

Project title:  
**Assessment of CO<sub>2</sub> storage potential in Europe**

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Project acronym:  
**CO2StoP**

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**CO2StoP GIS User Guide**

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## **1. INTRODUCTION**

The objective of the CO2StoP GIS is to produce a Geographical Information System that can incorporate the polygon locations of the CO2StoP storage formations, storage units and daughter units and allow meaningful access to the data in the CO2StoP database. The GIS also provides output in a format that can be used in the CO2StoP StoreFit Tool through the development of a custom built toolbar. The following user guide will explain how to install the GIS and toolbar, how to start using the GIS, the layout of the data and also to provide some guidance on the tools and features contained within the system. However, this guide is not designed to provide complete information on the functionality contained within ESRI's ArcGIS Desktop system. Should you require more guidance on how to use the ESRI software please see the ESRI web site ([www.esri.com](http://www.esri.com)) where you will find a large amount of useful information on how to use the software.



## **2. SYSTEM REQUIREMENTS**

### **2.1 Software**

The Co2StoP GIS requires the following software to be installed on your computer before it will run:

- ESRI ArcGIS 10.0 or 10.1 Desktop - ArcView licence (the GIS will also run on the ArcEditor and ArcInfo licences but these are not essential)
- Microsoft Access 2007
- Microsoft Word 2007

If you do not already own the ArcGIS 10.0 or 10.1 Desktop software you should contact your local ESRI distributor. Details of which can be found on the ESRI website

<http://www.esri.com/company/locations.html>

### **2.2 Hardware**

The minimum hardware requirements for the installation of the ArcGIS software are as follows:

- Intel Pentium 4, Intel Core Duo, or Xeon Processors; SSE2 (or greater)
- 2.2 GHz processor
- 2 GB RAM
- approximately 2.4 GB of free disk space (for installing the software)

### **2.3 Operating system**

The ArcGIS software will run on the following operating systems:

- Windows 7 (Ultimate, Enterprise, Business and Home Premium)
- Windows 2008 (Server, Server Terminal Services)
- Windows 2003 (Server)
- Windows XP (Home, Professional)



### 3. INSTALLATION

The CO2StopGIS\_Database\_Release\_v1.02 folder provided contains the following files:-

1. CO2Stop\_AddIn.esriAddIn – this is the installation file for the CO2Stop GIS tools
2. CO2Stop.mxd – This is the ArcMap GIS document
3. CO2Stop\_DataInterrogationSystem.mdb – this is the database containing all the data. This is linked to the GIS and can be opened independently to view the data.
4. CO2Stop\_Polygons.mdb – this just contains the polygons which are displayed in the GIS and should not be opened on its own.

In the first instance copy the folder across to your location of choice on your PC. Once this is done open the folder to view the files.

|  |                                     |                  |                       |           |
|--|-------------------------------------|------------------|-----------------------|-----------|
|  | CO2Stop.mxd                         | 27/06/2013 14:24 | ESRI ArcMap Doc...    | 4,970 KB  |
|  | CO2Stop_AddIn.esriAddIn             | 05/06/2013 15:19 | ESRI AddIn File       | 1,402 KB  |
|  | CO2Stop_DataInterrogationSystem.mdb | 19/06/2013 14:15 | Microsoft Office A... | 18,740 KB |
|  | CO2Stop_Polygons.mdb                | 30/07/2013 09:30 | Microsoft Office A... | 33,380 KB |
|  | CO2StopGIS_user_guide.docx          | 19/06/2013 14:16 | Microsoft Office ...  | 14 KB     |
|  | Copyright_Final.docx                | 07/06/2013 16:55 | Microsoft Office ...  | 27 KB     |

It is important that the CO2Stop.mxd, the CO2Stop\_DataInterrogationSystem.mdb and the CO2Stop\_Polygons.mdb file all stay in the same folder otherwise the GIS system will not work.

#### 3.1 Installing the CO2StoP Toolbar

To install the CO2Stop toolbar double click on the CO2Stop\_AddIn.esriAddIn file, when the AddIn Installation Utility dialog box opens click on Install Add-In.





## 4. USING THE GIS

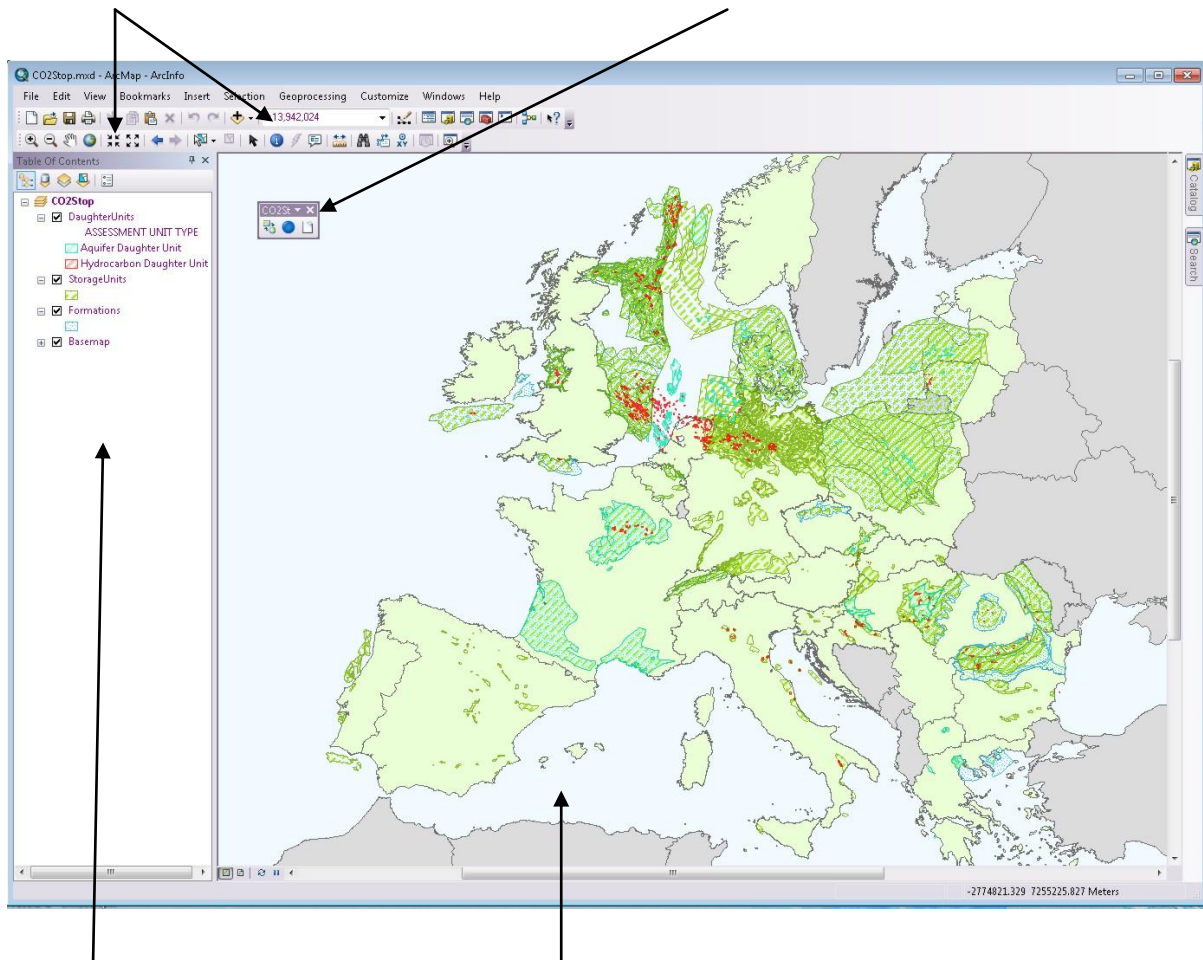
### 4.1 Opening the GIS

The GIS can be opened by double clicking on the CO2Stop\_GIS.mxd file that is within the CO2StopGIS\_Database\_Release\_v1.02 folder. Alternatively the GIS can be opened by opening a blank ArcGIS ArcMap document (Start>All Programmes>ArcGIS>ArcMap) and navigating to the Co2Stop GIS location when prompted by ArcMap.

### 4.2 Layout of the GIS

*ESRI standard toolbars*

*CO2StoP toolbar*

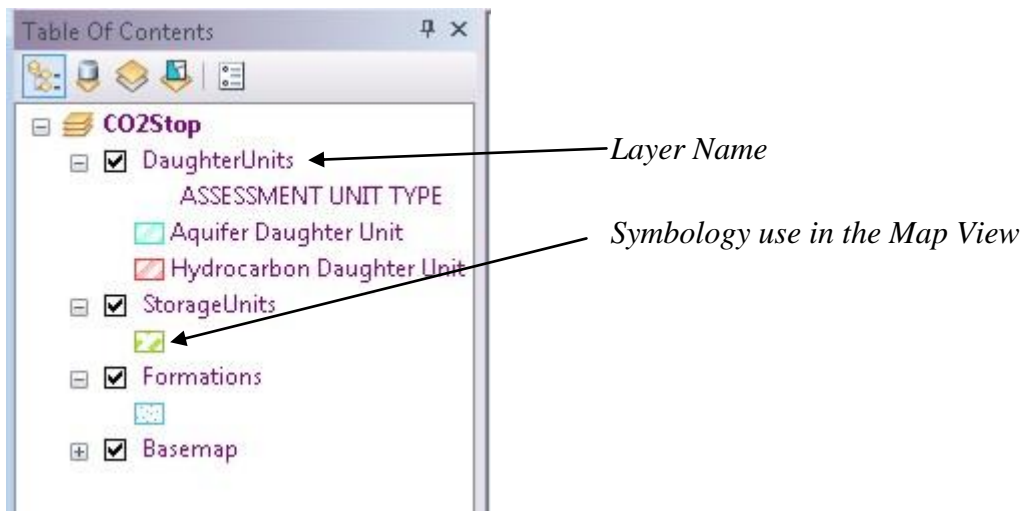


*Table of Contents*


*Map View*

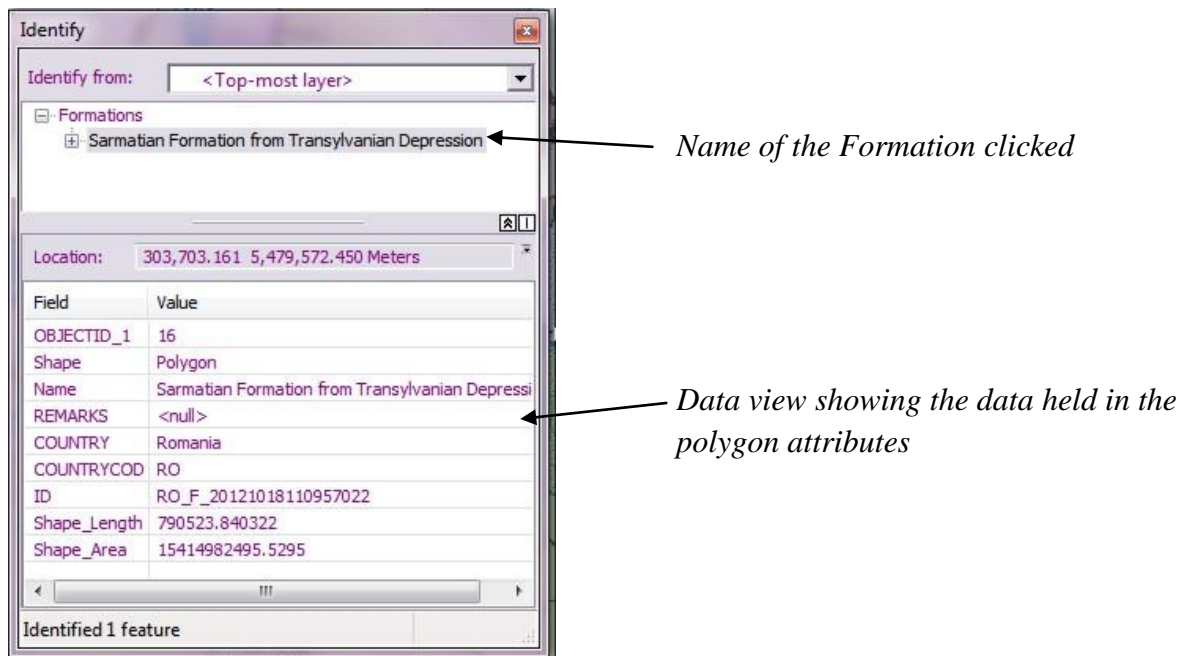
### 4.3 Viewing the data

The primary data that is visible in the map view is the polygon data provided by the partners. The symbology for each polygon layer is visible in the table of contents.



#### 4.4 Viewing the technical CO2StoP data

The data from the CO2StoP Data Interrogation System is available for viewing in the GIS and is linked to the polygons on the map by way of unique ids that are held both in the polygons and the data in the database. To view this data select the Identify tool  from the standard ESRI tool bar and click on the polygon of interest. This will open the Identify results dialog box. In the example below a formation polygon was selected.



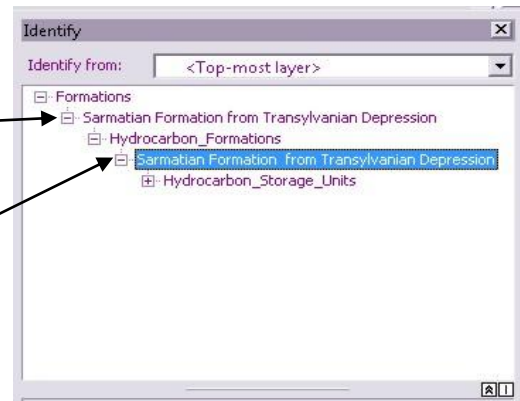
Once the Formation Polygon is listed in the Identify dialog box then it is possible to view and drill through the data held for that polygon in the database as well as view any associated Storage Units and Daughter units.





Click on the + symbol next to the Formation Name

This will then list the name of the formation pulled from the database. Clicking on this name will then display the data from database in the data view.



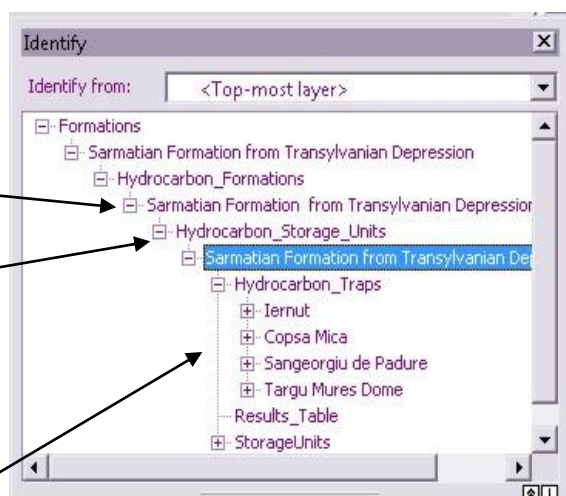
| Field             | Value                                  |
|-------------------|--|
| OBJECTID          | 172                                    |
| FORMATION_ID      | RO_F_20121018110957022                 |
| FORMATION_NAME    | Sarmatian Formation from Transylvanian |
| NO_STORE_UNITS    | 1                                      |
| NO_DAUGHTER_UNITS | 4                                      |
| ASSESS_UNIT_TYPE  | Saline Aquifer with hydrocarbon fields |
| PERIOD_MIN        | Neogene                                |
| PERIOD_MAX        | Neogene                                |
| AGE_MIN           | Serravallian                           |
| AGE_MAX           | Tortonian                              |
| STRAT_GROUP       | <null>                                 |
| STRAT_FORMATION   | <null>                                 |
| LITHOLOGY         | Sandstone                              |
| GEOGRAPHIC_AREA   | Transilvania                           |
| GEOLOGICAL_BASIN  | Transylvanian Depression               |
| ON_OFFSHOR        | Onshore                                |
| SEAL              | marls                                  |
| REP_THICK         | <null>                                 |
| REP_POR           | 20                                     |
| REMARKS           | <null>                                 |
| STORE_CAP_FORM    | 0                                      |

Identified 1 feature

It is then possible to drill into the rest of the data in the database that is associated to the Formation.

Click on Hydrocarbon\_Storage\_Units

Name (or names) of storage units will be listed. Click on the Storage Unit name, this will again display the data from the data base in the Data View.

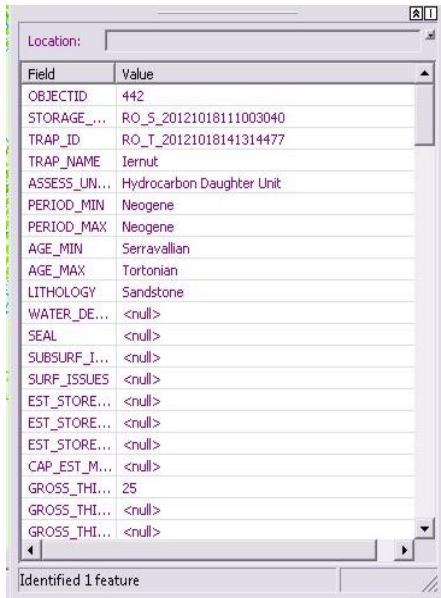


The list of daughter units belonging to the storage unit are also displayed (these are called Hydrocarbon traps in the database)





As before, clicking on the name of a daughter unit will display all the data from the database that is associated to that daughter unit



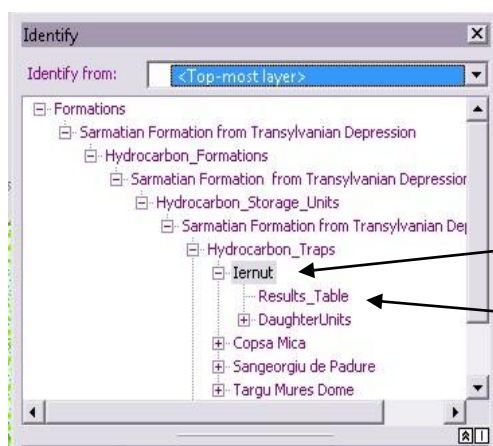
Location: [ ]

| Field        | Value                     |
|--------------|---------------------------|
| OBJECTID     | 442                       |
| STORAGE_...  | RO_S_20121018111003040    |
| TRAP_ID      | RO_T_20121018141314477    |
| TRAP_NAME    | Iernut                    |
| ASSESS_UN... | Hydrocarbon Daughter Unit |
| PERIOD_MIN   | Neogene                   |
| PERIOD_MAX   | Neogene                   |
| AGE_MIN      | Serravallian              |
| AGE_MAX      | Tortonian                 |
| LITHOLOGY    | Sandstone                 |
| WATER_DE...  | <null>                    |
| SEAL         | <null>                    |
| SUBSURF_I... | <null>                    |
| SURF_ISSUES  | <null>                    |
| EST_STORE... | <null>                    |
| EST_STORE... | <null>                    |
| EST_STORE... | <null>                    |
| CAP_EST_M... | <null>                    |
| GROSS_THI... | 25                        |
| GROSS_THI... | <null>                    |
| GROSS_THI... | <null>                    |

Identified 1 feature

## 4.5 Viewing Results from the StorFit Tool

As explained in the Data Analysis Sytem user guide it is possible to load results from the StorFit tool to the Data Interrogation System Database. This then means those results are accessible from the GIS. When viewing the list of storage or daughter units in the Identify Tool dialog box the daughter units or storage units that have results will have the results table listed as an option to click on to view the data in the Data View



*Name of the Daughter Unit*

*Results Table – click on this to view results in the Identify tool data view Data View*

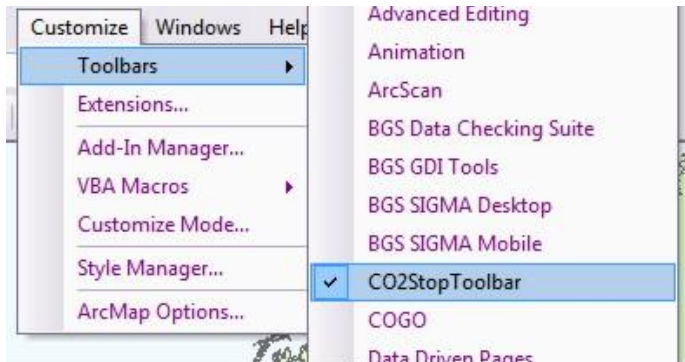


## 5. THE CO2STOP TOOLBAR

A custom built tool bar has been developed for the CO2StoP GIS that provides tools for use in the analysis of the CO2StoP data.

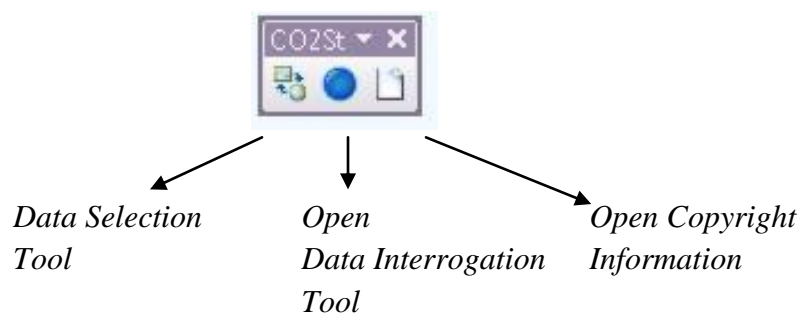
### 5.1 Opening the toolbar

Once the toolbar has been installed (as described in section 3.1) it may be necessary to turn the toolbar on in the GIS. To do this click on Customise > Toolbars > CO2Stop Toolbar



### 5.2 Using the Toolbar

The toolbar has three custom built functions, there is a tool to assist in the export of data for use in the StorFit tool, a button that will automatically open the Data Interrogation Database and a button that provide easy access to details of the course of the data and the contact details for the partner who has provided each piece of data.



#### 5.2.2 The Data Selection Tool

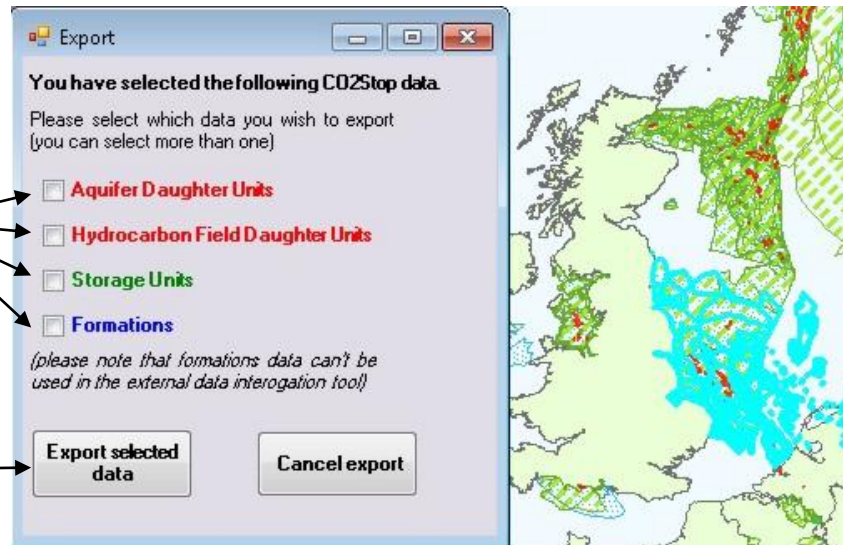
This tool allows on screen selection of any of the formations, storage units, aquifer daughter units and hydrocarbon daughter units and will then export the data, associated to those polygons in the database, in a format that can be used in the StorFit tool.

Firstly click on the button on the toolbar, the cursor will change to the standard ESRI selection tool cursor and a selection can be made in the map view by either clicking on a polygon, or dragging a selection box over an area of interest. Once a selection has been made the Export dialog box will open.



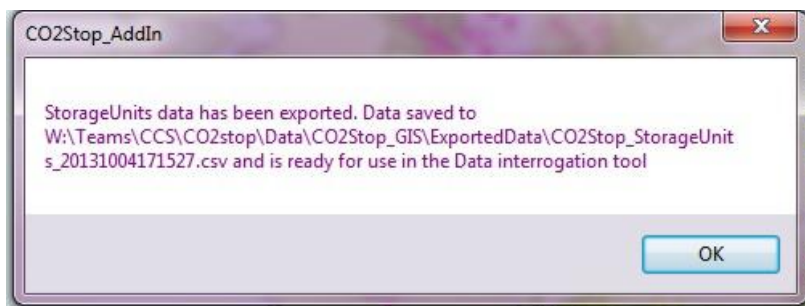
*Check the boxes to indicate which data should be exported*

*Click the Export button*



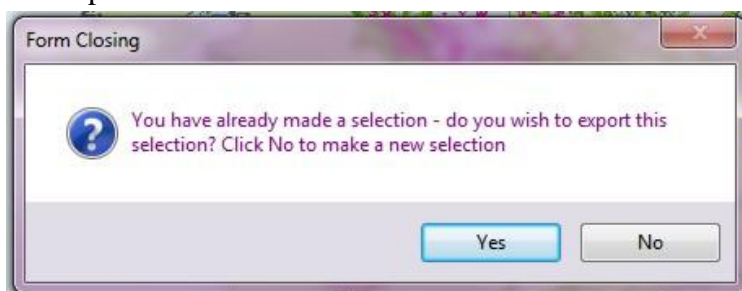
The options for export will depend on the on screen selection i.e. if no daughter units have been selected then that option will be greyed out.

When the Export button is clicked the system will then create a folder called ExportedData in same folder as the CO2StopGIS.mxd (if one doesn't already exist) and export the data into this folder. The data will be exported a .csv file and the name will include the date and the type of data that has been exported. See the example below.



The data in this csv file is now ready for use within the StoreFit tool.

Please note that if an on screen selection has already been made in the Map View when the Data selection tool is clicked the system will give you the option of using this existing selection or making a new one. Click Yes to use the existing selection or No to reselect from the map.





**NOTE:** At present it is not possible to filter on the basis of hydrocarbon field type because hydrocarbon fields have not explicitly been categorised as oil fields, gas fields, oil fields with a gas cap or gas condensate fields within the database. It is recommended that this is prioritised if the database and GIS are further developed.

### **5.2.3 Open Data Interrogation Database**

Clicking on the Open Data Interrogation database button will open the database ready for using in filtering, viewing or exporting the data directly from the data if this is preferable to using the GIS.

### **5.2.4 Open Copyright Documentation**

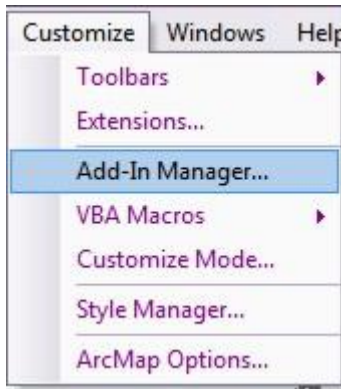
This button will open the word documentation containing all the details fo the source of the data as well as the contact details of the partners involved in providing this data. This document is also stored in the The CO2StopGIS\_Database\_Release\_v1.02 folder.



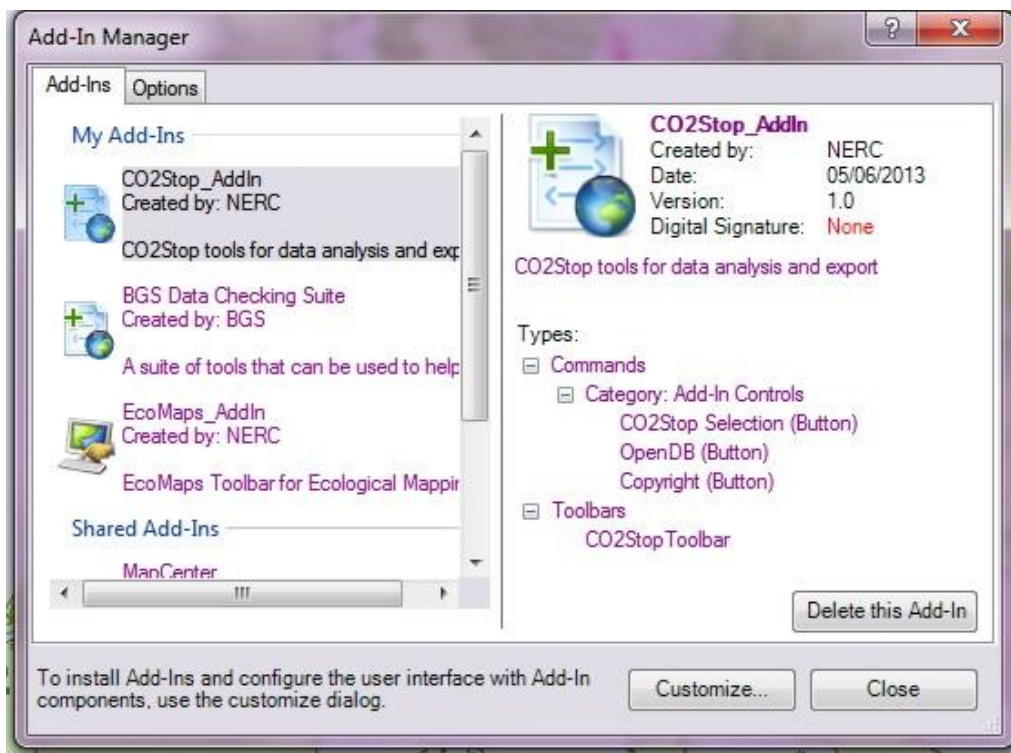
## 6. TROUBLESHOOTING

### 6.1 CO2StoP Toolbar not visible in the list of Toolbars

If the Toolbar is not available in the list of Toolbars then it is possible that the Add-In has not installed properly. To check it has installed Click on Customise > Add-In Manager



In the Add-In Manager you should see the Co2Stop\_AddIn listed



If the Add-In is not listed then install the add-in again following the instructions in section 3.1. If the Add-In is listed but the CO2Stop toolbar is still not available in the list of toolbars then Click on Delete this Add-In and then installed the Add-In again, this should solve the problem.



## 6.2 ArcMap fails to export the data as a .csv file

It is a known that ESRI systems get confused if the operating system on the PC is set up to use a comma as the decimal place instead of a point. If this is indeed the problem ArcMap will also fail to export the data when you try to do it manually (i.e. not using the CO2Stop Toolbar). If this is the case please see the following ESRI article for a solution.

<http://support.esri.com/en/knowledgebase/techarticles/detail/20909>

## 6.3 The .CSV files are exporting as Tab Delimited not Comma Delimited files.

If the files that are being exported from the GIS are Tab Delimited and not comma delimited this will cause them to fail when trying to import them for use in the StorFit tool. To solve this problem it is necessary to set the correct the system number format. To do this go to the Control Panel and select Clock, Language and Region. Then select Change the date, time, or number format. In the first dialog box click on Additional Settings. Please then check that your settings match those shown below.

