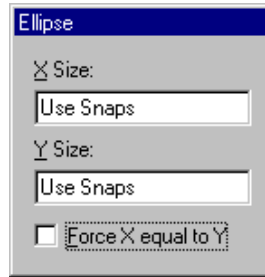
■ Drawing ellipses



The **Construct>Geometry 2D>Ellipse** command creates elliptical area items.

To create an elliptical Line item, first create the elliptical area item, then select it and use the **Alter>Unfill** command.

- 1 Select the **Construct>Geometry 2D>Ellipse** command.



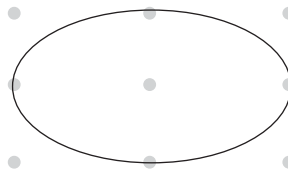
- 2 If you want to draw a circle, click the Force X equal to Y checkbox, or hold down the Shift key when you define the second point.
- 3 Click to define two diagonally opposite corners of an imaginary rectangle bounding the ellipse. As you do so you will see the ellipse rubberbanding into shape.



◆ To draw an ellipse of a specific size



- 1 Select the **Construct>Geometry 2D>Ellipse** command.
- 2 Type in the sizes for the X dimension and the Y dimension, and press Enter. (In the case of an ellipse, these dimensions are the semi-major and semi-minor axes.)
Alternatively, enter just one dimension, leaving the other as Use Snaps. This enables you to draw an ellipse with one dimension fixed, the other defined by the second screen position you click.
- 3 You will see an ellipse of the chosen size centred on the cursor. Click a position on screen. One of the following nine points on the imaginary bounding rectangle will be placed at this point:



- 4 Click a second screen position. The direction of this position from the first is used to locate the ellipse (you will see this happening as you move the cursor towards the second point before clicking it).

- 5 If you proceed to draw further ellipses in the current session, the sizes you entered will be remembered.
- Alternatively, if you do not want an ellipse of this size, click in the Ellipse dialog and change the X and Y dimensions. If you want to create an ellipse using snapped positions, remove the X and Y entries to leave them blank.

■ Creating area items from line items

The following commands are not available in Cadcorp SIS Map Viewer and Cadcorp SIS Map Manager.

◆ The Alter>Fill>Geometry Command



When you have a closed line item selected, use the **Alter>Fill>Geometry** command to turn it into an area item.

You cannot use this command with line items which are not closed.

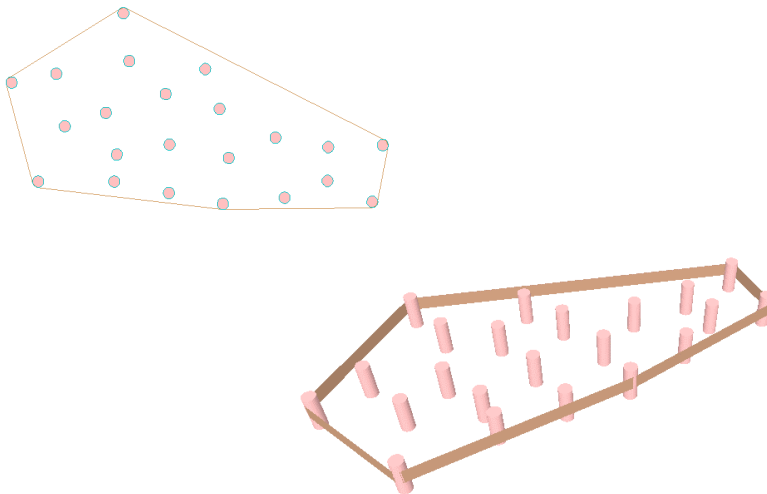
◆ The Alter>Fill>Fill Convex Hull Command



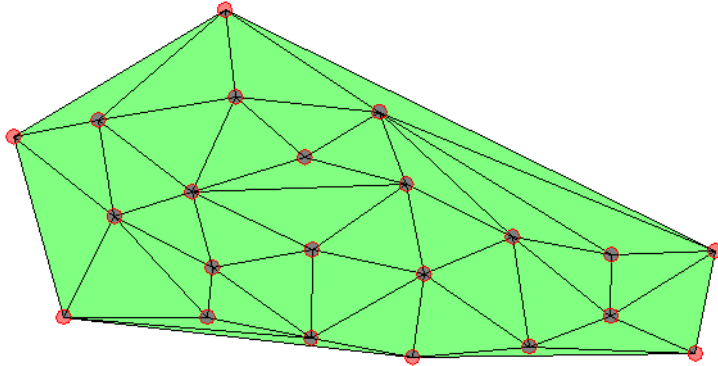
The **Alter>Fill>Fill Convex Hull** command draws a convex outline around the selected geometry. This usually results in an area item, but a convex hull created from a point item is a point, and a convex hull from a single line segment is a line.

If you select multiple lines or points, you can create a convex hull from these if you first convert them to a multi-line or multi-point item, using, for example, the **Alter>Boolean>Union** command.

A convex hull is the convex shape surrounding the multi-line or multi-point, as though each point is a nail and the boundary is a rubber band:



Alternatively, if you are using points in Cadcorp SIS Map Modeller, you can generate a TIN:



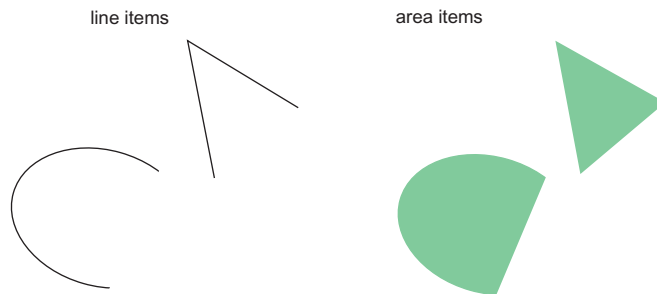
Chapter 57: “Grids”, Creating a TIN (Triangulated Irregular Network) from a grid

This command is part of the OGC Simple Features Specification.

◆ Convert to Area Command

All line items, whether closed or not, have the local command Convert to Area.

Open polylines and arcs can be converted to areas, their open ends being automatically joined:



■ Areas with offset pens

Sometimes you may want to draw an area with a thick outline, and determine whether the pen thickness is offset to the inside or the outside of the area. For instance, UK County boundaries are often drawn with shading to the inside of the boundary. This is easily achieved by using a pen with an offset.

A pen's offset is always placed to the left of the line, when looking along it in the direction in which it was drawn. Chapter 44: “Editing pens and brushes” Areas drawn in an anti-clockwise direction will therefore have their offset on the inside, and those drawn clockwise on the outside.



Whether an area is clockwise or anti-clockwise is indicated by the Clockwise property being shown as True or False. You can change this using the **Alter>Reverse** command.

This command is not available in Cadcorp SIS Map Viewer.

■ Editing area items

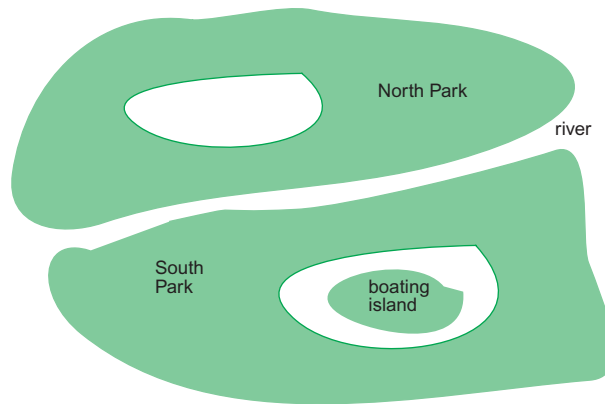
➤ Chapter 37: “Editing area items”

■ Multi-areas

A Multi-area is a collection of area items, which can be moved and manipulated as a single item. All its component areas are drawn with the same style.

Cadcorp SIS complies with the OGC specification, which says that a simple area must be connected (that is, it can have holes but it cannot have islands). Multi-areas are therefore used for regions which have islands.

For instance, the whole of this park could be a Multi-area:



➤ Chapter 37: “Editing area items”

◆ Creating multi-areas using Boolean edits

The **Boolean** commands on the **Alter** menu can be used to create new areas by combining existing areas in different ways. ➤ Chapter 37: “Editing area items”. The result can be a simple area item, or a multi-area.

These commands are not available in Cadcorp SIS Map Viewer and Cadcorp SIS Map Manager.

◆ Creating a multi-area using the Add Geometry command



- 1 Select an area item to add other areas to.
- 2 Select the **Alter>Add Geometry** command.
- 3 Click on an area to add to the selected area. The two area items now become one multi-area.
- 4 Until you end the command, you can keep on adding further area items to the multi-area.

This command can be used to add any type of geometry to any other type of geometry to create multi-geometry. ➤ Chapter 28: “Creating collections”

This command is not available in Cadcorp SIS Map Viewer.

◆ Using the Add Geometry command with overlapping area items

When you convert overlapping area items to a multi-area, the overlap is converted into a hole.

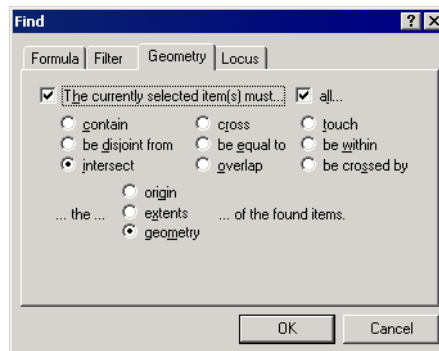


■ Using area items to select other items



The **Edit>Find...** command provides a powerful means of selecting items. ➤Chapter 34: “Selecting graphics”

The options on the Geometry tab of the Find dialog, when used in combination with area items, provide a useful tool for finding all items with a certain spatial relationship to the area. For example, they might have to fall within the area, overlap it, or touch it, etc.



You must first select the area item which is to be searched, then select **Edit>Find....** On the Geometry tab you can choose the criteria for the search.

You can also have multiple area items selected.

The items found are highlighted, and their number and type are shown on the status bar.

■ Buffers: areas of influence

A buffer is a zone of a user-specified size around selected point, line, or area items. It allows you to see an area of influence, giving an immediate visual indication of the proximity of other items to the selected items. A buffer can be an area or a QZone.



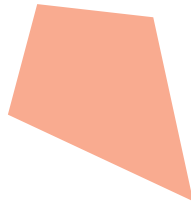
Existing items are used to create area or QZone buffers. The buffer is created in addition to the existing items (it does not replace them). To do this, select the item and use the commands **Construct>Buffer>Area** or **Construct>Buffer>QZone**.

Thiessen areas are areas of influence which are automatically calculated for you, based around items you have selected. Adjacent area items are created whose boundaries are equidistant from the selected items.

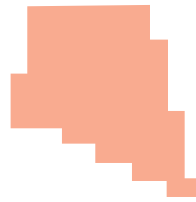
➤ Chapter 55: “**Spatial analysis**”

■ Making large areas more efficient: QZones

A QZone is a raster area item which is made up of very many squares of different sizes. If the cell size is large enough, you will see these squares on the QZone outline. If they are not, you can zoom in to see them.



Area item



QZone made from area item

◆ Advantages and disadvantages of QZones

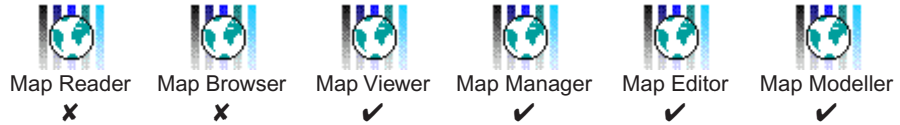
When dealing with large areas, it is sometimes better to use a QZone buffer rather than an area buffer. The squares which make up a QZone are regularly sized, so they provide a more efficient, and quicker, method of modelling buffers. Operations such as detecting whether a point is inside a large QZone is faster than detecting whether the point is inside an equivalent area item.

In general, if you have a large irregular outline, such as a coastline, a QZone takes up less memory and therefore operates more quickly than an area of comparable dimensions. However, QZones are less accurate than area items.

■ Topological polygons

If you want area items which are aware of their spatial relationships with one another (for example, Administrative Districts whose boundaries can change) you should use topological polygons.

➤ Chapter 30: “**Creating topology: chains and polygons**”



Creating points and placing shapes

■ What are points and shapes?	371
■ Placing points and shapes	371
■ Creating shapes	373
■ The overlay shape (By Overlay)	374

■ What are points and shapes?

A point is a single vertex which itself has no dimensions but can be positioned in 3D space. Points usually have a shape assigned to them. A shape is a pre-defined symbol. Cadcorp SIS provides a number of pre-defined shapes which are named objects stored in the (standard) library. You can also create your own shapes, which can consist of any group of line, area, bitmap, or box text items.

Points can also be seeds for polygons and chains. ➤Chapter 30: “**Creating topology: chains and polygons**”

■ Placing points and shapes

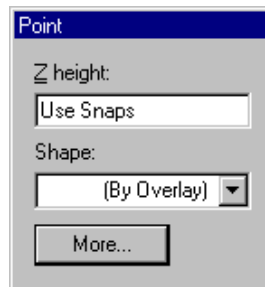
When constructing point items, if the dataset scale is inappropriate, Cadcorp SIS normally warns you and gives you the opportunity to change it. This is most likely to happen when constructing points on an internal dataset, because these take an initial dataset scale of 1 when they are created. ➤Chapter 8: “**Scale**”



If you do not want to see the scale warning, use the system option Suppress scale warnings (Options tab, **Tools>Preferences...**).

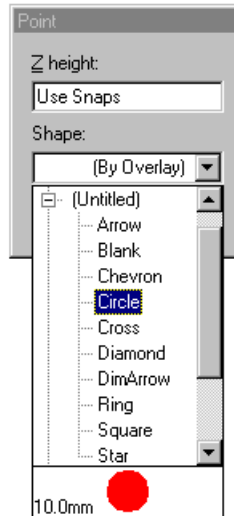


- 1 Select the **Construct>Geometry 2D>Point...** command.
- 2 If you are using Cadcorp SIS Map Editor or Cadcorp SIS Map Modeller you see the following Point dialog:



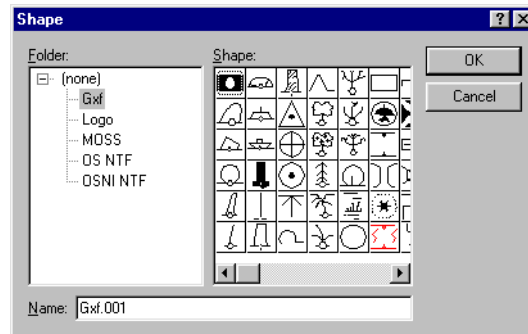
If you want to place the point in 3D space, type in a Z height (otherwise points are placed on the XY plane).

Select a shape from the drop-down list by double-clicking its name. Shapes are listed here by name. As you select one, you are shown what it looks like:

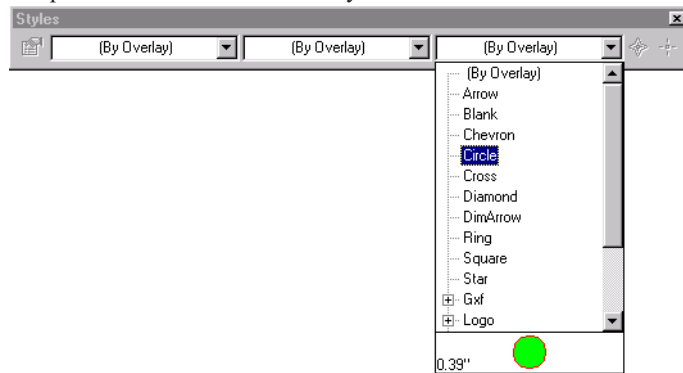


If you do not want a point to be visible, assign the Blank shape to it. This shape is not displayed on the screen (except when selected), nor is it printed. Alternatively, you could use any shape with a blank or invisible pen and brush assigned to it.

If you want to select a shape by its graphical appearance, click the More... button:



If you are using Cadcorp SIS Map Viewer or Cadcorp SIS Map Manager, the Point dialog is not displayed. You can set the required shape in the Styles toolbar and then create the points. The points will use the selected style.



- 3 Click a position on the screen to locate the point, or type in the co-ordinates of its position (using this method you can place the point in 3D space).
- 4 Continue placing points. If you want to change the shape used, or the Z height, do so in the Point dialog before placing the point.

◆ Multi-point items



A multi-point item is a single item consisting of more than one point, all the constituent point items having the same shape and style. You can create a multi-point item by first selecting a point item, then using the **Alter>Add Geometry** command to add further points to it.

A multi-point item can be manipulated as a single item. The shape used to display the points in the multi-point item is that of the original point item (the one to which other point items were added).

■ Creating shapes

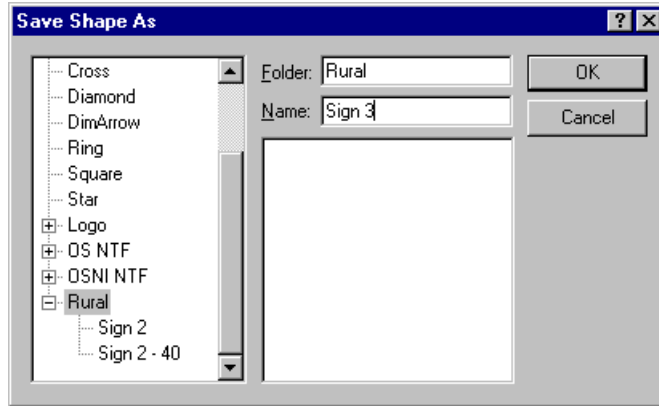
A shape may consist of any combination of line items, area items, box text and bitmaps (but not point text and topological structures; although you can use these items, they will not be displayed). You can create shapes using Cadcorp SIS Map Editor and Map Modeller.



- 1 Open a new, empty SWD.
- 2 Change the projection to the Paper Projection using the **Map>Co-ordinate systems...** command, or the Position toolbar.
- 3 Create the graphics that make up the shape. You could use the Construct 2D commands to create the shape, or you could use a bitmap. If you are using a bitmap for a logo, you may wish to resize the bitmap using the **Alter>Move Items** command, so that it is the correct size. Use the measure functions to obtain the correct size.
- 4 Select all the graphics which make up the shape.
- 5 Select the **Construct>Miscellaneous>Shape...** command.
- 6 Click a position for the centre of the shape. The centre is the position by which you will later place the shape.



- 7 In the Save Shape As dialog, type in a folder name if you want to create a new folder (you will need to do this if there are no other shapes in the enabled libraries), or select an existing folder name if appropriate. All shape folders in all enabled libraries are listed.



- 8 Enter a name for the shape. Shapes are named objects. ➤Chapter 50: “Named object libraries (NOLs)”
The shape is then stored in the current library.
- 9 If you wish, you may delete the graphics used to form the shape, as these are no longer required.

◆ Creating complex shapes

Shapes can be extremely complex objects, making extensive use of the advanced capabilities of Cadcorp SIS such as scale thresholds and levels. For example, it is possible to create shapes which appear differently at different scale thresholds.

◆ Ordnance Survey symbols (UK specific)

Ordnance Survey files contain locations for symbols of ordnance benchmarks, pylons, flow arrows, etc. These Ordnance Survey shapes are stored with appropriate names (eg Bench Mark, Pylon, Flow Arrow) in the OS DNF, OS NTF and OSNI NTF folders in the (standard) library.

■ The overlay shape (By Overlay)

When placing a point, if you select the (By Overlay) shape, the point adopts the shape assigned to the overlay on which the point is constructed.

◆ Changing the overlay shape

- 1 In the Overlays dialog, select the Styles tab.
- 2 Select the overlay for which you want to change the shape.
- 3 Double-click on the required shape in the Shape drop-down list. As you select a shape you will see a sample drawn, with the size indicated against it.

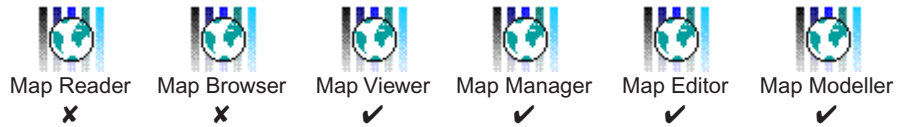
4 Click OK.

All points on that overlay which use the (By Overlay) shape will now use the shape you have just chosen. Any future points you construct on this overlay which use the overlay shape will also adopt this shape. Whenever you change the shape, all By Overlay shapes adopt the new shape.

◆ Forcing the shape of all points on an overlay

This is similar to setting the (By Overlay) shape (see above), except that this procedure makes all points on the overlay use the selected shape, not just those which use the (By Overlay) shape.

- 1** In the Overlays dialog, select the Styles tab.
- 2** Select the overlay for which you want to force the shape.
- 3** Double-click on the required shape in the Shape drop-down list. As you select a shape you will see a sample drawn with the size indicated against it.
- 4** Click in the Override checkbox.
- 5** Click OK.



Creating text

■ Text types and styles	377
■ Creating point text	379
■ Creating box text	381
■ Creating label text	382
■ Creating line text	383
■ Secondary annotation (point text and line text)	384

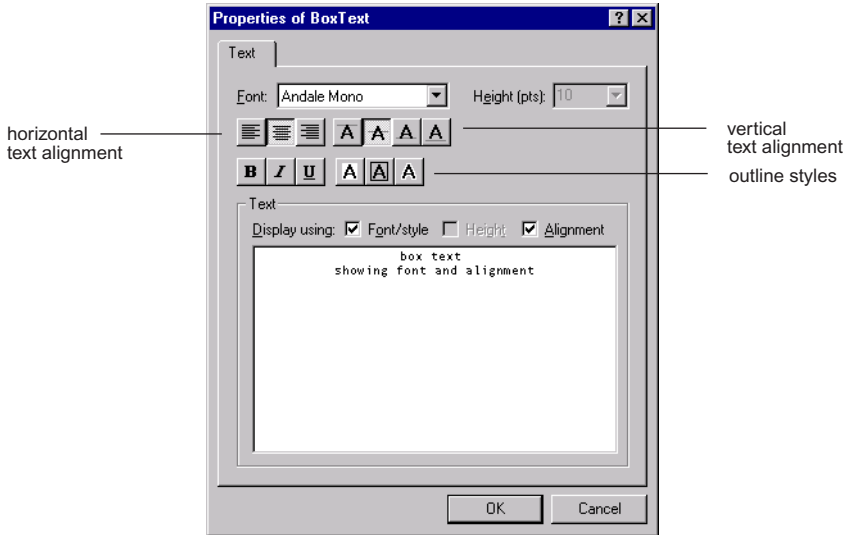
■ Text types and styles

There are four different types of text item:

- point text the height of point text is set in points. It always appears at a given point size when printed.
- box text box text is created in real world units. When printed it maintains its proportions to the surrounding graphics.
- label text label text provides a means of labelling items, being placed with a line drawn to the item it is labelling. It is created in real world units, like box text, and when printed maintains its proportions to the surrounding graphics.
- line text line text follows the path of a line item

Cadcorp SIS Map Viewer can create only point text items. Line text items can be created only in Cadcorp SIS Map Editor and Cadcorp SIS Map Modeller.

You can specify the appearance of text on dialogs such as the Text dialog and the Text tab of the Text or Label Item Property dialog. For example, here is the Box Text dialog:



◆ Alignment

All text types have Vertical and Horizontal alignment properties. The choices for vertical alignment are top, middle, baseline and bottom, and for horizontal alignment they are left, centre, and right. The alignment point of a text item is a combination of its vertical and horizontal alignment points:



There are 12 possible alignment points:

top left	top centre	top right
middle left	middle centre	middle right
baseline left	baseline centre	baseline right
bottom left	bottom centre	bottom right

The alignment point of the text item is placed at the screen position you use to locate the text item.

◆ Styles

You can choose different styles of text by using the icons on the Properties dialog. As well as bold, italic, and underlined, you can choose Outline, Box, and Opaque styles, which are suitable for presenting text against shaded or coloured backgrounds:

- the Opaque style draws a box behind the text, the size of the text string's extent. The brush used to draw the box is either the overlay default, or the brush you have selected.
- the Box style creates a box around the text, the size of the text string's extent. The pen used to draw the box is either the overlay default, or the pen you have selected. Box text is set in real world units to maintain its scale/proportion with the surrounding graphics.
- the Outline style creates a single pixel/dot outline around the edges of the letters. The brush used is either the overlay default, or the brush you have selected. The effect is like a 'halo' around the text. This improves the legibility of text against a shaded, coloured or 'busy' map background.

This is Opaque Text

This is Opaque Text with a box

This is Opaque Text in Bold, Italic

This is Box Text

This is Outline Text

This is Line Text

You can choose text styles in any combination.

■ Creating point text

When constructing point text, Cadcorp SIS normally warns you if the dataset scale is inappropriate and gives you the opportunity to change it. (This is most likely to happen when you are constructing point text on an internal dataset, because these take an initial dataset scale of 1 when they are created.) ➤ Chapter 8: "Scale"



If you do not want to see the scale warning, use the system option Suppress scale warnings (Options tab, **Tools>Preferences...**).



1 Choose the **Construct>Text>Point...** command.

- 2 In the Properties of Text dialog, you can set the following properties (any of these can be changed later):
- font
 - height in points (➞page381, **Height of point text**)
 - left, centre or right justified
 - vertical alignment: top, middle, baseline, or bottom
 - style: any combination of bold, italic, underlined, opaque, box, and outline (➞page379, **Styles**)



- 3 Select the check boxes if you want to display the text you type using the chosen font, height, and horizontal alignment. Otherwise, the text is displayed here in simplified form, but it will use the selected properties when the completed text item is placed in the map window.
- 4 Type in the required text, using the Enter key for a new line. You can also paste text from the clipboard into this box using the Ctrl+V key combination, or Paste on the local menu.
- 5 Click OK when you have finished entering text. Attached to your cursor is the text item. If the display scale allows it, you will see a box indicating the size the text item will be.
- 6 Click the screen position where you want to place the alignment point of the text item
➞page 378, **Text types and styles**.
- 7 Either:
- press Enter to place the text string horizontally

Point text

- click a second point, which defines the angle of rotation of the text



- 8 If you cannot see the text item on the screen, it is because it is too small or too large for the current display scale. The **Map>Zoom>Selection** command will display it. You may have to redraw your screen (**Map>Redraw** or F5) before the text appears.

◆ Height of point text

Point text height is set in point sizes, like text in word-processing. There are 72 points to the inch. One point is approximately 0.01389 inches, or 0.353 millimetres.

Height of point text and dataset scale

Point text always appears at the same size (its point size). If you change the dataset scale, the size of the point text will change. Dataset scale does not affect other text types, such box, label, and line.

To give point text a fixed screen height

Point text with a fixed screen height remains the same height (in pixels) on the screen, no matter how much you zoom in or out. Fixed height text (or “zoom independent text”) is useful in such circumstances as labelling a keymap, or labelling symbols.

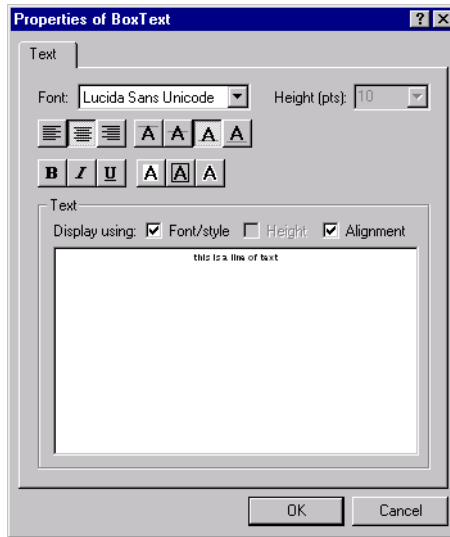
To make your point text fixed height, use a negative value in the Height (pts) box. For example, a value of -10 would produce text at point height 10, irrespective of dataset scale.

■ Creating box text

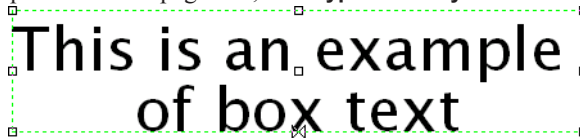


- 1 Select the **Construct>Text>Box...** command.

- 2 In the Properties of Box Text dialog, choose the properties, as for point text, except for the height:



- 3 Enter the required text in the Text area.
- 4 Click OK when you have finished entering text. The box text item is now attached to the cursor. If the zoom factor allows it, you will see a rectangular box on the cursor which is of a size sufficient to encompass the text item.
- 5 Click the screen position where you want to place the text. The box text's alignment point will be placed here. ➤page 378, **Text types and styles**



The alignment point is indicated by a butterfly shape.

◆ Box text height

The height of box text is set in real world units. For example, box text set to a height of 2.5 metres will appear the same size as a graphical item which measures 2.5 metres.

After selecting box text, you can change its size in one of two ways:



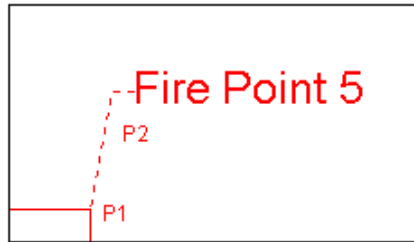
- you can change the Character Height property (using the **Edit>Properties** command). The height can be set to any value (in metres).
- you can visually re-size the box text item by holding the Ctrl key down while dragging any of the handles

■ Creating label text



- 1 Select the **Construct>Text>Label...** command.

- 2 In the Properties of Label dialog, enter the required properties (these are the same as for Box Text).
- 3 Enter the required text in the Text area.
- 4 Click OK when you have finished entering text.
- 5 You will now see a box attached to the cursor. Click where you want the label line to start (P1 in the following diagram).
- 6 You will now see a label line rubberbanding from this point, connected to a box. Click the position for the alignment point of the text (P2):



The label line is drawn using the Styles toolbar pen.

When selected, label text is displayed with a box around it (like box text), with handles at the corners, mid-points and centre. A butterfly shape is displayed at the current alignment point.

◆ Label text height

The height of label text is set in real world units, like box text. So, for example, a label text item with a height of 2.5 metres will appear in proportion to the surrounding graphics.

After selecting line text, you can change its size



- you can change the Character Height property (using the **Edit>Properties** command). The height can be set to any value (in metres).
- you can visually re-size the line text item by holding the Ctrl key down while dragging any of the handles

■ Creating line text

Line text is constructed to follow a single or multi-segment straight line or a curved line.



- 1 Select the line item along which you intend to construct the text.
- 2 Select the **Construct>Text>Line...** command.
- 3 In the Properties of line text dialog, enter the same properties as for point text.
- 4 Enter the required text in the Text area.
- 5 Click OK when you have finished entering text.

The text is placed along the selected line, using the current alignment setting. You can choose how the text is spaced along the line. ➤Chapter 39: “Editing text items”

■ Secondary annotation (point text and line text)

Secondary annotation is a reference embedded in a text block which calls up and displays the current value of a property. You would use it where a value is subject to change, and you always wish to include the current value in the text string. Formulae can be used.

Examples

- 1 On your map you have a piece of text against a line denoting a bus route. This note includes the length of the bus route. If you edit the bus route, you want the note to be automatically updated with the new length. If you use secondary annotation, Cadcorp SIS searches for the current value of the data and displays it.
- 2 On a map of a housing estate each lamp-post has a note against it, indicating its unique ID number. You could use the same piece of text (secondary annotation) each time, but have the correct ID number displayed in each instance.

◆ Creating secondary annotation



- 1 Select the **Construct>Text>Point...** command.
- 2 Type in what you require. Both regular text and secondary annotation can be included in the same text block, as in the following examples.

The format required for the secondary annotation is **^(Item number.property name)** where **Item number** applies to the item you want to annotate. You can obtain this from the Properties dialog or property view tab of the workspace window.

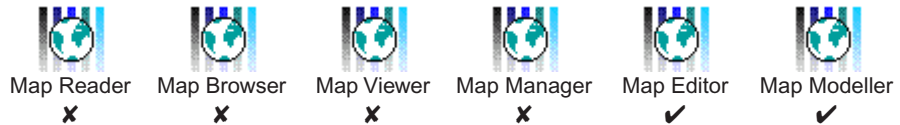
If you have made an error in the formula you have typed in, you will see a question mark (?) on the screen, instead of the text you required.

□ Examples of secondary annotation

What you type	What it means	What you see on screen
Class=^(23._class&)	show the class of item 23 in this dataset	Class=Area (if it was an Area item)
Area = ^(FindContainer("Areas"). _area#) m sq.	look in the overlay called Areas for an area that contains the hook point of the current item, and print out the area value of that area item	Area = XXX m sq. (and if this is a line text item, the above text will follow the line)
Now=^(FormatDate(date(), "Time: %X, Date: %x"))	show the current time and date If this formula is used with secondary annotation, it will update every time Redraw is used, and update every time it is printed. You can change the format of the time and date if you wish.	Now=Time: 16:01:34, Date: 08/01/00
Scale=^(3.(FormatFlt(_scale# ,"%10.1f")))	shows the item's scale property, formatted as a double number with one decimal place This provides an example of how to use more complex secondary annotation to display data.	Scale = 1.0

Property names

For more about property names or formulae, ⇨ Chapter 14: “**Properties**”, ⇨ Chapter 52: “**Formulae**”.



Creating collections

■ What are collections?	387
■ Blocks	387
■ Named items	388
■ Multi-geometry items	390
■ Assemblies	391
■ Groups	391

■ What are collections?

Collections consist of several items collected together to be handled as a single item. There are different types of collection, each having different attributes and uses:

- blocks (which are placed as inserts)
- named items
- multi-geometry items
- assemblies
- groups

Shapes provide a further method of handling complex graphics as a single item. ➤Chapter 26: “Creating points and placing shapes” ➤Chapter 38: “Editing points and shapes”

■ Blocks

Blocks are a collection of graphics and text which can be manipulated as though they were a single entity. Think of them as symbols which can be called up by name and placed at any selected position in the map window.

Blocks are named objects and are stored in libraries (NOLs).

◆ Creating a block



- 1 Select the editable graphics which are to constitute the block.
- 2 Choose the **Construct>Miscellaneous>Block** command.
- 3 Click a position on or near the graphics where you want the hook point to be. The hook point can be thought of as a handle by which the block will be referenced and recalled for future use.
- 4 Enter a name for the block in the block name dialog.

Blocks are created on the current user overlay (Internal overlay or BDS).

They are stored in the current library unless you name the block (anonymous) - see Block Names, below - or any of the selected items is a group or Insert item.

◆ Block names

Blocks use the same naming conventions as all named objects. ➤Chapter 50: “**Named object libraries (NOLs)**”

Instead of giving a new block a name, you can accept the name (anonymous), which is offered at the prompt. In this case, you can manipulate the block as normal, but it is not saved and you cannot recall it by name to place on the map base.

◆ Placing a block: inserts

Each placing of a Block is called an insert. To place a new insert:



- 1 Choose the **Construct>Miscellaneous>Insert Block...** command.
- 2 In the Block name dialog, select the required block or type its name.
- 3 Either:
 - place the block with a screen snap or by typing a co-ordinate. The block's origin is placed at this position.
 - press the Enter key to display the Transformation dialog, enabling you to scale, mirror or rotate the block by a specific angle
- 4 Either:
 - press the Enter key to place the block with the same orientation as when it was created
 - choose the rotation of the block with a screen snap or by typing a co-ordinate

◆ Editing blocks

➤Chapter 40: “**Editing collections**”

■ Named items

A named item is a collection of graphical items which is given a name by which it can be recalled later. Any item on an editable or hittable overlay can be made into a named item. Named items are a type of named object and are stored in libraries.

Recalling a named item places a copy of it on the current overlay in the same spatial location as when it was saved. This is similar to copying items to the clipboard, then pasting a copy of them back into the current overlay, except that named items allow more flexibility. In contrast to the temporary nature of the clipboard (which holds only one set of data at a time, which is overwritten when you store another set), you can build up a large number of named items.

◆ Creating named items

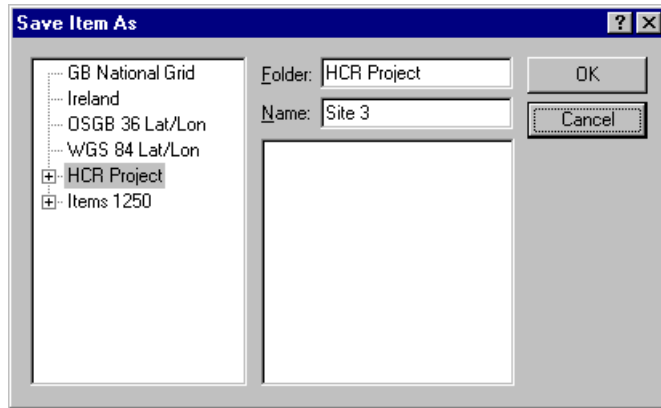
- 1 Make sure the library where you want to place the named item is the current library. ➤Chapter 50: “**Named object libraries (NOLs)**”

- 2 Select the item(s).

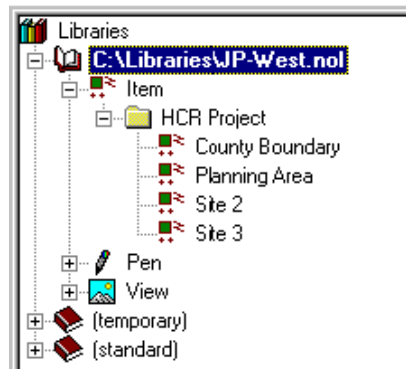


- 3 Choose the **Edit>Store Item...** command.
- 4 In the Save Item As dialog, type in a folder name if you want to create a new folder (you will need to do this if there are no other named items in the enabled libraries), or select an existing folder name if appropriate. All named item folders in all enabled libraries are listed.

- 5 Enter a name for the named item.



The item is then stored in the current library. (If there were several items selected to make up the named item, a group item is stored.)



◆ Placing named items



- 1 Choose the **Edit>Recall Item...** command.

- 2 In the Open Item dialog, choose the named item by selecting its folder and name.

The named item is recalled and placed on screen in the same spatial location as that occupied by the original item when it was stored.

It is stored in the current editable overlay's dataset, and will be transformed into the dataset projection, if necessary.

If multiple items were selected to make the named item, when recalled the item will be a group. ➤page 391, **Groups**

◆ Backdrops

A named item can be used as a backdrop.

Backdrops can be used in a Map Window. Other overlays are then drawn against this backdrop. ↗Chapter 4: “**Loading data**”, **Loading maps and other data files**, page 50.

Backdrops are also used when placing a keymap on a print template. ↗Chapter 47: “**Printing: print templates**”, **Add key map**, page 565.

■ Multi-geometry items

A multi-geometry item is a collection of point, line, area and text items. All the components are drawn with the same style, and can be selected and manipulated as a single item.

If the multi-geometry item is a collection of points, it is called a multi-point item. If it is a collection of lines, it is a multi-line. Multi-lines can have branches, and need not be connected. If the multi-geometry is a collection of areas, it is a multi-area. ↗Chapter 25: “**Constructing area items**”

◆ Creating multi-geometry items

Multi-geometry items are created by merging the geometry of two existing items, by adding them together, or by combining them using Boolean editing.

You can merge together point items, text items, line items and/or area items. Existing multi-geometry items can be merged with other items, to create more complex multi-geometry.

You cannot create multi-geometry from topology items.

The 3D items TINs, surfaces, solids and grids can be used to make multi-geometry items, but in doing so, the original items lose their Z height.

◆ Creating multi-geometry using the Add Geometry command



- 1 Select one of the items to be merged.
- 2 Select the **Alter>Add Geometry** command.
- 3 Click on the item to merge with it.
- 4 Continue clicking items to add, pressing Esc when you want to end the command.

◆ Creating multi-geometry using the Boolean commands

The **Alter>Boolean** commands can be used to create new multi-geometry items by merging existing items in one of the following ways:



- merge the selected items into one multi-geometry item (**Union** command)



- form the new multi-geometry item from the overlapping part of existing items (**Intersect** command)



- form the new multi-geometry item from existing items after deleting any overlap (**Exclusive Or** command)



- form the new multi-geometry item by using existing item(s) to cut away parts of another existing item (**Subtract** command)



- merge selected items based on an attribute value (**Dissolve** command)

↗Chapter 36: “**Editing line items**” ↗Chapter 37: “**Editing area items**”

◆ Editing multi-geometry Items

Multi-geometry items can be edited extensively. ➤Chapter 40: “Editing collections”

■ Assemblies

An assembly is a point item which has associations with a number of other items. These other items are unaware of this association and remain independent of the assembly. This means they can be selected separately.

Any item can be part of more than one assembly. You can also make assemblies of assemblies.

◆ Creating assemblies



- 1 Select the items to make into an assembly. The items must be in a single dataset.
- 2 Select the **Construct>Miscellaneous>Assembly** command.
- 3 Click where you want the assembly's origin (hook point) to be.

◆ The assembly's hook point

The hook point of an assembly is important, because this is the point by which you select the assembly.

■ Groups

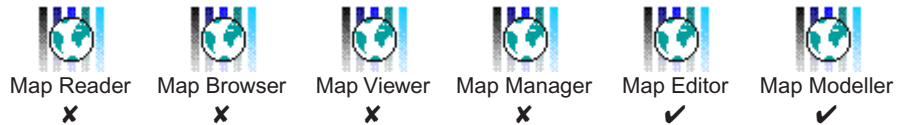
Groups are a special type of collection. They are designed for Microsoft Visual Studio.NET customisations using GisLink or applications written using Cadcorp SIS Control. They allow programmers to create new item types.



Groups cannot be created within Cadcorp SIS, but they can be placed. They have the item command Explode, which converts them back to their original components. These can then be manipulated in Cadcorp SIS.

They cannot be re-assembled, except under customisation or application control.

If named items contain multiple items, they will be recalled as groups.



Creating topology: links and nodes

■ What is topology?	393
■ Advantages of topology	393
■ Links and nodes.	394

■ What is topology?

Topology is the study of the spatial relationships between items, independent of their size and shape.

In Cadcorp SIS, such relationships exist in the form of:

link and node networks	These consist of a series of link lines, with nodes wherever the lines cross.
chains	Within the link and node networks you can define chains, which are a number of links collected together to form a single item. An example is a number of different streets in a town plan, which, when linked together, form a bus route.
polygons	These are a type of area item, made up of a number of links which create a closed loop or loops. They can be used to represent administrative districts, planning constraint zones, property boundaries, etc.

The key to topology is that, if a topological item changes, its spatial relationships with connected topological items are maintained. For instance, if you move a node item, the ends of all connected link items will be moved to the new node position. In addition, because chains and polygons refer only to link items, their path (for chains) and boundary (for polygons) will follow the new link line. Furthermore, if the link is a shared boundary between adjacent polygons, the adjacency of the polygons is maintained. ➤Chapter 30: “**Creating topology: chains and polygons**”

■ Advantages of topology

The advantages of using topological structures are:

- as you edit links or polygons, their spatial relationships to other adjacent links and polygons are maintained.
- it is efficient: a great deal of graphical information can be stored with minimal demand on the computer’s resources

◆ Topology in Ordnance Survey data (UK specific)

In the UK, Ordnance Survey MasterMap, BoundaryLine, and OSCAR are all examples of data in topological format. OS MasterMap uses topological polygons, as does BoundaryLine, while OSCAR uses a link and node network, allowing you to carry out route finding.

Samples of these and other data types are included on the Cadcorp SIS CD-ROM, and are also available on request from Ordnance Survey.

■ Links and nodes

Links and nodes are the building blocks of topology. They describe spatial relationships. They can be built upon using chains and polygons. ➤Chapter 30: “**Creating topology: chains and polygons**”

One powerful use of a link and node network is for route-finding.

➤Chapter 58: “**Route-finding**”

◆ Creating link and node topology from area items

You can convert area items into polygons using their item command Convert to Topology. In doing so, the line items forming their boundary are converted into links with nodes at either end. An area will be converted into one link and one node at the start/end point of the boundary.

Likewise, when you create polygons using any of the **Construct>Topology** commands, links and nodes are also created.

Automatic property

The links and nodes created using these commands have the property Automatic. Automatic links are automatically deleted if the chain or polygon to which they belong is deleted, and automatic nodes are automatically deleted when their links are deleted. However, the Automatic property is editable and can be changed.

➤Chapter 41: “**Editing topology**”, **Deleting a link**, page511

➤Chapter 41: “**Editing topology**”, **Deleting a node**, page514

◆ Creating a link and node network from line items

- 1 Construct the basic linework which may consist of lines, arcs, circles and Bezier curves. Lines may cross one another, or touch at any point. In order for them to be converted into topology they must all be in the same dataset.



- 2 To get the best results, you should use the **Alter>Clean Geometry** command to ensure that you start with clean lines. ➤Chapter 36: “**Editing line items**”, **Deleting unwanted line segments or vertices**, page477



- 3 If you wish to have chains created automatically at the same time, select Automatic chain creation on the Options tab in **Tools>Preferences....**

- 4 Select all the linework.

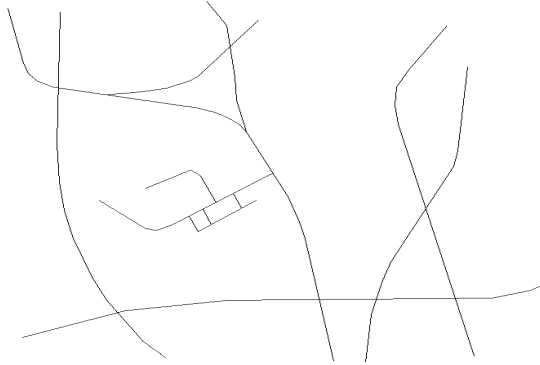


- 5 Choose the line item command Convert to Topology (accessed via the local menu or the Item main menu).

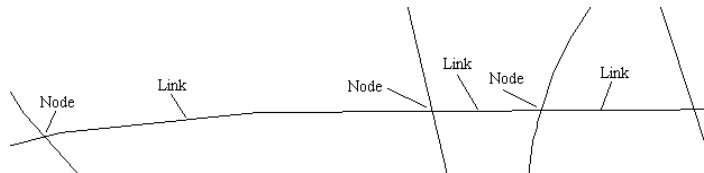
Troubleshooting When you convert line and point items to topology, you may lose some the attribute data associated with the items. You will also lose many of the Alter functions.

Example

The following example shows the type of linework (representing a portion of a road network) which is to be converted to topology:



At the end of the process, the original lines have been removed, and in their place is a series of links, each with a node at each end. One link is formed for each section of the original line, ie, a new link starts wherever a line was intersected by or joined another line.



◆ Keeping the original linework

- 1 Select the links.



- 2 Choose the **Alter>Topology>Copy links as Lines** command.

This copies links to lines. If there are no chains, each link is converted to a single line segment. Use the S snapcode (type S when the cursor is positioned over the line) to ensure that you select whichever you require at the time.

◆ Creating a new network which overlays existing topology

Sometimes you may want more than one set of topology in the same area. For instance, you may have one link and node network of roads, and, in the same area and criss-crossing over the road network, another link and node network of railway lines.

To create a new set of topology overlying existing topology, use either of the following methods:

Method 1

- 1 Choose the **Construct>Topology>Link** command.
- 2 Draw in new links, just as if you were constructing ordinary lines.
Links created with the **Construct>Topology>Link** command do not have the Automatic property (but the nodes do).

Method 2

- 1 Construct the linework to be converted to topology, making sure that it is on a different overlay from the existing topology. (Only items within the same dataset can be joined together as a single set of topology.)
- 2 Select all the linework.
- 3 Choose the line item command **Convert to Topology**.

◆ Displaying nodes

Nodes are not normally visible on screen or on the print. However, they are visible on screen when selected or when their adjacent link(s) are selected.

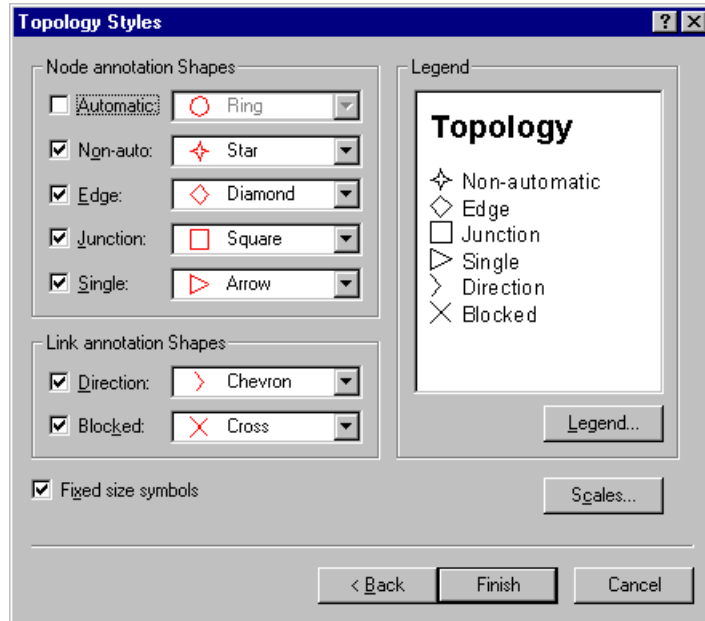
You can assign a shape to a node (its shape property) and change the scale of the shape (Scale property of node), thus making the node visible if required.

◆ Displaying the Topological Structure of a link and node Network

The Topology theme allows you to use symbols to represent the properties of nodes and the flow characteristics of links. For details of assigning flow characteristics to links and turning rules at nodes (junctions), ↗Chapter 58: “**Route-finding**”.

- 1 Start the New Theme Wizard. ↗Chapter 19: “**Thematic mapping**”

- 2 Choose the Topology option and choose the required parameters:



Fixed size symbols

With this option selected, the shapes remain the same pixel size on screen while you zoom in and out (subject to the scale thresholds). Otherwise they act like the rest of the graphics, ie they become smaller as you zoom out and larger as you zoom in.

Scales

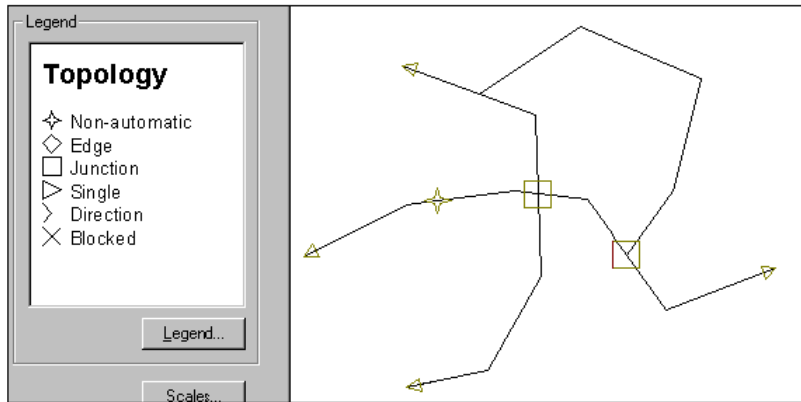
This allows you to set the minimum and maximum scale thresholds. When zoomed at a factor between these values, the node and link symbols are displayed. Outside of these values they are not displayed. ➤ Chapter 8: “Scale”

Node annotation Shapes

Choose Shapes to indicate automatic nodes (most nodes are automatic) and non-automatic nodes.

A single node is one which is at the end of a dangling segment (it only has one link entering it). A junction is where a node has had turning rules assigned. Edge nodes often occur at the edge of a map tile. They are not the natural end of a link, so Cadcorp SIS searches the adjacent map tile for continuity. You can see whether a node is an edge node by checking its Edge property (_bEdge&).

The following diagram shows single, junction, and non-automatic nodes:



Sometimes a node will have more than one shape. For instance, a node which has turning rules assigned and has the Automatic property can display both the Junction and Automatic shapes.

Link annotation shapes

For details of flow directions and direction flags, ➤Chapter 58: “Route-finding”, **Assigning a flow direction to links**, page 668.

You can determine the turning rules at junctions. ➤Chapter 58: “Route-finding”, **Turning rules of junctions**, page 669

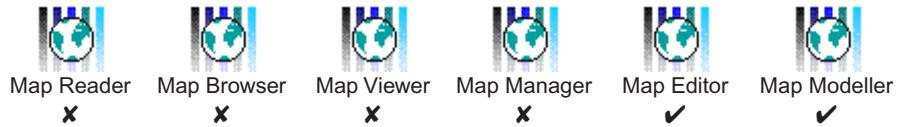
A link is shown as blocked if no flow is allowed through it (a value of 3 for the Direction flags property).

If the link only allows flow in one direction (a value of 1 or 2 for the Direction flags property), it uses the direction symbol.

If flow in both directions is allowed (Direction flags value 0), no symbol is shown.

Legend

For details on how to set up and use a legend, ➤Chapter 19: “Thematic mapping”



Creating topology: chains and polygons

■ Chains	399
■ Polygons	400

■ Chains

A chain is an association of links which together define a linear feature such as a road, a fence, a river, and so on.

Chains may also be defined along a polygon boundary to indicate the type of boundary.

Chains have seed points which are always invisible. The seed points may have data attached to them.

Chains may be used for route finding. ➤ Chapter 58: “Route-finding”

◆ Creating a chain



- 1 Choose the **Construct>Topology>Chain** command.
- 2 Click on the first link in the chain, near to the end where it starts.
- 3 Either:
 - click on each subsequent link in turn, close to its start. In each case Cadcorp SIS in traces to the end of this link.
 - click on the final link in the chain. Cadcorp SIS traces to the end of this link, taking the shortest route and forming a chain of all the intervening links.
- 4 Use the Backspace key if you want to take out the last selection.
- 5 Press Enter when you have finished defining the chain.

Although the graphics appear unchanged, the links now store the information that they form part of this chain. The chain stores references to the IDs of its constituent links - see its links property.

A link can be part of any number of chains.

◆ Automatic chain creation

When converting line items to topology, you can have Cadcorp SIS automatically create a chain item for each original line item at the same time.



To do this, select the Automatic chain creation option on the Topology section of the Preferences dialog (**Tools>Preferences...**).

■ Polygons

Polygons are a special intelligent type of area item. A polygon has knowledge of its relationship with adjacent polygons, so that, if an adjacent polygon boundary changes, its own boundary changes accordingly.

Adjacent polygons share boundaries, a fact which gives the following important advantages:

- there is no need for duplication of linework, which saves on computer resources
- when you edit the underlying structure of a topological dataset, adjacency and other rules are automatically respected. If you change the area of one polygon, adjacent polygons are automatically updated. Less work is involved, and fewer errors occur.
- this arrangement allows for a more complex and deeper hierarchy of polygons to exist. For instance, if the diagram depicted administrative boundaries such as districts and counties, there could also be additional zones which do not fit into the hierarchy, such as forested areas or Health Authority districts.
- the boundary lines may themselves be defined as topological chains, to represent linear features such as rivers, roads, fences, and so on

◆ Polygons in Ordnance Survey data (UK specific)

Ordnance Survey BoundaryLine data and MasterMap data uses polygons. Samples are included on the Cadcorp SIS CD-ROM, or you can request sample data directly from Ordnance Survey.

◆ Creating polygons from existing area items

You can convert simple areas or multi-areas to topology.

- 1 Select the area(s) or multi-area(s).



- 2 Choose the **Convert to Topology** command from the local menu or from the appropriate **Item>Area** menu.

The boundary of the original area is converted into links, and a polygon seed is created inside the original area. The seed stores all the properties previously stored with the area item.

Alternatively, where you have existing area items, you can create a new set of polygons on a new overlay by cookie cutting the area items. You may want to do this to see the effect on the area items of overlaying another area or polygon item. ➤page404, **Creating polygons by cookie cutting existing polygons or area items**

◆ Creating polygons from a link and node network

You can create polygons from an existing link and node network using a number of different methods.

The following commands are provided:

Construct>Topology command Technique



Polygon

click anywhere within an area bounded on all sides by links.



Polygons from Line

construct a line fence. All enclosed areas in the link and node network which are crossed by the line fence are turned into polygons.



Polygons from Area

construct an area fence. All enclosed areas in the link and node network which are crossed by or contained within the area fence are made into polygons.



Polygons from Items

select item(s) which lie inside an enclosed area bounded by links, and which are to be used to locate the polygon seed.

Construct>Topology>Polygon



- 1 Select the command.
- 2 Within the link and node network, click somewhere which is bounded by links on all sides to convert into a polygon.
- 3 Either:
 - if you do not wish to add further areas to the polygon, proceed to step 4. In this case, the position you clicked becomes the seed point of the polygon.
 - If you wish the polygon to include further areas adjacent to the first, click within them, one after another. In this case, Cadcorp SIS decides where the seed point will be. The selected areas which are to form the polygon are shaded. You can remove an area that is already selected by clicking in it again.
- 4 Press Enter to complete the polygon.
- 5 Repeat steps 2 to 4 to create more polygons if required.

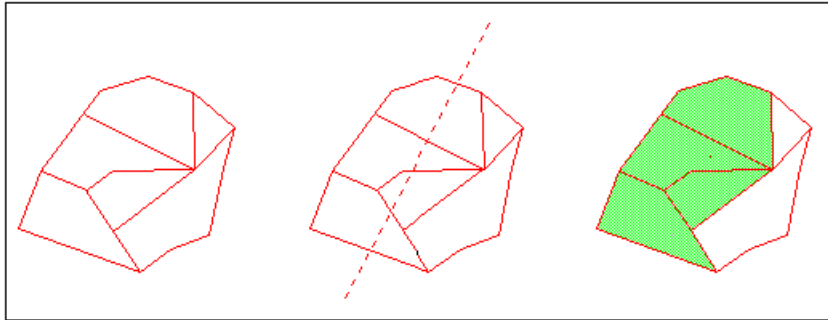
Construct>Topology>Polygons from Line

With this command you define a temporary line fence, and all areas which the line fence crosses are converted into polygons. Cadcorp SIS always creates the smallest polygons it can.



- 1 Select the command.
- 2 Construct a line fence by putting in points just as when using the Line command. Keep clicking points to draw to, or use the Backspace key to take out the last point input.

- 3 Press Enter when you have finished, or Ctrl + Enter to close to the first point input.



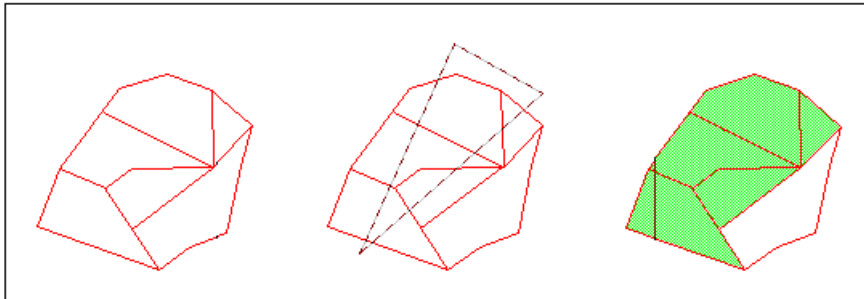
The line fence disappears when the operation is complete.

Construct>Topology>Polygons from Area

Using this command you define a temporary area fence, and all areas which this area fence overlaps are made into polygons. Cadcorp SIS always creates the smallest polygons it can.



- 1 Select the command.
- 2 Construct an area fence by inputting points similar to when constructing an area item. Press Backspace to take out the last point if it is incorrect.
- 3 Press Enter to finish.



All areas which fall within the area fence, or which it overlaps, become polygons. The area fence disappears.

Construct>Topology>Polygons from Items

This command creates polygons using existing items to position their seeds.



- 1 Select the item(s), which must lie within the link and node network.
- 2 Select the command.

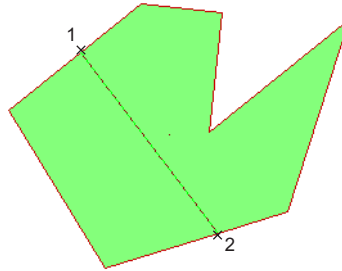
The polygon or polygons are automatically created, taking the selected item(s) origin(s) as seed(s) for the new polygon(s).

◆ Creating polygons by dividing an existing polygon

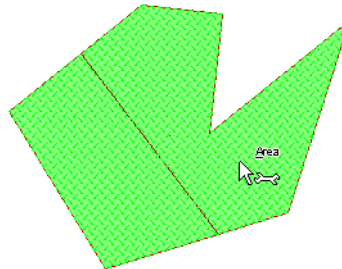


Using the **Divide Polygon** command, you can chip pieces off a polygon. The pieces chipped off become polygons in their own right.

- 1 Construct a link or links across the polygon, which delineate the piece(s) to be chipped away. These link(s) must touch the polygon boundary links. Use snapcodes to ensure accuracy.

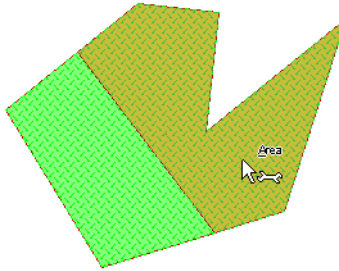


- 2 Select the polygon to edit, and select the command **Item>Area>Polygon>Divide Polygon**.
- 3 Click inside the area which is to be chipped away from the main polygon (this area is delineated by the links you have just constructed). The point where you click becomes the seed point for the new polygon.



- 4 If you have constructed more than one link across the polygon, continue clicking within each piece to chip away. Pieces which are already selected may be de-selected by clicking in them again. If you want separate polygons to be created, press Enter after each click within each polygon. If you do not do this, each new polygon will be grouped with all the other new polygons.

- 5 Press Enter. The original polygon is amended, and the new polygon(s) created.



◆ Creating polygons by cookie cutting existing polygons or area items

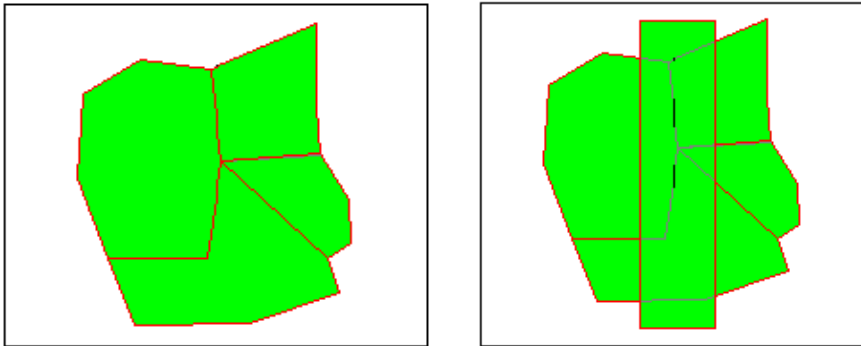


The **Construct>Topology>Cookie Cut...** command creates a new topological overlay by using selected polygon or area item(s) to cookie cut existing topology. This allows you to see the effect of overlaying an area or polygon item over another set of polygons or area items.

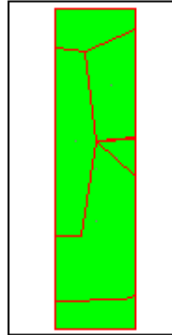
Example

The set of polygons on the left of the following diagram represents a tree plantation of 4 compartments containing different types of trees.

You could overlay another area item (right) to show a section which is to be felled.



The result would show how it affects each type of tree:



- 1 Select the area item or polygon to be used for the cutting.
- 2 Select the **Construct>Topology>Cookie Cut...** command.
- 3 In the following dialog, select which overlay is to be cut, and click on OK.

In the Overlays dialog you will now see that a new overlay has been created, called Cookie cut (you can, of course, rename it). This is a topological overlay, and contains the cut polygons. These polygons retain the attributes of the originals, such as the type of trees in each compartment.

◆ Removing splinters which occur during polygon creation

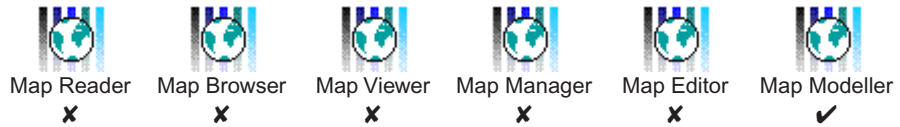
When you convert line and area items to topology, small splinters may occur between the line or area and the links. These will be automatically removed. You can choose whether Cadcorp SIS gives preference to the old line and area geometry or the newer link geometry by using the Favour old geometry in splinter removal option on the Options tab of



Tools>Preferences...

Polygons have a Splinter factor property. The splinter factor is the ratio of the maximal area to the actual area. The maximal area of a polygon is the largest area that could be enclosed by a line with the same length as the polygon. Circles have a splinter factor of 1, while a very long and thin area could have a splinter factor of 100. Areas with large splinter factors are often produced by overlapping lines which are almost, but not quite, the same.

Troubleshooting When you convert area items to topology, you may lose some of the attribute data associated with the items. You will also lose many of the Alter functions.



Creating 3D data

■ Cadcorp SIS 3D capabilities	407
■ Types of 3D data	407
■ Creating grids	408
■ Digital Terrain Models (DTMs)	410
■ Using the Relief theme	412
■ Using the Relief theme	412
■ Triangulated Irregular Networks: TINs	414
■ Creating 3D graphics using the Snap toolbar	418
■ Geodetic lines and buffers	419

■ Cadcorp SIS 3D capabilities

Cadcorp SIS can be used to:

- create 3D geometry by drawing to 3D positions
- create surfaces, solids, TINs, grids, and DTMs
- carry out ground modelling using TINs (Triangulated Irregular Networks) or DTMs (Digital Terrain Models)
- create 3D themes, extruding 2D items to a height dependent on the value of a given property ➤ Chapter 19: “Thematic mapping”

These functions are in Cadcorp SIS Map Modeller only.

■ Types of 3D data

◆ Surface

Surfaces are three-dimensional planar items, which have an area but no volume.

Creating a surface item

Surface items can be created three ways. One way to do this is:



- 1 Select the line or closed poly-line item(s).
- 2 Use the command **Construct>Geometry 3D>Extrude**.
- 3 Supply a height for which these items will be extruded.

An alternative method for creating a surface is:

- 1 Select the area item(s).
- 2 Use the local command **Convert to 3D Surface**.
- 3 You can give the area a height by using the properties, Origin Z, option.

A further method for creating a surface is:

- 1 Select the area item.
- 2 Click and hold on one of the 'grab handles'.
- 3 Hold the mouse button down and move to the position text box which shows the X, Y and Z co-ordinates.
- 4 Type in comma, comma and the new Z value (eg , , 50), then press Enter. The point on screen will be given this height, and, if viewed in a 3D window, the surface will appear curved.

◆ Solids

Solids are three-dimensional solid items which have volume. For example, a rectangular building could be represented by a solid item.

Creating a solid item

To create a solid item:



- 1 Select the area item(s).
- 2 Extrude the area using the command **Construct>Geometry 3D>Extrude**.
- 3 Supply a height to which these items will be extruded.

◆ Grids

Grids are raster items where each pixel or cell has a colour value that corresponds to a numerical value. This numerical value can represent various different scenarios - for example, the number of people living in the area represented by the cell (population density); the reflected sunlight produced from a certain type of vegetation represented by the cell (seen in certain types of satellite images); or the height above sea level represented by the cell. This last option is the starting point for a type of DTM (Digital Terrain Model). ➤Chapter 57: "Grids"

■ Creating grids

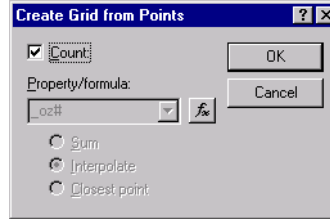
◆ Creating a grid using existing items

You can create a grid based on the distribution of existing point items. The grid can be created using a simple count of the items, the value of a chosen property of the items, or a formula calculated on the item's properties. Grids are saved as named items in a library.



- 1 Make sure the library where you want to save this grid is the current library.
- 2 Select the items on which the grid is to be based.
- 3 Select the **Construct>Geometry 3D>Scatter Grid** command.

- 4 In the Create Grid from Points dialog, either:



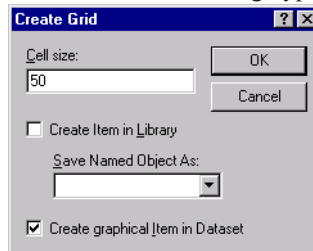
- tick the Count checkbox. This stores in each cell in the DTM a count of the number of items in a cell, the size of which will be defined later.
- deselect the Count checkbox. This makes the Property/formula field available. Here you can use a property of the points, eg the Z value (height), to create a grid item and you can apply a formula to this property. ➤Chapter 52: “**Formulae**”
- deselect the Count checkbox. Then type a property name in the Property box and select a method for combining the property values: either Sum, Interpolate, or Closest point:

Sum The property values for each selected item are added together and the sum stored in the cell.

Interpolate The value stored in the cell is interpolated from surrounding points. This method could be used where the property gives a continuously varying measurement, such as height above sea level.

Closest Point The value stored in the cell is that of the closest point.

- 5 Click OK.
- 6 Now you need to specify the size of each cell within the grid. Either:
- click two points on the screen. These define the extent of one cell.
 - press the Enter key, and in the Create Grid dialog, type in the required cell size:



For both of the above options the total size of the grid would be defined by the size of the map window. The cell size, if input manually, should take account of both this and the current scale. Cell size is also known as the grid resolution (the Resolution property).

- 7 If you want to save the grid for further use, enter a name for the new named object. It will be stored in the current library.
- 8 Check the Create Item checkbox if you want the grid to be created as a bitmap item in the current overlay.
- 9 Click OK.

Troubleshooting While creating the grid, if the Create Grid dialog flickers and reappears without using the cell size, the cell size is too small. Input a larger value. If there are problems viewing the grid, ensure that the projection/co-ordinates options are correct and that the grid is deselected. If you view your grid in 3D, you may find it looks wrong. Lowering the exaggeration to less than 1 may correct this.

◆ Creating a grid from other grid items

You can create a grid using a formula that refers to other existing grid items. These grids must exist as named items in a library.



- 1 Select the **Construct>Geometry 3D>Formula Grid** command.
- 2 Type a formula in the dialog box. The formula can include all arithmetical and Boolean operators. When using grid names, use the same names as are in the current library.

Example If there were two grid items called Density and Height stored in your current library, two possible formulae might be:

$2 * \text{Density} + 3 * \text{Height}$ 2 times the cell value of the Density grid, plus three times the cell value of the Height grid

$\text{Height} * \min(\text{Density}, 1)$ the cell value of the Height grid multiplied by the smaller of either the Density cell values or 1

Applying the formula to the values in overlapping cells creates the new grid. If the two original grids have different cell sizes, one of them is resampled so that it matches the other.

If you use a formula that includes division, be careful to avoid dividing by zero. For example, you might be dividing a grid containing a sum of values in each cell by a second grid containing the count of points in each cell, in order to produce a third grid containing average values in the cells. You might encounter problems if some of the cells in the second grid are empty - this would involve division by zero. To avoid this problem, use a formula such as:

$\text{sum} / \max(\text{count}, 1)$

Whenever the count of points is zero, the sum grid will be divided by 1, not zero.

■ Digital Terrain Models (DTMs)

A Digital Terrain Model, or DTM, is a method of viewing a grid or a TIN in three dimensions. DTMs are created by constructing either a grid with height values or a TIN item. This can be viewed in the 3D Window. An image can be draped over the DTM, eg a photograph of the area, if required.

◆ Colour-sets

All grid items use graduated colour-sets to define the values of their cells. Each colour-set consists of a number of colour-value pairs indicating which colour corresponds to which range of values. Colour-sets are named objects, stored in libraries. You can define your own colour-sets and choose which one each grid is to use.

Creating a colour-set

- 1 Use one of the following methods to create the colour-set initially:

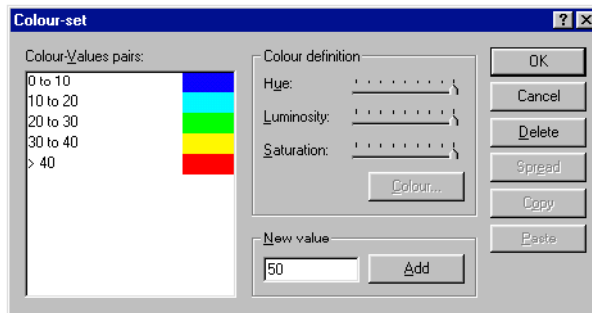


- Using the local commands on the libraries tab of the workspace window, copy an existing colour-set from the standard library and paste it into an editable library.
- Select the current library where the new colour-set is to be stored, and select New Object... from its local menu. (Remember that the standard library is read-only, so you cannot add any objects to it.) In the New Object dialog, select Colour-set from the drop-down, and click on OK.

2 In the Colour-set folder in the library you will see that a new colour-set has been added. New colour-sets are called Colour-set, Colour-set 1, Colour-set 2, Colour-set 3, etc, and are empty initially.



- 3 Rename the new colour-set using the local command Rename.
- 4 Use the local command Properties... to access the Colour-set dialog.
- 5 In the Colour-set dialog, create a colour-values pair by clicking in the New Value box, typing a cell value, and clicking on the Add button. Cadcorp SIS converts the cell values to ranges of values:



- 6 Define a colour by which each colour-value pair will be represented in the grid. You can either select a colour for each pair individually or let Cadcorp SIS assign graduated colours across a range.
- 7 To select individual colours for each pair, select a colour-value pair, then either:
- click the Colour button and select a basic or custom colour you have previously created, or define a new custom colour.
 - use the Hue, Luminosity and Saturation sliders. The Hue slider changes the colours from red to green to blue, and back to red. The Luminosity option gives a sliding scale of brightness or luminance of the colour. The Saturation is the intensity of the colour so that a colour with low saturation is a pastel shade or grey.
- 8 Where you have three or more colour-value pairs, you may choose to let Cadcorp SIS use graduated colours through the range. This is achieved by selecting a colour for the first colour pair, selecting a colour for the last colour pair, highlighting all the values for which you want the colour graduated, then clicking on the Spread button.
- 9 To delete a colour-value pair, select it and click on the Delete button.
- 10 To edit a colour-value pair, select it then change any of its values.
- 11 Click OK.

◆ Assigning a colour-set to a grid

To assign a colour-set to a grid:

- 1 Select the grid by clicking anywhere within or on its border.
- 2 Choose the Properties, All tab.
- 3 To set the colour-set property, either type in the name of the required colour-set, or choose one from the drop-down menu which appears when you click on the More button.
- 4 Click OK.

◆ Editing a colour-set

To edit a colour-set:

- 1 In the libraries tab in the workspace window, select the colour-set to edit.
- 2 Choose Properties from the local menu.
- 3 Make the required changes in the Colour-set dialog.
- 4 Click OK.



This should automatically refresh if you are working on a BDS dataset and if you have checked the Automatically refresh bds datasets option in **Tools>Preferences....** If you do not see your changes:



- select **Map>Regenerate**



- select **Map>Redraw**
- press the F5 key

◆ Working with grids

For more details about working with grids, ↗Chapter 57: “Grids”.

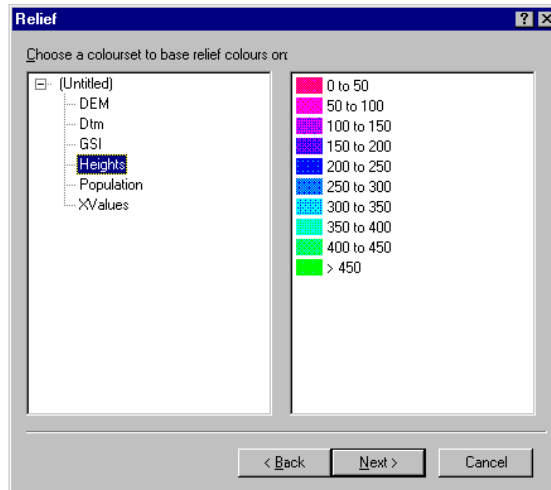
■ Using the Relief theme

You can use the Relief theme to indicate relief on a DTM. ↗Chapter 19: “Thematic mapping”

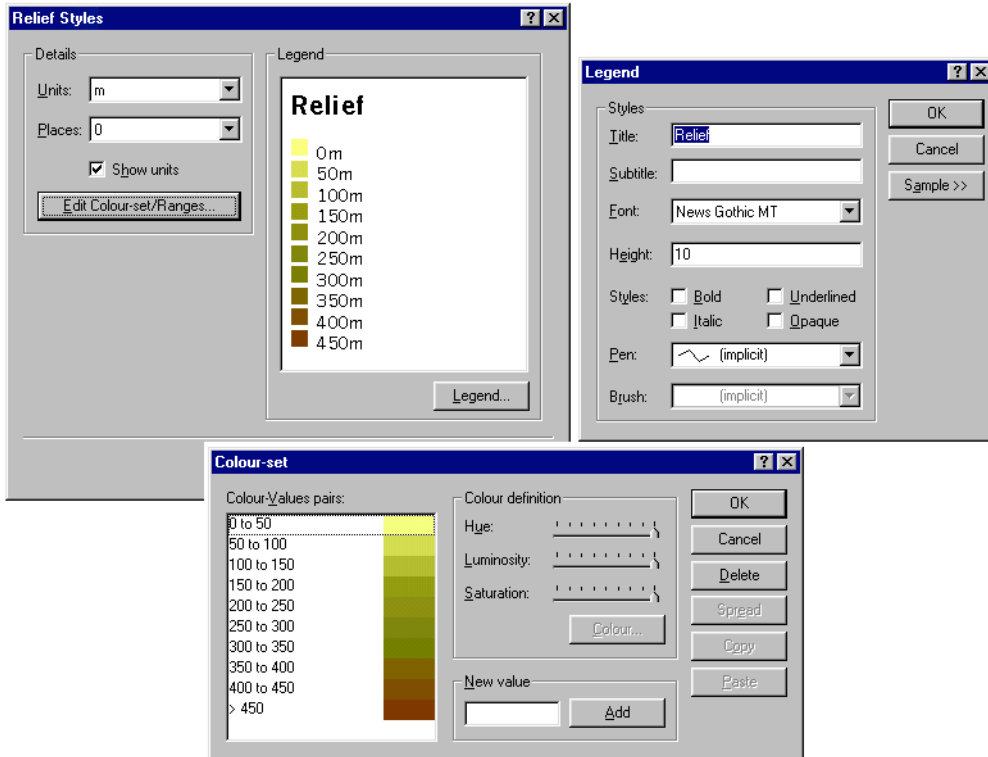


- 1 Start the New Theme Wizard.
- 2 Select the overlay containing the DTM.
- 3 Select the theme type Relief.

- 4 In the Relief dialog, choose an appropriate colour-set to indicate the heights:



- 5 In the next dialog:
- choose how the heights are to be displayed on the legend. If you want to customise the legend further, click on the Legend... button. ➤Chapter 19: “Thematic mapping”
 - if you want to edit the colour-set, click on the Edit Colour-set Ranges button or create your own colour-set



■ Triangulated Irregular Networks: TINs

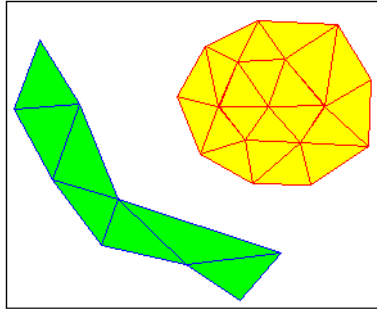
TINs, or Triangulated Irregular Networks, are three-dimensional planar items. A TIN is made up of many triangular surfaces which connect adjacent points containing height attributes. Each surface contains graduated height values, or a slope, thus contour and/or flow themes can be superimposed on TINs. Greater detail is obtained by using smaller triangles.

◆ Creating a TIN

TINs can be created in one of the following ways:

Using the Construct>Geometry 3D>Tin Fan/Strip Command

This command creates a strip or fan of connected triangles. Double-clicking finishes one fan and allows you to start a new one.



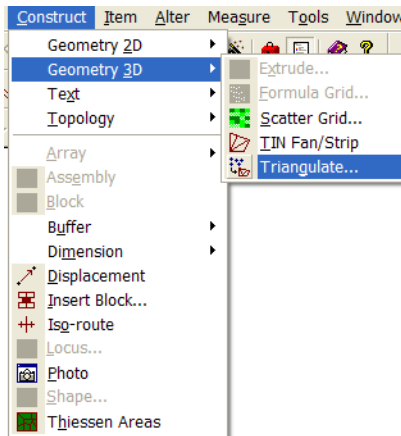
- 1 Select the **Construct>Geometry 3D>Tin Fan/Strip** command.
- 2 Click the first position, or type in its co-ordinates.
- 3 Click two more points to complete the triangle.
- 4 Click further points. Each one defines another triangle.
- 5 Press Enter to finish the TIN (or double-click).
- 6 Add further TINs if required.
- 7 Press Escape to finish.

From Existing Items

Existing items can be used to form the basis of a TIN. Triangular surfaces are created with their edges connecting the origin points of the selected items.

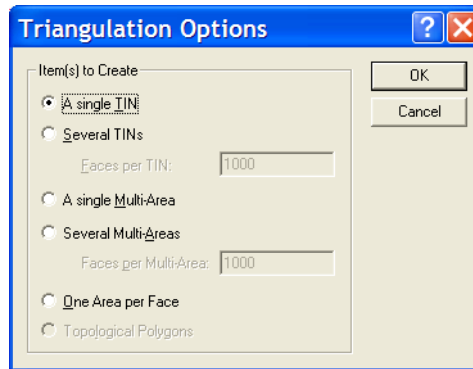


- 1 Select the items (there must be at least four of them).
- 2 Choose the **Construct>Geometry 3D>Triangulate** command.

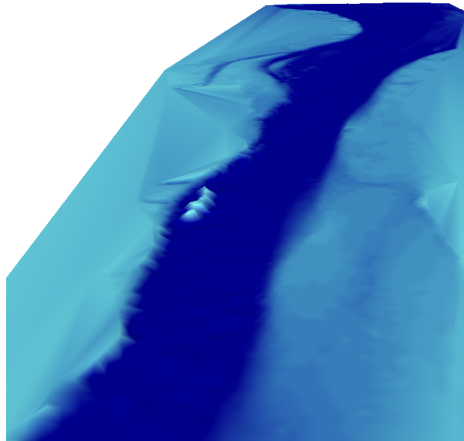


If you are joining items in 3D space, eg point items which have a Z value (height), the result is a 3D TIN.

- 3 The Triangulation Options dialog allows you to configure the TIN.



- 4 The TIN can now be generated as single TIN or as several. You can specify the number of faces per TIN. There is also an option for creating single or several Multi-Area TINs. The example below shows the TIN items further enhanced by the application of a Relief theme:



You can generate a Relief theme using the Theme wizard (**Map>Add Theme**). For more information about the creation of Relief themes, see [page 412, Using the Relief theme](#)

From an Existing Grid Item

Grid items can be used to create a TIN. TINs have two advantages over Grids:

- they are faster at redrawing in 3D
- some 3D formats do not support grids, so by converting your data to a TIN before exporting you can import it into other 3D viewing packages

- 1 Select the grid item.

- 2 Choose the **Item>3D>Grid>Convert to TIN** command.



- 3 You will be asked for a tolerance: the smaller the number you supply, the more triangles you will get.

◆ Tolerance

When converting a grid to a TIN, Cadcorp SIS tries to use as few triangles as possible, because this saves memory and makes the time taken to draw the 3D image faster. The result is large triangles covering lots of grid points. These large triangles are accurate at their corners, but may deviate in the interiors of the triangles. There are two ways of ensuring accuracy within the triangles:



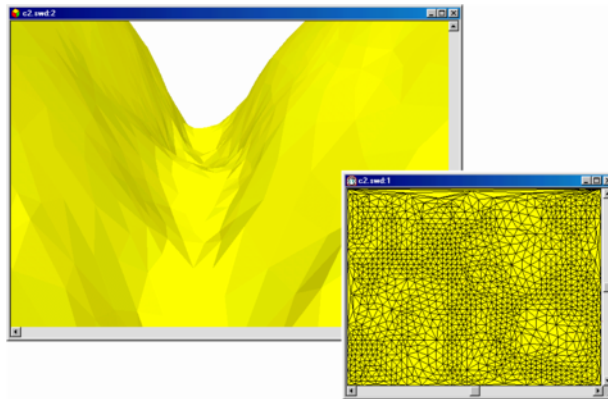
- raise the tolerance
- once the TIN is drawn, use **Item>3D>TIN>Subdivide**

The former will provide more accurate data initially; the latter will make any subsequent contours added to the display smoother.

Troubleshooting If you view your TIN in 3D you may find it looks wrong. Lowering the exaggeration to less than 1 may correct this.

◆ Viewing a TIN

You can view a TIN in 3D by using the 3D window but all editing must be carried out in the map window. ➤Chapter 9: “Viewing 3D Data”



◆ Selecting a TIN

When selecting a TIN you can use either the area snap or the line snap. This selects the whole TIN.

◆ Examining height values of a TIN

To see the height values of TIN items:

- 1 In the first pane in the Position bar (which lists co-ordinate display formats) select the option Co-ordinates or choose Grid item (eg DTM or DEM).
- 2 Tick the Track option.
- 3 Move the cursor over the TIN. You see a constant read-out of the cursor's position, including the height, at that point on the TIN.

◆ Display and editing of a TIN

A TIN can have a bitmap image or vector data draped over it. You can also create contour lines (using the Contour theme) and flow arrows (using the Flow theme). ➤Chapter 42: “Editing TINs”

◆ Editing a TIN

➤Chapter 42: “Editing TINs”

◆ Using the Relief theme

You can use the Relief theme to indicate relief on TIN items. ➤page 412, **Using the Relief theme** ➤Chapter 19: “Thematic mapping”

■ Creating 3D graphics using the Snap toolbar

Using the Snap toolbar with no Z values

If you want to place an area item or a line item onto a map on a position relative to any other two items, use the Snap toolbar.



To construct a line or area item with no Z value (height):



- 1 Start the **Construct>Geometry 2D>Line** or **Area** command.
- 2 While you are in the Construct mode, click on the X Snap button to snap to an X co-ordinate.
- 3 Click on an item where the X co-ordinate is known.
- 4 The Y and Z buttons now become active. Here you can click a known Y co-ordinate. The Z co-ordinate will be taken as the default value, normally 0 metres.
- 5 Repeat steps 2 to 4 for the rest of the line/area.
- 6 Click Enter to complete the line/area.

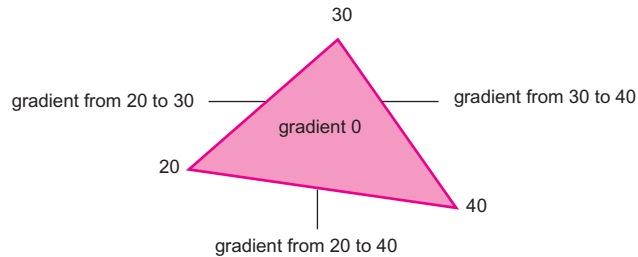
Using the Snap toolbar with Z values

If you want to construct a line or area item with a Z value:

- 1 Activate the **Construct>Geometry 2D>Line** or **Area** command.
- 2 While you are in the Construct mode, click on the X and Y Snap buttons to snap to X and Y co-ordinates.
- 3 Click on the point where you want the X and Y co-ordinates.
- 4 The Z button now becomes active. Here you can add a Z co-ordinate. To do this type two commas followed by the height in the relevant units in the Position box. The default for the Map Window you have open may vary. For example:
, , 10m
would add a height of 10 metres to the point.
- 5 Click Enter.
- 6 Repeat steps 2 to 4 for the rest of the line/area.
- 7 Click Enter to complete the line/area.

You may find that the default height value for the whole map window becomes the last Z co-ordinate you added. To reset the Z co-ordinate to zero, type two commas followed by zero in the Position box and press Enter.

If you draw an area with height values, you will find that you can see the gradient on the Position box. The gradient will appear only on the edge of the area, not the centre (see diagram below). To view this open a 3D Window.



Using the position bar with Z values

You can also use the Position bar to type in point heights.

- 1 Draw your area or line.
- 2 Select it.
- 3 Click and hold on the vertex you want to assign a height value to.
- 4 Drag this vertex to the position bar.
- 5 Type two commas and the required height, eg
,, 50m
and press Enter.
- 6 Repeat steps 2 to 5 for any other vertices requiring heights.
- 7 Again, you may have to reset the height value for the whole of the map window.

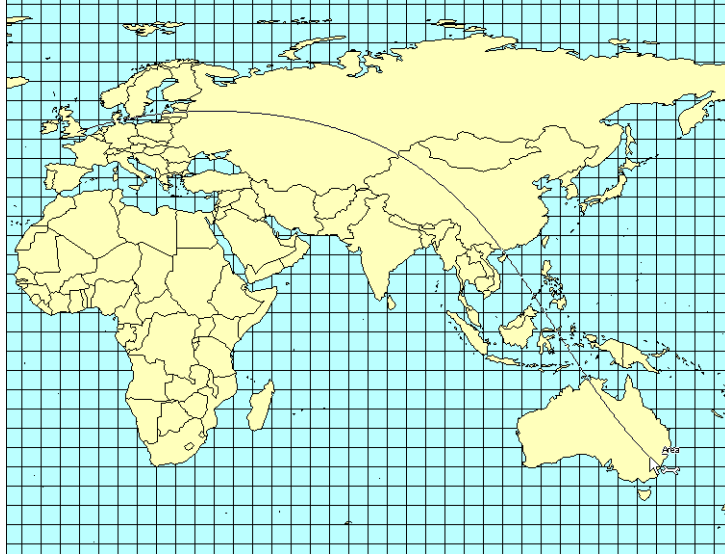
■ Geodetic lines and buffers

For many applications, sufficient accuracy is provided by 2D graphical constructions, and you do not need to consider the curvature of the earth when using them. However, for some tasks, such as plotting flight paths or navigation routes, 2D constructions would not be sufficiently accurate. Cadcorp SIS provides tools for constructing items that do take the earth's curvature into account. Using commands on the **Construct>Geodetic** menu, you can create:

- geodetic buffer items (**Construct>Geodetic>Buffer**)
- Great Circle line items (**Construct>Geodetic>Great Circle Line**)

◆ Create Great Circle line

A great circle line is a line item that takes into account the earth's curvature. The great circle line in the following illustration is being constructed between London and Sydney. The **Great Circle Line** command calculates the true path over the earth's surface.



- 1 Choose the **Great Circle Line** command from the **Construct>Geodetic** menu.
- 2 Cadcorp SIS prompts you for a distance. This value determines the length of each line segment that will be created to represent the great circle line. For greater accuracy, choose lower values (shorter lengths).
- 3 Click to define the start position of the line. The temporary graphics show the great circle line being constructed. Click twice to define the end of the line.

◆ Create geodetic buffer

A geodetic buffer is a buffer around an item that takes into account the earth's curvature.

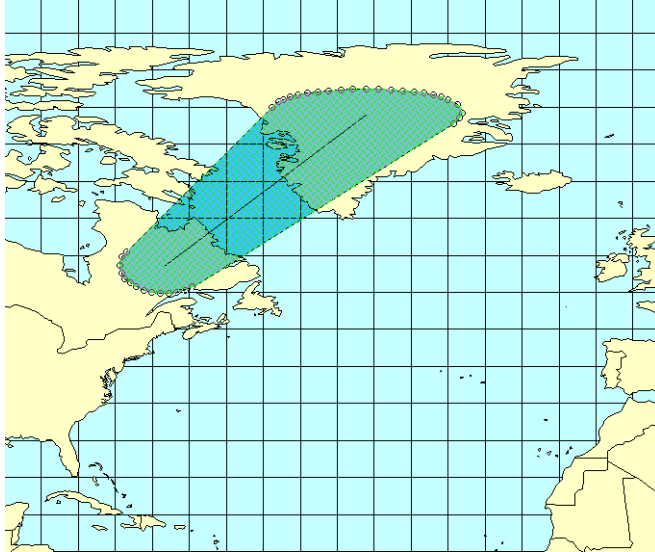


- 1 Select an item that you want to buffer.
- 2 Choose the **Buffer** command from the **Construct>Geodetic** menu. The Create Geodetic Buffer dialog opens.

A screenshot of the 'Create Geodetic Buffer' dialog box. It has a title bar with a question mark and a close button. Inside, there are two input fields: 'Radius (metres):' with the value '400000m' and 'Number of buffer points:' with the value '60'. To the right of these fields are 'OK' and 'Cancel' buttons.

- 3 Supply the radius for the buffer.
- 4 In the Number of buffer points box, type a value that determines the resolution or accuracy of the buffer. For greater accuracy, use higher values.

- 5 Click OK to create the buffer.



Cadcorp SIS constructs the buffer by constructing a temporary set of circles along the route of the buffer. The number you provide in the dialog determines how many points are used to construct each circle, thus defining the accuracy of the resulting buffer.



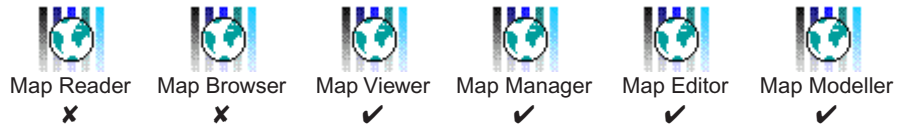
50 points



15 points



5 points



Pens and brushes

■ What are pens and brushes?	423
■ Pens.	423
■ Brushes.	426

■ What are pens and brushes?

Every item in Cadcorp SIS is displayed with a pen. A pen has:

- a colour
- a thickness
- a linestyle

A pen can also:

- exist on multiple levels
- have an offset
- have symbols which draw at the start and end of the line
- have a user-defined pattern
- have symbols which draw at intervals along a line

Area items are outlined with a pen and filled with a brush. A brush:

- has a colour
- is opaque or transparent
- can have user-defined hatch patterns
- can contain symbols or bitmaps that draw repeatedly inside the filled area

Pen and brush definitions are stored in libraries ➤Chapter 50: “**Named object libraries (NOLs)**”. Cadcorp SIS comes supplied with a variety of pens and brushes, and you can also create your own. ➤Chapter 44: “**Editing pens and brushes**”

Use the Styles toolbar for easy access to the Pen, Brush, and Shape controls.



■ Pens

Every item has a pen shown in an item’s Property dialog. Pens define the colour, thickness and pattern of lines and outlines.

◆ Styles toolbar pen

When you construct graphics, the new items are drawn using the pen shown in the Styles toolbar:

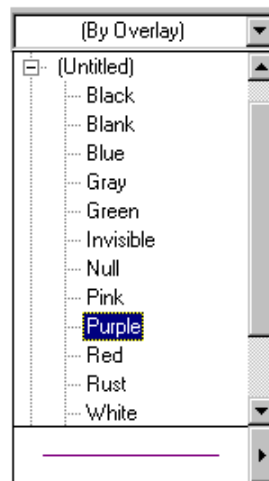


The Styles toolbar pen is:

- the pen of the currently selected item
- the pen of all currently selected items (if they all have the same pen)
- nothing, if multiple items are selected which have different pens
- the default pen for the current overlay if no items are selected

The pen shown in the Styles toolbar is normally adopted by any currently selected graphics and also by any new graphics you create subsequently.

You can change the Styles toolbar pen to any available pen (that is, any pen in any of the enabled libraries). Click the name of the folder containing the pen you want, then double-click the required pen:



◆ Overlay pen (By Overlay)

Each overlay is automatically assigned a pen, called the overlay pen (By Overlay). When graphics are drawn, if the Styles toolbar pen is (By Overlay), the graphics are drawn in the pen assigned to the overlay on which they reside.



Changing the overlay pen

- 1 Display the Overlays dialog.
- 2 Select the Styles tab.
- 3 Select the overlay for which you want to change the pen.
- 4 Double-click on the required pen in the Pen drop-down list. The overlay name is now highlighted in the colour of the pen you have just chosen.

- 5 Click OK. This changes all graphics on that overlay which use the (By Overlay) pen to the pen you have just chosen.

◆ Forcing the pen of all graphics on an overlay

This is similar to setting the (By Overlay) pen (see above), except that this procedure makes all graphics on the overlay use the selected pen, not just those which use the (By Overlay) pen.



- 1 Display the Overlays dialog.
- 2 Select the Styles tab.
- 3 Select the overlay for which you want to force the pen.
- 4 From the Pen drop-down list, choose a pen.
- 5 Click in the Override checkbox, then click OK.

◆ Forcing the colour of all pens on an overlay

This procedure makes all line items on the overlay display in the selected colour, while leaving their other characteristics (linestyle and line thickness) to be determined by their assigned pen.

- 1 Display the Overlays dialog.
- 2 Select the Styles tab.
- 3 Select the overlay for which you want to force the colour.
- 4 Click the Override checkbox adjacent to the Colour drop-down. From the Colour drop-down, choose a colour. This can be from the basic colours or your previously-defined custom colours. Alternatively you can create a new custom colour (Define Custom Colors button). Then click OK.

◆ Changing the pen of an editable item

Select the item and either:

- select the desired default pen from the drop-down on the Styles toolbar (remember to change it back unless you also want future graphics to be drawn in this pen)
- change its pen property. ➤ Chapter 14: “Properties”

If the item’s pen colour does not change, make sure that there are no overrides set on the pen or Colour in the Overlays dialog, Styles tab.

If you choose (By Overlay), this indicates that no pen is set for the current item, and it will be displayed in the overlay pen for the overlay on which it resides.

◆ Changing the pen of an Ordnance Survey feature (UK specific)

- 1 Select the required feature from the (standard) library.
- 2 Copy this into an editable library. (Remember that the (temporary) library is deleted at the end of the session.) ➤ Chapter 50: “Named object libraries (NOLs)”
- 3 Choose Properties from the feature table’s local menu.
- 4 Select the feature whose pen you wish to change. Under the Pen option, you will see its pen name is called Implicit. Choose a new pen from the drop-down list. These are the normal pens available in your libraries.



- 5 Back in the map window you will need to use the **Map>Redraw** command or press F5 to see the changes.

◆ Creating your own pens

You can create your own pens. ➤ Chapter 44: “Editing pens and brushes”

◆ Implicit pens

Ordnance Survey graphics use implicit pens with names like P_SOLID_255:0:0_0. The components of their name mean the following:

P means pen

SOLID is the style. It must be SOLID, DOT, DASH, DASHDOT or DASHDOTDOT.

255:0:0 are red, green and blue values (between 0 and 255) separated by colons

0 is the thickness in 1/100ths of a millimetre (or 0 for a standard thickness)

Using the above formula, you can make an implicit pen.

□ RGB values for common colours

red	255:0:0
green	0:255:0
blue	0:0:255
yellow	255:255:0
magenta (light purple)	255:0:255
cyan (turquoise)	0:255:255
orange	255:128:0
pink	255:128:128
brown	96:32:0
black	0:0:0
white	255:255:255
dark red	128:0:0
dark green	0:128:0
dark blue	0:0:128

Example An implicit pen with a purple dashed linestyle would be:

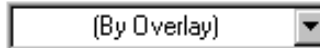
P_DASH_128:0:128_0

■ Brushes

A filled item (eg an area, polygon, box text, etc) uses a brush which defines its fill characteristics. The brush property can be viewed in the Property dialog.

◆ Styles toolbar brush

When you construct new filled items they are filled using the brush shown in the Styles toolbar at the top of the screen:

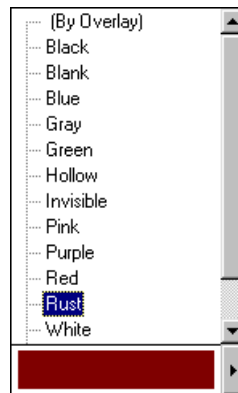


The Styles toolbar brush is:

- the brush of the currently selected item
- the brush of all currently selected items (if they all have the same brush)
- nothing, if multiple items are selected which have different brushes
- the default brush if no items are selected

The brush shown in the Styles toolbar is adopted by any currently selected filled items and also by any new filled items you create.

You can change the Styles toolbar brush to any available brush (that is, to any brush in any of the libraries you are using). Click the name of the folder where the brush is kept, then double-click the required brush:



◆ Overlay brush (By Overlay)

Each overlay is automatically assigned a brush, called the overlay brush (By Overlay). When filled items are drawn, if the Styles toolbar brush is (By Overlay), the filled items are filled using the brush assigned to the overlay on which they reside.

Changing the overlay brush

- 1 Display the Overlays dialog.
- 2 Select the Styles tab.
- 3 Select the overlay for which you want to change the brush.
- 4 Double-click on the required brush in the brush drop-down list.
- 5 Click OK. The fill of all filled items on this overlay which use the (By Overlay) brush, are then changed to use the brush you have just chosen.

◆ Forcing the brush of all filled items on an overlay

This is similar to setting the (By Overlay) brush (see above), except that this time all filled items on the overlay use the selected brush, not just those using the (By Overlay) brush.



- 1 Display the Overlays dialog.
- 2 Select the Styles tab.
- 3 Select the overlay for which you want to force the brush.
- 4 From the Brush drop-down list, select a brush.
- 5 Click in the Override checkbox. Then click OK.

◆ Changing the brush of an editable filled item

Select the filled item and either:

- select the desired default brush from the drop-down list on the Styles toolbar (remember to change it back unless you also want subsequently created graphics to be filled with this brush)
- change its brush property ➤ Chapter 14: “Properties”

If the item’s brush colour does not change, make sure that there are no overrides set on the brush in the Overlays dialog, Styles tab.

If you choose (By Overlay), this indicates that no brush is set for the current filled item, and it will be filled using the overlay brush for the overlay on which it resides.

◆ Creating your own brushes

You can create your own brush styles. ➤ Chapter 44: “Editing pens and brushes”

◆ Implicit brushes

Implicit brushes are used by Ordnance Survey (eg in their Meridian, LandForm, Strategi datasets, etc). They are also used with USGS for DLG and with Census Bureau for TIGER/Line 95, etc.

Implicit brushes do not exist as named objects. They are displayed according to their name, which has the format B_SO_128:0:128. The components of their names have the following significance:

B	means brush
S	the fill pattern: S for solid, H for hollow, or one of +, X, , -, \, / for hatched patterns
O	transparency: T for transparent, O for opaque
128:0:128	red, green and blue values (between 0 and 255) separated by colons

So the implicit brush B_SO_128:0:128 would display filled items with a solid, opaque purple fill.

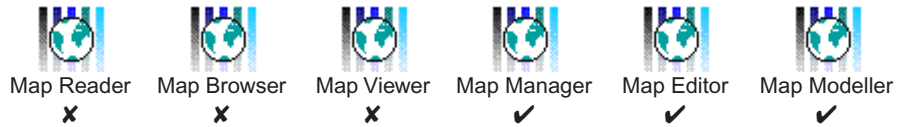
Advanced implicit brushes

The names of advanced brushes have the following form:

B_ft_r:g:b_gapx_gapy_ang_bX_bY_BRot_{pen,shp,bmp}

❑ Names of advanced brushes

Component	Defines
gapx	gap between X repetitions
gapy	gap between Y repetitions
ang	angle for repetitions
bX	should X lines be drawn?
bY	should Y lines be drawn?
bRot	should shapes be rotated?
pen	Library pen to use
shp	Library Shape to use
bmp	Library stored bitmap item



Precision dimensions and locations

■ Introduction	431
■ Snapcodes	431
■ Units	433
■ Snap grids	438
■ The axes	439
■ Typing co-ordinates	441

■ Introduction

◆ When do you need precision?

There are many occasions when you need to give a precise dimension or location. For example:

- when moving datasets to an exact location (eg raster files or DXF files which are not geo-referenced)
- when panning the view to an exact location on the map base
- when constructing graphics: eg drawing items, creating blocks, shapes or assemblies, creating topology, or working in 3D (with grids, TINs, etc)
- when selecting graphics
- when editing graphics, such as moving them to a new location, changing their outline, altering their dimensions, or scaling them

◆ The aids to precision

If you need to draw precisely, or to move items to precise locations, there are several features to help you to do this:

- snapcodes
- units
- snap grids
- axes
- typing co-ordinates

■ Snapcodes

Sometimes you want to select graphics by an exact position, such as the end of a line, or you may want to draw to an exact location, such as the centre of a circle.

By using snaps you can draw to precise points on existing graphics, such as ends of lines, midpoints of lines, centres of circles, etc.

Some snapcodes such as Line and Area appear at the cursor position when your cursor is in the correct location. By clicking when you see these snapcodes, you know you are snapping to the Line or Area.

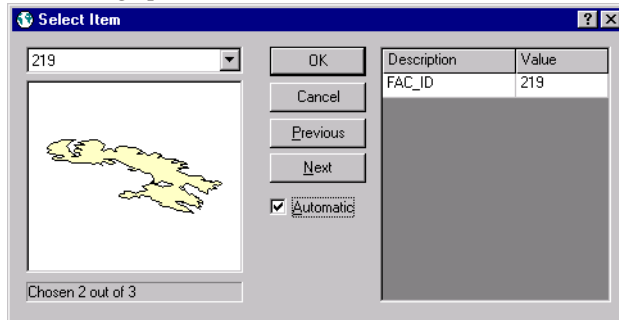
The available snaps, with their keyboard shortcut shown, are shown in the following table. Some are used only for selecting graphics, not in situations where you are creating graphics:

□ Snapcodes

Area	A Snap to the centre point of an area item. In the situation where several area items are found, the area with the smallest extent is selected (unless the Select dialog is in automatic mode - see below). When used with TINs and DTMs, it snaps to the Z height of the 3D item.
Box	B Snap to one of the justification points of a box text item.
Centre	C Snap to the centre of an arc or circle.
Dot	D Prevent snapping. The exact position of the cursor is used.
End	E Snap to the nearest end of a line.
Grid	G Snap to the nearest snap grid intersection point. This snapcode is available only if the snap grid is displayed and enabled for snapping (see the Map>Snap grid... command).
 Hook	H An item's hook point is the centre of a rectangular box drawn around it. It does not work with all item classes, for instance, not with point items.
Line	L Snap to the nearest geometric point on the nearest line item.
Middle	M Snap to the mid-point of a line segment.
Normal	N Snap to the nearest line, correcting to perpendicular.
Point	P Snap to a point or point text item.
Query	Q Show the Map Tips for that point.
Raster	Snap to a raster pixel. This snapcode is available for both un-compressed and compressed raster data. This snap is the only one which cannot be typed from the keyboard.

❑ Snapcodes (Continued)

Select S When you are using the **Edit>Select** command, this snap allows you to choose which item you require in ambiguous snapping situations. The Select Item dialog opens:



➤Chapter 34: “**Selecting graphics**”

Vertex V Snap to the nearest vertex point. This could be the end of a line, corner of a polyline, vertex point on a circle, etc.

X-Cross X Snap to the nearest intersection of two lines.

◆ Forcing snaps

Except in the case of the Raster snap, you can force the cursor to a snap by typing the keyboard shortcut.

To prevent the cursor snapping to a point, press the D key (for digitised) and the exact position of the cursor is used, with no correction.

◆ Forcing the Select Item dialog



In the Preferences dialog (displayed by the **Tools>Preferences...** command), there is an option called Automatically show Select Item dialog. When this is ticked, the Select Item dialog shows whenever you click on the map window, if there is a choice of items to select.

➤page 591, **Preferences**

■ Units

This section gives information on the units for linear, area, volumetric and angular measurements.

For information about typing co-ordinate units, ➤page 441, **Typing co-ordinates**.

Whenever you type units in Cadcorp SIS, you can:

- add a unit abbreviation (a unit specifier) to indicate the units of measurement to be used.
- type numbers with no unit specifier. If you do not specify the units, Cadcorp SIS assumes you mean the current set units. If the current co-ordinate system is Cartesian, the linear units are used (mm, km, etc), and if the co-ordinate system is spherical (Latitude/Longitude), the angular units are used (degrees, radians, etc).

Example If the current set units were millimetres (mm), you could type 4 metres in any of the following ways:

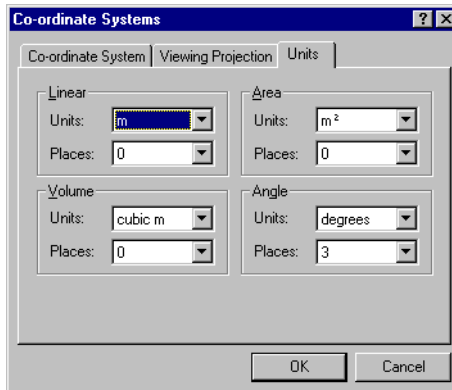
4000
4m
.004km
13.13'
and so on.

◆ Current set units



To set the units, use the **Map>Co-ordinate systems...** command. On the Units tab you can set your preferred units of measurement for each of the following:

- linear units
- area units
- volumetric units
- angular units



For each of these, select the unit required and the precision (number of decimal places).

◆ Typing units

When you select one of the Units drop-downs, you see a list of the available units. The units are listed using their specifier. The specifier is what you must use when typing units. For example, included in linear units are millimetres, centimetres, metres and kilometres. When you give dimensions using these units, you type mm, cm, m or km: for example 43mm, .043m.

◆ Unit definitions

The following table lists the units supported by Cadcorp SIS. The Name column shows the name of the unit as it is shown in Cadcorp SIS.

□ Units supported by Cadcorp SIS

Type	Name	EPSG	Notes	Ref.	Source	Unit	Multiplication factor
↔	ch (Ben)	British chain (Benoit 1895 B)	uses Benoit's 1895 British yard-metre ratio as given by Bomford as 39.370113 inches per metre; used in West Malaysian mapping	[1]	EPSG	metre	20.1167824943759
↔	ch (Sear)	British chain (Sears 1922)	uses Sears' 1922 British yard-metre ratio as given by Bomford as 39.370113 inches per metre; used in East Malaysian and older New Zealand mapping	[1]	EPSG	metre	20.11677651215526
↔	ch (US)	US Survey chain	used in USA primarily for public lands cadastral work	[2]	EPSG	metre	20.1168402336805
☼	degrees	degree	$\frac{\pi}{180}$		EPSG	radian	1.74532925199533E-02
☼	DMS	degree minute second	$\begin{array}{c} \text{degrees} \quad \text{arcminutes} \quad \text{arcseconds} \\ \text{integer} \quad \quad \text{integer} \quad \quad \text{real} \\ \text{space} \quad \quad \quad \text{space} \end{array}$		EPSG	radian	
			Convert to degrees using formula.				
↔	fathom	fathom	6 feet		EPSG	metre	1.8288
↔	foot	foot		[3]	EPSG	metre	0.3048
↔	ft (Cla)	Clarke's foot	assumes Clarke's 1865 ratio of 1 British foot = 0.304797265 French legal metres applies to the international metre; used in older Australian, southern African and British West Indian mapping	[4]	EPSG	metre	0.304797265
↔	ft (Sear)	British foot (Sears 1922)	uses Sears' 1922 British yard-metre ratio as given by Bomford as 39.370147 inches per metre; used in East Malaysian and older New Zealand mapping	[1]	EPSG	metre	0.304799471538676
↔	ft (US)	US survey foot	used in USA	EPSG	EPSG	metre	0.304800609601219
↔	GLM	German legal metre	used in Namibia	[5]	EPSG	metre	1.0000135965
☼	gradians	grad	$\frac{\pi}{200}$ In France, also abbreviated as "gr".		EPSG	radian	0.0157079633267949

□ Units supported by Cadcorp SIS (Continued)

Type	Name	EPSG	Notes	Ref.	Source	Unit	Multiplication factor
↔	Ind ft (Cla)	Indian foot (1975)	Indian foot = 0.99999566 British feet (A R Clark 1865); British yard (3 feet) taken to be J S Clark's 1865 value of 0.9144025m; rounded to 8 significant figures as 1 Ind ft = 0.3048995m; used in India since metrication	[6]	EPSG	metre	0.3047995
↔	km	kilometre		[7]	EPSG	metre	1000
↔	lk (Ben)	British link (Benoit 1895 B)	uses Benoit's 1895 British yard-metre ratio as given by Bomford as 39.370113 inches per metre; used in West Malaysian mapping	[6]	EPSG	metre	0.201167824943759
↔	lk (Cla)	Clarke's link	$\frac{1}{100}$ Clarke's chain Assumes Clarke's 1865 ratio of 1 British foot = 0.304797265 French legal metres applies to the international metre; used in older Australian, southern African and British West Indian mapping	[4]	EPSG	metre	0.2011661949
↔	lk (Sear)	British Link (Sears 1922)	uses Sears' 1922 British yard-metre ratio as given by Bomford as 39.370147 inches per metre; used in East Malaysian and older New Zealand mapping	[1]	EPSG	metre	0.20116767651215526
↔	lk (US)	US Survey link	used in USA primarily for public lands cadastral work	[2]	EPSG	metre	0.201168402336805
↔	m	metre	also known as International metre	[7]	EPSG	metre	1
↔	mile	Statute mile	5280 feet	EPSG	EPSG	metre	1609.344
↔	mile (US)	US survey mile	used in USA primarily for public lands cadastral work	[2]	EPSG	metre	1609.34721869444
↔	nautical mile	nautical mile			EPSG	metre	1852
☼	radians	radian	SI standard unit	[7]	EPSG	radian	1
☼	tubo	tubo	3 feet × 6 feet				

□ Units supported by Cadcorp SIS (Continued)

Type	Name	EPSG	Notes	Ref.	Source	Unit	Multiplication factor
↔	yd	British yard (Benoit 1895 B)	G Bomford “Geodesy” 2nd edition 1962; after J S Clark “Remeasurement of the Old Length Standards”; Empire Survey Review, no. 90; 1953	[1]	EPSG	metre	0.914399204289812
↔	yd (Sear)	British yard (Sears 1922)	uses Sears’ 1922 British yard-metre ratio as given by Bomford as 39.370147 inches per metre; used in East Malaysian and older New Zealand mapping	[1]	EPSG	metre	0.914398414616029
↔	yd (Ind)	Indian yard	Indian Foot = 0.99999566 British feet (A R Clarke 1865); British Yard (= 3 British feet), taken to be J S Clark’s 1865 value of 0.9144025 metres	[8]	EPSG	metre	0.914398530744441

Key

- ↔ length unit
 ✱ angular unit
 ☒ areal unit

References

- 1 G Bomford “Geodesy” 2nd edition 1962; after J S Clark “Remeasurement of the Old Length Standards”; Empire Survey Review, no. 90
- 2 Bureau of Land Management technical bulletin 6 (1973) and Standard Field Tables 8th Edition (1956)
- 3 ISO; 1958
- 4 Australian Land Information Group, <http://www.auslig.gov.au/geodesy/datums/>
- 5 Chief Directorate Surveys and Land Information; Mowbray; South Africa
- 6 G Bomford; “Geodesy”; 3rd edition 1975
- 7 ISO 1000
- 8 G Bomford “The Re-adjustment of the Indian Triangulation”; Survey of India Professional Paper 28; 1939

EPSG

The European Petroleum Survey Group (EPSG) was formed in 1986. It disseminates information to improve oil industry survey practices and procedures. From this group, the geodesy working group maintains a relational database of geodesy parameters which is used in Cadcorp SIS.

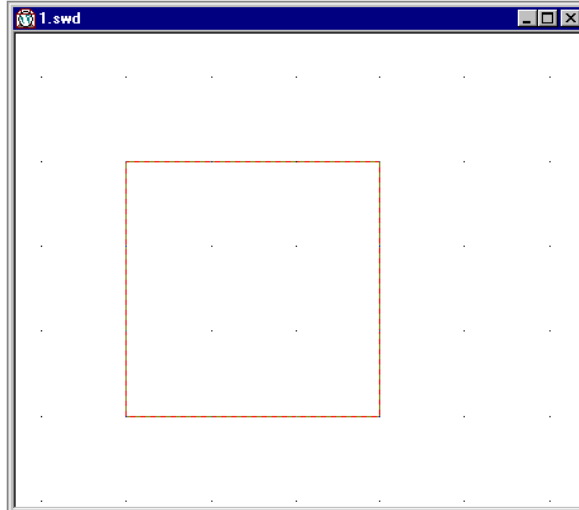
The European Petroleum Survey Group has compiled and distributes the various geodetic and cartographic co-ordinate system parameters. The co-ordinate systems in this database are listed in Cadcorp SIS.

■ Snap grids

Snap grids are used as an aid when:

- calibrating a digitiser
- constructing graphics

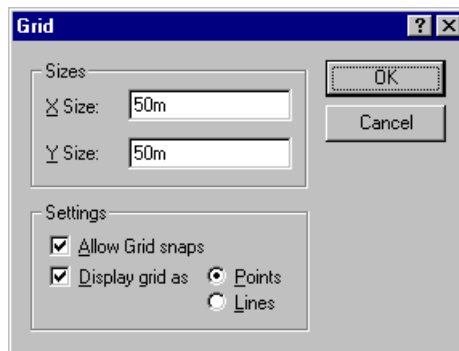
For example, with a grid set up with 10m spacing between grid points, you can use the Grid snapcode to draw a 30m by 30m rectangle:



◆ Setting up a snap grid



- 1 Select the **Map>Snap grid...** command.
- 2 Type the spacing you require in the X Size and Y Size boxes:



Notes

Snap grids do not appear on the print.

The X Size and Y Size need not be the same, so you can have a rectangular grid.

You can toggle the display of the grid on or off (use the Display grid as a checkbox).

The grid can be displayed either as lines or as points marking where the intersections of the lines would be.

Checking the Allow Grid snaps option allows you to force a snap to the nearest grid point by using the G snapcode.

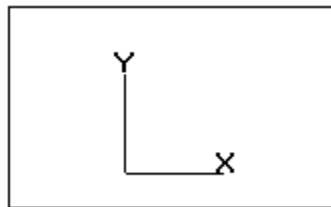


Grids are displayed parallel to the current Cartesian axes rotation. If you use the **Map>Axes>Angle...** command to rotate the axes, the grid is rotated to align with the axes.

To remove the grid, select the **Map>Snap Grid...** command and use a spacing of 0m and 0m.

■ The axes

The axes indicate the current orientation of the X and Y planes.



You may change the location of the axes origin, and also their orientation (and hence the X, Y and Z planes).

You reference or use the axes when:

- giving co-ordinates using the Co-ordinates format ➤page 441, **Typing co-ordinates**.
- cutting and pasting ➤page 441, **The axes and cutting, copying, and pasting**
- constructing rectangles, ortho lines, or dimensions, and displaying snap grids. All these are constructed parallel to the current X and Y axes.



You may choose whether or not the axes are displayed on your screen (using the **Map>Axes>Show** command). The axes are not printed.

These commands are for Cadcorp SIS Map Editor and Cadcorp SIS Map Modeller users.

◆ Axes origin and co-ordinates

The origin of the axes is used as the reference point from which measurements are taken in the following co-ordinate formats:

- Co-ordinates
- Irish Grid
- National Grid

◆ The axes origin and the National Grid (UK specific)

When using the standard Great Britain projection, the origin of the axes is the National Grid origin, and the axes origin are displayed here (which is why they are not usually visible on your screen). The axes can be moved to any position in 3-dimensional space and rotated to any angle.

An example of when you might need to do this is to enable you to input data from a measured survey.



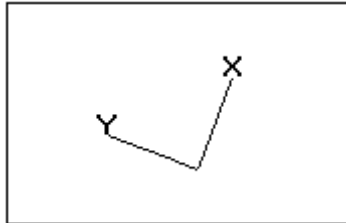
- 1 Select the **Map>Axes>Move** command. The axes become attached to the cursor.
- 2 Choose a position for the origin, either by snapping a position on the map, or typing in a co-ordinate (which can be a 3D co-ordinate). You will see the axes placed at this point. They rotate around the origin as you move your cursor.
- 3 Choose the orientation for the axes, by doing one of the following:
 - to keep the axes at their normal angle of rotation, press Enter
 - to rotate the axes to a new angle, give a position on the X axis (by co-ordinates or by clicking), then a position on the Y axis (or press Enter to use the current alignment of the Y axis relative to the X axis)

◆ Rotating the XY plane



- 1 Select the **Map>Axes>Angle** command.
- 2 Type in the angle by which the XY plane is to be rotated from its default angle. You may input any angle from -360° to 360° , positive angles being measured anti-clockwise from East (which is 0), and vice versa.

The following example shows the axes rotated by 70° :



◆ Rotating any plane

- 1 Select the relevant **Map>Axes** command:



Spin X rotates the YZ plane around the X axis



Spin Y rotates the XZ plane around the Y axis



Spin Z rotates the XY plane around the Z axis

- 2 Type in an angle by which the relevant plane is to be rotated. Positive numbers rotate the axes anti-clockwise (counterclockwise), and negative ones clockwise. The angle you enter for these commands is always incremental from the current orientation, and has no reference to compass bearings.

◆ Changing the axes back to their default (normal) setting

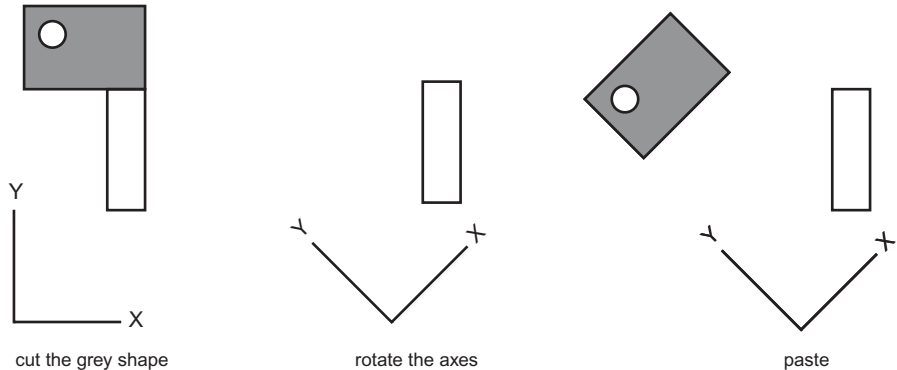
It is good practice to re-set the axes to their default location and rotation after use, otherwise co-ordinates you type subsequently may give undesired results.



The **Map>Axes>Normal** command will return the axes to their normal origin (National Grid origin) and rotation.

◆ The axes and cutting, copying, and pasting

When you cut or copy graphics to the clipboard, the item(s) remember their position and orientation relative to the location and angle of the axes at the time. When you paste them back, they are given the same position and orientation they had, only with reference to the location and angle of the axes now in force.



■ Typing co-ordinates

Co-ordinates specify positions. They are used:

- to show the current location of the cursor ➤ Chapter 6: “**Working with map windows**”
- when a precise location is required in drawing, measuring, moving, and so on. In this case you must type in co-ordinates.

Co-ordinates are both displayed and entered in the first pane of the position bar. If you begin to type a number while the focus is in the map window, the focus is moved to the position bar, allowing you to input co-ordinates.

The co-ordinate display format is shown in the first pane of the position bar. Co-ordinates must be typed as required by the co-ordinate display format currently in use. ➤ Chapter 6: “**Working with map windows**”

◆ Co-ordinates format

When typing in co-ordinates format, you must consider the following:

- whether the co-ordinate system projection is Cartesian or spherical
- the order in which the co-ordinates appear
- the units used ➤ page 433, **Units**
- whether absolute or relative mode is used ➤ page 444, **Absolute and relative modes**

The format looks like this:

241km,596km,0m	X, Y and optional Z position from the origin (Cartesian co-ordinate projection such as UK National Grid)
52.35°,1.14°,0m	latitude, longitude and optionally height. (spherical co-ordinate projection, such as Latitude/Longitude). Use negative values for Southern latitudes and Western longitudes.

Order of co-ordinates

Axes co-ordinates must be entered in the following order, with a comma separating each part of the entry:

450m,300m	X co-ordinate,Y co-ordinate (2D)
450m,300m,10m	X co-ordinate,Y co-ordinate,Z co-ordinate (3D Cartesian co-ordinates)
51°,1°,10m	Latitude, Longitude, Height (3D spherical co-ordinates)

Irish Grid format

IN 5067 6432	Use the format defined by the Irish Grid co-ordinate system. Locations are measured relative to the Irish Grid origin.

Latitude/Longitude format

51.569°,-3.760°,0km	Input positions in latitude, longitude and height (above the geoid), using the current co-ordinate system datum. Use negative values for Southern latitudes and Western longitudes.

See also ➤page 433, **Units**.

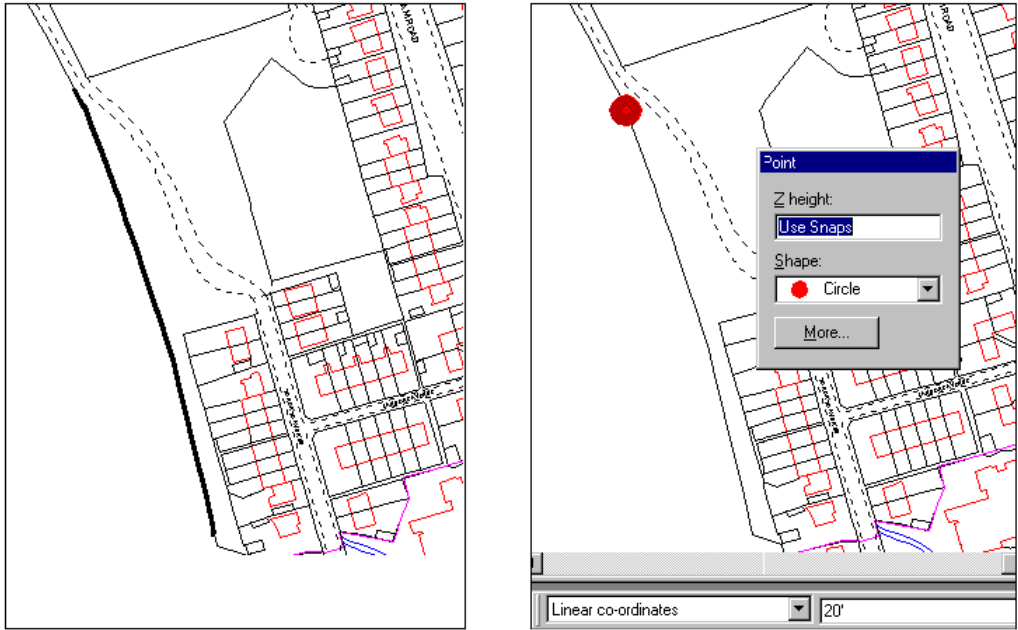
Linear co-ordinates

Linear co-ordinates input distances along a line, which you first define using the **Measure>Setup>Linear co-ordinates** command. This is useful for things like placing Shapes at specified non-regular intervals along an outline.



- 1 Select the **Measure>Setup>Linear co-ordinates** command.
- 2 Define the line along which the measurements will be taken, by tracing over an existing line item. When defining this line, use the same options as when constructing a trace line using the **Construct>Geometry 2D>Line...** command. ➤Chapter 23: “**Overlays, levels, and commands**”
- 3 The co-ordinate display mode changes to Linear co-ordinates. You can now construct items such as points, placing them along the line you have just defined, by typing in a distance.

- 4 The items are placed on the line at this distance from the start of the line.



National Grid format (Great Britain)

TQ 43765 62893

Uses the format defined by the Great Britain National Grid system. Positions should be given relative to the National Grid origin. The accuracy is determined by the number of digits you input (this example is given to an accuracy of 1 metre).

Polar co-ordinates format

215.76, 221.46, 0.00 Positions are shown as a bearing and a distance (and optional height) from the position chosen with the **Measure>Setup>Polar co-ordinates** command. When typing your own co-ordinates do not use units or you will receive an error message. Separate each number with a comma and a space, eg 215.76, 221.46, 0.00.

Relative polar co-ordinates format

48.70, 147.80, 0.00 You must type a bearing and distance, plus optional height, relative to the last snapped position. Do not use units or you will receive an error message. Separate each number with a comma and a space eg 48.70, 147.80, 0.00.

WGS84 Latitude, Longitude, Height format

-4°,52',48m

This mode allows you to type in a position using latitude and longitude. You can also add a height (above the geoid) to give a 3D position.

◆ Absolute and relative modes

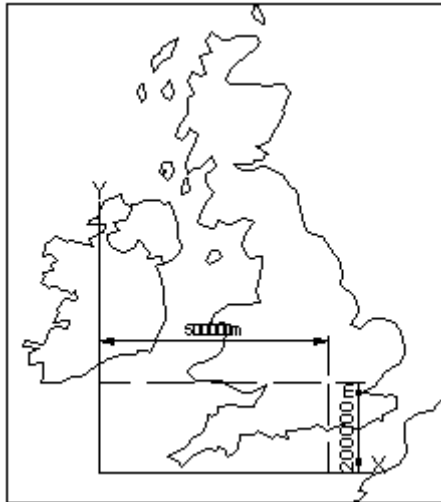
When inputting positions using the Co-ordinates format, co-ordinates may be either absolute or relative, depending on the point from which they are measured.

Absolute co-ordinates

Absolute co-ordinates are measured from the projection origin. An absolute co-ordinate is made up of measurements only (there is no R or r in front of the numbers).

When using the projection British National Grid, the origin (unless you change it) is a position off the Isles of Scilly in the south west: N.G. ref. SV 000 000.

The position shown below can be referred to as 500km,200km.



500km,200km,20m indicates the same plan position, but 20 metres off the ground.

Relative co-ordinates

Relative co-ordinates enable you to specify positions relative to the previous position you gave. The previous position could be either a co-ordinate you typed or a position on screen where you clicked.

Relative co-ordinates require the letter R or r in front of the number. For example, R50,R10 (with the preferred units set to metres) means 50 metres east and 10 metres north from the previous position given.

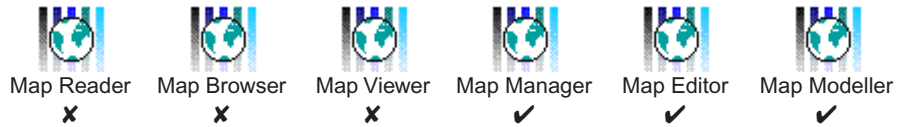
Mixing Absolute and Relative co-ordinates

Absolute and relative forms may be mixed, so that 500km,R20m means 500 kilometres east from the projection origin and 20 metres north from the previous position given.

If a number in the co-ordinate is missed out, it is assumed to be R0 (relative zero).

Example R20, is the same as R20,R0.

Note that a comma is required after the first co-ordinate.



Selecting graphics

■ Selecting graphics	447
■ The display of selected graphics	447
■ Selecting single items	447
■ Selecting several items at once	449
■ Combining selection methods	451
■ Selecting all items on all editable or hittable overlays	451
■ Selecting all items on an overlay	452
■ Finding and selecting items	452

■ Selecting graphics

You must select items before you can edit them.

There are many methods of selecting items. Most are described in this chapter, but see also ↗Chapter 56: “**Spatial testing: loci**”.

You can select items only if the overlay they are on is either hittable or editable (ie the status visible does not allow selection of graphics). Hittable graphics, when selected, may be copied to the clipboard or replicated, but may not be edited. Editable graphics may be copied to the clipboard, replicated or edited. ↗Chapter 15: “**Working with overlays**”



Before you select items, you must end the current command if there is one in operation. Do this by pressing the Esc (escape) key. This puts you into the **Edit>Select** command, which is the Cadcorp SIS default command.

■ The display of selected graphics



Selected graphics are highlighted, that is, displayed in a colour which contrasts with their normal colour. Selected graphics can also be made to flicker, to make them more conspicuous, using the Flicker selection option on the Options page in **Tools>Preferences...**

When you have several items selected, only the dominant one displays handles. The dominant item is normally the last item selected. You can change the dominant item by clicking on the required item with the Ctrl key held down.

■ Selecting single items

To select a single item, click on it. Only one item at a time can be selected by this method. If you click on the wrong item, clicking on the correct item will de-select the incorrect one. In the case of area and polygon items, you can select them by clicking on their outline or anywhere inside their outline.

◆ Selecting items by a particular point

As you click on items to select them, you can grab them by a precise point, such as the end or midpoint of a line. To do this, use snaps. ➤Chapter 33: “**Precision dimensions and locations**”, **Snapcodes**, page 431.

◆ Selecting one from a number of coincident items

Sometimes several graphical items may be exactly coincident, making it difficult to select the item you want. This is often the case when you have traced over existing graphics.



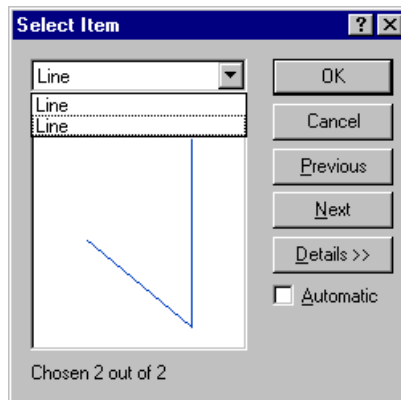
To select an item which is coincident with other items, use the S (Select) snapcode when the cursor is in the correct place, and use the **Edit>Select** command.

Alternatively you can choose to have the Select Item dialog automatically displayed whenever you click on spatially coincident items. To choose this mode, either click in the Automatic checkbox in the Select Item dialog, or select the Automatically show Select



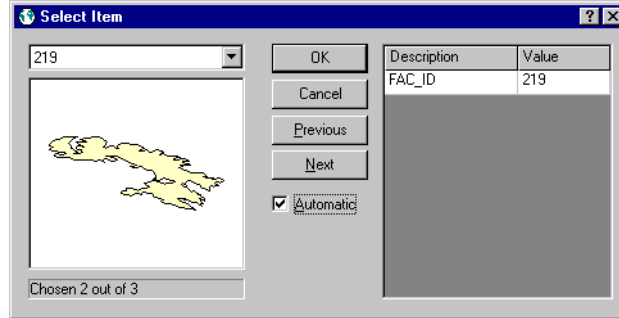
Item dialog option in **Tools>Preferences....**

Using either method you will see the Select Item dialog box, where you can pick your item from the list of those found at the point you clicked.



You see a drop-down list giving all the graphics found at this point. As you select them (by scrolling through the list, using the Previous and Next buttons, or clicking the graphic to go to the next item) you are shown a graphic to help you choose the correct one. Click on OK when the required item is shown.

Click the Details button to show the properties of the currently selected item:



■ Selecting several items at once

The status bar at the bottom of the screen reports the total number of items selected, the number of editable items selected, and the class of item (if they are all of the same item class):



◆ Selecting several isolated items

To select more than one item, hold the Shift key down while selecting each in turn. Click on an already selected item to deselect it.

◆ Selecting groups of items with a selection box

To select a group of items which are close together, you can enclose them in a selection box. Click and hold, and you will see a rectangle rubber-banding on the cursor. Release the mouse button when the required area is encompassed, and all items whose extents are enclosed by the rectangle will be selected.

In the case of point and point text items, their extent is just the point itself (the extents of the point's shape or the text's letters are ignored).

When you have selected a range of items by creating a selection box around them, you can de-select individual items within the box by clicking on them while holding down the Shift key.

◆ Selecting groups of items with a fence

A more flexible method of selecting a group of items is to use a fence. A fence is a temporary line or circle, within which (if it is closed) or within a certain distance of which, all items are selected. The **Edit>Fence** commands provide four methods of creating a fence.

Selecting all items within a closed regular-sided fence



Use the **Edit>Fence>Area** command to draw a polygonal fence enclosing the items you wish to select.

- 1 Select the **Edit>Fence>Area** command (or press F6).

- 2 Draw an area item around the graphics to be selected.
- 3 When all the graphics to be selected have been enclosed, double-click or press Enter.
- 4 Press Escape to quit the command.

Selecting all items within a closed circular fence



- 1 Select the **Edit>Fence>Circle** command.
- 2 Either:
 - click a position on the map which will be the centre of the circular fence. Then click a position on the circumference, or press Enter and type in a radius.
 - press the Enter key and type in a radius. The circular fence is then attached to your cursor by its centre. Position it on the map and double-click.
- 3 Press Escape to quit the command.

Selecting all items within a certain distance of the fence line (buffer fence)

The buffer option allows you to construct a temporary line. All items which fall within a chosen distance either side or either end of the line will be selected.



- 1 Select the **Edit>Fence>Buffer** command.
- 2 Give a buffer distance. All items will be selected which fall within this distance of the fence line.
- 3 Click onto an existing piece of geometry, either a line or area item, to start the fence.
- 4 Click the next point on the path or, to delete the last point clicked, press the Backspace key. While clicking points you may use the following key combinations:

Shift + snap to draw to the snap point, even if it is not on the graphics (this is called jumping).

You will need to use this if you are not tracing existing graphics.

Ctrl + snap to trace to the end of the line on which you snap, rather than to the snapped position.

Shift + Backspace to go back to the last vertex point on the traced data, even if you jumped over it.

- 5 Press Enter to finish defining the path, or Ctrl + Enter to close by drawing to the first point snapped.
- 6 Press Escape to quit the command.

Selecting all items within a certain distance of one side of the fence line (offset fence)

If you want to select only those items which fall to one side or the other of the fence line, use the Offset option.



- 1 Select the **Edit>Fence>Offset...** command.
- 2 Type in an offset. All items will be selected which fall within this distance of the fence you are about to draw.

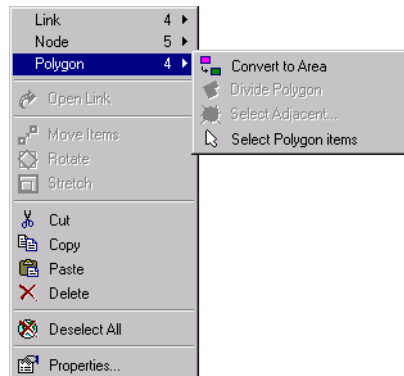
A positive value generates an offset to the left of the fence you define, so only items to the left of the fence are selected. A negative value generates an offset to the right, and ensures that only items which fall within the offset distance to the right of the fence are selected. (Left and right are when looking along the original line item in the direction in which it was drawn.)

- 3 Click onto an existing piece of geometry, either a line or area item, to start the fence.
- 4 Click the next point on the path. To delete the last point clicked, press the Backspace key. While clicking points you can use the same key combinations as the **Edit>Fence>Buffer** command (see above).
- 5 Press Enter to finish defining the path, or Ctrl + Enter to close by drawing to the first point snapped.
- 6 Press Escape to quit the command.

◆ Selecting one item class from items currently selected

When you have a number of items selected, the local menu shows you which item classes are included in the selection, and how many items of each class there are. (It also gives you their item menus).

If you want to have only one of these item classes selected, use the appropriate item command (accessed via the local menu or the Item main menu). For instance, if you want to have only polygon items selected, choose Select Polygon items. The other item classes become de-selected.



This works only in Cadcorp SIS Map Modeller and Cadcorp SIS Map Editor.

■ Combining selection methods

You may use the individual selection method, a selection box and a selection fence in conjunction with each other by holding the Shift key down each time you add to or subtract from the selection list.

■ Selecting all items on all editable or hittable overlays



Use the **Edit>Select All** (F7) or **Edit>Deselect All** (F8) commands to select/de-select all items in the SWD, as long as they are on editable or hittable overlays.

■ Selecting all items on an overlay

You can select all items on any particular overlay by selecting the overlay on the display view, theme view, or table view tabs of the workspace window, then using the overlay's local command Select Items.

■ Finding and selecting items



The **Edit>Find...** command allows you to find items in a number of different ways. You can define:

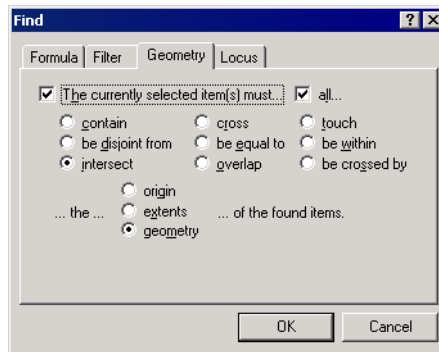
- a formula to find items with particular values for properties
- a filter
- a geometry test - eg you can find items that overlap the selected area item
- a locus

Items that meet your specifications are selected.

You can combine geometry tests, filters, loci, and formulae in any combination.

◆ Using items to find and select items

The Geometry tab of the **Edit>Find...** command allows you to use existing items to select other items, applying any of a number of tests. This command allows all OGC geometry relationships to be tested.



- 1 Select the item(s) ("the selected item(s)") to be used to find the other items ("the found items").
- 2 Tick the all... checkbox so that all of the selected items have to pass the test or leave it blank for one selected item to be enough.
- 3 Choose the selection criteria.

The tests, which conform to standard OGC specifications, are as follows.

❑ **Geometry tests for finding items**

Test	Finds items if
contain	their interior is completely inside the selected item
be disjoint from	they are completely separate from the selected item, and their boundaries do not touch
intersect	if they have a point in common with the selected item (they must not be disjoint)
cross	line items will be found if they intersect the selected item without being tangential. Other items will be found if their interior intersects with the interior of the selected item, and the selected item goes outside the found item.
be equal to	if their geometry is the same as that of the selected item
overlap	If the selected item is a line item, another line item will be found only if the two line items are tangential, and if neither contains the other. With other item classes, an item will be found only if its interior intersects with that of the selected item, and neither contains the other.
touch	if its interior is disjoint from that of the selected item, and if their boundaries intersect
be within	if the interior of the selected item falls completely within it
be crossed by	line items will be found if they intersect the selected item without being tangential. Other items will be found if their interior intersects with the interior of the selected item, and the found item goes outside the selected item.

You must also choose whether the selection is looking for the found item's geometry, its origin, or its extents to pass the test. An item's extents are considered to be a notional rectangle drawn to encompass the item. This rectangle is as small as possible, but still contains the entire item.

◆ **Using a locus to find and select items**

A locus allows you to limit which items are selected based on their position relative to the locus. ➤ Chapter 56: “**Spatial testing: loci**”

◆ **Using a formula to find and select items**

A formula can simply be a property (for instance, you could just select items with a certain feature code using the Feature Code property (`_FC&`)), or it can use a property or combination of properties in a mathematical or logical operation. ➤ Chapter 52: “**Formulae**”

Here are some examples of formulae you might use to select graphics:

□ Examples of formulae for selecting graphics

To select	Use the formula
only Building Outlines (Feature Code 1)	<code>_FC&=1</code>
all items except Road Centrelines (Feature Code 98)	<code>_FC&<>98</code>
only Building Outlines (<code>_FC&=1</code>), House Numbers & Building Names (<code>_FC&=1006</code>) and Road Centrelines (<code>_FC&=98</code>)	<code>(_FC&=1) or (_FC&=1006) or (_FC&=98)</code> each expression in brackets evaluates to true or false. An item can pass any one of the three expressions.
all items except Building Outlines (<code>_FC&=1</code>), House Numbers & Building Names (<code>_FC&=1006</code>), and Road Centrelines (<code>_FC&=98</code>)	<code>(_FC&<>1) and (_FC&<>1006) and (_FC&<>98)</code>
In this case an item must satisfy all of the expressions.	
only those Building Outlines which are closed, plus all other items except Road Centrelines.	<code>(_FC&<>1) and (_FC&<>98)</code> everything which is not Feature Code 1 or 98
or	<code>(_FC&=1) and (_closed&=-1)</code>
only Point items which fall within those Area items called Polygons	Feature Code 1, if the item is a closed shape <code>(FindContainer("Polygons")._id&<>0) and (_class\$="Point")</code>

◆ Using filters to find and select items



A filter allows you to base the selection process on the class of item, on features, on the properties of items, or on a combination of these. When an edit filter is applied (on the Filter tab, **Edit>Find...** command), the items filtered out are still displayed, but cannot be selected (they act as if they had been demoted to visible status).

Filters are named objects, stored in libraries, and so can be accessed on the library view tab of the workspace window. You can also create your own filters. These same filters can also be applied to selecting which items are displayed on screen. ➤ Chapter 16: “Filtering what you see”

Types of filter

There are several different types of filter, and they are used as follows:

To include or exclude entire classes of items If you want to exclude an entire item class from being selected, or conversely limit the selection process to just one item class (such as all Text items, or all Area items), use the Class based Filter.

To include or exclude certain feature types To exclude an entire feature type from being selected, or limit the selection process to include one feature type only, use the feature filter. This filter can be based on the feature types of many different datasets (eg LandLine, TIGER/Line95, Meridian, etc). It can also be used to include or exclude items with no feature code.

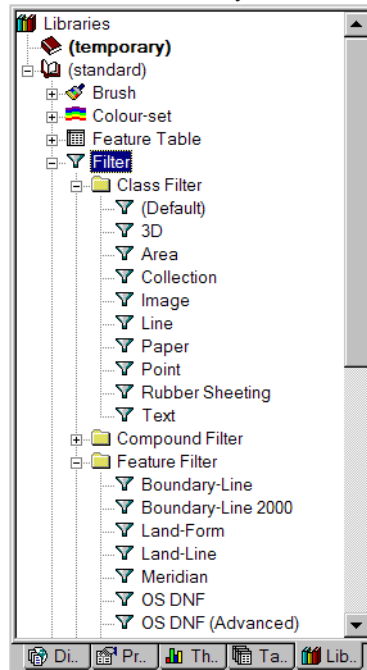
To include or exclude items based on their properties If you want to include or exclude items on the basis of a property value, use the property filter. For instance, you could limit the selection process so that only those items whose pen is Green are selected. Properties can also be combined in formulae.

To include or exclude items by combining filters Use the compound filter option to combine other filters.

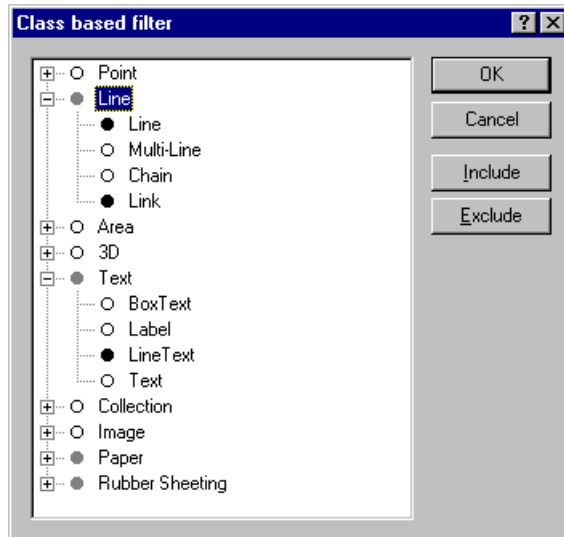
Filters in the (standard) library

Cadcorp SIS comes supplied with many filters already created. These are stored in the (standard) library and are read-only.

You can see the standard filters listed in the library view tab of the workspace window.



Using their local command Properties... you can see exactly what each filter includes or excludes. The following illustration shows the details of the property filter called Line. Only line items, link items, line text items and some paper and rubber sheeting items are included. All other items are excluded:

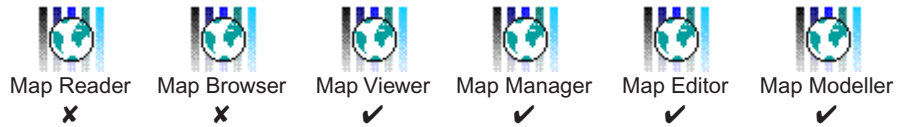


Applying edit filters

You can apply any of the filters supplied in the (standard) library or any you have created yourself and stored in an editable library. Or you can copy an existing filter and paste it into an editable overlay to alter it.

Creating your own filters

➤ Chapter 51: “Creating your own filters”



General editing techniques

■ Editing items	457
■ Deleting items	457
■ Moving, rotating, scaling, and mirroring items	457
■ Copying items	459
■ Placing multiple copies in regular arrays	459
■ Merging geometry: creating multi-geometry	462
■ Merging geometry: using Boolean methods	463
■ Breaking down complex items	463
■ Simplifying items	465
■ Generalising items	465

■ Editing items

When editing items, they must be editable or hittable, depending on the editing function chosen.

■ Deleting items

- 1 Select the items to be deleted. ➤ Chapter 34: “**Selecting graphics**” They must have a status of editable.



- 2 Either select the **Edit>Delete** command or press the Delete key on the keyboard.
If the selected items are a mixture of editable and hittable items, only the editable items will be deleted.

■ Moving, rotating, scaling, and mirroring items

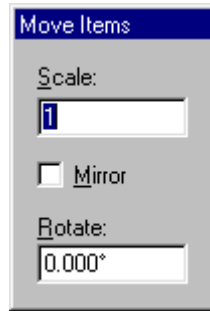
◆ Moving single or multiple items

- 1 Select the items. ➤ Chapter 34: “**Selecting graphics**”



- 2 Select the **Move Items** command (local menu or Alter main menu). This causes 9 handles to be superimposed over the selected item(s). These handles can be used to pick up and move the selected item(s).

- 3 The Move Items dialog box also opens. You can use this to:



- scale the item(s). A value greater than 1 increases the size, less than 1 decreases the size.
- create a mirror image of the item(s) around its/their Y axis
- rotate the item(s). A positive value will rotate it anticlockwise (in degrees), a negative value will rotate it clockwise (in degrees).

This command is not available in Cadcorp SIS Map Viewer.

◆ Rotating items: Alter>Rotate



Use the **Alter>Rotate** command to rotate selected items.

- 1 Select the item(s).
- 2 Select the **Alter>Rotate** command.
- 3 Click the first position.
- 4 Drag the item(s) about their centre point.
- 5 Click a second position to fix the item(s) in their new location.

◆ The Alter>Stretch command (rotating and scaling)



Use the **Alter>Stretch** command to rotate selected items, or rotate and scale them at the same time.

- 1 Select the item(s).
- 2 Select the **Alter>Stretch** command.
- 3 Click the first position.
- 4 Click a second position to fix the item(s) at their new size.

◆ Notes on rotated or mirrored bitmaps

Displaying rotated or mirrored bitmaps requires a lot of computer memory, so if your computer's memory is not sufficient, you will find they are displayed in outline only.

If they are displayed properly, but you find the computer slows down, you can choose to display rotated bitmaps in outline only, using the Draw rotated bitmaps checkbox on the Options tab of **Tools>Preferences...** (there is also a Print rotated bitmaps option, to speed up printing).



For information regarding the use of these options, and the display of rotated and mirrored bitmaps, ➤Chapter 4: “**Loading data**”, **Display of rotated/mirrored raster images**, page 70.

■ Copying items

◆ Copying editable items



- 1 Select the items. ➤Chapter 34: “**Selecting graphics**”
- 2 Select the Move Items command (local menu or Alter main menu).
- 3 Use the Move Items dialog box (➤Chapter 35: “**General editing techniques**”, **Moving single or multiple items**, page 457), but while carrying out the command keep the Ctrl key pressed down. This creates a copy of the item(s) on your map.
- 4 Keep the Ctrl key pressed down and repeat the command(s) for multiple copies.

◆ Replicating items



Both editable and hittable items may be copied using the **Edit>Replicate** command. This command creates an editable copy of the selected item(s) in a user-defined overlay without using the clipboard. The new copies are placed in exactly the same spatial location as the originals.

Edit>Replicate is useful for copying items between co-ordinate systems.

- 1 Select the item(s).
- 2 Select the **Edit>Replicate** command.
- 3 In the overlay to replicate to dialog, you can choose the overlay in which your replicated data will be placed, or you can create a new internal overlay for the data.
- 4 The new copy remains selected until you carry out another operation, so you may immediately reposition it if required.



The same result could be obtained by using the **Edit>Copy** and **Edit>Paste** commands. ➤Chapter 48: “**Using the clipboard**” However, when copying large amounts of data, it is preferable to use **Edit>Replicate**.

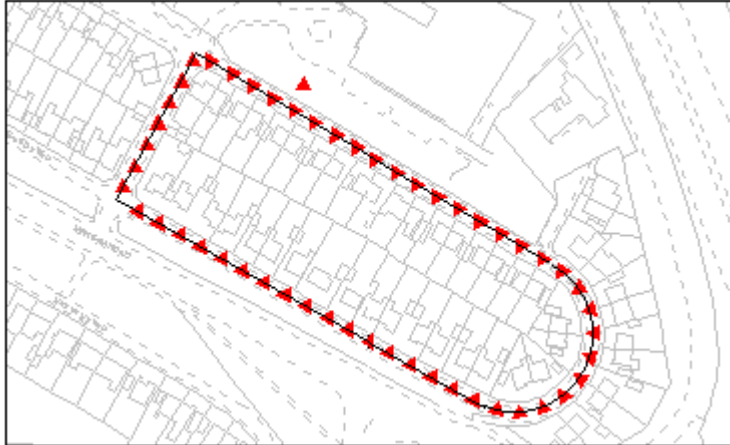
■ Placing multiple copies in regular arrays

An array is a regular repetition of an item or group of items. Cadcorp SIS enables you to create path, polar and rectangular arrays.

◆ Path arrays

A path array is a means of placing items at chosen regular intervals along a path on a line item.

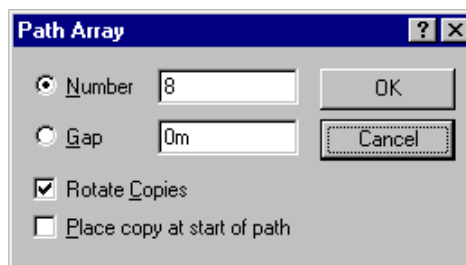
In the example below, an area of the map is outlined with red triangles to denote a particular purpose or zone.



Map extract © Crown copyright



- 1 If required, construct the line item along which to place the array copies.
- 2 If required, construct the graphics to be copied, or alternatively place a shape.
- 3 Select the graphics to be copied.
- 4 Select the **Construct>Array>Path...** command.
- 5 Click a position on the graphics to be copied. This is the reference point by which the copies will be placed along the path.
- 6 Click a point on the line item for the start of the path along which the copies will be placed.
- 7 Either:
 - click a point on the line item for the end of the path
 - hold the Ctrl key down and click anywhere on the line to make the path end at the end of the line item
- 8 In the Path Array dialog, specify the criteria for constructing the copies:



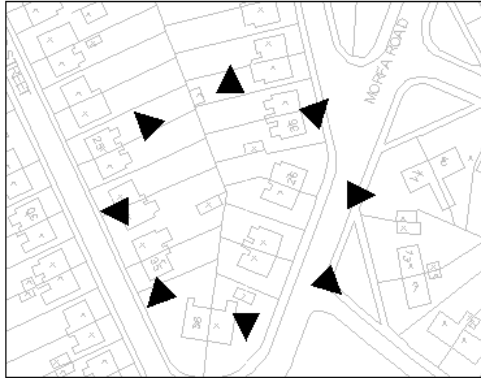
- The Number option enables you to specify the number of copies to be placed. Alternatively you may choose the Gap option, which allows you to specify the distance between each copy instead.
- The copies may be rotated so that they follow the direction of the line, or remain fixed in orientation.

- You have the option to place a copy at the start of the path.

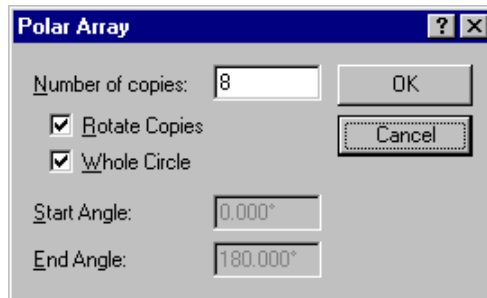
In the example shown above on the map extract, copies were placed every 10 metres, with each copy being rotated to align with the direction of the line.

◆ Polar arrays

A polar array is a replication of graphics in a circular pattern.



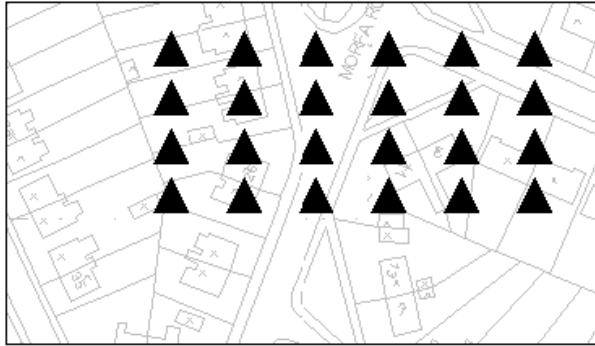
- 1 If required, construct the graphics to be copied, or alternatively place a shape.
- 2 Select the graphics to be copied.
- 3 Select the **Construct>Array>Polar...** command.
- 4 In the Polar Array dialog specify the criteria for constructing the copies:



- the Number of copies is the total, and includes the original copy
 - choose to have the copies rotated as they are placed around the circular array (as in the illustration above), or to maintain the original orientation
 - choose to copy items round a complete circle (as in the illustration above), or to have them created around just part of the circle (in which case you select the angle at which the copies start and end)
- 5 Click a position on the graphics to be copied. This is the reference point by which the copies will be placed around the circular array.
 - 6 Click a position for the centre of the circular array. The copies will be arranged around this centre point.

◆ Rectangular arrays

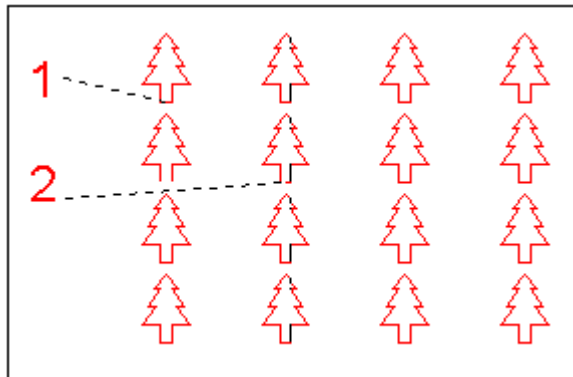
A rectangular array is a two dimensional matrix of copies. You can specify the number of horizontal and vertical copies.



Map extract © Crown copyright



- 1 If required, construct the graphics to be copied, or alternatively place a shape.
- 2 Select the graphics to be copied.
- 3 Select the **Construct>Array>Rectangular...** command.
- 4 In the Rectangular Array dialog input the number of copies required in both the X and the Y direction. This is the total number, and includes the original.
- 5 Click a position on the graphics to be copied. This is the reference point by which the copies will be placed (point 1 in the diagram below).
- 6 Click a position on screen where the second copy in both the X and Y directions will be placed (point 2 in the diagram below). The other copies then use the same spacing, to give a regular arrangement.



■ Merging geometry: creating multi-geometry

Multi-geometry items are a collection of point items, line items and/or area items. They are created from existing items in the following ways:



- by adding existing items together using the **Alter>Add Geometry** command
 ⇨ Chapter 28: “Creating collections”

- by editing existing items, using a Boolean method, to produce a new item

■ Merging geometry: using Boolean methods

All types of geometry can be merged together using Boolean editing operations to produce new geometric items. Some Boolean methods produce multi-geometry items.

The new item takes on the properties and attributes of the dominant item, so the commands sometimes show a dialog for selecting which item should be dominant. This does not appear if a choice is not necessary (for instance, if all selected items have the same style, data and height).

The height of the new item is the height of the dominant item, or the height of the dominant item's origin if the dominant item does not lie on a plane parallel to the XY plane.

For details on using these commands with line items or area items, ➤Chapter 36: “**Editing line items**” and ➤Chapter 37: “**Editing area items**”.

■ Breaking down complex items



Items with complex geometry can be broken down into simpler, separate items using the **Alter>Decompose...** command. You must first select the item(s) to decompose, then the command. For example, multi-geometry can be broken down into separate items, or a TIN can have each face converted to a separate area item. Data to be decomposed must be editable.

This command is available in Map Manager, Map Editor, and Map Modeller.

◆ Decompose and attribute data

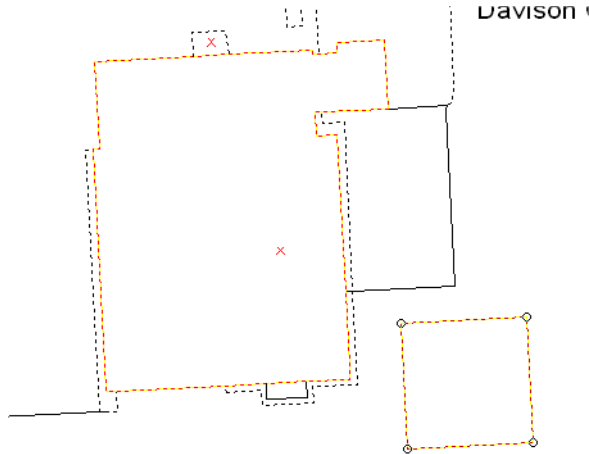
The **Alter>Decompose...** command appends any attributes on the original item to all of the decomposed items.

You may find it easier to edit the existing attributes in what are likely to be common item types than to input them again from scratch.



To use the **Alter>Decompose...** command:

- 1 Select the complex geometry in the map window that you want to decompose:



- 2 Choose **Decompose** from the Alter menu.
- 3 The complex geometry becomes separate items.

In this example, the complex geometry would decompose into two closed line items. Both retain the same attributes, but, as you might expect, the geometry properties in the two line items are different.

item 1

Attributes	
Description	Value
Feature Serial Number	1799
OS Sheet Number	TQ1503SE

Geometry	
Description	Value
Closed	True
Length	200.568046570115
Number of vertices	25
Origin Latitude	49.7661917246739
Origin Longitude	-7.55644116812172
Origin X	376.85
Origin Y	405.95
Origin Z	0
Simple	True
Size in X	44.96
Size in Y	53.57
Size in Z	0
Straight	True
Thin in X	False
Thin in Y	False
Thin in Z	True

item 2

Attributes	
Description	Value
Feature Serial Number	1799
OS Sheet Number	TQ1503SE

Geometry	
Description	Value
Closed	True
Length	76.6883459203548
Number of vertices	5
Origin Latitude	49.7661918928112
Origin Longitude	-7.55644047418802
Origin X	410.48
Origin Y	415.76
Origin Z	0
Simple	True
Size in X	20.07
Size in Y	20.07
Size in Z	0
Straight	True
Thin in X	False
Thin in Y	False
Thin in Z	True

■ Simplifying items

The OGC Simple Features specification contains rules for determining what can be classed as simple geometry (these are summarised below). When Cadcorp SIS simplifies geometry it follows the OGC rules, changing the original geometry as little as possible. It also keeps any data associated with the item, as far as it can.

Examples of when simple geometry may be required are:

- when exporting data for use in other programs. For example, lines with self-intersections can cause problems in other systems.
- when carrying out geometry tests. Many of these (for example, finding items which intersect with the selected item) rely on the items tested being simple.



You must first select the items to simplify, then select the **Alter>Simplify** command. This converts the selected item(s) to the OGC “simple” form (eg by removing self-intersections).

◆ Summary of the OGC simple form

- 1 A point item is always simple.
- 2 A line item is simple if it does not cross itself and it does not touch itself (except possibly at its end-points).
- 3 An area is simple if its loops do not cross and its interior is a single connected region.
- 4 Multi-items are simple if:
 - all the components of the multi-item are simple
 - the interiors of each component do not intersect any of the other components
 - in a simple multi-line, every junction between component lines has at least three paths leading out of it
 - in a multi-area, all the areas only touch at points

■ Generalising items



The **Alter>Generalise...** command, available in Cadcorp SIS Map Editor and Map Modeller, can be used to simplify line items. It is based upon the well-accepted and documented Douglas-Peucker algorithm.

The Douglas-Peucker algorithm simplifies lines while preserving shapes. The algorithm first joins the start and end vertices with a straight line. It then examines the perpendicular distances of the vertices from that line and, based upon a specified threshold, removes vertices within the threshold limit. The simplified line is then redrawn, in a series of successive tests.

The following example shows two simple cases of line generalisation resulting from different thresholds (distances) being set: the greater the threshold, the greater the simplification of the line (more vertices are removed).

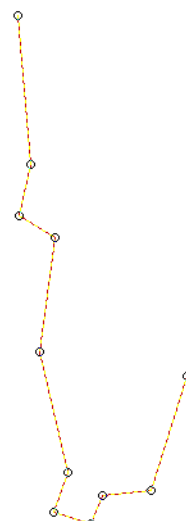
original line



generalisation 1

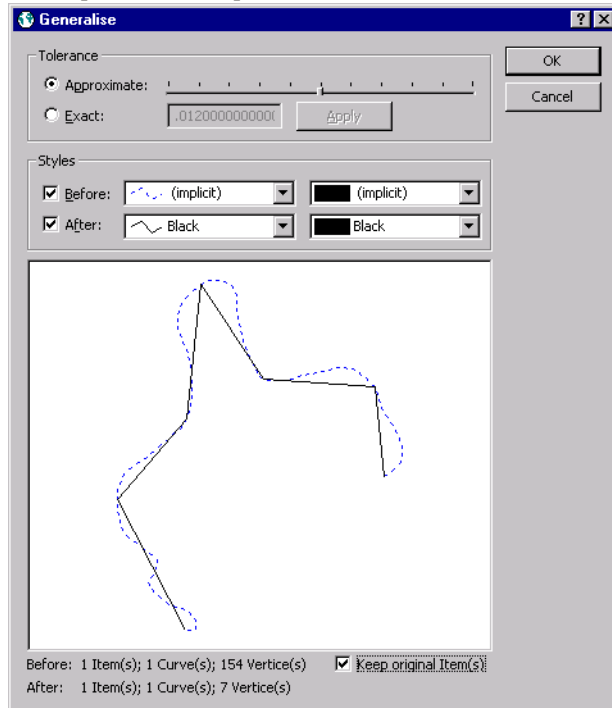


generalisation 2

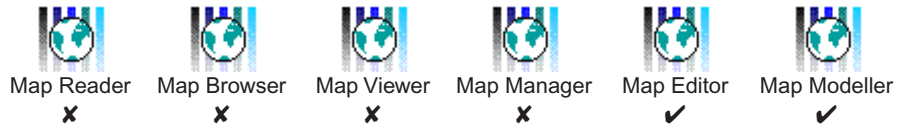


- 1 To simplify line items, select them, then choose **Generalise** from the Alter menu. The Generalise dialog opens.

- 2 Choose the tolerance value you want. You can either choose Approximate and move the slider, or choose Exact, then type in a tolerance factor and click Apply. You can see the effects of the operation in the preview window.



- 3 If you want to keep the original items intact, select the Keep original item(s) check box. When you are happy with the proposed simplification, click OK.



Editing line items

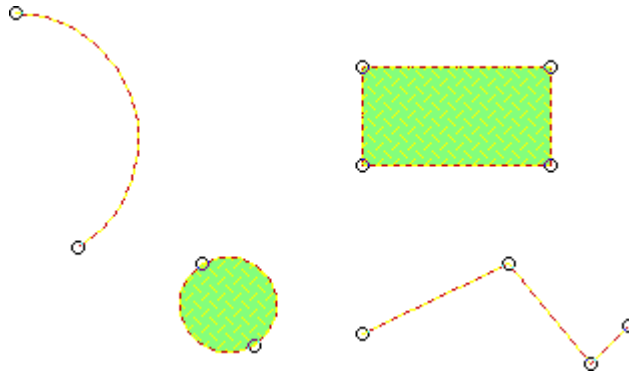
■ Selecting graphics before editing	469
■ Editing vertices (grab handles)	469
■ Editing lines	471
■ Editing dimensions	487

■ Selecting graphics before editing

Items must be selected and editable before editing. ➤Chapter 34: “Selecting graphics”

■ Editing vertices (grab handles)

When an editable item is selected, it has visible grab handles at its vertices:



◆ Selecting vertices

To select a handle, click on it. It becomes filled to show it is selected.

Once a handle is selected, press the tab key to select the next handle, and press Shift + tab to select the previous one.

In the case of a line which contains a large number of vertices (eg a freehand line), as you progressively zoom out, fewer and fewer vertices are displayed. However, pressing the tab key still steps to the next existing vertex, even if the vertex is not visible on screen.

◆ Moving vertices

- 1 Click once on the item to select it. Its handles then become visible.

- 2 Press and hold the mouse button down on the handle to be moved. The handle becomes filled to show that it is selected.
- 3 Keeping the mouse button held down, begin to move the cursor. You can then release the mouse button.
- 4 Click at the new position for the handle.

Move a handle on a circle to change the diameter.

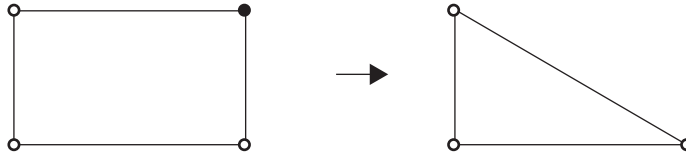
Move a handle of a circular arc to reposition one end, keeping the subtended angle the same.

You can move the handles of Bezier curves to reposition the ends or the control points.

◆ Deleting vertices

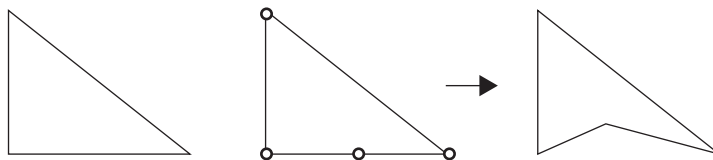
- 1 Click once on the item to select it. Its handles then become visible.
- 2 Click on the handle to select it (it becomes filled to show it is selected).
- 3 Press the Backspace key.

The vertex will be removed, and the graphic will change as though it is made of elastic stretched between pins. Deleting a vertex is like removing one of the pins. It is not possible to delete one of the two vertices of a single line segment.

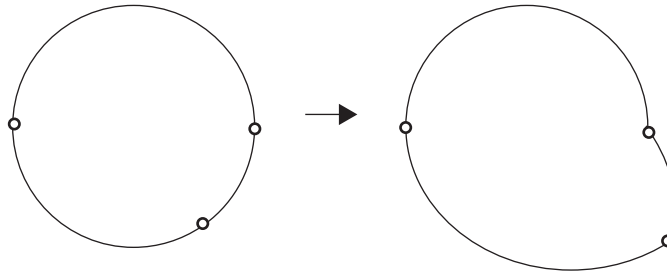


◆ Adding vertices

You can insert a vertex anywhere along the outline of a selected item by holding the Ctrl key down and clicking the cursor on the line. A handle appears at this point, which you can then move to the required position:



Adding a vertex to a circle will break the circle into a series of connected arcs. Moving these vertices moves the ends of the arcs:



The proportions of the arc are maintained, so that, if the arc is a semicircle, it will remain as a semicircle as the vertex is moved.

Adding a vertex to a Bezier curve splits it into two Beziers, each with its own four handles (two ends and two control points).

■ Editing lines

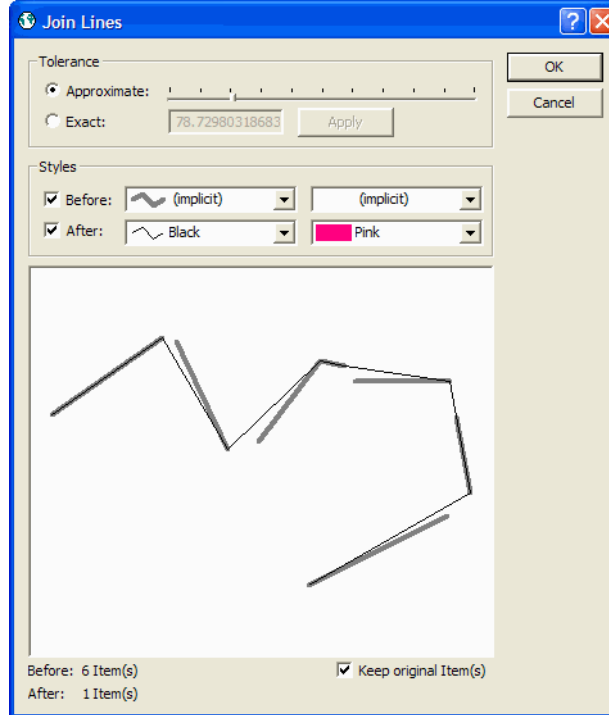
◆ Joining line items



The **Join Lines** command (on the **Item>Line>Line** menu) joins multiple selected line items. The Join Lines dialog shows you a preview of how the ends of each line will be moved, and you can see the effects of different tolerance values before making the changes. The dialog also gives you the option of creating a new line item and keeping the existing line items unchanged.

- 1 Select the items.

- 2 Select the Join Lines command. The Join Lines dialog opens.



- 3 Choose the tolerance, styles, and colours used to show the Before and After lines. Move the slider to change the tolerance value, or type in an exact value and click Apply.
- 4 If you want to keep the original items and create new line items, select the Keep original item(s) checkbox.

◆ Shortening or extending line segments



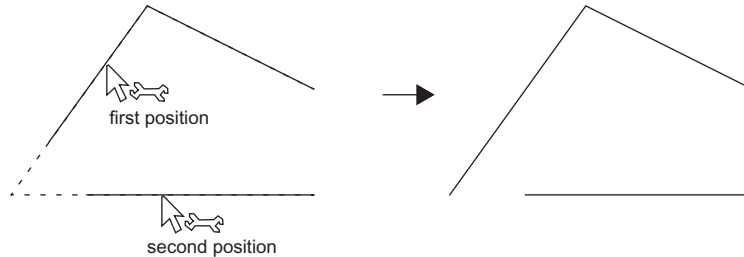
The **Alter>C.A.D.>Trim** command trims lines without joining them to other lines. The term trimming is used to describe either extending or shortening a line.

The line items must not be closed, nor can they be link items.

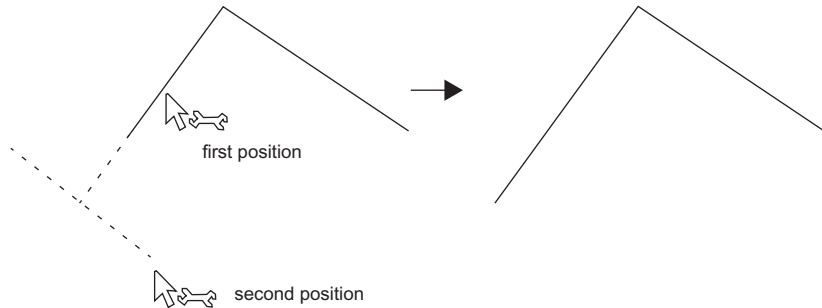
- 1 Select the **Alter>C.A.D.>Trim** command.
- 2 Select the line item to trim. Click on the line segment to trim, closest to the end which is to be extended or shortened.

Either:

- select a line to trim the first line to (in which case, the first line will be trimmed to meet the second line, or an imaginary extension of it):



- or select a point. The first line will then be lengthened or shortened to meet an imaginary line which would pass through this point at an angle normal to the line being trimmed:

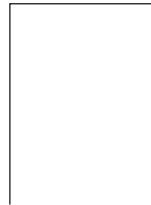


◆ Continuing an existing line

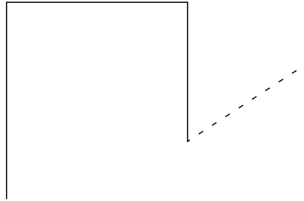


The local command Append Line allows you to continue a line you constructed earlier, carrying it on to draw further line segments. The original line and the new line all become part of a single line item. The line items must not be closed, nor can they be link items.

- 1 Select the existing line item.



- 2 Select the item command Append Line (accessed via the local menu or the Item main menu). You see a line rubberbanding from one end (whichever was the last position drawn to) of the selected line item:



If you want to append to the other end of the line item, you must first reverse it using the **Alter>Reverse** command.

- 3 Keep on inputting points to draw the line as normal.

◆ Changing the direction of a line

A line item remembers the direction in which it was drawn. The direction is important in the following cases:

- for some editing operations on the line item (eg when using the item command Append Line)
- with line items which use a pen with an offset
- when a line item is converted into an area item, and the area item uses a pen with an offset
- when constructing using offsets (eg with the **Construct>Geometry 2D>Line** and **Construct>Geometry 2D>Area** commands).



If you need to change the direction of an item or item(s), select them first, then use the **Alter>Reverse** command.

◆ Breaking one line item into two line items



The **Alter>C.A.D.>Break Line** command snips a single line item at the point where you click, so that two new line items are created, each having a vertex at the break position.

- 1 Select the command.
- 2 Click on the line item to be broken, at the point where the break is to be made.

The line will look the same. However when you try to select it you will see that it now consists of two separate line items, which meet at the point where you broke the original line.

◆ Moving part of a line item

Moving whole segments



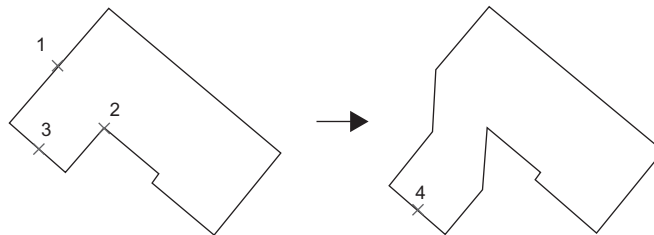
The **Alter>C.A.D.>Segment>Move** command moves the selected line segment to a new chosen position. The line segment remains joined to its original adjacent vertices by two new line segments.



Moving a path



The **Alter>C.A.D.>Path>Move** command is used to move a selected path to a new position. New lines are created connecting the path to its original adjacent vertices.

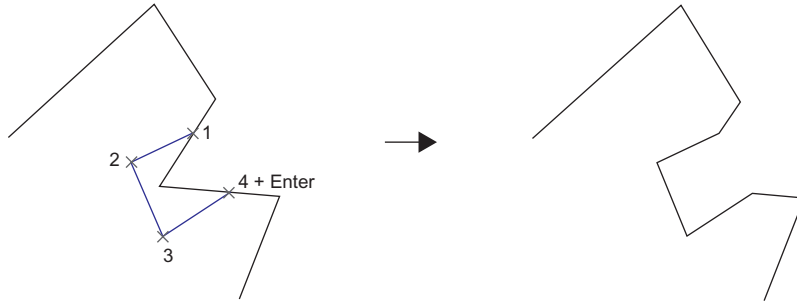


- 1 Select the command.
- 2 Select the start of the path (position 1 on the diagram).
- 3 Select the end of the path (2 on the diagram). The entire path between these two points will be moved.
- 4 Click a point to move from (3 on the diagram): this is the point by which the path is picked up and moved
- 5 Click a point to move to (4 on the diagram): the path will be moved so that the “move from” point (3) is placed at this point.

◆ Re-defining a path on a line item



The **Alter>Reprofile Line** command allows you to redefine a selected path of a line item, automatically deleting the old path and connecting the new path into the polyline. It can also be used with topology. ➤Chapter 29: “**Creating topology: links and nodes**”



- 1 Select the command.
- 2 Click a point for the start of the new path. This must be on an existing line item.
- 3 Click further points, just the same as when drawing a line, to construct the new path. The last point must be on the original line item.
- 4 Press Enter or double-click when you have finished.

◆ Deleting entire segments from a line item



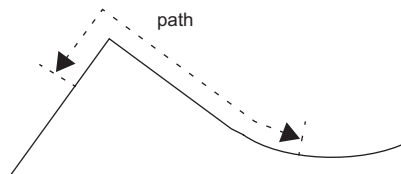
Use the **Alter>C.A.D.>Segment>Delete** command to remove a single line segment from a polyline.

- 1 Select the command.
- 2 Click on the line segment to delete.

If the segment intersects a line item, deleting it will produce two lines.

◆ Deleting a path from a line item

A path is any part of a line item between two user-selected points. These points may or may not coincide with vertices.



Use the **Alter>C.A.D.>Path>Delete** command to delete a path.



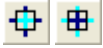
- 1 Select the command.
- 2 Click a point for the start of the path.

- 3 Click a point for the end of the path. The path between these two points is deleted.



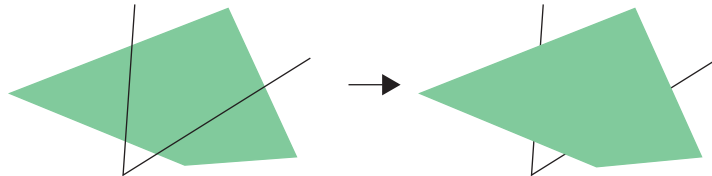
If you use this command on a closed line item, the path taking the shortest route between the two points is deleted.

◆ Deleting parts of a line item which fall inside or outside an area

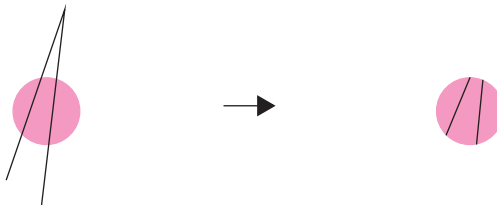


Using the **Alter>C.A.D.>Snip** commands you can snip away portions of selected items which fall inside or outside an area item. These commands can also be used to remove parts of area items.

- 1 Select the item(s) to snip.
- 2 Choose the appropriate Snip command (**Delete Inside** or **Delete Outside**).
- 3 Click on the area item to use.



a Line item snipped with Delete Outside



a Line item snipped by an Area item, with Delete Inside

◆ Using existing item(s) to cut away parts of an existing line



The **Alter>Boolean>Subtract** command allows you to cut away part of a line item using other items to do so. The resultant line item is a multi-line. The items used to do the cutting are deleted. Chapter 36: “**Editing line items**”, **Merging existing line items to form one multi-line**, page 481

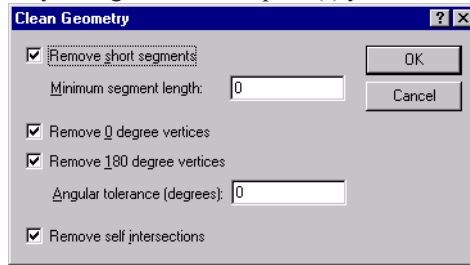
◆ Deleting unwanted line segments or vertices



The **Alter>Clean Geometry** command offers you various options for cleaning up lines or outlines which you may have drawn, or (more probably) which have been digitised. It can remove unwanted vertices or spurious small line segments.

- 1 Select the item(s) to clean.

- 2 Choose the **Alter>Clean Geometry** command.
- 3 In the Clean Geometry dialog, choose the option(s) you wish to use:



Deleting spurious small segments

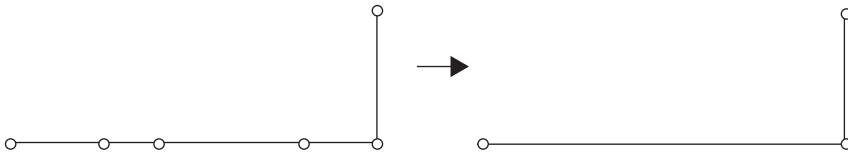
- 1 Put in a value for the Minimum segment length. Any segments shorter than this are removed.



- 2 Make sure the other options are not checked if you do not wish to use them.

Deleting co-linear or redundant vertices in the middle of a line segment

Click on the option Remove 0 degree vertices.



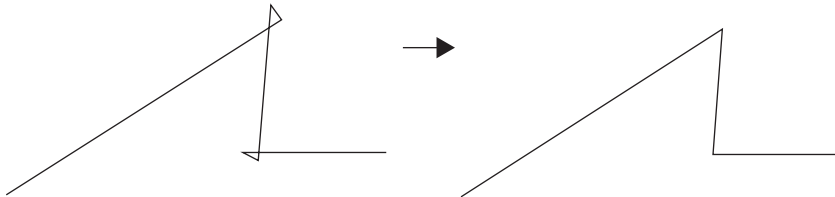
Removing spikes in a line

Click on the option Remove 180 degree vertices.



Removing self intersections

Click on the option Remove self intersections.

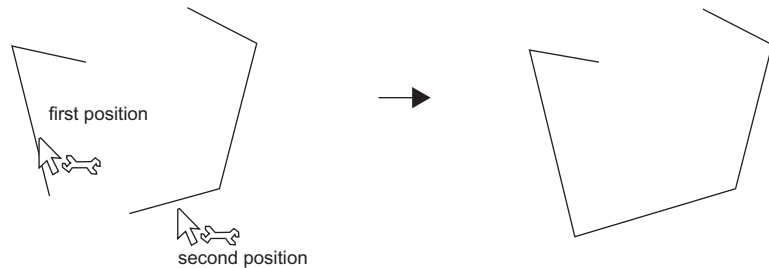


◆ Joining two lines by extending or trimming



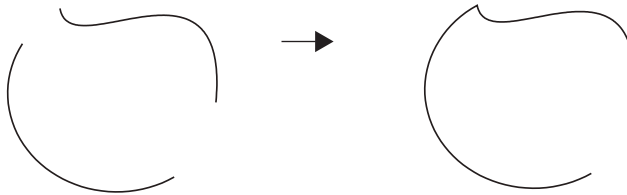
The **Alter>C.A.D.>Trim and Join** command extends or shortens two lines so they meet, joining them into a single polyline.

- 1 Choose the **Alter>C.A.D.>Trim and Join** command.
- 2 Select the first of the two lines to be joined.
- 3 Click on the second of the lines, near to the end at which it should be joined to the first line:



The line segments are truly extended, and no vertex remains at the original line ends.

When curves are intersected in this way, they are shortened or lengthened along their own length, using the rules of their own geometry:



an arc and a Bezier before and after Intersection

If the two items you join have different pens, the resulting item inherits the pen of the first one selected.

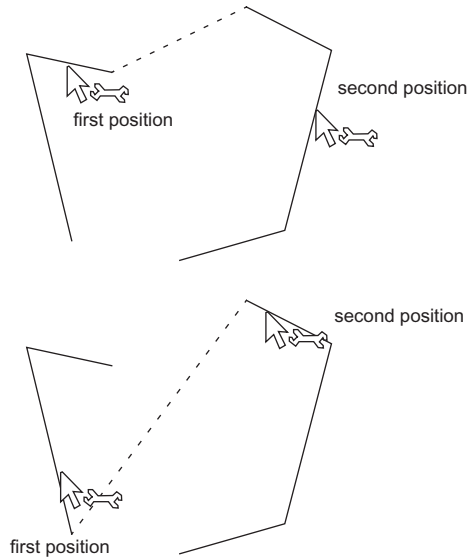
◆ Joining two lines with an additional line segment



The **Alter>C.A.D.>Join** command joins two line segments into one, linking them together by an additional straight line segment (unless the line ends are already touching).

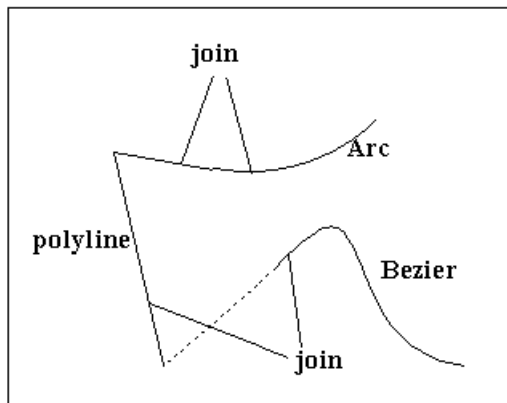
- 1 Choose the command.
- 2 Click on the first line, near to the end by which it is to be joined.
- 3 Click on the second line, also close to the end by which it is to be joined.

The positions you click are important. Click both lines anywhere beyond the midway position to tell Cadcorp SIS which ends to join:



The ends of the two lines will normally be linked by an additional straight segment. However, if the ends of the two lines are touching, they are joined without inserting an additional segment.

Curved lines (arcs and Beziers) can be joined to each other or to straight lines in the same way:



When joining items which have different pens, the resulting item inherits the pen of the first item selected. Attribute data may be lost during this operation.

◆ Merging existing line items to form one multi-line

New multi-line items can be created from existing line items by merging them in one of several ways, including arcs and circles.

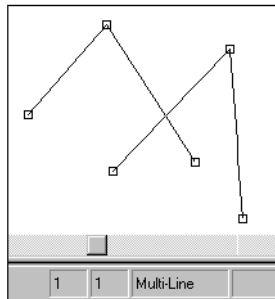
Select the existing line items first, then the appropriate Boolean command from the **Alter** menu.

For more details on multi-geometry, ➤ Chapter 28: “Creating collections”.

Create a multi-Line by merging lines

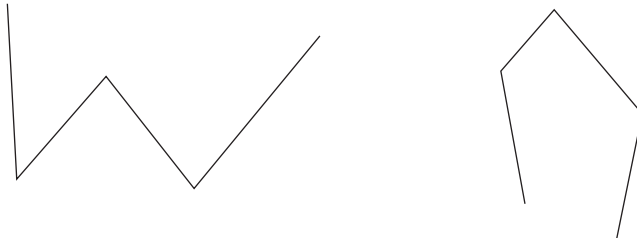


Use the **Union** command to merge the selected line items into one multi-line.

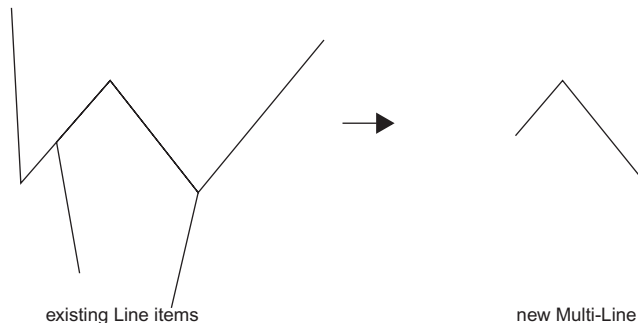


Create a multi-line from the overlap of existing lines

If the following two line items:



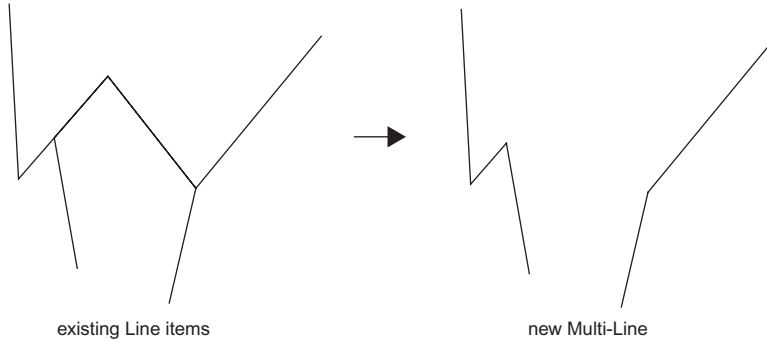
were superimposed as shown below, so that they overlapped, you could use the **Intersect** command to create a new item from the overlapping section:



Create a multi-line from existing line items after deleting any overlap



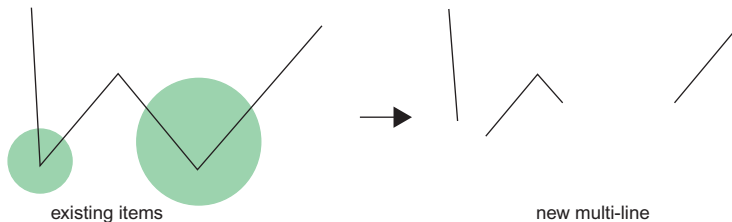
Using the same overlapping line items as shown for the **Intersect** command above, you could use the **Exclusive Or** command to create a new item of everything except the overlap. (This command does the opposite of the **Intersect** command.)



Create a multi-line by using existing item(s) to cut away parts of an existing line



The **Subtract** command does not merge line items to create the resultant multi-line, but for completeness it is described here. This time you need to select which of the items to keep (the others are used to cut away from this item, then they are deleted).



◆ Squaring up lines



The **Alter>C.A.D.>Align** commands can be used to square lines which should be, but are not quite, either:

- at right angles to one another (**Alter>C.A.D.>Align>To right-angles**)
- or aligned with the X and Y axes (**Alter>C.A.D.>Align>To co-ordinates**)

This facility is particularly useful for tidying digitised data.

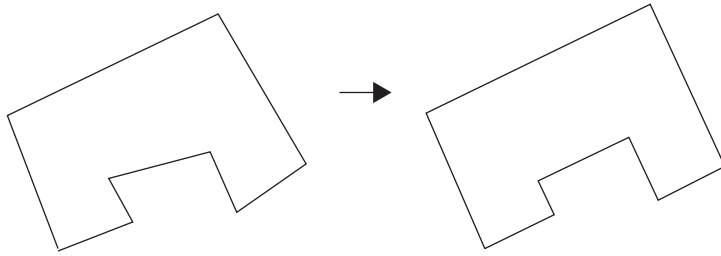
All lines which diverge by 14 degrees or less are rotated so that they form right angles. Any lines which diverge by more than this are left alone. The lines are rotated about their mid-point in order to align them.

Squaring lines to one another

- 1 Select the line item(s).



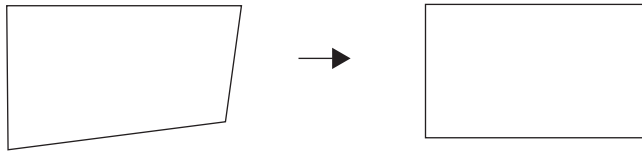
- 2 Choose the **Alter>C.A.D.>Align>To right-angles** command.



Squaring lines to the X and Y axes



- 1 Select the line item(s).
- 2 Choose the **Alter>C.A.D.>Align>To co-ordinates** command.

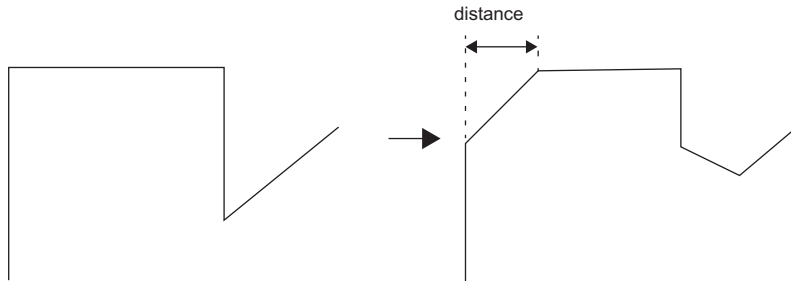


You can set the axes to any angle before aligning your lines to them. ➤Chapter 33: “**Precision dimensions and locations**”, **Rotating the XY plane**, page440

◆ Creating a chamfer



The **Alter>C.A.D.>Chamfer...** command creates straight line chamfers at the vertices of polylines.

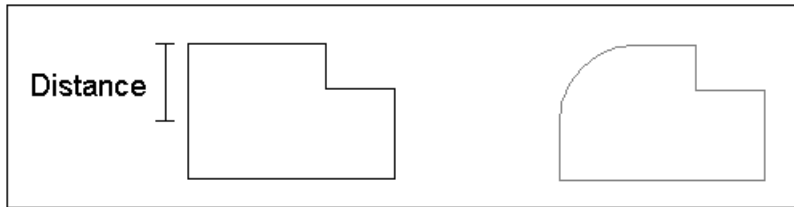


- 1 Choose the command.
- 2 Input a distance, as prompted. This is the distance from the vertex to the start or end of the chamfer.
- 3 Snap on the line item near to the vertex where you want the chamfer to be created.
- 4 If you wish, you can now continue selecting vertices to chamfer (they will all be created using the same distance).

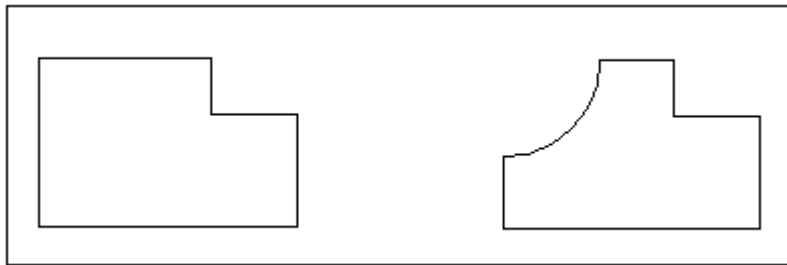
◆ Creating a fillet



The **Alter>C.A.D>Fillet...** command creates a circular blend at a vertex on a polyline.



- 1 Choose the command.
- 2 In the prompt line, type in a distance. This is the distance from the vertex to the start or end of the arc which will be drawn. A negative value gives an inverse fillet:



- 3 Click on the line item close to the vertex which is to be filleted.

◆ Creating a smooth curved line from a straight line item

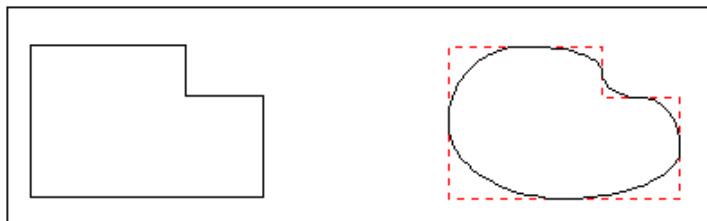


You can change an existing line item consisting of straight line segments into a curved line.

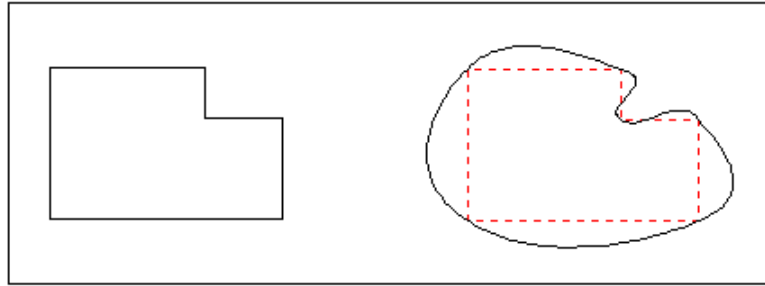


Use the **Alter>C.A.D>Smooth>Midpoint** command to have a new curved line created, which touches the original line at the midpoints of its segments. Use the **Alter>C.A.D>Smooth>Vertex** command to have the new curved line touch the original at its vertices.

- 1 Select the line item to smooth.
 - 2 Choose the command.
- The **Alter>C.A.D>Smooth>Midpoint** command:



The **Alter>C.A.D.>Smooth>Vertex** command:



◆ Faceting curved line segments

You can replace curved line items with a number of shorter straight segments (called faceting).

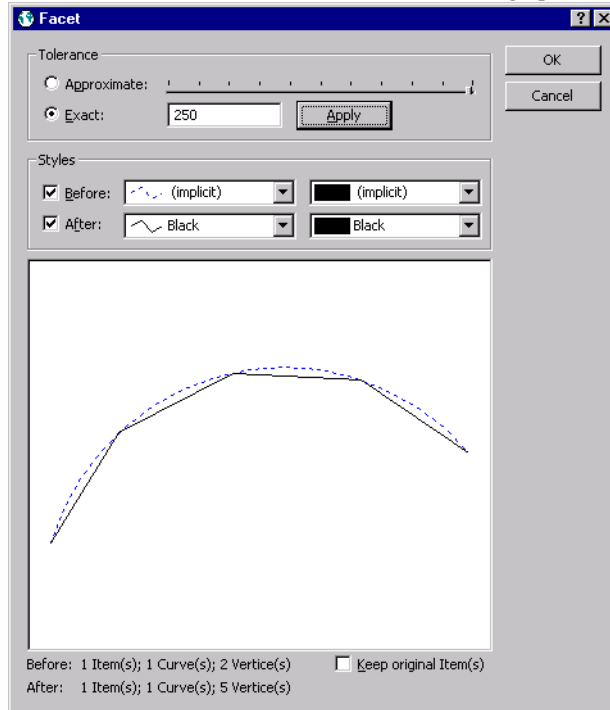
You may wish to facet curved line items before exporting to a format which cannot handle curves (such as NTF). When you export curves to such formats, they are faceted as part of the export process. If you facet them first yourself, you retain control over how they will appear in the new format.

The Facet dialog shows you a preview of how the lines will be altered, and you can see the effects of different tolerance values before making the changes. The dialog also gives you the option of creating new line items and keeping the existing line items unchanged.

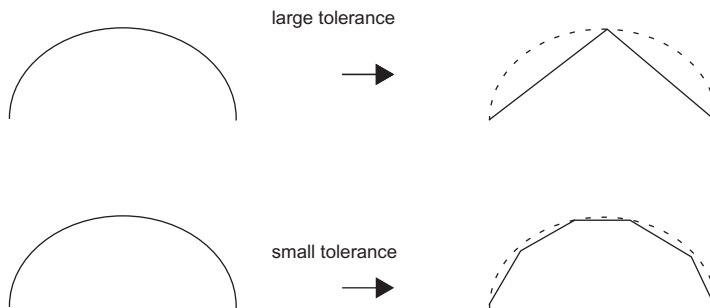
- 1 Select the curved line item to facet.



- 2 Choose the **Alter>C.A.D.>Facet** command. The Facet dialog opens.



- 3 Choose the tolerance, styles, and colours used to show the Before and After lines. Move the slider to change the tolerance value, or type in an exact value and click Apply. The tolerance value is the maximum distance allowed between the original curve and the new facet. The smaller the tolerance, the greater the number of line segments used in the faceting.

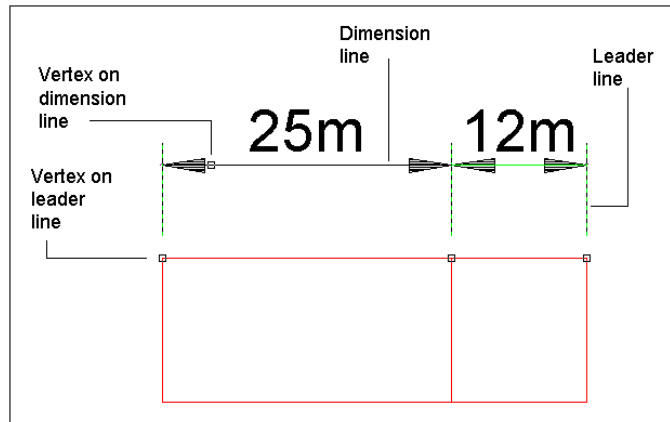


- 4 If you want to keep the original items and create new line items, select the Keep original item(s) checkbox.

■ Editing dimensions

The dimension graphics consist of:

- line items (the dimension and leader lines)
- text items (the dimension text)
- point items (the dimension arrow). The dimension text is displayed in the current default font and in the colour of the pen used for the dimension line.



◆ Selecting and moving/copying the dimension set

A set of dimensions can be picked up and copied/moved/deleted as a single item. To pick up the dimension set, click anywhere on the leader lines, or click on the dimension line anywhere except on its vertex.

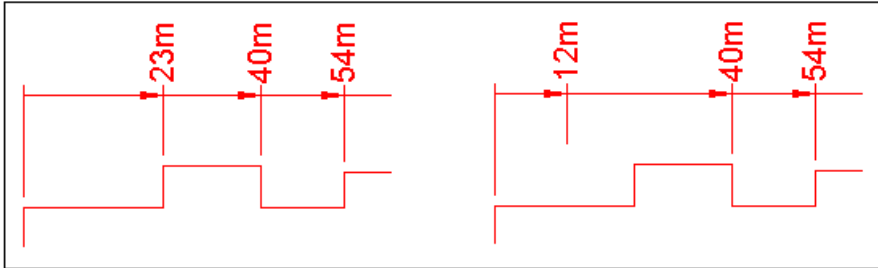
◆ Editing the lines

The lines are drawn using the pen indicated in the styles toolbar, and this can be changed in the normal way.

For all dimension types except distance, the dimension line can be moved closer to or further from the items you have dimensioned. Do this by clicking and dragging on its vertex. The leader lines are automatically stretched or shortened accordingly.

The leader lines may be stretched or shortened individually. When selected they have a handle which is offset from the end of the line. Click and drag this handle to stretch the leader line.

The leader lines may be moved by their handle so that they dimension to a different position. Dimensions are dynamic; if you move a leader line in this way, the dimension value is automatically updated:



◆ Editing the text

The dimension text is a point text item. You can edit any of the point text properties in the usual way. ➤Chapter 39: “**Editing text items**”



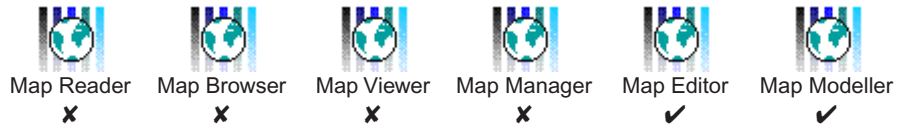
Use the Show units property to change whether units are displayed. Use the Places property to change the precision, and the Units property to change the units used. The units are the linear units selected on the Units tab of **Map>Co-ordinate systems...**

If your text is upside down, set its Horizontal Property to True.

◆ Using a different symbol (shape)

Cadcorp SIS uses a shape called DimArrow as a dimension marker. You can change this to any shape stored in the enabled libraries by changing the shape property.

➤Chapter 14: “**Properties**”



Editing area items

■ Area items	489
■ Notes on editing special types of area items	489
■ Selecting area items	490
■ Changing the outline of an area	490
■ Measuring area items	490
■ Changing an area's seed point	491
■ Deleting an area item inside/outside an overlapping area	491
■ Converting an area item into a line item	491
■ Changing an area item's clockwise property	492
■ Converting an area item to topology	492
■ Creating 3D surfaces from area items	492
■ Boolean editing	492
■ Editing multi-areas	495
■ Editing QZones	496

■ Area items

An area item is a distinct class of item with its own set of properties. Area items include:

- simple areas ↪ Chapter 25: “**Constructing area items**”
- multi-areas ↪ Chapter 25: “**Constructing area items**”
- photos ↪ Chapter 47: “**Printing: print templates**”
- topological polygons ↪ Chapter 30: “**Creating topology: chains and polygons**”
- QZones ↪ Chapter 25: “**Constructing area items**”
- buffer zones ↪ Chapter 55: “**Spatial analysis**”
- Thiessen areas ↪ Chapter 55: “**Spatial analysis**”

■ Notes on editing special types of area items

Photos are area items which can be edited using the same operations as other area items. However, as they can have additional properties such as a key map, north point symbol, legend, etc, they also have additional editing possibilities. ↪ Chapter 47: “**Printing: print templates**”

Polygons are a special type of topologically structured area item which have knowledge of their spatial relationships. Their boundaries are made up not of ordinary line items, but of special topological line items, called links and chains. There are therefore some differences in the way they are edited. ➤Chapter 41: “**Editing topology**”

QZones are raster area items, and so editing is limited to Boolean edits and to changing the brush property.

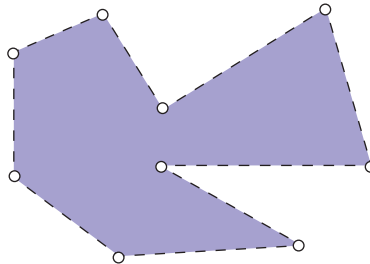
■ Selecting area items

You can select area items by snapping onto their boundary outline or anywhere in their interior.

The A (Area) snapcode is useful for selecting any area items. In the situation where several area items are found, the area with the smallest extent is selected (unless the Select dialog is in automatic mode - see below).

■ Changing the outline of an area

When selected, an area item displays grab handles at its vertices:



You can move these (by highlighting the grab handle and moving it) or delete them (by highlighting the handle and pressing Backspace) to change the outline of an area item. You can add additional vertices by holding the Ctrl key down and clicking.

➤Chapter 36: “**Editing line items**”, **Editing vertices (grab handles)**, page469

■ Measuring area items



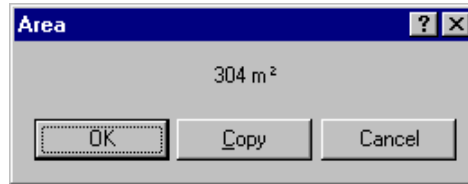
Cadcorp SIS can report the correct area value of all types of area items (areas, QZones, polygons, buffer zones), using the **Measure>Area** command.



The area value is reported in the current set units. If necessary, set the area units required on the Units tab in **Map>Co-ordinate systems....**

- 1 Select the area item(s) to be measured.
- 2 Select the **Measure>Area** command.

- 3 The value of the area is reported:



- 4 Click on the Copy button to copy this value to the clipboard.
Area items also have an Area property, the value being shown in square metres.

■ Changing an area's seed point

The origin of an area item is its seed point. Therefore you can see where an area item's seed is by examining its properties.

The seed point of an area is used to place thematic bar charts and pie charts. It is also used for some geometrical tests.

When you create an area item, the seed is placed in a default position. This will always be inside the area, and will be at its centre if possible. However, there are times when you may want to change the seed position.



- 1 Select the area item, then its item command Set Seed (accessed via the local menu or the Item main menu).
- 2 Click at the required location for the seed.

■ Slicing an area item with a line item

Use the **Alter>Slice** command to slice the selected area item with a line item.

- 1 Select the area item you want to slice.
 - 2 Choose the Slice command.
 - 3 Click on a line item. The area item is divided where it crosses the line item.
- You can also use the **Alter>Slice** command to split a line item with another line item.

■ Deleting an area item inside/outside an overlapping area



The **Alter>C.A.D.>Snip** commands can be used to snip away portions of selected area item(s) which fall inside or outside another area item. ➤Chapter 36: “Editing line items”

■ Converting an area item into a line item



A simple area item or photo can be converted into a line item by selecting it, then using the **Alter>Unfill** command.

In the case of a photo, it causes the contents of the photo to be removed (you may want to do this when creating a new print template. ➤Chapter 47: “Printing: print templates”

■ Changing an area item's clockwise property



An area's Clockwise property is determined by the direction in which it is drawn. You can change the Clockwise property by using the **Alter>Reverse** command.

Some GIS and CAD systems treat clockwise areas differently from anti-clockwise areas. In earlier versions of Cadcorp SIS, clockwise area items had negative values for their `_area#` property. This is no longer the case - all areas now have a positive area value.

■ Converting an area item to topology

A simple area or multi-area can be converted into a topological polygon, using the item command **Convert to Topology**. The line items making up its boundary are converted into links. ↗Chapter 30: “**Creating topology: chains and polygons**”

■ Creating 3D surfaces from area items

You can create 3D surface items from area items using their item command **Convert to 3D Surface**. ↗Chapter 31: “**Creating 3D data**”

■ Boolean editing

A Boolean operation (named after the logician George Boole, 1815-1864) typically uses the operators AND, OR, and NOT to construct a more complex condition or object from simpler criteria. Boolean operations have become part of spatial searching and editing in GIS software.

Boolean editing operations combine the selected geometry using the chosen Boolean method. Some methods produce multi-geometry items.

The new item takes on the properties and attributes of the dominant item, so the commands sometimes show a dialog for selecting which item should be dominant. This does not appear if a choice is not necessary (for instance, if all selected items have the same style, data and height).

The height of the new item is the height of the dominant item, or the height of the dominant item's origin if the dominant item does not lie on a plane parallel to the XY plane.

Boolean operations on area items are especially useful. They may be carried out on any combination of area items, although there are some differences with polygons and TINs.

◆ Boolean edits on polygons

Topological polygons may be combined together using these commands, but they cannot be combined with other area items.

◆ Boolean edits on TINs

TIN items are converted to simple areas when using these commands.

◆ Merging area items into one (Union command)

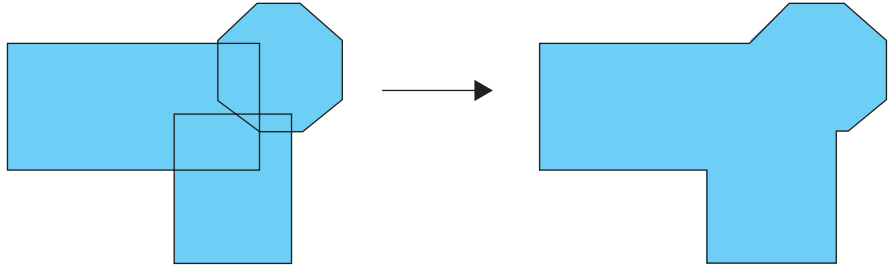
This command creates a new area or multi-area item by combining the geometry of the selected items.

1 Select the area items (two or more).

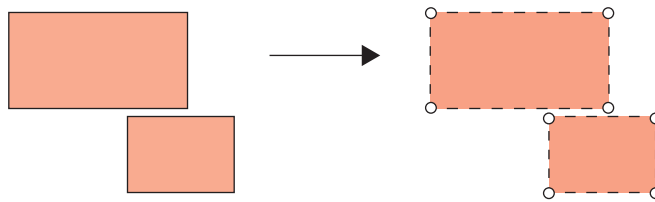


2 Select the **Alter>Boolean>Union** command.

If the original area items overlapped, an area item is created:



If the original areas did not overlap, a multi-area is created:

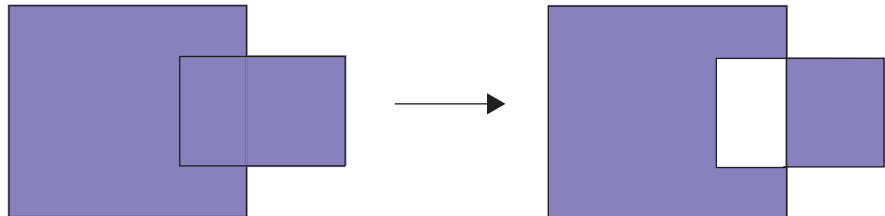


When using any of the above commands, if any of the selected items have different attributes, you are prompted for which item's attributes you want to keep. (The dialog is similar to the Select Item dialog, and works in the same way.) When the items are merged, only the attributes belonging to the chosen item are kept.

◆ Combining areas by deleting an overlap (Exclusive Or command)



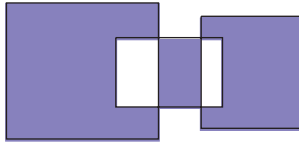
This **Alter>Boolean>Exclusive Or** command combines the selected items, replacing them with a multi-geometry item which consists of alternating geometry.



1 Select the area items (two or more).

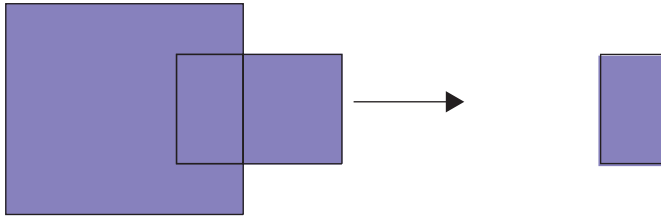
2 Select the **Alter>Boolean>Exclusive Or** command. The area of overlap is deleted, and a multi-area is created as shown above.

If there are multiple areas of overlap, they are alternately deleted or left intact:



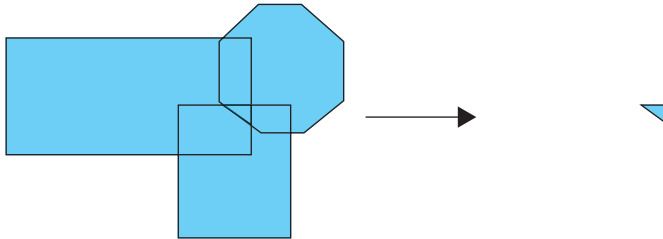
◆ Combining areas by deleting everything except the overlap (Intersect command)

This command combines the selected items, creating a new area item which contains the common geometry.



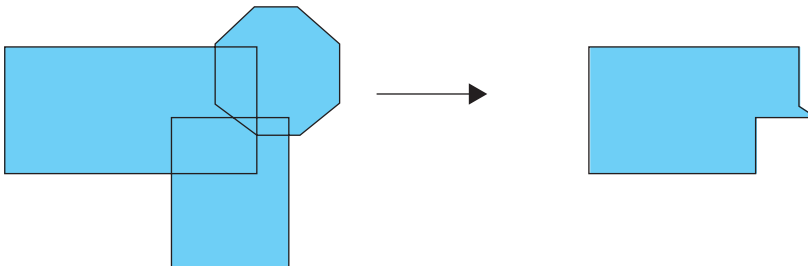
- 1 Select the area items (two or more).
- 2 Select the **Alter>Boolean>Intersect** command. A new area item is created, consisting only of the area of overlap. The original area items are removed.

This command also operates with more than two area items, providing that they all have a common area of overlap:



◆ Using one area to cut away from another (Subtract command)

This command creates a new simple area item by subtracting the geometry of the other selected item(s) from the item you choose to keep.



- 1 Select the area items (two or more).



2 Select the **Alter>Boolean>Subtract** command.

3 In the Select item to keep dialog, select an item from the drop-down list, then click OK.
A new area item is created. The item(s) used to do the cutting are deleted.

◆ Merging items based on an attribute value (Dissolve)



The **Alter>Boolean>Dissolve...** command can carry out Union operations based on attribute values. It merges selected items into one or two single items, based on the value of an attribute. For example, you can select a number of items and merge them into two new items based on a formula that examines their area: the first item contains all the items whose area matches the formula, the second item contains the items whose area does not match.

- 1 Select two or more area items.
- 2 Select the **Alter>Boolean>Dissolve...** command.
- 3 In the Formula dialog, type in a formula, then click OK.
- 4 All the selected items that match the formula are merged together (Boolean Union) into a single item. The rest of the selected items are merged into another single item.

■ Editing multi-areas

◆ Selecting a multi-area

Clicking anywhere on the multi-area selects the whole multi-area item. The Area property (area value) indicates the total area of the multi-area item.

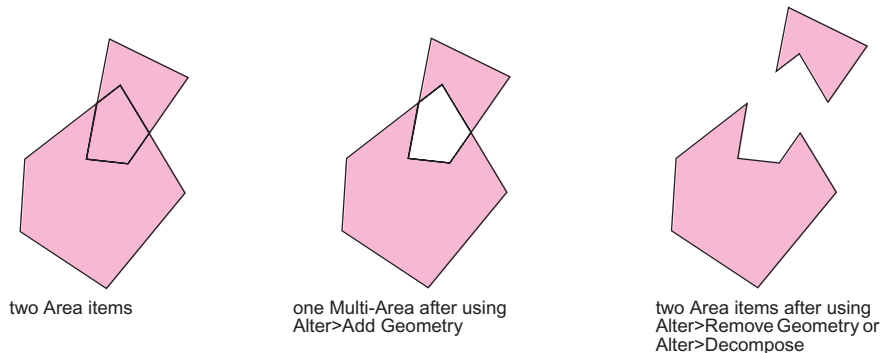
◆ Editing a multi-area



To remove a single area from a multi-area, select the multi-area, then choose the **Alter>Remove Geometry** command and click on the area to remove. Alternatively you can use the **Alter>Decompose** command. This command converts the multi-area back into its component areas. ➤ Chapter 40: “Editing collections”



Where you have a multi-area which was created from overlapping area items, the overlap would have been converted into a hole. If you later decompose a multi-area with a hole, you do not get the original area items back. Instead, you get these area items minus the hole:



◆ Measuring multi-areas



If you use the **Measure>Area** command on a multi-area, or look at its Area property, you will find that the area value reported is the total (of its area item components).

Where you have a multi-area with holes, the area of the holes is subtracted.

■ Editing QZones

◆ Limits on editing QZones

QZones are raster items and therefore options for editing them are limited. However, as the QZone does not replace the item from which it was created, the original item remains and another QZone can be created with the new parameters required.

◆ Creating grids from QZones



You can convert an existing QZone into a grid, using its local command Create Grid.

➤ Chapter 57: “Grids”

◆ Resolution of QZones

The resolution of a QZone is the size of the smallest square of which it is composed. When creating a QZone, you can decide the size of the smallest square (the Cell size option). Boolean operations (such as finding overlapping areas) are only as accurate as the reported resolution.

◆ Other features of QZones

QZones are raster items, but they have some of the usual area item properties, such as brush.

QZones can be used in conjunction with most of the commands used with area items. Some examples are:



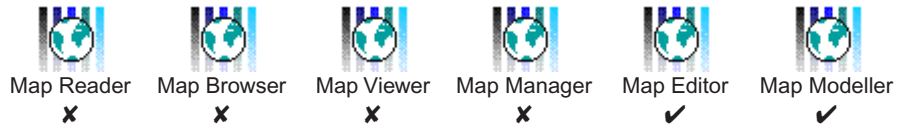
- defining a Locus (**Construct>Miscellaneous>Locus...** command)



- selecting other items using the Geometry tab of the **Edit>Find...** command

If you rotate a QZone, its component squares are also rotated. If the QZone is subsequently used for a procedure such as an **Edit>Find...**, the system will need to temporarily align the squares of the rotated QZone to the projection in order to carry out the search. This may make the process slow.

QZones provide a faster way of querying data than area buffers, but they are less accurate.



Editing points and shapes

■ Selecting shapes	497
■ Changing a shape	497
■ Editing shapes	497
■ Finding the location of a point	498
■ Properties of point items affecting shapes	498
■ Angle	499

■ Selecting shapes

A shape exists only as a symbol depicting a point item, so it is the point item which must be selected. Shapes cannot be selected by clicking on their component graphics. Select them either with the Point snapcode, or by a selection box around the point.

A shape is displayed at the size it was created, if the scale of the dataset on which it was placed (the dataset scale) matches the viewing scale (the scale at which the map is being viewed at, found at the bottom right hand corner of the screen). Otherwise it will be displayed at a size proportional to the scale of the new dataset. A similar rule applies to printing: to print shapes at the size they were created, the printing scale (chosen in the Printing Wizard) must be the same as the dataset scale.

You can change the size of the shape itself (without editing the shape in the library) by changing its Scale property.

You can choose whether shapes should be drawn while they are selected and while dragging them. ➤page 591, **Preferences**

■ Changing a shape

You can easily replace one occurrence of a shape with another shape.

- 1 Select the shape(s) to change.
- 2 Either:
 - select a new shape from the Styles toolbar
 - change the Shape property, selecting from the drop-down list which appears when you click on the More button



■ Editing shapes

You cannot edit the graphics which make up the shape. If you want to edit a shape you must first explode it back into its constituent graphical items, edit the items, and re-construct the shape.



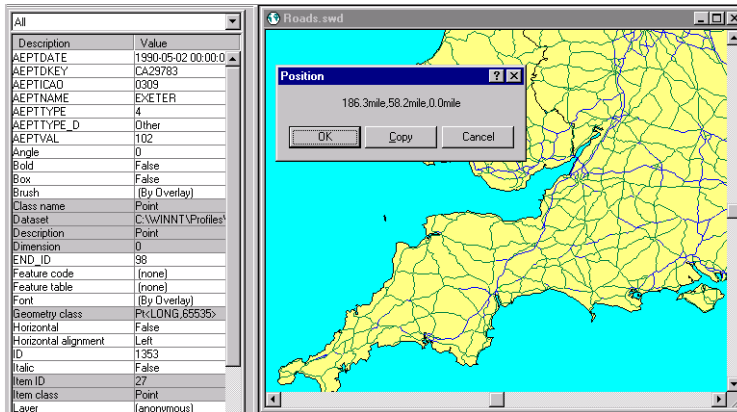
Use the point item's local command Explode Shape (accessed via the local menu or the Item main menu).

■ Finding the location of a point

By clicking on a point and looking at its Origin properties, you can see its co-ordinates.



If you use the **Measure>Position** command, you can see the point's co-ordinates, measured from the projection origin and displayed in the current set linear units:



■ Properties of point items affecting shapes

◆ Scale

A shape is displayed at the size it was created, if the scale of the dataset on which it was placed (the dataset scale) matches the viewing scale (the scale at which the map is being viewed at, found at the bottom right hand corner of the screen). Otherwise it will be displayed at a size proportional to the scale of the new dataset.

A similar rule applies to printing: to print shapes at the size they were created, the printing scale (chosen in the Printing Wizard) must be the same as the dataset scale.

You can change the size of the shape itself (without editing the shape in the library) by changing its Scale property.

Changing the size of a shape at a given scale

- 1 Select the point item to which the shape is assigned.
- 2 Click on the Scale property in the Property window. If the shape has not previously been scaled, this value will be 1. Type in a new value:
 - a positive value enlarges or reduces the shape by this factor (2 to double its size, 0.5 to halve it and so on)
 - a negative value causes it to remain the same height on the screen regardless of how much you zoom in or out

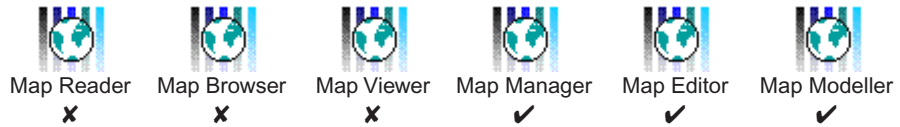
■ Angle

You can rotate a shape by setting its Angle property.

- 1 Select the point to which the shape is assigned.
- 2 Click on the Angle property, and enter an angle in degrees.

You must give the total angle of rotation in an anticlockwise direction.

Example To change the rotation angle of a shape from 45 degrees to 60 degrees, enter 60.



Editing text items

■ Selecting text	501
■ Moving a text item	502
■ Changing the size of a text item	502
■ Rotating a text item	502
■ Editing the text of a text item	503
■ Changing the font of a text item	503
■ Altering the alignment of a text item	504
■ Editing the appearance of line text	504
■ Text background colour	505
■ Drawing boxes around text items	505
■ Converting between text types	505
■ Creating graphical items from characters in a text item	505

■ Selecting text

You cannot select text items by snapping on the text characters. Use the following methods.

◆ Selecting point text

You must select point text by its alignment point. Do this by either:

- creating a selection box around the alignment point, or around the entire text block (if you are not sure where the alignment point is)
- using the Point snapcode when near the alignment point

◆ Selecting box text

You can select box text by its alignment point (as point text, except that you use the Box snapcode instead of Point).

You can also select box text by using the Box snapcode at any of the 8 points which make up the box.

When selected, box text is displayed with a box around it, with handles at the corners, mid-points and centre. A “butterfly” is displayed at the current alignment point.

◆ Selecting label text

You can select label text using the same methods as box text, or by clicking on the label line. The label line and text are all part of a single item, and are selected together.

◆ Selecting line text

Select line text by clicking on its associated line.

■ Moving a text item

Select and move point text by its alignment point.

Move box text items by clicking and dragging on any of their nine handles.

Move label text in the same way as box text, the label line being stretched to the new location of the text.

Move line text by moving the line or part of the line.

■ Changing the size of a text item

With point text and line text items, you can change their point height property. If you have the Text toolbar displayed, you can select a new point size from here.

With label text and box text items there are two options:

- change their Height property
- select the text item, then click and drag one of the handles on the box around the text (except the alignment point), holding down the Ctrl key as you do so

■ Rotating a text item

◆ Rotating any text type

You can use the **Move Items**, **Rotate**, and **Stretch** commands to alter your text items.

⇒ Chapter 35: “General editing techniques”



Move Items scales, mirrors, and/or rotates your text



Rotate rotates your text



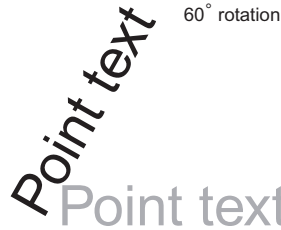
Stretch stretches the handles box surrounding your text

The Mirror command, in the Move Items dialog, creates a mirror image around the Y axis of the placement of the label text. It also creates a mirror image around the Y axis of the line item on which line text is based. It also reverses the direction of this line item. so the text is drawn on the other side.

The Stretch command changes the size of box text and label text. It changes the size of the line item on which the line text is based, although it does not change the size of the text itself. Stretch does not alter the size, only the placement of point text.

◆ Angle of point text

Point text has an Angle property, which can be changed by typing in a new value. The angle is measured anti-clockwise from the horizontal (East).



Some computer graphics cards are not capable of displaying rotated text correctly. If that is the case with your computer, you will not see the text rotated on screen. However, the text should appear correctly on a print-out.

■ Editing the text of a text item

You can edit the contents of of an existing text item. There are several options for doing this:



- Select the text item and then its Text property. Click on the More button to see the Text dialog where you can make the amendments.
- Select the text item and use the **Edit>Properties...** command (or the Properties... local command). With text items this displays a special Text tab, where you can re-type text as well as change the original properties you set (font used, point size if appropriate, whether bold, italic or underlined is used and justification).

Point text is the only text item where, once it is selected, you can access the properties of Text, Text tab, by double-clicking.

■ Changing the font of a text item



The Font property of any selected text item may be changed on the property view tab of the workspace window, or in the Properties of Text dialogs (accessed using the local command Properties... or by the **Edit>Properties** command).

Alternatively, if you have the Text toolbar displayed, you can select a new font from there.

◆ The overlay font (By Overlay)

Each overlay has a font assigned to it. When a text item uses the (By Overlay) font, it will use whatever font is set up for the overlay on which it resides. You can also force all text items on an overlay to use the same overlay font, overriding any individual font they have been set (see below).

Setting the overlay font

- 1 Call up the Overlays dialog.
- 2 Select the Styles tab.
- 3 Select the overlay for which you are setting the font.

- 4 In the Font drop-down list, select the font required for that overlay.

Forcing the font of all text on an overlay (Override)

- 1 Follow steps 1 - 4 in the above section Setting the Overlay Font.
- 2 Tick the Override checkbox.

■ Altering the alignment of a text item

◆ By selecting a new justification point

Select the text item and change either or both of the properties Horizontal alignment and Vertical alignment.

You will see the text item re-positioned, such that the new alignment point is placed at the screen position where the old alignment point was previously located.

In the case of box text, there is an alternative method: double-click on one of the nine handles shown when it is selected.

◆ By visual reference

Select the point text item, and then click on the alignment point. Press the Tab key to step to the next alignment point. Click on the new alignment point and press Tab to proceed to the next alignment point. You can step through all possible twelve alignment points this way. You will see the text block realigned as you do so. Pressing Shift and Tab steps through them in reverse order.

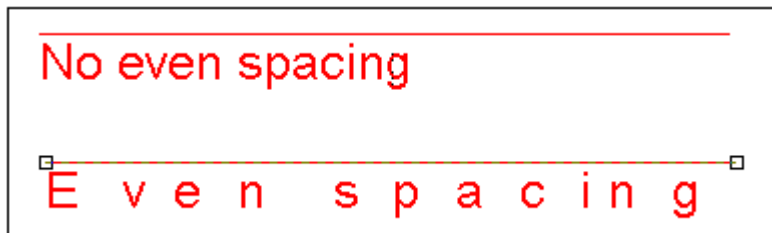
Use the same combination of keys with box text and label text to select the next/previous handle. Use the Enter key after you have pressed Tab or Shift Tab to see the “butterfly” handle move.

Use these keys with line text to select the next or previous vertex on the line.

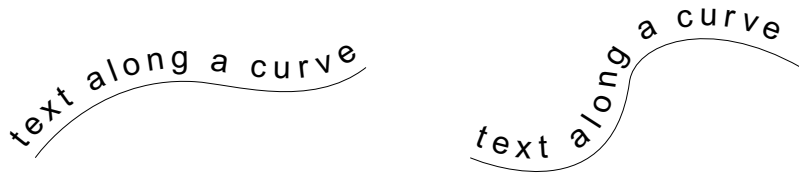
■ Editing the appearance of line text

Use the Draw line property to choose whether or not to display the line.

Use the Even spacing property to switch between normal (proportional) spacing (False), and even spacing (True) along the line.



If you edit the line by moving its vertices or joining it to other lines, the text will automatically follow the new path of the line:



■ Text background colour

All text items can be displayed against an opaque background of any colour. Set the text item's Opaque property to True. Set the colour for the background by setting the Brush property.

■ Drawing boxes around text items

You can display box text and label text items with a box drawn around them, using the box property. The colour for the box is the pen colour.

■ Converting between text types

You can convert box text to point text, and point text to box text, by selecting the Convert to Box Text or Convert to Point Text commands from the item menu (accessed via the local menu or the Item main menu).

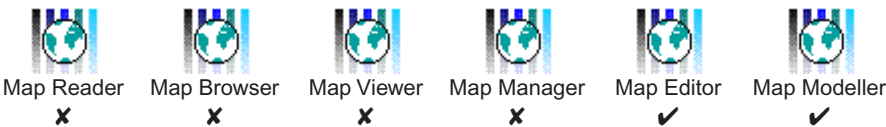
When box text is converted to point text, its height is set in points to the nearest point size, which allows it to retain its appearance at the current dataset scale. Sometimes there may not be a suitable point height to use at the current dataset scale. For example, the box text may be bigger than point text with the largest point height. In this case, the point height will be a sensible minimum (10 points) or the absolute maximum (1638 points).

When point text is converted to box text, its height is set (in metres) such that it retains its same appearance in relation to the surrounding graphics on the map base.

■ Creating graphical items from characters in a text item

You can use a box text item to create a multi-area whose outlines trace the outlines of the characters in the text string. In this way you can reproduce the text string as an editable multi-area item.

Use the box text item command Generate Area items.



Editing collections

■ Collections	507
■ Editing blocks	507
■ Editing multi-geometry items	508
■ Editing assemblies	508
■ Editing groups	509

■ Collections

Collections consist of several items collected together to be handled as a single item. There are different types of collections, each having different attributes and uses:

- blocks (which are placed as inserts)
- named items
- multi-geometry items
- assemblies
- groups

➤Chapter 28: “Creating collections”

■ Editing blocks

Blocks are named objects and are stored in named object libraries (NOLs).

◆ Selecting a block

A block can be selected by any of its constituent graphics for moving, copying, deleting, scaling, mirroring, rotating, etc.

◆ Editing a block



You cannot edit the constituent graphics of a block. If you want to change a block in this way, you must first explode it using its item command Explode. It is then no longer a block, having been turned back into the graphics from which it was originally made. You can now edit these graphics as normal, and re-construct them as a block (with a different name) if required.

◆ Exploding multiple blocks



You can explode many blocks at once using the item command **Insert *** (accessed via the local menu or the Item main menu). This command makes copies of the selected blocks, placing them on the current overlay. These copies are no longer blocks, but consist now of the items out of which the original blocks were made.

This command is very useful if you have a DXF file containing a lot of blocks, because it will insert the blocks into an editable overlay and explode them at the same time. These new items will also take on the precision of the current overlay's dataset. This may mean that the amount of memory required for the DXF data (which is often significant) is reduced.

■ Editing multi-geometry items

Multi-geometry items are created by merging existing items. ➤Chapter 28: “**Creating collections**”

◆ Selecting multi-geometry items

You can select a multi-geometry item by clicking on any of its components.

◆ Editing multi-geometry

The component items of a multi-geometry item can all be edited using the normal commands on the **Alter** menu.

◆ Removing an item from a multi-geometry item



- 1 Select the multi-geometry item.
- 2 Select the **Alter>Remove Geometry** command.
- 3 Click on the component item to remove.

This command is still active until you press **Escape**, so you can remove further geometry from the multi-geometry item.

◆ Breaking a multi-geometry item into its component items



Use the **Alter>Decompose** command.

- 1 Select the multi-geometry items.
- 2 Select the **Alter>Decompose** command.

The items remain selected, but become individual items.

■ Editing assemblies

An assembly is a point item which has associations with a number of other items. These other items are unaware of this association and remain independent of the assembly. ➤Chapter 28: “**Creating collections**”

◆ Selecting assemblies

If you click on any of the items making up an assembly, they are selected individually (they do not know that they are part of the assembly).

To select the entire assembly you must either:



- select the assembly hook point
- or make a selection box around the assembly, then from the local menu choose **Assembly** and its item command **Select Assembly items**

By selecting one of the grab handles of the assembly, all items within the assembly can then be moved, rotated, etc as a single item.

◆ Selecting the items within an assembly



When you have an assembly selected, you may use the item command **Select Assembly** (accessed via the local menu or **Item>Collection>Assembly>Select Assembly**) to select the items contained within the assembly.

◆ Editing assemblies



You can edit any of the items which are included in the assembly, in the normal way.

You can also add new items to the assembly, or remove items from it, using the **Edit Members** command (accessed via the local menu or **Item>Collection>Assembly>Edit Members**).

- 1 Select the assembly (by its hook point).
- 2 Select the item command **Edit Members**.
- 3 Either:
 - click on an existing item to remove it from the assembly
 - or click on a new item to add it to the assembly
- 4 Press **Esc** once the required alterations have been completed.

◆ Deleting assemblies

An assembly can be selected and deleted.



To delete an assembly you must first select its hook point. To do this, either select the known hook point if you know where this is, or use **Edit>Select All** and **Item>Collection>Assembly>Select Assembly items**.



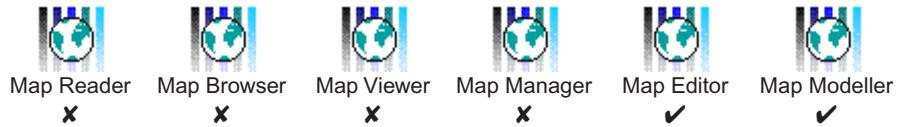
If you use the **Select Assembly** command you will select all the items within the assembly as well as the assembly hook point, and you will then delete all the items in the assembly.

■ Editing groups

Groups are a special type of collection. They are designed for Microsoft Visual Basic customisations using **GisLink** or applications written using **Cadcorp SIS Control**. They allow programmers to create new item types.

Groups cannot be created within **Cadcorp SIS**, but they can be placed. They have the item command **Explode**, which converts them back to their original components. These can then be manipulated in **Cadcorp SIS**.

They cannot be re-assembled, except under customisation or application control.



Editing topology

■ Topology	511
■ Editing links	511
■ Editing nodes	514
■ Route finding	515
■ Editing chains	516
■ Editing polygons	517

■ Topology

Topology is the mathematical study of the spatial relationships between items, independent of their size and shape. In spatial information systems such as Cadcorp SIS, such relationships exist in the form of links and nodes, and chains and polygons.

Links and nodes are the building blocks of topology, and they are used for the construction of chains and polygons. ↗Chapter 29: “**Creating topology: links and nodes**” ↗Chapter 30: “**Creating topology: chains and polygons**”

Link and node networks can be used for route-finding.

■ Editing links

◆ Moving a link

You can move a link by either:



- using the **Alter>Reprofile Line** command ↗Chapter 36: “**Editing line items**”. Polygons and chains defined on the existing structure are updated automatically.
- moving the nodes at either end ↗page 514, **Editing nodes**

◆ Deleting a link

Automatic links

When you construct a link and node network by converting line or area items into topology, the links created have the property Automatic. The Automatic property of links is editable and can be changed.

Automatic links are automatically deleted if the chain or polygon to which they belong is deleted. ↗Chapter 30: “**Creating topology: chains and polygons**”

Non-automatic links



Links created using the **Construct>Topology>Link** command are not automatically deleted when chains and polygons are deleted. If required, they must be selected and deleted explicitly, by selecting them and using the **Edit>Delete** command (Del key). Links cannot be deleted if they are part of an existing chain or polygon.



◆ Link vertices

You can edit link vertices (eg move them, or insert new ones) just as you can when editing a line.

◆ Adding a new link to existing topology

1 Construct the lines for the new link(s) as ordinary line items.



2 Select the local command **Convert to Topology**.



Alternatively, if you want to create new links which overlies, but which are not part of existing topology, use the **Construct>Topology>Link** command. ➤Chapter 29: “**Creating topology: links and nodes**”, **Creating a new network which overlays existing topology**, page 395

◆ Converting existing lines to links



Line items can be converted to links using their item command **Convert to Link**. They are not integrated into any existing link and node network, unless the end vertices of the line items (converted to nodes) are coincident with links in the same dataset.

◆ Changing the pen of a link

You can change the pen of link items using methods detailed earlier.

When the links are used to form chains or the boundaries of polygons (➤Chapter 30: “**Creating topology: chains and polygons**”) you can use a different pen for the link, the chain and/or the polygon boundary.

◆ Replacing a link with an ordinary line

To replace a link with an ordinary line you can either:



- use the **Alter>Topology>Copy Links as Lines** command. This creates an ordinary line, while retaining the link.
- or delete the link, then construct an ordinary line as normal

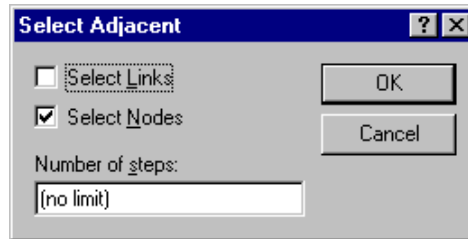
◆ Selecting adjacent links and nodes



The link item command **Select Connected...** allows you to select links and/or nodes that are connected to the selected link.

- 1 Select the link whose connections you want to see.
- 2 Select the item command **Select Connected...**

- 3 In the Select Adjacent dialog, choose whether to look for adjacent links only, nodes only, or links and nodes.



- 4 Input the number of adjacent steps to take. If this value is 1, then only the immediately adjacent links will be selected. If you input 2, then links immediately adjacent will be selected, plus links immediately adjacent to these. If (no limit) is used, then all connected links out from the selected link are selected.

This command is also available with nodes.

◆ Removing unwanted links

When linework is converted to topology the result can include unwanted links. There are two commands which can be used to clean up such links.

Deleting inconsistent links

Normally all links know which nodes they are connected to, and vice versa. An inconsistent link is one which has lost this knowledge, or which has a missing node. This can happen when inconsistent data is read in from an external format.



The **Alter>Topology>Delete inconsistent Links** command can be used to get rid of such links:

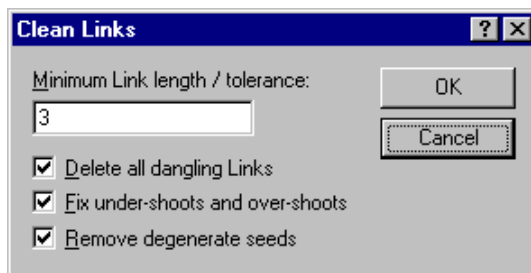
- 1 Select the inconsistent link(s).
- 2 Select the **Alter>Topology>Delete inconsistent Links** command.

Removing small unwanted links



The command **Alter>Topology>Clean Links...** allows you to perform various operations to get rid of small unwanted link lines. Such links may occur where digitised data is converted to topology.

- 1 Select all links.
- 2 Select the **Alter>Topology>Clean Links...** command, then select the operation(s) you wish to carry out.



Minimum link length/tolerance

This is the length of the smallest link to leave undeleted when using the listed options.

Delete all dangling links

If this is checked, all dangling links will be deleted, regardless of their length. A dangling link is one which is not connected to another link at both ends.

Fix under-shoots and over-shoots

An under-shoot is where there is a small gap between link lines. With this option checked, the gaps will be closed.

An over-shoot is a small dangling link. With this option checked, all over-shoots are deleted.

Remove degenerate seeds

Links are used to create polygons and chains, which are seed items. With this option selected, all seed items whose links are deleted will be deleted too.

If you do not use this option, it can be difficult to remove the seeds later as they are difficult to snap onto. However, the disadvantage is that if you do delete them, you will also lose any data which is stored with them.

This option also removes links which form splinters with other existing links, even if no seed is involved.

■ Editing nodes**◆ Displaying nodes**

Nodes are not normally visible on screen or on the print. However, they are visible on screen when selected or when their adjacent link(s) are selected.

You can assign a shape to a node (its Shape property) and change the scale of the shape (Scale property of node), thus making the node visible if required.

◆ Selecting a node

Select a node by creating a selection box around the node.

Alternatively, select a connected link using the S snapcode, then select Node from the drop-down.

◆ Moving a node

- 1 Select a link to which the node is connected.
- 2 Click and drag the node to its new position. The attached links will also be moved.

◆ Deleting a node**Automatic nodes**

Nodes have the property Automatic when they are created either:

- as part of link and node topology (using the line or area command Convert to Topology)
- or when you construct single links (using the **Construct>Topology>Link** command)



Automatically-created nodes are automatically deleted when their links are deleted.

Non-automatic nodes



Nodes created using the **Construct>Topology>Node** command are not automatically deleted when links are deleted. They must be selected and deleted explicitly.

Automatic nodes can be made into non-automatic nodes, and vice versa, using the Automatic property in the Property window.

◆ Adding additional nodes

Nodes may be added to existing topology:



- 1 Select the **Construct>Topology>Node** command.
- 2 Click on the link at the position where you want to insert the node. The original link then becomes two links, joined at the new node.

Nodes created using the **Construct>Topology>Node** command are non-automatic. However, they can be changed to automatic nodes - see the previous section Deleting nodes.

◆ Selecting adjacent links and nodes



The Node item command **Select Connected...** allows you to select links and/or nodes that are connected to the selected node.

◆ Fixing inconsistent nodes

Normally all nodes know which links they are connected to, and vice versa. An inconsistent node is one which has lost this knowledge. This can happen when inconsistent data is read in from an external format.



The **Alter>Topology>Fix up inconsistent Nodes** command can be used to get rid of such nodes:

- 1 Select the inconsistent node(s).
- 2 Select the **Alter>Topology>Fix up inconsistent Nodes** command.

◆ Merging coincident nodes



Sometimes you will have coincident nodes which are unnecessary or unwanted. You can use the **Alter>Topology>Merge Nodes** command to merge nodes which are coincident, causing adjacent links to be connected.

- 1 Select the coincident nodes.
- 2 Select the **Alter>Topology>Merge Nodes** command.

■ Route finding

Once you have a link and node network you may carry out route finding. A flow direction may be assigned to links, and at the junction of links, each node can have turning rules applied. ➤Chapter 58: “Route-finding”

■ Editing chains

◆ Selecting chains

Once you have created a chain, clicking on any of its constituent links using the S snapcode will allow you to select either the link or the chain.

◆ Deleting chains



Select the chain(s) to delete and use the **Edit>Delete** command (Del key).

If the constituent links are not used by any other chains, they are also deleted as long as they have the Automatic property. (All links are made automatic, except those created with the **Construct>Topology>Link** command. However, this property is editable and can be changed.)



◆ Copying chains

Chains may be copied via the clipboard. If the copy is created on the current overlay, and the original chain is also on the current overlay, the new chain and the original chain share the existing links. If the original chain is on a different overlay, new links and nodes are also created on the current overlay, in order to support the new chain.

◆ Changing the route of a chain

The route of a chain can be changed by editing the links it uses.

The links property of a chain lists its component links.

◆ Editing a chain



Chains cannot be edited. However, you can convert a chain to a line item, using its item command Convert to Line. If required, you can then edit the line item in the usual way and convert it back to topology.

◆ The pen of a chain

A chain may have a pen assigned so that it is displayed in a certain way. The chain's pen has no effect on the pen of the underlying links. The pen of the chain can therefore be used to distinguish the chain from the links.

◆ The seed point of a chain

Chains (in common with polygons) have a seed point. However, unlike polygons, the seed point of a chain is always invisible. Seeds are a sub-class of point items, and may have data attached to them.

◆ The chain category

A chain can be assigned to a category. A category indicates a group of chains of the same type. Examples of categories are Minor Road, Main Road, or Bus route.

To assign a chain to a category:

- 1 Select the chain.

- 2 Click in the value box for the Topology category property, and type in the category name.

◆ Attribute data with chains

Attribute data can be assigned to chains. For example, a road chain could have attributes such as its speed limit, its type, etc. For details of how to create and administer attribute data, see Chapter 18: “Adding your own attribute data”.

■ Editing polygons

◆ Selecting polygons

To select a polygon, either:

- click anywhere within it
- use the S snapcode when clicking on its boundary. See page 431, **Snapcodes** The Select Item dialog offers you the choice of the link item(s) you clicked on, plus all chains and polygons of which they form part. If the chain or polygon has a Topology Category, this is shown after the word Chain or Polygon. If it does not, it will appear simply as Chain or Polygon.

◆ Selecting adjacent polygons



Using the item command Select Adjacent..., you can select polygons which are adjacent to the selected polygon, as long as they share links and have the same Topology Category as the selected polygon.

- 1 With the first polygon selected, choose the item command Select Adjacent...
- 2 Input the number of adjacent steps to take. If this value is 1, then only the immediately adjacent polygons will be selected. If you input 2, then polygons immediately adjacent will be selected, plus polygons immediately adjacent to these. If (no limit) is used, then all adjacent polygons out from the selected polygon are selected.

◆ Deleting polygons



You can delete a polygon by selecting it and using the **Edit>Delete** command (or Del key).

As the polygon is deleted, the links which it uses are notified so that the topology is kept consistent. If the constituent links are not used by any other polygons they are deleted, as long as they have the Automatic property. (All links are made automatic, except those created with the **Construct>Topology>Link** command. This property is editable and can be changed.)



Alternatively you can convert a polygon back into an area using its item command Convert to Area.

◆ Copying polygons

Polygons may be copied via the clipboard. If the copy is created on the current overlay, and the original polygon is also on the current overlay, the new polygon and the original polygon share the existing links. If the original polygon is on a different overlay, new links and nodes are created on the current overlay, in order to support the new polygon.

◆ Editing the polygon boundary



Use the **Alter>Reprofile Line** command to change the route of the links which make up its boundaries. ➤Chapter 36: “**Editing line items**”

◆ Altering the polygon area

Boolean edits

The normal Boolean edits provided by the Boolean commands on the Alter menu can all be used with polygons. ➤Chapter 37: “**Editing area items**”

Chipping pieces away from the polygon

The item command Divide Polygon can be used to chip away pieces of the polygon. ➤Chapter 30: “**Creating topology: chains and polygons**”, **Creating polygons by dividing an existing polygon**, page403

◆ Pen and brush of a polygon

You may allocate a pen and a brush to a polygon. The brush can be used to fill in the polygon and differentiate it from other polygons.

The pen is used for the outline of the polygon, and has no effect on the pen used for the links and chains which form its boundaries. The pen of a polygon can therefore be used to distinguish the polygon outline from its constituent links.

◆ The seed of a polygon

Polygons have a seed. Seeds are a sub-class of point items and may have attribute data attached. A polygon’s seed may be moved using the mouse.

You can choose any shape for the seed (the shape property in the Property window), and also set the scale of the shape in the normal way. The shape can therefore be used to indicate symbolically what the area signifies (for instance, you could use a tree shape for a polygon depicting a forest area).

◆ The polygon category

A polygon can be assigned to a category. All polygons in a category are of the same type. Examples of categories are Parish, District Council, or Irrigated Land.

To assign a polygon to a category:

- 1 Select the Polygon.
- 2 Click in the value box for the Topology Category property, and type in the category name.

◆ Measuring the area of a polygon



You can measure the area of a selected polygon or polygons using the **Measure>Area** command. The information is given in the current area units.

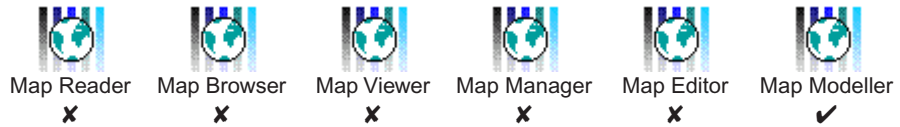
The area value of a polygon is also shown by the Area property.

◆ Using a polygon to find other items



The **Edit>Find...** command can be used to locate items when applied in conjunction with polygons.

For instance, you may want to find other item(s) which are contained by the polygon, or which cross its boundaries, or you may want to find other polygons which have the same area value. ➤ Chapter 34: “**Selecting graphics**”



Editing TINs

■ Triangulated Irregular Networks (TINs)	521
■ Simplifying a TIN	522
■ Merging TIN items	522
■ Snipping a TIN to an area	523
■ Converting a TIN to an area	523
■ Draping vector data onto a TIN	523
■ Draping a bitmap image onto a TIN	523
■ Creating contour lines on a TIN	524
■ Displaying flow arrows on a TIN	525
■ Smoothing TINs	526

■ Triangulated Irregular Networks (TINs)

A Triangulated Irregular Network (TIN) provides a means of ground modelling using triangular surfaces. These surfaces are made from a network of points connected by lines forming triangles. ➤Chapter 31: “**Creating 3D data**”

◆ Selecting a TIN

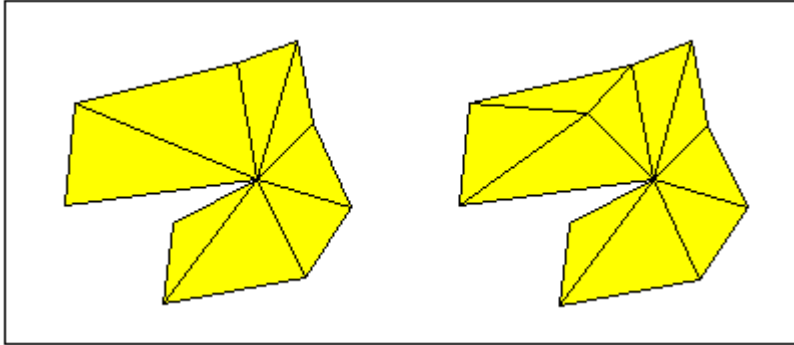
You can select a TIN by clicking anywhere within it, or by using the Area snap. Using the Area snap you can snap to the Z height of a TIN.

◆ Editing a TIN

You cannot carry out any editing in a 3D Window. All editing must be done in the map window, and the changes will be reflected in the 3D view.

◆ Inserting nodes

You can add extra nodes to the TIN and thereby add extra triangles.



Select the TIN, then add a node by clicking where you want the node to be, while holding down the Ctrl key.

As you insert a new node, Cadcorp SIS adjusts the triangulation to accommodate it, keeping the triangles as small as possible.

◆ Deleting nodes

You can remove individual nodes from a TIN. Select the TIN, then select the node to be deleted, ensuring that it appears filled. Then use the Backspace key.

If you delete an interior node, the TIN is re-triangulated. If you delete an edge node, then triangles will be removed.

In some situations you are not allowed to delete an edge node. This is to prevent you creating a TIN which has a node with disconnected triangles (a manifold). An example of a manifold is a figure 8. If you are not allowed to delete a particular node, then try deleting the nodes in a different order.

■ Simplifying a TIN



The **Alter>Simplify** command converts the TIN into area, line and point items.

■ Merging TIN items



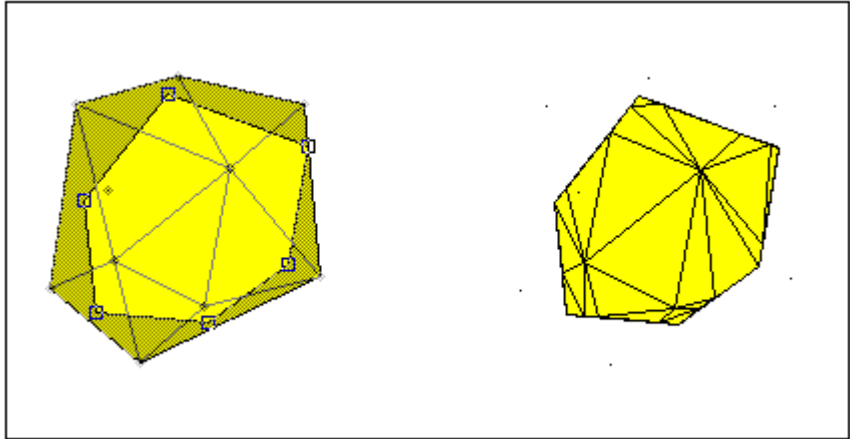
You can merge together two or more TIN items into a single TIN item. The TINs being merged need not have common edges or nodes.

Select the TINs, then their item command Merge TIN items.

■ Snipping a TIN to an area



You can use the TIN item command Snip to remove that part of a TIN which does not overlap an area item.



Select the TIN, then its item command Snip. Next, click on the area item, which must lie completely within the TIN.

New nodes are created in order to complete the triangular faces.

■ Converting a TIN to an area



A TIN can be converted into a simple area item, using the item command Convert to Area. The edges of the TIN are used to define the area, the interior nodes being discarded.

■ Draping vector data onto a TIN



The TIN item command Drape vector overlay drapes line items over the surface of a TIN. The line items must be on an editable overlay and must lie totally inside the TIN.

This command moves the vertices of the lines up or down so that they lie on the surface of the TIN. In addition, wherever the line crosses a TIN triangle, a 3D vertex is added to the line at the edge of the triangle.

- 1 Select the TIN, and its item command Drape vector overlay.
- 2 From the dialog drop-down select the overlay on which the line items occur.

■ Draping a bitmap image onto a TIN

You can drape a bitmap image over a 3D TIN, using the Drape commands on the 3D menu. The bitmap can be an existing bitmap item called Drape in the current library, or you can create a temporary bitmap image of the view in the current map window, and drape this over the TIN (**3D>Drape>Save**). Chapter 9: “Viewing 3D Data”, Draping bitmap images over 3D data, page 157



■ Creating contour lines on a TIN

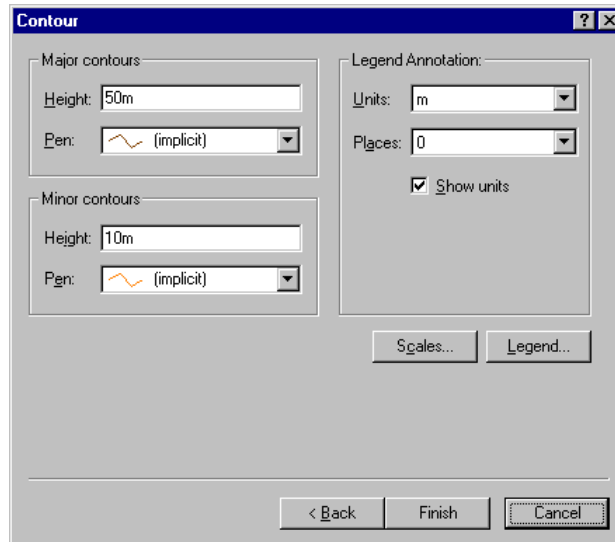
You can use the Contour theme to draw contour lines over a 3D TIN. ➤Chapter 19: “**Thematic mapping**”

Exploding a Contour theme generates joined-up contour lines (they are multi-line items). You can then use the Label theme to label these contours, if required.



- 1 Start the New Theme Wizard, select the overlay containing the TIN, and select the theme type Contour.
- 2 In the Contour dialog you can choose the spacing for the major and minor contours, and which pen to use for them.

You can also specify how the units will be displayed on the legend.



To customise the legend further, use the Legend... option. ➤Chapter 19: “**Thematic mapping**”

To specify the display scales between which the contours will be displayed, use the Scales... button.

◆ Creating smoother contour lines

If you require smoother contour lines, use one of the following methods:

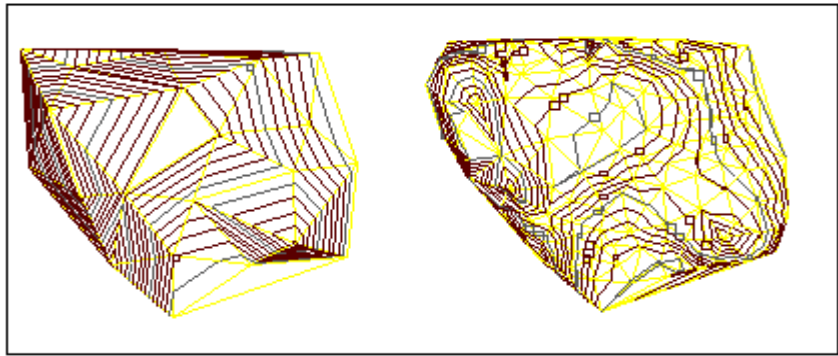


- 1 If there are not too many contours, after creating them you can smooth them using the **Alter>C.A.D.>Smooth>Vertex** command. This makes very smooth contours, but they may cross over each other, and may not be very accurate.
- 2 Before creating the contours, subdivide the TIN item, perhaps more than once, using the TIN item command Subdivide.



Method 2 is theoretically more valid, and usually makes more accurate contours which will not cross. However, the resulting contours may not be as smooth as Method 1.

The following diagram shows a TIN with contours applied, then the same TIN subdivided twice before having contours applied:

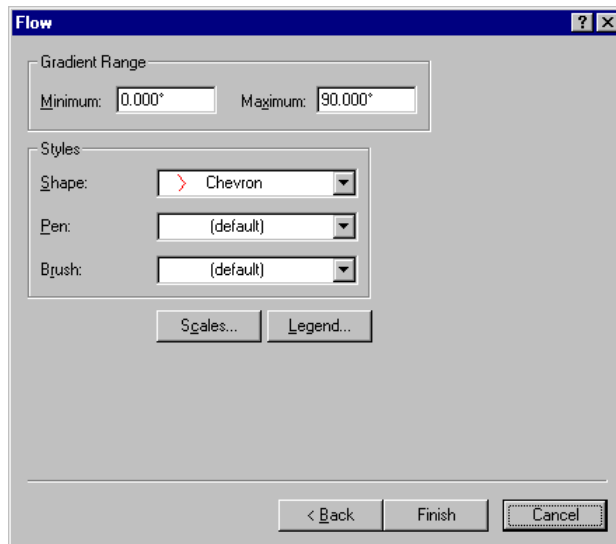


■ Displaying flow arrows on a TIN

You can use the Flow theme to display flow arrows on a 3D TIN. ➤Chapter 19: “**Thematic mapping**”.



- 1 Start the New Theme Wizard, select the overlay containing the TIN, and select the theme type Flow.
- 2 In the Flow dialog select a minimum and maximum gradient which will be depicted with a flow arrow:



Choose a shape and pen to be used for the flow arrow.

- 3 To customise the legend, use the Legend... option. ➤Chapter 19: “**Thematic mapping**”
- 4 To specify the display scales between which the flow arrows will be displayed, use the Scales... button.

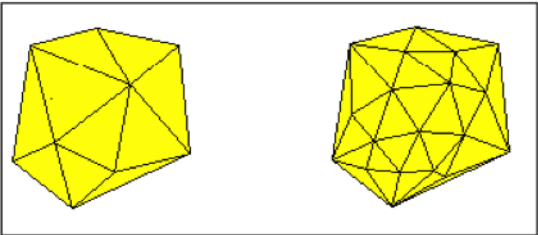
Troubleshooting When putting flow arrows onto your TIN, check the scale of the TIN and the display scale of your shapes. Too large a scale and the shapes will not appear unless you zoom in. Too small a scale and they will appear too big. An alternative to using one of the default shapes is to create your own arrows. To do this, draw one on screen that displays at a suitable scale and then use **Construct>Shape...** This shape will be stored in the current library; you will need to save it if you wish to use it again. ➤Chapter 26: “**Creating points and placing shapes**”, **Creating shapes**, page373



■ Smoothing TINs



Using the item command Subdivide, you can make a TIN appear smoother. You may want to do this before creating contours, or exporting to another GIS or CAD system. A new node is added into each face of the original TIN. The height of each new node is calculated using De Casteljau’s Subdivision algorithm over each original face.

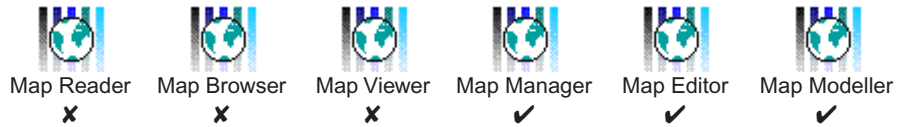


◆ Smoothing filters

You can apply a smoothing filter to the created TIN. To do this, select the TIN item, display the properties tab in the workspace window, and set the Smooth property to True:

Miscellaneous	
Description	Value
Blended Colours	False
Class name	TinSurface
Dataset	(Untitled) 3
Delaunay	True
Description	TIN
Dimension	2
Horizontal	False
Item ID	1
Item class	TIN
Number of edges	128681
Number of nodes	42902
Parent feature code	0
Scale	1
Smooth	True
URI (Hyperlink)	False
	True

Cadcorp SIS reprocesses the TIN to produce a smoother effect of the model. This is best viewed in a 3D window.



Editing raster data

■ Selecting a raster image	527
■ Moving and Copying a raster Image	527
■ Editing raster data	528
■ Zooming a raster image to get the best resolution	528
■ Displaying rotated or mirrored bitmaps	528
■ Inserting a logo	528
■ Compressing bitmaps	529
■ Changing pixel resolution of bitmaps	529
■ Distorting raster maps: rubbersheeting	530

■ Selecting a raster image

You can select any raster image by clicking on its boundary.

You can also select a raster image by clicking on the picture itself (using the raster snapcode). However, this raster snapcode works only when the cursor is on the boundary of pixels with contrasting colours and/or shades, eg the edge of a black area on a white background - at this point you will see a bitmap tip shown at the cursor position.

The Raster snapcode is the only one which cannot be typed.

■ Moving and Copying a raster Image

Original raster data has a maximum status of hittable. Therefore, if you wish to edit it, you must use one of the following functions:



Edit>Paste From



Edit>Copy/Paste



Edit>Replicate



local command **Copy To** followed by



Map>Add>Overlay... Imported File

Raster items can be moved and/or copied using the following methods:

- use the drag-and-drop to move the image
 ➤ Chapter 35: “General editing techniques”

- use the Ctrl key with the local command Move Items to copy the image ↪Chapter 35: “General editing techniques”
-  • use the **Alter>Move Dataset** command. This will move all the data on the overlay, not just the selected items.
-  • if you wish to scale, mirror or rotate the image, use the Move Items dialog. Rotated or mirrored raster images require a lot of memory in order to display them. ↪Chapter 4: “Loading data”, **Computer memory requirements for raster data**, page 70

■ Editing raster data

You cannot edit the contents of a raster data file in Cadcorp SIS, ie you cannot add, move or delete individual pixels. There are Windows applications available which provide tools for carrying out these tasks.

You can change various properties of the bitmap using the Properties dialog. One property that you may want to change is the pen, which is used to draw the border of the bitmap.

You can use the Transparent property to view data lying beneath the raster image. Set this to True and the Brush property to Hollow.

Colour raster files may be viewed in greyscale by using the Convert to Gray command from the local menu.

■ Zooming a raster image to get the best resolution



The **Map>Zoom>Raster** command works on the selected bitmap or grid item, setting the view scale so that one pixel in the bitmap or grid item equals one pixel on the screen, in order to achieve the perfect resolution. The view is zoomed in or out, without its centre being changed.

The width (X dimension) will always be correct, and, if the bitmap's pixels are square, the height will be correct too.

This command will also operate without a bitmap or grid item being selected. In this case, Cadcorp SIS searches for a bitmap or grid item and zooms to it.

■ Displaying rotated or mirrored bitmaps

Displaying rotated or mirrored bitmaps requires a lot of computer memory, so if your computer's memory is not sufficient, you will find they are displayed in outline only.

If they are displayed properly, but you find the computer is becoming slow to operate, you can choose to display rotated bitmaps in outline only, using the Draw rotated bitmaps checkbox on the Options tab of **Tools>Preferences...** (there is also a Print rotated bitmaps option, to speed up printing). Vector data can also be transformed using this method.

For the use of these options, and how you can cause rotated and mirrored bitmaps to be displayed properly, ↪Chapter 4: “Loading data”.

■ Inserting a logo



An alternative to drawing your logo is to scan it, then insert it where required using the **Edit>Paste From** command (↪Chapter 4: “Loading data”).

■ Compressing bitmaps



The Compress command takes an uncompressed bitmap and compresses it to an appropriate TIFF format so that the bitmap item uses less memory, and the overlay or SWD file containing the bitmap uses less disk space.

The Compress command can be found on the **glter>Raster** menu and on the bitmap item menu.

The resulting TIFF format bitmap item is saved inside the overlay. (If the original bitmap was a linked bitmap, the link is now broken, and the resulting bitmap is no longer linked.)

Once compressed, the image might be slower to draw.

■ Changing pixel resolution of bitmaps

Resampling is when several bitmap pixels need to be merged into one pixel, or when the colour halfway between two pixels needs to be interpolated. You cannot resample bitmaps which have been compressed (either read in as compressed files, or subsequently compressed using the Compress command).



Once a resampling method has been selected for a bitmap, it remembers this method and uses it if it is ever resampled again.

If you do not need to select a resampling method, omit steps 2 and 3. If this is the first time this bitmap has been resampled, or if you wish to change its resampling method:

- 1 Select the bitmap.
- 2 Select the **Alter>Raster>Set Resample Method...** command.
- 3 Choose one of the following methods:



Copy closest pixel's value

This is the fastest and most common method. It should be used for bitmaps which represent pictures but which use a colour palette.

Interpolate between closest pixels

This should only be used for true-colour bitmaps (ie greater than 8-bit colour depth), where colour quality is important. This is a slower operation than copying the closest pixel's value, so use this method when quality is more important than speed.

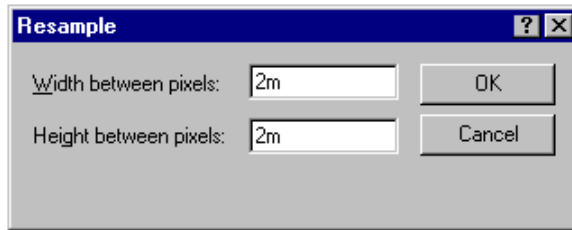
Keep sum of pixels constant

This should only be used for non-picture bitmaps. For example, grid items use pixel values to represent linear values and not colours. Sometimes the linear value represents a count, such as the number of houses within the square occupied by a pixel. In this case you would want to keep the number of houses the same before and after any bitmap resample operations.



- 4 Select the **Alter>Raster>Resample...** command.

- 5 In the Resample dialog change the spacing between pixels. The current spacing is shown, the values being with reference to the map data underneath:



If you decrease the spacing, you increase the number of pixels making up the bitmap. If you increase the spacing, the number of pixels decreases, with a corresponding decrease in the resolution of the image.

■ Distorting raster maps: rubbersheeting

Raster data can suffer from distortion if it originates from scanned paper or photographic data. Cadcorp SIS provides tools for correcting the distortion of raster maps using known survey or control points. This distortion operation is known as rubbersheeting since it is analogous to stretching a map drawn on a sheet of rubber to its correct geographical position.

Rubber-sheeting is used with raster data which has been overlaid using:



Edit>Paste From



Edit>Copy/Paste



Edit>Replicate



Copy To followed by



Map>Add>Overlay... Imported File

Rubbersheeting is not possible with linked datasets or index datasets unless they have been overlaid using one of the above methods, because original datasets cannot be edited.

➤ Chapter 4: “Loading data”

Rubbersheeting is carried out in the following three stages:

- create a rubbersheet transform
- select a rubbersheeting method
- use the rubbersheet to transform the bitmap

Stage 1: Create a rubbersheet transform

Steps 1 to 7 describe the first stage of the process, creating a rubbersheet, which expresses the distortion required. It consists of a number of control points which are to be either anchored where they are, or moved to their correct location.



- 1 Select the **Construct>Miscellaneous>Displacement** command.
- 2 Snap a position either on or near the feature which is to be moved, or on a feature which is to be anchored in its current position.
- 3 Either:
 - click on the new location if the feature is to be moved. A line with an arrow at one end is displayed, to indicate the displacement.
 - press the Enter key if it is to be anchored at its current position
- 4 Repeat steps 2 and 3 to create as many displacements as you want. A minimum of two is required, but to ensure the accuracy of the rubbersheet you should provide as many displacements as possible.
- 5 Press Esc to end the command.
- 6 Ensure that the displacements are selected.
- 7 Select the displacement item command Make Rubber Sheet (via the local menu or the Item main menu). This creates a rubber sheet transform.



Stage 2: Select a rubbersheeting method

Steps 8 to 11 describe the second stage of the operation, selecting the rubbersheeting method.



- 8 Make sure the rubbersheet is selected.
- 9 If the rubbersheet is not correct, use the item command Explode (via the local menu or the Item main menu). This changes it back to displacement points again. You can then edit the displacements or add further ones before re-creating the rubbersheet transform.
- 10 If the rubbersheet looks correct, select the item command Set Rubber Transform (via the local menu or the Item main menu).
- 11 In the Set Rubber Transform dialog, select the appropriate method.

The options represent different algorithms which use displacement items in different ways. All algorithms are essentially two-dimensional transformations and operate in the XY plane.

If you understand how they work you can choose the best one for the circumstances, otherwise you can follow these guidelines:

Fitted Linear

Only three of the displacement items are used, so if you have created and selected more than three, you will not be able to predict the results.

Its most appropriate uses are:

- transforming one rectangle into another eg to place a pasted Metafile or bitmap
- fitting a scanned bitmap onto existing data approximately
- geocoding accurate third party vector data eg DXF

- Inverse Square Weighted** All displacement items are used to transform every point, but the closer displacements have more effect on a particular point than the more distant ones. If a point is exactly on the start of a displacement, it will be transformed to the end of that displacement.
- Points a long way away from all displacements will be moved by the average displacement. Therefore, if the average displacement is zero, the transformation will only have a local effect.
- This method is most suited to fitting a scanned bitmap onto existing data accurately.
- Linear Patch** All the start points of the displacements are triangulated. Only points which lie inside one of the triangles, or on its border, are transformed - other points are left where they are.
- This method is most suited to fitting digitised vector data to known positions.

Stage 3: Use the rubbersheet to transform the image

Steps 12 to 13 describe the last stage of the operation, transforming the raster image.

- 12** Select the raster image.



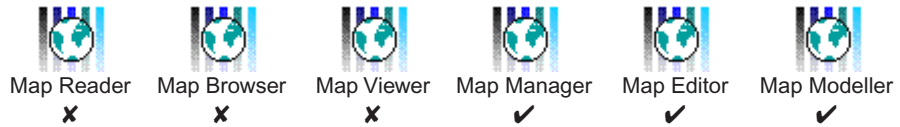
- 13** Select the **Alter>Rubber sheet** command.

Cadcorp SIS then distorts the raster graphics, extrapolating out beyond the rubbersheet control points.

This command creates raster images with square pixels, and with approximately as many output pixels as input pixels.



- 14** To save this image, use **File>Export>To File**. You will be asked the width and height of the bitmap.



Editing pens and brushes

■ Pens and brushes	533
■ Creating new pens	533
■ The Edit Pen dialog	534
■ Multi-level pens	539
■ Creating new brushes	540
■ The Edit Brush dialog	541

■ Pens and brushes

Pens and brushes are named objects, and are stored in named object libraries (NOLs).
 ➤ Chapter 50: “**Named object libraries (NOLs)**”

■ Creating new pens

To create a new pen:

- 1 Use one of the following two methods to create the pen initially:
 - using the local commands on the library view tab of the workspace window, copy an existing pen and paste it into an editable library. Proceed to step 2.
 - select the library where the new pen is to be stored, and select New Object... from its local menu. (Remember that the (standard) library is read-only, so you cannot add any objects to it.)



In the New Object dialog, select Pen from the drop-down, and click on OK.

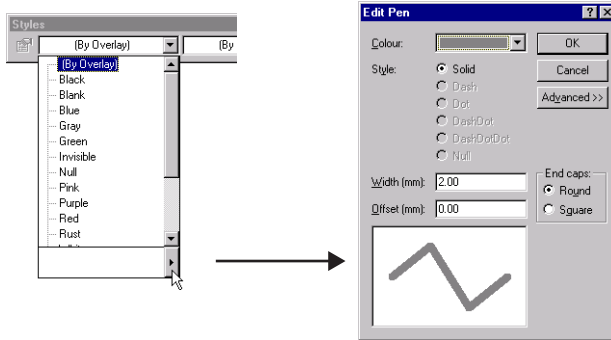
In the Pen folder you will see that a new pen has been added. New pens are called pen_1, pen_2, pen_3, etc, and all have the same properties initially (they have a solid black linestyle with no width).

- 2 Rename the new pen using Rename from the local menu.
- 3 Edit it as required, changing its properties in the Edit pen dialog (accessed via the local command Properties...).

Alternatively, you can take an existing editable pen and change its properties. To do this:

- 1 Select a pen from the drop-down list on the Styles toolbar.

- 2 Click the arrow at the bottom to display the Edit Pen dialog.

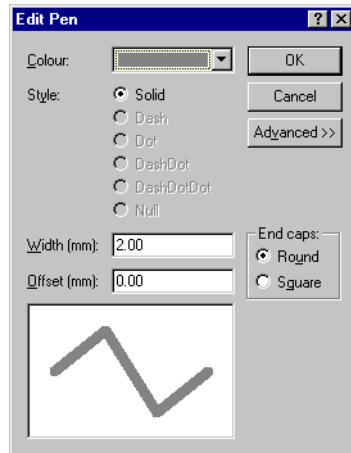


- 3 Specify the pen's details and click OK.

This will change the implicit pen, but it will not be saved.

Troubleshooting Changing an editable pen into an implicit pen is not recommended, because this pen is not saved in any library, and therefore cannot be re-used at any time without having to be recreated.

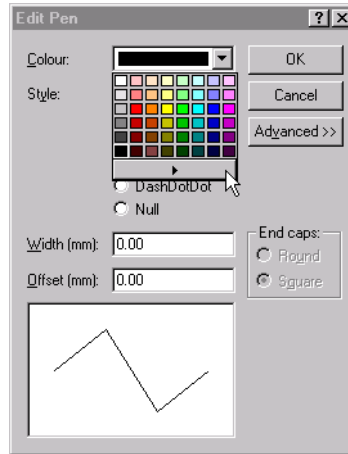
■ The Edit Pen dialog



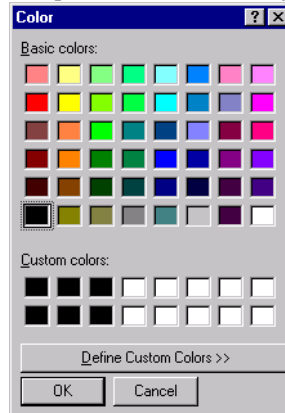
To edit your pen, select any of the parameters described below, and click on OK when finished.

◆ Colour

From the Colour drop-down, either choose a colour from the palette (with a double-click), or click on the arrow:



This allows you to access the Color dialog. This contains 48 pre-defined basic colours from which you may choose, as well as up to 16 colours which you can define yourself.



To mix your own custom colours, click on the Define Custom Colours button.

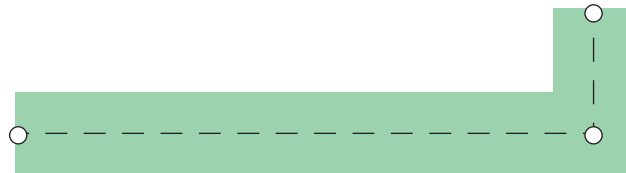
◆ **Style**

There are 6 possible styles to choose from (these are options provided by Windows). Null gives an invisible line. The other options give the following results:

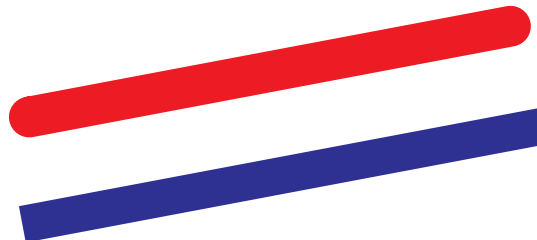
— — — — —	Dash
— . — . — . — . — .	DashDot
— . . — . . — . . — . .	DashDotDot
.	Dot
—————	Solid

◆ **Width**

This is the width of the pen on the print (unless it is scaled up or down at the printing stage). The width is in millimetres, and may be a decimal or a whole number. Unless you specify an offset (see below), the thickness is centred about a line drawn directly between the points you input.

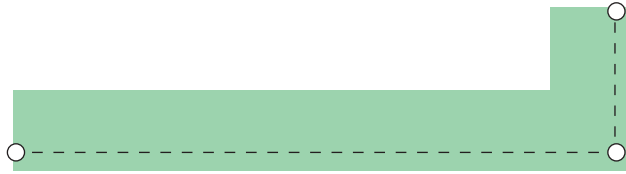


If you create a wide pen, you can choose whether to have square or round end-caps. Round end caps allow thick lines to be drawn faster and smoother.

◆ **Offset**

The offset option can be used where you have specified a width for a line. If you specify an offset, the line will not be drawn between the points you input, but instead offset by the given amount from a line joining the points. The offset is in millimetres, and is the distance

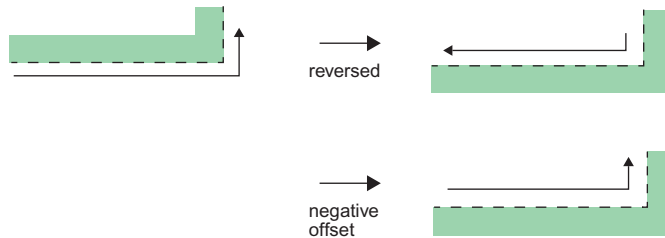
the line will appear offset on the print. The offset is to the left of the line, looking in the direction in which it was drawn. If you type a negative offset, it will be drawn to the right of the line, in the direction in which it was drawn.



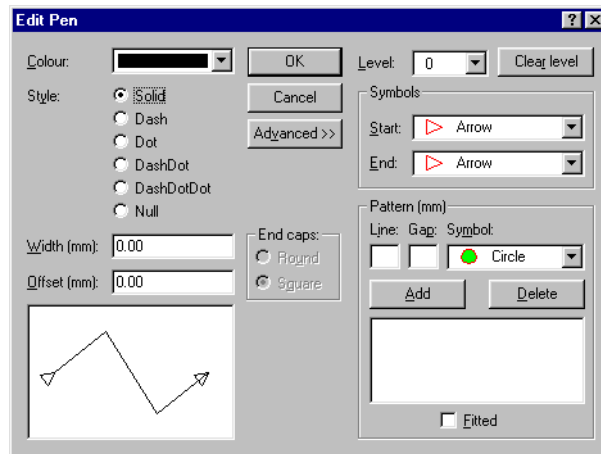
If you combine the offset with the pen width, you can create an offset which lies along the edge of a line. Make the offset half of the pen width.



You can use the **Alter>Reverse** command (not available in Cadcorp SIS Map Viewer) to reverse the direction of the line. This moves the offset to the other side of the line, and saves you having to define a line with a negative offset.



◆ Advanced



- Level** Every graphical item is assigned a level between 0 and 255. The level of items dictates the order in which they are drawn on the screen, level 0 being drawn first, then level 1, then level 2, etc. In this way items on level 2 will overlay, and may obscure, items on levels 0 and 1. ➤page540, **Creating multi-level pens**
- Start Symbol** You can choose to have a symbol drawn at the beginning and/or end of a line. An example might be to place an arrow-head. Select the symbol required from the drop-down list.
- End Symbol**
- Pattern** You can define your own style of pen using lines, gaps and symbols. Each symbol is a Shape which can be inserted into the line at selected intervals.
- **Line** the length of the line segments (in millimetres on the print). A line length of zero (0) is permitted.
 - **Gap** the length of the gap (in millimetres on the print). A gap length of zero (0) is permitted.

- **Symbol** the name of the Shape. This is placed half way through the gap. More precisely, the Point item, of which the Shape is a property, is placed half way through the gap.



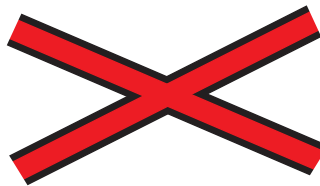
You can see from this example that when you construct lines, they start halfway through the length of one line segment, and that the pattern is carried on around corners.

- **Fitted** If you choose the Fitted option, the repeat pattern will be stretched or contracted such that there are an exact number of repeats along the line (finishing, as it starts, with a line segment half the length of the first specified segment length).
- **Add** Add the newly-defined line spacing, gap spacing and symbol name to the list of those available for use in defining pens.
- **Delete** Delete the selected line, gap and symbol definition from the list of those available for use in defining pens.

Troubleshooting When creating new pens and brushes, you may find that when you apply them to your data, they do not appear. This is because the scale of your map is inappropriate for the width of your new pen. You may have to alter your dataset scale (using the Overlays dialog, Dataset tab) for the new pen style to be visible. Remember that the dataset scale should be the same as the printing or viewing scale if the graphics are to be displayed as they were created.

■ Multi-level pens

You may create pens with more than one level. Each level can have a different style, thickness, etc. For example, you might want to create a pen to depict a major road, as drawn in a road atlas. A convention for this is to depict it as a thick red line bordered in black.



You could create such an effect using a pen with two levels: one level consisting of a very thick black line, the second level being a thinner red line. The thick black line would be on level 0, therefore drawn first, the thinner red line drawn on level 1, lying on top of the black line. Where two roads drawn with this pen cross, the black always lies beneath the red. There are 32 different levels available for multi-level pens.

◆ Creating multi-level pens

- 1 Select each level in turn and define it as you would a single-level pen. If you make a mistake or want to change your mind about the definition of a level, click on the Clear level button and start again.
- 2 Once you have defined all levels, click on OK.

◆ Levels and the order in which graphics are drawn

The order in which graphical items were created has no effect on the order in which they are drawn on screen. Instead this is controlled by a strict hierarchy, which is summarised below:

Screen display sequence:

```

Overlay #1
  Level 0 Items
    Level 0 Item #1
      Pen level #0
    Level 0 Item #2
      Pen level #0
    ...
    Level 0 Item #1
      Pen level #1
    Level 0 Item #2
      Pen level #1
    ...
    ...
  Level 1 Items
    Level 1 Item #1
      Pen level #0
    ...
    ...
    ...
Overlay #2
  ...
  ...
  ...

```

The order of items in each level is controlled by the spatial index, so the item number here does not refer to the item ID.

■ Creating new brushes

To create a new brush:

- 1 Use one of the following methods to create the brush initially:



- using the local commands on the Library View tab of the Workspace Window, copy an existing brush and paste it into an editable Library. Proceed to step 2.
- select the Library where the new brush is to be stored, and select New Object... from its local menu. (Remember that the (standard) library is read-only, so you cannot add any objects to it.)

In the New Object dialog, select Brush from the drop-down, and click on OK.

In the Brush folder you will see that a new brush has been added. New brushes are called brush_1, brush_2, brush_3, etc, and all have the same properties initially.

- 2 Rename the new brush using Rename from the local menu.
- 3 Edit it as required, changing its properties in the Edit brush dialog (accessed via the local command Properties...).

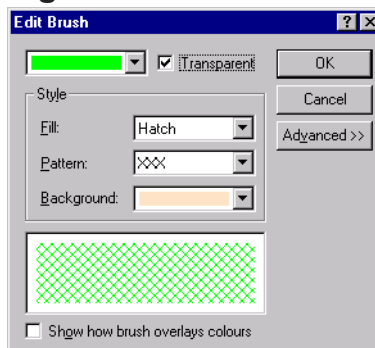
Alternatively, you can take an existing editable brush and change its properties. To do this:

- 1 Select a brush from the drop-down list on the Styles toolbar.
- 2 Click the arrow key adjacent to where it is displayed, to access the Edit brush dialog.

This will change the implicit brush but it will not be saved.

Troubleshooting Changing an editable brush into an implicit brush is not generally recommended (although there are some circumstances where it is preferred), because this brush is not saved in a library (it is saved within the SWD), and therefore cannot be re-used without being recreated. However, it is more reliable to copy an existing brush into an editable library and then change it, and, if this brush is not renamed, Cadcorp SIS uses this created brush as the pull-down menu default.

■ The Edit Brush dialog



To edit your brush, select any of the parameters described below, and click on OK when finished.

◆ Colour

From the Colour drop-down, either choose a colour from the palette (with a double-click), or click on the arrow, which allows you to access the Color dialog.



This contains 48 pre-defined basic colours from which you may choose, as well as up to 16 colours which you can define yourself.

To mix your own custom colours, click on the Define Custom Colours button.

Select the Transparent checkbox in the Edit Brush dialog to ensure that the brush allows any graphics underneath it to show through (applicable to the solid and hatch brush styles). If this option is not selected, the brush will obscure any graphics underneath. Click the Show how brush overlays colours checkbox to see a demonstration in the sample window.

◆ Style

Select the style required:

Solid This produces a brush where the Area item is completely filled with the colour chosen. Use the Transparent option to determine whether this colour is transparent or opaque.

Hollow A hollow brush is one where there is no colour used to fill the item, causing it to be completely transparent. This style is used with brushes where you want to change the spacing or angle of hatch lines, or use bitmaps or Shapes in Area fill.

Hatch This produces a brush consisting of a hatch pattern selected from the Pattern drop-down (one of the following):

///

\\

||

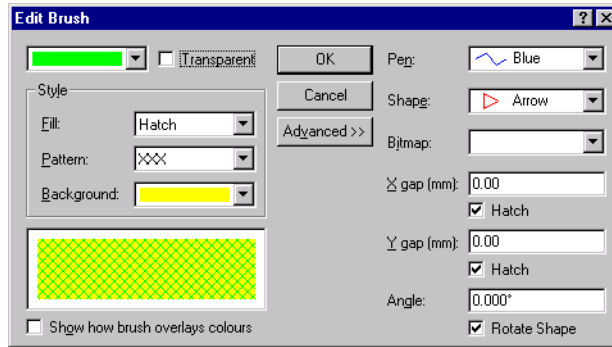
+++

===

XXX

Choose a background colour if you want the hatch patterns to be superimposed over a colour and deselect the Transparent check box. Leave the Transparent check box ticked to produce no background colour.

◆ Advanced



Pen This is the pen for the advanced brush features. It can be either a system colour pen or a user-defined pen.

Shape This draws a shape at each (X gap, Y gap) point.

Bitmap This draws a bitmap at each (X gap, Y gap) point. The bitmap is fitted to the (X,Y) gap sizes.



Choose an image to use for the brush. Select it and save it using the **Edit>Store Item** command. Give it an alphanumeric name. It will be saved in the current library as a named item. Make sure the image resolution is appropriate for the (X gap, Y gap) size. The bitmap resolution must be appropriate for the (X gap, Y gap) size, otherwise the bitmap pixels will be too big or too small and the bitmaps will not draw.

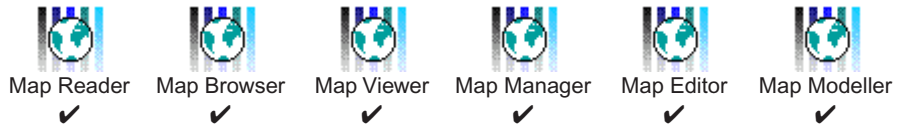
Make sure the brush style is either Hollow or Hatch. If Hatch is chosen, there will be lines running down the bitmap pattern. If you use Hollow, there will be no lines.

When you use a bitmap, the Angle option is ignored.

X gap, Y gap This is the horizontal and vertical spacing before a pattern is repeated. The values given refer to millimetres on the print.

Use the Hatch checkboxes to determine whether the hatch lines should be drawn. This option is useful for advanced hatching with a definite spacing and angle. The hatching option in non-advanced brushes is fast, but can be unpredictable with different printers etc.

Angle the angle for shapes and advanced hatch lines. Use the Rotate Shape checkbox to rotate the points where the shapes will be drawn. You can also choose whether you want the shapes themselves to be rotated.



Sharing data

■ User datasets	545
■ Sharing databases	545
■ Saving session details: SWD files	547
■ Published Window Definition (PWD) files	548
■ Open Window Definition (OWD) files	548
■ Saving raster files	548
■ Exporting files to other formats	549
■ Exporting data in tiles	550
■ Exporting to data sources	553
■ Sending documents by email	553

■ User datasets

When you create your own graphics (lines, points, polygons, and so on) they are stored in one of the following:

- a base dataset file (BDS)
- an internal dataset
- an Editable Geometry dataset
- a Shared Dataset (SDS) file

BDS is a Cadcorp proprietary file format. You can also export BDS in tiles. ➤page 550, **Exporting data in tiles**

Internal datasets are used where the data is of a temporary nature. Internal datasets are saved as part of an SWD. They cannot be accessed by other users.

Editable Geometry datasets use a Cadcorp proprietary format and store data in ODBC-compliant databases. ➤Chapter 20: “**Databases**”

A Shared Dataset file is an editable overlay, used with large datasets, which returns only a user-specified view of the data. ➤Chapter 4: “**Loading data**”, **Shared dataset (SDS) files**

For more details on where your own data is stored, ➤Chapter 22: “**User datasets**”.

■ Sharing databases

Databases are one of the main mechanisms available for managing corporate data. There are benefits of using a centrally-managed corporate database:

- data can be shared throughout the organisation
- database security helps control who can access the data
- data management (loading and backing up) is made easier

- data consistency is enhanced by having only a single copy within the organisation
- Cadcorp SIS allows you to share data in databases and in shareable files.

◆ Database support

Cadcorp SIS supports the following databases:

- Oracle
- PostGIS
- SQL Server
- Microsoft Access
- ODBC (connectivity to any ODBC-compliant database)

Spatial data can be stored in any of these, and it can then be managed as a corporate asset. All databases provide tools which allow the data to be managed and shared securely.
➤ Chapter 20: “Databases”

Oracle

Spatial data can be stored in Oracle using Oracle’s native spatial data type SDO_Geometry.

Migrating Data Spatial data can be stored in the Oracle database by migrating it from any spatial format supported by Cadcorp SIS. The Export utility in Cadcorp SIS will export the data to Oracle preserving the spatial data and its attributes.

Creating new Data New data can be created in Oracle by either editing an existing spatial layer held in Oracle or by exporting a new overlay.

The database administrator is then responsible for allowing users to have access to the data.

PostGIS

Spatial data can be stored in PostGIS using PostGIS’s native spatial format.

Migrating Data Spatial data can be stored in the PostGIS database by migrating it from any spatial format supported by SIS. The export utility in Cadcorp SIS will export the data to PostGIS preserving the spatial data and its attributes.

Creating new Data New data can be created in PostGIS by either editing an existing spatial layer held in PostGIS or by exporting a new overlay.

The database administrator is then responsible for allowing users to have access to the data.

SQL Server, Access, and ODBC-compliant databases

Spatial data can be stored in SQL Server, Access, or other ODBC-compliant databases using one of the following spatial formats.

Editable Geometry Database

This format provides multi-user access to spatial data including topological spatial data.

➤ Chapter 20: “Databases”

To load data into this format, the data has to be replicated from one overlay into the Editable Database overlay. New data can be drawn directly in the overlay.

OGC SQL92 Dataset

This format provides support for spatial data in a format that conforms to a specification published by the Open GIS Consortium.

To load data into this format, it can be uploaded from an existing overlay as a part of the dataset creation process. New data can be drawn directly in the overlay.

◆ Shareable Files

If you do not have access to a corporate database, you can share data using one of the following mechanisms (datasets):

- SDS
- ODB (OS MasterMap only)

SDS

The SDS dataset is a Cadcorp proprietary format which supports a multi-user environment for viewing and editing data. The underlying SDS file should be placed in a central location so that users can access it.

Creating an SDS Dataset To create an SDS dataset, export an existing overlay of spatial data to an SDS file using the Cadcorp SIS export utility. You can add new data by opening the file in Cadcorp SIS and editing the overlay.

➤ Chapter 4: “Loading data”, Shared dataset (SDS) files

ODB

This a read-only dataset set available for users of Ordnance Survey MasterMap data. The underlying ODB file should be placed in a central location.

Creating an ODB OS MasterMap Dataset You use the Cadcorp OS Mastermap Manager utility to create OS MasterMap datasets.

■ Saving session details: SWD files



When you carry out a **File>Save** or **File>Save As** you create an SWD file (Saved Window Definition). An SWD is normally a small file, containing little data, but holding a record of the following:

- a list of all datasets in use, and their status at the time of the save
- any indexes created
- any overrides or filters set. Examples of overrides include default colours for graphics, default fonts for text, etc, which you may have set. Filters govern which items are displayed on screen, and which are not.
- any internal overlays and the graphics contained within them
- any overlay schemas
- any themes
- any loci

The SWD file links to file-based datasets by remembering their file names (ODBC datasets remember their ODBC connection strings). This link will be broken if the dataset files are moved and the SWD is not. It is therefore advisable to store the SWD file on the same disk as the datasets it references.



The **File>Save All** command saves all open files (SWDs, workspaces, BDS files, and libraries).

■ Published Window Definition (PWD) files

Cadcorp SIS Map Reader is the entry-level product in the Cadcorp SIS desktop product range. The Map Reader can view data that has been pre-defined in a Published Window Definition (PWD) file by the higher-level Cadcorp SIS Map Manager, Map Editor, and Map Modeller products.

A PWD file is an assembled view of one or more datasets. It is normally a small file, containing little actual data but holding a record of the following:

- a list of all overlays in use, and their status at the time of the last save
- any overrides or filters set. Overrides control the default colours for graphics, fonts for text, and so on
- filters which govern which items are displayed on screen.
- a view extent

The PWD file links to datasets by remembering their file locations. Be careful when you move PWD files and datasets to different disks. Try to store PWD files on the same disk as the datasets they reference.



A PWD file can be created only in Cadcorp SIS Map Manager, Map Editor, or Map Modeller. Use the **File>Save Copy As** command.

◆ How to create a PWD

- 1 Choose **Save Copy As...** from the File menu. The Save Copy As file browser dialog opens.
- 2 Choose Published Window Definition from the Save as type menu.
- 3 Type in a name for the new PWD file, then click Save.

■ Open Window Definition (OWD) files

Cadcorp SIS Map Browser, Map Manager, Map Editor, and Map Modeller can download OGC-compliant geographic data from web servers. These products can also open previously-defined OWD files.

A OWD file is an assembled view of one or more datasets. ➤Chapter 11: “**Cadcorp SIS and the Open Geospatial Consortium**”

◆ How to create an OWD

You can create an OWD using the Cadcorp SIS Map Browser commands **Save**, **Save As**, and **Save Copy As**.

■ Saving raster files

There are several processes for saving raster files.



To write everything which is on screen to a file, use the **File>Export>to File...** command. This command can create bitmaps, dithered bitmaps, JPEG files, PNG, and various types of TIFF files. ➤page 549, **Exporting files to other formats**



To create bitmap tiles using Ordnance Survey or other file naming conventions, use the **File>Export>to Multiple Tiles** command. Tiles can be created in BMP, JPG, PNG, and TIFF formats.

To write a raster file which consists of just the bitmap item and no other graphics from the current view, use the item command **Copy To...** (accessed via the local menu or the Item main menu). You are given a standard Save As dialog, which allows you to save the image in bmp format, as a PNG bitmap, or as a TIFF file (with no compression, Packbits compression, or LZW compression). If you have a 24-bit, true-colour bitmap, you will also be offered the ability to save it as a JPEG or greyscale JPEG file.

When you use the **Copy To...** command, the new file has the resolution of the bitmap being copied.

■ Exporting files to other formats

Before exporting data which is to be used in other software programs, you may wish to simplify the geometry in the datasets. Simple geometry has far more chance of being read correctly by another system. For details on the **Alter>Simplify** command, see Chapter 35: “General editing techniques”.



Use the **File>Export>to File...** command to export the data you have on screen to another format. See Chapter 5: “File formats”



When you use this command, the extents of the saved image are not necessarily those of the view you see on screen. What is saved is the unpadding view, ie the extents of your last zoom. (When you carry out a **Map>Zoom** command to describe a rectangle to zoom in to, if this area does not have the same aspect ratio as the window, it is padded. The result is that all the area you chose is shown, but additional information is also given to fill the window.)



In the case of raster data, the bitmap dimensions are forced to match the aspect ratio of the current view.

◆ Exporting bitmaps and dithered bitmaps

You can choose to save as an ordinary bitmap (either monochrome or colour), or as a dithered bitmap if you have a colour image.

- 1 Select the **File>Export>to File...** command.
- 2 Select Bitmap (*.bmp) or Dithered Bitmap (*.bmp) from the drop-down list Save as type. Give the file a name, and select the directory where it is to be put.
- 3 In the Bitmap dialog choose the resolution (number of pixels in height and width).
- 4 If you chose Bitmap, use the Monochrome box if you require a monochrome bitmap.

◆ Exporting WMF

Windows Metafiles are saved with a resolution near 2048 in width and height.

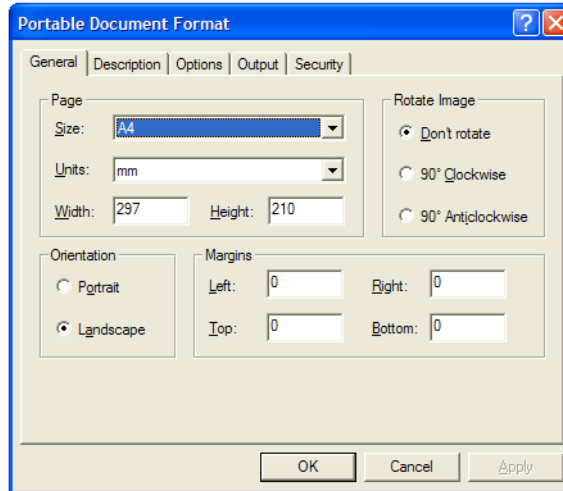
◆ Exporting VRML



Using the **File>Export>to File...** command, 3D geometry can be saved in VRML format. It is a good idea to move the axes to the centre of the scene before exporting, because this command responds to the location of the current axes.

◆ Exporting PDF

The Portable Document Format dialog provides a number of options for exporting to PDF.



■ Exporting data in tiles

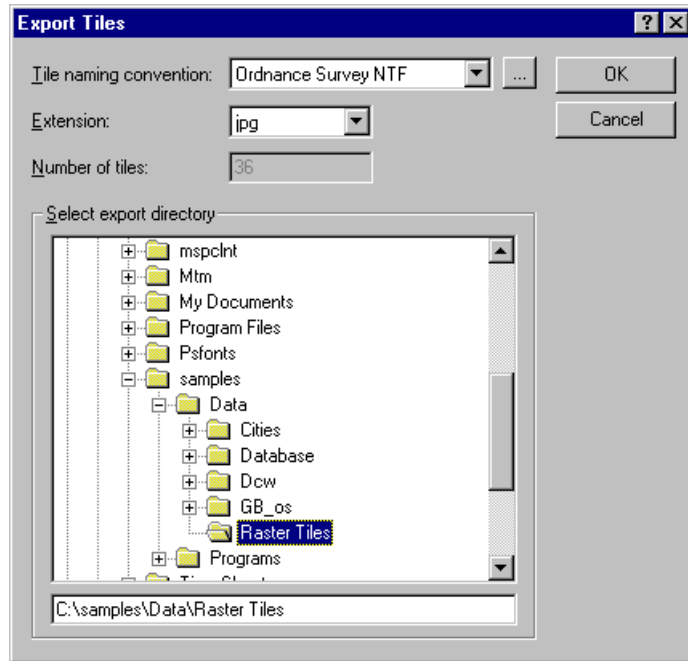
You can create tiles of the current view, selecting a standard tile naming convention. Examples are Bartholomew 50km, or any one of various Ordnance Survey formats, etc. The tiles can be saved in raster format (BMP, JPEG, PNG or TIFF), as BDS files or as Windows MetaFiles.

When exporting raster tiles, the bitmap dimensions are forced to match the aspect ratio of the tile size.



- 1 Select the **File>Export>to Multiple Tiles...** command.

2 In the Export Tiles dialog:



Select the tile naming convention, eg Bartholomew 50km, Ordnance Survey LandLine 1:1250, etc. If appropriate, click the More button to select more options.

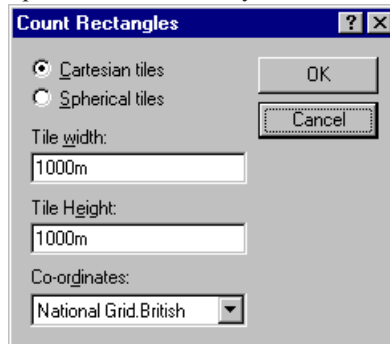
Some examples are:

LandLine 1:1250 options given are British or Irish

OSNI select from a range of scales

OSCAR (pre-April 1994) no further selections are required

Count Rectangles This option allows you to specify many details of the files saved, for instance the size of the tiles, and whether they use the Cartesian or Spherical co-ordinate system:



Click the Co-ordinates button to choose the co-ordinate system to use (and change its parameters if required).

- 3 Choose which file type to create (the Extension drop-down).
- 4 Select a directory to which the tiles will be saved.
- 5 Click on OK.

The map area on screen is divided into the appropriate number of tiles. The tiles are saved remembering their correct spatial location, and are given an appropriate name (according to the file naming convention you have chosen).

Compatible bitmaps which overlap a tile are merged together and cut again at the tiles' borders. This allows seamless tiled bitmap coverage to be re-tiled in a different projection (for example, converting (lat,lon) bitmaps into Transverse Mercator).

When saving BDS tiles, box text items are exported into the tile which contains their justification point (hook point). This may mean they overhang the edge of a tile.

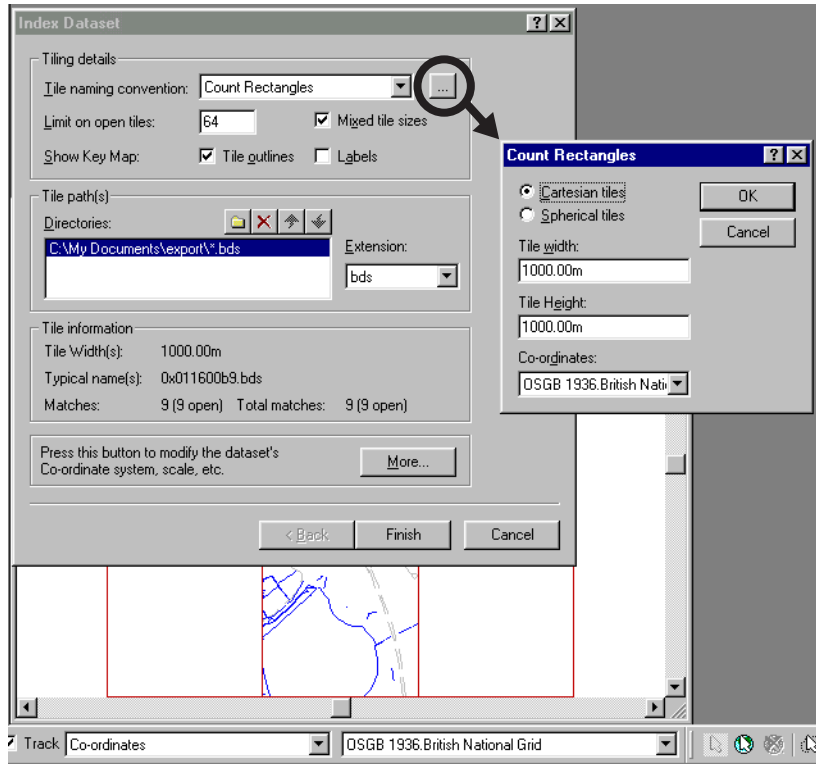
You can change the tile width and height, giving you rectangular tiles. If you do this, to view these correctly you must alter the Tile Naming Convention parameters in the Index Dataset Details, so that the new tiles match the width and height when you open them.

◆ Exporting as an index dataset

If you want to view your exported files as an index dataset, when you get to the Index Dataset dialog, check that:

- the projection in the map window is correct
- the Tile naming convention is correct

- the parameters chosen in the Tile naming convention options dialog are the same as those parameters chosen when exporting



■ Exporting to data sources



The **File>Export>to Server...** command allows you to export database files, eg Oracle Spatial Cartridge files, to a remote server. You must have the required Export Server driver installed.

◆ SIS Export Dataset Format (SED)

SED is a format specified by Cadcorp, designed to be easy for non-Cadcorp software to read and write. It is an open ASCII file format used by datasets and exporters.

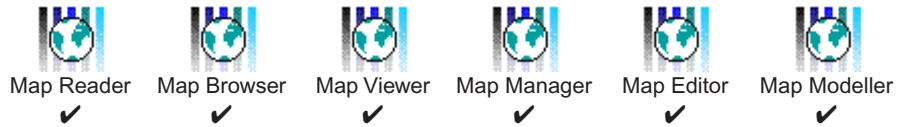
The SED file format is based on the Cadcorp SIS item classes. When you export, the resulting text file has almost everything which is in your dataset (although there are a few omissions, such as line text).

■ Sending documents by email



You can send the active document through electronic mail using the **File>Send...** command. This is a standard Windows function. This command is available only if the computer has email software enabled.

If you are sending an SWD file, the data sent will be readable by the recipient only if they have a Cadcorp SIS product and all the relevant datasets stored in the same places (except internal datasets, which are saved within an SWD).



Printing: the Print commands

■ About printers	555
■ The Print commands	555

■ About printers

Any printer that can generate graphical output, and has a suitable Windows driver, can produce a print.

Printer device drivers are supplied by the printer manufacturer, and are installed using Windows.

Raster data, colour-filled vector boundaries, thickened lines and Windows TrueType fonts are printed at the resolution of the printer being used. In particular, some printers do not support true colour output, therefore raster data may not appear as expected.

◆ Monochrome or colour printing

By default, Cadcorp SIS queries the printer driver to find out whether the printer can handle colours or not.

If the printer cannot handle colours, Cadcorp SIS forces all printed colours to monochrome.



Sometimes the printer driver does not pick up the capabilities of the printer. In this case, you can force Cadcorp SIS to generate colour or monochrome graphics when printing. You can use the **File>Print Preview** command to see what effect this option will have.

■ The Print commands

In common with many Windows applications, Cadcorp SIS has the commands **File>Print Preview**, **File>Print...** and **File>Print Setup...**

◆ File>Print Setup...



This is a standard Windows feature. Refer to the Windows documentation if you require help.

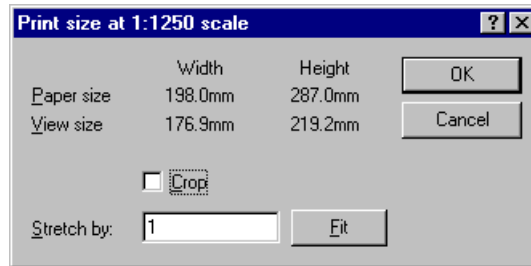
◆ File>Print Preview



This is a standard Windows feature. It allows you to see what the print will look like on the piece of paper, before you go ahead and print it.

1 Select the **File>Print Preview** command.

- 2 You will see the Cadcorp SIS Print size dialog (the same one as appears during the Print command):



- 3 When you are happy with the options here, click on OK. You will then be shown a preview of what the print will look like.
- 4 Either choose to print from here, or go back and choose different options.

◆ File>Print...



Select the **File>Print...** command (shortcut Ctrl + P) to print the view in the current window to the selected printer, whether it is a map window, a table window or a 3D window. This command prints exactly what appears on the screen.

An alternative to using the **File>Print...** command is to print onto a print template in order to include associated information such as notes, a grid, a north point, etc. ➤Chapter 47: “Printing: print templates”



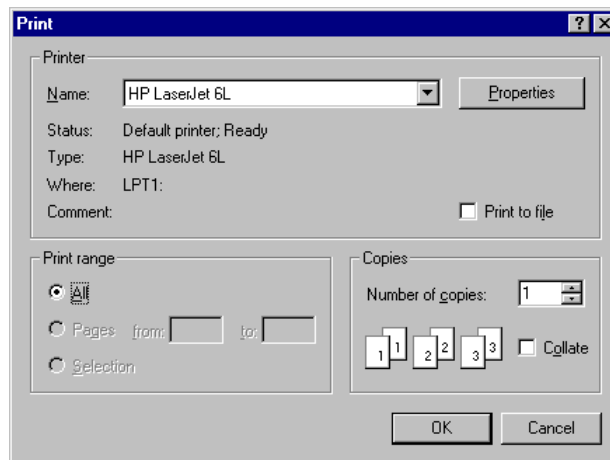
- 1 If you want to force monochrome or colour printing, use the option Print colour capabilities on the Options tab of **Tools>Preferences...**



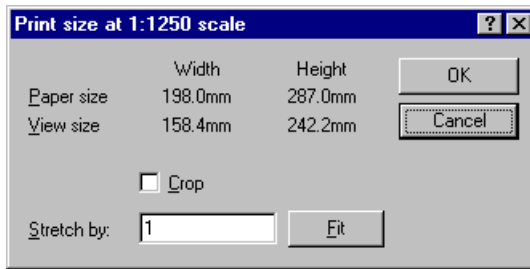
- 2 If required, use the **File>Print Preview** command to see what the print will look like.



- 3 Select the **File>Print...** command. A Windows Print dialog is displayed, where you have options to select a different printer (if installed), set the number of copies, set the print quality, etc:



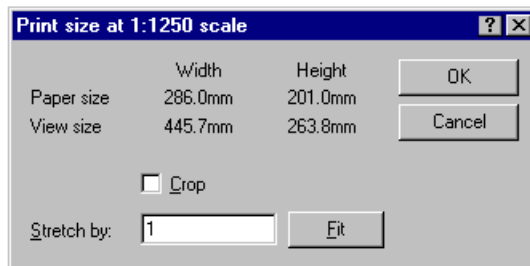
- 4 Click OK when you have finished setting the print parameters. The Cadcorp SIS Print size dialog is displayed:



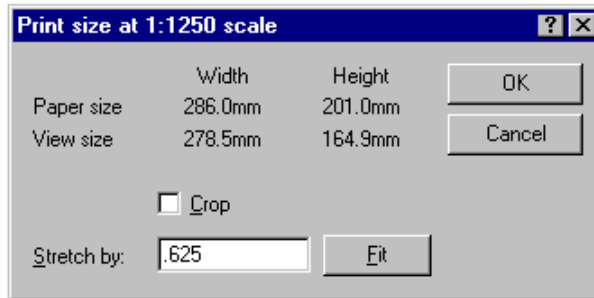
The title bar shows the map scale of the current window. Chapter 8: “Scale”

This dialog shows the Paper size (width and height) and the View size (width and height). The Paper size is the size of the paper chosen in the Print Setup. The View size is the size of either the SWD window or the print template.

- 5 If the Paper size (width and height) is not the same (approximately - it should not be exactly the same) as the View size (width and height), it is likely that the paper chosen is not the same size or orientation as the SWD or print template. (The Paper size should be slightly larger than the View size.) If you want to change any of the above, or the scale of the print, do one of the following.
- Fit the view to the paper. Clicking the Fit button will cause the view to be scaled up or down so that the selected graphics fill the available paper size. Only choose this option if scale is not important.
 - Crop the view. If you click the Crop checkbox, the desired scale (map scale) is kept. However, only that part of the view is printed which fits on the paper (the centre of the view being centred on the paper).
 - Press Cancel. This allows you to go back to Print Setup. There, you can choose a different size or orientation of paper, or change the scale of the map.
 - Choose a different scale for the print. Print scale can be worked out by dividing map scale by the Stretch by factor. Input a Stretch by factor to give you the scale you want. For example, if the area you had chosen was too large to print at 1:1250:

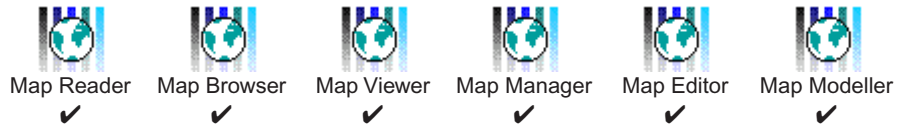


you could set a Stretch by factor of 0.625, to give a print scale of 1:2000 (the map scale of 1:1250 divided by 0.625 is 2000). At 1:2000 the view fits on the paper:



6 When you have decided how to fit the map view on the paper, click on OK.

Troubleshooting If your Paper size does not match the View size (you see the error message “View is bigger than available paper”), check that the orientation of the paper and the orientation of the print template used match.



Printing: print templates

■ About print templates	559
■ The Print Template Quick Wizard	559
■ The Print Template Wizard	563
■ Printing or saving a template	576
■ The photo	577
■ Creating your own print templates	580

■ About print templates

Print templates allow you to customise your prints, adding annotation such as titles, scale, date, grids, notes (eg the Ordnance Survey copyright notice), north points, etc.

The view to be printed (which can be in a map window or a 3D window) is placed onto a pre-formatted sheet, called a print template. This can contain standard features such as scale bars, titles, your company details, company logo, etc, and can be further customised for each particular print (eg to include a legend or a north point).

Two wizards will help you with the process of creating and using print templates:

- the Print Template Quick Wizard
- the Print Template Wizard (not available in Cadcorp SIS Map Viewer)

■ The Print Template Quick Wizard

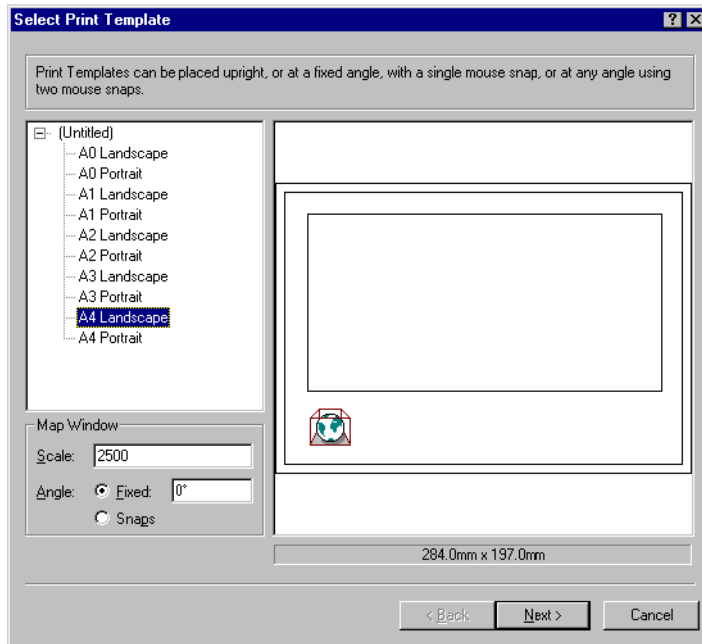


The **Quick Wizard** allows you to select a print template, choose its angle and scale, and place it on the area to be printed. If you want further options, such as placing a graticule, scale bar, north point, etc, use the Print Template Wizard instead.

Make sure the current window contains the view that you want to print.

- 1 Select the **File>Print Template>Quick Wizard...** command.
- 2 On the Select Print Template page, select the required print template from the tree structure in the left-hand box. You will see an image of the chosen template in the right-hand box, with its dimensions shown.

The inner rectangle on the print template is the area where your map will be placed (it is called the photo).

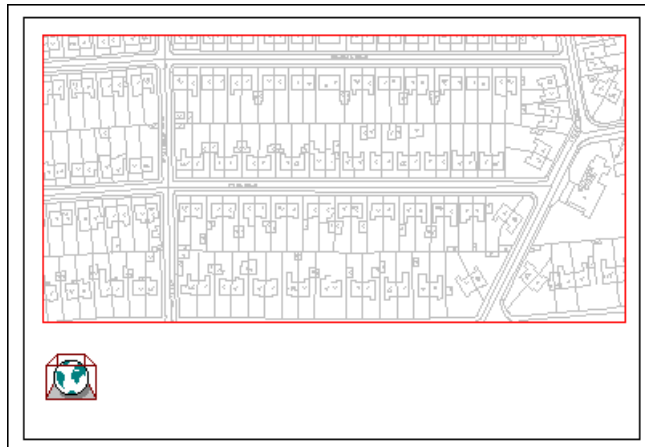


- 3 Change the scale if required.
- 4 Change the angle of rotation if required. You may want to do this, for example, to align a major road or building horizontally on the paper. You have two options:
 - Fixed Type in the angle required. North is 0°, East is 90° etc. The print template is rotated anti-clockwise. For example, if you type an angle of 90°, East will be pointing up. Note that when you come to place the print template on the map base, it will appear to be rotated in the opposite direction. This is because the map graphics are to appear rotated once the print template is aligned back with the sheet of paper.
 - Snaps When you later place the template, this option will require you to give an extra snap to indicate interactively the angle of rotation.

View of map in the current window, showing the print template rectangle at 1:1250, rotated 72°:



The resulting print template:



5 Click the Next button.

If you see the Place Print Template page, proceed to step 6.

If you see the Print Size dialog, the print template you have chosen does not fit onto the current printer paper at the scale you have chosen. You can:

- go back a step to choose a different scale or another print template
- choose Print Setup to access the Print Setup dialog to change the paper used
- click on Fit to fit the template to the paper
- press Next to continue.

➤ Chapter 46: “**Printing: the Print commands**”, **File>Print...**, page 556

- 6 On the Place Print Template page you will see the same area of the map base as in your current view, and you should see a rectangle attached to the cursor. This rectangle shows you the area of the map which will be displayed in the resulting print template. If you typed in an angle of rotation, the rectangle will be rotated. This rectangle may be outside the extents of the wizard view.

If you cannot see the rectangle, it is either bigger than the view or very small. Zoom out or in until you can see it using the “+” or “*” keys, and the Up, Down, Left or Right arrows, or return to the first page to choose a different scale or print size.

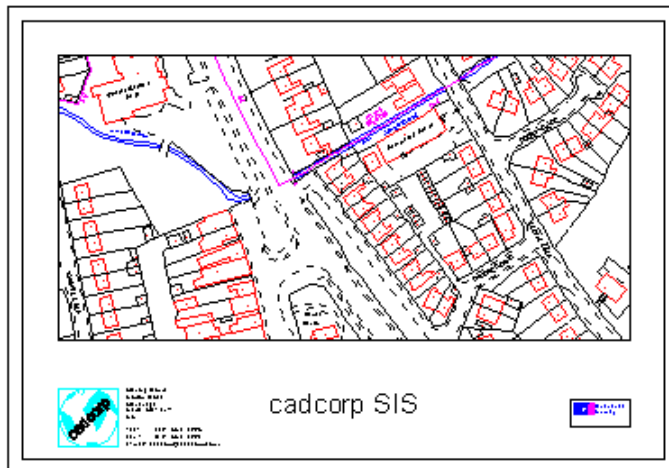
- 7 Click to place the centre of the template at the centre of the area to be printed. Alternatively you can type the co-ordinates of a position. If you chose to rotate the print template using snaps, you are required to give a second position to indicate the angle of rotation.
- 8 If you want to change anything, go back through the Quick Wizard. If you want to change the scale at any point during this process, type the new scale into the scale box, and press Enter. If you are finished, press Finish, and a new SWD is created containing the completed print template.

The photo is filled with the selected area of the map base. This view is dynamic, always reflecting the current appearance of the overlays it contains.



- 9 You can now save the print template as an SWD (**File>Save As...** command), or print it using the **File>Print...** command. The **File>Print...** command prints only what is in the map window, so before you print press **Map>Zoom>Extent**. This zooms the print template SWD to its extents and ensures the whole of the map is printed.

In future, when you recall this file, the map view in the template (the photo) reflects the current appearance of the original data (except in the case of an internal dataset). ➤page 577, **The photo**



Map extract © Crown copyright

■ The Print Template Wizard

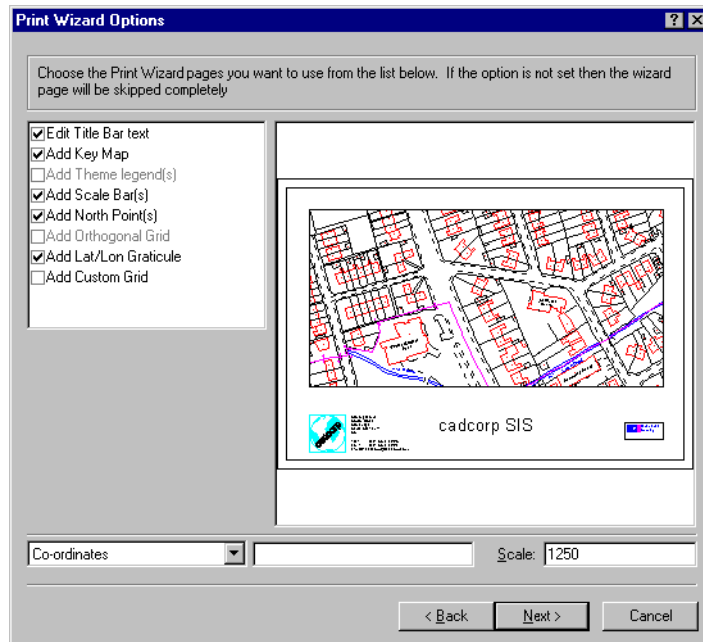
Using the Print Template Wizard you can choose a print template for your print and then add to it any of the following, customising each for the current print:

- title bar
- key map
- theme legend(s) (if using themed overlays)
- scale bar(s)
- north point(s)
- orthogonal grid
- Lat/Lon graticule
- custom grid

Make sure the current window contains the view that you want to print.



- 1 Select the **File>Print Template>Wizard...** command.
- 2 Follow steps 2 - 7 of the **Print Template>Quick Wizard...** method. ↗page 559, **The Print Template Quick Wizard**
- 3 On the Place Print Template page, click on the Next button.
- 4 On the Print Wizard Options page, select the options you want on the print:



Some of the options may be unavailable: it depends on the print template being used, the SWD in the photo and the current library setup.

- 5 The Print Wizard will then step through the available options with each press of the Next button. See the relevant following section for full details on each of these options.

On each page you have the opportunity of changing the photo scale. You can also specify positions when placing the print template or creating other graphics.

- 6 At the end of specifying the options, you will see the Print dialog. See the later section Printing or Saving a Template for details.

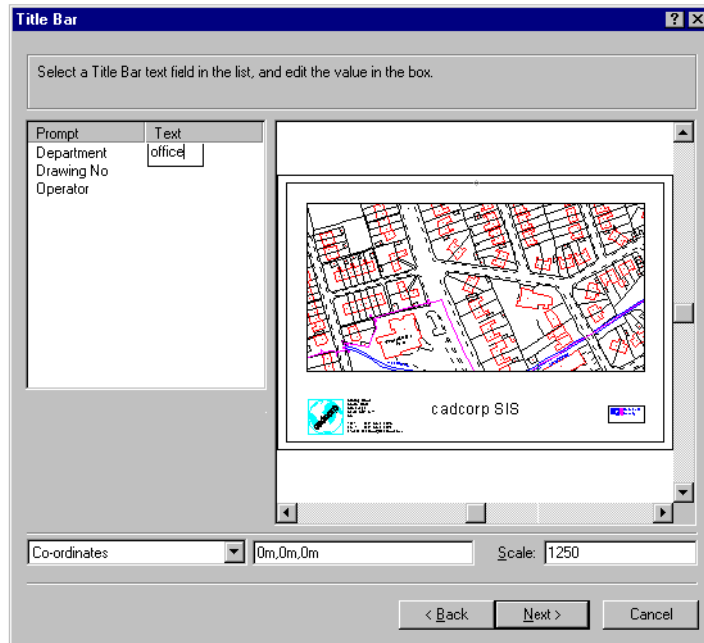
The options are available only under the conditions shown:

☐ **Availability of Print Wizard options**

Option	Available if
Add Key Map	One or more named items exist in the enabled libraries with a name which starts “*km.”. There is a folder containing such items in the (standard) library.
Add Theme Legend(s)	The photo SWD includes overlays containing themes which have a legend.
Add Scale Bar(s)	One or more shapes exist in the enabled libraries with a name which starts “*sb.”. There is a folder containing such shapes in the (standard) library.
Add North Point(s)	One or more shapes exist in the enabled libraries with a name which starts “*np.”. There is a folder containing such shapes in the (standard) library.
Add Orthogonal Grid	The print template contains a photo item.
Add Lat/Lon Graticules(s)	The print template contains a photo item.

◆ Edit title bar text

The title bar text can contain your own information for the print. Examples are the name of the department concerned or the project title, etc. Select the Prompt (eg Department), then either press F2 or click below the Text title. Type the text values in the boxes. Press Enter once finished.



Map extract © Crown copyright

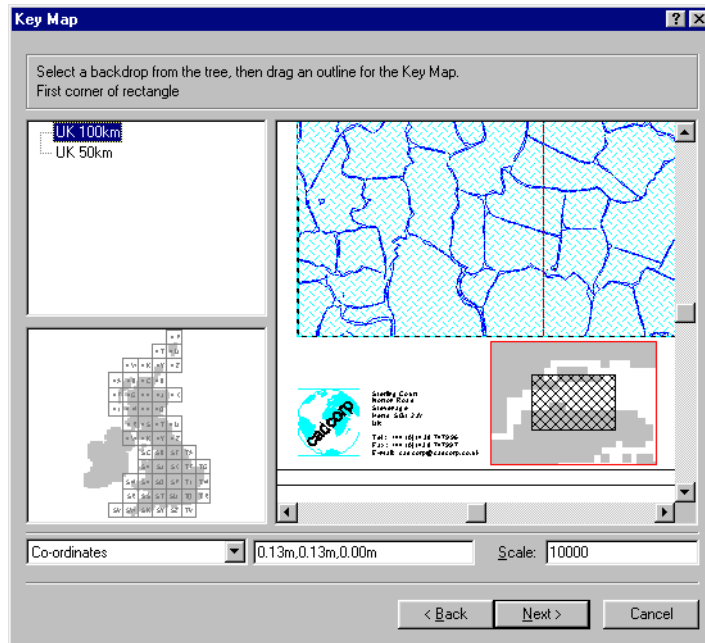
◆ Add key map

A key map gives a visual indication of the spatial location of the area being printed. It displays a polygon representing the area of map printed, superimposed on a larger area (the backdrop).

Cadcorp SIS provides two backdrops for the UK: one based on 100 kilometre squares, the other on 50 kilometre squares. These are stored as named items in the (standard) library. If the scale of the backdrop is too large in comparison to the map being printed (eg a backdrop with scale 1:10 000 000 and a print map with scale 1:3000), the backdrop will appear as a blank rectangle in the print template.

- 1 Select the key map required in the top left-hand box. An image of it will be displayed in the lower box.

- 2 To place the key map, click two corners within the print template which define the opposite corners of the key map.



Map extract © Crown copyright

◆ Creating your own key map

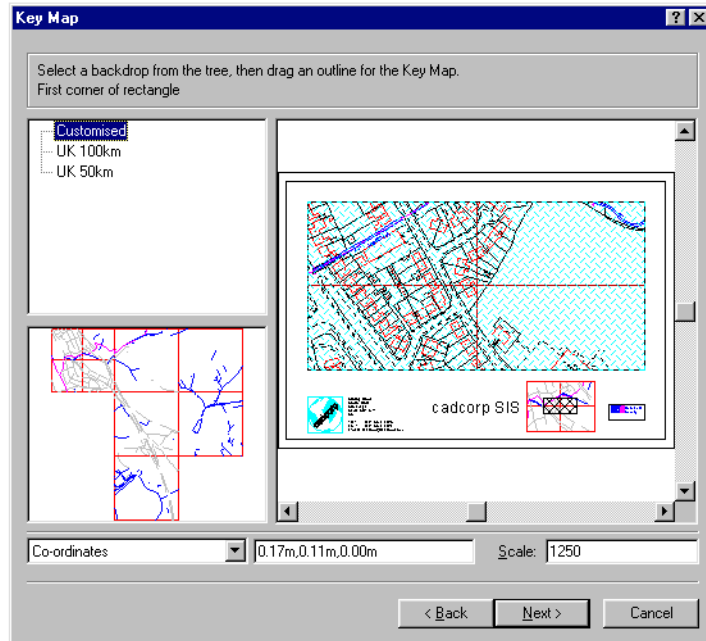
- 1 Open a Saved Window Directory containing the data for the key map (this can be vector or raster).
- 2 Select all the items to be used as the key map and choose the **Edit>Store Item...** command.
- 3 In the Store Item dialog, name the file, and give the folder the name *KM. This means that the file can be viewed only in the print template.

 If you have selected Toggle ‘*’ Objects (this local command is on the default menu of the workspace window, libraries view, libraries item), you do not see the *KM folder.

◆ Creating your own backdrops for key maps



You can create your own backdrops for key maps, by storing an item or items (for example, a larger map depicting a County) as a named item in a library. First, select the item(s), then use **Edit>Store Item**. To be used as a key map backdrop, the named item must be inside a folder called *KM. ➔Chapter 28: “**Creating collections**”



Map extract © Crown copyright

◆ Add theme legend(s)

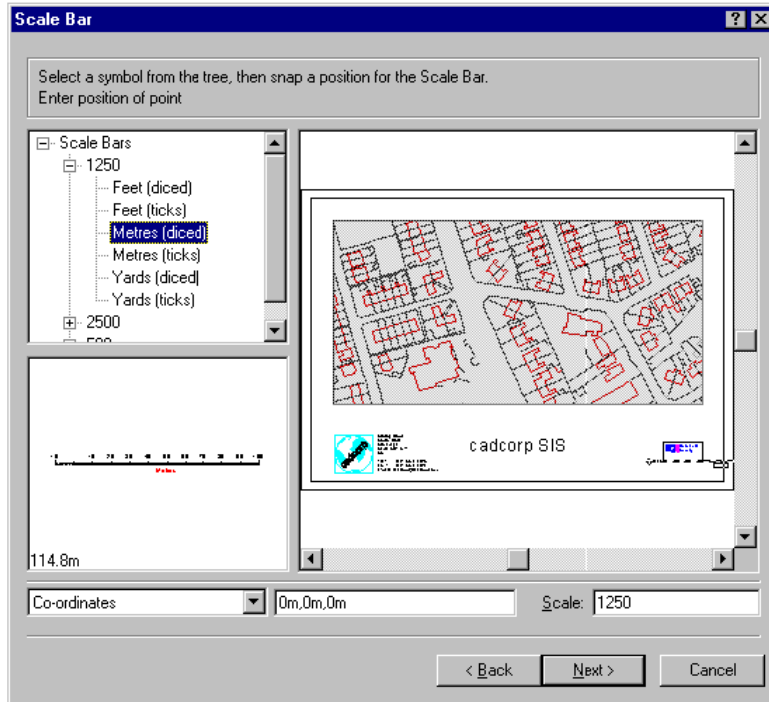
This option is available only where you are using themed overlays, or overlays and datasets which use Cadcorp Feature Tables. It allows you to place theme legends on the template.

- 1 Select the theme required from the tree structure. As you do so, you will see its legend displayed in the lower box.
- 2 Click on the template where you want to place the legend.
- 3 If the legend is the wrong size for the template, it can be edited using local commands once the template has been created.

If you wish to add a theme legend to a previously created template, you can do so using the photo's local command Legend.

◆ Add scale bar(s)

- 1 Select the scale bar required from the tree structure. As you do so you will see it displayed in the lower box, together with its length in real world units relative to the photo.



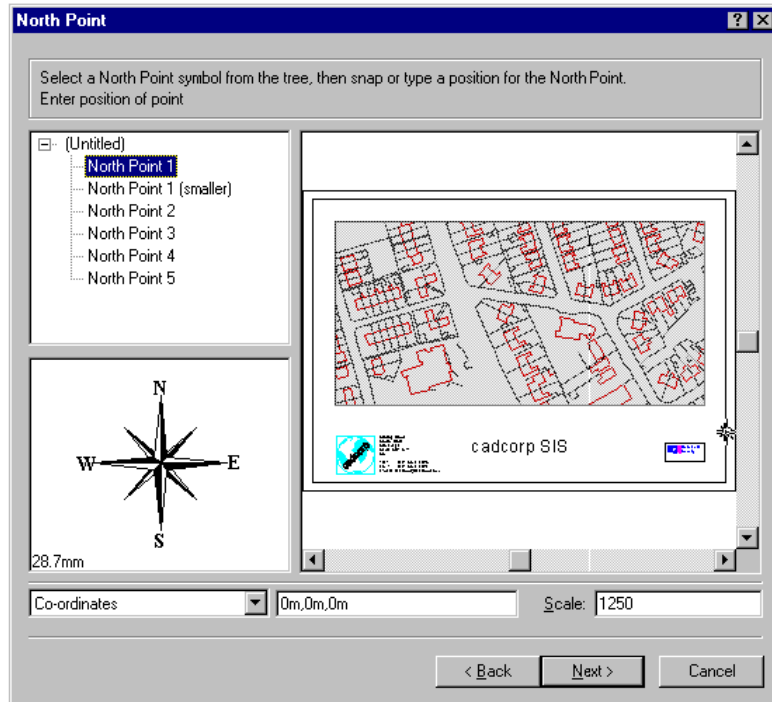
Map extract © Crown copyright

- 2 Click the position on the template where you want to place the scale bar.
- 3 If you make a mistake in placing the scale bar, click on Back to go back a stage, then Next to return to this option, or you can edit it using local commands on the template photo.

If you wish to add a scale bar to a previously created template, you can do so using the photo local command Create Scale Bar.

◆ Add north point(s)

- 1 Select the North point required from the tree structure. As you do so you will see it displayed in the lower box, together with its dimensions.



- 2 Click the position on the template where you want to place it.
- 3 If you make a mistake in placing the North point, click on Back to go back a stage, then Next to return to this option.

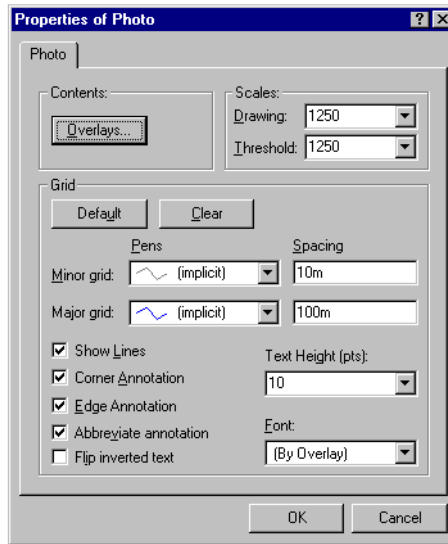
If you wish to add a north point to a previously created template, you can do so using the photo local command Create North Point.

◆ Add photo grid

This option allows you to show eastings and northings by means of grid lines and/or annotation.

- 1 Select the photo to have a grid (a template can contain more than one photo).

- 2 Click on the Add button, and in the Properties of Photo dialog give the parameters for the grid:



This is the standard Properties dialog for photos, and allows you to change other parameters as well as those of the grid. You can choose:

- which overlays will be shown in the photo
- the scale of the photo contents (Drawing scale), and optionally, a generalisation scale (Threshold). The Threshold scale means that only those items which would be visible at that scale on the map SWD will be visible in the print template photo item, irrespective of the Drawing scale of the print template.
- to create a default grid using the current settings
- to clear the grid from the photo

When deciding how the grid lines should appear, you can choose:

- the pen to be used for both major and minor grid lines, and their spacing
- whether the grid lines are shown, or just the annotation (Show Lines)
- whether annotations are displayed along the edges (Edge Annotation), and whether the special annotation given at the corners is shown (Corner Annotation)
- the appearance of the annotation text (Text Height and Font)
- whether annotations are shown in full, or abbreviated so that only the changing portion of edge annotation is shown (Abbreviate annotation)
- whether text, which would normally appear upside down when viewed from the bottom of the photo, should be flipped (Flip inverted text)

Most of the options you specify here become properties of the photo and can be changed later in the photo's Properties dialog.

- 3 Click on OK, and you will see the grid applied to the print template.

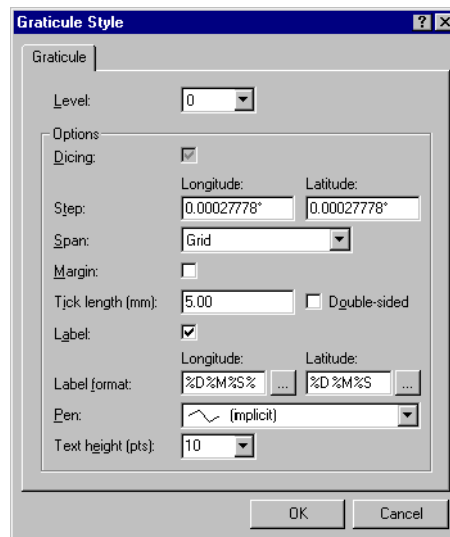
If the photo contents have been rotated, the gridlines will be correspondingly rotated. Rotation angles between 0° and 45° will display eastings along the bottom and top of the photo. Angles between 45° and 90° will display eastings along the left and right sides. Grid lines will always be drawn on top of the photo contents.

◆ Add graticule(s)

This option enables you to display a graticule and define how it will appear. Each graticule can consist of up to 8 levels, each level being a sub-division of the previous level. For instance, level 0 (the first level), defines the appearance of the lines of latitude and longitude, and that of their labels. Level 1 defines the spacing of the dicing, and how it is labelled, and so on.

Graticule styles are named objects, stored in libraries.

- 1 On the Graticule page, select the photo which will contain graticules (a template can contain more than one photo). If you have already created any graticules and saved them as named objects, the Edit and Remove buttons are enabled. Otherwise, click on Add.
- 2 On the Graticule Style page define each level in turn (defaults are set automatically).



See the following section Graticule parameters for more detail.

- 3 When you have finished defining these parameters, click on OK.
- 4 Back on the Graticule page you now see the template with the graticule. Click on Next if you are happy with it, or Back to go back and re-define it.

If you want to add a graticule to a previously created template, you can do so using the photo local command Create Graticule.

◆ Saving a graticule as a named object



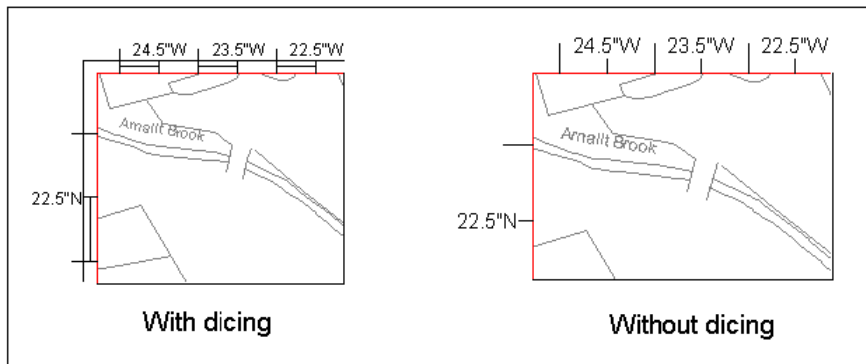
Once you have created a graticule on a print template, you can save it for future use, using its item command Store style.... You can select a graticule using the S snap.

Graticules are named objects, and are stored in the current library.

◆ Graticule parameters

Dicing

Here you choose whether or not to display dicing. This parameter can only be set in level 1.



Map extract © Crown copyright

Step

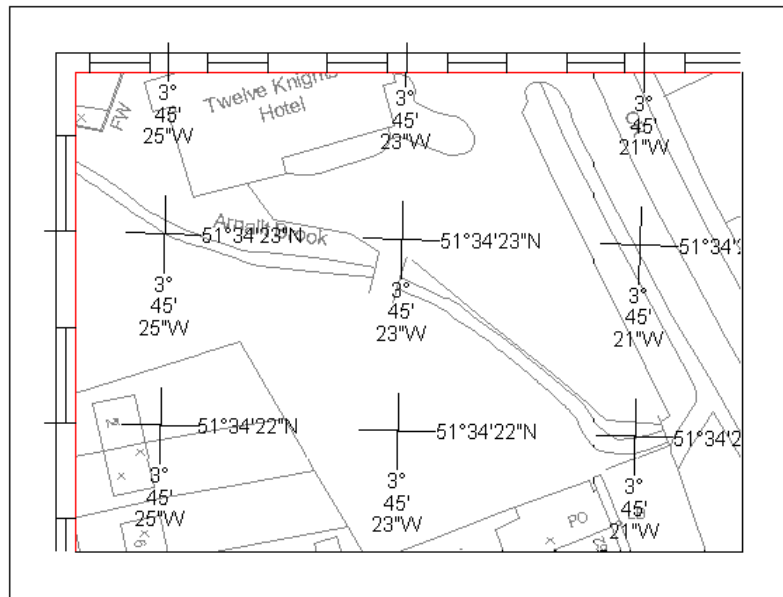
These are the intervals at which the graticule lines will be drawn, in the current angular units.

Span

The span determines how the graticule lines are drawn at this level. There are four options:

- None - no lines appear across the photo, but labels or ticks can still be drawn if required (see the Label and Tick length options below)
- Grid - grid lines are ruled right across the photo
- Crosshair Grid - a crosshair is drawn at the intersection of lines

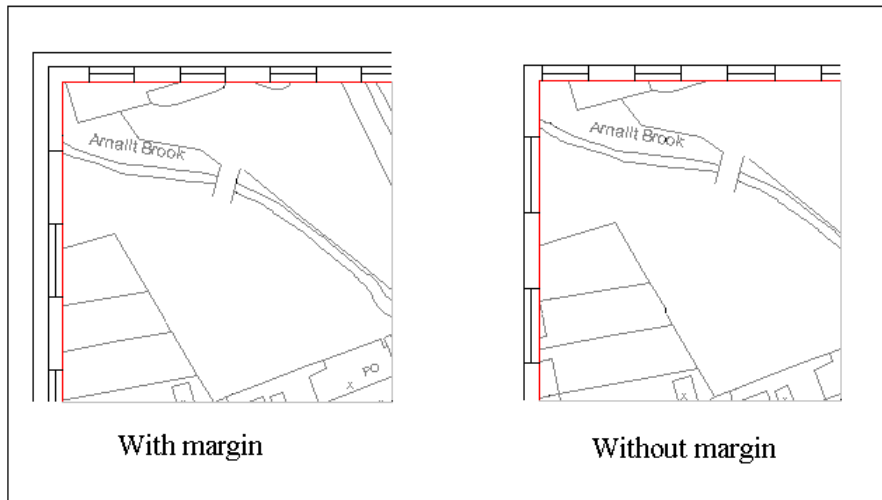
- Crosshair Grid with Text - the position (in latitude and longitude) of each crosshair is shown (the level text style and label format are used):



Map extract © Crown copyright

Margin

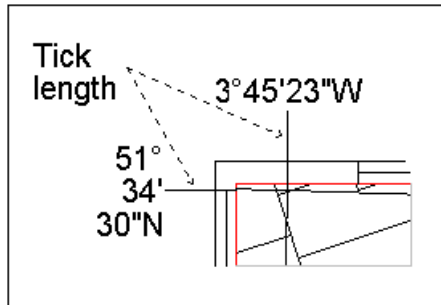
Use this option to determine whether or not a margin is drawn at this level.



Map extract © Crown copyright

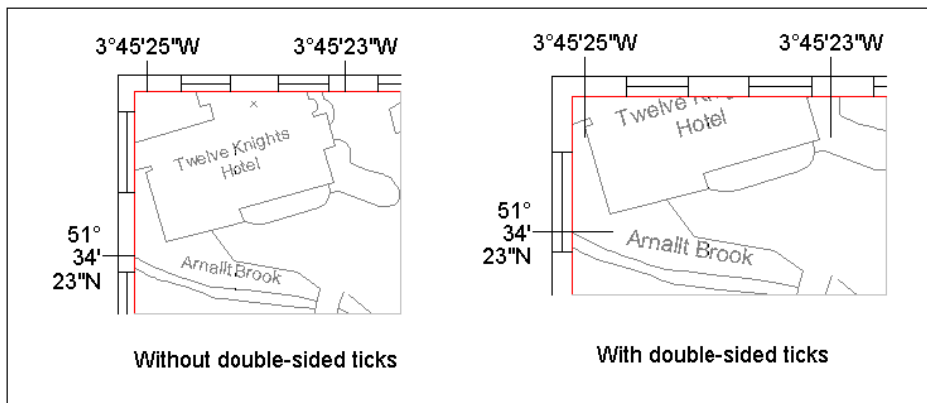
Tick length

This is the distance that the ticks which appear on the graticule border (at the step intervals) extend beyond the graticule border.



Ticks are always drawn perpendicular to the graticule border (whereas span lines are drawn along lines of equal latitude or longitude).

By selecting the Double-sided checkbox, the tick lines are drawn on both sides of the graticule border.

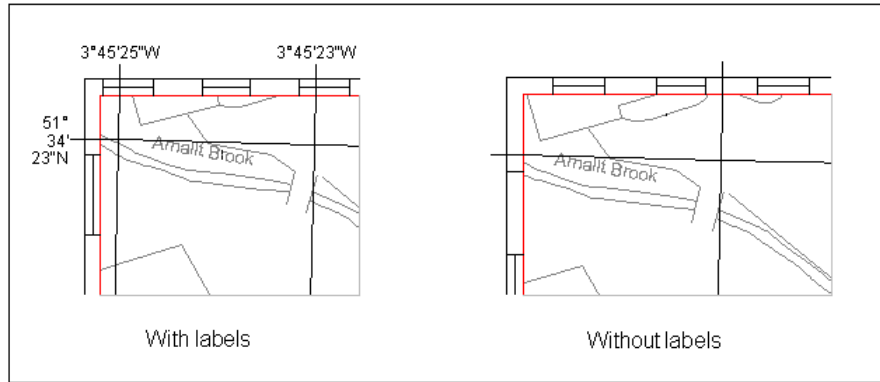


Map extract © Crown copyright

Map extract © Crown copyright

Label

Using this checkbox you can decide whether or not to have the graticule ticks labelled:



Map extract © Crown copyright

Label format

At each level you can choose whether to show degrees, minutes, seconds and the compass point. The options are:

- %d or %D print the degrees (%D appends a degrees symbol)
- %m or %M print the minutes (%M appends a ')
- %s or %S print the seconds (%S appends a ")
- %c or %C print the direction (N, S, E, or W)

%d, %D, %m, %M, %s and %S can be modified to print fixed width and precision. For example, %4.2s will print at least 4 characters, with 2 decimal places.

Pen

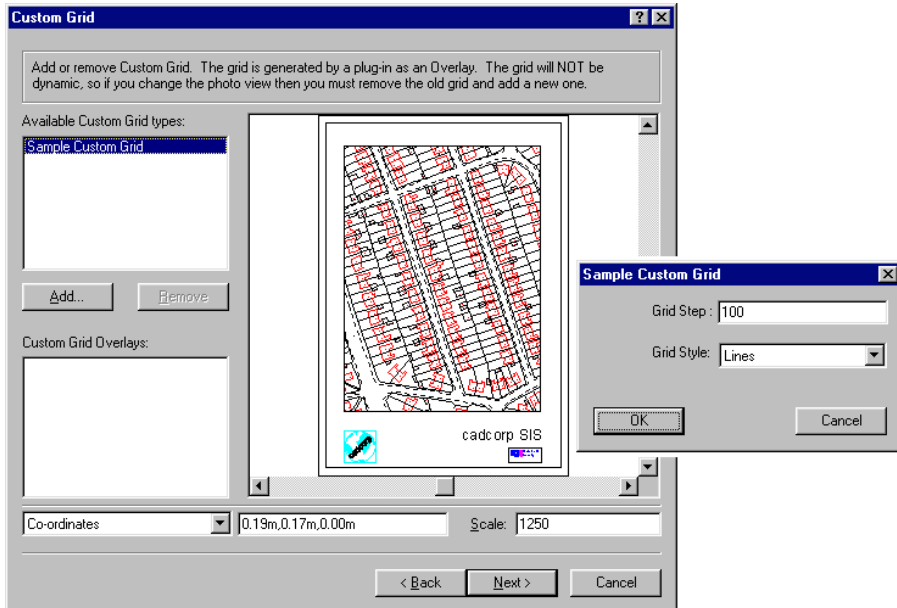
The pen used for the graticule lines and the labels. Use the More button to edit the current pen using the Edit Pen dialog.

Text height

This is the point height of the label text and/or the graticule span text.

◆ Adding a custom grid

A custom grid enables you to create a grid for the photo item. Using the Developers SDK, you, or your Cadcorp SIS supplier, can write suitable code that generates a custom grid. This code can change the number of levels on which graphics are drawn, add your own labels in your choice of units, and add your own graphics to the grid.



The custom grid is, however, static. If you change the view in the photo item, the custom grid graphics will be out-of-date and will have to be deleted and then re-generated.

This option should be used only when customising Cadcorp SIS Map Modeller, Cadcorp SIS Map Editor or Cadcorp SIS Map Manager.

■ Printing or saving a template

When you have specified the parameters for your template (title bar text, key map, theme legend, scale bar, north point, photo grid, and graticule), you see the Print page of the Wizard.

- 1 The cursor is shown as a magnifying glass. Click to see the Roamer, with which you can check small detail on the print template. Clicking again restores the magnifying glass cursor.
- 2 If required, you can change the scale of the photo, or give a different position for it to centre on.
- 3 Select whether to print the template now or save it as an SWD file for editing or printing later. You can also save it as a PDF (Portable Document Format) file. Choose the option you want from the drop-down menu.
- 4 Click on Finish.



If you chose to save the template as an SWD, a new window is created containing the template, which you can edit and/or save. This window can then be printed using the **File>Print...** command.

■ The photo

The area in the Template which contains the map extract is called a photo. A photo is an area item. It has all the usual properties of area items (eg a brush), and can be edited like any other area item.

Any internal datasets which appear in a photo are copies of the ones in the original map data, frozen at the time the photo was created. If an original internal dataset is edited, the changes are not reflected in the photo.

All other overlays are references to the original data. The photo always reflects the current state of the original data in these overlays.

◆ Editing the data in a photo

The data in a photo cannot be edited. To edit the original map data, you must open up a map window containing the original data, using the photo item command **Activate contents**. This creates a new map window, which opens the necessary datasets as defined by the photo's overlays. You can make any changes you require in this new map window.

To ensure that the photo contains these updates, select the photo item command **Fill Photo**, and click in the map window where you have just made changes.

You can also make alterations to the overlays in a photo, by using the photo local command **Properties...** . On the Photo tab, click on the **Overlays...** button to see an **Overlays** dialog for the overlays in the photo. Here you can make any changes in the normal way.

◆ Removing the map data from a photo

To remove the contents of a photo so that it becomes empty:

- 1 Select the photo and its local command **Properties...**
- 2 On the Photo tab of the **Properties of Photo** dialog, click on the **Overlays** button.
- 3 In the **Overlays** dialog, remove the overlays in the normal way.

◆ Moving a photo on a template

You can move a template by clicking on its outline and dragging it. Alternatively use the local command **Move Items**.

◆ Editing the outline of the photo

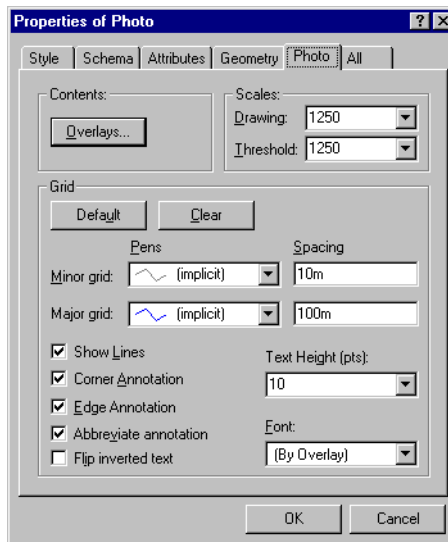
A photo is an area item, and can be edited like other area items. When selected, it has handles which allow you to stretch it. If you want to add geometry to the photo, you can use the **Boolean** commands. This geometry need not be rectangular, so you can achieve irregular-shaped photos. You can also rotate the photo using the local command **Rotate Photo**, or create several photos on the same template by using **Copy** and **Paste**, and then moving the new photo item. If you wish, each photo can have a different scale.

◆ Panning the view in a photo

A photo has the local command Pan Photo, which allows you to shift the view of the map base it contains. Click a “from” point (a point to be moved), and a “to” point (where the first position will be moved to). Instead of the “to” point, you can press Enter to place the “from” point in the centre of the photo. (However, you cannot snap to items within the photo.)

◆ Photo properties

A photo's properties can be edited in the Property View tab of the workspace window. Alternatively, the Properties of Photo dialog can be accessed using the photo's local command Properties..., or by using the **Edit>Properties...** command. The Properties of Photo dialog has an extra Photo tab:



All the settings of the photo's grid can be changed here.

A photo also has the properties Photo Scale and Photo Angle. These are the settings you chose when placing the print template, and they can now be changed retrospectively in a Properties dialog. Changing the scale increases or decreases the area of graphics covered by the photo (the actual photo size is unaffected). The graphics and the text on the map therefore appear larger or smaller.

The Photo Threshold property dictates what items are drawn, without affecting the scale of the output in any way. The initial Photo Threshold will be the same as the photo item's scale. Choosing a different scale threshold will mean that the data displayed in the photo (and printed) will be the same as that which is displayed when zooming to this particular scale. For example, with Land-Line data, if you zoomed to 1:2500 on screen, building seeds would disappear. Similarly, by choosing a photo threshold of 2500, building seeds will not appear on the print.

Many items in mapping datasets have their own scale ranges within which they are visible. The Photo Threshold scale is compared against the scale range for each item inside the Photo to determine which items to draw.

◆ Adding a graticule



If you have created a print template without a graticule, and saved it as an SWD file, you can still add a graticule at a later date, using the photo local command Create Graticule. Selecting this command displays the Graticule Style dialog. ➤page571, **Add graticule(s)**

◆ Editing a graticule

You can select a graticule by using the S snapcode when clicking on the photo to call up the Select Item dialog, then choosing graticule from the drop-down list. You can then change any of its properties. Alternatively, you can edit a graticule's properties by selecting it in the library view tab of the workspace window, and using its local command Properties....



A graticule also has the item commands Store style... and Recall style....



Store style... allows you to save the graticule style as a named object in the current library.



When stored graticules exist, the Recall style... command can be used to apply a stored graticule style to the current graticule, keeping the border but losing the existing style.

◆ Adding a key map, a north point or a scale bar

If you have prepared a print template without a key map, a north point, or a scale bar, you can add one retrospectively, using the photo's local commands Create Key Map..., Create North Point..., or Create Scale Bar....

To be able to add a key map there must be at least one named item whose name begins with “*km.” in the current libraries. ➤page565, **Add key map**

To add a north point shape, there must be at least one shape with a name beginning “*np.” in the current libraries. ➤page569, **Add north point(s)**

To add a scale bar, there must be at least one shape with a name beginning “*sb.” in the current libraries. ➤page568, **Add scale bar(s)**

◆ Adding a legend



If the print template contains themed overlays, you can add their legends to the template, using the photo local command Legend.

Select the required legend, then click to place it on the template.

◆ Manipulating the overlays in a photo

You cannot edit the items on the overlays in a photo - this must be carried out in the original map window.

However, the overlays in the photo can be manipulated separately from those in the original map window (eg made invisible, filters applied, etc).



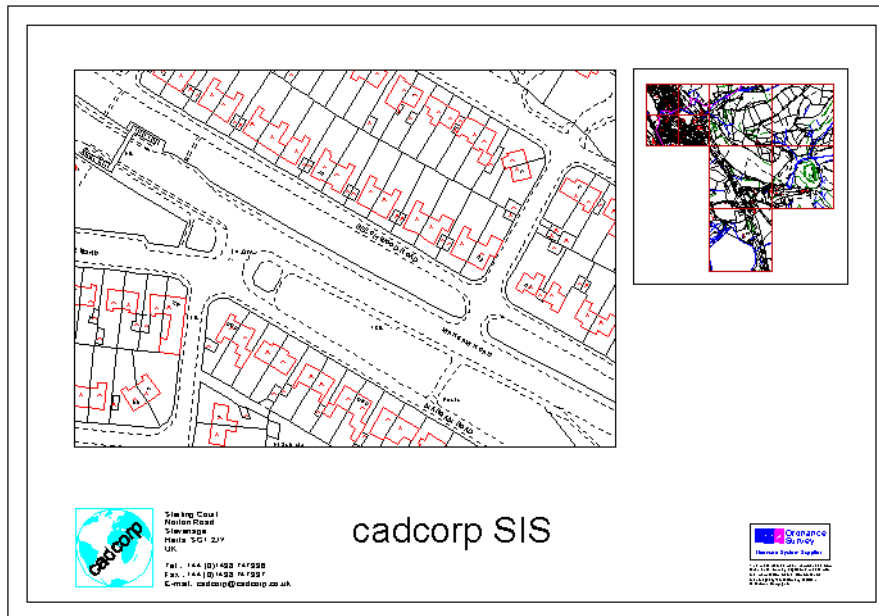
- 1 Select the photo.
- 2 Select the local command Properties....
- 3 On the Photo tab, click on the Overlays... button.

- 4 Use the resulting Overlays dialog to choose which overlays to see in the photo, their styles, their overrides etc.

Any changes made here affect the photo only. They do not have any effect on the overlays in the original map window.

◆ Multiple photos

Once a print template has been created, you can edit the photo, and even make copies of it so that you have more than one photo on the template which can be set to different scales using their Photo Properties.



Above are two photos side by side on the same template. The left hand photo has a scale of 1:1250. The right hand one is set to 1:50 000.

■ Creating your own print templates

You can create your own print templates by editing those that already exist on your system, or by creating them from new. Print templates are named objects stored in libraries.

➤ Chapter 50: “Named object libraries (NOLs)”

◆ Creating a new print template from an existing one



- 1 Select the **File>Print Template>Recall...** command.
- 2 In the Open Print Template dialog, select the print template which most closely matches the style you wish to create.
- 3 Carry out the edits. For example, you might want to delete or change some text and logos, or change the size and position of the photo.



4 When the print template is finished, carry out a **Map>Zoom>Extent**. This ensures that the template fits the screen fully and will print out correctly when sent to the printer.



5 Make sure the library where you want to store the new template is the current library.
6 Select the **File>Print Template>Store...** command, select the folder where it is to be stored, and give it a name.

Alternatively, as with all named objects, you can copy an existing print template and paste it into an editable library. Here you can rename it, edit its properties, or recall it to edit it as described above.

◆ Creating a print template from new

You can create a brand new print template by drawing its outline and adding text, logos and a photo.



1 Open a new, blank SWD and change its projection to Paper (using the **Map>Co-ordinate Systems...** command, Co-ordinate System tab). This means that you can view accurately the units of your print template.

2 Draw a rectangular frame the size of the printable area for your printer (paper size, less the margins used by your printer).

3 Add all the required text, logos, north points, etc.



4 Use the **File>New...** command and create a new blank map document. Use the Overlays dialog to display in this window a part of your map base which is typical of the maps for which you will use the print template.



5 Use the **Window>Tile Vertically** command to display the window containing the template next to the window showing the map base.

6 Make the window containing the template the current window.



7 Select the **Construct>Miscellaneous>Photo** command and click within the window containing the view of the map base.

8 If the photo is small enough, you will see its rectangular outline attached to the cursor. Place it on the template. If you cannot see the rectangular outline of the photo, zoom out until you can. Then place it on the template.

9 Remove the map data from the photo:

- select the photo and its local command Properties...
- select the Photo tab of the Properties of Photo dialog
- click on the Overlays... button
- in the Overlays dialog, select all the overlays, use the Remove button, then click on OK



10 Move or resize the photo as required.

11 Select the **Map>Zoom>Extent** command.



12 Save the new template using the **File>Print Template>Store...** command.



Alternatively, you can use **File>Print Template>Recall...** command and open a print template, edit it and use **File>Print Template>Store...** to save it. This will create a print template as a named object in the current library.

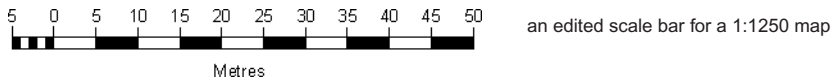
◆ Creating your own scale bars

Scale bars are themselves scaled, based on the scale factor assigned in a print wizard. So, when creating scale bars, remember that real co-ordinates are used, ie centimetres, inches, metres, and so on, using a Paper projection.

Creating a scale bar is similar to creating a print template, because there are several default scale bars in the Cadcorp SIS (standard) library.

To create a scale bar based on an existing one, follow these steps. Before you start, use the Toggle “*” Objects command on the library view’s default local menu so that you can see the *SB folder.  **Library view tab**

- 1 Locate a scale bar similar to the scale bar you want.
- 2 Copy it into the current library.
- 3 Once copied, rename the *SB folder to **SB** to allow editable access to the library.
- 4 Set up an SWD with the Paper projection.
- 5 Choose the **Construct>Geometry 2D>Point** command and choose the scale bar (from the SB folder) that you want.
- 6 Insert a scale bar point.
- 7 Select it, and, from its local menu, choose Explode Shape. This changes it into its component parts.
- 8 Edit it by changing text values, size and colour, and the dice or tick marks.
- 9 Other useful commands for editing scale bars are the **Construct>Geometry 2D>Divide>Distance...** command to divide a line into segments, and the **Measure>Distance** command to confirm the scale bar lengths.



- 10 There is no 'correct' way to create scale bars. In general, however, the main scale runs to the right and the extension scale (which is in smaller units) runs to the left. More than one type of scale can be used on a map (eg miles and kilometres).
- 11 Finally, to save the scale bar and put it into the scale bar folder, select all the parts of the scale bar and choose the **Construct>Miscellaneous>Shape...** command. Click on the point for the shape centre, and, when prompted for a folder and name, use the *SB folder and give the scale bar a new name. The scale bar appears in the Print Wizard options.
- 12 Remember to save this in a workspace or named library if you want to use it again.



◆ Creating your own north points

North points can be created in a similar way. Before you start, use the Toggle “*” Objects command on the library view’s default local menu so that you can see the *NP folder.

Library view tab

- 1 Set up an SWD with the Paper projection.

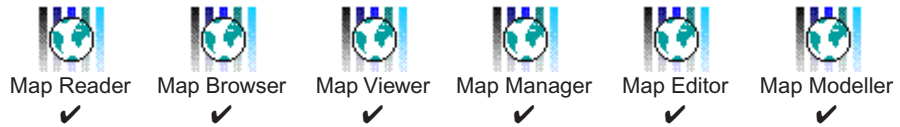
- 2 Draw your north point. Remember to think about the size of the point in relation to the map on which it will be put.



a customised North Point



- 3 Finally, to save the north point and put it into the north point folder, select all the parts of the north point and choose the **Construct>Miscellaneous>Shape...** command. Click on the point for the shape centre, and, when prompted for a folder and name, use the *NP folder, and give the north point a new name. The north point appears in the Print Wizard options.
- 4 Remember to save this in a workspace library or named library if you want to use it again.



Using the clipboard

■ The clipboard	585
■ Copying or cutting graphics to the clipboard	585
■ The Edit>Paste Special... command	586
■ Pasting Cadcorp SIS graphics into Cadcorp SIS	587
■ Pasting Cadcorp SIS graphics into other applications	588
■ Pasting text from other applications into Cadcorp SIS	589
■ Pasting bitmaps into Cadcorp SIS	589

■ The clipboard

The clipboard is used as temporary storage for text, graphics and other data. You can use it to transfer information within and between applications.

Cadcorp SIS utilises the clipboard to:

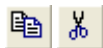
- move or copy data from one overlay to another in the same map view
- move or copy data from one map view to another
- move or copy data from the map base to another application, such as a word processor

The clipboard commands are:

	Cut	Ctrl + X
	Copy	Ctrl + C
	Paste	Ctrl + V

Each use of the **Edit>Copy** or **Edit>Cut** command in any application overwrites the contents of the clipboard.

■ Copying or cutting graphics to the clipboard



Any graphics or text selected in Cadcorp SIS can be copied to the clipboard, using either **Edit>Copy** or **Edit>Cut**.

Using these operations, selected items in Cadcorp SIS are copied to the clipboard in Cadcorp SIS format, storing pen and brush settings, etc. The entire current view is also copied to the clipboard in Windows Metafile (WMF) format, which is a generic graphics format which can be displayed by standard Windows applications.

◆ The Edit>Copy command



Edit>Copy copies selected items to the clipboard in Cadcorp SIS format, storing pen and brush settings, etc. **Edit>Copy** can also copy 3D Windows to the clipboard.

◆ The Edit>Cut command



Edit>Cut simultaneously copies editable data to the clipboard and removes it from the current application. With hittable layers the data is copied but not removed.

■ The Edit>Paste Special... command



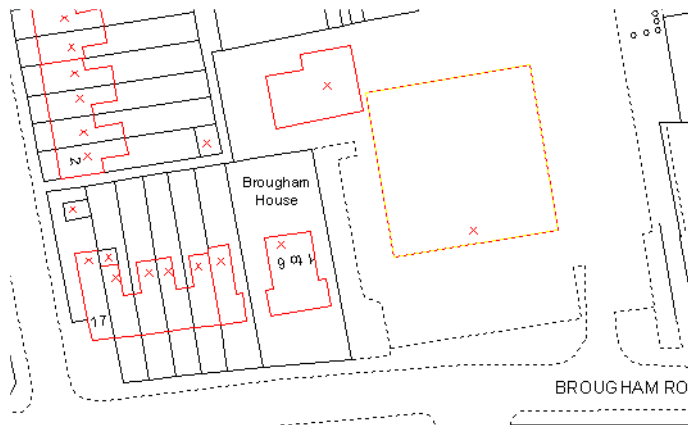
Many applications, including Cadcorp SIS, place several different formats of data into the clipboard within a single Copy operation. With the Paste command, the application chooses the most appropriate format to paste. If you use the **Edit>Paste Special...** command instead, then you can choose which format to paste. The choice depends on the application where the Copy was carried out and what was copied. You can choose between Bitmap, Picture (WMF file), Text or Cadcorp SIS items.

◆ Paste the geometry of items

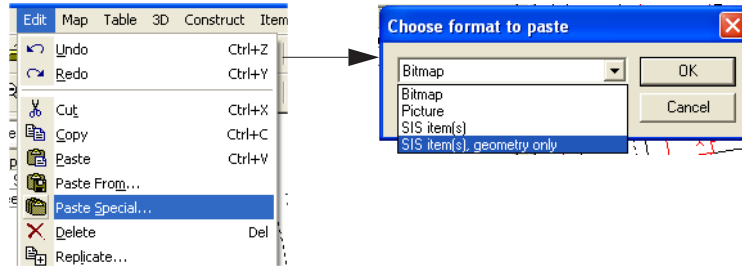
The **Edit>Paste Special...** command allows you to paste just the geometry of items, with the attributes being automatically stripped out.

There are occasions when you want to copy the geometry of an item on the map but you don't want to use the attributes associated with the item you're pasting. You can choose whether to paste geometry and attributes, or just the geometry. Here is an example of the **Edit>Paste Special...** command.

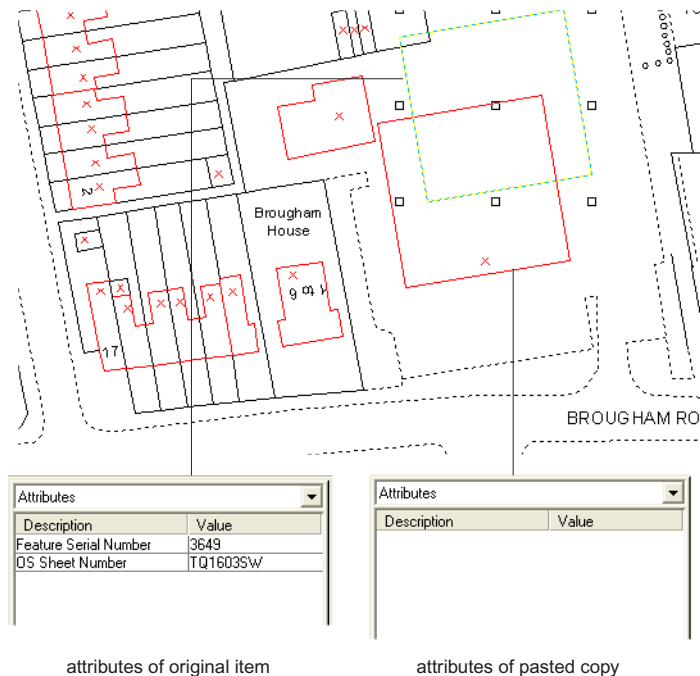
- 1 Select an item on the map and choose **Edit>Copy** or **Edit>Cut**.



- 2 Choose **Edit>Paste Special...**. The Choose Format to Paste dialog opens.



- 3 Select the Cadcorp SIS item(s), geometry only option, and click OK.
 4 A copy of the item geometry is pasted onto the editable layer without any associated attribute data:



■ Pasting Cadcorp SIS graphics into Cadcorp SIS

When Cadcorp SIS graphics are copied to the clipboard, a record is made of their position relative to the current axes position. When the graphics are pasted, they are placed so that they have the same spatial relationship to the axes position at the time of pasting as they had to the axes at the time they were copied.

Graphics are pasted onto the overlay from which they were copied if it is editable. If it is not, a new internal dataset is created and the graphics placed here.



To copy large datasets within Cadcorp SIS, or to copy items between co-ordinate systems, use the **Edit>Replicate** command instead of **Edit>Copy** and **Edit>Paste**. ➤Chapter 35: “General editing techniques”

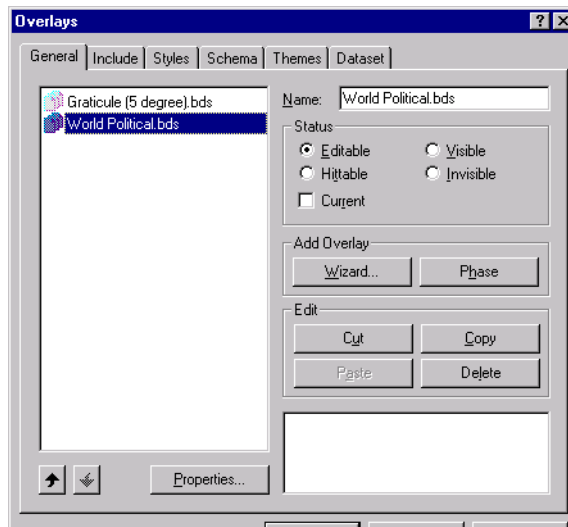
◆ Moving or copying graphics from one overlay to another

The clipboard is useful for copying or moving items from one overlay to another.

Copying non-editable data to the clipboard (such as Ordnance Survey data), then pasting it to an editable overlay, provides an editable copy of the data.

◆ Copying an entire overlay

The contents of an entire overlay can be copied to the clipboard, then pasted back, using the buttons on the General page of the Overlays dialog.



➤Chapter 15: “Working with overlays”

◆ Pasting a picture of one window into another



Use the **Edit>Paste Special...** command to paste a picture of one window into another. This is especially useful with print templates. ➤Chapter 47: “Printing: print templates”

■ Pasting Cadcorp SIS graphics into other applications



The **Edit>Copy** command copies the whole of the current view to the clipboard as a Windows Metafile (WMF).

The WMF may be pasted into another application which is capable of accepting Windows Metafiles. When the view is pasted into another application, the graphics appear just as they did in the map window. That is, the application should clip the graphics which overlap the clipping frame. (However, be aware that some applications do not use the clipping frame, especially when printing.)

■ Pasting text from other applications into Cadcorp SIS

You can paste text from other applications into Cadcorp SIS using the clipboard, but you should be aware that text is pasted at the centre of the map window.

- 1 Copy the text from the other application to the clipboard.
- 2 In Cadcorp SIS, display the required location for the text.
- 3 Select the **Edit>Paste** command.
- 4 Move the text using the Alter commands on the item's local menu.

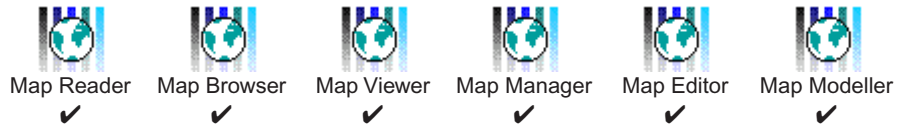


Text items created by pasting take on the default item properties. They will be drawn in the default font and size.

■ Pasting bitmaps into Cadcorp SIS

You can copy a bitmap (raster image) from another application into Cadcorp SIS. The procedure is the same as for pasting text.

➤ Chapter 43: “**Editing raster data**”



Customising your system

■ Setting environment parameters: workspaces	591
■ Preferences	591
■ Other ways of customising your system	596

■ Setting environment parameters: workspaces

Workspaces contain a number of default settings, which are applied to all SWDs created while the workspace is open, eg the default viewing projection, default co-ordinate system, details of libraries, and named tables.

Workspaces are useful for a number of reasons. For example:

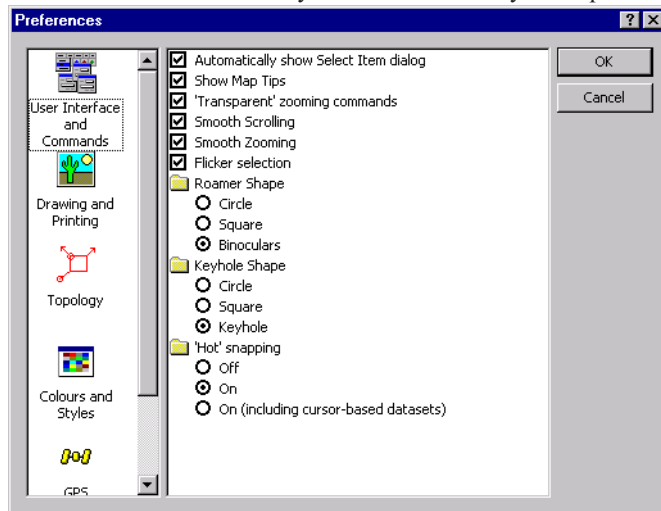
- where several people are contributing towards the same projects, you might create a workspace for that project, thus ensuring that everyone uses the same basic setup
- where individuals share a computer, each user might have their own workspace. This allows each person to set up their own environment.

➤Chapter 4: “Loading data”

■ Preferences



The **Tools>Preferences...** command lets you control various system options.



◆ User interface and commands

Automatically show Select Item dialog

This controls whether the Select Item dialog should be shown whenever you snap onto overlapping items.

Show Map Tips

This controls whether Map Tips are used. ➤Chapter 12: “Querying the data in the map window”

‘Transparent’ zooming commands

This option controls whether the Zoom commands are ‘transparent’. If they are, you can use them to move around the map window while you are in the middle of other commands. If they are not ‘transparent’, you must finish a command before selecting a Zoom command.

Smooth scrolling

When scrolling, Cadcorp SIS draws newly-exposed areas immediately. This avoids the ‘white space’ that can appear in the map window.

Smooth zooming

This option controls the quality of the zooming action in commands such as **Map>Zoom>Drag**.

Flicker selection

This option causes Cadcorp SIS, when not active, to turn the selection on every half a second. This makes selected items appear to flicker, so that they are more easy to see.

This facility can be useful when using a table window with a map window and selecting items in the table window.

Roamer Shape

The Roamer magnifying glass (**Map>Zoom>Roamer**) can be a circle, a square, or two overlapping circles suggesting a view through binoculars

Keyhole shape

The keyhole shape (**Map>Zoom>Keyhole**) can be a circle, a square, or a keyhole shape.

‘Hot’ snapping

This option controls the ability to display snapcodes and Map Tips when using cursor datasets.

Off	no snapcodes or Map Tips are shown on any type of dataset except when using the Q snap, which forces the Map Tip
On	snapcodes and Map Tips are shown on all datasets except cursor datasets
On (including cursor-based datasets)	snapcodes and Map Tips are shown on all datasets

◆ Drawing and printing

Draw rotated bitmaps

You may choose whether rotated bitmaps are drawn on screen or just indicated in outline.
 ➤Chapter 43: “Editing raster data”

Print rotated bitmaps

If you have decided to draw rotated bitmaps on screen, you can choose whether to print them fully or just in outline. ➤Chapter 43: “Editing raster data”

Print using a bitmap

This option forces Cadcorp SIS to create a bitmap image of the map window before printing it. Use this option only if the printer cannot handle certain aspects of the print, such as transparency.

Highlight selected shapes and text

With this option selected, whenever you select a point item the whole shape is highlighted, and when you select point text, the whole text item is highlighted. Without this option, a small diamond is drawn over the selected point.

Draw shapes flat on screen

This option forces all shapes to be drawn on screen or printed without being re-projected.

Simulate GDI pen styles

Some older printer drivers cannot draw dotted and dashed pen styles. If this is the case with your printer, you can force Cadcorp SIS to calculate the start and end positions of the dots and dashes within styled pens. This is a reliable way to get re-usable styles on all output devices. The drawback is that it is slower than using Windows GDI (Graphic Device Interface).

Fill 2D items in 3D views (eg area items)

This option fills 2D items when you are viewing them in 3D. ➤Chapter 9: “Viewing 3D Data”

Fill 3D items in 2D views (eg surface items)

This option fills 3D items when you are viewing them in 2D.

Full redraw after pan

This option forces Cadcorp SIS to redraw the overlays every time you pan the map window.

Redraw after each Overlay

This option forces Cadcorp SIS to redraw the map window after each overlay is loaded.

Printer colour capabilities

This option lets you specify how Cadcorp SIS uses colour when printing:

Query printer driver Cadcorp SIS queries the printer driver to find out whether the printer can handle colours or not.

Monochrome Cadcorp SIS forces all colours to monochrome when printing.

Colour Cadcorp SIS uses colours when printing.

◆ Topology

Automatic chain creation

When you convert line or area items to topology, link items are created. Using this option you can have the system automatically create a chain item for each original line item simultaneously.

Favour old geometry in splinter removal

When you convert line or area items to topology, there may be small splinters between the line/area items and the existing link items. These splinters are automatically removed, but in doing so, Cadcorp SIS needs to know whether the old link item geometry is more reliable than the new line/area item geometry.

◆ Colours and styles

Default Overlay styles

Use these options to set the default styles for new overlays.

Selection style

This colour is used for drawing selected items.

Output settings

This option lets you specify the DPI (dots per inch) or output resolution on a printer or plot or, alternatively, tells Cadcorp SIS to query the printer or plotter to determine a default DPI. This is useful if you want to force a degradation or enhancement of a pattern within a plot.

◆ GPS

GPS Display Options

You can control the way GPS information is displayed. You can display:

- direction/track angle
- fix information
- the trail

Transformation Options

The datum used for GPS positioning is WGS84 (World Geodetic System 1984). The ellipsoid used in this datum is designed for the best fit of the geoid of the earth as a whole. To obtain greater accuracy within the UK, you can use one of following methods to transform data to Ordnance Survey coordinates:

- National Grid Transformation OSTN02
The new and definitive Ordnance Survey transformation and geoid model OSTN02 is an improvement over the previous model, OSTN97. The horizontal transformation accuracy has been improved from 0.2m to 0.1m rms, and the vertical accuracy has been improved from 0.05m to 0.02m rms.
- National Grid Transformation OSTN97
This is an initial transformation with lower accuracy.
- Standard Transverse Mercator
This is the minimum transformation with lower accuracy.

◆ Miscellaneous

Suppress backups

Normally when you save an SWD or BDS file, the old version of the file is not overwritten, but instead is renamed as “Backup of *filename.**”. This can be useful if you wish to return to the situation before the last save (for instance, if you saved changes you meant to discard). If you open and save one of the backups without renaming it, you will get backups of the backups.

However, saving these backup files uses up more of your disk space, so you may want to suppress this operation.

Suppress Undo Logging



Normally a log is kept of operations carried out in the current session since the last **File>Save**. This log allows the Undo and Redo commands to work, so these commands will not function if you have this option selected.

Suppress Scale Warnings

When you construct points or point text, Cadcorp SIS normally warns you if the overlay on which you are constructing them has an inappropriate dataset scale. Use this option if you do not want to see these warnings.

Check feature codes when merging items

This option controls the operation of the editing commands when merging line and area items. ➤Chapter 36: “**Editing line items**” and ➤Chapter 37: “**Editing area items**”

Check attributes when merging items

This option controls the operation of the editing commands when merging line and area items. ➤Chapter 36: “**Editing line items**” and ➤Chapter 37: “**Editing area items**”

Confirm before deleting items with no support for undo



The **Edit>Delete** command usually asks for confirmation before deleting items, in cases where there is no Undo available. If you don’t want this confirmation, uncheck this item.

Automatically refresh BDS datasets

BDS files can be accessed by several people at once. Normally, the first person to load a BDS gets editable access and is the owner. The owner can make changes to the file. All those users who subsequently load the file only get hittable access and cannot make any edits.

If you are not an owner, and you do not have this option checked, then the version of the BDS you are seeing is the same as it was at the time you loaded it. With this option selected, Cadcorp SIS will automatically check to see if there have been any saved changes to the file, and if there have, it will re-load with the latest version.

This option increases network traffic, so it should not be used if your network is slow. Additionally, some combinations of Server and Client operation systems do not allow changed files to be detected.

Check for Network Dongle

If you are using a network dongle you should have this option selected. Cadcorp SIS initially checks the parallel port on your computer for a dongle. If it does not find one there, it will then check to see if this option is selected. If it is, the computer will then look over the network for a network dongle.

If you do not have a network dongle, you should turn this option off, because it can take some time to search the network.

■ Other ways of customising your system

There are many ways you can customise your system using the following facilities. These are covered in more detail elsewhere.

◆ Toolbars

In Cadcorp SIS Map Manager, Map Editor, and Map Modeller, you can customise the toolbars, choosing which commands are shown. You can also create your own toolbar definitions, using the library tab in the workspace window.

➤Chapter 3: “Introducing the interface”, ➤Chapter 50: “Named object libraries (NOLs)”, Creating new named objects

◆ Pens and brushes

You can create your own pens and brushes, and you can set the pen or brush for any overlay or any item. ➤Chapter 32: “Pens and brushes” ➤Chapter 44: “Editing pens and brushes”

◆ Shapes

You can create your own shapes, set the default shape for any overlay, and assign any shape to any individual point item. ➤Chapter 26: “Creating points and placing shapes”

◆ Scale thresholds

Scale thresholds are the minimum and maximum display scales between which the item will be displayed. You can also set scale thresholds for an entire overlay, between which all items (regardless of their individual scale thresholds) will be displayed. ➤Chapter 8: “Scale”

◆ Units

You can choose from a list of linear units, area unit types, volumetric units and angular units. You can also choose the precision to which measurements should be shown. ➤Chapter 33: “Precision dimensions and locations”

◆ Stored views

You can store views in order to return to them in the future. ➤Chapter 6: “Working with map windows”

◆ Set axes

You can rotate the axes (which affects the orientation of rectangles, dimensions, ellipses, snap grids, etc) and you may move their origin. ➤Chapter 23: **“Overlays, levels, and commands”**

◆ Snap grids

You can set up a snap grid as an aid to drawing regular outlines. The grid may be of any chosen spacing. ➤Chapter 23: **“Overlays, levels, and commands”**

◆ Filters

You can set up filters to restrict what is displayed and which items can be selected for editing. ➤Chapter 16: **“Filtering what you see”** ➤Chapter 51: **“Creating your own filters”**

◆ Print templates

Print templates provide great scope for customising your print output. For instance, you can add to the print your logo, a title, any other text you require, grids, north point symbols, a legend, etc. ➤Chapter 47: **“Printing: print templates”**

◆ Customising your prints

You can design your own print templates to use when you print a portion of map data. A print template can contain your own information, such as company details and logo, standard notes and acknowledgements, etc, which should appear on every print. ➤Chapter 47: **“Printing: print templates”**

◆ Loci

Loci offer an advanced means of filtering which items are selected for editing. ➤Chapter 56: **“Spatial testing: loci”**

◆ Colour-sets

DTMs and density analysis grids are displayed using a colour-set. A colour-set defines which colours or shades are to be used to represent which values on screen (like contours). You can design your own colour-sets, and choose which one to use for each grid. ➤Chapter 57: **“Grids”**

◆ Creating customised projections

Projections and geodetic datums are stored as named objects. The (standard) library contains many projections and geodetic datums, whose properties you can examine on the library view tab of the workspace window.

You can create editable copies of the existing projections and geoid datums and edit them, saving them under a new name. ➤Chapter 54: **“Co-ordinate systems and projections”**

◆ Using your own feature tables

You can create your own feature tables either based on existing ones, or entirely from new. You can create your own feature codes, and all feature codes in editable feature tables can have their properties edited. You can assign a feature table and feature code to your own data. ➤Chapter 53: “**Feature tables**”

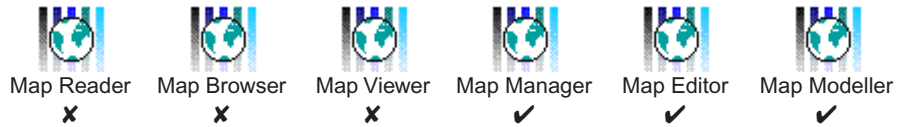
◆ Loading custom programs

Cadcorp SIS can be customised so that it runs other programs when it starts. These custom programs are stored in a Custom subdirectory in the Cadcorp SIS folder. If this folder does not exist, you can create it.



If the custom program is to be run with all versions of Cadcorp SIS software, store it in the Custom folder. If you have a number of Cadcorp SIS products, and want the custom program to run only with one of the products, create an additional subfolder, named after the product. For example, a custom program in the Map Manager folder in the Custom folder runs only when you start Cadcorp SIS Map Manager.

GisLink programs are product-specific: they use functionality which is available only with a particular Cadcorp SIS product. So if you run a GisLink program with a product which does not have the matching functionality, it will not work. For example, a program that uses the Loci option will work with Cadcorp SIS Map Modeller but not with Cadcorp SIS Map Manager.



Named object libraries (NOLs)

■ What is a named object library (NOL)?	599
■ The workspace window's library view tab	600
■ Creating new libraries	600
■ Opening existing libraries	600
■ Current library	601
■ Removing libraries from the workspace	601
■ Shared libraries	601
■ Library search order	601
■ Saving libraries	602
■ Creating new named objects	602

■ What is a named object library (NOL)?

A named object library (NOL) is a file in which named objects are stored. The following are all named objects:

- brushes
- filters
- feature tables
- pens
- loci
- projections
- shapes
- schemas
- geoid datums
- blocks
- print templates
- toolbar definitions
- named items
- graticule styles
- colour-sets
- views

Cadcorp SIS provides many named objects, and you can create your own. When you create named objects they are stored in the current library. ↗page 601, **Current library**

◆ The (standard), (temporary) and (workspace) libraries

Cadcorp SIS comes with a number of named objects already provided in a library called (standard). This is a read-only library, so you cannot add anything to it or edit items existing in it.

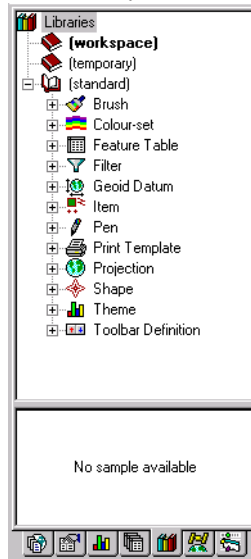
There is an additional library called (temporary) to which you can write. However, this library is deleted at the end of each session, without asking you, and is therefore empty at the beginning of each session.

If there is a workspace file open, there is also a library called (workspace). This library is saved within the workspace (.sis) file so that, whenever you use the workspace, its library is automatically loaded. Workspace's libraries are not available for you to use separately from the workspace to which they belong.

You can create your own libraries to store your own named objects, and you can also use libraries created by other users.

■ The workspace window's library view tab

Library operations are available on the library view tab in the workspace window.



■ Creating new libraries

To create a new library, either:



- Use the **File>New...** Wizard, selecting Named Object Library from the options. Select a directory for the library, and type in a name.
- On the workspace window library view tab, choose New Library... from the Libraries icon's local menu.

■ Opening existing libraries

To open a library:



- use the **File>Open...** command, selecting Named Object Library (*.nol) from the Files of type drop-down menu
- on the workspace window's library view tab, choose Open Library... from the Libraries icon's local menu.

- use drag and drop to select a library from a list of filenames and insert it into the Workspace

When you open a workspace, all libraries which were being used when the workspace was last saved are automatically loaded.

■ Current library



New named objects you create are placed in the current library. The current library is highlighted in bold in the workspace window.

To make a library current, select the command Make Current from its local menu.

◆ Folders

Folders for each category of named object (pen, shape, filter, etc) are automatically created. You can create folders within these by clicking on the existing folder name and selecting New Folder from the local menu.

■ Removing libraries from the workspace



To remove a library, use its local command Remove. You cannot remove the (standard) library.

If there are any unsaved changes to the library, you will be asked whether to save them before the library is closed.

■ Shared libraries

Libraries can be shared over a network, and several users may have read-access to them at the same time. Only one person has write-access, and this person is called the owner.



To gain write-access to a library, select Own from the library's local menu. You can only become the owner if no other user is currently the owner. You are automatically given the up-to-date version of the library file, including all changes made by other users.



To relinquish ownership and allow other users to write to this library, select the library's local command Disown.

■ Library search order

When Cadcorp SIS displays a map, it searches the libraries in turn for the pens, brushes, shapes, etc to use. If an identically named object exists in more than one library, the order of the libraries in the workspace window becomes significant. The current library is always searched first, then the other libraries in the order they appear in the list, descending.

◆ Changing the order in which libraries appear in the list



- 1 Select the library to be moved in the list.
- 2 From its local menu select Promote to move it up one place in the list, or Demote to move it down one place in the list.

◆ Excluding libraries from the search

Only enabled libraries are searched. You can exclude a library from a search by either:



- ensuring the local menu command Enabled is not selected
- clicking on the library's image in the Toolbar



Alternatively, you can remove the library from the list completely using the Remove command.

■ Saving libraries

All editable libraries which have changed during a working session, are automatically saved at the end of that session (except (temporary) which is always emptied).

Alternatively, you can save a library at any time during the session using the local command Save.



If you remove a library from the current session, you are asked whether to save any changes made in the current session.

Additionally, libraries are saved whenever the workspace is saved (as long as the library is on the same disk). Workspace files also prompt to be saved if they detect changes to the library setup.

■ Creating new named objects

◆ Creating new objects

With all named objects, you can create an editable copy of an existing object and place it in an editable library:



- 1 In the (standard) library, select the object to copy, and use its local command Copy.



- 2 In an editable library, use the local command Paste.



- 3 Rename the new editable object, using its local command.



- 4 Use its Properties... command to edit it as required.

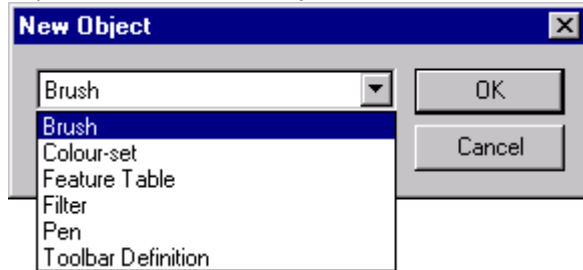
Some types of named object are also created using other methods - for details see the relevant chapters in this manual. In these cases, the new named object is automatically stored in the current library.



For example, some types of named object are created using specialist commands (eg **Construct>Miscellaneous>Block**).



Some use the library local command New Object....



◆ Naming objects

Named objects can have names of any length, which can be a mixture of upper and lower case characters. (However, note that when looking at lists of objects, you may see only the first few characters of their names.)

You can use most characters on the keyboard (eg -, _, @, and so on), but you cannot use the Backslash, tab or Escape characters. An asterisk (*) at the beginning of the name makes the object invisible in the user interface.

The dot character (.) is used to separate library folders (much like the backslash key is used in Windows to separate folders), and so should also be avoided.

◆ Working with the named objects in the workspace window

Using the folder's local menu, you can transfer entire folders between libraries via the clipboard.



You can delete an entire folder using the folder's local command Delete.



You can create new folders as sub-divisions of the main folder, using the local command New Folder.

Remember that the (standard) library is read-only, and therefore some of these operations are not allowed.

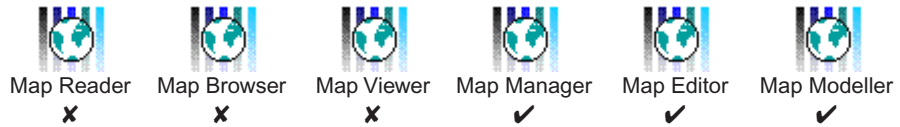
◆ Editing objects



The local command Properties... takes you to the relevant dialog for viewing and editing the properties of the object. For example, in the case of a pen, you see the Edit Pen dialog; in the case of a projection, you see the Projection dialog; in the case of a toolbar, you get the Customize Toolbar dialog, etc.

■ Customising NOLs

The (standard) library consists of all the NOL files in the Cadcorp SIS Libraries folder. These NOLs can be copied, renamed, edited or removed and new NOLs can be added to this folder. Once Cadcorp SIS is restarted these updated NOLs will become inserted into the read-only (standard) library.



Creating your own filters

■ What are filters?	605
■ Creating filters	605
■ Existing filters	607

■ What are filters?

A filter is a named object, which has rules that it uses to “pass” some items, but “fail” others.

Filter objects work by examining the properties of an item. So one filter could look at the colour of an item and only “pass” those that are red (in the same way that a camera can use coloured glass to filter the images of the photographs).

Filter objects can be applied to overlays to control the visibility of the items in that overlay. Only items that pass are drawn. Items that fail to pass through the filter are not drawn, so you can make them temporarily invisible without having to delete them.

Use filters:

- to decide which items are displayed on screen (overlay filters) ➤ Chapter 16: “**Filtering what you see**”
- to restrict which items are selected for editing ➤ Chapter 34: “**Selecting graphics**”

Filters are named objects stored in libraries. ➤ Chapter 50: “**Named object libraries (NOLs)**”

■ Creating filters

You can create your own editable filters, based on the read-only filters in the (standard) library. You can either make an editable copy of an existing filter on which to base your new one, or you can use the **Edit>Find...** command. Both methods are described below.



◆ Using Copy and Paste

Using the local commands on the library view tab in the workspace window, copy a filter from the (standard) library and paste it into an editable library. It is best to copy a filter which is as similar as possible to the one you want to create, because this will require the least editing.

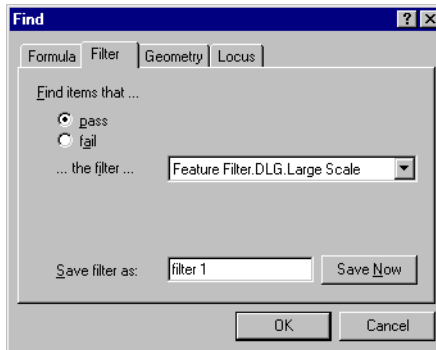
Once you have an editable copy, you can rename it and use the Properties... local command to edit it.

◆ Using the Edit>Find... command

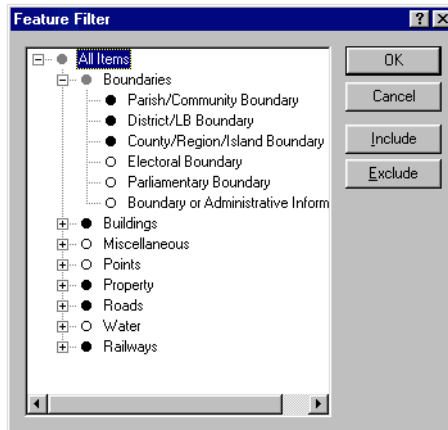
The procedure for creating a filter using the **Edit>Find...** command is as follows.



- 1 In the library view tab of the workspace window, select the library where you want the new filter to be stored as the current library.
- 2 Select the **Edit>Find...** command, and the filter tab.
- 3 Select a filter on which your new filter will be based. It is better to use one which is as similar as possible to the one you are about to create, as this means less editing.
- 4 In the Save filter as box, give the new filter a name and click on Save Now.



- 5 The new filter is now in the current library. You can use its local command Properties... to edit it.



To view all the items, click on the plus sign next to each item. It will change to a minus and the structure of the filter will be revealed.

To include items, click the circular button so that it is black, or select them. Then click Include. To exclude items, click the circular button so that it is white or select them. Then click Exclude.



- 6 Apply this new filter by choosing it in the **Map>Overlays** command Include tab. See the next section for more information on the different types of filters.

■ Existing filters

There are four different types of filter:

□ Types of filter

Type	Action
class	includes or excludes entire classes or sub-classes of items
feature	includes or excludes entire classes or sub-classes of features
property	includes or excludes based on a property value or formula
compound	combines two existing filters

◆ Class filters

These allow you to include or exclude entire classes or sub-classes of items.

- 1 Create an editable class based filter. ➤page 605, **Creating filters**



- 2 When you select the filter's local command Properties..., you see the class based filter dialog.
- 3 Edit the filter by including and excluding items.

◆ Feature filters

Feature filters allow you to include or exclude entire classes or sub-classes of features. You can also include or exclude items with no feature code.

- 1 Create an editable feature filter. ➤page 605, **Creating filters**



- 2 When you select the filter's local command Properties..., you see the Feature Filter dialog.
- 3 Edit the filter by including and excluding items.

◆ Property filters

This filter is used to exclude or include on the basis of having a given value for a certain property or formula.

When creating a property filter you will use the Property name. Property names are listed in the column headed Property in a Property dialog. The Property column is normally hidden. ➤Chapter 14: **"Properties"**

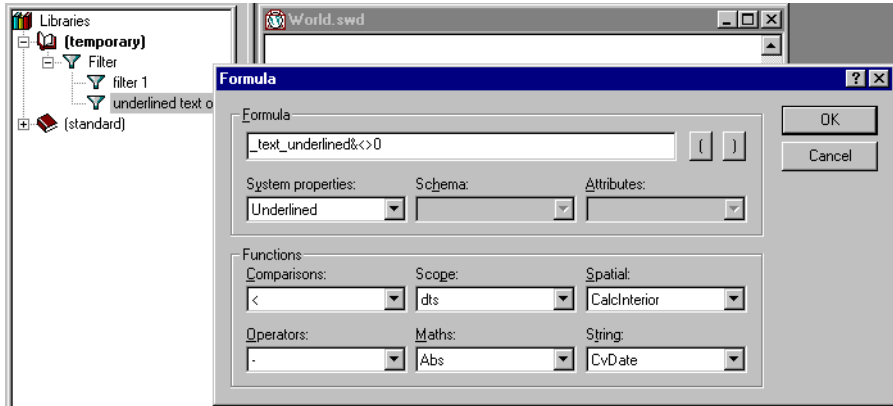
For information about using a formula, ➤Chapter 52: **"Formulae"**.

- 1 Create an editable Property filter.



- 2 When you select the filter's local command Properties..., you see the Formula dialog.

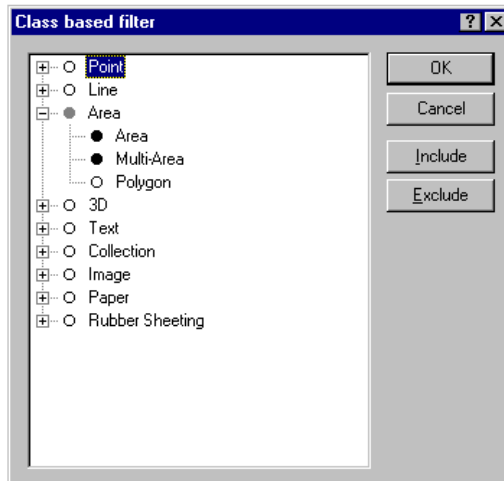
- 3 Type in the property to use and its value, or create a formula.

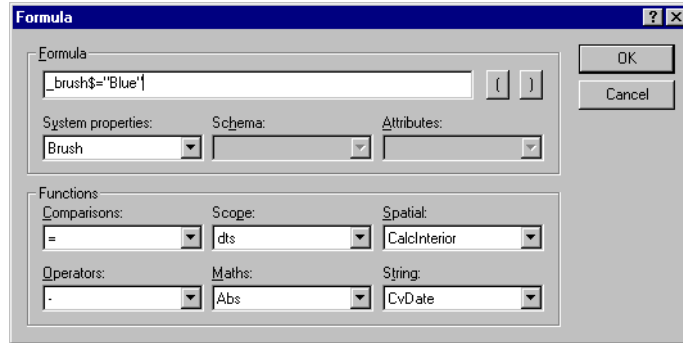


◆ Compound filters

Compound filters allow you to apply two existing filters to the selection process, combining them in a number of different ways. For example, in order to be selected, items might have to pass both filters, or pass one and fail the other.

The two filters you are going to combine must already exist. In this example we are going to combine a class based filter which finds area items and multi-area items, with a property filter which finds only those items with a Blue brush. The resulting compound filter will find areas and multi-areas which do not use the Blue brush.

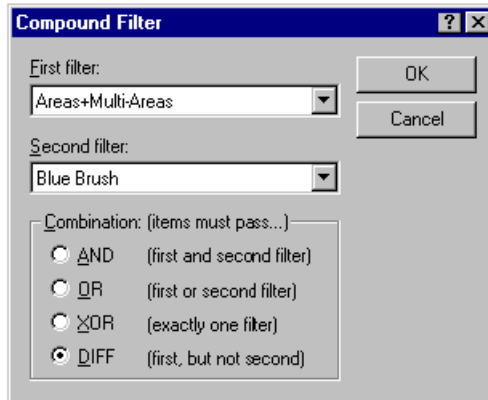




- 1 Create an editable compound filter. ↗page608, **Compound filters** (There is only one compound filter to copy, called (Default).)



- 2 Select the filter's local command Properties... to see the Compound Filter dialog.



- 3 Select the filters to use, then the method by which they should be combined:

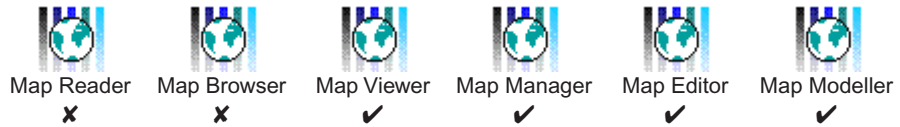
AND items must pass both filters

OR items must pass at least one of the filters, and possibly both

XOR items must pass one filter, or the other, but not both

DIFF items must pass the first filter and fail the second

In the above example, items will be found only if they pass the filter which finds area items and multi-areas, and if they also fail the filter which finds only items with the Blue brush. The result is to find all areas and multi-areas which use any brush other than Blue.



Formulae

■ Properties and formulae	611
■ Some examples of formulae	612
■ Building formulae.....	612
■ The Formula dialog	614
■ Operators, functions and spatial searches	614
■ Syntax of operators, functions and spatial searches.....	617

■ Properties and formulae



Every Item in Cadcorp SIS has properties that are shown in the workspace window's property view when you select an item. The properties hold such information as the pen to draw the item with, the length of a line item, and the point height of text items. The **Edit>Properties...** command shows a tabbed dialog with advanced controls for editing item properties.

Every property has a name, a description and a value. The name of a property follows the rules used for computer language variables (eg Microsoft Visual Basic). In particular the property name always ends in a special character indicating its type; either "\$" (string property), "#" (floating point property) or "&" (integer property).

The property description is a word or phrase that indicates its meaning in normal language. When you use the Cadcorp SIS user interface you are shown the property description, but if you are programming or using formulae you must use the property names to avoid ambiguities.

The system automatically supplies a list of properties for every item. These properties are called system properties, and you can recognise them because their names always start with an underscore character. You can also add your own properties to any editable item as attribute data. To avoid confusion, you cannot use the underscore character as your property name's first character.

◆ Formulae

As well as using single properties in schemas and filters, several properties can be combined into a mathematical formula. The formulae can use mathematical operators, functions, and spatial searches. Cadcorp SIS calculates the value for the formula in the same way as many computer programming languages.

Using formulae, the values of properties can be:

- compared
- combined in mathematical operations or logical operations

- used in calculations
- used to create compound strings or format numbers as strings
- used to perform spatial queries

Some Cadcorp SIS operations where you might use formulae are:



- when carrying out an advanced selection process using the **Edit>Find...** command
 ↳ Chapter 34: “**Selecting graphics**”
- when creating filters ↳ Chapter 51: “**Creating your own filters**”
- when creating schema columns ↳ Chapter 17: “**Schemas**”
- when creating themes ↳ Chapter 19: “**Thematic mapping**”



- when creating a grid item from other existing items using the **Construct>Geometry 3D>Scatter Grid** command ↳ Chapter 57: “**Grids**”
- when route-finding ↳ Chapter 58: “**Route-finding**”

■ Some examples of formulae

◆ Formulae in filters

```
_closed <> 0
    Find all closed line items.

_sz#>1
    Find all items higher than 1 metre tall.

FindInterior("AddressPoint")._class$="Point"
    Find all buildings which have an Address Point seed.
```

◆ Formulae in schemas or themes

```
_length#/area#
    Get the value of the length of the item divided by its area.

_length#^2
    Get the value of the length squared (raised by the power of 2).

Item id="+Str(_id&)"
    Find the item's ID and convert it to a string.

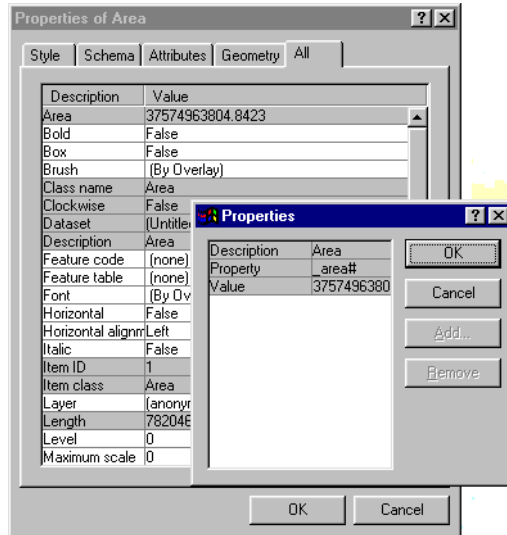
FindContainer("Polygon Overlay")._area#
    Look on the overlay called Polygon Overlay and find the area item which contains the
    selected point or item. Get the value of this area item's _area# property.
```

■ Building formulae

Formulae are composed of property names, operators, functions and spatial searches. Where a formula is required, you can always type it in. Alternatively you can use the Formula dialog, which provides a means of building functions into formulae.

◆ Property names

When building formulae, you need to know the names of properties. In the Properties dialog, the Property name is found by using the Schema, Attributes, Geometry, or All tabs. Select the property, and choose Properties from the local menu. The dialog shows the property's Description, Property name, and Value, which you can copy for your formula.



➤ Chapter 14: “Properties”

◆ Operators, functions and spatial searches

Expressions can contain all the arithmetic operators (+, -, *, /, etc), comparison operators (=, >, etc), numeric, trigonometric and string functions (Sin, Cos, Log, etc), logical operators (And, Or, etc) and spatial query expressions.

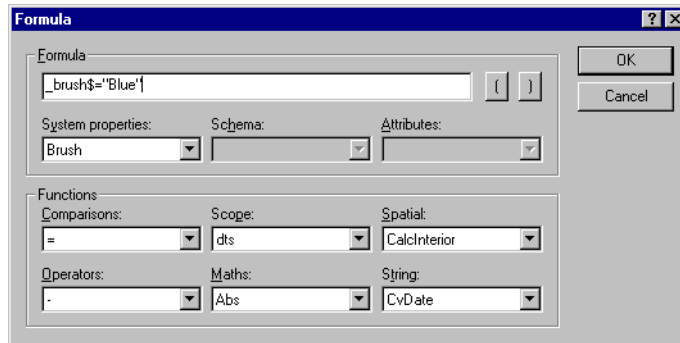
Formulae can interpret numbers in scientific notation.

For a full description of the functions you can use, ➤ page 614, **Operators, functions and spatial searches**.

■ The Formula dialog



In operations where formulae can be used, you can access the Formula dialog by clicking the Formula button.



Construct your formula in the blank Formula area. You can either type in a function, or select it from the options given (see below).



The Formula dialog has buttons for finding matching parentheses. Where you have expressions containing several sets of parentheses, this function finds the one which matches the one you have selected.

■ Operators, functions and spatial searches

- page614, **Comparison operators**
- page615, **Maths operators**
- page616, **Operators**
- page616, **Property formulae**
- page616, **Spatial query expressions**
- page617, **String formulae**

◆ Comparison operators

These functions comprise those for comparing values and those for combining the results of the comparison. You can compare two numerical values or two string values.

The Choose and If functions both test values and return a new value dependent on the result.

And Bitwise And operator. This is used to perform a logical conjunction on two expressions.

Choose This selects and returns a value from a list of arguments.

= Are two values equal?

<> Are two values different?

<= Is one value less than or equal to another?

< Is one value less than another?

>=	Is one value greater than or equal to another?
>	Is one value greater than another?
If	This returns one of two parts, depending on the evaluation of an expression.
Like	This compares a string with a pattern.
Not	Get the two's complement of a binary value, or convert between True and False.
Or	Bitwise Or operator. This is used to perform a logical disjunction on two expressions.

For more information, [page 617](#), **Syntax of operators, functions and spatial searches**.

◆ Maths operators

These formulae carry out simple mathematical functions.

The number formats supported in these expressions are as follows:

Long Integer ranges in value from -2 147 483 648 to 2 147 483 647

eg a&

Double Precision Decimal ranges in value from

eg a# -1.79769313486232 × 10³⁰⁸ to -4.94065645841247 × 10⁻³²⁴
for negative values and 4.94065645841247 × 10⁻³²⁴ to
1.79769313486232 × 10³⁰⁸ for positive values

Conversions between integer and floating point values are carried out automatically.

For help with these functions, [page 617](#), **Syntax of operators, functions and spatial searches**.

Abs	Get the absolute value of a number.
ACos	Get the angle, in radians, of a cosine value.
ASin	Get the angle, in radians, of a sine value.
ATan	Get the angle, in radians, of a tangent value.
ATan2	Get the angle, in radians, of the tangent of two values.
Chr	Get a character from an ASCII value.
Cos	Get the cosine of an angle in radians.
Exp	Get the natural exponent of a number.
Fix	Get the integer portion of a number.
Int	Get the integer portion of a number.
Log	Get the natural logarithm of a number.
Max	Get the larger of two numbers.
Min	Get the smaller of two numbers.
Round	Round a fractional value to an integer, or a given number of decimal places.

<code>Sin</code>	Get the sine value of an angle in radians.
<code>Sqrt</code>	Get the square root of a number.
<code>Tan</code>	Get the tangent value of an angle in radians.

◆ Operators

The following operators can be used to carry out simple mathematical operations, the precedence being: $^$ $*$ $/$ $+$ $-$.

<code>/</code>	Divide one numerical value by another.
<code>.</code>	Get a property value from an item.
<code>-</code>	Subtract one value from another.
<code>+</code>	Add two values together.
<code>^</code>	Raise a value by a power.
<code>*</code>	Multiply two values together.

The `+` (plus) operator can be used to concatenate two strings together, as well as to sum two numbers.

The `.` (dot) operator is used to get properties from items found using Spatial Queries.

◆ Property formulae

The following operators can be used to get properties from various objects:

<code>dts</code>	Get a property from a dataset.
<code>swd</code>	Get a property from an SWD.
<code>Table</code>	Get a property from a column in a named table.
<code>this</code>	Get a property from an item.

◆ Spatial query expressions

The following routines all work by comparing the current item with items on another overlay.

<code>CalcInterior</code>	Perform a mathematical operation on a numeric property of the items on another overlay whose hook points are inside the current item.
<code>Extents</code>	Get a comma-separated string of the extents.
<code>FindContainer</code>	Find an item on another overlay which contains the current item.
<code>FindInterior</code>	Find an item on another overlay whose hook point is inside the current item.
<code>Grid</code>	Get the value of a grid item on another overlay at the hook point of the current item.
<code>Origin</code>	Get a comma-separated string of the hook point.

Overlap Area	Get the area of overlay between an item on another overlay and the current item.
Tin	Get the value of a TIN item on another overlay at the hook point of the current item.
WKT	Get the OGC Well Known Text representation of Geometry.

◆ String formulae

The following routines manipulate string variables. ➤page 617, **Syntax of operators, functions and spatial searches**

CvDate	Convert year/month/day and optional hours/minutes/seconds numbers to a date number.
Date	the date number of the current date and time
Exists	Does the given property exist on this item?
Find	Find the position of a sub-string within a string.
FormatDate	Format a date number as a string.
FormatFlt	Format a floating point number as a string.
FormatInt	Format an integer as a string.
FormatStr	Format a string.
Fuzzy	Compare two strings using a fuzzy comparison.
Grep	Compare two strings using Regular Expression style wildcards.
Left	Get a number of characters from the left of a string.
Len	Get the length of a string.
Local	Add digit group symbols to a number.
Lower	Convert a string to lowercase characters.
Ltrim	Trim spaces from the start of a string.
Mid	Get a number of characters from the middle of a string.
Right	Get a number of characters from the right of a string.
Rtrim	Trim spaces from the end of a string.
Str	Get the string representation of a number.
Upper	Convert a string to uppercase characters.
Val	Get the numerical value of a string.

■ Syntax of operators, functions and spatial searches

◆ Abs

Syntax Abs (a#)

returns the absolute value of a number. The absolute value of a number is its unsigned magnitude. For example, `ABS(-1)` and `ABS(1)` both return 1.

◆ **ACos**

Syntax `Acos(a#)`

returns the angle, in radians, whose cosine is given in parentheses.

◆ **AND**

Syntax `(expr1) AND (expr2)`

used to perform a logical conjunction on two expressions.

If, and only if, both expressions evaluate True, the items will be displayed. If either expression evaluates False, the items will not be displayed.

◆ **ASin**

Syntax `Asin(a#)`

returns the angle in radians whose sine is given in parentheses.

◆ **ATan**

Syntax `Atan(a#)`

returns the angle in radians whose tangent is given in parentheses.

◆ **ATan2**

Syntax `Atan2(x#,y#)`

returns the angle in radians whose tangent is given by the x and y distances shown in parentheses.

◆ **CalcInterior**

Syntax `CalcInterior(alias$, prop$, operation%)`

performs a mathematical operation on a numeric property of the items on another overlay whose hook points are inside the current item. The current item must be a closed area item, eg an area, bitmap, QZone, polygon, or TIN.

`alias$`

the overlay on which to search for the contained items

`prop$`

the numeric property on which to perform the operation

`operation%`

the mathematical operation to perform on the contained items

0 calculate the total number (`prop$` may be empty)

1 calculate the sum of the values of the property `prop$`

2 calculate the average of the values of the property `prop$`

Example `CalcInterior("Lampposts", "Watts&", 1)`

gets the sum of the property `Watts&` on all the contained items on the overlay `Lampposts`

◆ Choose

Syntax Choose(index, a, b, c, d, ...)

selects and returns a value from a list of arguments

index

a numeric expression which evaluates to a number between 1 and the number of available choices

a, b, c, d, ...

the list of choice values. These may be strings or numbers, but must all be of the same type. All of them will be evaluated (even though only one of them will be returned), therefore all of them must be valid expressions.

Returns the value of the given index. If the index evaluates to 1, then the value “a” is returned.

Example Choose(Status&, "Pending", "Approved", "Closed")

returns Pending if the value of the user attribute Status& on the current item equals 1, Approved if Status& equals 2, etc

◆ Chr

Syntax Chr(a%)

returns the character whose ASCII code is given in parentheses, where a% is an integer in the range 0 to 255

◆ Cos

Syntax Cos(a#)

returns the cosine of the angle in radians given in parentheses

◆ CvDate

Syntax CvDate(yr%, mn%, dy%[, h%, m%, s%])

converts year/month/day and optional hours/minutes/seconds numbers to a date number

Returns the date, and optional time, in number representation

Example FormatDate (Date () , "Time: %X, Date: %x")

formats the current time and date in the current locale formats, eg Time: 12:10:35,

Date: 05/11/96

◆ dts

gets the value of a property on the current item's dataset

Example dts._bModified&

gets the value of the modified flag on the current item's dataset

◆ Exists

Syntax Exists(attr\$)

does the given property exist on the current item?

Returns True if the attribute in parentheses exists where attr\$ is a text string, False if it does not

Example `Exists("_text_alignV&")`

returns True only for text, box text, label and line text items

◆ Exp

Syntax `Exp(a#)`

get the natural exponent of a number

◆ Extents

Syntax `Extents()`

returns a comma-separated string of the extents of the current item

◆ Find

Syntax `Find(a$,b$)`

returns the position of a sub-string within a string

Example `Find("The Cat","Cat")`

returns 4

`Find("The Cat","The")`

returns 0

`Find("The Cat","Dog")`

returns -1

◆ FindContainer

Syntax `FindContainer(alias$)`

find an area item on another overlay which contains the current item (the current item's hook point is used). The dot operator is used to get the properties of the found item.

`alias$`

the overlay on which to search for a containing item

Example `FindContainer("Polygon Overlay")._area#`

gets the area value of the containing item on the overlay "Polygon Overlay"

◆ FindInterior

Syntax `FindInterior(alias$)`

find an item on another overlay whose hook point is inside the current item (which must be a closed area item). The dot operator is used to get the properties of the found item.

`alias$`

the overlay on which to search for a containing item

Example `FindInterior("Place Names")._text$`

gets the text of the contained item on the overlay "Place Names".

◆ Fix

Syntax `Fix(a#)`

get the integer portion of a number. If the number is negative, then `Fix` returns the first negative number greater than or equal to the given number.

Example `Fix(4.3)` returns 4

`Fix(-4.3)` returns -4

◆ FormatDate

Syntax `FormatDate(a#, fmt$)`

format a date value as a string using MFC `ColeDateTime` formatting

a#

a date value. Date values can be calculated using `CvDate`, and are also read from ODBC database columns with type `SQL_DATE`, `SQL_TIME` or `SQL_TIMESTAMP`.

fmt\$

an MFC `ColeDateTime` format specification. See the on-line help for a list of the codes which the format specification can contain.

An example format would be `%d:%m:%y`.

◆ FormatFlt

Syntax `FormatFlt(a#, fmt$)`

format a floating point number as a string

a#

a floating point number

fmt\$

a C `printf` format specification

The format string must have the following general form:

`%[flags] [width] [.precision] type`

where the fields are as follows:

flags (optional) can contain these characters: - + # 0

width (optional) the number of digits before the decimal point

precision (optional) the number of digits after the decimal point

type is one of the characters: e E f g G

e double signed value having the form `[ - ]d.ddd e [sign]ddd`
where *d* is a single decimal digit, *ddd* is one or more decimal digits, *ddd* is exactly three decimal digits, and *sign* is + or -

E double identical to the e format except that E rather than e introduces the exponent

f	double	signed value having the form [-] <i>dddd.dddd</i> , where <i>dddd</i> is one or more decimal digits. The number of digits before the decimal point depends on the magnitude of the number, and the number of digits after the decimal point depends on the requested precision.
g	double	signed value printed in f or e format, whichever is more compact for the given value and precision. The e format is used only when the exponent of the value is less than -4 or greater than or equal to the precision argument. Trailing zeros are truncated, and the decimal point appears only if one or more digits follow it.
G	double	identical to the g format, except that E, rather than e, introduces the exponent (where appropriate)

An example format would be %10.3f.

◆ FormatInt

Syntax FormatInt(a&, fmt\$)

formats an integer as a string.

a&

an integer

fmt\$

a C printf format specification.

The format string must have the following general form:

%[*flags*][*width*][.*precision*]*type*

where the fields are as follows:

flags can contain these characters: - + # 0

width is an optional number

precision is another optional number

type is one of these characters: c d i o u x X

c int single-byte character

d int signed decimal integer

i int signed decimal integer

o int unsigned octal integer

u int unsigned decimal integer

x int unsigned hexadecimal integer, using "abcdef."

X int unsigned hexadecimal integer, using "ABCDEF."

An example format would be %05d.

◆ **FormatStr****Syntax** `FormatStr(a$, fmt$)`

format a string.

a\$

a string

fmt\$

a C `printf` format specification.

The format string must have the following general form:

`%[flags][width][.precision]type`

where the fields are as follows:

flags can contain these characters: - + # 0*width* is an optional number*precision* is another optional number*type* must be the character `s`, to specify a single-byte-character string◆ **Fuzzy****Syntax** `Fuzzy(a$, b$)`

compares two strings using a fuzzy comparison, returning a value between 0 and 1 depending on the closeness of a\$ and b\$

Example `Fuzzy(_DESC$, "Bilding Outlins") > 0.7`

This returns True if the value of _DESC\$ is better than a 70% match with the text in quotes.

Building Outline would PASS

Building Seed would FAIL

`Fuzzy(_DESC$, "Bilding Outlins") > 0.6`

Building Outline would PASS

Building Seed would PASS

Fuzzy matches less than 0.5 are usually too vague.

◆ **Grep****Syntax** `Grep(re$, b$)`

compares strings using a regular expression

re\$

a regular expression

b\$

a string to compare against the regular expression

Returns True if the strings match, and False if they do not

The comparison uses Regular Expression wildcards:

- . matches any single character, except a newline
- * matches any number of occurrences (even zero) of the expression that precedes it
- + matches one or more occurrences of the preceding expression
- ? matches zero or one occurrence of the preceding expression
- [] defines the beginning and end of a character class
- () defines the beginning and end of a group of expressions. Groups expressions into larger units, which dictate precedence. Each group is also a Reference Group which may be pasted into a replacement string.
- | alternation. This allows matching the expression on the left or on the right of the operator.
- \$ matches the end of a line
- ^ two meanings: matches the beginning of a line, or complement operator when the first character in a character class
- \\ used for escaping metacharacters and non-printing characters
- \\c the position in the pattern at which the cursor is placed at the end of a successful search

Examples `grep("ROAD",_text$)`
 finds text containing string "ROAD"
`grep("Line",class$)`
 finds items with class Line or LineFeature etc
`grep("B.*",_text$)`
 finds text string starting with letter "B"
`grep("[0-9]",_text$)`
 finds text containing digits (eg house numbers)

◆ Grid

Syntax `Grid(alias$)`
 gets the value of a grid item on another overlay at the hook point of the current item.
`alias$`
 the overlay on which to search for the grid item

◆ Iif

Syntax `Iif(expr, truepart, falsepart)`
 returns one of two parts, depending on the evaluation of an expression
`expr`
 an expression which evaluates to True or False
`truepart, falsepart`
 the values to return. The values may be strings or numbers, but must both be of the same type.

Both `truepart` and `falsepart` will be evaluated, even though only one of them will be returned. Therefore they must both be valid expressions.

Returns The value `truepart` if `expr` is `True`, otherwise the value `falsepart`.

Example `Iif(_length#>1000, "This Line is long", "This Line is short")` returns the string "This Line is long" if the current Line item is longer than 1km, and "This Line is short" if less than 1km.

◆ Int

Syntax `Int(a#)`

returns the integer portion of a number. If the number is negative, `Int` returns the first negative number less than or equal to the given number.

Example `Int(4.3)`

returns 4

`Int(-4.3)`

returns -5

◆ Left

Syntax `Left(a$, n%)`

get a number of characters from the left of a string

`a$`

a string

`n%`

the number of characters to return

Example `Left("abcdefghij", 3)`

returns "abc"

◆ Len

Syntax `Len(a$)`

get the length of a string, returning the number of characters, including spaces, in `a$`

◆ Like

Syntax `result = string Like pattern`

The right-hand side is a regular expression.

This function returns `True` if `string` matches `pattern`, `False` if there is no match. If either `string` or `pattern` is `Null`, `result` is `Null`.

`?` matches any single character

`*` matches zero or more characters

`#` matches any single digit (0-9)

`[charlist]` matches any single character in `charlist`

`[!charlist]` matches any single character not in `charlist`

Examples `MyCheck = "aBBBa" Like "a*a"`

```
returns True
MyCheck = "F" Like "[A-Z]"
returns True
MyCheck = "F" Like "[!A-Z]"
returns False
```

◆ Local

Syntax Local()

create a localised version of a number by adding digit group symbols

Example Local(123456789)

returns 123,456,789

◆ Log

Syntax Log(a#)

returns the natural logarithm of a number

The natural logarithm is the logarithm to the base e. The constant e is approximately 2.718282.

◆ Lower

Syntax Lower(a\$)

Returns a\$ converted to all lower case characters

◆ Ltrim

Syntax Ltrim(a\$)

removes spaces from start of a string

◆ Max

Syntax Max(a#, b#)

get the larger of two values, returning the greater of a# and b#

Example Max(_np&, 5)

This compares the _np& attribute (number of points or vertices) of each item with the number 5, and returns the greater of the two.

◆ Mid

Syntax Mid(a\$, pos%, len%)

get a number of characters from the middle of a string

a\$

a string

pos%

the position in a\$ from which to get the characters, starting from 1

len%

the number of characters to get, or use -1 to get the rest of the string

Example Mid("abcdefghij", 1, 3)

returns "abc"


```
Mid("abcdefghij", 4, 3)
returns "def"
Mid("abcdefghij", 7, -1)
returns "ghij"
```

◆ Min

Syntax Min(a#,b#)

get the smaller of two values, returning the lesser of a# and b#

Example Min(_np&,5)

This compares the _np& attribute (number of points or vertices) of each item with the number 5, and returns the lesser of the two.

◆ Not

Syntax Not(expr)

perform logical negation on a boolean expression, or get two's complement of an integer expression

expr

a boolean expression, or a numerical expression

◆ OR

Syntax (expr1) OR (expr2)

used to perform a logical disjunction on two expressions

If either or both expressions evaluate True, the items will be displayed. If both expressions evaluate False, the items will not be displayed.

◆ Origin

Syntax Origin()

returns the extents of an item, in a comma-separated string, at the hook point of the current item

◆ OverlapArea

Syntax OverlapArea(alias\$, prop\$, [val\$|min#, max#])

get the area of overlap between items on another overlay and the current item. The current item, and the overlapping items, must be closed Area items.

alias\$

the overlay on which to search for items

prop\$

the property to look for on any items found. Setting both this argument and the val\$ argument to empty will force all items to be considered.

val\$ or min#, max#

a string value, or range of numerical values. The found item will be included in the overlap calculation only if prop\$ is empty, or if the found item value matches val\$ for string values, or is in the range min#,max# for numerical values.

Returns The area of the current item which is overlapped by the found items which passed the prop\$ and val\$/min#, max# tests. This value cannot be greater than the area of the current item, but may be 0.0.

Example `OverlapArea ("Counties", "County$", "Hertfordshire")`
gets the overlap between the current item and the item representing “Hertfordshire” on the overlay “Counties”

◆ Right

Syntax `Right(a$, n%)`

gets a number of characters from the right of a string

Example `Right("abcdefghij", 3)`

returns “hij”

◆ Round

Syntax `Round(v#, places%)`

rounds a floating point number to a number of decimal places

v#

value to round

places%

optional number of decimal places. Use 0 for an integer, 1 for one decimal places, or -1 for nearest multiple of 10, etc.

◆ Rtrim

Syntax `Rtrim(a$)`

removes spaces from the end of a string

◆ Sin

Syntax `Sin(a#)`

returns the sine value of the angle in radians given in parentheses

◆ Sqrt

Syntax `Sqrt(a#)`

returns the square root of a#

◆ Str

Syntax `Str(a#)`

gets the string representation of a#

◆ swd

Syntax `swd`

gets the value of a property on the current SWD

Example `swd._noverlay` gets the number of overlays in the current SWD

◆ **Table**

Syntax `Table(table$, column$,prop$)`

gets the value of a column in a named table from the first row to which the current item is joined

`table$`

the table from which to get the column value

`column$, props$`

a comma-delimited list of table columns and item properties which together define the item-to-table join

The `column$` and `prop$` arguments must both contain the same number of comma-delimited entries, with a minimum of one. The join compares the values in the given table columns to those of the given item properties. (Some previous versions of Cadcorp SIS did not use these arguments.)

Example `Table("Properties", "REF$", "Reference$") .Rent#`

returns the value in the `Rent#` column of the named table “Properties”, where the value in the table column `REF$` matches the item attribute `Reference$`.

◆ **Tan**

Syntax `Tan(a#)`

returns the tangent value of the angle in radians given in parentheses

◆ **this**

gets the value of a property on the current item

Example `this._area#` returns the area value of an area item

◆ **Tin**

Syntax `Tin(alias$)`

gets the value of a TIN item on another overlay at the hook point of the current item

`alias$`

the overlay on which to search for a TIN item

Returns the value of the found TIN item, if any, at the hook point of the current item

◆ **Upper**

Syntax `Upper(a$)`

converts a string to all uppercase characters, returning `a$` converted to all uppercase characters

◆ **Val**

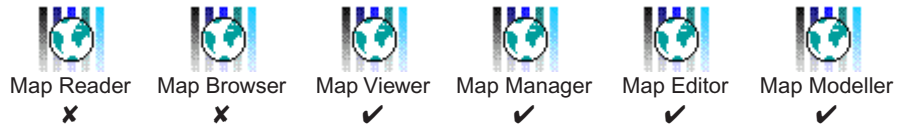
Syntax `Val(a$)`

gets the numerical value of a string

◆ WKT

Syntax `WKT()`

returns the OGC Well Known Text representation of geometry



Feature tables

■ What is a feature table?	631
■ Inspecting the feature tables	631
■ Importing and exporting feature tables	633
■ Creating new feature tables	633
■ Assigning feature codes to your own items	633
■ Using the Feature Code theme	634

■ What is a feature table?

A feature table details code-numbers that have standardised features (properties, styles, scale thresholds, and so on) associated with them. These tables can be applied to data that also contains these code-numbers. When selected, an item will show in its properties which feature table is being used, and which code from the table it has. In the UK, Ordnance Survey data is an example of the use of feature tables and codes. All features with the same feature code use the same pen, brush, shape, etc.

The data types that use feature tables and codes are: OS Boundary-Line, OS Land-Form, OS Land-line, OS Meridian, OS MasterMap, OSCAR, OSNI (Large Scale and Miscellaneous) RST, OS Strategi, TIGER/Line, and DLG (Large and Small Scale).

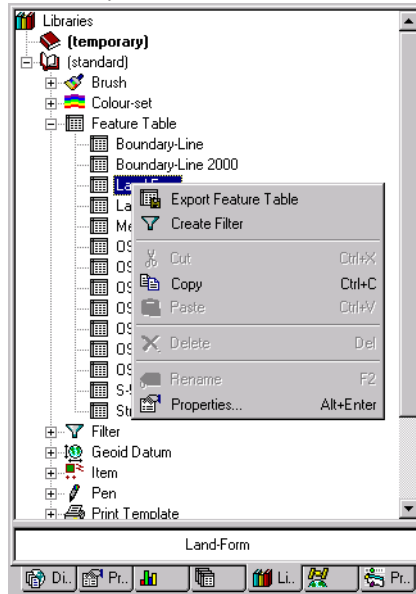
■ Inspecting the feature tables



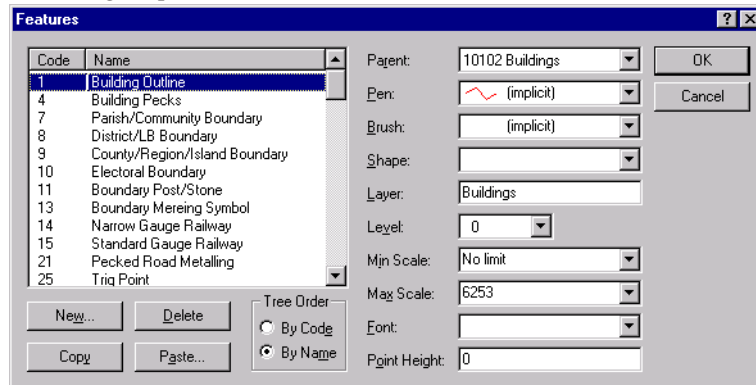
In Cadcorp SIS, feature tables are named objects, stored in libraries. You can inspect the libraries in the workspace window to see what feature tables they contain.

◆ Library view tab of the workspace window

The (standard) library contains all the feature tables supplied with Cadcorp SIS. These are read-only (but you can also create your own editable feature tables).



You can examine the details of each feature code in a feature table by selecting a feature table and selecting Properties from its local menu.



In the previous example, taken from the Land-Line feature table, all items with feature code 1 (Building Outlines) are on a layer called Buildings, and will be displayed only between the scales of 1:1 (No limit) and 1:6253.

■ Importing and exporting feature tables

You can import a feature table as a text file (*.txt). Use the Import Feature Table option on the local menu of each editable library.

There is also an Export Feature Table option on the feature table's local menu, which allows you to create a text file (*.txt) of any of your feature tables.

■ Creating new feature tables

You can create a new feature table in which you can define all the properties of each feature code. First make sure that the library where you want to store your new feature table is the current library, then use one of the following methods.

Creating a new empty feature table

- 1 Display the local menu for the library which will contain the feature table.
- 2 Choose New Object, and choose feature table from the pull-down menu. This creates a new, empty feature table.
- 3 Display the local menu for the feature table and choose Properties to create and view the feature codes.
- 4 Create new feature codes using the New... button, and define their properties as required.
- 5 When you are satisfied with the features' codes, click OK. A Save As dialog box opens. Give a new name for the feature table, and it will appear in the relevant library.

Creating a feature table based on an existing feature table

If you want to base your new feature table on an existing one, select it on the library view tab of the workspace window, and copy and paste to the destination library. Once there you can rename this editable copy, and:

- amend the existing feature codes
- delete the existing feature codes
- create new feature codes using the New... button

■ Assigning feature codes to your own items

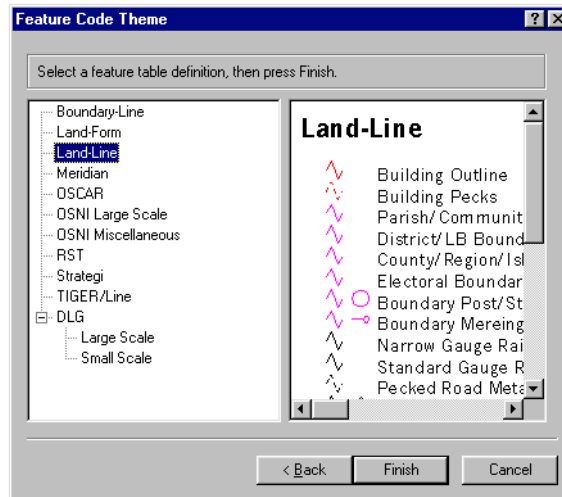
Your own data initially has no feature table (none) and no feature code (a feature code of none), but you can assign a feature table and feature code to it, using its properties.

You can change a feature table on the fly on the property view tab in the workspace window. In this case you are changing the feature table for the selected item(s) only. This means that there could be more than one feature table in use for one overlay (although this is not recommended).

■ Using the Feature Code theme

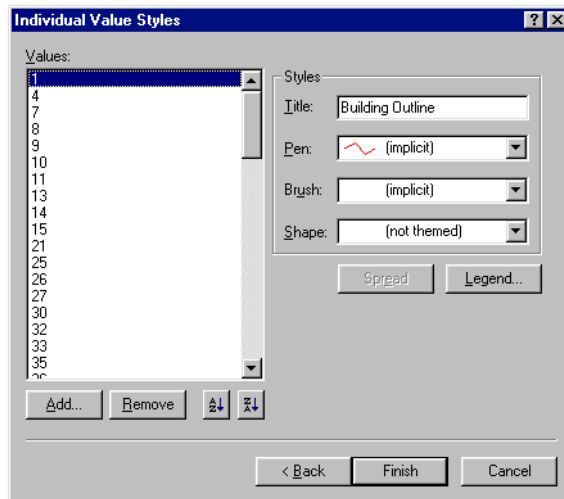
If you have created a map containing a feature code, and you want a feature code legend, you can use the Feature Code theme option. This uses the Theme Wizard to construct a legend based on the feature table used. This should not change the map in any way, it will simply allow you to add a Feature Code Legend as you go through the Print Template Wizard.

- 1 Start the Theme Wizard.
- 2 Choose the Feature Code theme.



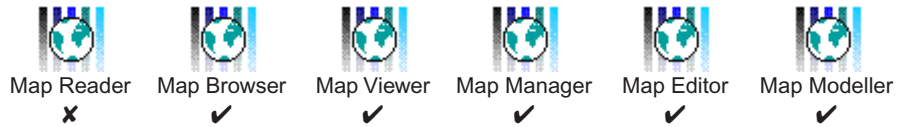
- 3 Choose the feature table definition which is relevant to your map.
- 4 Click Finish.
- 5 If you wish to edit the values in the legend, go to the Theme View Window and double-click on the Feature Theme.

This shows the Individual Values Style dialog which you can edit.



6 When you have completed the theme you can view the legend in the Theme View Window.

➤ Chapter 19: “Thematic mapping”, **Legends**, page 271



Co-ordinate systems and projections

■ What are co-ordinate systems and projections?	637
■ The Cadcorp SIS projections	637
■ The map window	638
■ Co-ordinate systems	638
■ Examining the properties of a projection	641
■ Geodetic datums	641
■ Creating your own projections	642

■ What are co-ordinate systems and projections?

A co-ordinate system defines how the positions of items are stored in datasets and reported to you. You also use the co-ordinate system when you enter new positions into a dataset.

A map projection describes how the positions in a dataset are drawn on the screen or on paper. It is a mathematical model that determines how the three-dimensional reality of the Earth's curved surface is distorted so that it can be drawn on a flat surface.

Many different map projections are available. They all have particular strengths (eg some preserve shape, others preserve distance, area or direction), but all have different limitations. This makes some projections more suitable for different purposes or for different areas of the globe.

The majority of map users need give little thought to which map projection is best for their particular application, as standard map projections are often used. However, in many countries there may be more than one standard for the production of maps, and you may need to be aware of their different properties.

■ The Cadcorp SIS projections

There are many different ways to classify map projections. Cadcorp SIS uses the most common models:

- Cylindrical
- Pseudo-cylindrical
- Conical
- Pseudo-conical
- Azimuthal
- Miscellaneous

For a list of the properties and uses of the supported projections, ➤Chapter 59: “Map projections”.

In addition, there are two special projections.

The Paper Projection

This is a neutral co-ordinate system, which is useful for drawing paper graphics, such as print templates and shape definitions. The tolerance for geometry inside this co-ordinate system is optimised for graphics that are less than 1 metre in size. So you should not use this projection for world-size map datasets.

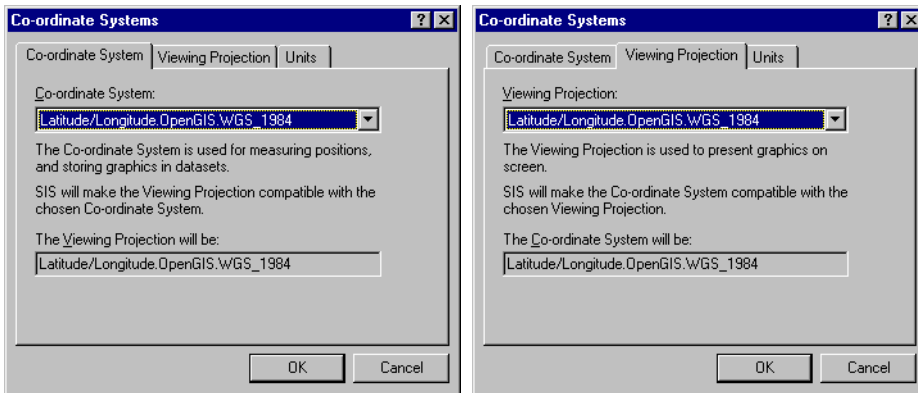
The Latitude/Longitude “Unknown” Projection

If you choose to use the Latitude/Longitude projection you have to choose a geoid. If you select Unknown, Cadcorp SIS chooses one which fits your co-ordinate system.

■ The map window



Use the **Map>Co-ordinate Systems...** command to select the co-ordinate system and viewing projection for the current map window.



For efficiency, Cadcorp SIS keeps the co-ordinate system and viewing projection compatible with each other. So as you change one, Cadcorp SIS may change the other. The mathematics behind projections can be complicated, involving spherical and elliptical trigonometry, so datasets draw faster when their co-ordinate system is compatible with the viewing projection. To speed up drawing, Cadcorp SIS uses a matrix approximation when the difference between a full conversion and a matrix conversion is less than a couple of pixels. (This approximation is only ever used for drawing, never for snapping or transforming items.)

■ Co-ordinate systems

◆ Cartesian and Spherical co-ordinates

There are two different types of co-ordinate system.

Spherical co-ordinate systems are based on lines of latitude and longitude, which are curved. The Z axis of a spherical projection measures height above sea level.

Cartesian co-ordinate systems have X, Y, and Z-axes which are straight and at 90 degrees to each other at all places (ie orthogonal). Units are linear (miles, metres, etc); this means that items can be easily and accurately measured for length, area and volume. An example of a Cartesian co-ordinate system is Geocentric. This is centred at the centre of the globe, with its X and Y axes pointing towards the equator and its Z axis pointing towards the North Pole.

◆ The dataset co-ordinate system

The position bar shows the currently selected co-ordinate system.



Choose the pull-down menu at the right to display all the supported projections. Choose the middle pull-down menu to change the way the co-ordinates are displayed in the box at the left. Use the **Map>Co-ordinate Systems...** command to change the co-ordinate system and projection. On the Dataset tab of the Overlays dialog you can see the co-ordinate system projection for each dataset.

◆ Mixing co-ordinate systems

If you overlay two datasets with different co-ordinate systems in a single SWD, then Cadcorp SIS will do on the fly conversions between them.

◆ Constructing new items in a given projection

New items are constructed in the current overlay, in whatever co-ordinate system it uses. To ensure that new items are constructed in the co-ordinate system you want, you must make sure that the current overlay (as selected in the Overlays dialog) has the desired co-ordinate system before you begin to draw.

◆ Position information displayed

You can choose the format of the cursor position read-out on the position bar. This shows the co-ordinates of the cursor's position on the surface of the view's projection. If you choose Co-ordinates format, then the position is mapped from the view projection into the axes projection, where the Z co-ordinate may not be 0.

◆ Pseudo-Orthogonal co-ordinate systems

Some mapping projections give rise to pseudo-orthogonal co-ordinate systems. Their X and Y axes are approximately 90 degrees to each other (and to the Z axis at all points near the projection's origin). They are not truly orthogonal since their surfaces are arranged to match the surface of the Earth. Examples are Universal Transverse Mercator, the British National Grid and the Japanese orthogonal projections.

◆ Converting items between co-ordinate systems



You can use the **Edit>Replicate** command to copy the selected item into the current overlay. The current overlay should have the required co-ordinate system set (on the Dataset tab of the Overlays dialog), in order that the copy is converted as required.

Converting items between co-ordinate systems should normally be avoided, as accuracy can be lost in subtle ways.

◆ **GB data: converting co-ordinates from WGS84 into British National Grid via OSTN97 or OSTN02**

To convert co-ordinates from the European Terrestrial Reference System (ETRS89) into the National Grid reference system of Great Britain, Cadcorp SIS uses the OSTN97 and OSTN02 transformations, which allow data collected using global positioning systems (GPS) to be positionally transformed from WGS84 to OSGB36. (OSTN02 is more accurate than, and supersedes, OSTN97.)

Example You have been out trekking in the Cairngorms with your GPS, calibrated to use ETRS89 (European Terrestrial Reference System 89) co-ordinates from the active GPS Network stations. Back at base, you want to download your ETRS89 Latitude and Longitude co-ordinates sets and convert them to National Grid co-ordinates.

To do this:

- 1 Create an overlay with the co-ordinate system WGS84 and load your co-ordinates into it.



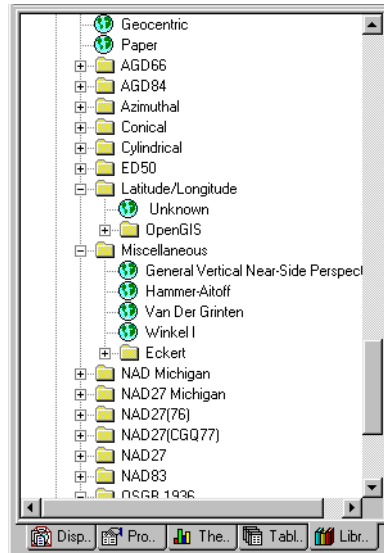
These transformations are intended to work only over the mainland and within a buffer of approximately ten miles from the coast.

- 2 Create a new overlay and set the co-ordinate system to GRS80.British National Grid (via OSTN97 or OSTN02). Select all the points on the first overlay and replicate to the second overlay.

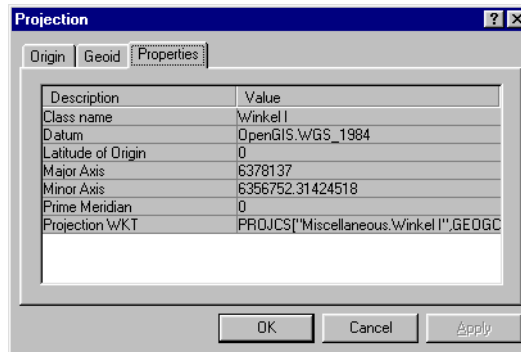
Further information can be found on the Ordnance Survey's GPS web site www.gps.gov.uk.

■ Examining the properties of a projection

Projections are stored as named objects in libraries. To examine them use the libraries tab of the workspace window. The (standard) library holds all the projections supplied with Cadcorp SIS, divided into folders containing the different types of projection:



To examine the details of any particular projection, use its local command Properties....



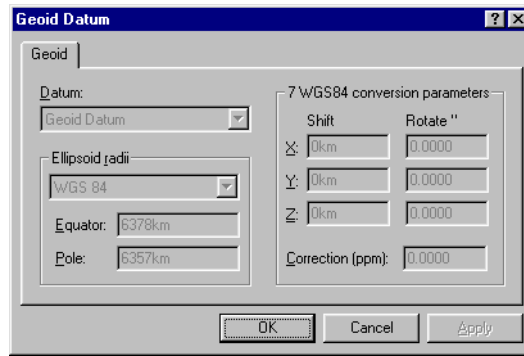
■ Geodetic datums

A geodetic datum is a set of parameters defining co-ordinate systems for local parts of the Earth, or for all of the Earth. They are used to produce a better local fit of a spheroid to the actual shape of the Earth (the geoid).

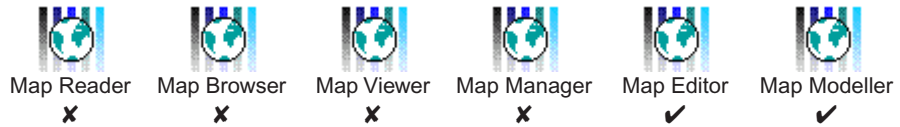
Many different datums have been produced, and they are provided as named objects in the (standard) library. You can create your own custom geoid datum by copying an appropriate one from the (standard) library into one of your own editable libraries. You may then edit it, and rename it as required.

■ Creating your own projections

You can create editable copies of the existing projections and amend them as you wish. For example, you might want to use the Equidistant Conic projection, but on a different part of the Earth. It uses the parallel 55° North as its Latitude origin - you could change this in order to use the projection at a different location:



- 1 Select an existing projection which most nearly matches the new projection you wish to create.
- 2 Use its local command Copy to copy it to the clipboard.
- 3 Paste it into an editable library.
- 4 Use the local command Rename to give it a new name.
- 5 Use the local command Properties... to see and amend the details of the projection.



Spatial analysis

■ What is spatial analysis?.....	643
■ Buffers.....	643
■ Thiessen areas.....	647

■ What is spatial analysis?

Spatial analysis is a feature in GIS which allows you to investigate the relationships between features. Analytical techniques in Cadcorp SIS let you ask questions such as:

- How many items are within a given distance of a feature?
- Which houses are occupied *and* within an industrial park *and* over 1000 metres square in area?

Spatial analysis gives an immediate visual indication of the proximity of items to other items.

Cadcorp SIS provides two analysis tools: buffers and Thiessen areas.

- buffers allow you to display areas of influence of a user-defined distance around selected items. There are two types of buffer: the area buffer and the QZone buffer.
- Thiessen areas are constructed around selected items. Adjacent areas are constructed around each point such that their boundaries are equidistant from neighbouring points.

You can use these in conjunction with the Querying facilities (⇒Chapter 56: “**Spatial testing: loci**”) to analyse your data.



These items provide only visual information. However, they can also be used for spatial testing using the **Edit>Find...** command (⇒Chapter 34: “**Selecting graphics**”) or using



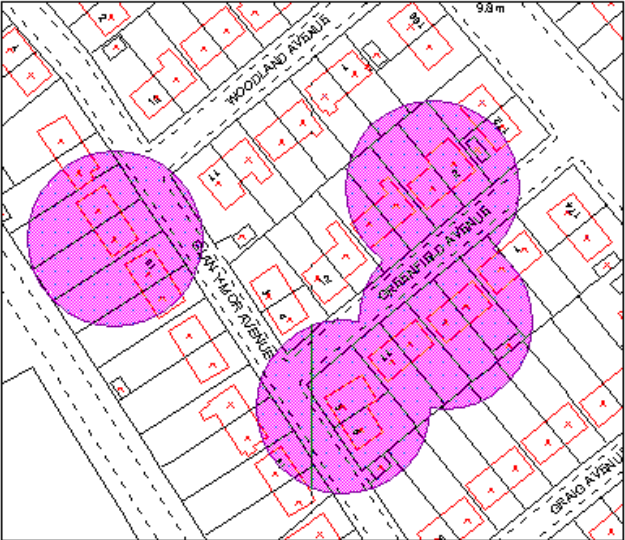
the **Construct>Miscellaneous>Locus...** command (⇒Chapter 56: “**Spatial testing: loci**”).

■ Buffers

A buffer is a zone of a user-specified size around selected items. For example, you can use buffers:

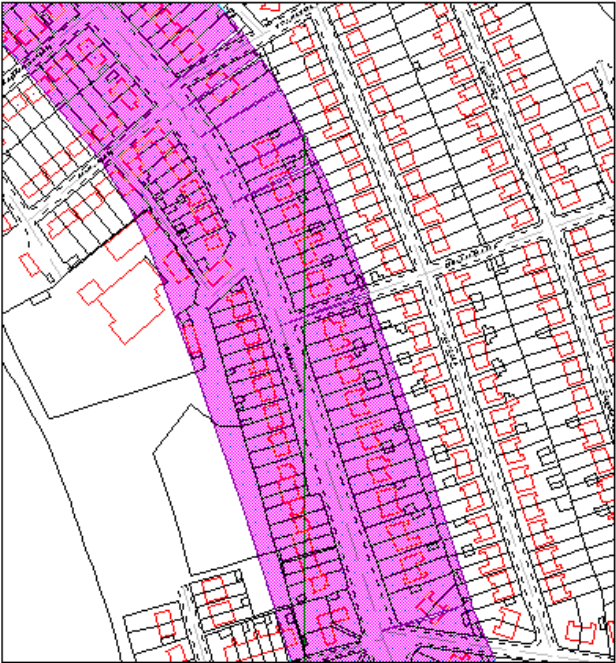
- to see all areas of industry which lie less than 5km from a motorway
- to see all residential addresses within 100m of a proposed fast food outlet

The example below shows 20m buffers around four different addresses.



Map extract © Crown copyright

This example shows a buffer 50m either side of a main road:



Map extract © Crown copyright

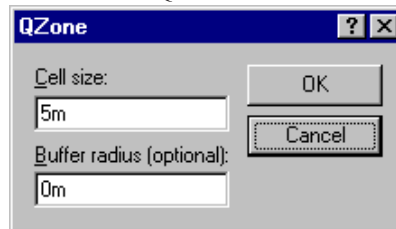
A buffer can be either an area buffer or a QZone buffer. An area buffer is an area item created around the selected item(s). A QZone is made up of squares or cells of a user-specified size. It is quicker for the computer to model the regularly sized cells in QZones, than area buffers, which are more accurate but take longer to process. So, for rapid processing of large areas, use QZone buffers, but for smaller areas which need more accuracy, use area buffers.

Buffers are created in the current axes projection. This could lead to a new Internal dataset being created, if no editable datasets exist with the same projection.

◆ Creating a buffer zone

Buffers are created as area or QZone items on the current overlay.

- 1 Make sure the overlay on which you want to create the buffer is the current overlay. You should consider putting buffers on their own separate overlay.
- 2 Select the item(s) around which you wish to see the buffer.
- 3 Select the relevant command, either **Construct>Buffer>Area**, or **Construct>Buffer>QZone....** Supply the buffer radius, the distance from the selected item(s) to the new buffer.
- 4 If you are creating a QZone buffer, in the QZone dialog, type in:
 - the cell size. This is the size of the smallest square to be used in making up the QZone. It determines the resolution of the QZone.



- the buffer radius. This is the distance from the selected item(s) to the buffer.

◆ Editing buffers

A buffer is a normal area or QZone item, and can be edited as normal (for instance, you might want to change its brush). ☞Chapter 25: “**Constructing area items**”, ☞Chapter 37: “**Editing area items**”

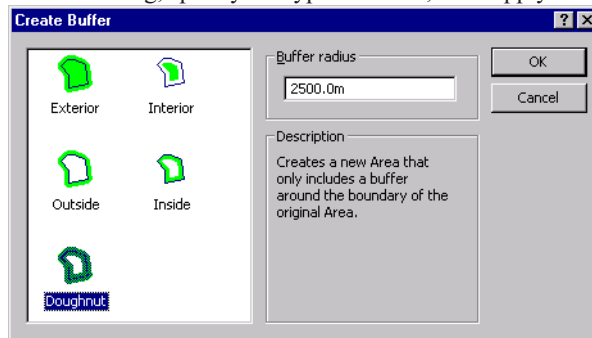
◆ Creating advanced buffers

You can create buffers based on an existing area item.

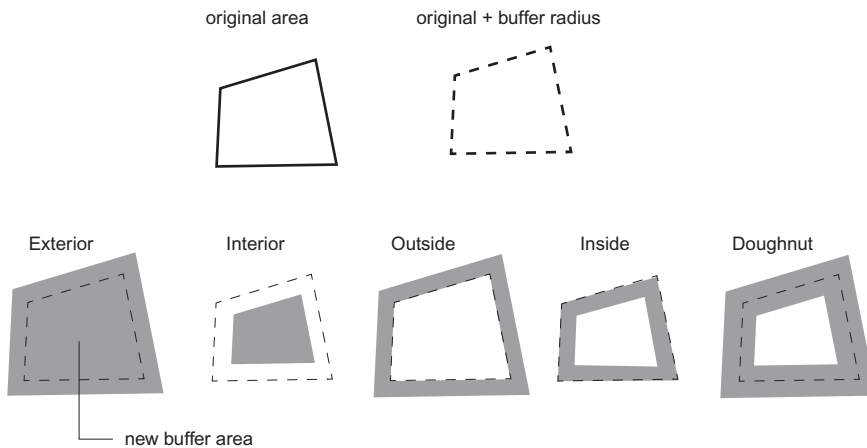


- 1 Choose the **Construct>Buffer>Advanced** command.

- 2 In the Create Buffer dialog, specify the type of buffer, and supply a radius.

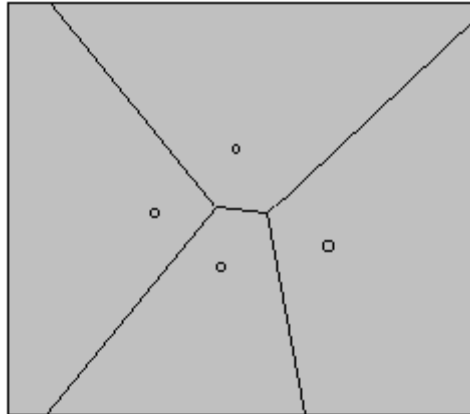


The options control how much of the original area is included in the new buffer:



■ Thiessen areas

Thiessen Areas (also known as Voronoi, 1909, or Dirichlet cells, 1850) are areas created automatically, based on selected items. Adjacent area items are created whose boundaries are equidistant from the selected items.



◆ Creating Thiessen areas (Cadcorp SIS Map Modeller only)

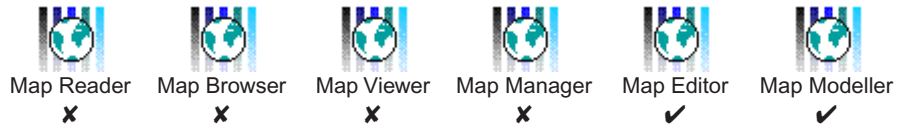
Thiessen areas are created as area items on the current overlay.

- 1 Make sure the overlay on which you want to create the Thiessen areas is the current overlay (you could consider creating a separate overlay for these items).
- 2 Select the items around which to create areas of influence. There must be at least two of them.
- 3 Select the **Construct>Miscellaneous>Thiessen Areas** command.



◆ Editing Thiessen areas

Once constructed, a Thiessen area is an area item, and can be edited in the same way as any area item - you can change its size and shape, its pen and brush, and so on. ➤Chapter 25: “Constructing area items” ➤Chapter 37: “Editing area items”



Spatial testing: loci

■ What is a locus?	649
■ Creating a locus	649
■ Locus tests	651
■ Spatial tests	652
■ Using an overlay locus	658
■ Clearing an overlay locus	658
■ Using a locus when selecting items	659
■ Inspecting and editing a locus	659

■ What is a locus?

A locus is a region used to include or exclude items based on their positions and geometry relative to the locus.

Loci can be created from any item on an editable or hittable overlay. A locus can be used once, or saved as a named object in a library for future use. You use the library view tab of the workspace window to inspect and amend stored loci.

You can choose from a number of tests for the locus to apply. For instance, if the locus is based on an area item or closed line item, it could exclude all items which lie outside it; if it were based on an open line item, it could include only those items which intersect with it; or if based on a point item, it could include only those items which contain it.

Once created, a locus can be used for the following purposes:

- when applied to an overlay, you can use the locus to filter out items from the display. On that particular overlay, only those items will be displayed which pass the locus selection tests.



- when used with the **Edit>Find...** Filter command it can be used to limit which items in the current map window are selected.

A locus applied to an overlay stays in force until it is explicitly cleared.

■ Creating a locus



If you want to create a new locus using a graphical item which has not been the basis of a locus before, you must use the **Construct>Miscellaneous>Locus...** command.

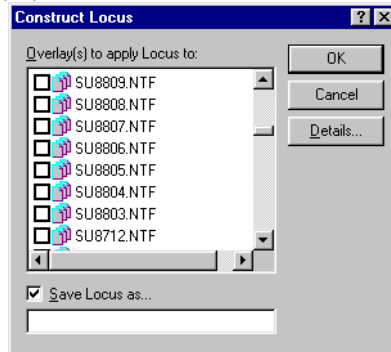
◆ Using the **Construct>Miscellaneous>Locus** command

- 1 If you plan to save the locus as a named item, make sure the library where you want the locus stored is the current library. ➤ Chapter 50: “**Named object libraries (NOLs)**”
- 2 Select the item to be used for the locus. This must be on an editable or hittable overlay.

Alternatively, construct an item to use for the locus. If this is the sole purpose of the item, it may be better to place it on a separate overlay from other data.

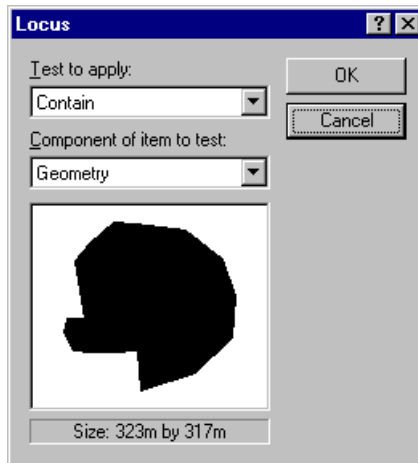


- 3 Select the **Construct>Miscellaneous>Locus...** command.
- 4 In the Construct Locus dialog, if you want the locus applied to an overlay or overlays straight away, select the overlay(s) to apply it to. The locus will then filter the display of items on the overlays you select.



If you want to save it for future use, select the Save Locus as checkbox, and give it a name. It will be stored in the current library.

- 5 Click on the Details... button to set the selection test the locus will use:



There are two variables:

- what test the locus will apply ➤ page 651, **Locus tests**
- what component of the searched for items are tested - their extents, their geometry, or their origin

Items will be displayed only if they pass both components of this test. In the above example, the locus must contain an item's geometry for it to be displayed/selected.

The geometry of the test item is always used, the component to test (geometry, extents, or origin) applies to the candidate items.

◆ Using the workspace window to create a locus based on an existing one

Like all named objects, a locus can be copied into another editable library, and the new copy renamed and its properties changed. There are of course no loci in the (standard) library, but once you have created loci in your own libraries, you can use this method to create other new loci. ➤ Chapter 50: “**Named object libraries (NOLs)**”

■ Locus tests

The locus has the options detailed below. There are some exceptions, marked with ❖.

❑ Locus options

Test to apply	Component of item to test	Description
Contain	Extent	retains items where extent is contained by locus
Cross	Extent	retains items where extent is contained or crossed by locus
Cross by	Extent	retains items where extent is crossed by locus
Disjoint	Extent	retains items where their extents are not contained by the locus
❖ Equal	Extent	the geometry of the test item cannot equal the extents of a candidate item, except in the following case: where the test item is rectangular and aligned with the axes, and the candidate extents are the same as the rectangle
Intersect	Extent	retains items where their extents are intersected by the locus (lines where not touching locus but extents are)
Overlap	Extent	extents are entirely overlapping locus
Touch	Extent	extents are touching outer rim of locus. Extents are not inside or overlapping.
Within	Extent	retains those items for whom the locus is wholly within their extents
Contain	Geometry	retains those items which are contained by the locus
Cross	Geometry	retains those items which are crossed by the locus as well as those contained by the locus
Cross by	Geometry	retains those items which are crossed by the locus but not those contained by the locus
Disjoint	Geometry	retains those items which are not crossed by the locus or those contained by the locus
Equal	Geometry	retains only those items which are equal to the locus in area and location
Intersect	Geometry	retains those items which intersect the locus
Overlap	Geometry	retains those items which overlap the locus

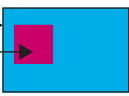
□ Locus options (Continued)

Touch	Geometry	retains those items which touch the locus but do not overlap
Within	Geometry	retains those items which are wholly within the locus
Contain	Origin	retains point/line/area items which are contained by the locus
Cross	Origin	retains point/line/area items for which their origins are contained by the locus
❖ Cross by	Origin	The candidate item (a point) does not go outside the test item (the polygon), except where the test item is rectangular and aligned
Disjoint	Origin	retains items where their origins are not contained by the locus.
❖ Equal	Origin	The geometry of the test item cannot equal the origin of a candidate item, except in the following case: where the test item is rectangular and aligned with the axes, and the candidate extents are the same as the rectangle
Intersect	Origin	retains origins within or intersecting
❖ Overlap	Origin	The test item (the polygon) contains the candidate item (a point)
Touch	Origin	retains items where origin touches locus but does not overlap
❖ Within	Origin	The test item (the polygon) is not inside the candidate item (a point)

■ Spatial tests

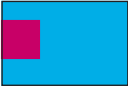
The following tables describe the spatial tests used in Cadcorp SIS.

For example, in the first row, you have selected the rectangular area item, and you want to find the square area item which lies inside it. You can use the Contain, Cross, and Intersect tests. In these tables, the double arrow (↔) at the top of a column indicates that the test item is also returned in the results. So, if you use Contain or Intersect, the test item (a rectangle in this example) is returned.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
selection → 	✓	✓	.	.	.	✓	.	.	.

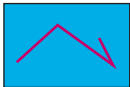
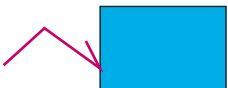
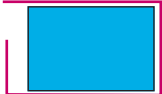
Selected item: area - candidates to find: areas

In this table, the selected item is an area item, and the tests are looking for area items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	.	✓	.	.	.	✓	✓	✓	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	✓	.	.	.	.	.
	.	.	.	.	.	✓	.	.	✓

Selected item: area – candidates to find: lines

In this table, the selected item is an area item, and the tests are looking for line items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	.	✓	.	.	.	✓	✓	✓	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	✓	.	.	.	.	.
	.	.	.	✓	.	.	.	.	.

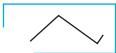
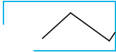
Selected item: area – candidates to find: points

In this table, the selected item is an area item, and the tests are looking for point items.

Test		Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
		↔					↔	↔		↔
		✓	✓	.	.	.	✓	.	.	.
		.	✓	✓	.	.	✓	.	.	.
		.	.	.	✓	.	.	.	.	.

Selected item: line – candidates to find: lines

In this table, the selected item is a line item, and the tests are looking for line items.

Test		Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
		↔					↔	↔		↔
		.	.	.	✓	.	.	.	.	.
		.	✓	.	.	.	✓	.	✓	.
		.	.	✓	.	.	✓	.	.	.
		.	.	✓	.	.	✓	.	.	.
		.	.	✓	.	.	✓	.	.	.
		.	✓	.	.	.	✓	.	✓	.
		.	.	.	✓	.	.	.	.	.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
	.	✓	.	.	.	✓	.	✓	.
	.	.	.	.	.	✓	✓	.	.
	✓	.	.	.	.	✓	.	.	.

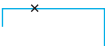
Selected item: line – candidates to find: areas

In this table, the selected item is a line item, and the tests are looking for area items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔				↔	↔			↔
	.	.	.	✓	.	.	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	✓	.	.	.	✓	✓	✓	.
	.	.	.	✓	.	.	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	.	.	✓	.	✓	✓

Selected item: line – candidates to find: points

In this table, the selected item is a line item, and the tests are looking for point items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	.	.	.	✓	.	.	.	.	.
	✓	✓	.	.	.	✓	.	.	.
	.	.	✓	.	.	✓	.	.	.

Selected item: point – candidates to find: areas

In this table, the selected item is a point item, and the tests are looking for area items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	.	.	.	.	.	✓	.	✓	✓
	.	.	✓	.	.	✓	.	.	.
	.	.	.	✓	.	.	.	.	.

Selected item: point – candidates to find: lines

In this table, the selected item is a point item, and the tests are looking for line items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
	.	.	.	✓	.	.	.	.	.
	.	.	✓	.	.	✓	.	.	.
	.	.	.	.	.	✓	.	✓	✓
	.	.	.	✓	.	.	.	.	.

Selected item: point – candidates to find: points

In this table, the selected item is a point item, and the tests are looking for point items.

Test	Contain	Cross	Touch	Disjoint	Equal	Intersect	Overlap	Crossed by	Within
	↔					↔	↔		↔
x	✓	.	.	.	✓	✓	.	.	✓
x x	.	.	.	✓	.	.	.	.	.

■ **Using an overlay locus**

As you go through the **Construct>Miscellaneous>Locus** command it prompts you for the overlays to apply the locus to. However, if you want to use an existing locus on different overlays, follow these steps.

- 1 In the Overlays dialog, select the Include tab.
- 2 Select the overlay to apply the locus to.
- 3 From the Locus drop-down, select the locus to apply.

On the selected overlay, only those items which pass the chosen locus are displayed.

■ **Clearing an overlay locus**

Once applied to an overlay, a locus stays in force until you clear it. There are two ways you can do this:

- on the display view tab of the workspace window, select the overlay to which the locus is applied. Then use the Reset Locus command from its local menu.
- on the Overlays dialog Include tab, click on the cross next to Locus



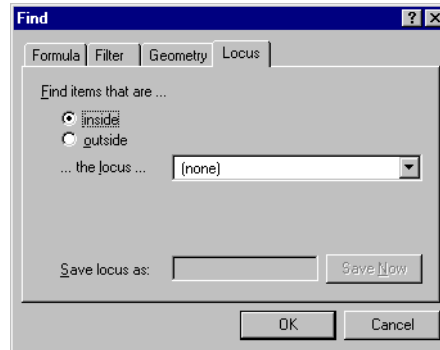
This clears the locus, ensuring that all data on the overlay is available for a new query.

■ Using a locus when selecting items



The **Edit>Find...** command allows you to use an existing locus, either on its own or in combination with a filter and/or formula, to select certain items in the map window and not others.

- 1 Select the **Edit>Find...** command and the Locus tab.



- 2 Choose the locus required. If you click on the right arrow next to its name you can access the Locus dialog to create a new locus based on this one. You can also save the locus with a new name.
- 3 If you use the Inside option, the test is applied and the results accepted. If you use the Outside option, the meaning of the test is reversed - that is, the test is applied, and those items are selected which fail the test.

All items found are highlighted in the map window, and the number found (total number and number of editable items) is shown on the status bar. If you cannot see the selected items, pan and/or zoom until you can, or use the **View>Zoom>Selection** command. The Flicker selection option (Options tab, **Tools>Preferences...**) may be useful here, as it highlights selected items by making them appear to flicker.

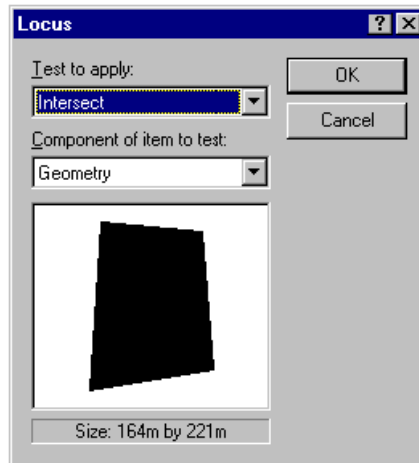


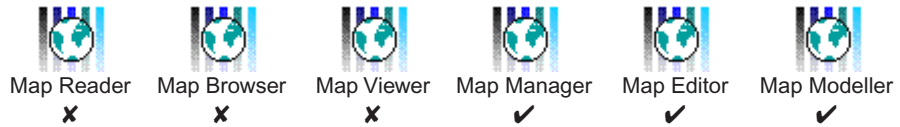
If you set a formula and/or a filter as well as the locus, items are selected only if they pass the locus test plus the formula and/or Filter. ➤Chapter 51: “**Creating your own filters**”
➤Chapter 52: “**Formulae**”

■ Inspecting and editing a locus

On the library view tab of the workspace window you can inspect all libraries currently in use, and their properties.

Using the locus' local menu, you can rename the locus, or use the Properties... command to see and change details of the test it applies:





Grids

■ What is a grid item?	661
■ Working with grids	661
■ Creating a TIN (Triangulated Irregular Network) from a grid	662
■ Creating a shadow from a grid	663
■ Creating a QZone from a grid	663
■ Viewsheds: visibility from a viewpoint.	664
■ Creating slope, aspect, and gradient grids from a TIN	664

■ What is a grid item?

Grids are raster items where each pixel or cell has a colour value that corresponds to a numerical value.

This numerical value can represent various things: the number of people living in the area represented by the cell (eg population density), the reflected sunlight produced from a certain type of vegetation represented by the cell (seen in certain types of satellite images), the height above sea level represented by a cell, and many others. When the numerical value corresponds to height above sea level, this is the starting point for a type of Digital Terrain Model.

For more information regarding the creation of grids, ↗Chapter 31: “**Creating 3D data**”

■ Working with grids

If you wish to view your data in three dimensions, you must open a 3D window. ↗Chapter 9: “**Viewing 3D Data**”

However, you should do your editing in the map window.

◆ Selecting a grid

You can select a grid item by clicking on its outline, or by using an area snap anywhere within it.

◆ Zooming grid items to get the best resolution



The **Map>Zoom>Raster** command works on the selected grid item, setting the view scale so that one pixel in the grid item equals one pixel on the screen to achieve the perfect resolution. The view is zoomed in or out, without changing its centre. The width (X direction) will always be correct. If the grid’s pixels are square, the height will also be correct.

This command works for any bitmap item and also operates without a bitmap or grid item being selected.

◆ Transparency of a grid

Grids can obscure items that are drawn on lower levels. Use the Transparent and Brush Properties to make the grid transparent.

- 1 Select the grid item.
- 2 Using the local commands, go to the Properties of the grid.
- 3 Make the brush property Hollow and the transparent property True.

◆ Indicating relief on a grid

You can produce an effect similar to relief on grid items, either by using the Relief theme (which applies a range of colours as defined by a chosen colour-set) or by simulating shadow casting.

◆ Examining the property values in a grid

The Resolution property shows the size of the cells. The Height and Width properties show how many cells there are in the grid height (top to bottom) and how many cells there are in the grid width (left to right). The Maximum and Minimum Grid Value Properties indicate respectively the maximum or minimum value found overall in the grid.

To see the value of individual cells, either:

- 1 In the second pane in the position bar (which lists co-ordinate display formats) select the option Co-ordinates.
- 2 Tick the Track option.
- 3 Move the cursor over the grid. You will get a continuous read-out of the cursor's position and cell value at that point on the grid.

Or:

- 1 In the second pane in the position bar, select the option Grid Item (eg DTM or DEM).
- 2 Tick the Track option.
- 3 Move the cursor over the grid. You will see a continuous read-out of the cursor's cell value at that point on the grid.

◆ Draping a bitmap image onto a grid

There are several methods for draping a bitmap image over a grid. ➤ Chapter 9: “Viewing 3D Data”

◆ Exploding a grid



You can convert a grid item into area items by exploding it. Each grid cell becomes an area item. To explode a grid, select it and choose Explode from the grid's local menu.

■ Creating a TIN (Triangulated Irregular Network) from a grid

You can convert a grid item into a TIN using the grid item command Convert to TIN.



- 1 Select the grid.
- 2 Select the item command Convert to TIN.

- 3 Type in the Tolerance value required.



For more information about TINs, ➤ Chapter 31: “Creating 3D data”.

■ Creating a shadow from a grid

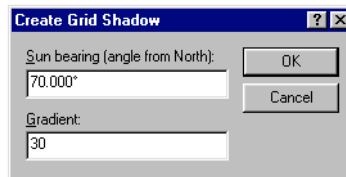
Shadow casting simulates the effect of viewing terrain aspect. This is especially effective on mountainous regions. Think of a grid as a collection of cells each with a numerical value (the height): the shadow is calculated by examining the difference between each adjacent cell value.

The shadow effect is achieved by shading certain cells that are on a user-defined sun bearing and gradient. A transparent monochrome bitmap is created which is displayed over the grid making some areas darker, thus simulating a shadow.



You can create a shadow from a grid item using the local command Create Shadow....

- 1 Select the grid.
- 2 Select the item command Create Shadow... from its local menu.



- 3 In the Create Grid Shadow dialog, specify your sun-bearing and gradient:

Sun bearing (angle from North) the angle of the sun, in degrees from the North (North is 0, East is 90 and so on)

Gradient This is the gradient between adjacent Grid cells which will cause a shaded pixel to be drawn. For instance, say you made this value 10. If the difference between adjacent cells is less than 10, a shaded pixel will not be drawn. If the difference is 11 or more, then you will get a shaded pixel.

The shadow is created as a semitransparent bitmap image draped over the grid.

■ Creating a QZone from a grid

You can create a QZone that covers pixels in a grid having values within a chosen range.

- 1 Select the grid.
- 2 Select the item command Create Range QZone.



- 3 Type in the value range required. This should be the first number, followed by a space, followed by the second number, eg 1000 4000.



For more information about QZones, ➤ Chapter 37: “Editing area items”.

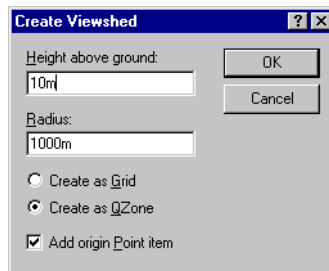
■ Viewsheds: visibility from a viewpoint

A viewshed is the area that can be seen from a particular 3D location. For example, you could calculate a viewshed to determine how many residents in an area would be able to see a proposed wind generator. Cadcorp SIS can calculate viewsheds for DTM or grid items.

To create a viewshed:



- 1 Select a DTM or grid item
- 2 Choose the **Construct>Geometry 3D>Viewshed** command.
- 3 Click the location for the viewpoint in the map window.
- 4 On the Create Viewshed dialog, specify the height above ground and the radius of the viewshed.



You can choose to create the viewshed as a grid item or a QZone, and you can choose to add a point item to mark the viewpoint permanently.

- 5 Click OK to create the item.

■ Creating slope, aspect, and gradient grids from a TIN

You can create grid items that show the slope, aspect, or gradient of a TIN. For example, you could create a grid item where the colour each cell shows the angle of slope of the area of land it represents: this is a slope grid. This would then allow you to evaluate the value of land used for farming, for example.

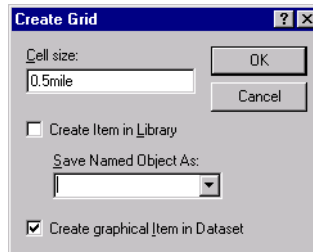
Cadcorp SIS lets you create aspect, slope, and gradient grids. The Create Grid dialog is used for all three types of grid.

◆ Aspect grid

The colour of each cell in an aspect grid shows the direction in which the area of land it represents faces, relative to North.

To create an aspect grid:

- 1 Select the TIN.
- 2 Choose the **Geometry>3D>Slope and Aspect>Aspect** command.
- 3 In the Create Grid dialog box, specify the cell size, and how you want to create the item.



- 4 Click OK to create the grid.

◆ Slope grid

The colour of each cell in a slope grid shows the angle of slope (between 0 and 90°) of the area of land it represents.

- 1 Select the TIN.
- 2 Choose the **Geometry>3D>Slope and Aspect>Slope** command.
- 3 In the Create Grid dialog box, specify the cell size, and how you want to create the item.
- 4 Click OK to create the grid.

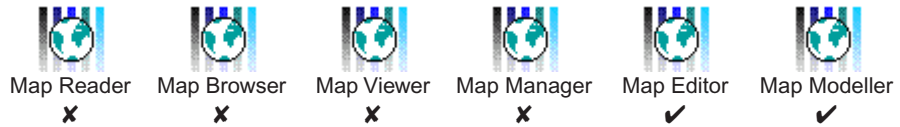


◆ Gradient grid

The colour of a square in a gradient grid shows the gradient (as a percentage value between 0 and 100%) of the area of land it represents.

- 1 Select the TIN.
- 2 Choose the **Geometry>3D>Slope and Aspect>Gradient** command.
- 3 In the Create Grid dialog box, specify the cell size, and how you want to create the item.
- 4 Click OK to create the grid.





Route-finding

■ Route-finding	667
■ The Measure>Route command.....	667
■ Route-finding with topological data.....	667
■ Constructing an iso-route.....	670

■ Route-finding

Cadcorp SIS can carry out automatic route-finding for you. It can:



- allow you to set up a traffic model, by assigning flow directions and junction turning rules on a topological network. Routes based on shortest distance or other criteria can then be found using the **Measure>Route** command.
- produce an iso-route to show you where you could reach if you left from a given point, and your travel was subject to given conditions

■ The Measure>Route command



With the **Measure>Route** command you can find the distance between two points on existing line items, and see that route drawn between them. The two points must be on the same line item, except when used with topological data. Routes respect overlay filters and loci.

Route-finding can be carried out on the following types of data:

- external data such as Ordnance Survey LandLine. Although, due to the way it was digitised, you will often find that what appears to be a single line item is in fact made up of several shorter line items.
- some types of 2D geometry, eg line items created with the Line... and Freehand Line commands, and on the outlines of closed area items
- topology, where routes can be found across a link and node network. ➤Chapter 29: **“Creating topology: links and nodes”** When used with link and node topology, the route calculated need not be the shortest, because you can have it based on a formula instead. In this way you can have attributes on the links (such as speed limits) taken into account in the route calculations.

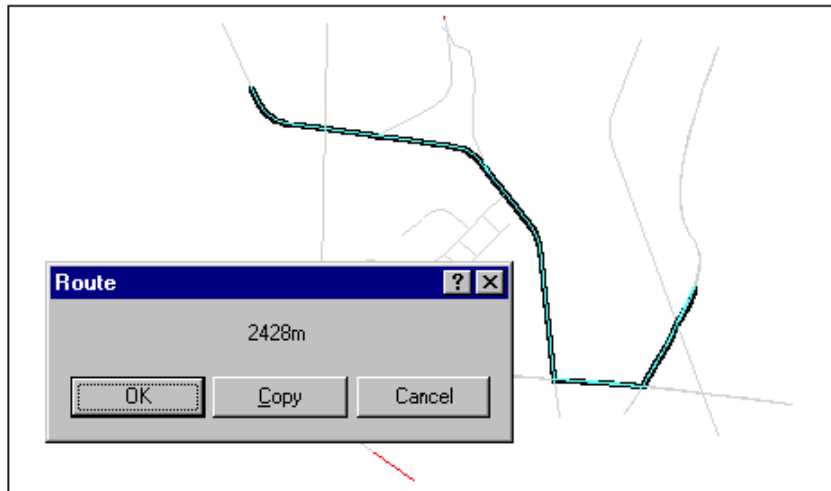
➤Chapter 12: **“Querying the data in the map window”**

■ Route-finding with topological data

When route-finding over a link and node network, you can find the route between any two points. These points do not have to be on the same link or chain item, because topological items are aware of their spatial relationship with adjacent items.

You can also create a sophisticated model of traffic flow by assigning flow directions to each link, and turning rules to the nodes at the junctions of links. The **Measure>Route** command then takes into account:

- the current locus, if you are using one ↪ Chapter 56: “**Spatial testing: loci**”
- the current overlay filter, if any ↪ Chapter 16: “**Filtering what you see**”
- the flow direction of each link item ↪ page 668, **Assigning a flow direction to links**
- any turning rules applied to junctions (nodes) ↪ page 669, **Turning rules of junctions**



◆ Assigning a flow direction to links

Links can have a flow direction assigned to them, which governs whether traffic and routes through this link are allowed to run in both directions, in one direction only, or are not allowed through the link at all.

The flow direction is given by assigning rules to the nodes at either end.



- 1 Select the link to which you wish to assign the flow direction.
- 2 Choose the **Connection type...** command (from the link's local menu or the **Item>Line>Link** menu).
- 3 Click on the link, ensuring that you click closer to the node in question than to the node at the other end.
- 4 In the Connection type dialog, select the required option from the drop-down list. You can choose to have the flow in both directions (Both), either into the node only (In) or out of it (Out), or there can be no flow at all (None). In this case this link will be ignored for route finding purposes.

◆ Changing the flow direction of links

Having assigned a flow direction to a link, you can change it using the Direction flags property in the Property window. Type in the number required:

0 = Both

- 1 = In
- 2 = Out
- 3 = None

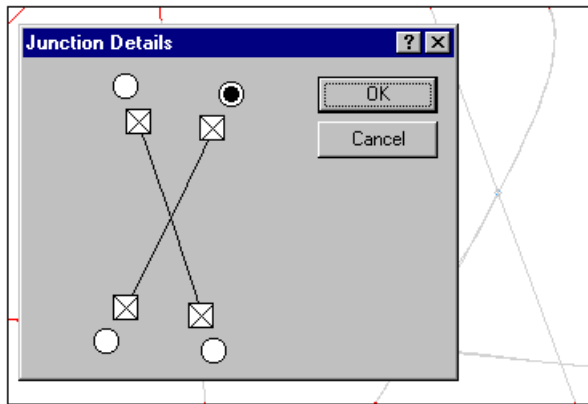
◆ Turning rules of junctions

You can determine turning rules at junctions by using the **Junction** command. At each junction there can be several entry points. For each entry point you can assign rules for each valid exit point. Turning rules are taken into account when route-finding.

- 1 Select the node.

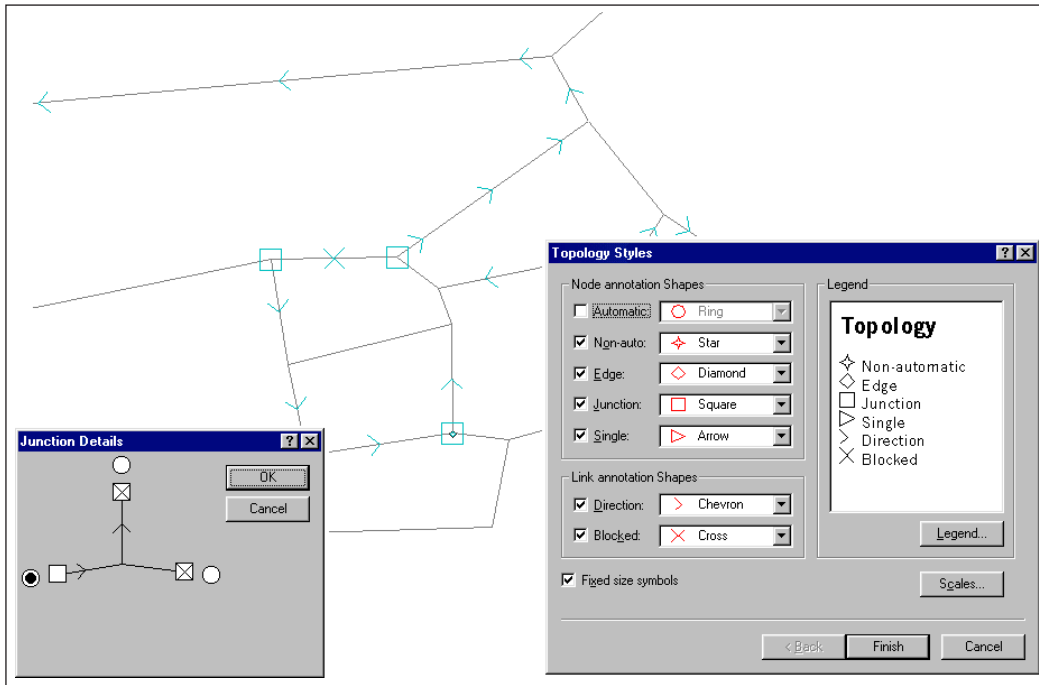


- 2 Choose the **Junction** command (**Item>Point>Node>Junction...** or from the node's local menu). You see a pictorial representation of the junction at that node.



- 3 Choose the entry direction whose exit points you wish to modify by clicking in the relevant circle. Only one entry point is valid at a time.
- 4 Click in the checkboxes to determine whether you can turn in this direction, from the selected entry point. A cross in this box indicates that you can turn in this direction; a blank square indicates you cannot.

Using the Topology theme, you can easily visualise your junction network. ➤ Chapter 29: “Creating topology: links and nodes”



■ Constructing an iso-route

An iso-route is a network traced over existing graphics which shows what distance you could travel if you were leaving from a given point and your journey was subject to given conditions.

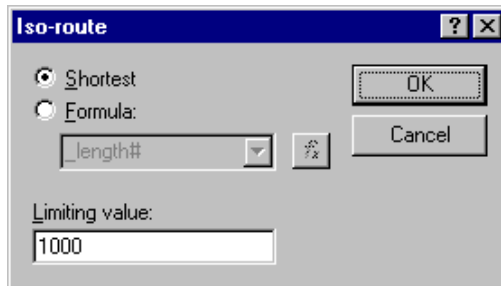
For instance, you could construct an iso-route which covered all places on a street map which are within 500m of a hospital. Or you could carry out drive-time analysis and find out where you could reach in a given time when starting from a given point and driving at a given speed (which would be useful at a Fire Station).

The iso-route is created as a line or multi-line item. As it overlays existing data, it is best created on a different overlay from the original data, so that you can view it easily.

- 1 Make a suitable overlay the current overlay.
- 2 Choose the **Construct>Miscellaneous>Iso Route** command.



- 3 In the Iso-route dialog choose whether the route taken should be the shortest, or whether it should be based on a formula (eg distance divided by speed, to give time).



If you ask Cadcorp SIS to find the shortest route, the `_length#` property of the items is used.

If you use a formula, the “cost” of each line segment or link is used. For instance, if the formula were:

`_length#/SpeedLimit&`

(the attribute `SpeedLimit&` must exist for each line or link), then the time for each section would be calculated.

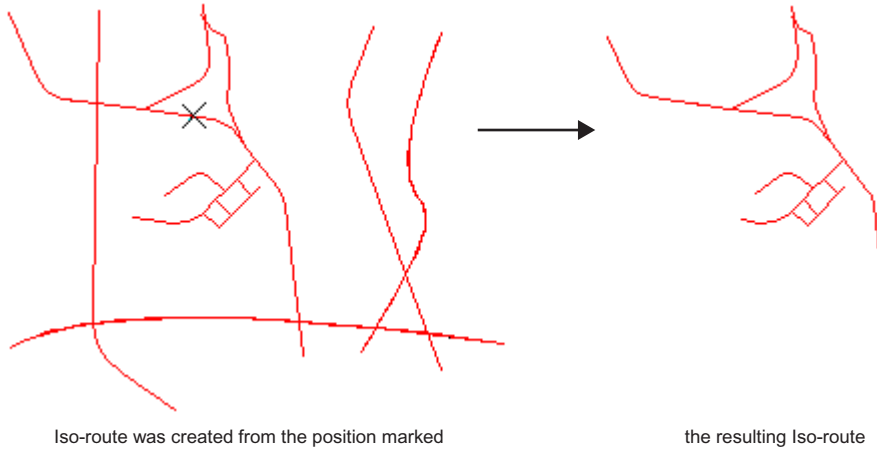
- 4 Put in a limiting value. This gives the furthest point to which the iso-route is constructed in any direction from the starting point.

If you chose to base the route on the shortest distance, you need to put in a distance here. The above example shows an iso-route that will be constructed 1000 m in all directions from the start point.

If you chose a time-based formula (eg distance divided by speed), this should be the number of seconds to travel (this is then an iso-chrone).

- 5 Click a position to start the iso-route from.

The Iso-route is then created, but as it overlays existing graphics, you may not be able to see it. However, if it was created on a separate overlay from the original data, you will be able to view it separately and use it to create a Buffer.





Map projections

■ About map projections	673
■ List of projections	674

■ About map projections

A projection is a mathematical model used to convert the three-dimensional reality of the Earth’s surface into two dimensions for representation on a paper map or computer screen. Map projections have different properties that give them particular strengths (eg they can preserve either shape, distance, area or direction), but they all have corresponding limitations (they can distort some combination of the above factors).

Generally speaking, the larger the scale of the map (such as on street maps), the smaller the impact will be on the end-user application. However, as the map scale becomes smaller, the area of map being displayed increases and the properties of the map projection become increasingly important.

There are three main types of projection:

- cylindrical
- azimuthal
- conic

Cylindrical is analogous to wrapping a sheet around the globe to form a cylinder; it will be accurate where the cylinder touches the globe but the accuracy will decrease as you move away from these areas. When the cylinder touches the globe at the Equator, you will have curved meridians and straight parallels. This is seen on maps of the world.

Meridians are lines running from the two poles, lines of Longitude. Parallels are the lines running perpendicular to these, eg the Equator, the Tropics of Cancer and Capricorn and lines of Latitude.

Azimuthal projections apply a flat plane tangentially to the globe at a point, either on a Pole, on the Equator, or any other place on the Earth’s surface. If this point is at one of the poles, the meridians look like straight lines radiating from the pole with the parallels as equally spaced concentric circles. This is used for maps containing circular or square shapes.

Conic projections apply a cone to the globe. This can either touch the globe on one standard line (a parallel) or it can slice through the globe on two standard lines. This is useful for mapping countries that lie mainly on one half of the globe, eg the United States.

This chapter describes briefly the supported projections, some of their properties, and their possible uses. For more detailed explanations of the features of map projections, the recommended reading is **Map Projections – A Working Manual**, by John P. Snyder (US Geological Survey Professional Paper 1395).

■ List of projections

◆ Cylindrical

❖ Cassini

Meridians	Central Meridian, each meridian 90° from it and Equator are straight lines. Others are complex curves.
Parallels	Parallels are complex curves.
Graticule Spacing	
Linear Scale	Scale is true along Central Meridian and along lines perpendicular to CM.
Notes	Conformal.
Uses	Still in limited use outside USA although largely replaced elsewhere by Transverse Mercator. Used for topographic mapping.

❖ Cylindrical Equal Area

Meridians	Parallel straight lines.
Parallels	Parallel straight lines.
Graticule Spacing	Meridians and parallels intersect at right angles.
Linear Scale	Scale diminishes polewards. At any point, the scale along meridians is too small as the parallel scale is too large ie meridian and parallel scales are compensatory.
Notes	Direction is not correctly represented. Areas are represented equally.
Uses	Has often been used for distribution maps in Tropical areas.

❖ Equirectangular

Meridians	Equidistant straight lines.
Parallels	Equidistant straight lines.
Graticule Spacing	Meridians and parallels intersect at right angles.
Linear Scale	Scale is true along the central parallel, normally the Equator.
Notes	Neither Equal-area nor Conformal. Poles shown as lines.
Uses	Primarily used for display of general World or Regional information where distortion is considered to be unimportant.

❖ Gall Stereographic

Meridians	Parallel straight lines.
Parallels	Parallel straight lines. Parallels are projected stereographically ie from one end of the Equator.
Graticule Spacing	Meridians and parallels intersect at right angles.
Linear Scale	Scale is true only along parallels 45°N and 45°S. Scale along meridians expands towards the poles but is only correct around latitude 45°.
Notes	Neither Equal-area nor conformal. Areas of land progressively diminished equatorwards, but polewards of Latitude 45° they are progressively enlarged.
Uses	Used in Atlases to show distribution examples.

❖ Mercator

Meridians	Parallel straight lines.
Parallels	Parallel straight lines.
Graticule Spacing	Meridians and parallels intersect at right angles. Meridian spacing is equal, and parallel spacing expands polewards.
Linear Scale	Scale is true only at the Equator.

Notes	Conformal. Poles cannot be represented. Reasonably accurate within 15° of the central parallel (Equator).
Uses	Universally used for Marine navigation because all straight lines on the map are lines of constant Azimuth (Rhumb lines). Also used for display of Equatorial regions.

❖ **Miller Cylindrical**

Meridians	Parallel straight lines.
Parallels	Parallel straight lines.
Graticule Spacing	Meridians and parallels intersect at right angles. Meridians are equidistant. Parallel spacing expands away from the Equator.
Linear Scale	Scale is true only at the Equator.
Notes	Poles shown as lines. Less scale exaggeration than Mercator.
Uses	Used for World maps as an alternative to Mercator.

❖ **Oblique Mercator**

Meridians	Complex curves towards the line of tangency.
Parallels	Complex curves concave towards the nearest Pole.
Graticule Spacing	Graticule spacing increases away from the line of tangency.
Linear Scale	Scale is true along the line of tangency or along two lines equidistant and parallel to the line of tangency.
Notes	Conformal. Mathematically based on a cylinder tangent along any Great Circle other than the Equator or any Meridian.
Uses	Most often used for Navigation strip charts and satellite tracking charts.

❖ **Transverse Mercator**

Meridians	Complex curves concave to a straight Central Meridian that is tangent to the globe. The straight Central Meridian intersects the Equator at 90°.
Parallels	Complex curves, concave towards the nearest pole. The Equator is straight.
Graticule Spacing	Parallels are spaced at their true distances on the Central Meridian. Spacing increases away from the tangent meridian.
Linear Scale	Scale is true along the line of tangency or along two lines equidistant and parallel to the line of tangency.
Notes	Conformal. Shape is true only within a small area. Area enlargement increases away from the tangent meridian. Cannot be edge-joined in an East-West direction if each sheet has its own Central Meridian.
Uses	Used where the North-South dimension is greater than the East-West. Used for National Topographic maps.

◆ **Pseudo-Cylindrical**❖ **Craster Parabolic**

Meridians	Meridians are parabolic curves concave towards a straight Central Meridian.
Parallels	Straight parallel lines.
Graticule Spacing	Meridian spacing is equal and decreases towards the poles. Parallel spacing is equal.
Linear Scale	Scale is true on the parallels and the Central Meridian.
Notes	
Uses	Used to display areas that have maximum extent in a North-South direction. Also used in Atlases as a World map to show distribution patterns.

❖ **McBryde-Thomas Flat Polar Quartic**

Meridians	Meridians are equally-spaced sinusoidal curves.
Parallels	Straight parallel lines.
Graticule Spacing	Parallels decrease spacing polewards.
Linear Scale	Scale is true on the parallels and the Central Meridian.

Notes	Equal-area.
Uses	Used in Atlases as a World map to show distribution patterns, particularly in Equatorial and mid-latitude areas.

❖ **MollWeide**

Meridians	Central Meridian straight line. 90th meridians are circular arcs. All other meridians are equally spaced elliptical arcs.
Parallels	Unequally spaced straight lines, parallel to each other. Poles are points.
Graticule Spacing	An Equal-area projection within an ellipse.
Linear Scale	Scale is true along 40°44' North and South.
Notes	Equal area.
Uses	Used for world maps with single Central Meridian or in interrupted form with several Central Meridians. Also used for regional maps of the Pacific.

❖ **Robinson**

Meridians	Meridians are complex curves.
Parallels	Unequally spaced straight lines, parallel to each other. Equidistant only between $\pm 38^\circ$ latitude, the only lines true to scale.
Graticule Spacing	
Linear Scale	True to scale only along parallels $\pm 38^\circ$ latitude.
Notes	Based on table of co-ordinates, not mathematical formulae. Distorts shape, area, scale and distance.
Uses	Used for World maps.

❖ **Sinusoidal Equal Area**

Meridians	Meridians are sinusoidal curves concave towards a straight Central Meridian.
Parallels	Straight parallel lines.
Graticule Spacing	Meridian spacing is equal and decreases towards the poles. Parallel spacing is equal. The graticule spacing retains the property of equivalence of area.
Linear Scale	Scale is true on the parallels and the Central Meridian.
Notes	Projection may have several Central Meridians and may be interrupted on any meridian to help reduce distortion at high altitudes.
Uses	Used to display areas that have maximum extent in a North-South direction. Also used in Atlases as a World map to show distribution patterns.

◆ **Conical**❖ **Albers Conical Equal Area**

Meridians	Meridians are straight lines converging on the Polar axis but not at the pole.
Parallels	Parallels are arcs of concentric circles concave towards a pole.
Graticule Spacing	Meridian spacing is equal on the standard parallels and decreases towards the poles. Parallel spacing decreases away from the standard parallels and increases between them.
Linear Scale	Scale is true on the standard parallels.
Notes	No area deformation. Individual sheets can be joined along their edges.
Uses	Used for thematic maps of large countries with a large East-West orientation.

❖ **Equidistant Conic**

Meridians	Meridians are straight lines converging on a polar axis but not at the pole.
Parallels	Parallels are arcs of concentric circles concave towards a pole.
Graticule Spacing	Meridian spacing is true on the standard parallels and decreases towards the pole. Parallels are spaced at true scale along the meridians. Meridians and parallels intersect at right angles.
Linear Scale	Scale is true along all meridians and along the standard parallel(s).
Notes	North or South pole is represented by an arc.
Uses	Used in Atlases for maps of mid latitude areas. Good for representing regions with a few degrees of latitude lying on one side of the Equator.

❖ **Lambert Conformal Conic**

Meridians	Straight lines converging towards the pole.
Parallels	Arcs of concentric circles concave towards a pole and centred on a pole.
Graticule Spacing	Meridian spacing is true on standard parallels and decreases towards the pole. Parallel spacing increases away from the standard parallels and decreases between them.
Linear Scale	Scale is true on standard parallels.
Notes	Area distortion is minimal but increases away from the standard parallels. Opposite pole cannot be projected. Great Circle lines are approximately straight. Sheets can be joined along their edges.
Uses	Used for topographic maps of large countries in mid latitudes having a large East-West orientation.

❖ **Polyconic**

Meridians	Central Meridian and Equator are straight lines. All other meridians are complex curves.
Parallels	Parallels are non-concentric arcs of circles.
Graticule Spacing	Meridian spacing is equal and decreases towards the poles. Parallels are spaced true to scale on the Central Meridian and the spacing increases towards the East and West borders.
Linear Scale	Scale is true along each parallel and the Central Meridian.
Notes	Neither Conformal nor Equal-area. Has both area and angular deformation.
Uses	Used for maps of areas with a North-South orientation.

◆ **Pseudo-Conical**❖ **Bonne**

Meridians	Central Meridian is a straight line, others are complex curves.
Parallels	Parallels are concentric circular arcs but the poles are points.
Graticule Spacing	
Linear Scale	Scale is true along the Central Meridian and along all parallels.
Notes	Equal area. No distortion along the Central Meridian and along the standard parallel.
Uses	Used for Atlas maps of continents and for topographic mapping of some countries.

◆ **Azimuthal**

There are three different cases for this particular classification: Polar, Equatorial and Oblique. Only outline information is given for typical cases and we suggest you consult the recommended reading for more detailed information.

❖ **Alaska Grid - Modified-Stereographic Conformal for Alaska**

Meridians	Meridians are normally complex curves.
Parallels	Parallels are normally complex curves.
Graticule Spacing	All meridians and parallels are normally complex curves although some may be straight under certain conditions.
Linear Scale	Scale is true along irregular lines.
Notes	Conformal.
Uses	Maps of Alaska.

❖ **Azimuthal Equidistant**

Meridians	All meridians on the Polar aspect, the Central Meridian on all other aspects and the Equator on the equatorial aspect are all straight lines.
Parallels	Parallels on the Polar aspect are circles spaced at true intervals (equidistant for the Sphere).
Graticule Spacing	
Linear Scale	Distances measured from the centre are true.
Notes	Neither Equal-area nor Conformal.
Uses	Polar aspect - World maps and polar hemispheres. Oblique aspect - Atlas maps of continents and World maps for aviation and radio use.

❖ **Gnomonic**

Meridians	All meridians are straight lines.
Parallels	All parallels except the Equator (a straight line) are ellipses, parabolas or hyperbolas.
Graticule Spacing	Distortion rapidly increases away from the centre.
Linear Scale	Scale rapidly increases away from the centre.
Notes	Neither conformal nor Equal-area. All Great Circles are shown as straight lines. Directions from the centre are true.
Uses	Used for navigation charts.

❖ **Lambert Azimuthal Equal-Area**

Meridians	All meridians in the Polar aspect are straight lines.
Parallels	Parallels in the polar aspect are circles.
Graticule Spacing	
Linear Scale	Scale decreases rapidly away from the centre.
Notes	Equal-area
Uses	Maps of continents and hemispheres.

❖ **Orthographic**

Meridians	All meridians are ellipses, circles or straight lines.
Parallels	All parallels are ellipses, circles or straight lines.
Graticule Spacing	Closely resembles a Globe in appearance.
Linear Scale	Radial scale factor decreases away from the centre.
Notes	Perspective projection from an infinite distance.
Uses	Used chiefly for pictorial views.

❖ **Polar stereographic**

Meridians	Meridians are straight lines, radiating from the pole.
Parallels	Parallels are concentric circles.
Graticule Spacing	A perspective projection of the sphere.
Linear Scale	Scale increases away from the centre.
Notes	Conformal.
Uses	Used for Polar maps and miscellaneous special maps.

❖ **Stereo**

Meridians	Meridians are straight lines, radiating from the pole.
Parallels	Parallels are concentric circles.
Graticule Spacing	
Linear Scale	Scale increases away from the centre.
Notes	Conformal.
Uses	Used for Polar maps and miscellaneous special maps.

❖ **Two Point Equidistant**

Meridians	Meridians are complex curves.
Parallels	Parallels are complex curves.
Graticule Spacing	Limited to one hemisphere.
Linear Scale	
Notes	All Great Circles are straight lines.
Uses	Used for navigation charts.

◆ **Miscellaneous**❖ **General Vertical Near-Side Perspective**

Meridians	All meridians are ellipses, circles or straight lines.
Parallels	All parallels are ellipses, circles or straight lines.
Graticule Spacing	Closely resembles a Globe in appearance.
Linear Scale	Radial scale factor decreases away from the centre.

Notes	Perspective projection.
Uses	Used chiefly for pictorial views.

❖ **Hammer-Aitoff**

Meridians	Central Meridian straight line. All other meridians are equally spaced elliptical arcs.
Parallels	Unequally spaced straight lines, parallel to each other. Poles are points.
Graticule Spacing	An Equal-area projection.
Linear Scale	Scale decreases away from the centre.
Notes	Equal-area.
Uses	Used for world maps with single Central Meridian.

❖ **Van Der Grinten**

Meridians	Central Meridian straight line. All others are arcs of circles.
Parallels	Equator is a straight line. All other parallels are arcs of circles.
Graticule Spacing	Shows entire globe enclosed in a circle.
Linear Scale	Equator is true to scale. Expands rapidly towards the Poles.
Notes	Neither Equal-area nor Conformal. A curved modification of the Mercator projection. With great distortion in the Polar areas.
Uses	Used only in the spherical form. Distribution maps of mineral resources on the sea-bed.

❖ **Winkel 1**

Meridians	Complex curves.
Parallels	Unequally spaced straight parallel lines. Poles are straight lines, half as long as the Equator.
Graticule Spacing	
Linear Scale	
Notes	
Uses	

❖ **Eckert I**

Meridians	Meridians are equally spaced at the Equator.
Parallels	Parallels are equally spaced straight lines.
Graticule Spacing	Graticule entirely composed of straight lines. Poles are straight lines, half as long as the Equator.
Linear Scale	
Notes	Not Equal-area.
Uses	Considered to be a novelty projection.

❖ **Eckert II**

Meridians	Meridians are equally spaced at the Equator.
Parallels	Parallels are unequally spaced straight lines.
Graticule Spacing	Graticule entirely composed of straight lines. Poles are straight lines, half as long as the Equator.
Linear Scale	
Notes	Equal-area.
Uses	Considered to be a novelty projection.

❖ **Eckert III**

Meridians	Central Meridian is a straight line, 180° is a semi-circle, and all others are elliptical arcs.
Parallels	Parallels are equally-spaced straight lines.
Graticule Spacing	Poles are straight lines, half as long as the Equator.
Linear Scale	
Notes	Not Equal-area.
Uses	

❖ **Eckert IV**

Meridians	Central Meridian is a straight line, 180° is a semi-circle, and all others are elliptical arcs.
Parallels	Parallels are unequally spaced straight lines.
Graticule Spacing	Poles are straight lines, half as long as the Equator.
Linear Scale	Scale is true along latitudes 40°30'N and S.
Notes	Equal-area.
Uses	Used for World maps and Atlas maps of climate and other themes.

❖ **Eckert V**

Meridians	Central Meridian is a straight line, all others are sinusoidal curves.
Parallels	Parallels are equally spaced straight lines.
Graticule Spacing	Poles are straight lines, half as long as the Equator.
Linear Scale	
Notes	Not Equal-area.
Uses	Used for World maps.

❖ **Eckert VI**

Meridians	Central Meridian is a straight line, all others are sinusoidal curves.
Parallels	Parallels are unequally spaced straight lines.
Graticule Spacing	Parallels are straight lines. Meridians are sinusoidal curves. Poles are straight lines, half as long as the Equator.
Linear Scale	Scale is true along latitudes 49°16' N and S.
Notes	Equal-area.
Uses	Used in Atlases and text books for World maps.

Glossary

■ About the glossary

This chapter contains short definitions of technical terms used in Cadcorp SIS.

3D Data

The majority of map data is two-dimensional, existing on a single plane (the XY plane). However, three-dimensional data is also available. An example is Ordnance Survey LandForm Panorama. Such data includes the heights of the terrain.

Cadcorp SIS can display external 3D data, and also allows you to create your own 3D items, such as TINs, surfaces and DTMs. 2D items can be extruded (given a height) to produce solids.

3D window

The map window displays items in two dimensions (like a piece of paper). If you want to view 3D data in three dimensions, you must open a 3D window. A 3D window is for viewing only - editing must be carried out in the map window.

3D windows do not use the normal panning and zooming commands, but have their own special commands (and these work differently in the different display modes).

Cadcorp SIS uses OpenGL, an industry standard 3D software library, to draw 3D graphics.

ADDRESS-POINT

Address Point data is supplied by Ordnance Survey, and provides the Royal Mail postal address and National Grid Refer-

ence for every address in the tile. Its information can be used to provide a link to databases, and searches can be carried out on different details of the address, such as the postcode.

ADO

ActiveX Data Object is a standard which allows Cadcorp SIS to connect directly to relational or non-relational database files which use it. Examples include Microsoft products Access, Excel, or an HTML file, and so on.

Area

Area items are one of the basic item classes in Cadcorp SIS. They are closed polygons, filled with a user-selected colour or a pattern. An area item may consist of more than one loop (or polygon), while still remaining a single logical area.

Assembly

An assembly is a point item which remembers an association with a number of other items. By selecting the assembly's hook point, all items which are included in the assembly can be selected too. However, these other items are unaware of this association and remain independent of the assembly. This means they can be selected separately.

Attributes

Attribute data is non-graphical information assigned to editable items, SWDs, overlays and datasets. An attribute is a type of prop-

erty which gives extra information about its owner (as opposed to a system property which is a necessary part of its owner).

Some external datasets have attributes, for example, Ordnance Survey ADDRESS-POINT. You can also add your own attributes to editable data.

Axes

The axes indicate the current orientation of the X and Y planes as represented on your screen.

You may choose whether or not the axes are displayed (they are not printed). You may change the location of the axes origin, and also their orientation (and hence the X, Y and Z planes).

The axes can be used only in Cartesian co-ordinate systems, so you cannot display or move the axes in (latitude, longitude) systems.

Axes are referenced when using the Co-ordinates co-ordinate display format, when cutting and pasting, when constructing rectangles, ortho lines, and dimensions and when displaying snap grids. All these are created parallel to the current X and Y axes.

Backdrop

A backdrop is an image over which other data is displayed. It can give an immediate indication of what part of the world or the country you are considering.

Backdrops can be included as an overlay in the map window, against which your map data is displayed. In this case the backdrop is usually drawn first, and can have a maximum status of visible. Backdrops can also be used as the background to a key map on a print template.

Backdrops are named items.

Bar Charts

The Bar Chart theme is an annotation theme, which uses bar charts to compare the values of several properties. The height of each bar chart is proportional to the value of a chosen property or formula.

BDS

Base DataSet. This is a Cadcorp SIS proprietary format for a user file where you store your own graphical information. A BDS is loaded as an overlay, just like any other dataset.

A BDS file can be shared over a network, with one user (the owner) having editable access, while the others have read-only access.

Bitmap

A bitmap is an image consisting of an array of coloured dots stored in a file.

Block

A block object is a collection of graphics and text which can be manipulated as though they were a single entity. They are stored in libraries and can be called up by name and placed where required in the map window.

A placement of a block is called an insert.

Boolean

In mathematical logic, a Boolean value is either True or False. In a GIS, a geometrical shape can be thought of as a Boolean function of space - the function is True for points that are inside the shape and False for points that are outside the shape. For example, the "Union" of two geometrical shapes can be formed by combining their two Boolean functions with the Boolean operator "Or". For this reason, certain geometrical operations like Union and Intersect are called Boolean operations in many GIS and CAD systems.

Box text

Box text is created in real world units. When printed it is scaled with the rest of the graphics and so maintains the same proportions to the surrounding graphics.

Brush

Brushes are named objects. They determine the appearance of filled item interiors (areas, polygons, box text, etc). A brush can be a system brush stored in the (standard) library, it can be a user-defined brush or it can be an implicit brush. An implicit brush does not appear in a named library, but has names made up of different components describing the brush's appearance (colour, pattern, etc).

Buffer

A buffer is a zone of a user-specified distance around a point, line or area, giving an immediate visual indication of the proximity of features to the selected items. This is a commonly-performed analysis operation in a GIS.

CAD

Computer Aided Design. CAD systems are for the design, drafting and presentation of graphics. They are commonly used for applications such as architectural design, planning and site layouts, and so have many associations with mapping and GIS.

Cartesian Co-ordinate Systems

Cartesian co-ordinate systems have straight, perpendicular X, Y and Z-axes (ie orthogonal). This means that items can be easily and accurately measured for length, area and volume.

Cell

The basic element within a grid.

Centroid

The centre point of a polygon. The centroid may be mathematically derived (such as the centre of gravity), or it may be chosen by the user. It should always be placed inside the polygon.

Chain

A chain is a topological item, consisting of a number of links collected together to form a single item. An example is a number of different streets in a town plan, which, when linked together, form a bus route.

Cities Revealed

Cities Revealed is a series of geo-referenced ortho-corrected aerial photographs of a number of European cities, produced by GeoInformation International.

These aerial photographs are available as compressed JPEG raster files, which use file names based on the Ordnance Survey file naming conventions. Cadcorp SIS is able to read these files, the file name allowing it to locate automatically the map tiles in their correct position.

Colour-set

A colour-set is a series of values with associated colours. It is used by grid items to indicate heights, densities or other values by graduated colour shades.

Compression

Bitmaps can use up a lot of storage space on a computer or network, and be very demanding on computer memory while they are being used. One way to overcome this is to compress them.

Cadcorp SIS can compress bitmaps, choosing the compression scheme depending on the colour depth of the bitmap. The resulting TIFF format bitmap item is saved inside the overlay (if the original bitmap was a linked bitmap, then the link is broken). Once compressed, the bitmap is slower to draw.

Contours

Contour lines can be created on a TIN using the Contour theme. You can choose the spacing and appearance of major and minor contour lines.

Co-ordinate system

A co-ordinate system defines how the positions of items in datasets are stored and reported to you. The projection determines how co-ordinates are drawn on screen or paper.

Co-ordinates

Co-ordinates consist of numbers representing the location of a position relative to an origin. This can be the origin of the current co-ordinate system projection or some other point.

DAO

Data Access Object. A standard which allows Cadcorp SIS to connect directly to database files which use it. Some examples are Lotus 1-2-3, Microsoft Access, Microsoft Excel, Microsoft FoxPro, Paradox, dBase and HTML documents.

Databases

Databases contain non-graphical and graphical information. Cadcorp SIS uses databases: to create named tables for viewing databases; to attach database data to existing graphical items; as storage for graphical items using OGC SQL92 Database and Editable Geometry datasets; to view point data using the View Points dataset; and to view graphical items using the View Geometry dataset.

Dataset

Datasets are the files containing data which are loaded into Cadcorp SIS as overlays.

Cadcorp SIS can use many different types of datasets, for example Ordnance Survey tiles and database tables. Data Sources also allow access to non-file based datasets.

Dataset scale

Items which do not have real world sizes on the map (such as text, symbols and line thicknesses) need to be scaled differently from real world items (roads, buildings etc). To deal with this, each dataset has a scale.

Different datasets in an SWD can have different scales. This allows you to overlay, for example, 1:1250 scale maps with 1:10 000 scale maps.

Many read-only datasets know the scale at which their items are designed to be drawn (eg Land-Line files are at 1:1250 and 1:2500, or 1:10 000 for remote areas).

When you create your own dataset you can choose its scale. By default, newly-created datasets take their scale from the current map scale.

Data sources

Data sources are the means by which Cadcorp SIS accesses and exports datasets. They are seamlessly integrated into the interface, so you need not be aware of their existence.

A data source is a special type of dataset which does not use a single file, but instead gets its information from a server or composes its information from many files. For instance, the Oracle Spatial Data Cartridge reads graphics from a relational database, and the Digital Chart of the World composes information from a CD-ROM.

Cadcorp Value Added Resellers can create their own data sources for formats not supported by Cadcorp SIS.

DCW

Digital Chart of the World. This is a geographical database developed by the United States Defense Mapping Agency, in accordance with the Vector Product Format (VPF). It is based primarily on the 1:1 000 000 Operational Navigation Charts

(ONCs) and 1:2 000 000 Jet Navigation Charts (JNCs) developed by the Defense Mapping Agency (DMA).

DCW has world-wide coverage, composed of four regions (North America, Europe/Northern Asia, South America/Africa/Antarctica and Southern Asia/Australia). It contains a world-wide index by place name, and is designed for the same military, scientific, and educational uses as a small-scale base map.

DCW is implemented in Cadcorp SIS by means of a Data Source.

Derived properties

Derived properties are system properties which, although the item is editable, cannot be changed. An example is the system property `_Area#` which remains the same unless you alter the area of the item.

Digitising

The conversion or encoding of existing maps from paper format into digital information used on a computer. The process may use a digitising tablet with a hand-held cursor (“heads-down digitising”), or may be directly onto a computer screen using a mouse (“heads-up digitising”).

Dimension

The dimension (or ‘order’) of an item.

A point has dimension = 0. A line has dimension = 1. An area has dimension = 2

Display scale

The display scale is the reduction factor currently applied in order to display the maps on your screen. The current display scale is always shown on the status bar, and constantly changes as you zoom in and out.

Scale thresholds are applied to data to govern between which display scales they are displayed.

Drag and drop

Drag and drop is a technique which allows you to select objects and, while holding the mouse button down, drag them into a program or part of a program.

Draping

Draping is the method of covering a 3D view of a grid or TIN with 2D data. A drape can be a raster item or it can be vector data. Raster items provide a high resolution image of the current 2D window which, when draped, will add detail to 3D views. Vector data is draped in a similar fashion over the surface of 3D data.

DTM

A Digital Terrain Model (DTM) is a grid item where the cell values are height above sea level. They are 3D items and can be viewed in the 3D window.

DWG

The file format for the AutoCAD Computer Aided Design software.

DXF

Digital eXchange Format. A format originally designed by Autodesk for exchanging data between AutoCAD and other software programs. It is now widely used, including by GIS applications, although it does have a number of limitations.

Ordnance Survey supplies many of their data types in DXF format.

Editable Geometry Dataset

An editable geometry dataset is an editable dataset which stores items as strings in a database.

Cadcorp SIS can use various formats for these datasets, including the OGC standards. The structure of the database tables is defined by Cadcorp SIS, and all table management is handled by Cadcorp SIS.

External Point Dataset

This is a database of point data, containing a series of points defining such items as Road Traffic Accident locations, addresses of hospital patients, Land or Hydrographic survey positions or centroids of Post Code sectors.

Feature code

Feature codes are numbers which assign styling information to graphical items. This information each item will use when it is drawn. All features with the same feature code use the same styles and scale thresholds. Details regarding feature codes are held in a feature table. The feature code's hierarchy allows features of a similar type, eg Motorways, A-Roads, B-Roads, to be grouped together to enable them to be switched on and off fast.

Feature table

A feature table is a list of feature codes and their settings. Each different Ordnance Survey data type (eg LandLine, OSCAR) uses a different feature table.

Feature tables are named objects.

Fence

A fence provides a method of selecting items. It consists of a temporary line or circle, within which (if it is closed) or within a certain distance of which, all items are selected.

Filter

A filter is a named object. It contains rules, based on item properties, which allow it to pass some items and fail others.

Filters are used on overlays to control which items on that overlay are displayed and which are not. They can also be applied to the selection process, ensuring that only items which pass the filter are selected for editing.

Floating point properties

Floating point properties are properties which hold fractional values. They are suffixed with the hash sign (#), for example, `_area#`.

A double precision floating point number is any positive or negative value, stored with about 15 significant decimal places.

Generalisation

Generalisation is carried out to ensure a mapping database is legible over a range of viewing scales. Cadcorp SIS uses several generalisation techniques, but they operate automatically as you zoom and pan about so that what you see are fast, clear graphics.

Geodetic datum

A geodetic datum is a set of parameters defining co-ordinate systems for local parts of the Earth or for all of the Earth. Different datums have been produced and revised over time. They are used to produce a better local fit of a spheroid to the actual shape of the Earth (the geoid).

Examples are ED50 (the European datum for 1950) and WGS84 (the World Geodetic System for 1984).

Geoid

The geoid is the surface of constant gravitational energy, which also matches the average sea-level of the earth. This goes up and down, and so varies depending where you are on the Earth's surface.

The geoidal height is sometimes given - this is the height above the geoid.

Projections are usually based on a spheroid (a squashed sphere). A geodetic datum is used to produce a better local fit of a spheroid to the geoid.

Geo-referenced

If a dataset is geo-referenced it knows its spatial location in the world, and Cadcorp SIS can automatically place it in its correct location on the map base.

Sometimes datasets are not geo-referenced, and do not know where they should be located. This can be the case with some DXF and raster files. There are methods for locating such datasets, if this is required.

GIS

A Geographical Information System is a broad term for a system enabling access to and analysis of data that is associated with map-based features.

It can be used for capturing, storing, checking, manipulating, analysing and displaying data which is spatially-referenced to the Earth.

Grab Handles

See Handles.

Graticule

A graticule is an optional element of a print template. It automatically draws latitude and longitude ticks and graticules using the world position of the contents of the photo.

Graticules can be quite complex, using up to eight different levels of settings. Because graticules can be time-consuming to set up, graticule styles can be saved as named objects.

Grid

Grids are raster items where each pixel or cell has a colour value that corresponds to a numerical value. The cell values are mapped to colour on screen using a colour-set.

The values stored in each cell could represent various different scenarios. For example, the value could be the amount of reflected sunlight produced from a certain

type of vegetation represented by the cell (seen in certain types of satellite images). Another common use of grid items is for each cell to store the height above sea level of the ground at that point. In this case, the grid is a Digital Terrain Model (see DTM).

Handles

When an editable item is selected, and is the only item currently selected, it displays grab handles. If several items are selected, the dominant item displays handles (you can make a selected item dominant by clicking on it again).

Handles can be selected, dragged to a new position, or deleted. You can also add new ones, although the permitted operations depend on the class of the item selected.

Hook point

See Origin (item).

Image servers

Datasets can be image servers by creating image items. Cadcorp SIS does not draw the contents of image items itself, but instead lets the datasets which created them do the drawing. The image item can therefore handle very large resolution raster formats, and use anti-aliasing.

Implicit Brush

See Brush.

Implicit Pen

See Pen.

Imported file

Imported files are editable copies of non-editable external datasets. External datasets stored on disk or available over a network contain data which in most cases cannot be edited. Imported files provide a means of editing that data without changing the original datasets.

Index Overlay

Index overlays do not contain any data, but are a pointer to other datasets which tile together to make a continuous map base. You can use multiple paths and/or file types, so that files which are in several different locations can be accessed via the one Index. When you use an Index, the computer opens map tiles as you pan to them and closes them as you pan away. This gives you seamless mapping as you pan around on screen.

Indexes also provide the advantage that any number of datasets in an overlay or overlays can be loaded, and if you add extra ones at any time, they are automatically included as well.

Insert

An Insert is the name given to each placement of a block item.

Integer properties

Integer properties are those which hold whole number values. This is indicated by the ampersand (&) used as a suffix. An example is `_FC&` (feature code).

A long integer is a positive or negative whole number between -2 147 483 648 and 2 147 483 647.

Internal dataset

An internal dataset is an alternative to a BDS, in that it is a place where users can save their own data. However, an internal dataset does not exist as a separate file, being saved as part of the SWD. Its data cannot be shared. It is often used for data of a personal or temporary nature.

Item

Cadcorp SIS is an object-oriented system, and all the graphical entities it uses are known as items. Items fall into classes which control their basic characteristics. Examples of item classes are point items

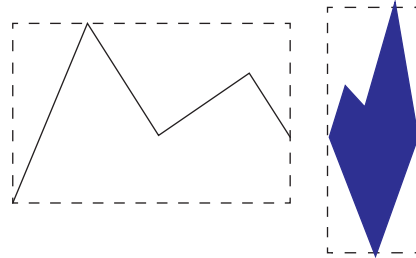
(symbolic points), and line items (for straight and curved lines, outlines, and so on).

All items of one class have the same basic properties and the same set of appropriate operations. These are shown on the item menu, where you can see the different item classes, the items they include and the commands appropriate to them.

A named item is a type of named object, stored in a library.

Item extents

Every item can be thought of as having a notional rectangular extent which encompasses it:



When carrying out geometrical tests you can often choose to test for item extents (as opposed to their actual geometry).

Sometimes the origin of an item is considered to be the centre of its rectangular extents (see *Origin (item)*).

Item ID

All items have this system property. The value for each item is unique within a dataset.

When an item is edited, Cadcorp SIS tries to maintain the attribute data on that item. Commands which merge items together into a single item give the new item the ID and attribute data of the dominant item (the one which displays grab handles).

Item menus

The item menu shows all the operations available to each item class.

JPEG

JPEG is a raster file format (with the file extension *.jpg or *.jpeg).

Key map

A key map gives an overall view of an area, and indicates on it the particular area of current interest. This allows you to see immediately where on the map base is the area you are currently considering. You can generate a key map for an index overlay, to show the area covered by the tiles it references, or you can use one on a print template to show the area being printed.

Label text

Label text includes a line drawn to the item it is labelling. It is created in real world units, like box text, and when printed maintains its actual proportions to the surrounding graphics.

Layer

For some datasets (eg DXF and DWG) graphics are divided into layers. Layers control the order in which graphics are drawn. This becomes important when graphics overlap each other. For instance, to draw the intersection of two motorways each having a thick red line bounded by two black lines you would make sure that the red line was in a higher level than the black lines so that when they crossed there were no joins. Using Cadcorp SIS you can also switch layers on and off individually and use layer filters.

Legend

A legend is a key used in themes to show what the annotations or styles of the theme mean. Legends are displayed on the theme view tab of the workspace window. They can also be placed on print templates.

Level

All items are assigned a level property between 0 and 255. Levels determine the order in which items are drawn on the

screen, level 0 being drawn first, then level 1, then level 2, and so on. In this way, items on level 1 may obscure items on level 0, and items on level 2 may obscure items on levels 0 and 1, and so on.

The level of items on editable overlays can be changed.

Library

A library, or named object library (NOL) is where named objects are stored. You can access the libraries on the library view tab of the workspace window. Cadcorp SIS provides default libraries: the read-only (standard) library which contains standard pens, brushes, projections, etc; and the (temporary) library which stores items created by the user. At the end of each session the named objects in the (temporary) library are lost. When a workspace is saved, a (workspace) library is created which can store all the named objects for that workspace. These can be edited and saved for future use. You can also create your own libraries which have the extension *.nol.

Line

Line items are one of the basic item classes in Cadcorp SIS. A line item is a connected path with two or more vertices. Any of the vertices can have a height, making the line item a 3D item.

Line text

Line text is constructed to follow the path of an existing line item.

Link

A link is a topological item, being a line item which has a node at each end. Links exist in link and node networks, which consist of a series of link lines with nodes wherever the lines cross. See also Topology and Network.

Linked bitmaps

Displaying raster data uses up much computer memory. One way of overcoming this is the use of linked bitmaps.

Normal bitmaps are stored on an overlay. By contrast, the contents of a linked bitmap are only required when the bitmap is being drawn on screen. If more memory is required for another task, the contents of an existing linked bitmap can be removed from memory to make more space. This swapping of files is carried out automatically.

Linked bitmaps must not be deleted from disk, because this will cause the image to be deleted from your data (ordinary bitmaps can be deleted from disk, as they are stored on the overlay inside the SWD).

Local menus

A local menu is one which contains commands applicable to the item or other object on which you have clicked. It is displayed when you click on the item or object using the secondary mouse button.

This is a standard Microsoft Windows feature.

Locus

A Locus is a region used to include or exclude items based on their position relative to the locus. Loci use geometry tests to determine whether items are included or excluded (eg the locus may have to contain items for them to pass, it may have to intersect with them, and so on).

Loci can be used with overlays to determine which items are displayed and which are not, or when selecting items for editing.

Map projection

A map projection is a mathematical model used to convert the three-dimensional reality of the Earth's surface into two dimensions for representation on a paper map or computer screen.

Map projections have different properties which give them particular strengths (eg some preserve shape, others preserve distance, or area, or direction) - but they all have corresponding limitations.

Cadcorp SIS uses a co-ordinate system projection for positions that are stored in datasets and reported to the user, and a viewing projection to convert the curved surface of the Earth for display on the flat computer screen.

Map scale

Each map window has a map scale. The map scale is the factor by which real world items (such as buildings, roads etc) are scaled to fit on a sheet of paper.

You can change the map scale if required. This has no effect on the graphics on screen, but is relevant when you come to print.

Map Tips

Map Tips is a special Cadcorp SIS feature where chosen properties of an item (or the result of a formula) can be displayed on the cursor when it hovers over that item in a map window. The user can determine which properties (or formulae) are used.

Map window

A map window is the main area of the Cadcorp SIS window. It is where graphics are displayed and edited. You can have more than one map window displayed at the same time.

The map window displays its data in two dimensions. To view 3D data in three dimensions, you need to open a 3D window.

Maximum scale

See Scale thresholds.

Members

System properties are sometimes called members.

Minimum scale

See Scale thresholds.

Multi-geometry

Multi-geometry is a collection of line, area and point items. Multi-geometry items are manipulated as a single item, and all their component items use the same styles.

If the multi-geometry item consists of points, it is called a multi-point item. If it consists of lines, it is a multi-line. If it consists of areas, it is called a multi-area. The OGC specification says that simple areas cannot have islands, therefore Cadcorp SIS uses multi-areas for area items which include islands.

Multi-line item

See Multi-geometry.

Multi-point item

See Multi-geometry.

Named item

A named item is one of the types of named object which are stored in libraries (along with pens, brushes, views, and so on).

Any graphical item can be stored as a named item, but it must be specifically saved as such. Named items can be recalled for later use, and are also used as backdrops for map windows and print template key maps.

Named objects

Named objects are stored definitions which include such things as pens, brushes, filters, views, and so on. The use of named objects makes Cadcorp SIS more efficient - for example, each item does not need to remember the definition of its pen, brush, etc, just the name of a pen, brush, etc.

Named Object Library (NOL)

See Library.

Named tables

A named table is a connection to a database table, or possibly a stored view. The table data can be viewed in a table window and linked to existing graphical data using the named table name.

Cadcorp SIS can connect to databases using the ODBC standard or DAO.

National Grid

The National Grid referencing system is based upon the division of Great Britain into 100km squares, each assigned a two-letter code: TQ, SS, NY, and so on. References to positions within any square may be made by means of the eastings and northings in metres from the bottom left hand corner of the square. The number of digits in the easting and northing give the precision.

For example, SS 78382 87596 refers to a point 78382 metres east and 87596 metres north of the bottom left of the SS square.

Network

A network is a model representing interconnected elements through which some form of resource can be transmitted or will flow. It is represented by a series of nodes connected by links. Links can have attributes representing flow characteristics.

Node

A node is a point item which represents the beginning or end of a link, or the junction of a number of links.

NTF

NTF stands for National Transfer Format. NTF is one of the methods used by Ordnance Survey to distribute digital map data in vector format. It is also used by Ordnance Survey Northern Ireland (OSNI). Most Ordnance Survey data types are produced in both NTF and DXF format.

ODBC

Open DataBase Connectivity (ODBC) is a standard which Cadcorp SIS can use to access databases. If a database has an ODBC driver (or uses DAO), Cadcorp SIS can access it.

OpenGL

OpenGL is an industry standard 3D software library. Cadcorp SIS uses it to draw 3D graphics.

OpenGL is also a software interface to hardware. This allows graphics card vendors to build OpenGL functionality into their graphics cards, thus increasing 3D performance. Cadcorp SIS does not require any special graphics card because OpenGL is available in most Microsoft Windows operating systems. However, adding an OpenGL graphics card can dramatically increase OpenGL performance.

OGC SQL92 Dataset

These are editable datasets which store items in an OGC SQL92 database.

The structure of the database tables is defined by the Open Geospatial Consortium. This allows Cadcorp SIS to operate with other software which supports the OGC SQL92 standards.

Origin (item)

All items have an origin point, which is used in certain places in Cadcorp SIS (eg for the placement of Blocks, or as the placement position for annotation graphics added by themes).

The origin for a line item is its start position; for a point item it is the point itself; for an area item it is usually its centre.

The origin for other items is often the centre of its rectangular extents. This position often does not correspond to anything meaningful, but it is quick for the computer to calculate.

The item origin was sometimes referred to as its “hook” point in previous versions of Cadcorp SIS.

Orthogonal Co-ordinate Systems

See Cartesian Co-ordinate Systems.

OS MasterMap

OS MasterMap is the latest large-scale mapping available from the British National Mapping Agency, Ordnance Survey.

Overlay

An SWD is made up of a list of overlays. These may be thought of as transparent sheets, laid on top of each other, onto which any graphical data may be placed. This data can consist of external datasets or user datasets.

Overlay pen/brush

When it is created, each overlay is automatically assigned a pen and a brush, called the overlay pen (By Overlay) and the overlay brush (By Overlay). When graphics are drawn, if the Styles toolbar pen or brush is (By Overlay), the graphics are drawn using the pen or brush assigned to the overlay on which they reside.

Owner

Editable datasets which can be shared (eg BDS files) have an owner. The owner is the only user who can edit the dataset - all other users have read-only access.

The owner is normally either the creator, or the first person to open it. However, an owner can relinquish ownership and allow another person to become the owner.

Post Office Address Files (PAF)

Post Office Address Files are text files containing the full postal address of every property in the UK, produced by the Royal Mail.

PAF files can be accessed by Cadcorp SIS to display each address as a point or symbol on the map base.

Path

A path is that part of a line which lies between two user-selected positions, which need not coincide with vertex points.

Pen

Pens are named objects. They determine the appearance of lines on a map (line items, the edges of polygons, chains, text etc). Every item has a pen. A pen can be a system brush stored in the (standard) library, it can be a user-defined pen or it can be an implicit pen. An implicit pen does not appear in a named library, but has names made up of different components describing the pen's appearance (colour, thickness, etc).

Phase

Within an SWD you can include a dataset as an overlay several times. Each inclusion of the dataset is called a phase.

You may want to do this in order to set different criteria for each phase, eg different filters. For instance, one phase could contain a filter so that only building outlines are shown, whereas another might display only roads. You can then make each phase visible or invisible in turn, which gives a fast method of looking at certain detail in a dataset.

Each phase can be given a descriptive name to distinguish it from another phase of the same dataset.

Photo

A photo is that part of a print template which contains the view of the map window.

A photo is an area item, and can be edited as such. It also has additional properties, eg it can have a graticule added.

A photo contains a link to the datasets it contains. So whenever the print template is printed, the photo contains an up-to-date view of the datasets it contains.

Photo Grid

A photo grid is an optional element of a photo which shows eastings and northings, by means of grid lines and/or annotation.

Pie Charts

The Pie Chart theme is an annotation theme which uses pie charts to compare the values of several properties. The size of the pie chart slices are proportional to the value of a chosen property or formula.

Pixel

A pixel is a picture element. Pixels have X, Y and Z values. The X and Y components reference that pixel in space. The Z component is a value which corresponds to a colour. The raster images on your screen are made up of many thousands of pixels, each pixel being stored sequentially in a file.

Pixel resolution

See Resampling.

Point

A point item represents the simplest geographical element. It is represented as a single X, Y, Z co-ordinate. Point items often have attributes associated with them.

In Cadcorp SIS, point items always have a shape property: they are displayed using a shape, although this shape can be just a dot.

Point text

Point text is given a height in point sizes (as used in word-processing). This means it will always appear at a given point size when printed.

Polygon

A polygon is a topological item which represents an enclosed region. Its boundary consists of a number of links. Polygons often have attribute data describing the region they represent. They can be used to represent administrative districts, planning constraint zones, property boundaries, and so on.

Position bar

This is an area of the Cadcorp SIS window where co-ordinate display modes are selected and positions are displayed and input. You can choose whether to display or hide the position bar, and if displayed, you can place it anywhere on your screen.

Precision

When a computer needs to remember numbers there are various trade-offs which can be made between precision and memory requirements. The more precisely an item's geometry is stored, the more memory is taken up, and the bigger the data files become.

64-bit precision provides the most accurate data, but uses the most memory. A lot of map data only uses 16-bit precision in 2D, which reduces memory requirements by one-eighth. However, it is important not to lose accuracy by carelessly reducing precision.

Cadcorp SIS can store and manipulate co-ordinates in 16-, 32- or 64-bit precision, in both 2D and 3D. Therefore it can use the most compact format for all datasets with no loss of accuracy.

If you decide that you do not need high accuracy on an editable dataset, then you can reduce its precision. Then when you modify any of the items, their geometry will be recalculated using the new precision.

Print scale

Print scale is the scale applied to the data when printed. If you know this scale, items can be measured and accurately scaled from the print.

Print template

A print template is a pre-formatted "sheet" onto which you can place an area of the map base to print. It can contain standard features (such as titles, your company details, company logo, and so on), and also allows you to customise each individual print by the addition of a title, scale bars, grids, legend, north point, graticule and/or a key map as required.

Print templates are named objects.

Program View tab

The Program View tab, which can be displayed in the workspace window, shows a record of all commands invoked in the current session, and whether they succeeded or failed. This is useful if you are using GisLink to customise Cadcorp SIS, or Cadcorp SIS Control to write applications, when it can help you in debugging.

Properties

Properties are non-graphical data belonging to graphical items, and to certain other things such as overlays, Named objects and SWD files. They can be either String, Integer, or Floating Point properties.

Properties dialogs

There is a Properties dialog for every type of object in Cadcorp SIS which contains properties. There are categories of property including style, schema, attributes, "all" and various other, object-specific properties. Item properties are also displayed on the property view tab of the workspace window.

Property names

You need to know the names of properties when building formulae, writing GisLink customisations, or using Cadcorp SIS Control to write applications.

In Properties dialogs, property names are accessed by right-clicking on the Property Description on either the Schema, Attributes, Geometry or All tabs.

The property names follow the rules used for computer language variables. In particular the property name always ends in a special character indicating its type (one of \$, &, or #).

QZone

A QZone is a type of buffer made up of regularly-sized squares. This makes it an efficient way for the computer to model a 2D region (detecting whether a point falls inside a large QZone is much faster than detecting whether the point is inside the equivalent area item).

You can specify the resolution of a QZone (size of its smallest square).

Raster data

Raster data is picture data, produced by electronically scanning paper maps, or by generating a computer-readable picture file.

A raster image is made up of a grid of tiny, rectangular picture elements (called pixels). Each pixel is stored sequentially in a file, and is generally represented by a number denoting its colour.

In Microsoft Windows, the standard format for raster data is known as a bitmap (it has the file extension *.bmp).

Compared with vector data, which contains information on its contents (lengths of lines, item types, values of areas, feature codes, feature descriptions, and so on), raster data is 'unintelligent'. Its main function is to provide visual detail and it is often used as a backdrop for vector data.

Raster data requires a lot of computer memory to display it. There are several methods of overcoming this problem, such as using compressed or linked bitmaps.

Relief

Relief is the illusion of three dimensions on a map or 2D image. You can produce an effect of relief on Digital Terrain Models using either the Relief Theme (which applies a range of colours, as defined by a chosen colour-set, to the heights in the model), or by simulating shadow casting.

Resampling

Resampling is the process by which you change the pixels in a raster image, or when the colour halfway between two pixels needs to be interpolated.

If you decrease the spacing between pixels, you increase the number of pixels and increase the resolution (giving you a clearer image).

The opposite is true - if you increase the spacing, you decrease the number of pixels, and with it the resolution and clarity of the image.

Resolution

The resolution of a digital dataset expresses the size of the smallest object which can be depicted. The term is most commonly used with raster data, where the resolution of a raster or grid is expressed as the size of the cell in the real world.

Increased resolution leads to larger storage and processing requirements but clearer and more detailed images.

Roamer

The Roamer provides you with a magnifying glass on your cursor. This allows you to move your cursor over the data in the map window, magnifying only the portion which lies underneath the Roamer.

Rubber sheeting

Rubber sheeting is a process used to adjust the relative positions of features within a dataset in a non-linear or non-uniform way. Raster maps may suffer from distortion if they have been scanned from paper maps or aerial photographs. Cadcorp SIS provides tools for correcting this distortion using known survey or control points. This operation is known as rubber sheeting, because the raster map looks as though it has been drawn onto a sheet of rubber which is then stretched from the positions identified to new positions.

Saved Window

See SWD (Saved Window Template) and SWD (Saved Window Definition).

Scale

Scale is the reduction applied to real world items when representing them on paper or a computer system while maintaining their correct proportions.

Cadcorp SIS applies scale in four main areas: the reduction factor currently applied to display the maps on your screen (in Cadcorp SIS known as the display Scale); the factor by which real world items (buildings, roads etc) are scaled to fit on a sheet of paper (known as the map scale); the scale applied to items which do not have real world sizes on the map eg text, symbols and line thicknesses (the dataset scale), and the scale applied to the maps when they are printed (the print scale).

Scale thresholds

Overlays and features have two scale thresholds, a Minimum scale and a Maximum scale. The Minimum scale is the scale below which the data will not be displayed. The Maximum scale is the scale above which the data does not appear. The

data to which these scales apply is visible only when the display scale is between these two numbers.

Schema

A schema is a list of data columns for an overlay. The data columns consist of the properties of the items on that overlay, or a formula. They should include all the data which you wish to appear in the table window and in other parts of the user interface where data is used, such as themes. If you are using Map Tips, you can choose which of the data columns is used for the Map Tip on the Schema tab.

Schemas are named objects.

SDS (Shared Dataset)

The Shared Dataset format is a native geometry format within Cadcorp SIS which is used in a multi-user environment for concurrent data editing. It supports vector geometry but not topology.

Secondary annotation

Secondary annotation is a reference embedded in a text string which calls up and displays the current value of a property. You would use it where a value is subject to change and you want to include the current value in the text string. Formulae can be used.

Seed

A seed is a special type of point item. All chains and polygons have a seed, which contains references to the links from which the chain or polygon is formed.

Selected items

Many operations in Cadcorp SIS are carried out on selected items. This means items must be selected before starting that command. There are many ways of selecting items, which allow you to build up a comprehensive selection list.

Selection box

The selection box is one method of selecting items. You click when the cursor is over an empty position on the screen to define one corner of a box. You then move the cursor to the opposite corner of the box and click again. All items which lie within the box are selected (provided they are on an editable or hittable overlay).

Shape

A shape is a symbol which is stored as a named object. These can be system-defined, when they are stored in the (standard) library or they can be user-defined where they are stored in the (current) library. Point items have a shape assigned to them as an attribute. The point item can store information which scales and rotates the shape. Shapes provide an efficient means of creating and placing common symbols that are used regularly.

Snap grid

A snap grid consists of a regular array of points or lines, which are spaced at the intervals you choose. When constructing or moving items, you can then snap to grid intersections to increase your accuracy.

Snapcodes

When drawing, moving and editing items, snapcodes allow you to snap exactly to precise points on existing graphics, such as ends of lines, midpoints of lines, centres of circles, etc.

Snapcodes are shown as you move the cursor over the map base, indicating when the cursor is exactly over a line, a vertex, a point, and so on.

Solid

A solid is a three-dimensional solid item, which has volume. Solids are used when creating three-dimensional buildings.

Spatial analysis

This is the process of applying analytical techniques to geographical-referenced datasets, to extract or generate new geographical information. Spatial analysis may be used to model complex geographical interactions, and is useful for investigating site suitability and predicting future events.

Spherical Co-ordinate systems

The X and Y axes of a spherical co-ordinate system are degrees of latitude and longitude. The Z axis of a spherical projection measures height above sea-level.

Splinter

When you convert line and area items to topology, small splinters may occur between the line or area and the links. These are automatically removed, and you can choose whether preference is given to the link geometry or the line or area geometry.

Splinter factor

Polygons have the property Splinter factor. The splinter factor is the ratio of the maximal area to the actual area. The maximal area of a polygon is the largest area that could be enclosed by a line with the same length as the polygon. Circles have a splinter factor of 1, while a very long and thin area could have a splinter factor of 100. Areas with large splinter factors are often produced by overlapping lines which are almost, but not quite, the same.

SQL

Structured Query Language (SQL) is a language developed by IBM in the 1970s for defining and manipulating relational databases. It has since become the industry standard, and is often used to enable GIS toolkits to access the data held in existing corporate databases.

Status

Each overlay has one of the following statuses: editable, hittable, visible and invisible.

If an overlay is editable, you can perform any operation on the data. If it is hittable, you can select it, copy it, or query it, but not cut or delete it. If it is visible, it can be seen but not selected. If it is invisible, it cannot be seen and no operations can be performed on it.

A backdrop is for visual reference only, and can be visible or invisible.

Status bar

The status bar is displayed at the bottom of the Cadcorp SIS window. It provides information and prompts the user for their next action.

The information provided consists of what the highlighted command does, the number of items currently selected, the number of editable items currently selected, the class of the selected items (as long as only one item class is selected), the displayed width (in real world units) of the view in the current window and the current display scale.

Stored item

See Named item.

String properties

Text, or a mixture of text, numbers and punctuation is called a string. Properties which hold a string are suffixed with a dollar sign (\$). An example is `_dataset$` (the name of an item's dataset).

The value of a string is stored in Unicode, which means you can safely use any foreign language characters (although to appear correctly, the computer displaying them must have the correct language installed).

The size of a string property value is virtually unlimited, but the user interface is only designed to handle comfortably about

80 characters. Therefore, if you wish to use longer properties, you may consider using a Microsoft Visual Basic customisation.

Styles toolbar pen/brush

The Styles toolbar pen and Styles toolbar brush are the pen and brush currently shown on the Styles toolbar.

If any items are selected, the Styles toolbar pen shows which pen they use (if they all have the same pen), or nothing (if they have different pens). Similarly, the Styles toolbar brush shows the brush they use (as long as they all use the same one), or nothing (if they use different brushes).

If no items are selected, the Styles toolbar pen and brush show the default pen and brush, which will be adopted by any new items you create.

Surface

A surface is a three-dimensional planar item, which has area but no volume.

SWD (Saved Window Definition)

A Saved Window Definition is the list of overlays to be included in a view, together with any overrides or filters applied to the overlays. This can be saved with a name, so that in future you do not need to rebuild the map base.

The saved file has the extension `*.swd`, and can be saved anywhere on your computer or network; it contains all the necessary information to link up and display the required datasets next time you use it.

SWT (Saved Window Template)

A Saved Window Template is a collection of overlays and a view which you can save. This allows you to have one Saved Window Template (SWT) which will act as a basemap, which you can recall, add overlays to, and save as an SWD. For example, there could be one SWT for a council, and individual SWDs based on the SWT for Planning, Environmental Health, and so on.

The saved file has the extension *.swt and can be saved anywhere on your computer or network. It contains all the necessary information to link up and display the required datasets next time it is opened.

System properties

System properties come with the data and are a necessary part of the data. They can be recognised by the underscore character at the beginning of their name eg _FC&. Some system properties are called members, as Cadcorp SIS implements them as members of C++ objects. Other non-editable system properties are called derived properties (see Derived Properties), since they are always calculated on the fly by Cadcorp SIS (eg the length of a line item).

Table window

Table windows allow you to display properties, attributes and data from external databases in a tabular form. A table window is associated with a map window, and every graphical item in a map window has a corresponding entry in the table in the table window.

A table window is dynamically linked to the map window, so that any changes to either window causes the other to be updated automatically.

TARGA

TARGA is an image format developed by Truevision Inc.

Text

Text is an item class consisting of different text types; point text, box text, line text, label text, and secondary annotation.

Thematic mapping

A thematic map is one which communicates a single theme or subject, based on attribute data. For example, a population density map and political boundary map are both thematic maps. This contrasts with a topographical map which is a gen-

eral purpose map containing landscape features such as rivers, roads, landmarks and elevation.

Thematic mapping is achieved by controlling the styling of the map (eg using colours to represent attribute data) or by annotating it with extra graphics (such as pie charts or labels).

Thiessen areas

Thiessen areas are areas of influence where adjacent areas are constructed around each selected item such that their boundaries are equidistant from the selected items.

TIFF

Tagged Image File Format. This is a widely used, general-purpose image data format.

TIN

TINs, or Triangulated Irregular Networks, are three-dimensional planar items. A TIN is made up of many triangular surfaces which connect adjacent points containing height attributes. Each surface contains graduated height values, or a slope, thus contour and/or flow themes can be superimposed on TINs. Greater detail is obtained by using smaller triangles.

Toolbars

A toolbar is a moveable group of icons which are designed to provide rapid access to specific commands. All commands in Cadcorp SIS have a corresponding icon. Clicking the icon on the toolbar runs the command in the same way as selecting it from a menu.

Topology

Topology concerns spatial relationships between connected or adjacent geographical objects, independent of their size and shape.

Topological graphics are made up of link, node, chain and polygon items. These items all store references to each other where they touch or join.

The essence of topology is that if a topological item changes, then its spatial relationships with connected topological items are maintained. For instance, if you move a node item, then the ends of all connected link items will be moved to the new node position. In addition, because chains and polygons only refer to link items, their path (for chains) and boundary (for polygons) will follow the new link line. Furthermore, if the link is a shared boundary between adjacent polygons, then the adjacency of the polygons is maintained.

Transparent zoom commands

You can use most of the Zoom commands while you are in the middle of another operation, such as constructing a line or measuring graphics. You can select this option on the Preferences dialog.

User overlay

A user overlay is an overlay on which you can save your own data. This is a BDS file or an internal dataset.

User overlays can have any status.

Vector data

Vector data consists of point, line or area data that is defined in space by a series of co-ordinates. This data can have tabular or attribute data associated with it.

View

A view is the extent of the map base currently displayed in a map window. You can save views (as named objects), and return to them later.

View scale

See Map scale.

Wizard

A Wizard is a self-contained unit within a program, which leads you through a process by means of explicit dialogs. It is designed so that the process is straight-forward. You can progress to the next step only when you have completed the current one.

Workspace

A project workspace file (*.sis) saves the following information: the user set-up (including toolbars, preferences, open SWD files and windows); named tables from databases; the (workspace) library; linked libraries; and the default co-ordinate system and viewing projection. Workspaces are useful for saving the state of the current session. They are the only way of saving libraries and named tables.

Workspace window

The workspace window displays detail about the current session. It also allows settings and properties to be changed, and provides access to many commands and operations.

The workspace window has five tabs, dealing with different areas of the system: the display view tab (for access to SWDs, overlays and their contents), the property view tab, the theme view tab, the table view tab and the library view tab.

You can choose whether or not to have the workspace window displayed. When it is displayed, it appears to the left of the map window.

Index

Symbols

*.000 99
*.030 99
*.aft 91
*.aif 85
*.alg 83
*.ap 68, 95
*.bds 4, 53, 83
*.bfw 105
*.bif 85
*.bil 84
*.bip 84
*.bmp 105, 549
*.bwl 90
*.cit 86
*.csv 68, 84, 95, 96
*.ctf 96
*.dat 96
*.dcw 92
*.ddf 91
*.dem 91
*.dgn 83
*.di 86
*.do 91
*.dpf 87
*.dpw 87
*.dwf 82
*.dwg 82
*.dxf 82
*.e00 84
*.ecw 70, 84
*.edbs 97
*.ffs 100
*.gdal 86
*.gif 106
*.gml 68, 88, 92, 168
*.gxf 99
*.gz 68, 92
*.gzip 88, 168
*.hdf 107
*.hdr 84, 91, 106
*.img 106
*.jfw 107
*.jpg 69, 107
*.k85 97
*.lft 91
*.man 86
*.mem 98
*.mif 87
*.nol 600
*.ntf 68, 93, 94, 95, 96
*.opt 91
*.owd 78
*.paf 96
*.pdf 100
*.pft 91
*.png 108
*.pwd 78
*.ql 96
*.raw 84
*.rlc 108
*.rle 86
*.rst 98
*.rwl 90
*.sds 53, 57, 83
*.sed 83
*.shp 84
*.sid 70, 109
*.sis 2, 31, 47, 49, 78, 700
*.svg 99
*.svgz 99
*.swd 78, 698
*.swt 699
*.tab 87
*.tfd 87
*.tft 91
*.tfw 108
*.tga 110
*.thf 85
*.tif 109
*.vc 87
*.wmf 111
*.wrl 99

Numerics

- 3D data
 - creating using the Snap toolbar 418
 - draping bitmaps 157
 - Solids 408
 - Surfaces 407
 - transparency 233
- 3D geometry 593
- 3D menu
 - Drape>Drape command 523
 - Drape>Save command 523
 - Exaggerate Z command 156
 - Move Mode command 151
 - Previous View command 153
 - Reset command 153
 - View Details command 153
- 3D operations
 - Cadcorp SIS Map Modeller 3D capability 149, 407
 - OpenGL 149
- 3D Theme 261
- 3D views
 - enhancing 156
 - moving around in 150
- 3D Windows 149–150, 593
 - opening 150

A

- About command 7
- abs** (in formulae) 617
- acos** (in formulae) 618
- Activate contents command 577
- ActiveX Control 4
- Add Geometry command 368, 390
- Add OGC Overlay 169
- Add-In Manager 78
- ADDRESS-POINT (10cm resolution) (*.ntf, *.csv or ap) 95
- Adobe Reader 113
- Align>To co-ordinates command 482
- Align>To right-angles command 482
- ALK 97
- alpha blend factor 71, 74
- Alter menu
 - Add Geometry command 368, 390
 - Boolean commands 390, 492–493
 - C.A.D.>Align commands 482
 - C.A.D.>Break Line command 474
 - C.A.D.>Chamfer command 483
 - C.A.D.>Facet command 485
 - C.A.D.>Fillet command 484
 - C.A.D.>Join command 479
 - C.A.D.>Path>Delete command 476
 - C.A.D.>Path>Move command 475
 - C.A.D.>Segment>Delete command 476
 - C.A.D.>Segment>Move command 475
 - C.A.D.>Smooth commands 484
 - C.A.D.>Snip commands 477
 - C.A.D.>Trim and Join command 479
 - C.A.D.>Trim command 472
 - Clean Geometry command 394, 477
 - Decompose command 463, 508
 - Fill submenu
 - Fill Convex Hull command 366
 - Fill submenu>Geometry command 366
 - Move Dataset command 3, 69, 75, 111, 528
 - Raster>Compress command 529
 - Raster>Resample command 529
 - Raster>Set Resample Method command 529
 - Remove Geometry command 508
 - Reprofile Line command 476, 511, 518
 - Reverse command 367, 474, 492
 - Rubber sheet command 532
 - Simplify command 465, 522
 - when exporting data 549
 - Stretch command 458
 - Topology>Clean Links command 513
 - Topology>Copy Links as Lines command 395, 512
 - Topology>Delete inconsistent Links command 513
 - Topology>Fix up inconsistent Nodes command 515
 - Topology>Merge Nodes command 515
 - Unfill command 491
- Alter>Decompose... 463
- Alter>Generalise... 465
- Alter>Slice 491
- and** (in formulae) 618
- Append Line command 473
- Arc command
 - 3 Points 349
 - Angle Centre Point 349
 - Angle Point Point 350
 - Centre Point Point 350
 - Radius Centre Point Point 351
- ARC/INFO ASCII GRID 104
- ARC/INFO Binary Grid 104
- ArcInfo DTM (*.csv) 84
- ArcInfo Export (ASCII) (*.e00) 84
- ArcView Shape (*.shp) Cadcorp SIS Cursor Dataset 84
- Area command 359
- Area items 359
 - Boolean editing 492–493
 - clockwise or anti-clockwise 367, 492
 - converting to Line items 491
 - converting to topology 492
 - creating 359–370
 - circular 360
 - elliptical 365
 - from Line items 366
 - rectangular 362
 - creating Surface items from areas 492
 - measuring area 368, 490
 - Multi-areas 368–369
 - Seed 491
 - selecting 490
 - using to select items 369
 - with offset Pens 367
- Array>Path command 459
- Array>Polar command 461
- Array>Rectangular command 462
- asin** (in formulae) 618
- aspect grids 665
- Assemblies 391
 - creating 391
 - deleting 509
 - editing 508
 - hook point 391
 - selecting 391, 509

Assembly command 391
atan (in formulae) 618
atan2 (in formulae) 618
 ATKIS 97
 Atlantis MFF Raster 104
 Atlantis MFF2 (HKV) Raster 105
 Attributes 249–251
 adding
 to a dataset 250
 to an SWD or overlay 250
 to items 249
 displaying 251
 modifying 251
 string attributes 250
 attributes
 copying 587
 losing when editing 251
 not copying when pasting geometry 586
 AutoCAD Drawing File 12 - 2000 (*.dwg) 82
 AutoCAD DXF 12 - 2000 (*.dxf) 82
 Autodesk Drawing Web Format (*.dwf) 82
 Automatic chain creation 594
 Automatic chain creation (Tools>Preferences>Options)
 394, 399
 Automatically refresh BDS datasets 595
 Automatically refresh BDS datasets (Tools>Preferences>Options) 339
 Automatically show Select Item dialog 592
 Automatically show Select Item dialog (Tools>Preferences>Options) 448
 Axes 439–441
 and cutting/copying and pasting 441
 origin
 and co-ordinates 439
 moving 439
 rotating 440
 setting default 440
 Axes>Angle command 440
 Axes>Move command 440
 Axes>Normal command 441
 Axes>Spin X command 440
 Axes>Spin Y command 440
 Axes>Spin Z command 440

B

B&W TIFF with anti-aliasing (*.tif, *.tiff) 109
 Backdrops 389
 for key maps 567
 Backspace key 470
 Backups 595
 Base dataset. See BDS files
 BaseDataGB (*.ntf) 95
 BDS files 338–339
 creating 338
 opening 338
 ownership 232, 339, 595
 saving 339
 updating 595
 Begin Transaction 57
 Bentley Geographics HMR raster 83
 Bentley MicroStation design file (*.dgn) 83
 Bezier command 351
 bitmap and image items 104

bitmap image transparency 71
 Bitmaps
 compressing 529
 displaying rotated bitmaps 458
 dithered 549
 saving 548
 draping over 3D data 157
 pasting 589
 pixel resolution 529
 rotated bitmaps 593
 saving 549
 transparency 233
 Blocks 387
 creating 387
 editing 507
 exploding 507
 Inserts 388
 naming 388
 placing 388
 selecting 507
 BMP (*.bmp) 105
 BMP dithered (*.bmp) 105
 BMP files
 exporting 549
 Boolean commands 390, 463
 Boolean commands with Area items 492–493
 with Polygons 492
 with TINs 492
 Exclusive Or
 with Area items 493
 with Line items 482
 Intersect
 with Area items 494
 with Line items 481
 Subtract
 with Area items 494
 with Line items 477, 482
 Union
 with Area items 493
 with Line items 481
 BoundaryLine 96 - 2000 (*.ntf) 95
 box style for text 379
 Box text
 creating 381
 creating Area items from 505
 height 382
 selecting 501
 Break Line command 474
 Brushes 426–429
 changing an item's Brush 428
 containing bitmaps 544
 containing Shapes 544
 creating 540–544
 hatched 543
 implicit Brushes 428
 opaque 543
 overlay Brush (By Overlay) 233, 427
 changing 427
 forcing 428
 setting colour 542
 solid colour 543
 Styles toolbar Brush 427
 the Edit Brush dialog 541
 transparent 543

BSB raster files 108
 Buffer>Area command 645
 Buffer>QZone command 645
 Buffers 643, 647
 creating 645
 editing 645

C

Cadcorp 12
 website 7
 Cadcorp apSIS 5
 Cadcorp mSIS 5
 Cadcorp SIS ASCII geometry format 100
 Cadcorp SIS Base Dataset (*.bds) 83
 Cadcorp SIS Control 4
 Cadcorp SIS Export Dataset (*.sed) 83
 Cadcorp SIS Map Editor 3
 Cadcorp SIS Map Manager 3
 Cadcorp SIS Map Viewer 3
 Cadcorp SIS Shared Dataset (*.sds) Cadcorp SIS Cursor Dataset 83
 CADCORP.SIS.EXE 30
 calcinterior (in formulae) 618
 Chains 393, 399
 automatic Chain creation 394, 399, 594
 category 516
 changing route 516
 converting to Lines 516
 copying 516
 creating 399
 deleting 516
 editing 516—517
 Pen 516
 Seed Point 516
 selecting 516
 with attribute data 517
 Chamfer command 483
 Check for Network Dongle (Tools>Preferences...) 596
 choose (in formulae) 619
 Choropleth mapping 260
 chr (in formulae) 619
 Circle command
 2 Points 360
 3 Points 360
 Centre Point 361
 concentric circles 361
 Radius Centre 361
 Radius Point Point 362
 Cities Revealed 681
 Clean Geometry command 394, 477
 Clean Links command 513
 Code Point (*.csv) 96
 Collections 387
 creating 387—391
 editing 507—510
 Colours
 forcing 425
 overlay colour 233
 Override 425
 Colour-sets 410
 Command line options 31
 Commit Transaction 57
 Complex items
 breaking down 463
 simplifying 465
 Compress command 529
 Concentric circles 361
 Construct menu
 Array>Path command 459
 Array>Polar command 461
 Array>Rectangular command 462
 Assembly command 391
 Buffer>Area command 645
 Buffer>QZone command 645
 Dimension commands See Dimensions
 Displacement command 531
 Geometry 2D 342
 Arc command 349—351
 Area command 359
 Bezier command 351
 Circle command 360—362
 Divide>Distance command 352
 Divide>Path command 352
 Ellipse command 365
 Freehand Line command 348
 Point command 371
 Rectangle command 362
 Rule command 353
 Geometry 3D
 Extrude command 407, 408
 Tin Fan/Strip command 415
 Triangulate command 408
 Geometry 3D>Formula Grid 410
 Insert Block command 388
 Miscellaneous submenu 388, 391
 Displacement command 531
 Iso Route command 670
 Locus command 496, 649
 Photo command 581
 Shape command 582
 Thiessen Areas command 647
 Shape command 373
 Text>Box command 381
 Text>Label command 382
 Text>Line command 383
 Topology>Cookie Cut command 404
 Topology>Link command 396
 Topology>Node command 515
 Topology>Polygon command 401
 Topology>Polygons from Area command 402
 Topology>Polygons from Items command 402
 Topology>Polygons from Line command 401
 Construct>Geometry 3D>Viewshed 664
 Contour Theme 524
 Convert to Area command (Line items) 367
 Convert to Area command (TINs) 523
 Convert to Box Text command 505
 Convert to Line command 516
 Convert to Link command 512
 Convert to Point Text command 505
 Convert to TIN command 416
 Convert to Topology command (Areas) 394
 Convert to Topology command (Lines) 396, 512
 Cookie Cut command 404
 Co-ordinate display formats
 Co-ordinates 116
 Irish Grid 116

- Latitude/Longitude 116
 - National Grid 116
 - Polar co-ordinates 117
 - WGS84 Latitude, Longitude, Height 117
 - Coordinate display formats
 - Linear co-ordinates 116
 - Co-ordinate Systems command 638
 - Co-ordinates
 - absolute co-ordinates 444
 - relative co-ordinates 444
 - typing co-ordinates 441–445
 - Bearing and distance from point (polar) 443
 - Co-ordinates format 441
 - Irish Grid 442
 - Latitude/Longitude 442
 - Linear co-ordinates 442
 - National Grid 443
 - Co-ordinates (co-ordinate display format) 116
 - Copy command 586
 - Copy Links as Lines command 395, 512
 - Copy To command 549
 - Copying items 459–462
 - along a path 459
 - between overlays 588
 - editable items 459
 - entire overlays 588
 - in a circular pattern 461
 - in a rectangular array 462
 - in regular arrays 459–462
 - making editable copies of non-editable items 459
 - COS (in formulae) 619
 - Create Grid from Points 409
 - Create Grid Shadow 663
 - Create Key Map command 579
 - Create North Point command 579
 - Create Scale Bar command 579
 - current overlay 230
 - Current position 115
 - Current window 115
 - cursor dataset 57
 - Cursor datasets 56
 - Curves 351
 - facetting 485
 - custom grids 576
 - custom programs
 - loading 598
 - Customising Cadcorp SIS 2, 591–598
 - loading customisation programs at start-up 596
 - Workspaces See Workspaces
 - Cut command 586
 - cvdate (in formulae) 619
- D**
- Dangling segments 397
 - Data sources
 - exporting to Data Sources 553
 - database
 - row locking 288
 - Database Query Wizard 311
 - Databases 275–329
 - Data-Point (*.ntf) 94
 - Dataset scale See Scale, dataset scale
 - Datasets
 - attributes 250
 - Cities Revealed 681
 - information on 234
 - projection 639
 - user datasets See User datasets
 - Decompose command 463, 508
 - Default overlay styles 594
 - Delete command 457
 - Delete inconsistent Links command 513
 - Delete key 457
 - Deleting 457
 - vertices 470
 - Deselect All command 451
 - digital camera images (EXIF) 106
 - Digital Chart of the World (*.dcw) 92
 - Digital Elevation Model 110
 - Digital Terrain Elevation Model (DTED) 105
 - Digital Terrain Models (DTMs) 410
 - Dimension command
 - Dimension>Chain 356
 - Dimension>Datum 357
 - Dimension>Distance 355
 - Dimension>Run 358
 - Dimensions 354–358
 - copying 487
 - dimension symbol 488
 - editing 487–488
 - editing the lines 487
 - editing the text 488
 - moving 487
 - selecting 487
 - Displacement command 531
 - Display filters See Filters, on overlays
 - Display scale See Scale, display scale
 - Dithered bitmaps See Bitmaps, dithered
 - Divide Polygon command 403, 518
 - Divide>Distance command 352
 - Divide>Path command 352
 - dividing by zero
 - Formula Grid 410
 - Dongle 25, 596
 - Douglas-Peucker 465
 - Drape vector overlay command 523
 - Draping bitmaps 157
 - Draw rotated bitmaps 592
 - Draw rotated bitmaps (Tools>Preferences>Options) 458
 - Draw shapes flat on screen 593
 - Draw toolbar 342
 - DTM
 - relief 412
 - dts (in formulae) 619
 - DXF files
 - geo-referenced 75
 - not geo-referenced 75
- E**
- EDBS (Germany) (*.edbs) 97
 - Edit Members command 509
 - Edit menu
 - Copy command 586
 - Cut command 586
 - Delete command 457
 - Deselect All command 451

Fence>Area command 449
 Fence>Buffer command 450
 Fence>Circle command 450
 Fence>Offset command 450
 Find command
 using Area items 369
 with Polygons 519
 Paste Special command 588
 Recall Item command 389
 Redo command 595
 Replicate command 459, 639
 Select All command 451
 Select command 447
 Store Item command 388
 Undo command 595
 Edit>Hyperlink 247
 Edit>Paste From 527
 Edit>Paste Special... 586
 Edit>Select command and S snapcode 433
 Editable status 228
 Editing items
 Assemblies 508
 Chains 516–517
 collections 507–510
 general 457–465
 Link items 511–514
 Multi-geometry items 508
 Nodes 514–515
 Point items 497–499
 Polygons 517–519
 raster data 527–532
 Shape items 497–499
 Text items 501–505
 TINs 521
 topology 511–519
 Ellipse command 365
 Email 553
 ENVISAT Image Product Raster Format 106
 EOSAT FAST-L7A (Landsat) 106
 ER Mapper Image Web Server 84
 ER Mapper's Algorithm (*.alg) 105
 ER Mapper's Algorithm file (*.alg) 83
 ER Mapper's ECW (*.ecw) 84
 ER Mapper's Enhanced Compression Wavelet (*.ecw) 105
 ER Mappers ECW Image Web Server 101
 Erdas Imagine 106
 Esc (Escape key) 447
 ESRI ArcIMS Image Service 85
 ESRI ArcSDE 85
 ESRI Binary Interleave file (*.bil, *.hdr, *.bip, *.raw) 84
 ESRI Binary Interleave Format (*.bil, *.hdr) 105
 ESRI Personal Database 85
 ETRS89
 converting into GB National Grid 640
 EuroNav (*.gxf) 99
 Exaggerate Z command 156
 Exclusive Or command 493
 with Line items 482
 EXIF digital camera images 76, 106
 exists (in formulae) 619
 exp (in formulae) 620
 Explode command (Blocks) 507
 Explode command (Groups) 509

Explode Shape command 498
 Export>to File command 548, 549
 Export>to Multiple Tiles command 549, 550
 Export>to Server command 553
 extents (in formulae) 620
 Extrude command 407, 408

F

F10 key 121
 F11 key 126
 Flkey 6
 F2 key 51, 144, 210, 225
 F5 key 117, 381, 412
 F6 key 129, 449
 F7 key 451
 F8 key 451
 Facet command 485
 Favour old geometry in splinter removal 594
 Favour old geometry in splinter removal (Tools>Preferences>Options) 405
 Feature codes
 assigning to items 633
 Feature tables 234, 631–633
 creating 633
 importing and exporting 633
 inspecting 631
 Fence>Area command 449
 Fence>Buffer command 450
 Fence>Circle command 450
 Fence>Offset command 450
 File formats 77–113
 BMP 549
 formats you can write 545, 553
 JPEG 69
 JPG 69
 SED 553
 VRML 549
 File menu
 Export>to File command 548, 549
 Export>to Multiple Tiles command 549, 550
 Export>to Server command 553
 Print command 556–558
 Print Preview command 555
 Print Setup command 555
 Print Template>Quick Wizard command 559
 Print Template>Recall command 580, 581
 Print Template>Store command 581
 Print Template>Wizard command 563
 Save All command 547
 Save As command 547
 Save command 547
 Send command 553
 Fill 2D items in 3D views 593
 Fill 2D items in 3D views (Tools>Preferences>Options) 156
 Fill 3D items in 2D views 593
 Fill 3D items in 2D views (Tools>Preferences>Options) 156
 Fill Column command 333
 Fill Convex Hull command 366
 Fill Geometry command 366
 Fillet command 484
 Filters

- class based filter 238, 454, 607
- compound filter 238, 608
- creating 605–606
- feature filter 238, 455, 607
- for selecting items 454–456
- in the (standard) Library 238, 455
- on overlays 232, 237–241
 - applying 239
 - clearing 241
 - property filter 238, 455, 607
- find** (in formulae) 620
- Find** command
 - Filter tab 454
 - Formula tab 453
 - Geometry tab 452
 - using Area items 369
 - with Polygons 519
- findcontainer** (in formulae) 620
- findinterior** (in formulae) 620
- Fit>To** Header command 332
- Fit>To** Window command 332
- fix** (in formulae) 620
- Fix** up inconsistent Nodes command 515
- Flicker selection 592
- Flicker selection (Tools>Preferences>Options) 447
- Flow arrows 525
- Flow Theme 525
- Fonts
 - changing 503
 - overlay font 233, 503
- formatdate** (in formulae) 621
- formatflt** (in formulae) 621
- formatint** (in formulae) 622
- Formats from Safe Softwares Feature Manipulation Engine (FME) 100
- formatstr** (in formulae) 623
- Formula Grid 410
- Formulae 611–630
 - comparison operators 614
 - constructing 612
 - examples for filters 612
 - examples for Schemas or Themes 612
 - maths operators 615
 - operators 616
 - property operators 616
 - spatial query 616
 - strings 617
 - the Formula dialog 614
 - with the Edit>Find command 453
- Freehand** Line command 348
- Full redraw after pan 593
- Function keys
 - F1 6
 - F10 121
 - F11 126
 - F2 51, 144, 210, 225
 - F5 117, 381, 412
 - F6 129, 449
 - F7 451
 - F8 451
- fuzzy** (in formulae) 623

G

- gazetteers
 - additional 124
- GDS AIF (*.aif) 85
- GDS BIF (*.bif) 85
- GDS Things file (*.thf) 85
- Genasys GenaMap file (*.di) Unsupported 86
- Generate Area items command 505
- GeoBMP (*.bmp + *.bfw) 105
- geodetic buffer 420
- GeognoSIS.NET 4
- Geography Markup Language (GML) documents 168, 185
- Geoids 641
- GeoJPEG (*.jpg + *.jfw) 107
- Geomedia Access Warehouse 86
- Geometry>3D>Slope and Aspect 665
- Geo-referencing files 111
- Geospatial Data Abstraction Library (*.gdal) 86
- GeoTIFF (*.tif, *.tiff + *.tfw) 110
- GIF (*.gif) 106
- GisLink 2
- Global Positioning System (GPS) 159
- GML 167
- Google OGC Web Search 168
- GPS 159
- GPS Display Options 594
- GPS Transformation Options 594
- Grab handles
 - on Area items 490
 - on Line items 469
- gradient grids 665
- Graticules 571–575
 - adding to an existing Photo 579
 - editing 579
 - including on a Print template 571
 - saving 572
 - selecting 572
 - setting parameters 572
- Great Circle line 420
- grep** (in formulae) 623
- Grid
 - creating from other Grid items 410
- grid** (in formulae) 624
- grid references
 - zooming to 206
- Grids 661–663
 - transparency 662
- grids 664
 - creating 408
- Groups 391
 - editing 509

H

- Handles See Grab handles
- Help menu
 - About command 7
 - Contents command 7
 - SIS on the web command 7
- Hierarchical Data Format 107
- Highlight selected shapes and text 593
- Highlighting of selected graphics 447

Hittable status 228
hot snapping 592
HTTP GET and POST query strings 182
hyperlinks 246

I

iif (in formulae) 624
image and bitmap items 104
image transparency 71
Implicit Brushes 428
Implicit pens 426
Index datasets 58–61
 advantages 58
 creating 59
 keymap 60
Informix OGC Datablade 103
Insert * command 508
Insert Block command 388
Inserts 388
Installation 26–30
int (in formulae) 625
Intellimouse 117
Intergraph CIT image file (*.cit) 86
Intergraph CIT image files (*.cit) 107
Intergraph RLE image file (*.rle) 86
Intergraph RLE image files (*.rle) 107
Internal datasets 337–340
 automatically created 338
 creating 337
Internet Development Kit (IDK)
 installation 30
Intersect command 494
 with Line items 481
Invisible status 228
Irish Grid (co-ordinate display format) 116
Iso Route command 670
Iso routes 670–672
Iso-chrones 671
Item menu
 3D>Grid>Convert to TIN command 416
Item menus 33
Item properties
 inspecting 199
Item>Line>Join Lines 471

J

Japanese GSI (*.mem) 98
Japanese GSI (*.rst) 98
Join command 332, 479
Join Lines command 471
JPEG (*.jpg) 107
 JPEG 2000 107
JPEG files 69
 saving 548
JPEG Multi-Level (4 levels) (*.jpg) 107
JPG See JPEG files

K

Key maps (Print templates) 565, 579

 adding to an existing Print template 579
Keyhole shape 592
keyhole zooming 123
KF-85 (Sweden) (*.k85) 97

L

Label text
 creating 382
 height 383
 selecting 501
Land-Form PANORAMA DTM 1
 50 000 (*.ntf) 94
Land-Form PROFILE contours 1
 10 000 (*.ntf) 94
Latitude/Longitude (co-ordinate display format) 116
left (in formulae) 625
Legend command 579
Legends 271
 adding to an existing Print template 579
 on Print templates 567
 styling 271
 using 271
len (in formulae) 625
Levels 341
 with Pens 540
Libraries 599–603
 (standard) library 599
 (temporary) library 599
 (workspace) library 600
 creating 600
 current Library 601
 excluding from search 602
 folders 603
 opening 600
 removing 601
 saving 602
 search order 601
 sharing 601
Licence number (licence key) 26
like (in formulae) 625
Line command 344–348
 creating offset lines 346
 Find Route 345
 Orthogonal 344
 Simple 344
 Trace 345
Line items 343
 aligning 482
 breaking into two 474
 changing direction 474
 constructing 343–358
 continuing 473
 converting to Links 512
 creating chamfers 483
 creating fillets 484
 deleting a section (path) 476
 deleting a section (using other items) 477
 deleting a section (within an area) 477
 editing dimensions 487–488
 joining 471, 479–480
 merging 481–482
 moving a section (path) 475
 re-defining a section (path) 476

- smoothing 484
- tidying 477
- Line segments
 - deleting 476
 - moving 475
 - shortening/extending 472
- Line text
 - creating 383
 - display of the line 504
 - selecting 502
 - spacing of characters 504
- Linear co-ordinates (coordinate display format) 116
- Linear co-ordinates command 442
- Lines
 - dimension lines See Dimensions
 - drawing
 - freehand lines 348
 - offset lines 346
 - orthogonal lines 344
 - ruling 353
 - tracing 345
- Link and Node networks 393
 - creating 394–398
 - from Area items 394
 - from Line items 394
 - creating overlying networks 395
 - displaying topological structure 396–398
- Link command 396
- Links
 - adding to existing topology 512
 - automatic Links 511
 - creating from existing Line items 512
 - deleting 511
 - editing 511–514
 - flow direction 668
 - inconsistent 513
 - moving 511
 - non-automatic Links 512
 - Pen 512
 - removing 513
 - replacing with Lines 512
 - selecting adjacent Links and Nodes 512
 - vertices 512
- loading custom programs 598
- local (in formulae) 626
- Local menus 33
- Loci 649–660
 - creating 649
 - editing 659
 - for selecting 659
 - inspecting 659
 - Locus tests 651
 - on overlays 232, 658
- Locus command 496, 649
- log (in formulae) 626
- Logos 528
- lower (in formulae) 626
- ltrim (in formulae) 626
- M**
 - Make Rubber Sheet command 531
 - Map Browser 3, 548
 - Map menu
 - Add>Theme command 254
 - Axes>Angle command 440
 - Axes>Move command 440
 - Axes>Normal command 441
 - Axes>Spin X command 440
 - Axes>Spin Y command 440
 - Axes>Spin Z command 440
 - Co-ordinate Systems command 638
 - Pan>Continuous command 126
 - Pan>Drag command 126
 - Pan>Re-centre command 126
 - Pan>Snap command 126
 - Redraw command 117
 - Regenerate command 339
 - Snap grid command 438
 - View>Recall command 127
 - View>Store command 127
 - Zoom>All command 119
 - Zoom>Box 125
 - Zoom>Extent command 119
 - Zoom>Gazetteer... command 124
 - Zoom>Raster command 122, 528
 - Zoom>Roamer command 121
 - Zoom>Selection command 121
 - Zoom>Set Keyhole Overlay command 123
 - Zoom>To Scale command 122, 143
 - Map Reader 548
 - Map scale See Scale, map scale
 - Map tips 198, 245, 592
 - defining 198
 - display 198
 - Map>Co-ordinate systems...
 - Units tab 204, 434
 - Map>Zoom>Drag
 - quality 592
 - Map>Zoom>Grid Reference 206
 - Map>Zoom>Keyhole
 - shape 592
 - Map>Zoom>Roamer
 - shape 592
 - MapInfo Interchange format (*.mif) 87
 - MapInfo TAB file (*.tab) 87
 - max (in formulae) 626
 - mean
 - of table columns 333
 - Measure menu
 - Angle command 205
 - Area command 204, 490, 518
 - Distance command 200
 - Fence command 202
 - Length command 204
 - Position command 205, 498
 - Radius command 205
 - Route command 203, 667
 - Setup>Linear co-ordinates command 442
 - Measuring
 - angles 205
 - area 204, 490
 - areas 202
 - distances 200
 - length 204
 - radius 205
 - Menu bar 33
 - Merge Nodes command 515

Merge TIN items command 522
 Merging items 463
 Meridian (*.ntf) 95
 MicroGDS file (*.man) 86
 Microsoft Visual Studio.NET 2
 Microsoft Word
 WMF metafile 111
 mid (in formulae) 626
 min (in formulae) 627
 MOSS MX range (*.dpf) 87
 MOSS MX range (*.dpw) 87
 Mouse
 Intellimouse 117
 three-button mouse 118
 Move Mode command 151
 Moving items
 between overlays 588
 single items 457
 Moving vertices 469
 Multi-areas 368–369, 390
 measuring area 496
 selecting 495
 Multi-geometry items 390
 breaking into component items 508
 creating 390–391
 editing 508
 removing items from 508
 selecting 508
 Multi-lines 390, 481–482
 Multiplication key (*) 118
 Multi-points 390

N

Named items 388
 backdrops 389
 creating 388
 placing 389
 Named objects 602–603
 creating 602
 editing 603
 Named Tables 333
 National Grid 116
 National Imagery Transmission Format (NITF) 107
 New 3D Window command 150
 New Overlay Wizard 51
 New Table Window command 332
 NIMA 125
 NIMA Vector Map Level 0, Vmap0 (Edition 3) (*.aft, *.lft, *.pft, *.tft) 91
 NOAA/MAPTECH/NDI/SoftChart BSB 108
 Node command 515
 Nodes
 adding 515
 automatic Nodes 514
 deleting 514
 displaying 396, 514
 edge Nodes 397
 editing 514–515
 inconsistent Nodes 515
 merging 515
 moving 514
 non-automatic Nodes 515
 selecting 514
 selecting adjacent Links and Nodes 515
 turning rules 669
 North points 569
 adding to an existing Print template 579
 north points
 creating 582
 not (in formulae) 627

O

OCX 4
 ODB 103
 ODD
 sharing data 547
 OGC 5
 Geography Markup Language (GML) (Any Database) 88
 Simple Features Specification 6
 Area items 368
 Simple Form 465
 spatial tests 453
 SQL92 dataset (Any Database) 89
 Web Coverage Service 89
 Web Feature Server WFS (Vector) 89
 Web Map Server WMS (Raster) 89
 Web Terrain Server WTS (DEM) 89
 website 6
 Well Known Binary (WKB) (Any Database) 88
 Well Known Text (WKT) (Any Database) 88
 OGC Geography Markup Language 2 (*.gml + *.gzip) 88
 OGC OWS Context Documents 90
 OGC Technical Committee 5
 OGC Web Map Context Document 90
 On-line help 6
 opaque 379
 Open Window Definition 167
 OpenGIS
 OGC Technical Committee 5
 OpenGL 149
 Options See Tools menu, Preferences... command
 or (in formulae) 627
 Oracle8 Spatial Cartridge (Relational Model) 101
 Oracle8i Spatial (Object Relational Model) 102
 Oracle9i Locator (Object Relational Model) 102
 Oracle9i Spatial (Object Relational Model) 102
 Ordnance Survey data
 updating 62
 Ordnance Survey GB overlays 62
 Ordnance Survey Ireland (*.ntf) 96
 Ordnance Survey Northern Ireland (*.ntf) 97
 origin (in formulae) 627
 OS CTF Topo 96 (*.q1) Additional charge applicable 96
 OS Land-Line 1:1250, 1:2500, 1:10 000 (*.ntf) 93
 OS LIDAR (*.dat) 96
 OS MasterMap 63
 OS MasterMap (*.gml and *.gz) 92
 OS MasterMap Independent Polygons for Microsoft Access 2000 100
 OS MasterMap Independent Polygons for Microsoft SQL Server 101
 OS MasterMap Independent Polygons for Oracle 9i 101
 OS MasterMap Index 93
 OSCAR Asset Manager (*.ntf) 94
 OSCAR Network Manager (*.ntf) 94

OSCAR Traffic Manager (*.ntf) 93
outline style 379
Output settings 594
overlaparea (in formulae) 627
Overlays
 adding 227
 attributes 250
 controlling what is displayed 231
 coordinate system 234
 copying 227, 588
 feature table 234
 filters 232, 237–241
 applying 239
 clearing 241
 Loci 232, 658
 making current 230
 Notes 231
 order of overlays 229
 overlay Brush 233, 427
 overlay colour 233
 overlay font 233, 503
 overlay Pen 233, 424
 overlay Shape 233, 374
 phasing 228
 properties 235
 removing from the SWD 230
 renaming 230
 scale thresholds 232
 Schemas 235, 243–246
 and item properties 245
 and Table Windows 246
 creating 244
 status 228, 339
 the Overlays dialog 225
 accessing 225
 Dataset tab 195, 234
 Include tab 231
 Themes 235, 253–274
 transparency 233
 working with 225–235
overlays
 default styles 594
OWD 167, 548

P

Pan commands
 Pan >Continuous 126
 Pan >Drag 126
 Pan >Re-centre 126
 Pan>Snap 126
Pan Photo command 578
Panning
 using a three-button mouse 118
 using an Intellimouse 117
 using the cursor keys 118
 using the scroll bars 117
Paper projection 638
Paste command
 pasting bitmaps 589
 pasting into other applications 588
 pasting text 589
Paste Special 586
Paste Special command 588

Path>Delete command 476
Path>Move command 475
PDF 576
 exporting 550
PDF Portable Document Format 113
Pens 423–426
 changing an item's pen 425
 changing the pen of an Ordnance Survey feature 425
 creating 533–540
 implicit pens 426
 linestyles containing Shapes and gaps 538
 multi-level 538, 539
 offset 536
 overlay Pen (By Overlay) 233, 424
 changing 424
 forcing 425
 round end-caps 536
 setting colour 535
 square end-caps 536
 start symbols and end symbols 538
 style 536
 Styles toolbar Pen 424
 the Edit Pen dialog 534
 width 536
Photo command 581
Photos 577–580
 angle 578
 complex 580
 editing data within 577
 editing the outline 577
 graticules 579
 key map 579
 Legend 579
 overlays within 579
 panning within 578
 Photo grids 569
 scale 578
Plus key (+) 118
PNG Bitmap 24-bit (*.png) 108
PNG Bitmap 256-colour (*.png) 108
PNG files
 saving 548
Point command 371
Point items 371
 finding position 498
 placing 371
Point text
 angle 503
 creating 379–381
 selecting 501
Polar co-ordinates (coordinate display format) 117
Polygon command 401
Polygons 393, 400
 Brush 518
 category 518
 copying 517
 creating 400–405
 by cookie-cutting 404
 by dividing existing Polygons 403
 from a Link and Node network 400–402
 from Area items 400
 deleting 517
 dividing 518
 editing 517–519

- editing boundary 518
- in Ordnance Survey data 400
- measuring area 518
- Pen 518
- Seed Point 518
- selecting 517
- selecting adjacent Polygons 517
- splinters 405
- using to find other items 519
- Polygons from Area command 402
- Polygons from Items command 402
- Polygons from Line command 401
- Portable Document Format 113
- Position bar 38, 115
 - Track 115
- Position Bar command 38
- Position finding 205
- Post Office Address File (10m resolution) (*.paf) 96
- PostGIS 90
- Precision 431–445
- Preferences
 - Options See Tools menu, Preferences command, Options
- Print command 556–558
- Print Preview command 555
- Print rotated bitmaps 593
- Print rotated bitmaps (Tools>Preferences>Options) 458
- Print Setup command 555
- Print templates 559–581
 - creating 559–581
 - Graticules 571–575
 - key map 565, 579
 - north points 569, 579
 - Photo grids 569
 - photos See Photos
 - printing 576
 - Quick Wizard 559, 559–562
 - saving as an SWD 576
 - scale bars 567, 579
 - Theme legends 567
 - title bar text 565
 - Wizard 559, 563–577
- Printer drivers 555, 593
- Printing 555, 559–581
 - monochrome 556
- Projections 46–47, 637–642
 - coordinate system projections 638–640
 - cartesian 638
 - pseudo-orthogonal 639
 - spherical 638
 - creating 642
 - dataset projection 639
 - Geoids 641
 - Paper 638
 - properties 641
 - selecting 46
 - Unknown 638
- Properties 219–223
 - inspecting 199
 - Property column 613
 - property names 613
 - URI 223
- Property column 613
- PWD 548

Q

- Quick Wizard command 559
- QZones 370
 - advantages 370
 - converting to Grids 496
 - editing 496
 - resolution 496

R

- Raster data 68–70
 - copying 527
 - display limits 70
 - display of rotated or mirrored images 70
 - editing 527–532
 - JPG files 69
 - memory requirements 70
 - moving 527
 - not geo-referenced 69
 - pixel resolution 529
 - resolution 122, 528
 - rubbersheeting 530–532
 - saving 548
 - selecting 527
 - without standard naming conventions 68
 - zooming 528
- Raster Index 108
- Recall Item command 389
- Rectangle command 362
- Redo command 595
- Redraw after each overlay 593
- Redraw command 117
- Refill command 332
- Refill Selected command 332
- Regenerate command 339
- Relief Theme 412, 418
- Remove Geometry command 508
- Replicate command 459, 639
- Reprofile Line command 476, 511, 518
- Resample command 529
- Resampling 529
- Reverse command 367, 474, 492
- right (in formulae) 628
- Right mouse button 33
- RLC Run-length encoded bitmap file (*.rlc) 108
- Roamer 121
- Roamer Shape 592
- Rollback Transaction 57
- Rotating items 458
- round (in formulae) 628
- Route command 667
- Route finding 202, 345, 667–672
 - flow direction 668
 - Iso-routes 670–672
 - turning rules 669
 - with topology 515, 667–670
- row locking 288
- rtrim (in formulae) 628
- Rubber sheet command 532
- Rubbersheeting 530–532
- Rule command 353

S

- S57 Catalogue (*.000) 99
- S57 Chart (*.030) 99
- Safe software's Feature Manipulation Engine (FME) 103
- satellite information 163
- satellites 164
- Save All command 547
- Save As command 547
- Save command 547
- Save Copy As 548
- Saved Window Definition See SWD files
- Scalable Vector Graphics (*.svg, *.svgz) 99
- Scale 143
 - dataset scale 148
 - with Point text 381
 - display scale 143–147
 - map scale 147
 - maximum scale 147
 - minimum scale 147
 - print scale 148
 - thresholds 143
 - overriding (on features) 146
 - overriding (on overlays) 144
- Scale bars 567
 - adding to an existing Print template 579
- scale bars
 - creating 582
- Scaling items 458
- Schemas
 - and item properties 245
 - and Table windows 246
 - creating 244
- Scroll bars 117
- Scroll command 333
- SDS
 - sharing data 547
- Secondary annotation 384
- SED files 553
- Segment>Delete command 476
- Segment>Move command 475
- Select Adjacent command 517
- Select All command 451
- Select Assembly command 509
- Select command 447
- Select Connected command 512, 515
- Select Item dialog 448, 592
- selected items
 - colour 594
 - flickering 592
- Selecting
 - all items on an overlay 452
 - Area items 490
 - by using other items 452
 - combining selection methods 451
 - flicker selection 447
 - from coincident items 448
 - from current selection 451
 - raster data 527
 - several items 449
 - single items 447
 - using filters 454–456
 - using formulae 453
 - using Loci 659
 - using spatial tests 453
 - vertices 469
 - with a box 449
 - with a fence 449
- selecting
 - flicker selection 592
- selection
 - flicker 592
- Selection style 594
- Send command 553
- set current overlay 229
- Set Resample Method command 529
- Set Rubber Transform command 531
- SETUP.EXE 26
- Shadow Casting 412
- Shape command 373, 582
- Shapes
 - angle 499
 - changing 497
 - creating 373–374
 - editing 497–499
 - overlay Shape (By Overlay) 233, 374
 - changing 374
 - forcing 375
 - scale 498
 - selecting 497, 593
- Shared Dataset (SDS) files 57
- Show Map Tips 592
- SID - LizardTech's MrSID format (*.sid) 109
- Siemens SICAD (*.vc) 87
- Simplify command 465, 522
 - when exporting data 549
- Simulate GDI pen styles 593
- $\sin$ (in formulae) 628
- SIS Export Dataset Format See SED files
- skyplot 164
- Slice 491
- slope grids 665
- slope, aspect, and gradient grids 664
- Smooth commands 484
- Smooth scrolling 592
- Smooth zooming 592
- Snap grid command 438
- Snap grids 438–439
 - setting up 438
- Snap Toolbar 418
- snapcodes 431
- snapping
 - hot 592
- Snaps 431–433
 - forcing snaps 433
- Snip command (TINs) 523
- Snip commands 477
- Software Development Kit (SDK)
 - installation 30
- Solids
 - creating 408
- Sort>Advanced command 332
- Sort>Ascending command 332
- Sort>Descending command 332
- Spatial Data Transfer Standard (SDTS) (*.ddf) 91
- Spatial tests 453
 - using Loci 649–660
- $\sqrt{}$ (in formulae) 628

standard deviation
 table columns 333
 Statistics command 333
 Status (overlays) 228
 user datasets 339
 Status bar 39, 199
 Store Item command 388
str (in formulae) 628
 Strategi (*.ntf) 95
 Stretch command 458
 styles
 defaults for new overlays 594
 Subdivide command 526
 Subtract command 494
 with Line items 477, 482
 Supported Databases for use with Database spatial systems. 103
 Suppress backups 595
 Suppress Scale Warnings 595
 Suppress Undo Logging 595
 Surfaces
 creating 407
swd (in formulae) 628
 SWD files 50
 attributes 250
 creating 50
 opening 50
 saving 547
 Sysdeco Tfile (*.tfd) 87
 System requirements 25

T

table (in formulae) 629
 Table menu
 Fill Column command 333
 Fit>To Header command 332
 Fit>To Window command 332
 Join command 332
 Refill 332
 Refill Selected 332
 Scroll Dominant command 333
 Sort>Advanced command 332
 Sort>Ascending command 332
 Sort>Descending command 332
 Statistics command 333
 Table Windows 36, 331–335
 Schemas 246
 Tables
 viewing 332
tan (in formulae) 629
 Targa Image File (*.tga) 110
 Text
 alignment 378, 504
 background colour 505
 box around text 505
 Box text See Box text
 changing font 503
 changing size 502
 converting between types 505
 creating Area items from text strings 505
 editing 501–505
 horizontal in rotated views 128
 Label text See Label text
 Line text See Line text
 moving 502
 overlay font 233, 503
 pasting 589
 rotating 502
 secondary annotation 384
 selecting 501, 593
 types 377
 Text>Box command 381
 Text>Label command 382
 Text>Line command 383
 Themes 253–274
 Bar Charts 255
 Contour 524
 converting to editable items 274
 deleting 273
 Dot Density 260
 editing 273
 Extrude 2D Items in 3D Views 261
 Flow 525
 Graduated 262
 Individual Values 266
 Labels 263
 legends. See Legends
 New Theme Wizard 254
 Pie Charts 257
 Ranges 268
 re-ordering 273
 Topology 396–398
 viewing 273
 Thiessen areas 647
 creating 647
 editing 647
 Thiessen Areas command 647
this (in formulae) 629
 Three-button mouse 118
 TIFF files
 orientation 68
 saving 548
 TIFF Group 4 fax (*.tif, *.tiff) 109
 TIFF LZW Compression (*.tif, *.tiff) 110
 TIFF No compression (*.tif, *.tiff) 109
 TIFF Packbits (*.tif, *.tiff) 109
 Time Line 104
 Timelines 103
tin (in formulae) 629
 Tin Fan/Strip command 415
 TINs 414
 converting to simple Areas 523
 creating contour lines 524
 deleting Nodes 522
 draping bitmaps 523
 draping vector data 523
 editing 521
 flow arrows 525
 inserting Nodes 522
 merging 522
 selecting 521
 simplifying 522
 smoothing 526
 smoothing contour lines 524
 snipping 523
 Title bar (Print templates) 565
 Toolbars

- customising 41
- displaying 39
- Draw toolbar 342
- moving 41
- Toolbars command 40
- Tools menu
 - Position Bar command 38
 - Preferences... command 591–595
 - Toolbars command 40
 - Workspace window command 37
- Topology 393
 - advantages 393
 - Chains See Chains
 - creating 394–398, 399–405
 - editing 511–519
 - Ordnance Survey data 394
 - Polygons See Polygons
 - Theme 396–398
- Tracing 345
- Track 115
- Training 11
- transactions 57, 296, 305
- Transparency 233
- transparency 71
 - brushes 74
 - printing 593
- transparent commands 130
- Transparent zoom commands 592
- Triangulate command 408
- Triangulated Irregular Networks 414
- Trim and Join command 479
- Trim command 472

U

- Undo command 595
- Unfill command 491
- Uniform Resource Indicator 223
- Union command 493
 - with Line items 481
- Units 433
 - typing units 434
- upper (in formulae) 629
- URI (Hyperlink) 247
- URI property 223
- US Census Bureau TIGER/Line (*.bw1, *.rw1) 90
- User datasets 337–340, 527–532
 - BDS files 338–339
 - internal datasets 337–340
 - status 339
- USGS Digital Elevation Model (1 degree) (*.dem) 91
- USGS Digital Orthophoto Quadrangles 110
- USGS DLG-3 Optional format (ASCII) (*.opt, *.do) 91
- USGS GTOPO30 (*.hdr) 91
- USGS Optional ASCII DEM 110
- USGS SDTS DEM 111

V

- val (in formulae) 629
- variance
 - of table columns 333
- Vertices

- adding 470
- deleting 470
- grab handles See Grab handles
- moving 469
- selecting 469
- Views
 - copying 127
 - deleting 127
 - multiple views 128
 - recalling 126
 - refreshing 117
 - renaming 127
 - rotating 127
 - saving 126
- Views See also Windows
- viewsheds 664
- Visible status 228
- VRML (*.wrl) 99

W

- Web Feature Server 167
- Web Feature Server (WFS) datasets 168
- Web Map Context (WMC) documents 168
- Web Map Server 167
- Web Map Server (WMS) datasets 168
- Well Known Binary 6
- Well Known Text 6
- WGS84
 - converting into British National Grid 640
- WGS84 Latitude, Longitude, Height 117
- Window menu
 - Create by Zooming command 128
 - New 3D Window command 150
 - New Map Window command 128
 - New Table Window command 332
 - Next command 129
 - Push command 128
 - Split Horizontal command 128
 - Split Vertical command 128
 - Tile Horizontally command 128
 - Tile Vertically command 128
- Windows
 - creating new windows 128
 - multiple windows 128
- Windows MetaFile (*.wmf) 111
- Windows Metafiles 549
- Wizard command (Print templates) 563
- wkt (in formulae) 630
- Workspace window 37, 209–217
 - Display view tab 212–213
 - displaying 211
 - GPS view tab 217
 - Library view tab 600
 - Program view tab 217
 - Property view tab 213
- Workspace window command 37
- Workspaces 47–49
 - (workspace) library 600
 - creating 49
 - saving 49

X

XML data sources 167

Z

Zoom commands 119

Zoom>All 119

Zoom>Box 125

Zoom>Extent 119

Zoom>Gazetteer... 124

Zoom>Raster 122, 528

Zoom>Roamer 121

Zoom>Selection 121

Zoom>Set Keyhole Overlay 123

Zoom>To Scale 122, 143

Zooming

* key 118

+ key 118

keyhole **123**

to grid references 206