
OpenGround Power BI Connector

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Introduction

This guide will enable you to install the OpenGround Power BI Connector, run the example reports using your own data and to design your own reports.

You will need Power BI installed on your machine and access to an OpenGround account to complete all sections.

This guide is not an introduction to Power BI and assumes you have some experience of linking Power BI to datasets and creating basic reports.

M is the programming language that Power BI Query Editor uses. This guide covers how to collect data from OpenGround using M but does not cover the many ways to manipulate data. It is recommended that you visit [Microsoft's Quick Tour pages](#) to learn more about this powerful language.

This guide includes examples reports & templates. These templates are available to download from Bentley Communities.

Installation

The OpenGround Power BI Connector is currently available for i5 cloud users. It can be installed & launched from the OpenGround Launcher.

Troubleshooting

If the OpenGround Connector does not work, then check the security settings and ensure the following option is selected as this release of the Power BI OpenGround Connector is not certified.

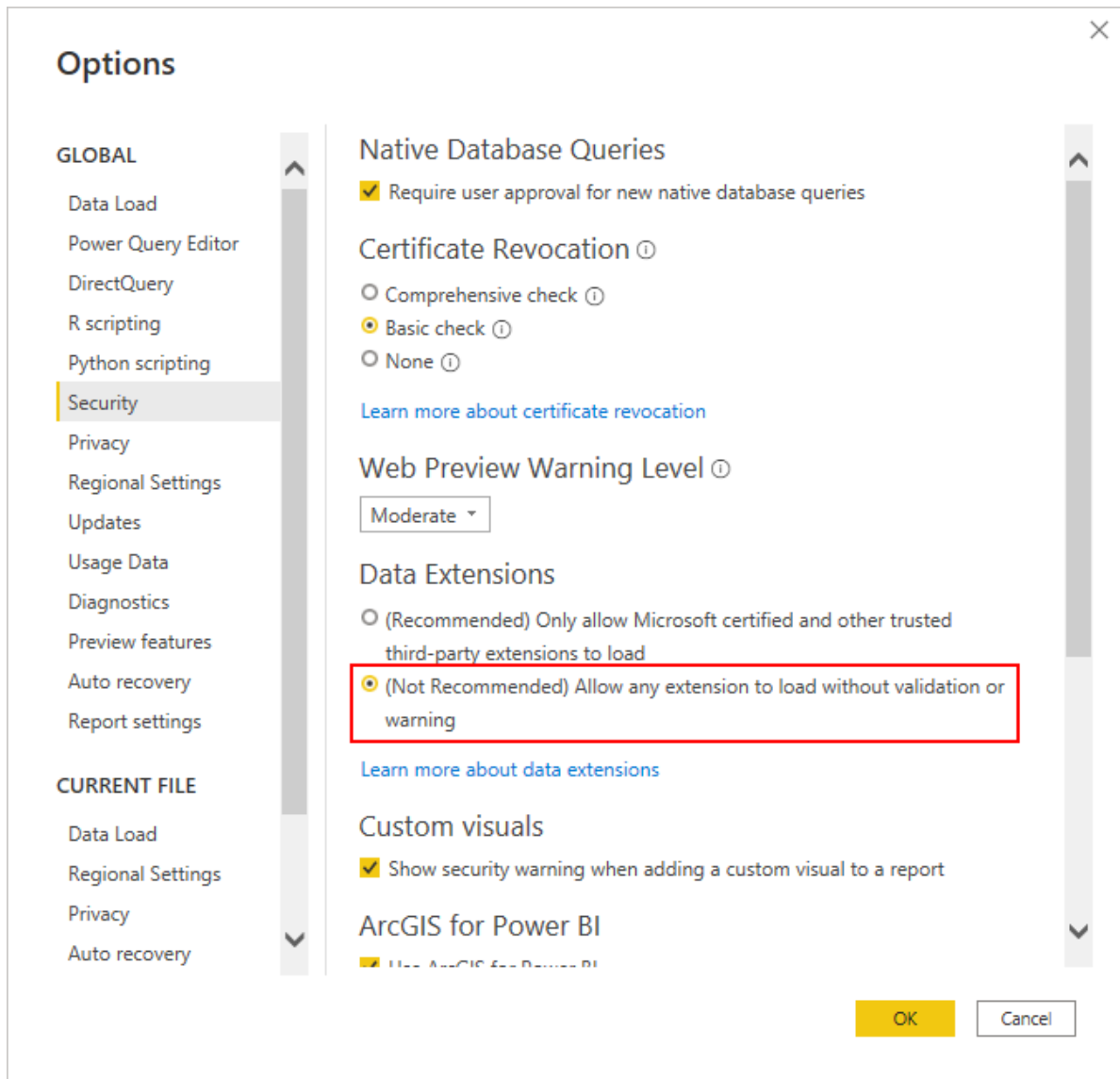


Figure 1 - PowerBI Security Options

Running Your First Reports

This section runs through three of the included reports. More example reports can be downloaded from [Bentley Communities](#).

Report 1 - Cloud Parameters

The first report to run is the “Cloud Parameters” Report. This report displays the parameters you need to connect the data reports to your OpenGround instance.

1. Open the **Cloud Parameters.pbix** file downloaded with your installation and click the Refresh icon on the Power BI toolbar



Figure 2 - PowerBI Ribbon

- 1) This will trigger the OpenGround Connector to request you to log in to your OpenGround account. Click on "Sign in as different user" on the Bentley OpenGround login form (shown below).

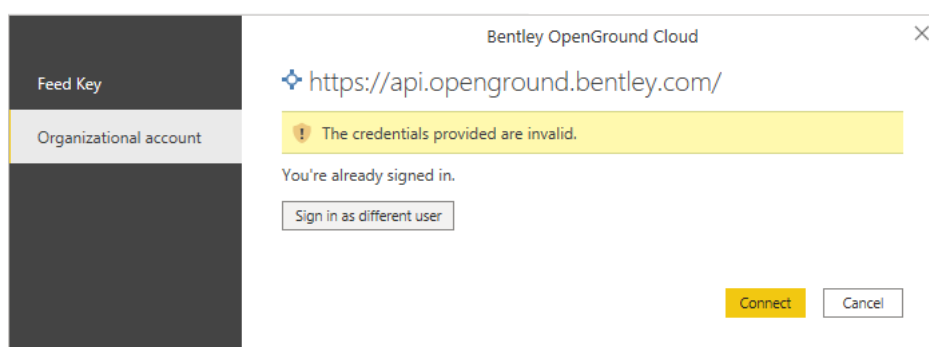


Figure 3 - Power BI Credential Manager

- 2) Login using your Bentley account and Allow the Request for Approval (shown below)



Figure 4 - Bentley/OpenGround IMS Authenticator

- 3) Click the Connect button on the Bentley OpenGround login form to complete the connection. The report will now be updated to display your cloud information.

Click Refresh and the list of OpenGrunds you have access to will be listed below. These values are needed in the other Power BI reports. For CloudID use the right click copy option and paste the value into the Power BI Parameters form

CloudRegion	CloudName	CloudID
eastus	BentleyUS	3378376c-0321-4ab2- XXXXXXXXXX

Figure 5 - OpenGround Cloud Parameters in PowerBI

Note: It is best to right-click on the values in the PowerBI Cloud parameters report and select Copy -> Value from the menu as you will need these parameters in later reports.

Report 2 – Location Count Report

The second report to run is the “Location Count” Report. This report will display statistical information about your projects in OpenGround and is a good example of a cross project PowerBI report.

To run the Locations Plotting example follow the steps below:

- 1) Double click on the **Location Counts.pbix** file to open the template in Power BI.
- 2) Enter your Cloud Parameters in the form below (see can be found using the Cloud Parameters report above)

Location Plotting

Display locations on a map

CloudID (1)

CloudRegion (1)

uknorth

CloudItems (1)

Load

Cancel

Figure 6 - Power BI Location Count Parameter Entry

- 4) OpenGround Connector may request you to log in to your OpenGround account again. Click on "Sign in as a different user" on the Bentley OpenGround login form (shown below).

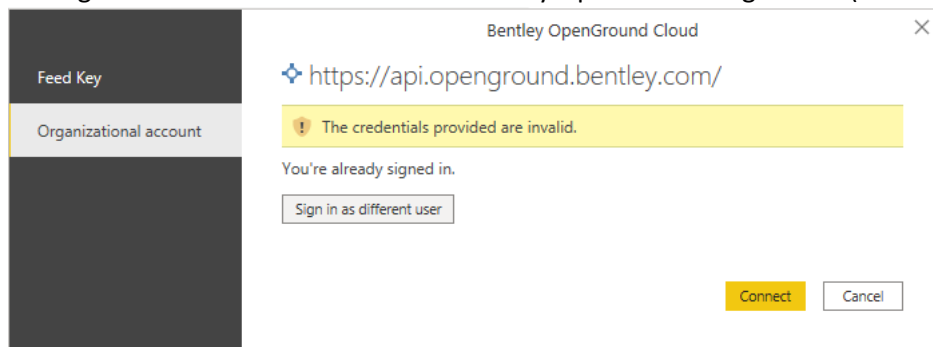


Figure 7 - PowerBI Credential Manager

Note: the login is requested a second time as this is logging into your cloud instance and the first report logged into the OpenGround Controller API. Once you have logged into your instance, you should not need to log in again.

- 5) Login using your Bentley account and Allow the Request for Approval (shown below)



Figure 8 - Bentley/OpenGround IMS Manager

- 6) Click the Connect button on the Bentley OpenGround login form to complete the connection. Once connected the data in the report will update and be displayed as shown below.

BentleyUK
OpenGround Cloud Name

29
Projects

2589
Locations

28.58K
Total Length

Project	Locations	Total Length
ATC Amendment to Newark Drive	11	1,343.47
ACME Gas Water Redevelopment	1	1.12
Boundary Styles	1	12.56
Bell Ring St	86	86.88
Barton Road Extension Phase 1	8	8.88
BURTON 2PHS TRAM STATION REPAIRS	54	243.88
Canterbury Project	2	40.18
Canterbury Converter	1	1.12
Canterbury Tunnel	11	154.18
CLIFTON ROAD TO SALFORD AND LONDON CITY AIRPORT	181	1,318.98
CLYDEWICK Extension	25	364.48
East West Rail Phase 2	1188	58,871.48
Grange Road	28	274.15
HOLMESIDE EAST (L100-WF2-WF3) (DITCH BAYTON)	34	774.28
LDW111	31	445.18
LMS	1	1.12
MARSH Key Stage 6	70	2,598.18
Mapping Config	27	275.08
Midlands	1	1.12
Midlands	1	1.12
Quarry Test Project	28	274.15
Redbridge Girdings	85	505.15
SHILLING STP FIBRE ACCESS	8	33.08
ST. JOHN'S BRICK, BANWICK STATION REPAIRS	8	37.08
Synthetic House Redevelopment	25	208.01
Test project for Clouds	27	375.08
U.S. Test Project	101	895.18
Westwood Station Example	1	1.12
Westwood Station	148	8,608.18
Total	2589	28,581.18

Figure 9 - PowerBI Location Summary Report

Note: You can save it as a standard Power BI report (extension *.PBIX) once you have entered the cloud information and run the report. Your cloud details are saved with the report so subsequent users will only need to open the report and click the refresh data to view the latest information.

Report 3 – Project Summary

The third report to run is the “Project Summary Example” Report. This report will display statistical information about a single project OpenGround and is an example of a single project PowerBI report.

To run the Project Summary Report follow the steps below:

- 1) Double click on the **Project Summary Example.pbix** file to open the template in Power BI.
- 2) Enter your Cloud Parameters and Project ID in the form below (see can be found using the Cloud Parameters report above)

Edit Parameters

ProjectID

CloudID (1)

CloudRegion (1)

CloudName (1)

- 3) Once connected the data in the report will update and be displayed as shown below.

Quinley Test Project

Project:

Locations

Type	Number	Length
CP	14	206.83
SCP	1	78
TP	14	54.5

Samples

Type	Number
C	1
Care	1
O	1
J	1
B	133
-2	
ES	27
CB	3
D	316
U	76
W	9

Geology

Geology	Top	Base
		0.00
BOULDER CLAY	25.00	0.00
COARSE GRANITE KIMBLOS	52.75	45.43
FILL	2.00	0.00
GLACIAL TILL	6.38	0.30
LIVESTONE	38.00	17.70
PEAT	4.00	0.10
SANDSTONE	49.40	24.00
Total	2.88	46.80

Figure 10 - PowerBI Project Specific Report

Editing reports

This section walks through the editing of existing reports.

Working with Advanced Editor

Power Queries collect the data from OpenGround. The Advanced Editor in Power Query is used to modify the Queries.

Follow the steps below to access the Advanced Editor.

- 1) Click on the Transform Data icon on your Power BI Report
- 2) Select the Query you want to edit on the Query list on the left-hand side of the Power Query Editor form.
- 3) Click the Advanced Editor icon on the Power Query Editor toolbar.

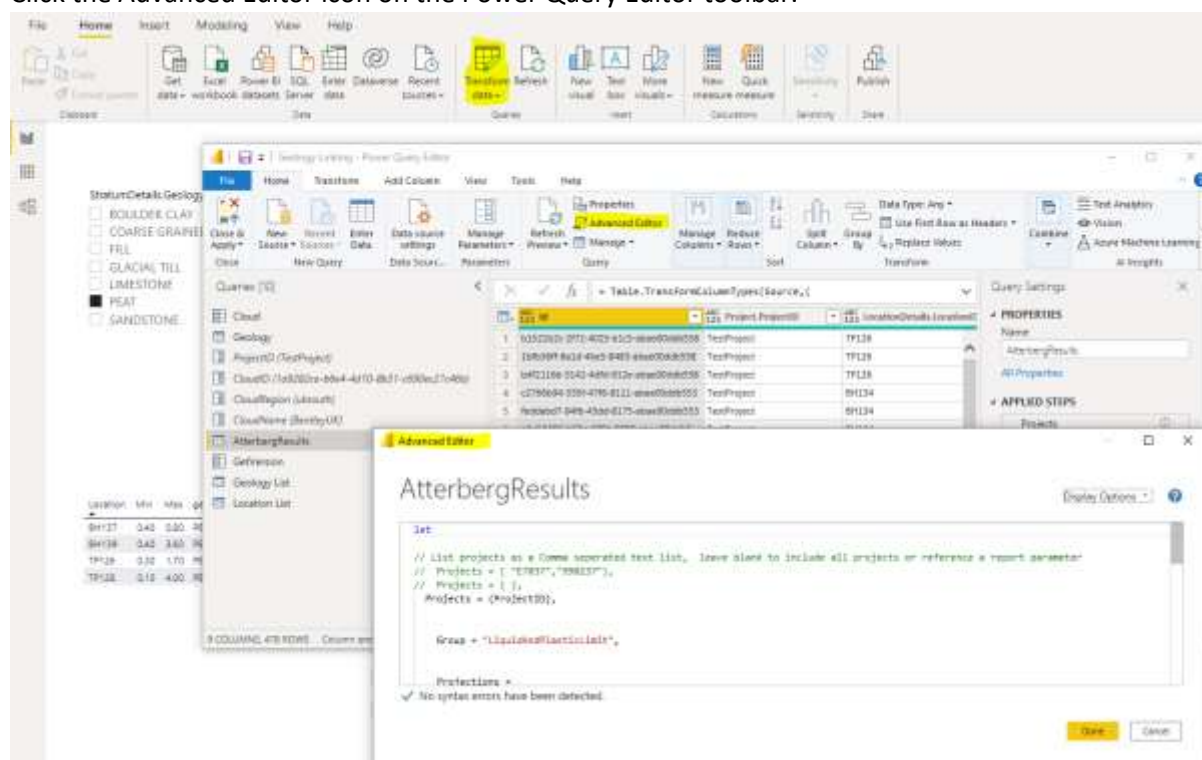


Figure 11 - PowerBI Advanced Editor & Power Query Windows

Syntax of a Query

The OpenGround.Query command collects the data from OpenGround and inserts it into a data object in Power BI.

An example use for the command is shown below.

```
let
    Projects = { }, // list of projects - leave blank for all projects. CSV list in quotes for fixed projects
    Group = "LocationDetails", /// groupname as it appears on the model manager
    Projections =
    {
        "Project.ProjectId",
        "Project.ProjectTitle",
        "LocationDetails.LocationID",
        "LocationDetails.FinalDepth",
        "LocationDetails.LocationType",
        "LocationDetails.LatitudeNumeric",
        "LocationDetails.LongitudeNumeric"
    },
    Filters = { },
    Groupings = { },
    Ordering = {},

    Source = OpenGround.Query(Cloud, Projects, Group, Projections, Filters, Groupings, Ordering)
in
    Source
```

Figure 12 - PowerBI OpenGround.Query Syntax

The command has seven parameters which are detailed below:-

1. Cloud – Name and details for the OpenGround Cloud to connect to.
2. Projects – Project, or list of projects, to query
3. Group – The Primary group to be queried.
4. Projections – The list of columns to return
5. Filters – Conditions that the data must meet to be returned
6. Ordering – the Order the data is to be returned.
7. Groupings – ways in which the data within each column is to be displayed

Cloud

The Cloud Variable comprises of three items, CloudID, Cloud Name and Region. It is usually set up as a query variable within the report and then referenced as using the query name. All the example reports are set up using this method and the Query and referenced parameters can be copied from any of these reports.

```
let
    Cloud = [
        Id = CloudID,
        Name = CloudName,
        Region = CloudRegion
    ]
in
    Cloud
```

Figure 13 - OpenGround.Query Cloud Syntax

If the report is for a single cloud then the parameters can be hardcoded into each query.

```

let
    Cloud = [
        Id = CloudID,
        Name = "BentleyUK",
        Region = "uksouth"
    ]
in
    Cloud

```

Figure 14 - OpenGround.Query with Hardcoded Cloud

Projects

The Projects parameter controls which projects are included in the Query.

The snippet below shows the three ways this parameter can be used.

```

// List projects as a Comma separated text list, leave blank to include all projects or reference a report parameter
// Projects = { "E7037", "990237"},
// Projects = { },
// Projects = {ProjectID},

```

Figure 15 - OpenGround.Query Snipped for Project Selection Choices

- 1) Include a comma-separated text list
- 2) Be left blank to include all projects
- 3) Include reference to a Power BI Report Parameter (LINK XXX) so the user can change it using the interface

Group

The Group Variable defines the group name in the Query. This is the group name as it appears in the Model Manager in OpenGround. Note the Groupname is likely to be different from the tab name as it appears in OpenGround so it is important to double-check the model manager to ensure you are using the right name.

```
Group = "StratumDetails",
```

Figure 16 - Highlighted Group Name in OpenGround Professional

Projections

The Projections variable defines which columns to return. The column list a comma-separated list of groupname.header values as shown below.

```
Projections =
{
    "LocationDetails.LocationID",
    "StratumDetails.DepthTop",
    "StratumDetails.DepthBase",
    "StratumDetails.GeologyCode",
    "StratumDetails.LegendCode"
},
```

Figure 17 - OpenGround.Query Header Selection Syntax

The Heading name must be the same as it appears in the Model Manager in OpenGround and not the column name as it appears in the user interface.

Edit Heading (StratumDetails - DepthTop)

Database Options

Column Name: **DepthTop**

Data Type: Decimal

Decimal Places: Small (3dp)

Is Depth: ☒

Figure 18 – Highlighted Heading Names in OpenGround Professional Model Manager

Projections can reference Parent tables or linked tables using the same construct, for example in the above example the LocationID is referenced from the LocationDetails Group.

The Projections variable should be left blank if Groupings variable is used.

Groupings

The Groupings parameter is a collection of Groupby values. Each Groupby value has a Group, Header and Aggregate value.

Groupings Parameter has the syntax `{[Group="",Header="",Aggregate=""],[Group="",Header="",Aggregate=""],etc}`.

All headings must appear in the Groupings variable. Headings can appear more than once but must have different aggregate command

Column names returned are returned as "Header & Aggregate"

	Project.ProjectID	Project.ProjectTitle	1.2 StratumDetails.DepthTop Min	1.2 StratumDetails.DepthBase Max	1.2 StratumDetails.GeologyCode
1	TestProject	Quinley Test Project	0	null	null
2	TestProject	Quinley Test Project	0	33	BOULDER CLAY
3	TestProject	Quinley Test Project	-49.4	52.7	COARSE GRAINED IGNEOUS
4	TestProject	Quinley Test Project	0	2.6	FILL
5	TestProject	Quinley Test Project	0.5	6.3	GLACIAL TILL
6	TestProject	Quinley Test Project	17.7	28	LIMESTONE
7	TestProject	Quinley Test Project	0.1	4	PEAT
8	TestProject	Quinley Test Project	24	-49.4	SANDSTONE

Figure 19 - PowerBI Table Showing OpenGround Data

The Groupings for the above example are shown below.

```
// set up the groupings - No projections needed as they are defined by the Groupings instead
Groupings =
{
  [
    Group = "Project",
    Header = "ProjectID",
    Aggregate = "None"
  ],
  [
    Group = "Project",
    Header = "ProjectTitle",
    Aggregate = "None"
  ],
  [
    Group = "StratumDetails",
    Header = "DepthTop",
    Aggregate = "Min"
  ],
  [
    Group = "StratumDetails",
    Header = "DepthBase",
    Aggregate = "Max"
  ],
  [
    Group = "StratumDetails",
    Header = "GeologyCode",
    Aggregate = "None"
  ]
},
```

Figure 20 - OpenGround.Query Syntax for Groupings

The following list of Aggregate commands can be used

- None – Grouped By
- Avg – Average Value for each group
- Count – The number of rows per group
- Max – The maximum value for the heading per group
- Min – The Minimum value for the heading per group
- Sum – The total of all values for the heading per group

Filter

The Filter parameter is a collection of Filterby values. Each FilterBy value has a Group, Header, Operator and Value.

Filters Parameter has the syntax {[Group="",Header="", Operator="", Value=""],[Group="",Header="", Operator="", Value=""],etc}.

```

Filters =
{
  [
    Group = "Project",
    Header = "ProjectID",
    Operator = "Equals",
    Value = "TestProject"
  ],
  [
    Group = "StratumDetails",
    Header = "DepthTop",
    Operator = "GreaterThan",
    Value = 3
  ]
},

```

Figure 21 - OpenGround.Query Filters Syntax

Filters =

```

{[
Group = "LocationDetails",
Header = "Remarks",
Operator = "Equals",
Value = null
]}

```

List of Filter Operators

Text Filters (Values need to be surrounded by quotes)

- None
- In
- NotIn
- Like
- NotLike
- CaseInsensitiveLike
- NotCaseInsensitiveLike
- Equals
- NotEquals
- CaseInsensitiveEquals
- NotCaseInsensitiveEquals
- BeginsWith
- NotBeginsWith
- CaseInsensitiveBeginsWith
- NotCaseInsensitiveBeginsWith
- EndsWith
- NotEndsWith
- CaseInsensitiveEndsWith
- NotCaseInsensitiveEndsWith
- InSubQuery

-
- Contains
 - NotContains

Number and Date Filters (Values do not need to be surrounded by quotes)

- LessThan
- NotLessThan
- LessThanOrEqualTo
- NotLessThanOrEqualTo
- GreaterThan
- NotGreaterThan
- GreaterThanOrEqualTo
- NotGreaterThanOrEqualTo

Orderings

The Orderings parameter is a collection of Orderby values. Each OrderBy value has a Group, Header, and Ascending.

Orderings Parameter has the syntax {[Group="",Header="", Ascending= true],[Group="",Header="", Ascending=false],etc}.

```
Orderings =  
{  
  [  
    Group = "Project",  
    Header = "ProjectID",  
    Ascending = true  
  ],  
}
```

Figure 22 - OpenGround.Query Ordering Syntax

Manipulating data in Power BI

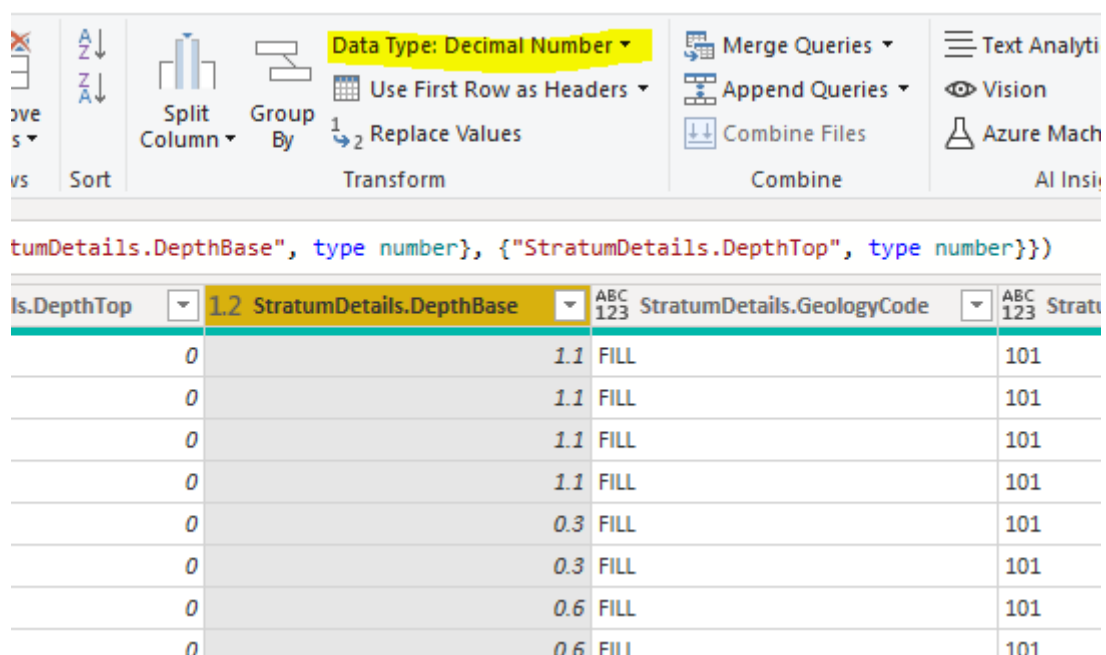
Correcting Data types

When Power BI collects data from OpenGround for the first time, it makes a guess at the PowerBI data type that best represents the data. Unfortunately, this data type is not always right and may need correcting. For example, if a number has been incorrectly set to text you won't be able to summarise the data for Max and Min values.

Follow the steps below to change the Data Type.

- 1) Select the column in the Power Query Editor
- 2) Select the correct data type from the Data type Dropdown.
- 3) Select the required data type.

Once this change has been set using the interface, it is automatically scripted in the PowerQuery and so will be applied the next time data is collected from OpenGround.



The screenshot shows the Power Query Editor interface. The 'Data Type: Decimal Number' dropdown menu is highlighted in yellow for the 'StratumDetails.DepthBase' column. Below the ribbon, the M code is visible, and a preview table shows the data with 'DepthTop' and 'DepthBase' columns.

StratumDetails.DepthTop	StratumDetails.DepthBase	StratumDetails.GeologyCode
0	1.1	FILL
0	1.1	FILL
0	1.1	FILL
0	1.1	FILL
0	0.3	FILL
0	0.3	FILL
0	0.6	FILL
0	0.6	FILL

Figure 23- OpenGround Data in PowerBI

Inverting Y-Axis

When Plotting Depth Graphs in Power BI you may need to flip the Y axis so Positive it down. This is called Inverting in Power BI and can be found in the formatting section of the graph parameter panel.