Fast-track Power BI

Sample manual - first two chapters

Wise Owl Training

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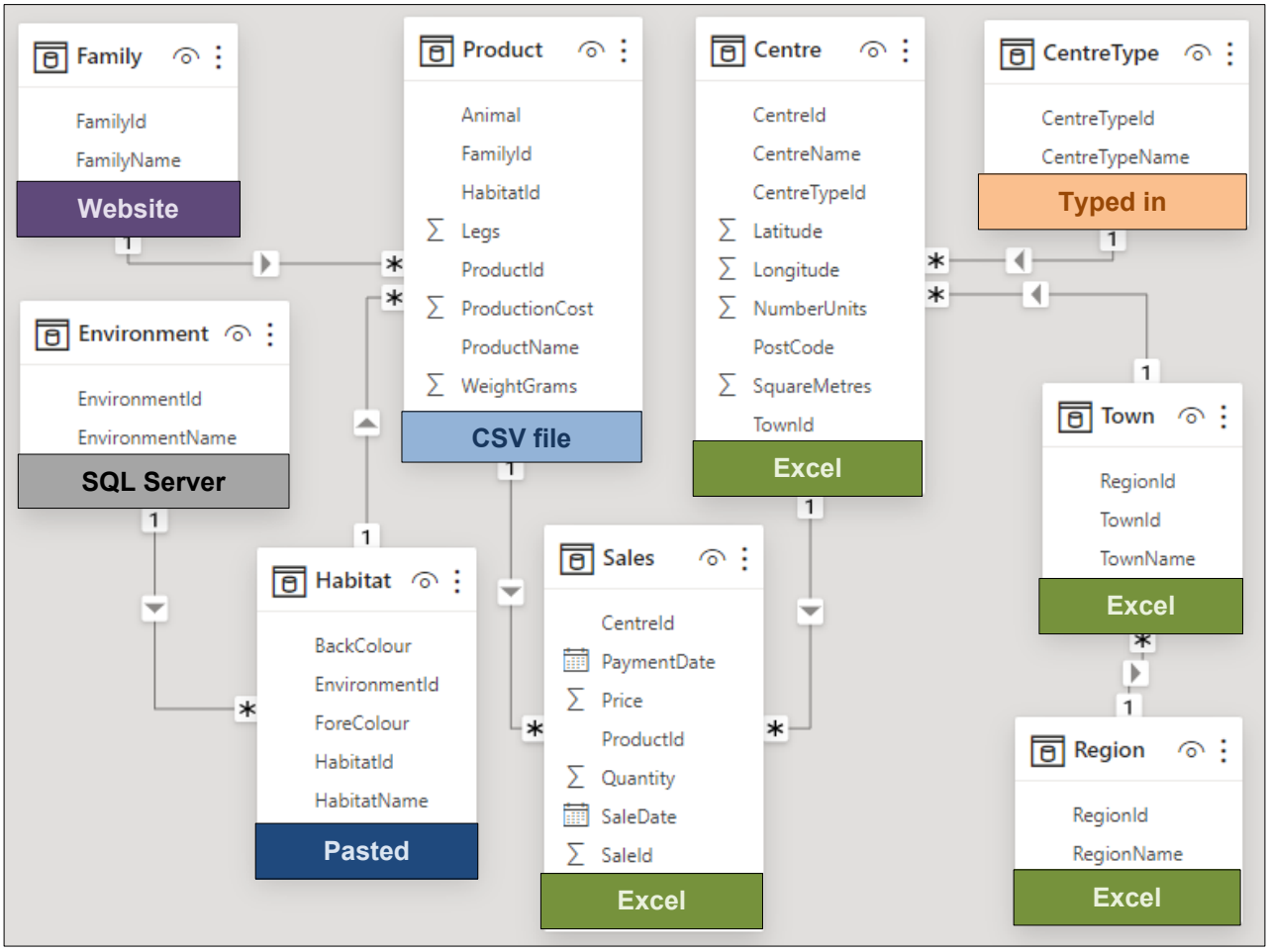
CHAPTER 1 - IMPORTING DATA

1.1 Our Example

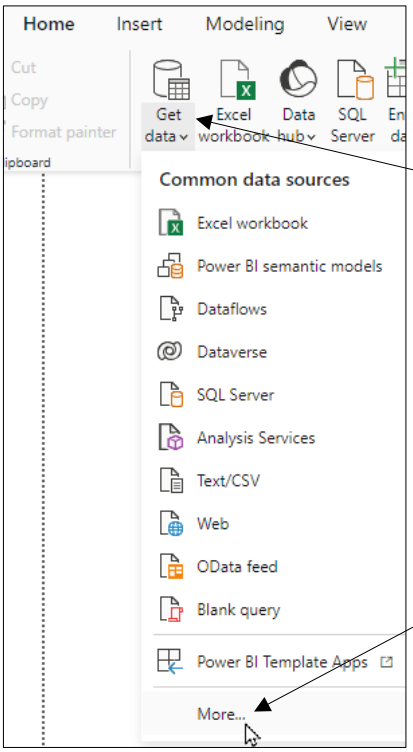
Our example is based on a relational database which keeps track of sales of soft toys. The diagram below shows which type of data source we'll use to import each table:



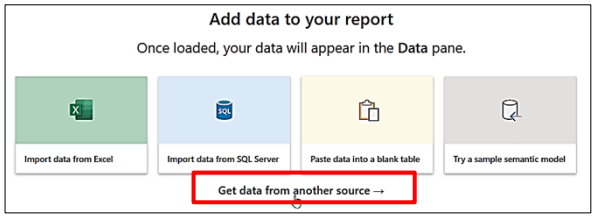
Once you've loaded your data into Power BI from disparate data sources all tables will be treated equally (so for example you can join a table imported from Excel with one imported from a website without any problem).

1.2 Importing from Different Sources

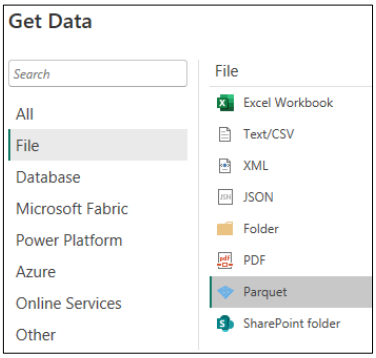
This section shows how to import data into a report from a variety of common data source types. Regardless of which data source type you're using, you can begin the import process as follows:



a) From the ribbon choose **Home | Get Data**. You can also click the top half of the **Get Data** tool to open the dialog box shown below, or click on this link in a new report:



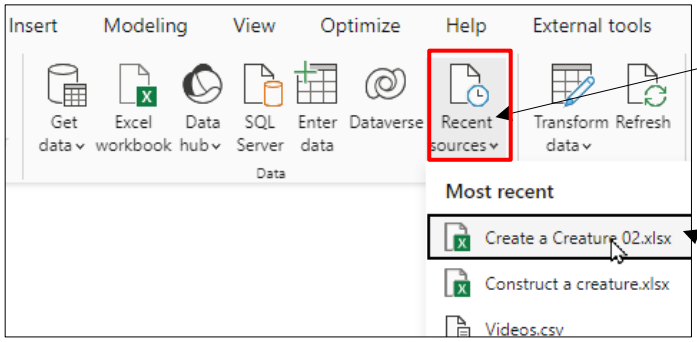
b) Pick a data source type from the **Common data sources** list, or click **More…** to see more choices.



What happens next depends on which data source type you've chosen, but it inevitably involves launching some type of wizard which will help you import your data.

Re-Using a Data Source

You can quickly re-use a recent data source as shown below:

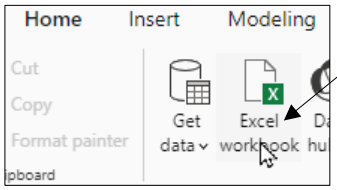


a) From the ribbon choose **Home | Recent Sources**.

b) Pick from the list of databases, workbooks, websites, etc from which you've already imported data.

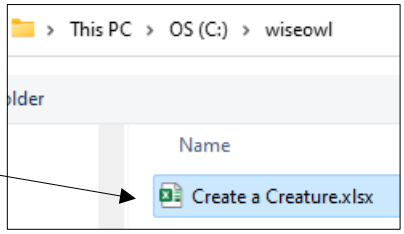
1.3 Importing from Excel

To start importing from an Excel workbook, use this short-cut:



Power BI gives you a special Excel tool because it's such a popular choice.

Double-click on a workbook containing one or more worksheets or named ranges that you want to import.

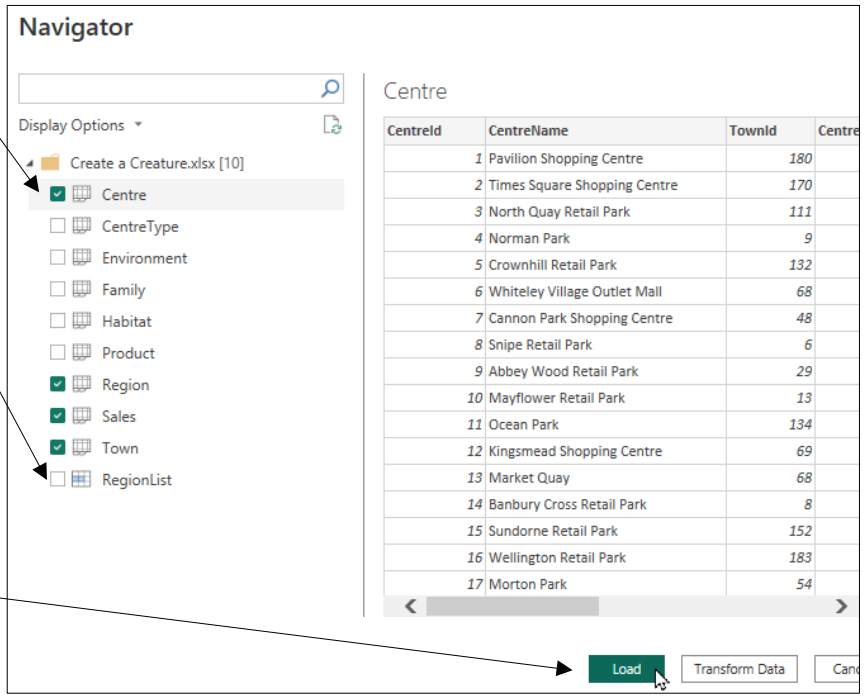


The dialog box which appears lists the contents of the workbook you have selected. You can choose which parts of the workbook you want to import as shown below:

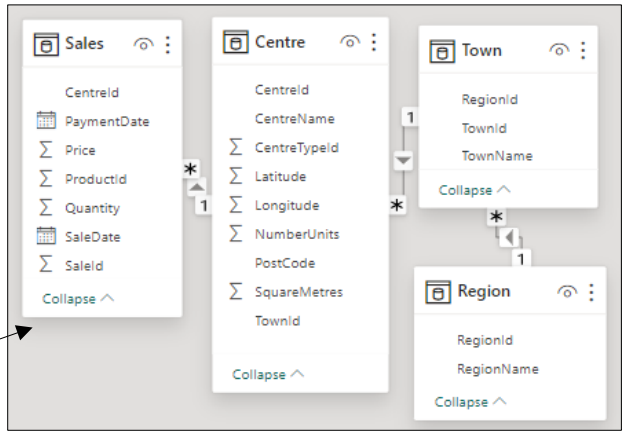
Tick the box next to the name of any item you want to import. Here we've chosen to import the **Centre**, **Region**, **Sales** and **Town** worksheets.

The dialog box will list worksheets in your workbook, but also named ranges in the file such as **RegionList** here. These names ranges have a different icon next to them and appear at the bottom of the list of options.

When you've chosen which worksheets or named ranges you want to import choose either to load them into your model or to go to Query Editor for further processing.



Note that Power BI Desktop will where possible build relationships between the worksheets you've imported:



Power BI Desktop creates these relationships for this example (we've tidied the diagram up a bit). You'll learn how and why Power BI Desktop creates relationships between pairs of loaded tables in another chapter in this courseware.

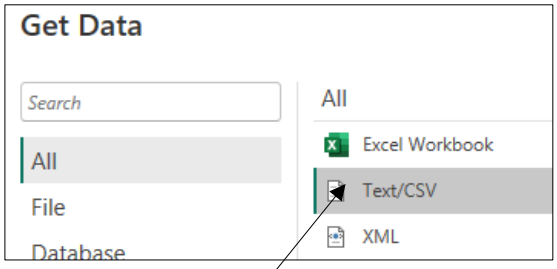
1.4 Importing CSV or Text Files

You can import from CSV files as well as a variety of other text file types.

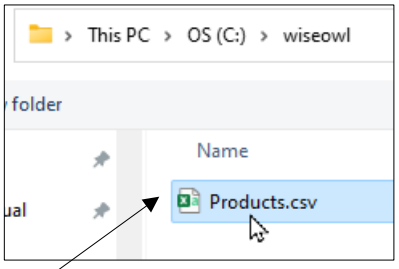
CSV stands for **Comma Separated Values**. The value in one column is separated from the next by a comma. Our example file also includes a row of column headers.

```
ProductId,ProductName,Animal,Hab
1,Sammy,Snake,1,0,1,950,7.19
2,Pokyo,Penguin,4,2,3,850,4.5
3,Fenella,Frog,3,4,4,400,10.79
4,Layla,Lemur,2,2,5,550,4.28
```

To begin importing from a text file like this:



Choose to get data from a **Text/CSV** file …



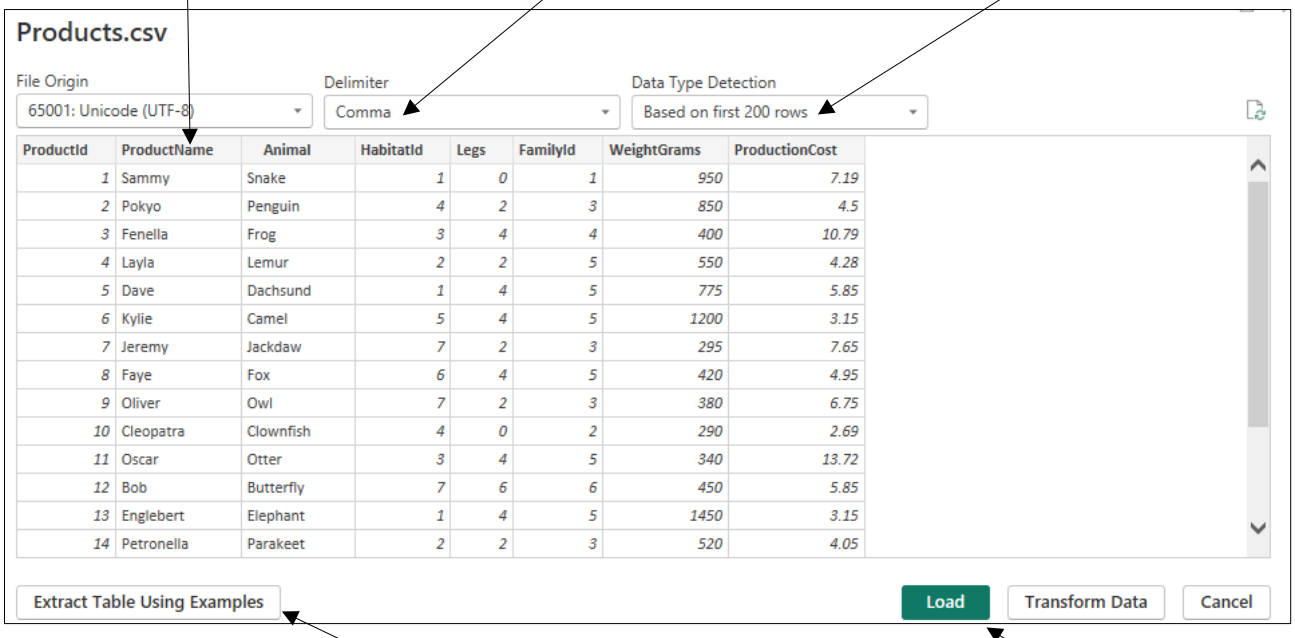
… then browse for and double-click the file you want to import.

You can then choose exactly how the text file is configured using the dialog box which appears:

The preview of your data is a good way to check if you've selected the correct options.

If Power BI Desktop hasn't picked the correct delimiter, you can choose a new one.

Power BI Desktop attempts to work out the data type of each column using a sample of rows. You can set the sample size here.



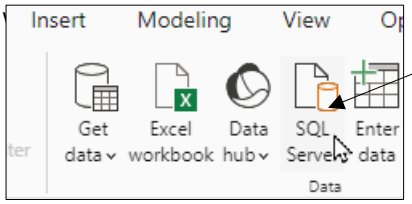
ProductId	ProductName	Animal	HabitatId	Legs	FamilyId	WeightGrams	ProductionCost
1	Sammy	Snake	1	0	1	950	7.19
2	Pokyo	Penguin	4	2	3	850	4.5
3	Fenella	Frog	3	4	4	400	10.79
4	Layla	Lemur	2	2	5	550	4.28
5	Dave	Dachsund	1	4	5	775	5.85
6	Kylie	Camel	5	4	5	1200	3.15
7	Jeremy	Jackdaw	7	2	3	295	7.65
8	Faye	Fox	6	4	5	420	4.95
9	Oliver	Owl	7	2	3	380	6.75
10	Cleopatra	Clownfish	4	0	2	290	2.69
11	Oscar	Otter	3	4	5	340	13.72
12	Bob	Butterfly	7	6	6	450	5.85
13	Englebert	Elephant	1	4	5	1450	3.15
14	Petronella	Parakeet	2	2	3	520	4.05

Optionally you can click on this button to train Power BI on which columns you want to import, although it's usually easier to import everything then remove from the query the columns you don't want.

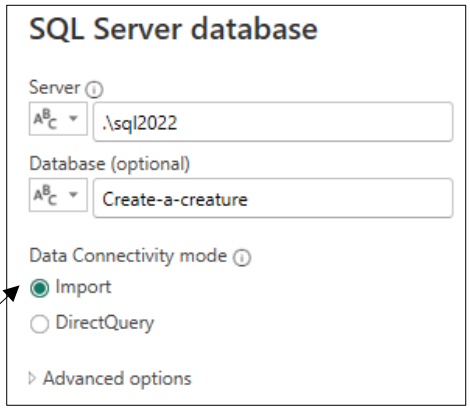
When you've finished configuring the text file, click the **Load** button to import it into your Power BI report.

1.5 Importing from SQL Server

You can import data from a SQL Server database as shown in the diagram below:

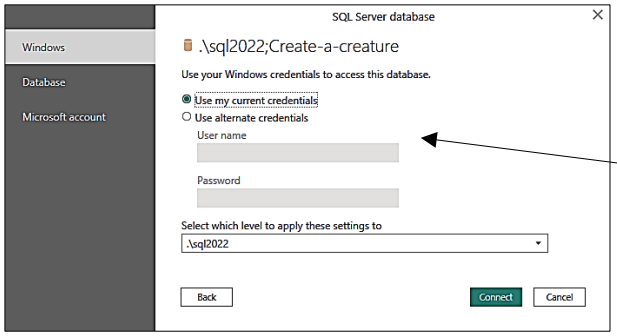


a) Like Excel, SQL Server has a dedicated import tool!

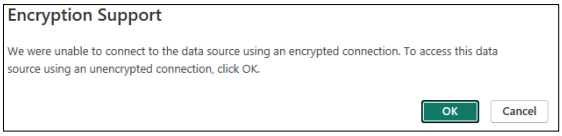


b) Enter a server name and, optionally, the name of a database.

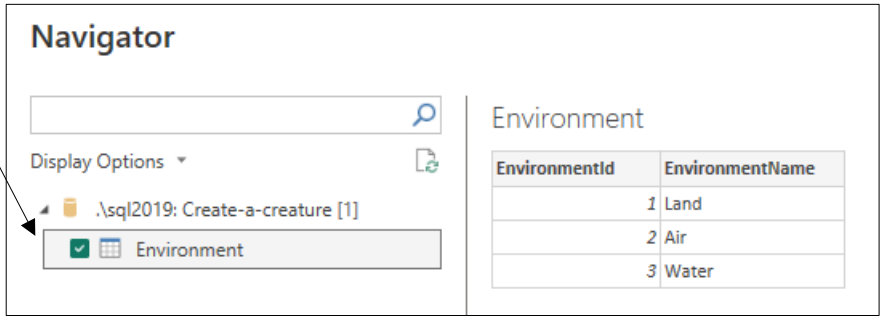
c) Choose to **Import** the data and then click **OK** (see the hint below for more on what **DirectQuery** means).



d) If required enter your credentials to connect to the server you have chosen. Click **Connect** when you've done so - you may then have to confirm you're happy to use an unencrypted connection:



e) In the next dialog box you can pick from a list of tables to import. Here we've chosen to import the **Environment** table.



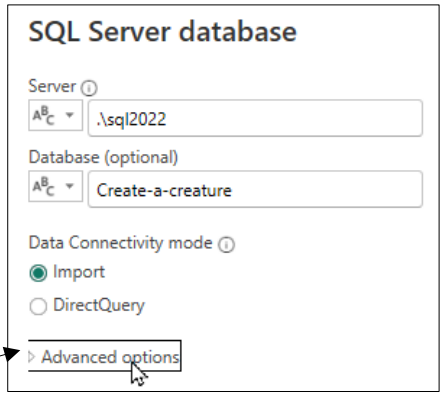
If you're wondering, DirectQuery *means you don't import the data into your model: you just link to it. On the plus side this means that the data in your visuals is always up to date, but on the downside reports may run more slowly, and there are numerous limitations (for example, you can only use a few types of data source and you can't use something called* calculated columns*).*

Using Queries and Stored Procedures

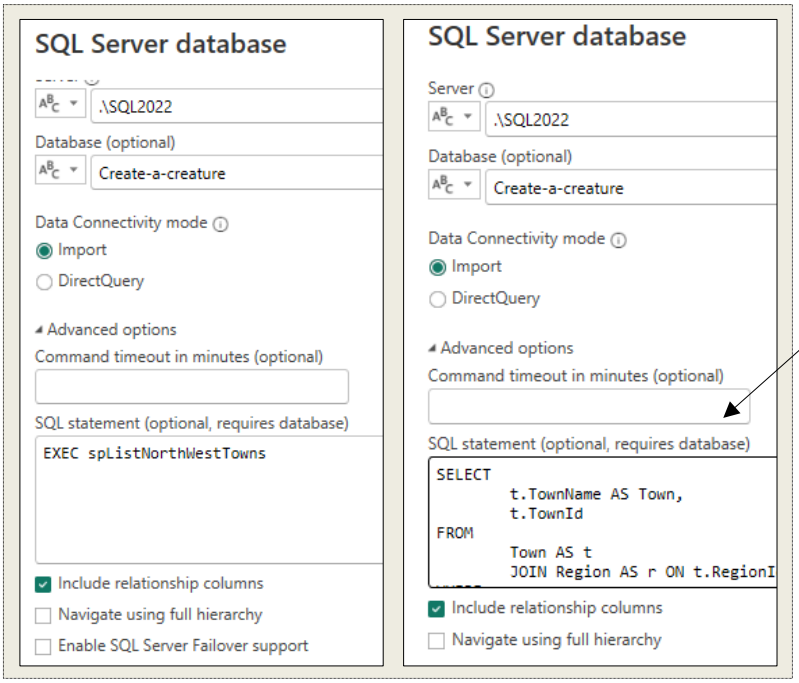
Rather than choosing to import from a list of tables, you can write a *query* to return your data. This is more complicated but provides much more control over which data you get.

```
USE [Create-a-creature]
GO

CREATE PROC spListNorthWestTowns
AS

-- list the towns in the North-West
SELECT
    t.TownName AS Town,
    t.TownId
FROM
    Town AS t
    JOIN Region AS r ON t.RegionId = r.RegionId
WHERE
    r.RegionName = 'North West'
```

a) It's much easier to test your query in SQL Server Management Studio than it is to type it into Power BI! When your query or stored procedure is working, copy the query text or the name of the stored procedure to the clipboard.



b) While loading SQL Server data, choose to show advanced options.



c) Choose either to execute a stored procedure (left) or run a query (right). Either option will then let you load your data:

.\sql2022: Create-a-creature

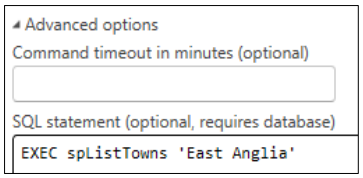
Town	TownId
Aintree	1
Altrincham	3
Ashton Under Lyne	6
Birkenhead	18
Blackburn	20
Bolton	21
Bootle	22

Be careful: Power BI Desktop seems to have a preference for choosing **Direct Query** when you load data from SQL Server like this; be sure to set this back to **Import**.

Passing Arguments to Stored Procedures

Note that you can now pass arguments to a stored procedure using these advanced options:

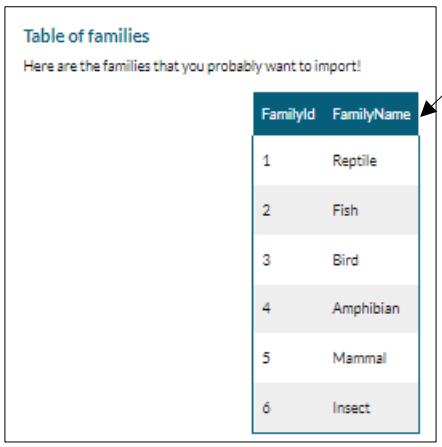
Here we have a stored procedure listing out all the towns for any given region. We could load this as follows:



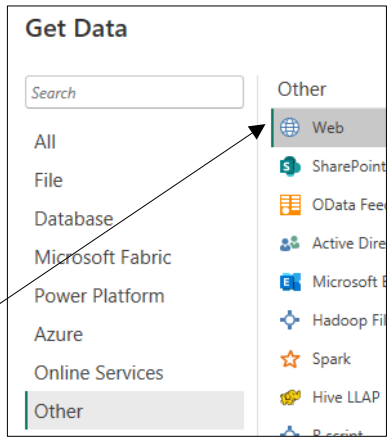

```
CREATE PROC spListTowns(
  @region varchar(100)
)
AS

-- list the towns in any given
region
SELECT
  t.TownName AS Town,
  t.TownId
FROM
  Town AS t
  JOIN Region AS r ON t.RegionId
= r.RegionId
WHERE
  r.RegionName = @region
```

1.6 Importing from a Website

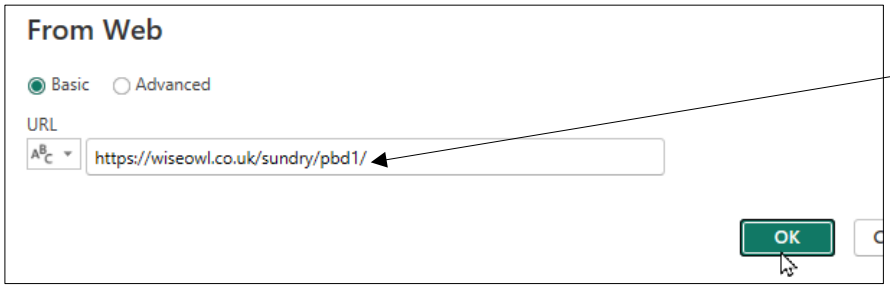
Power BI Desktop makes it easy to grab data from a website, as shown below:



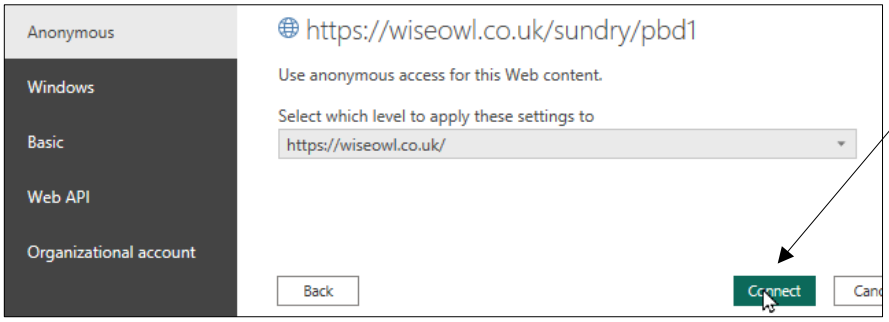
a) Find a website which contains a table of data that you want to import (this one is at wiseowl.co.uk/sundry/pbd1/).



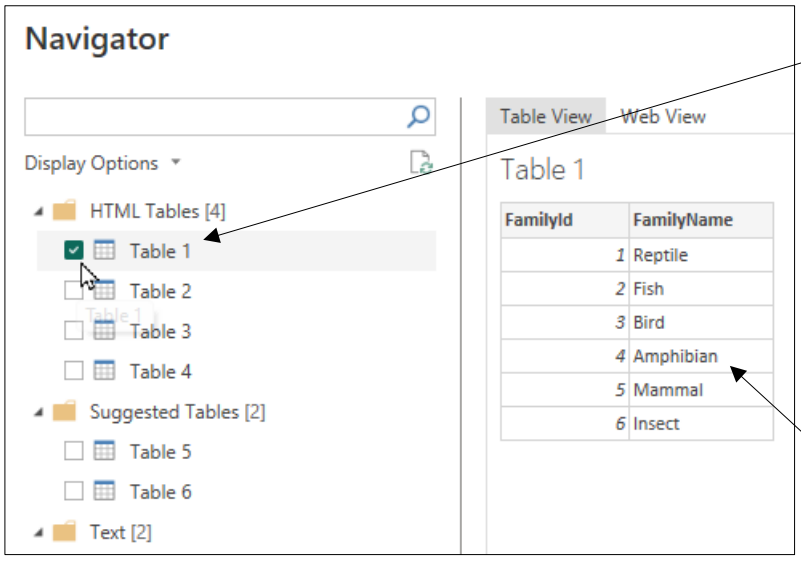
b) Choose to get data from a **Web** source in the **Other** category.



c) Enter the URL of the page containing the table you want to import and click **OK**.



d) If this is the first time you've connected to this page you'll be asked if you want to use any credentials. Here we're opting to connect to the site anonymously.



e) Tick the box next to any table you want to import.

f) Choose one of these buttons to load the data directly or to further process it before loading:

1.7 Entering Data Manually

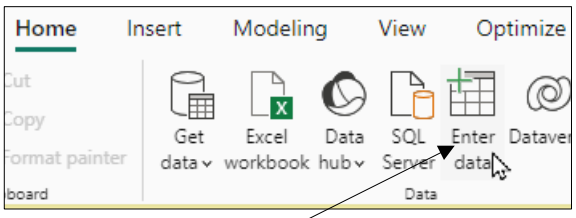
As well as importing existing data, Power BI Desktop allows you to enter data into a model manually.

Pasting Data

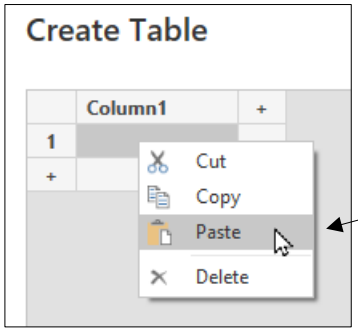
Although you can't import directly from Word, you can copy and paste:

HabitatId	HabitatName	EnvironmentId	BackColour	ForeColour
1	Grasslands	1	Light green	Black
2	Forest	1	Dark green	White
3	Fresh water	3	LightBlue	Dark blue
4	Salt water	3	#78aaf5	White
5	Desert	1	#d6a740	Black

a) In Word, select the table you want to import and copy it.



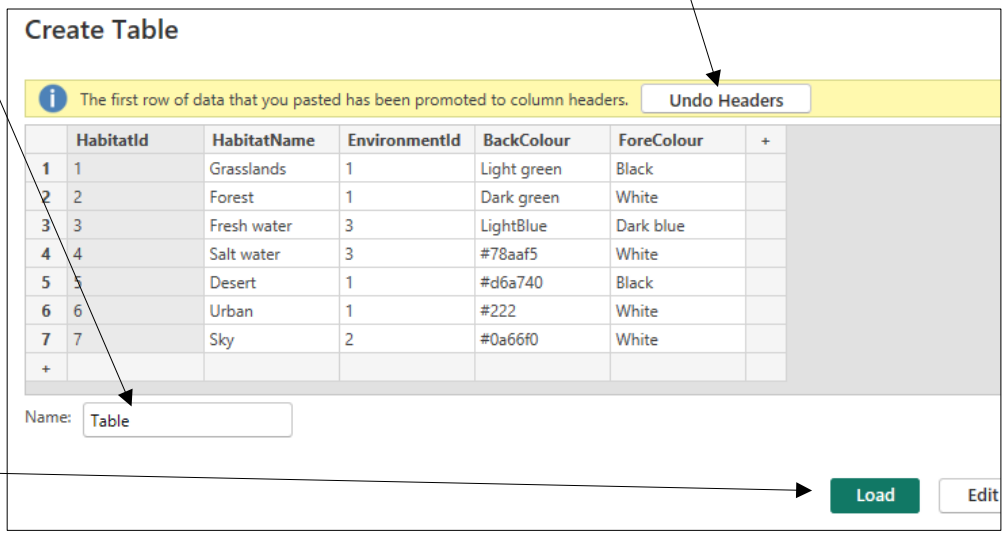
b) Click on this button to enter data into a new table.



c) Right-click on the empty grid and choose to paste in your data.

d) *Power BI Desktop* will decide whether the first row of your table should become the header columns.

e) Give your table a better name.



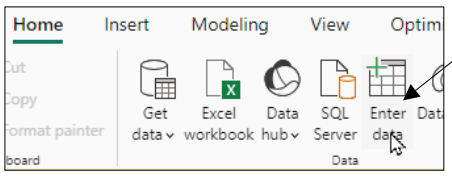
	HabitatId	HabitatName	EnvironmentId	BackColour	ForeColour
1	1	Grasslands	1	Light green	Black
2	2	Forest	1	Dark green	White
3	3	Fresh water	3	LightBlue	Dark blue
4	4	Salt water	3	#78aaf5	White
5	5	Desert	1	#d6a740	Black
6	6	Urban	1	#222	White
7	7	Sky	2	#0a66f0	White

f) Choose to **Load** it into your data model.

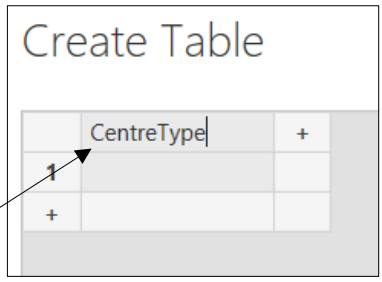
If you copy and paste data, you obviously won't be able to refresh the resulting table to bring in updates.

Typing in Data

The final option for loading data into a model in *Power BI Desktop* is to type it in!



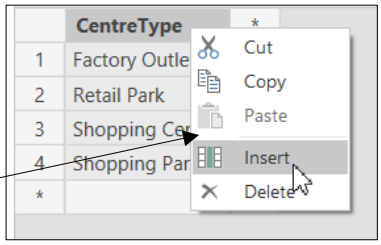
a) From the ribbon select this icon to enter data.



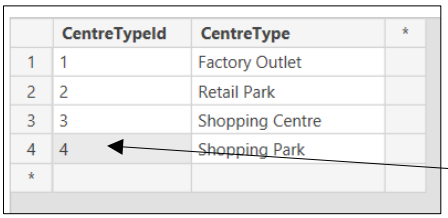
b) You can overtype any column name to rename it.

	CentreType	*
1	Factory Outlet	
2	Retail Park	
3	Shopping Centre	
4	Shopping Park	
*		

c) Type in the data that you want to store in the table.

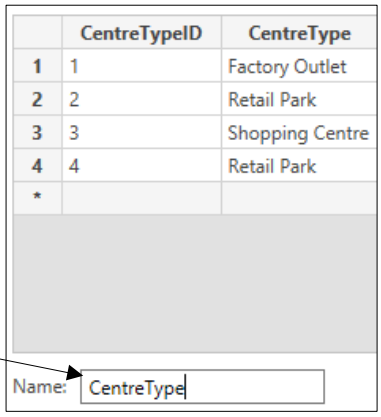


d) Right-click to insert any additional columns that you need.



	CentreTypeId	CentreType	*
1	1	Factory Outlet	
2	2	Retail Park	
3	3	Shopping Centre	
4	4	Shopping Park	
*			

e) Type in any data for new columns that you've added.



	CentreTypeID	CentreType
1	1	Factory Outlet
2	2	Retail Park
3	3	Shopping Centre
4	4	Retail Park
*		

Name: CentreType

f) Give the table a name and click **Load** to add it to the report.

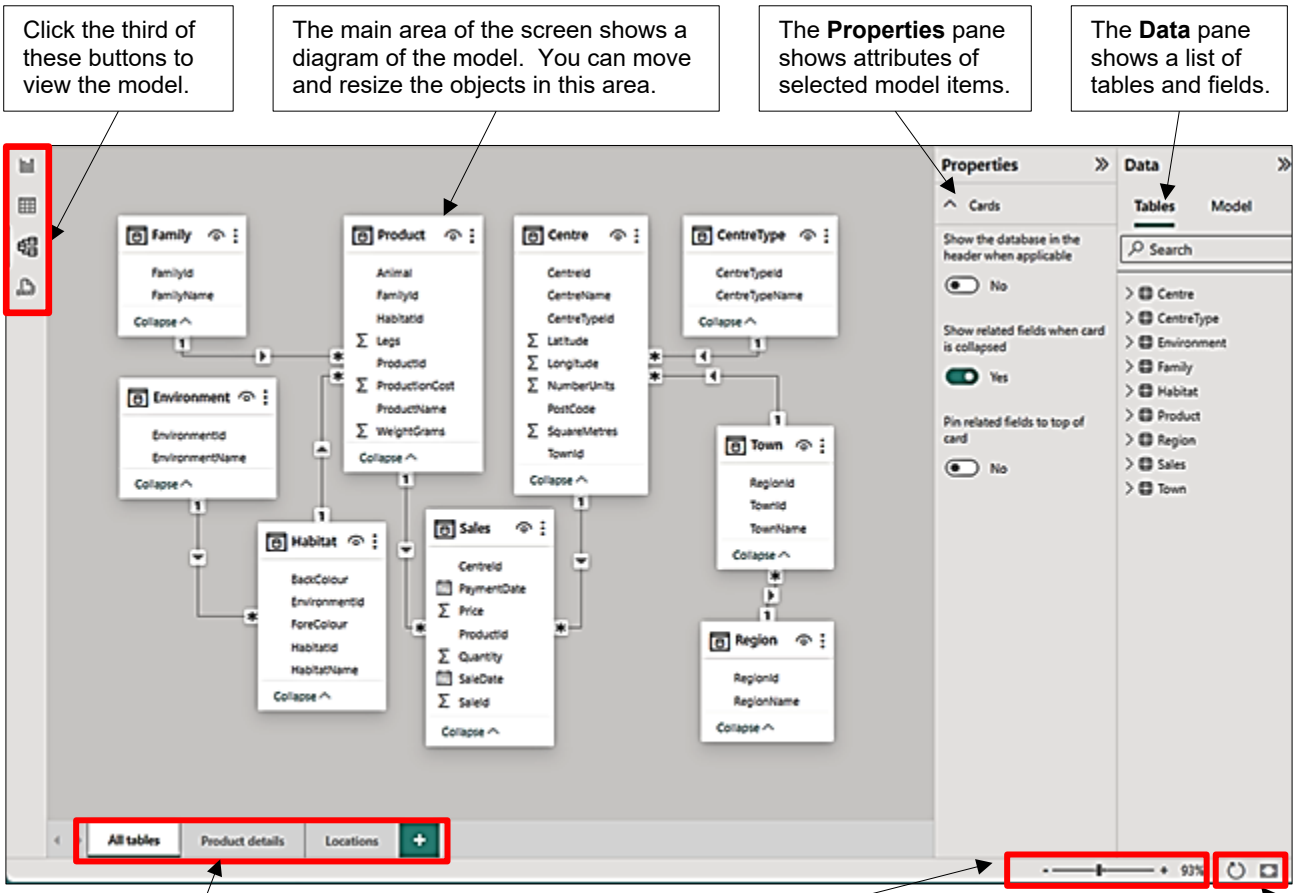
CHAPTER 2 - DATA MODELS

2.1 Data Models

Every table that you import into a report belongs to a single *data model* (or *semantic model*). This model holds information on how all the tables you have imported are related.

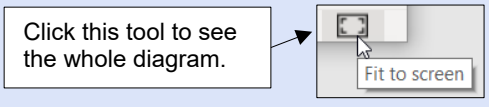
Viewing a Model

After you've imported some data you can see your data model in **Model** view:



Wise Owl's Hint

You can click the button in the bottom right corner of the screen to see the entire diagram. This is useful when you can't find a table you have imported!



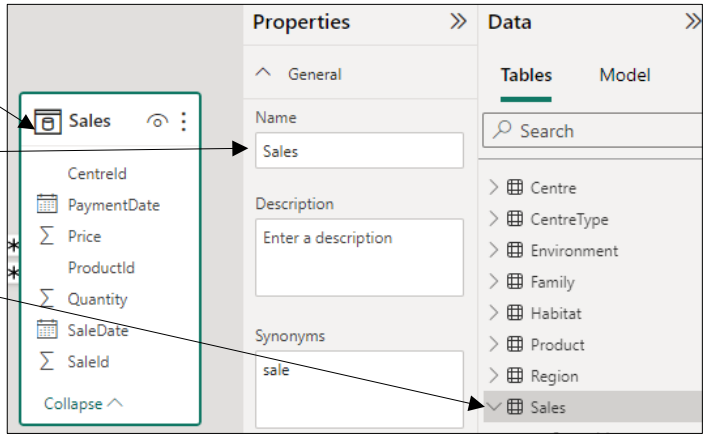
Selecting Single Model Items

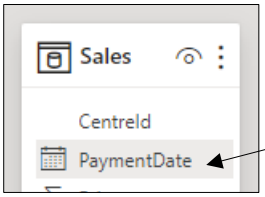
You can manipulate model items in a variety of ways once you've selected them. You can select a single table or field in a model by clicking on it in the diagram or the **Fields** pane.

Click the title of a table in the diagram to select it.

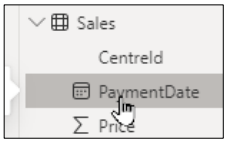
The **Properties** pane will show attributes of the item you have just selected.

Selecting an item in the diagram selects the same item in the **Fields** pane. The reverse is also true.





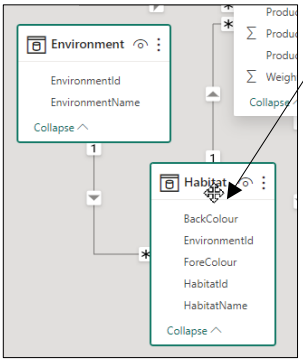
You can click the name of a field in the diagram to select it. You could also select the field in the **Fields** pane – the same item will be selected in the diagram if you do so.

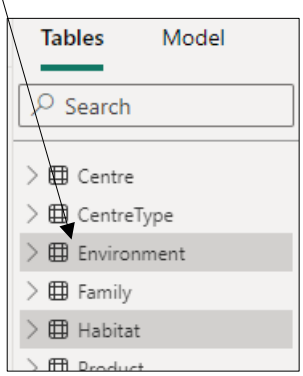


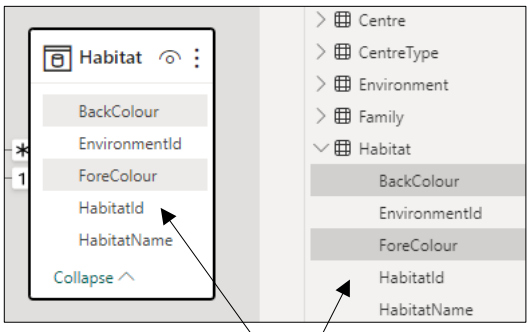
Selecting Multiple Items

You can select multiple tables or multiple fields in both the model diagram and **Fields** pane.

Hold Ctrl and click on multiple tables in the diagram or the **Fields** pane to select them (they are given green borders).





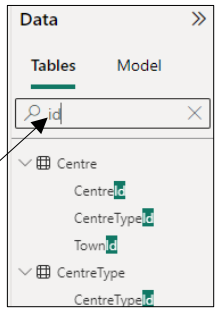


Hold Ctrl and click on multiple fields to select them. Selected fields are highlighted in the diagram and in the **Fields** pane.

Searching for Fields

It's useful to be able to search for fields:

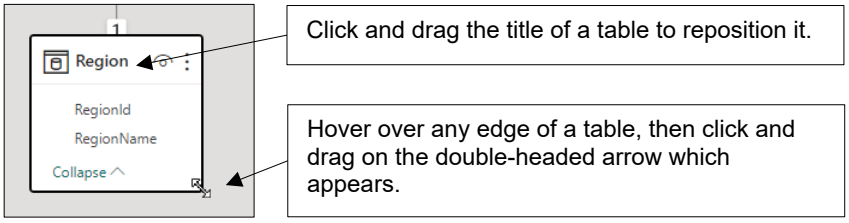
Type part of a table or field name in the search box at the top of the **Fields** pane. The list of items will be filtered to show only those which match your search phrase. You can then select the required items as usual.



2.2 Model Diagrams

Arranging Tables in a Model

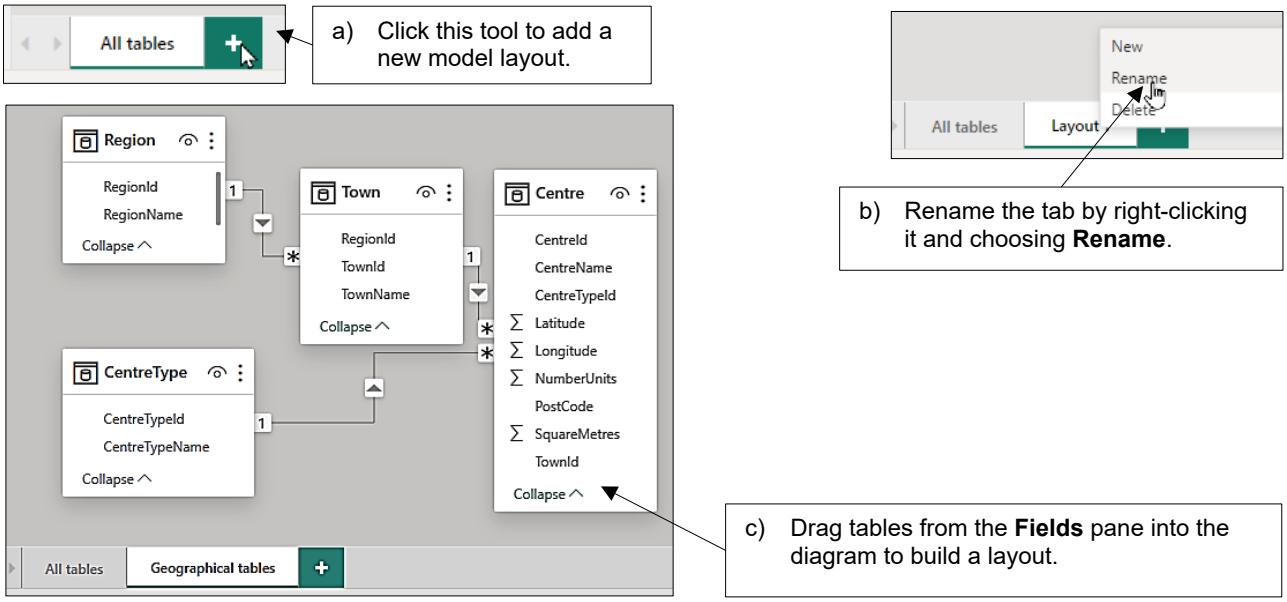
Power BI Desktop adds tables to a diagram in a fairly haphazard way. You can arrange the tables in a diagram by moving and resizing them.



You can resize multiple tables at the same time in this way: select the tables you want to resize, hover over any edge of any table and then click on drag on the double-headed arrow which appears.

Diagram Layouts

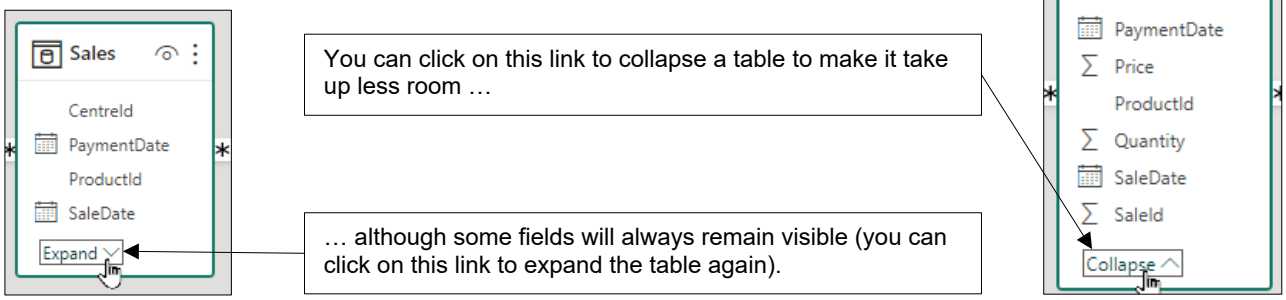
A report has only a single model, but you can create as many model layouts as you like. This is useful if you have a complex model and want a separate diagram to show the detail of part of it.



*Note that you can't remove tables from the first **All tables** layout (this will always show every single table that you've loaded into your model).*

Collapsing and Expanding Tables

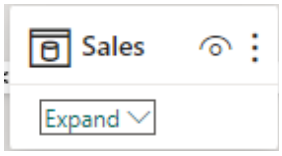
To avoid tables taking up too much room, you can *collapse* them:

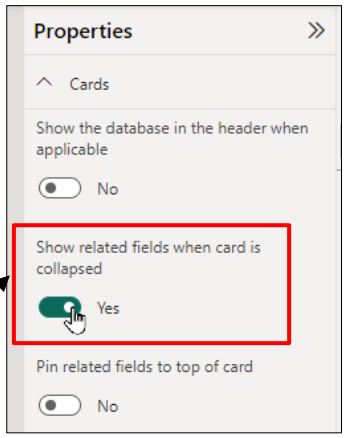


Controlling Expand/Collapse Field Visibility

You can control which fields you see when you expand or collapse a table by clicking on the background of model view and setting its *properties*:

If you want your collapsed tables to take up less room, unset this option. For the table above this would give the following if unset:

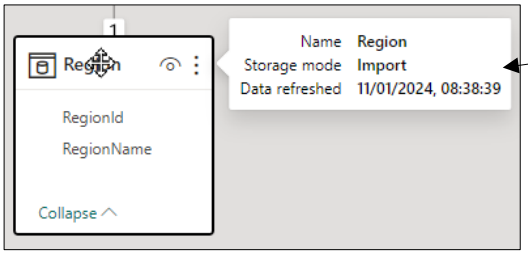




*Presumably the **PaymentDate** and **SaleDate** fields appear as related fields because Power BI sets up a date hierarchy for them, which involves a hidden relationship to a hidden internal calendar table.*

Seeing Table Information

You can hover over any table's header to see when it was last refreshed, and how:

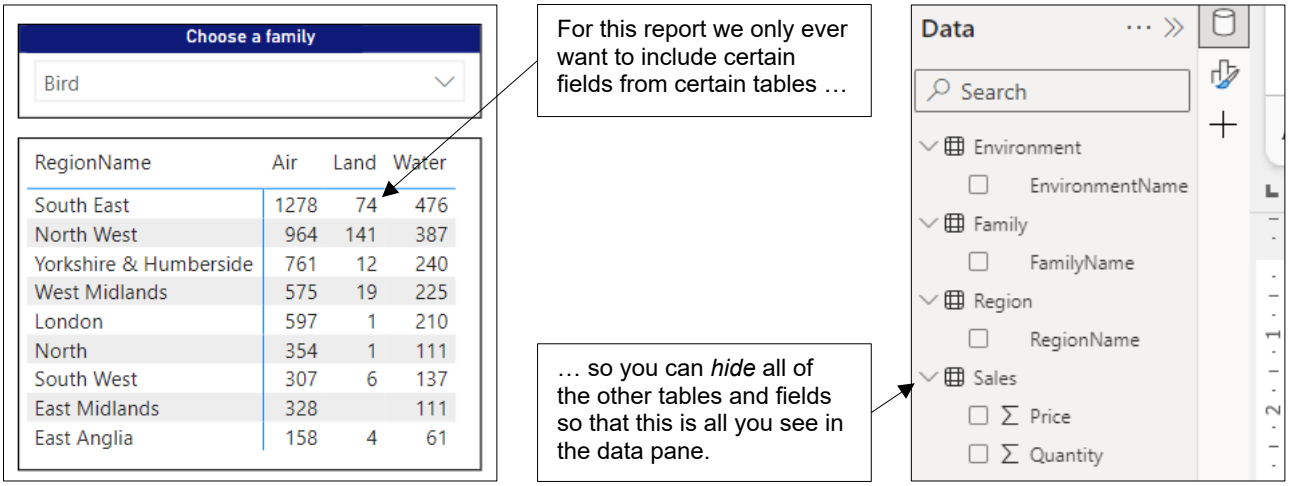


The precision of the time update is a bit more than you'd normally need! This table was imported (rather than being linked to using Direct Query).

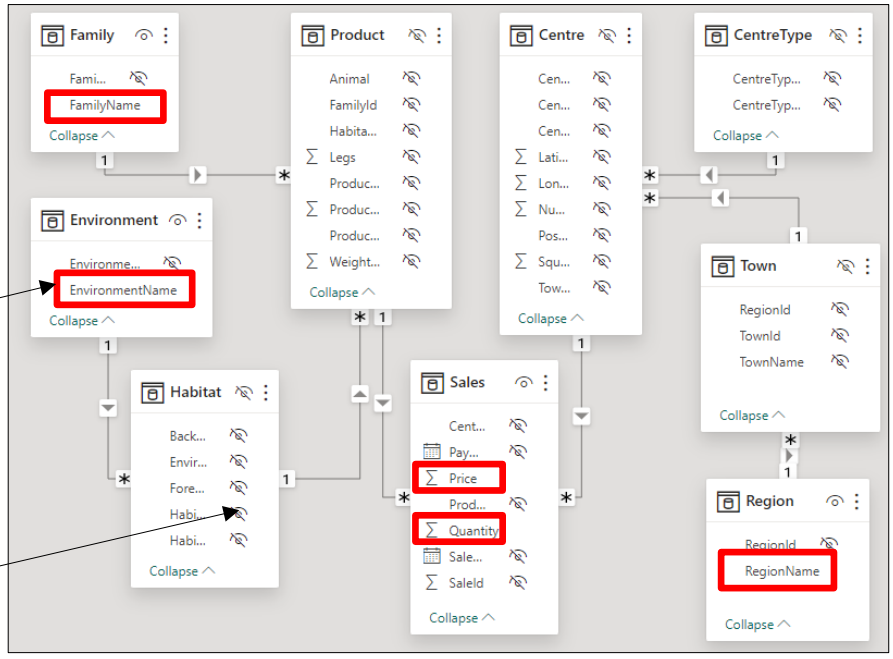
2.3 Hiding Objects

Why you might Want to Hide Tables and Fields

Often you will want to avoid cluttering up your data pane and confusing your report creator:



Here's what the data model might look like for this example:

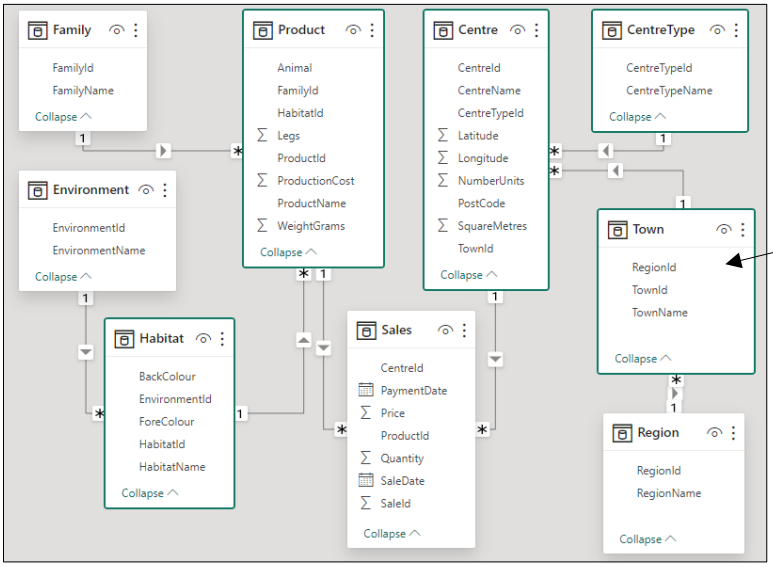


The only fields which we haven't hidden are shown in the red boxes.

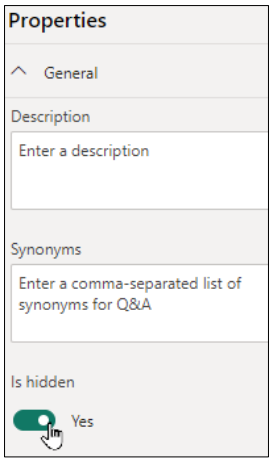
The crossed-out eye symbol next to a table or column name shows that it will be hidden when you come to create your report.

Hiding Tables

The easiest way to hide multiple tables is as follows:



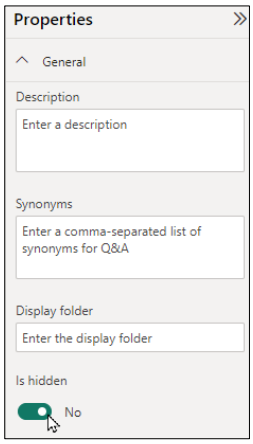
Use the Ctrl key to select the **Habitat**, **Product**, **Town**, **Centre** and **CentreType** tables, then change this option in the **Properties** pane:

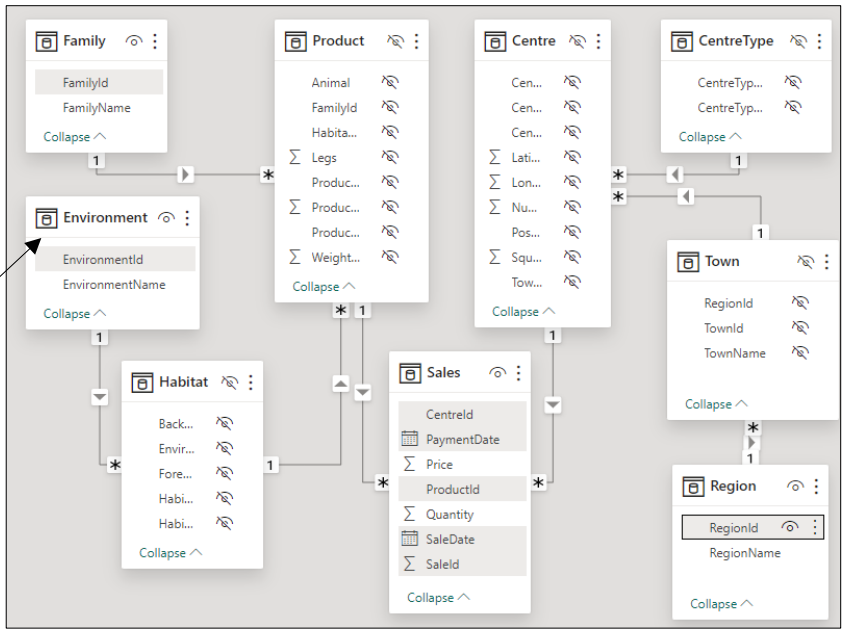


Hiding Fields/Columns

You can hide fields in a similar way:

Use the Ctrl key to select unwanted fields in the **Family**, **Environment**, **Sales** and **Region** tables then choose to hide the fields you have just selected:





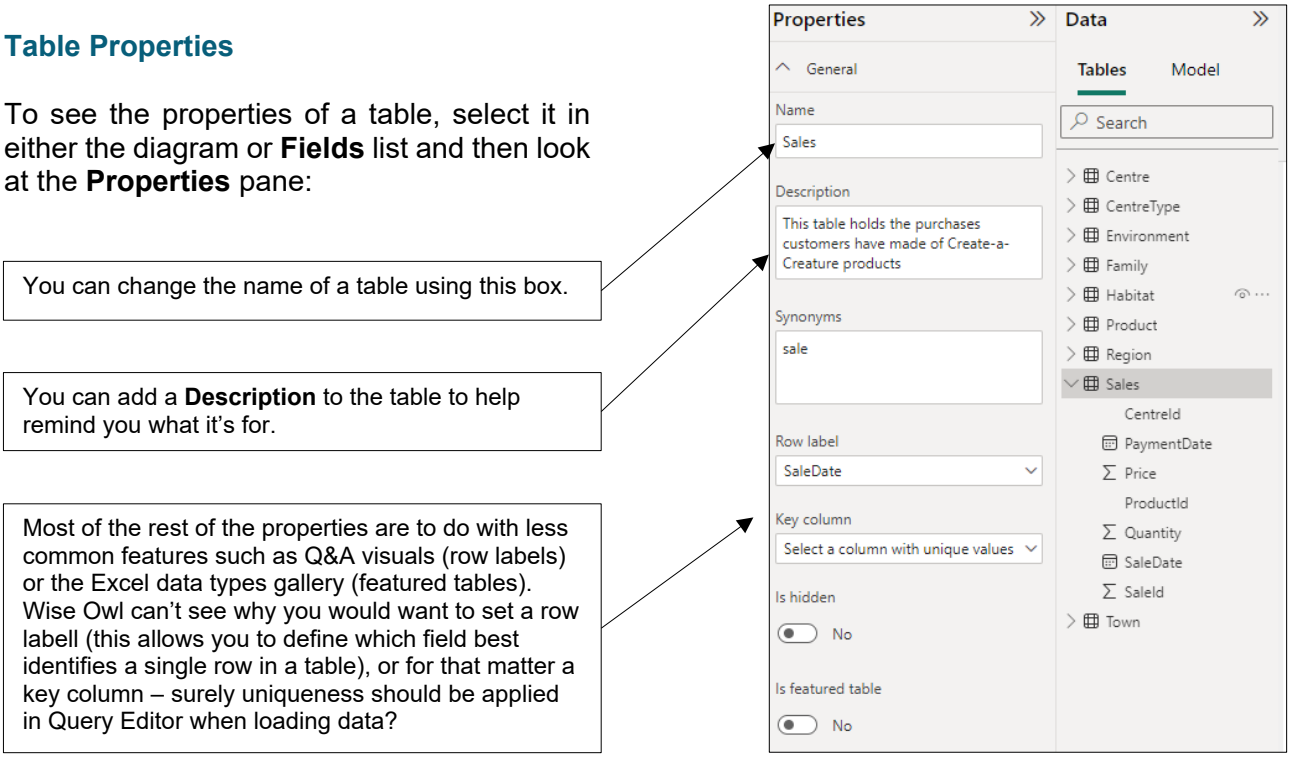
*You can also right-click on tables and fields then tick or untick the **Hide in report view** option to hide or display them.*

2.4 Model Properties

The tables and fields in a model have a variety of *properties*, many of which can be changed to make your model easier to use when creating reports.

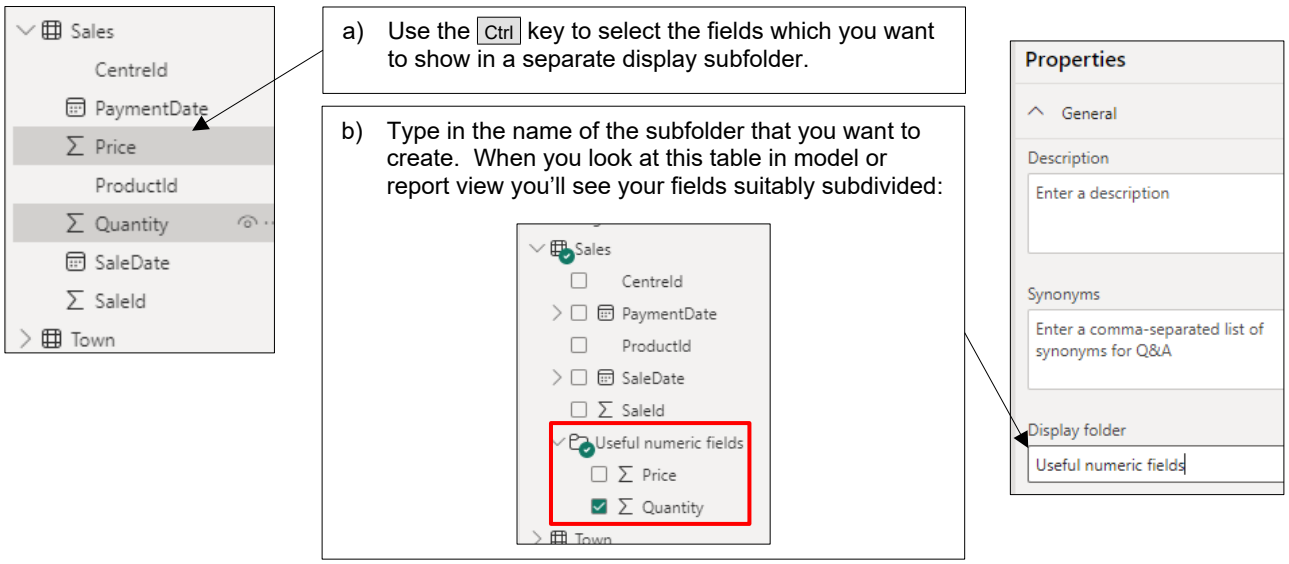
Table Properties

To see the properties of a table, select it in either the diagram or **Fields** list and then look at the **Properties** pane:



Display Folders

You can view and alter the properties of a field in the same way as for a table. One useful application for this is to divide fields into different *display folders*:

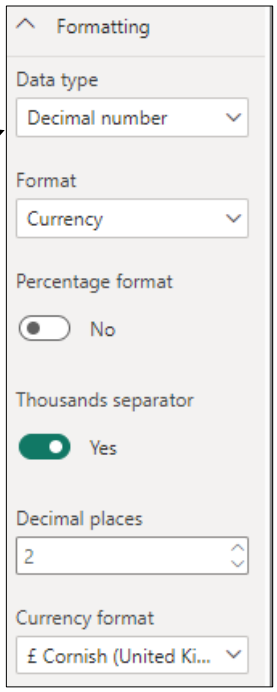


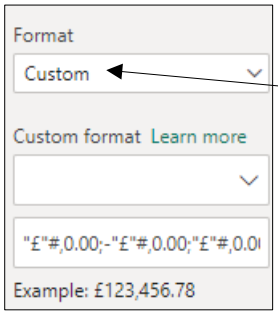
Default Number and Date Formatting

This is probably the best way to set a default format for any field:

You can choose a standard number or data format from the dropdown list (the example shown here would display the selected field, price, with 2 decimal places and a leading £ sign).

RegionName	Average of Price
East Anglia	£6.93
East Midlands	£7.25
London	£7.20
North	£7.02



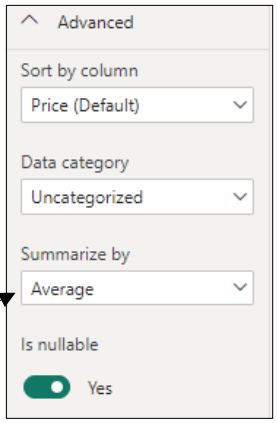


Alternatively you can choose **Custom** and type in a number format using almost the same rules as for Excel. Custom formats are particularly useful for dates – for example you could type in a format of **dddd dd mmmm yyyy** to display 9/11 as Tuesday 11 September 2001.

Changing the Default Aggregation for a Field

When you add a price to a visual, you'll usually want to average, not sum it:

By default Power BI will sum numerical fields, but you can change the default aggregation to a different function, as here.



2.5 Relationships

The Need for Relationships

If you are taking fields from more than one table, the tables must be directly or indirectly linked for the answer to make any sense.

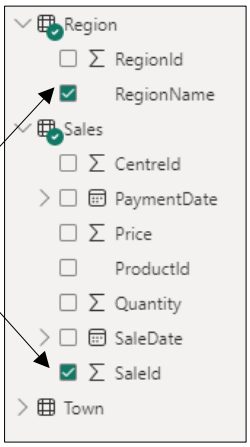
RegionName	Count of SaleId
East Anglia	32471
East Midlands	32471
London	32471
North	32471
North West	32471
South East	32471
South West	32471
West Midlands	32471
Yorkshire & Humberside	32471
Total	**32471**

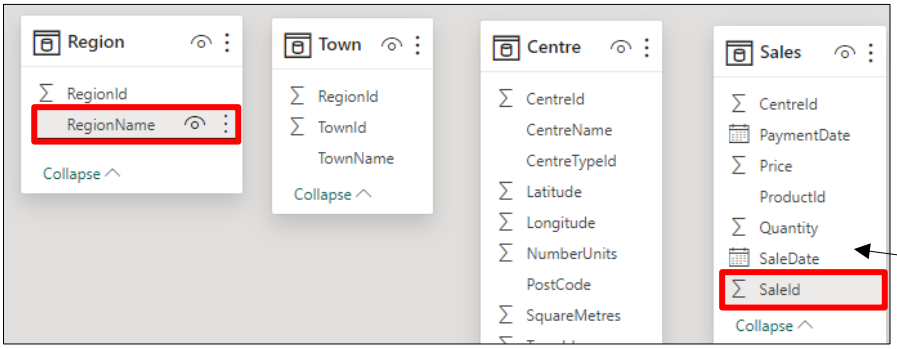
This table is meant to be showing the number of purchases made for each region, but the answer is 32471 in each case.

The fields included are as follows:

- **SaleId** from the **Sale** table;
- **RegionName** from the **Region** table.

These are shown in the diagram below.





The problem is that we haven't told *Power BI Desktop* how the region, town, centre and sales tables link together.

Parent-Child Relationships

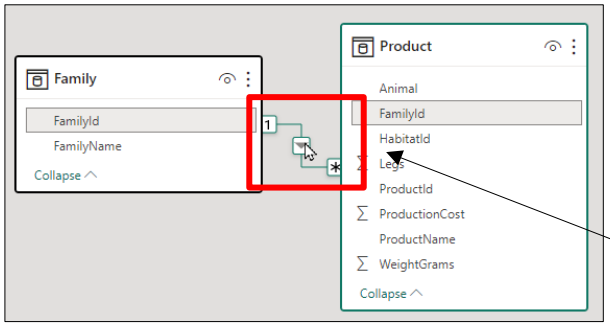
Nearly all relationships are one-to-many, or parent-to-child. Here's what this means:

ProductId	ProductName	Animal	HabitatId	Legs	FamilyId
1	Sammy	Snake	1	0	1
2	Pokyo	Penguin	4	2	3
3	Fenella	Frog	3	4	4
4	Layla	Lemur	2	2	5
5	Dave	Dachsund	1	4	5
6	Kylie	Camel	5	4	5
7	Jeremy	Jackdaw	7	2	3
8	Faye	Fox	6	4	5
9	Oliver	Owl	7	2	3

For example, the **FamilyId** is repeated multiple times in the **Product** table (since two or more products can obviously belong to the same family).

FamilyId	FamilyName
1	Reptile
2	Fish
3	Bird
4	Amphibian
5	Mammal
6	Insect

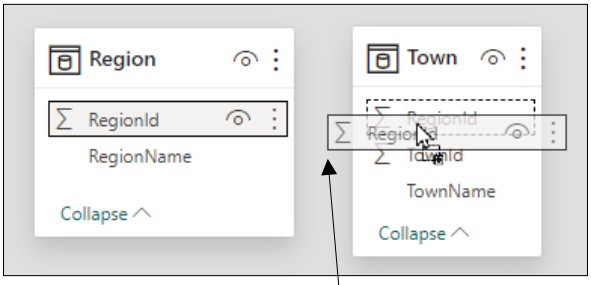
However, in the **Family** table the **FamilyId** is unique, since each family appears once and once only.



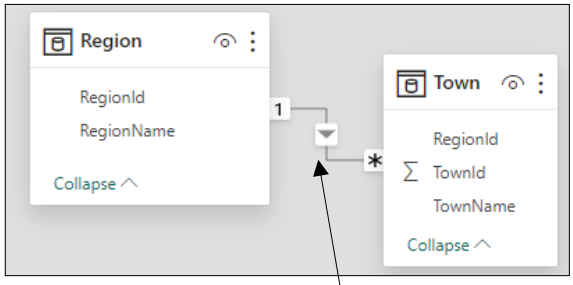
The parent end of the relationship is shown with a **1**, and the child end with a *. For this example, *Power BI Desktop* is showing that each single family can have multiple products within it.

Creating a Relationship

To link two tables, drag the common field from one to the other:



For example, here we're dragging the **RegionId** field from the **Region** table onto the **RegionId** field in the **Town** table …



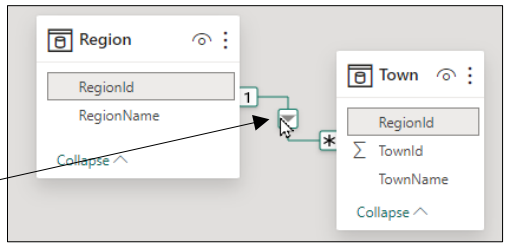
… to create a relationship like this when you release the mouse button.

Note that it usually doesn't matter which way round you drag (Town-to-Region or Region-to-Town), as Power BI will work out from the underlying data which is the parent and which the child.

Editing Relationships

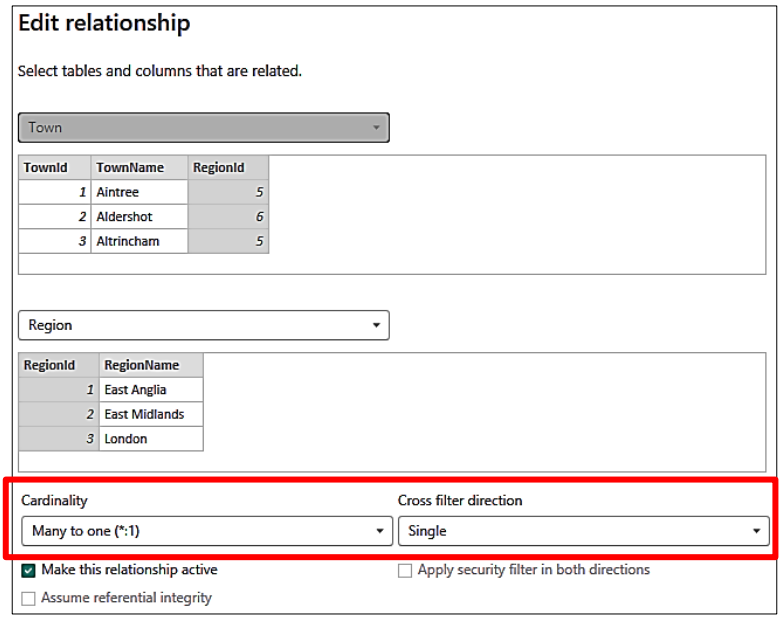
Sometimes you'll need to change relationships created (and in any case, it's always nice to have a nosey):

a) Hover over the relationship symbol, and *Power BI* will show you which columns are involved from the two tables. You can then double-click on the symbol to edit the relationship.



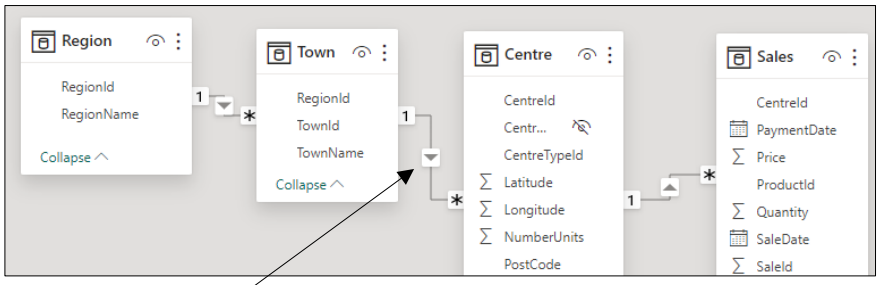
b) For some reason the software always shows the child (many) end of the relationship first. Because each region can contain lots of towns, the **Town** table appears first.

c) It is very unlikely that you'll need to change the cardinality. The **Cross filter direction** can be either **Single** or **Both** – see overleaf for more on this.



The Effect of Relationships

Suppose that for our example you create the extra relationships:



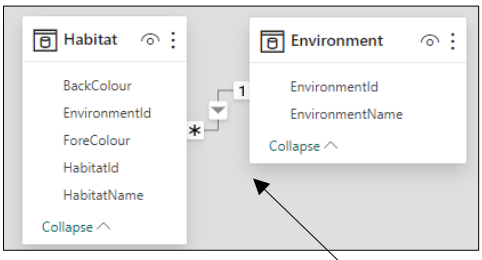
RegionName	Count of SaleId
East Anglia	1074
East Midlands	2050
London	4167
North	2068
North West	5570
South East	8094
South West	1935
West Midlands	3799
Yorkshire & Humberside	3714
Total	**32471**

As a rule of thumb, you should usually ensure that you link all tables you've loaded into your model.

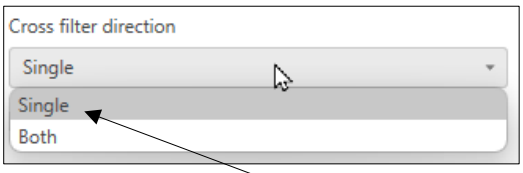
You can now see for each region how many sales were made within it.

Cross-Filter Direction

To see how this property works, consider the relationship between environments and habitats:

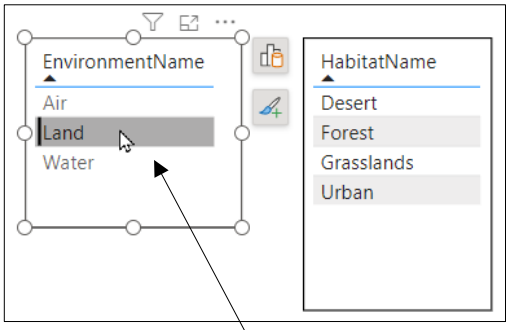


Each environment on the right can have one or more habitats.

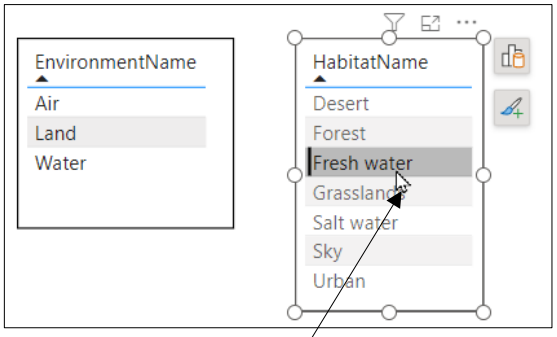


You can set this property for a relationship to **Single** or **Both**. By default it will normally be **Single** for a relationship like this.

When you choose an environment, it will affect the list of habitats, but the converse is not true:



If you choose **Land**, for example, the list of habitats will contract from those shown to just the land ones …



… whereas if you choose **Fresh water**, for example, the environments listed won't change.

However, if you change the cross-filter direction to **Both** the filter will work both ways.


Wise Owl
Training


Wise Owl
Training


Wise Owl
Training


Wise Owl
Training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Training


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Training


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Training


Wise Owl
Training

What we do!

		Basic training	Advanced training	Systems / consultancy
Office	Microsoft Excel			
	VBA macros			
	Office Scripts			
	Microsoft Access			
Power BI, etc	Power BI and DAX			
	Power Apps			
	Power Automate (both)			
SQL Server	SQL			
	Reporting Services			
	Report Builder			
	Integration Services			
	Analysis Services			
Coding	Visual C#			
	VB programming			
	MySQL			
	Python			


Wise Owl
Training