INSTITUTE MARINE AFFAIRS

Marine Data Hub Training Manual

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IMA Marine Data Hub (MDH) Training Outline

Day 1

Module 1: Introduction to EGIS and GeoPortals

Lecture:

- Review of GIS Concepts
- Traditional vs Web-Based GIS
- GIS Web Service Fundamentals
- Esri's ArcGIS Enterprise Platform
- MDH Architecture and Components
- Overview of the Marine Data Hub

Practical:

- Exploring the Marine Data Hub
- Accessing the MDH EGIS Portal
- ArcGIS Portal User Types
- Overview of ArcGIS Pro 3.0

Module 2: Geospatial Data Acquisition and Management

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- Geospatial Data for Information Products
- Data Acquisition Techniques
- Field Data Collection using Smart Mobile Devices
- Geospatial Data Storage and Management
- User Managed vs ArcGIS Managed Data
- The ArcGIS DataStore
- Metadata
- Datums and Map Projections

Practical:

- Creating and Configuring Enterprise Workgroup Databases in ArcMap
- Connecting to Workgroup Databases in ArcGIS Pro
- Creating and Managing Database Users
- Configuring Permissions
- Loading and Manipulating Geospatial Data
- Creating Geospatial Data Using ArcGIS Pro

Day 2:

Module 3: Geospatial Content Creation and Dissemination

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- Creating and Managing Geospatial Content in MDH
- The Role of the Map Viewer for Content Creation
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- Creating Web Maps using MDH GeoPortal Content
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Module 4: Marine Data Hub Administration

Lecture:

- Review of the MDH Architecture
- Fundamentals of GeoPortal Administration
- Managing User Access with Groups
- Data Backup and Protection
- ArcGIS Server Manager
- ArcGIS Server Manager and Portal for ArcGIS Admin Pages
- Log Files
- ArcGIS Monitor – Brief Introduction

Practical:

- Overview of the MDH GeoPortal Organization Page
- Creating and Managing Users
- Creating New User Roles
- Automating Administrative tasks Using ArcGIS Notebooks
- Backing up and Restoring Geospatial Data
- Troubleshooting and Using ArcGIS Server Manager Log Files

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Introduction

This training course introduces GIS concepts and tools used to efficiently store, edit, manage and share data on IMA's Enterprise GIS and Marine Biodiversity Hub. You will acquire and master fundamental skills that will prepare you to perform common GIS workflows in your organisation such as creating geodatabases, creating web maps and apps and collaborating via the Marine Diversity Hub GeoPortal. The training material covers both theory and practical exercises.

REQUIRED BACKGROUND

This course is designed for individuals who have no or minimal experience with GIS. An open, alert mind is all that is required.

REQUIRED MATERIALS

To successfully complete this course, you will need:

- A web browser, ArcMap 10.8.x and ArcGIS Pro 2.x/3.0
- Lecture Notes: provided by course facilitator
- Training Manual: provided by course facilitator
- Sample data: provided by course facilitator

Module 1: Introduction to E-GIS and GeoHubs

The Marine Data Hub (MDH) is a geospatial information portal focused on marine data for Trinidad and Tobago. The portal can be found here: https://mdh.ima.gov.tt/portal/apps/sites/#/datahub. It fosters and encourages the creation and sharing of marine data for improved analysis and decision-making through the Enterprise GIS (EGIS). The EGIS can be found here: https://mdh.ima.gov.tt/portal/home/index.html. This module will provide an overview of the portal's interface and capabilities.

Module objectives

At the end of this practical you should be:

1) Familiar with the Marine Data Hub interface
2) Able to locate data in the Hub
3) Access the E-GIS
4) Familiar with the E-GIS interface

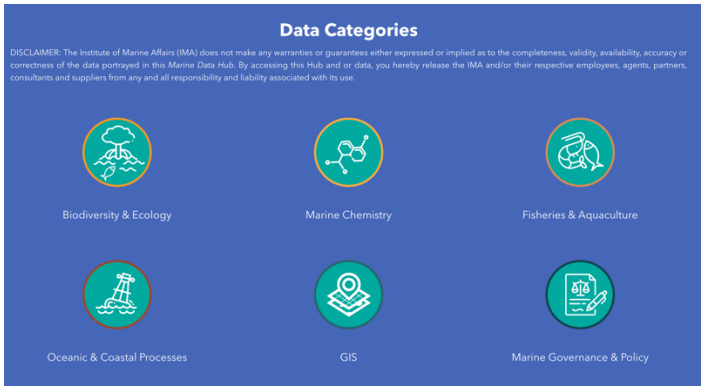
1.1 Exploring the Marine Data Hub

The Marine Data Hub is a website interface powered by ArcGIS Hub to facilitate geospatial content access and management in the E-GIS. In this section, you will be introduced to the Portal.

On the Data Hub you can access data that has been made public. The main header of the Hub allows the users to navigate to the E-GIS Portal (requires login), the Trinidad and Tobago Biodiversity Hub, Training Resources, and the IMA's website.

Below the header, there is a description of the MDH. At the top-right of the homepage, the user can sign-in using provided E-GIS Portal credentials. It is not required to sign-in to the E-GIS to view and use public resources, however, tags and groups allow discoverability of the resources of the Hub to be managed and restricted as necessary.

Scrolling down on the homepage provides the user quick links to various categories of data.



1.1.1 Filtering and searching for content

Accessing geospatial data resources on Hub can be done by searching the Data Catalog.

STEPS:

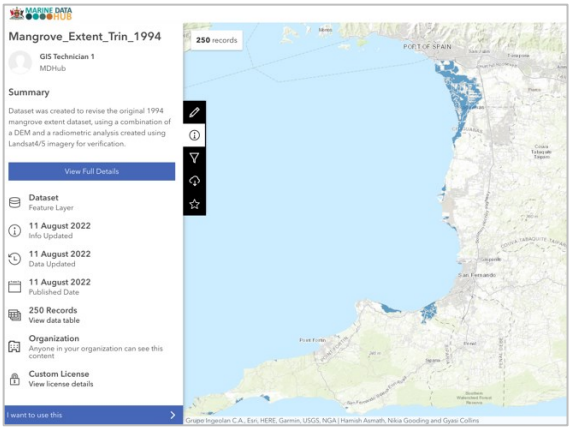
1. Click a Data Category, the loads all available content in that category on the Catalog page.
2. You can filter the content using the Data, Documents and Apps and Maps tabs at the top of the list.
3. You can also search for content using the search bar at the top of the page.

1.1.2 Using content

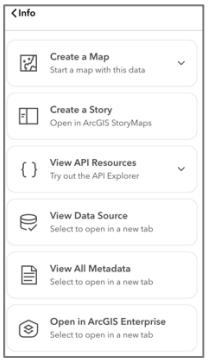
Once you have located a suitable data item, you can review the item, download it and even create maps or visualisations.

STEPS:

1. Click the title of the item.
2. This takes you to a summary page which displays metadata for the item.



3. Depending on the permissions set, you can edit, filter and download this data using the icons that appear to the right of the summary.
4. At the bottom of the summary tab, click I want to use this to review the options for using the data item. Options include creating a map and creating a story map.



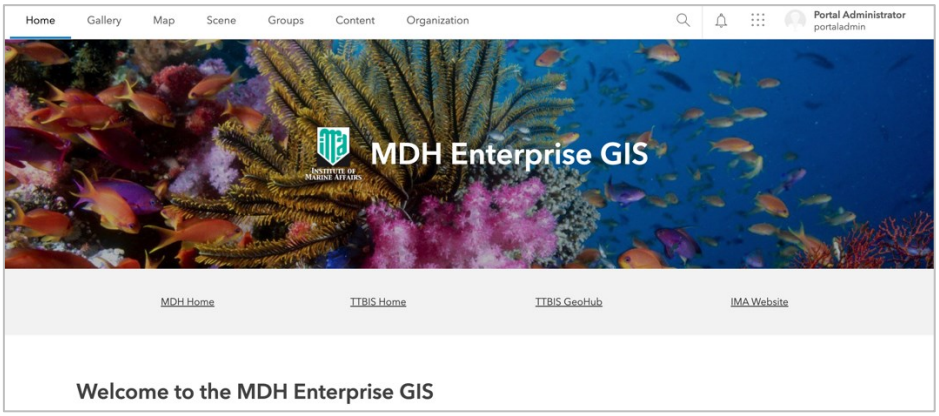
1.2 Explore the MDH Enterprise GIS Portal

The MDH E-GIS Portal is a core component of the GIS platform as it integrates all desktop, server, mobile and web elements of the E-GIS. The E-GIS Portal allows organisations to share and access data across the organisation via the E-GIS Portal website. This data is stored securely on your organisation's servers, allowing for a high degree of collaboration while maintain security.

The E-GIS Portal can be found using the link above or in the top menu of the Hub page. You can create geospatial products and data such as maps, apps and surveys.

STEPS:

1. Navigate to the Hub using the link above.
2. The EGIS interface has seven tabs (two visible only when logged in) at the top left and a sign-in option at the top right.



3. Sign-in using the credentials provided to you.
4. At the top are links to the major sections of the portal: Gallery, Map, Scene and Groups.
    a. Gallery: shows selected maps and applications that can be accessed by everyone.
    b. Map: create a web map

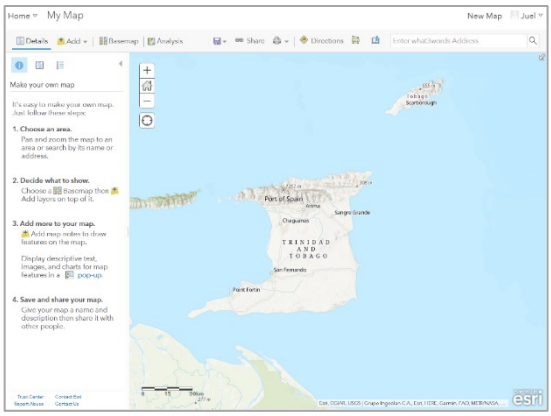
c. Scene: create 3D views

d. Groups: Used to share and edit content with selected persons. View groups that you have created or been added to.

e. Content: View layers, maps and applications you have created.

f. Organization: Provides site information on members and data (visible to administrators).

5. Click **Map** tab at the top of the window to open the map viewer. A new map called **My Map** opens.



6. By default, a topographic map of the world is displayed, centred on Trinidad and Tobago. You can change this by clicking **Basemap** at the top. Basemaps provide context to users of your map. There are 23 options; change the default basemap to **Imagery**.

7. Click **Add** to review the options. You can add layers in 5 ways:

- *Search for Layers*: This option searches for layers within an organisation's content based on entered search parameters or searches all content on ArcGIS Online.
- *Add Layer from File*: Use this option to import a shapefile, delimited text file or GPX file.
- *Add Layer from Web*: With this option you can use online data in the form of an ArcGIS Web Service, KML or CSV by entering the URL.
- *Add Map Not*e: With this option you can create annotate features on your map.
- *Browse Living Atlas Layers*: Searches all Living Atlas content on ArcGIS Online.

1.3 Reviewing Portal User Types, Roles and Privileges

The E-GIS uses a combination of user types and roles to control the privileges assigned to members.

All users are assigned a role when added to the E-GIS. There are two user types available in your oragnisation: Creator and Viewer.

1.3.1 Creator and Viewer User Types

Members assigned as Creators can create edit and create 2D data, 3D content, maps, apps and perform geospatial analysis. This user type can also function as administrator in the E-GIS (if assigned this role) allowing them to activate user accounts in the E-GIS and administer the Portal site.

This user type also has access to all the essential apps such as ArcGIS Map Viewer, Dashboards, StoryMaps, Web AppBuilder and Experience Builder. All field apps are also available (Field Maps, Survey 123 and QuickCapture).

Members assigned as Viewers are often persons who need to view and use maps and applications, for example, operations dashboards, but are not responsible for creating them. Viewers can access content from all the essential apps previously mentioned. They can view content using field apps.

1.3.2 Roles

A role defines the privileges that a user type has. There are five default roles in your organisation: Administrator, Publisher, User, Data Editor and Viewer.

Viewer: view items such as maps, apps, scenes, and layers that have been shared with the public, the organization, or a group to which the member belongs. Cannot share or create content. The role can be assigned to all user types.

Data Editor: *Viewer privileges* plus the ability to edit features shared by other users. The Data Editor role can be assigned to all user types except Viewer.

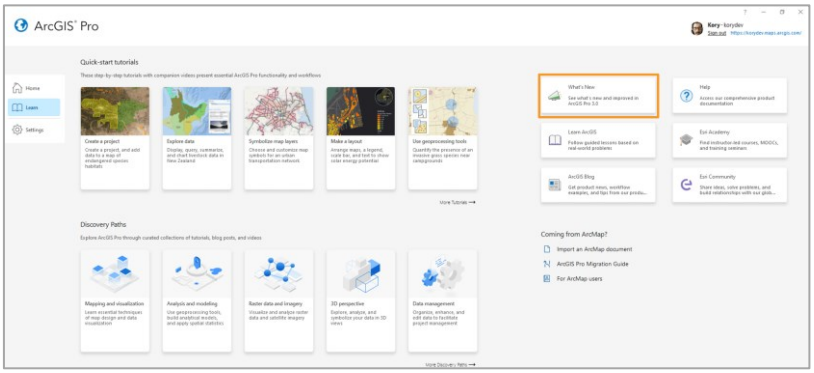
User: *Data Editor privileges* plus the ability to create groups and content. Users can use the organization's maps, apps, layers, and tools, and join groups that allow members to update all items in the group. Members assigned the User role can also create maps and apps, edit features, add items to the portal, share content, and create groups. The User role is compatible with the Creator user type.

Publisher: *User privileges* plus the ability to publish hosted web layers, ArcGIS Server layers, register data stores, publish from data store items and perform analysis. The Publisher role is compatible with the Creator user type.

Administrator: *Publisher privileges* plus privileges to manage the organization and other users. An organization must have at least one administrator, two is recommended, however. For security reasons, you should only assign this role to those who require the additional privileges associated with it. The Administrator role is compatible with the Creator user type.

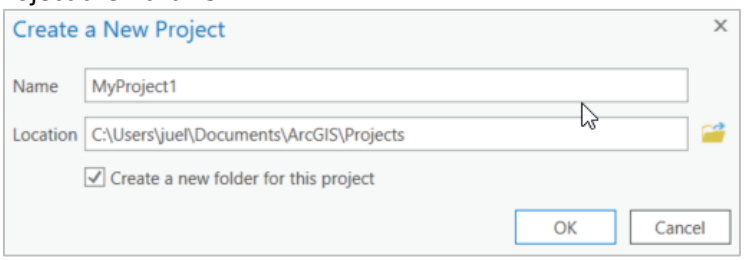
1.4 Overview of ArcGIS Pro 3.0

ArcGIS Pro is a desktop application that facilitates a seamless experience between the desktop and web geospatial content. ArcGIS Pro allows you to work in data in both 2D and 3D. You can also have multiple maps, layouts, tables and charts within a single project.



Setting up a new project

a. Open the ArcGIS Pro application and sign-in with your EGIS Online account.
b. Create a new project using the **Map** template. By default, ArcGIS Pro documents are organised into projects. This makes maps and their associated layers more portable. Note, to ensure maximum portability you should import any required layers into the project database or make a copy to the project folder.
c. Name the project then click Ok.



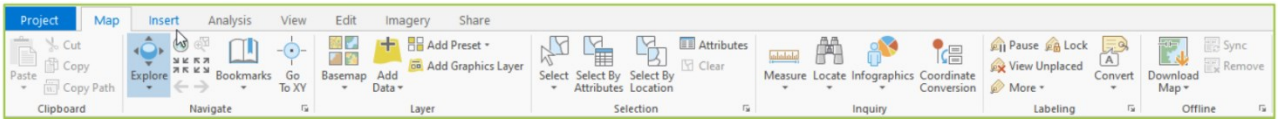
d. ArcGIS Pro's interface has four main sections:
    a. The menus and ribbon
    b. The Contents pane which acts as a table of content for the layers in your map
    c. The Map View which displays the contents of the layers added
    d. The Catalog pane which allows easy access to local and web-based layers

ArcGIS Pro is a ribbon-based application, like many other Windows applications. The main parts of the ArcGIS Pro interface are the ribbon, views, and panes. In ArcGIS Pro, a body of related work—consisting of maps, scenes, layouts, data, tables, tools, and connections to other resources—is typically organized in a project. By default, a project is stored in its own system folder. Project files have the extension .aprx. A project also has its own geodatabase (a file with the extension .gdb) and its own toolbox (a file with the extension .tbx).

Ribbons

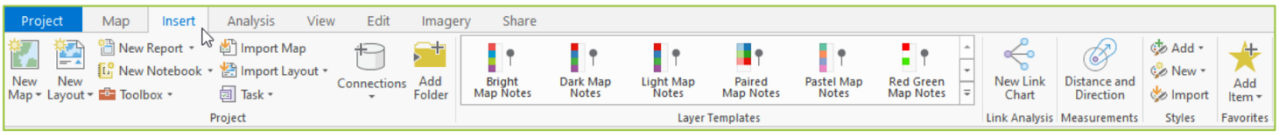
Many commands are available from the ribbon at the top of the ArcGIS Pro window. ArcGIS Pro uses a horizontal ribbon at the top of the application window to display and organize functionality into a series of tabs. Some of these tabs (core tabs) are always present. Others (contextual tabs) appear when the application is in a particular state. Above the map view is the ribbon. The ribbon has a set of core tabs—**Map**, **Insert**, **Analysis**, **View**, **Edit**, **Imagery**, and **Share**—that are always present when a map view is active. Each tab has its own set of tools, organized in groups.

Map tab



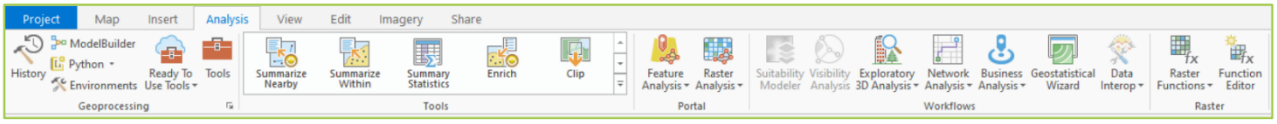
a) The Map tab is where you will find tools used to interact with Maps in your project.
b) You can have multiple maps in a single project.

Insert tab



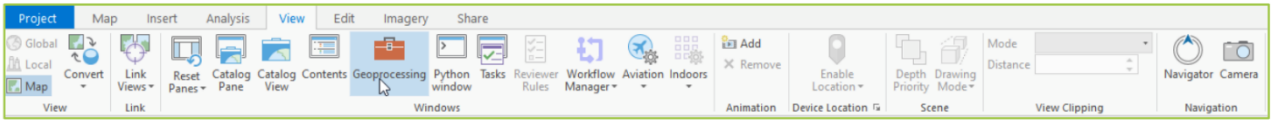
a) The Insert tab allows you to create new maps and layouts in your project as well as import existing maps into your project.
b) The Import Map tool can be used to import existing ArcGIS ArcMap documents into your project.

Analysis tab



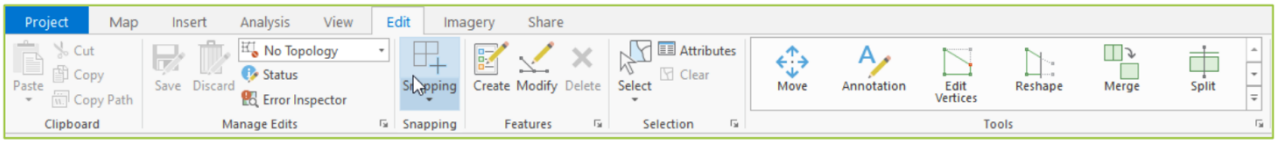
a) The Analysis tab is where you will perform geoprocessing tasks using tools similar to ArcGIS Desktop.
b) Depending on the content in you ArcGIS Pro Projects, different geoprocessing tools will be exposed and active.

View tab



a) The View tab controls how you view the content of your project. This includes viewing the Contents panel.

Edit tab

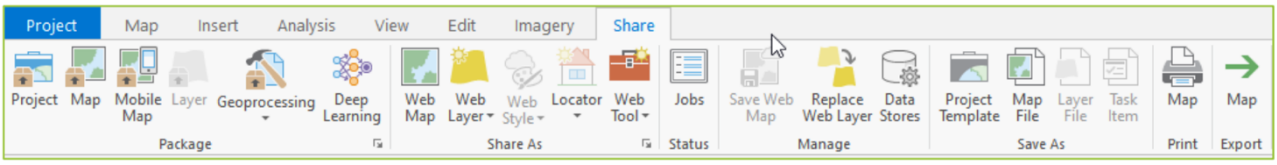


a) The Edit tab is where all of the feature editing tools and tasks are found. Unlike ArcMap, Editing is always enabled in ArcGIS Pro, you do not need to start or stop editing to perform editing operations.
b) Edit tools are context sensitive and active depending on the type of active feature selected in the project.

Imagery tab

a) The Imagery tab controls imagery and raster functions.

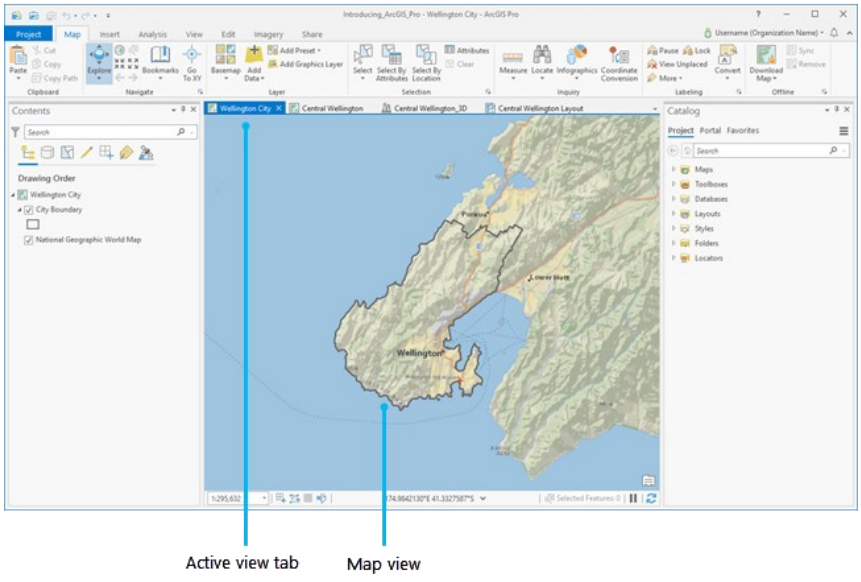
Share tab

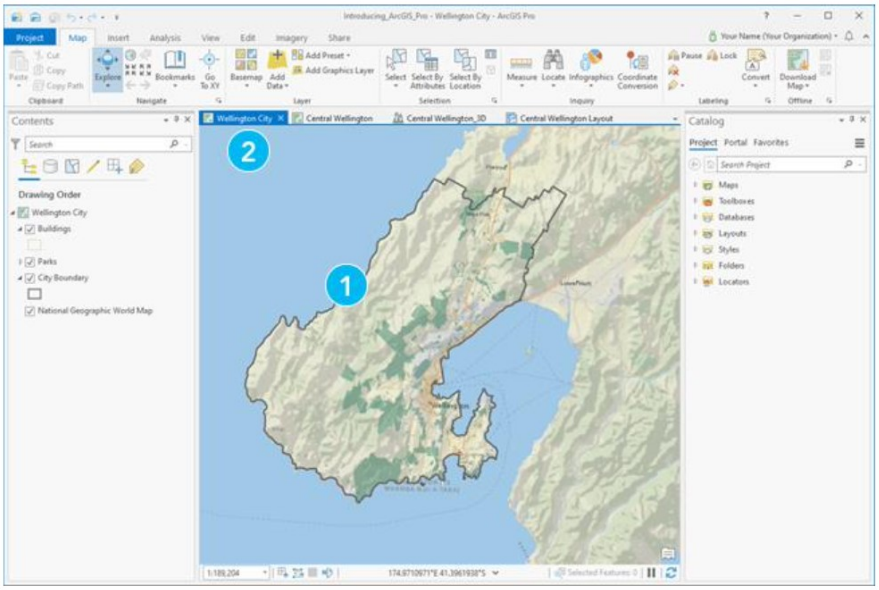


a) The share tab is used to share your ArcGIS Pro projects with other users or to ArcGIS Online or Portal. In ArcGIS Pro, you can package your project including data into a project package that can be shared online or with other users who have the appropriate file system access.

Views

Views are windows for working with maps, scenes, tables, layouts, charts, reports, and other presentations of data. A project may have many views, which can be opened and closed as needed. Several views can be open at the same time, but only one is active.



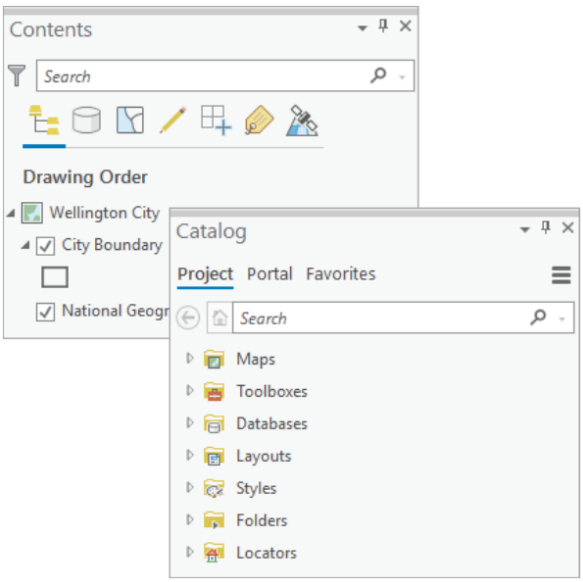


1: A map view is a window that displays a map.

2: Every view has a tab that can be used to close the view or drag it to a different position. The tab of the active view is blue. Clicking a view tab makes the view active.

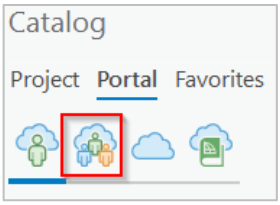
Panes

A pane is a dockable window that displays the contents of a view (the Contents pane), the contents of a project or portal (the Catalog pane), or commands and settings related to an area of functionality, such as the Symbology and Geoprocessing panes.



Locating the E-GIS web layers

a. Go to the **Catalog pane** at the right. If it is not visible, go to **View > Catalog pane**.
b. Click **Portal** then the **Groups** icon (second from left). Open data layers on the portal are shared to various groups. If you know which group the layer you require is shared to you can double-click the group to open it and add a layer to your map. Alternatively, you can enter search terms in the search field.



Adding web-based feature layers to the map

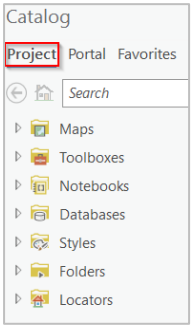
a. In the Catalog pane, go to **Portal > Groups**. Find the group of interest, open it and add the required layer to the map.
b. The layers should appear at the left in the **Contents** pane.

Symbolising layers in ArcGIS Pro

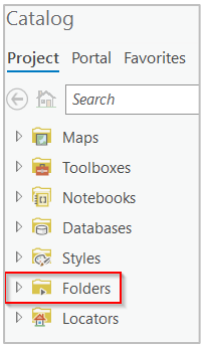
c. Vector layers are symbolised randomly as they are added to a map. You can configure the colour, pattern, transparency and more in the layer's properties.
d. Double-click the symbol below the protected area layer in the *Contents pane*.
e. The **Symbology pane** will open at the right.
f. You can select a preconfigured symbol in the gallery or create a custom symbol by going to **Properties**.
g. Change the protected areas symbol to a red outline 2pts wide. Click **Apply** when complete.

Adding local data to a map

h. First, confirm the location of your local data in the file explorer. If needed, copy your data to the required location.
i. In the Catalog pane at the right, click **Project**. From here you can navigate and add data, maps and databases from your local machine or network. The pane organises content by type. All maps create in the project appear in the **Maps** node. Local folders containing data layers can be accessed from the **Folders** node.



j. To add folder connection or shortcut to the project, open Folders using the small triangle at the left of the icon. You should see the default folder identified by a small house icon. Right-click the *Folders* node then click **Add Folder Connection**.



k. In the *Add Folder Connection window* that appears, navigate to your folder location then click once to select it. Click **Ok** to complete the process.
l. The shortcut should appear in **Folders**.
m. Expand the folder. Your data layers should appear.

Module 2: Geospatial Data Acquisition and Management

The geodatabase is the primary data storage mechanism in ArcGIS. For small and medium organisations collaboration across units is expected. Field teams often collect data that needs to be used, edited and analysed by other teams.

ArcSDE (Arc Spatial Data Engine) geodatabases allow you to use other ESRI products, as well as custom applications to store, use and manage all your GIS data in one of the following commercial database management systems: Oracle, Microsoft SQL Server, IBM DB2, IBM Informix, or PostgreSQL. ArcSDE is sometimes described as middleware, software that sits between Esri's ArcGIS products and RDBMS software and manages data exchanges between them.

Multiuser geodatabases require the use of ArcSDE and can be unlimited in size and numbers of users. There are 3 types/levels of ArcSDE geodatabases — Desktop (Personal SDE), Workgroup and Enterprise. While Enterprise geodatabases allow the most flexibility, all levels of ArcSDE allow you to store your data in a central database and support the concurrent multiuser editing necessary for most GIS data management workflows and are scalable from one to the other.

In the ArcGIS platform, the term *database server* refers to instances of Microsoft SQL Server Express that have been enabled to store geodatabases. You create geodatabases and perform other administrative tasks for database servers through the Database Servers node in the Catalog window or ArcCatalog in ArcMap.

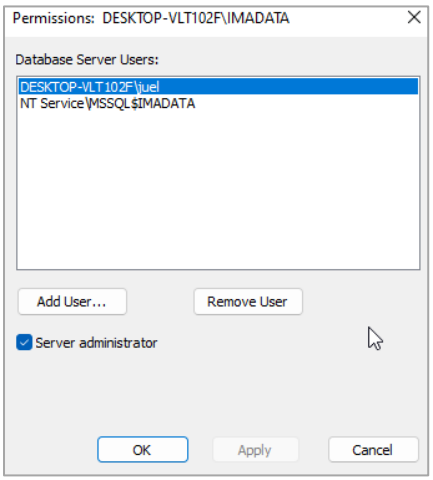
	Desktop/Personal SDE Geodatabases	**Workgroup SDE Geodatabases**	**Enterprise SDE Geodatabases**
Application Scenario	Small teams/single user	Small or medium department	Large scale enterprise
Data Storage	SQL Server Express	SQL Server Express	Enterprise RDBMS -Oracle -SQL Server -PostgreSQL
Management Interface	ArcCatalog	ArcCatalog	ArcCatalog RDBMS ArcSDE command line
Storage Capacity	10 GB	10 GB	Depends on DBMS limits
Licensing	ArcGIS Desktop Advanced ArcGIS Desktop Standard	ArcGIS for Server Workgroup	ArcGIS for Server Enterprise
Platform	Windows	Windows	Any
Number of concurrent users	1 editor and 3 readers	10 editors and readers	Unlimited editors and readers

2.1 Creating and Configuring Enterprise Workgroup Databases in ArcMap

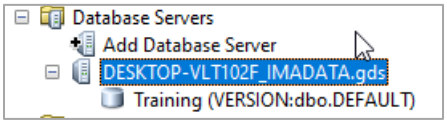
Before you can create a Workgroup geodatabase, you must connect to an ArcSDE database server. Creating geodatabases requires server administrator permissions on the database server. Follow the steps below to create a new geodatabase:

STEPS:

1. Open ArcMap.
2. Locate the Catalog pane and expand the Database Servers folder in the catalog tree.
3. In the Database Server box, enter: `<Your Computer Name>\<Instance name>`. Click Ok when complete.
4. The database server should appear in the catalog tree. Right-click the new server connection to confirm you are connected – it should be greyed out.
5. Select **Permissions**. The user account that was used to create the database server should be checked as the **Server administrator**.



6. In the Catalog tree, right-click the database server and click **New Geodatabase**.
7. Enter **Training** as the geodatabase name then click **OK**.
8. The new geodatabase is added under the connected database server.



2.2 Connecting to a Workgroup Geodatabase in ArcMap

To access data in a multiuser geodatabase, clients must connect to the geodatabase. The connection is made directly using an ArcSDE service.

STEPS:

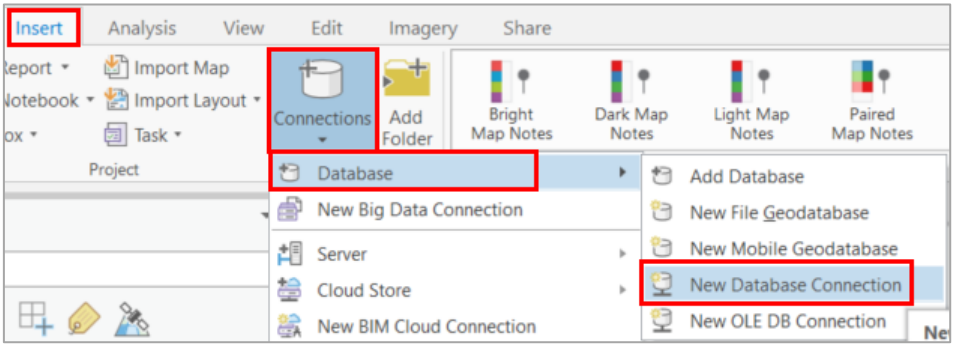
1. Expand the **Database Connections** folder in the Catalog tree.
2. Double-click **Add Database Connection**. This opens the Database Connection dialog box.
3. SQL Server is automatically entered in the Database Platform field.
4. In the Instance text box, type the name of the server on which the SQL Express database resides. Type `<Computer Name>\<Instance name>`.
5. Leave Authentication Type as default.
6. In the **Database** field, type **Training**.
7. Click **OK**.
8. If successful, the connection is created. Rename the connection `Training@<Computer Name>` by right-click the connection and selecting **Rename**.
9. Double-click the connection to connect to the Training geodatabase.

2.3 Connecting to a Workgroup Geodatabase in ArcGIS Pro

To access data in a multiuser geodatabase, clients must connect to the geodatabase. The connection is made directly using an ArcSDE service.

STEPS:

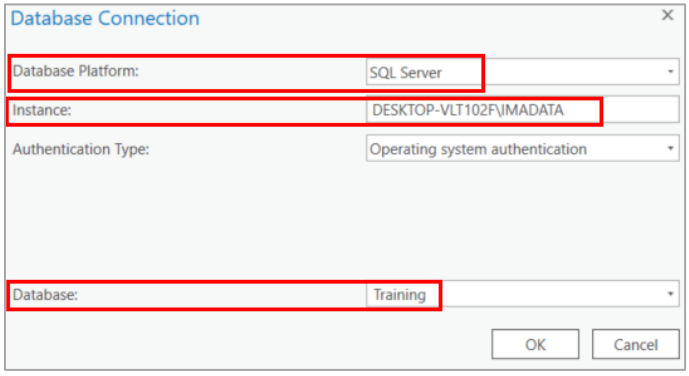
1. Open your previous ArcGIS Pro project.
2. In the **Insert menu**, click **Connections**.
3. Select **Database** > **New Database Connection**. This opens the Database Connection window.



4. Change the **Database Platform** to **SQL Server**.
5. In ArcMap right-click the database server and select *Properties*. Copy the *Name* and paste this in the **Instance** field in ArcGIS Pro.

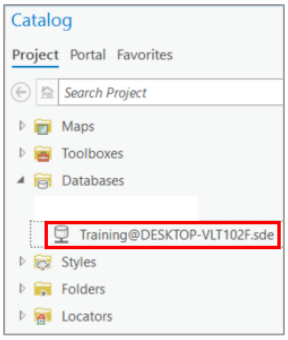
6. Leave *Authentication Type* as *Operating system authentication*.

7. Click the **Database** field. Once your instance name is correctly entered, ArcGIS will connect to the database server and display a list of all geodatabases on the database server. Select the Training database then click Ok.



8. In the **Catalog** pane, expand the Databases section. The database connection should be visible.

9. By default the connection is named using the computer name. Right-click the connection and rename it **Training@<Computer name>**.



2.4 Creating and Managing Database Users

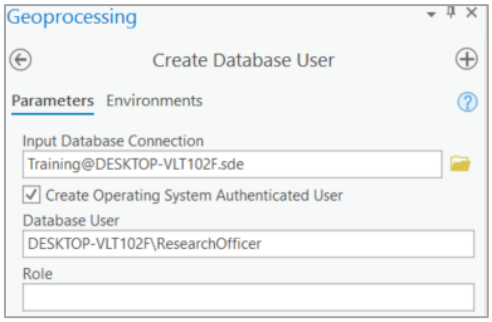
Database administrators add logins to the SQL Server instance and these logins are mapped to users in individual databases on the SQL Server instance. The Create Database User tool can be used to add users to add users to a server instance or database. You can add users that have an existing Windows user account or create a database user that does not have a Windows user account.

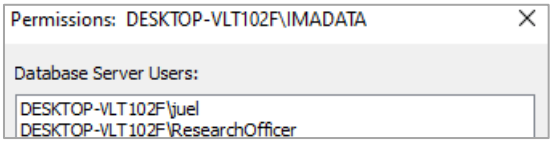
SQL Server database access is grant using **logins**. A login allows SQL Server to know who is connecting to the server. Access to a geodatabase(s) is granted through **users**. While logins deal with authentication, user accounts provide authorisation to perform tasks in a geodatabase.

STEPS:

1. In Windows Settings, go to the Accounts the click **Add account**.
2. Click **I don't have this person's sign-in information**.
3. Click **Add a user without a Microsoft account**.
4. Create two accounts: **ResearchOfficer** and **FieldOfficer**.
5. Right-click the connection and go to **Administration** > **Create Database User**.

6. Check the **Create Operating System Authenticated User** box.
7. Enter the user account name with the following format: `<Domain/computer name>\ResearchOfficer`
8. Click **Run**.
9. Switch to ArcMap.
10. Right-click the database server and select **Permissions**. The Permissions window should open displaying all users added to the database server. The database user created should be visible in the list.





11. You can also add or remove users using the Permissions window in ArcMap. Try adding the FieldOfficer user account.
12. Note: when adding users from ArcMap: you can add either domain or local Windows logins or groups. That means the logins and groups must exist on the network or the local computer before you can add them to the database server.

2.5 Configuring Permissions

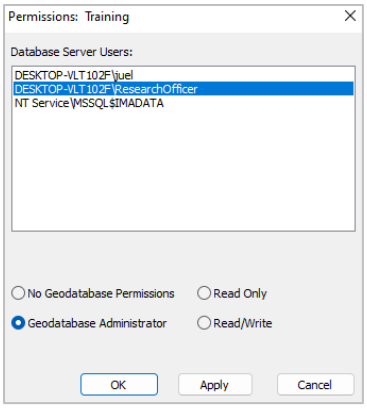
Once a geodatabase is created many persons in an organisation may need to use it. Since their job and responsibilities differ, the level of access each person has will also vary. Generally, there are three categories of users roles: server administrators, geodatabase administrators and geodatabase users. The server administrator performs the administrative tasks for the database server and the geodatabases on it. Geodatabase administrators perform a similar function but only for geodatabases they are assigned to administrate.

Users added to the database server must be granted permission to each geodatabase on the server. Only the server administrator has automatic access to all geodatabases on the server. Permissions can be configured to at the database server level, the geodatabase level and the dataset level.

Predefined Role	Permissions
None	No specific access to geodatabase or the datasets granted.
Read Only	The user can only view and select data.
Read/Write	The user can read, write to and create new datasets in a geodatabase or can read and write to an existing dataset.
Admin	The user can perform administrative tasks in a specific geodatabase.
Server Administrator	This user manages the database server.

STEPS:

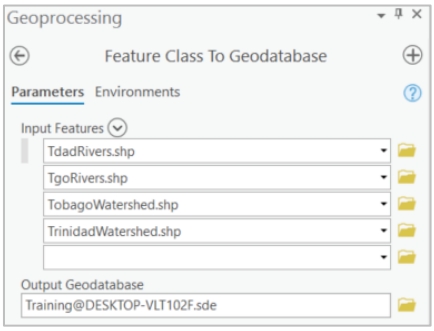
1. Right-click the **Training** geodatabase and select **Permissions**.
2. Select the server administrator. Notice that you cannot configure permissions for the server administrator.
3. Click the *ResearchOfficer* user that was added. By default, the user has no permissions. Radio buttons at the bottom of the window indicate the permissions currently granted to each user for the selected geodatabase.
4. Make the *ResearchOfficer* a **Geodatabase Administrator** by selecting that option in the Permissions window. Assign the *FieldOfficer* **Read/Write** permissions.
5. Click **Apply** then **OK**.



2.6 Loading and Manipulating Geospatial Data

Loading data into a Workgroup database can be done using the menu options available by right clicking the geodatabase connection.

STEPS:



1. In ArcGIS Pro, right-click the Training database connection.
2. Select **Import** > **Feature classes**.
3. In the **Feature Class to Geodatabase** window, navigate to your data using the **Browse** icon select the watershed and rivers shapefiles for Trinidad and Tobago.
4. Click **Run**.
5. Right-click the database connection then click **Refresh**. The feature classes should be now visible.
6. With data loaded, you can perform standard tasks such as renaming, copying and deleting.
7. As the server or geodatabase administrator, you can further control the access through the **Privileges** options.
8. Right click the *Trinidad Rivers* feature class and select **Privileges**.
9. Give the *FieldOfficer* **Select** privileges only.
10. Login to the FieldOfficer account to and test the permissions.

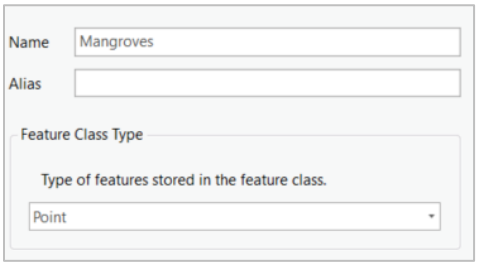
2.7 Creating Geospatial Data using ArcGIS Pro

There are several ways to create ways. Heads-up digitizing is the most commonplace digitising method. With head-up digitising, you display an aerial photograph, satellite image or ortho-photograph onscreen as a basemap, then you draw features such as roads, buildings or parcels on top of it.

ArcGIS Pro automatically starts an edit session when you modify existing data or create new data. You can edit any data source that is granted view and edit privileges. Saving or discarding your edits automatically stops the edit session. Any subsequent edits you make resumes the edit session until you save or discard your edits. By default, there are no buttons to start or stop an edit session.

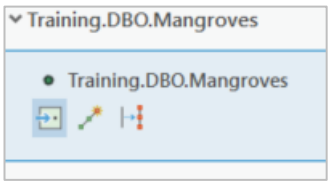
STEPS:

1. Locate the **Databases** node in the Catalog pane. By default, all projects have a geodatabase to store related project files. Importing all related files makes your project more portable if it needs to be shared with colleagues.
2. Right-click the *Training* geodatabase then click **New > Feature Class**. The *New Feature Class* dialog box should open.
3. In the **Name** field, enter **Mangroves**.
4. The **Type** should be set to **Point**.



5. Click **Next**.
6. In the first field enter **Name** under **Field Name** and set the **Data Type** to **Text**. Set the length to **40**.
7. Click **Finish** to accept all other defaults and create the feature class. It should appear in your table of contents.
8. In the Map menu, click **Basemap** and select **Imagery**.
9. Click on the **Create** 

tool in the **Edit tab**.
10. This should open the *Create Features* pane at the right-hand side of your screen, displaying all the current editable layers.



11. Click on the *Create Feature icon* for the *Mangrove* layer. This reveals all the point editing tools available.
12. When the Create Feature icon is active the mouse cursor changes shape over the map and any click on the map will add a vertex.
13. Zoom in to a mangrove.
14. Click once to create a point. Locate and create additional points.
15. Select one of the points you digitised using the **Select Features** tool  .
16. Click the **Attributes** button 

. The Attributes pane will open at the left.
17. Click the **Name** field to enter the name of the mangrove.

Module 3: Geospatial Content Creation and Dissemination

Creating and organisation of spatial data are two of the most common activities you will do in ArcGIS Pro. This requires knowledge of how to edit and import data in ArcGIS Pro. Where datasets already exists, digitizing is the process of converting features into a digital format. Alternatively, you can need to upload data directly to the portal.

This module will guide you through essential editing and data management processes in ArcGIS Pro.

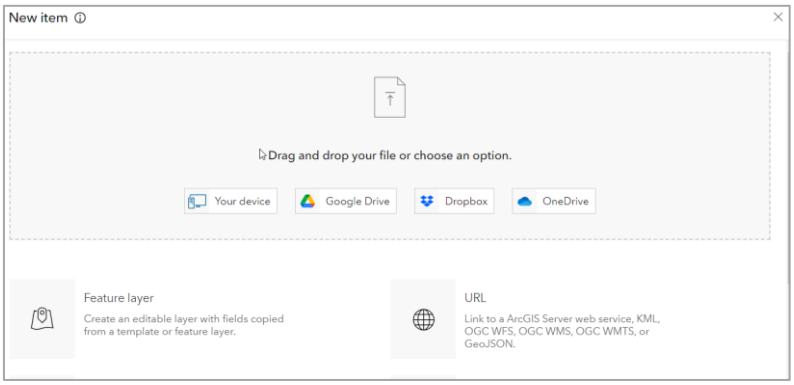
3.1 Uploading Geospatial Content

If you have existing Shapefiles, CSVs or Excel files with spatial data, you can upload them to ArcGIS Online. A shapefile is an Esri vector data storage format for storing the location, shape, and attributes of geographic features. It is stored as a set of related files and contains one feature class. The primary way to upload a shapefile is to add it to a .zip file, upload it. You should zip the shapefile directly, that is, do not place the files in a folder before zipping. Instead, select all the associated files, then right-click then select Compress to ZIP file.

STEPS:

1. In ArcGIS Online, click Content. This takes you to your content page.
2. In the top left corner, click **New Item** 

. The New item pane should open, displaying the various options available to upload files or create layers directly online.



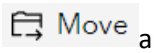
3. Drag your files onto the pane to upload the file.
4. The location fields are also automatically detected. Click **Next**.
5. The new layer will be created in your personal content page but you can organise your content using folders.
6. Add tags as appropriate.
7. Enter a summary then click **Save**.
8. Once the layer is created, the Overview page of the layer should open.
9. From the Overview page you can:
    - Data: review the data in the layer
    - Visualisation: preview the location of the features
    - Usage: see how many times the layer has been used or viewed
    - Settings: allows you to turn on delete protection, mark a layer as authoritative (useful if the data is from official sources), turn on editing which allows users to make changes to the features or add new features and allow users to export the data

3.2 Searching and Accessing Content

To access the MDH EGIS Portal, either directly or by choosing EGIS from the Hub page or following this link. Data uploaded or published to the portal should be organised into folders, groups and appropriately tagged.

STEPS:

1. Login to the EGIS.
2. Click **Content** at the top of the page.
3. By default, you are taken to your personal **My Content** page. Any items you create is listed here. Under **My Favorites**, any item you have starred will appear. Data assigned to any groups you create or are a member of will be listed under **My Groups** and all content you have access to within the organisation (portal) with be under **My Organisation**. Under each tab there is a search bar that allows you to search for content.

4. At the left of the window, you can create folders using the **Create new folder icon**  . To move items to a folder, select the required items then click **Move** 

and select the require folder.

3.3 Exploring the MDH Data Categories

Content in the MDH is organised into 6 categories: Biodiversity & Ecology, Marine Chemistry, Fisheries & Aquaculture, Oceanic & Coastal Processes, GIS and Marine Governance & Policy.

STEPS:

1. Open the Marine Data Hub. Scroll to the bottom of the page click a data category.
2. Any data linked to the category is listed. This included maps, apps and feature layers.
3. Click an item to see the full metadata.
4. Depending on the item, users can download, view, filter or open it. Users can also create maps or create a storymap.

3.4 Working with Groups and Tags

Groups allow you to manage the access and visibility of layers, surveys, maps and applications. It facilitates collaborative work with smaller groups on the platform. Before creating a group, carefully consider the data products to be created and the level of access needed by members of your department. When creating items, you must apply tags. This aids in searching content. If necessary, organisations may choose to standardise the tags being used to ensure consistency.

STEPS:

1. Click **Groups** at the top of the page.
2. At the top left, click **Create Group**.
3. Fill in the Group's name, summary and tags.

4. Group configuration options:

    a) How can people join the group?
        I. By invitation: Use if the group's content members should be strictly managed
        II. By request: Use to allow portal members optional membership
        III. By adding themselves: Use to allow portal members self-managed membership
    b) Who can view this group?
        I. Only Group Members: Use if the group should only be visible to your department
        II. All organisation members: Use if everyone with login access to the EGIS should see the group
        III. Everyone (public): Use if the group should be visible to the public (without login)
        NB: If the Everyone option is used, you can configure so that anyone can join the group, members must be invited or only those who request to join and are approved are member of the group.
    c) Who can contribute content to the group?
        I. Group members: Use if only group members can share content to the group
        II. Only group owner and managers: Use if the group owner and managers will be responsible for sharing content. This option may be useful for managing 'viewers'.
    d) Who can see the list of members on the Members tab?
        I. All group members: Use if members can see each other
        II. Only group owner and managers: Use if limiting the member list view

    Group designations can also be configured. *Shared update* allows members to update items in the group. If it a group in which members cannot leave, use the *Administrative group* option.

5. Click **Save** when complete.
6. Use **Invite Users** add users to the group and **Add items to group** to add content.

3.5 Linking Content to MDH Data Categories using Tags

The MDH content is sourced from the EGIS. For items to available in the MDH publicly, the item must be shared with the public, assigned to the Marine Data Hub Content group and be tagged to appear in the appropriate data category. Tags for each category are:

Data Category	Tags
Biodiversity & Ecology	biodiversity, ecology, wetlands
Marine Chemistry	marine
Fisheries & Aquaculture	fish
Oceanic & Coastal Processes	
GIS	fundamental data
Marine Governance & Policy	transportation

STEPS:

1. Tags are assigned when data is created but they also can be updated from the *Item Detail page*.
2. In Content, click the ellipsis button ••• then click **View Item Details**.
3. From the Item Details page you can update metadata, group sharing, tags, attribution, add terms of use and change the owner of the item (by the portal administrator).
4. Scroll down the page to the **Tags** section. Click **Edit** to add or update a tag.

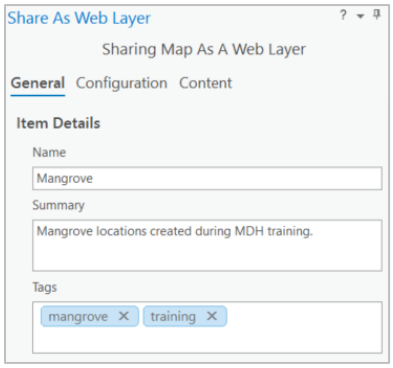
3.6 Preparing and Sharing Content from ArcGIS Pro as a Web Service

There are seven web layer types that can be shared from ArcGIS Pro: feature, tile, vector tile, map image, imagery, scene, and elevation. Feature, tile, vector tile, map image, and imagery layers share 2D data, while scene and elevation layers share 3D data. You can publish maps with multiple layers and tables as a web layer or service. layers in your map become service sublayers. Each sublayer is identified by a unique numeric ID that allows you to work with it or reference it in a web map or application.

STEPS:

1. In ArcGIS Pro, prepare a map with content to be published to the Portal.
2. In the Table of contents, right-click the map 

and select **Properties**. Check the **Allow assignment of unique numeric IDs for sharing web layers** box. Click Ok when complete.
3. In the menu click **Share > Web Layer**. The **Share Map As Web Layer** panel will open at the right.
4. Fill in the **Name, Summary** and **Tags**. Separate each tag with a comma.



5. In the **Layer Type** section, check **Feature**.
6. For **Location**, click the dropdown to select and existing folder or create a new one. The layer will be saved to the selected folder in *Contents* on the portal.
7. In **Share with**, you can choose to share the layer to the public or a group.
8. Click **Configuration**. In this tab you can configure the capabilities of the layer and select the appropriate time zone if needed. Click the **Edit** button . Here you can enable editing and select what users can edit. You can also allow the layer to be downloaded using the **Export Data** option. If the layer will be used in a mobile application, use the **Enable Sync** option.
9. Click **Configure Parameters** . If the layer has date fields, select the local time zone.
10. Click **Analyze**. This checks the map for any errors.
11. Click **Publish**. The process will take a few minutes. Layers with more features will take longer to publish.
12. Once complete you will see a message in the tab.

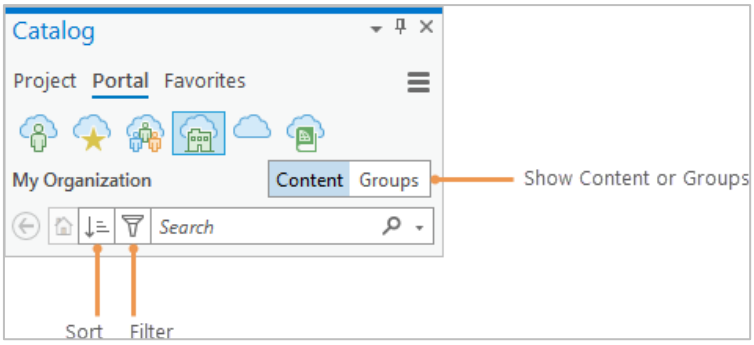
13. In the web browser, go to your **Content** page and confirm that the layer has been published. If needed, refresh the page.

3.7 Accessing Portal Content in ArcGIS Pro

You can add content to an ArcGIS Pro project from your portal. You can browse, search, filter, and sort portal content and add it to maps and scenes just as you do with content stored locally or in other locations. Portal content includes items owned by you and items owned by others that are made available to you through sharing.

STEPS:

1. In the Catalog pane, click **Portal**.
2. The top row allows you to see data items from My Content , My Favorites , My Groups , My Organisation , ArcGIS Enterprise and the Living Atlas .
3. You can sort and filter the data and switch between content and groups on the My Groups, My Organisation and ArcGIS Enterprise tabs.
4. Once you have located and item of interest, right click and select **Add to Current Map** or **Add to New**.

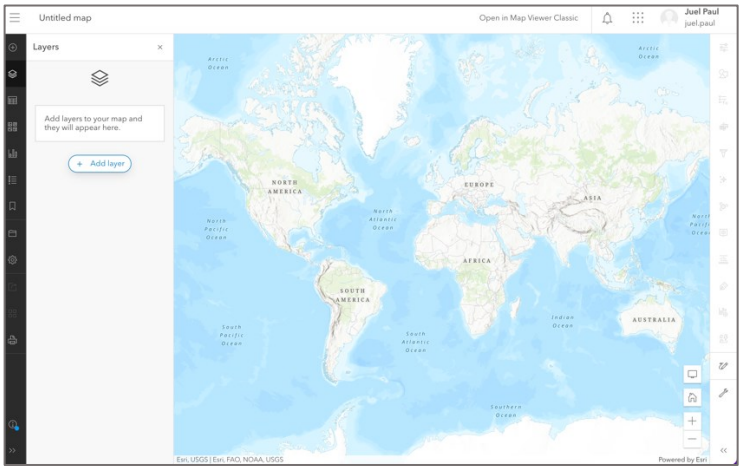


3.8 Creating Web Maps using MDH GeoPortal Content

Web maps typically have two types of layers: operational layers which display the main themes of your map and a base layer which provides context to the operational layers.

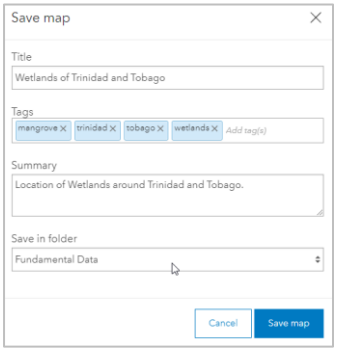
STEPS:

1. Go to Map page in the Geoportal. At the top of the page click **Open new map in Map Viewer**. **N.B.** Performing analysis functions can only be done in Map Viewer Classic currently. This functionally should be migrated to Map Viewer within the coming months. Maps can be created and used in either view.
2. By default, a topographic map of the world is displayed, this provides geographic context such as water bodies and political boundaries.



3. The Map Viewer includes two vertical toolbars—the *Contents* (dark) toolbar at the left and the *Settings* (light) toolbar at the right. Use the Contents toolbar to manage and view the map contents. Use the Settings toolbar to access options for configuring and interacting with map layers.
4. The Layers pane is also open. As you add data to your map, they will be listed here.
5. You can expand each toolbar using the Expand icon » at the bottom of each toolbar.
6. At the top left, click the **Add** button ⊕ on the Contents toolbar.
7. There are several options for adding data to your webmap. By default, **My Content** is selected. If you have not created content, you can search your organisation. Click My Content and select **My Organisation**. Scroll through the list of layers available.
8. Click the My Content drop-down

9. Use the Add button ⊕ to add the layer to your map.
10. Close the Browse layers panel.
11. Click the **Layers** button the view a list of the layers in the map.
12. You can rearrange the layers by dragging a layer up or down the list.
13. In the *Contents toolbar*, click the **Basemap button** to view the basemap options.
14. Review the legend using the **Legend** button .
15. Centre you map in the desired location.
16. Save the map by clicking the **Save** button . When you save the map for the first time you will need to enter the name, description, and tags. Click Save map when complete.



17. You can rename the layers by clicking the ellipsis button ••• and selecting **Rename**.
18. If you cannot see a layer, clicking the ellipsis button ••• and selecting **Zoom to** will pan the map to the layer's extent.
19. As you click a layer, the *Settings* toolbar at the right will open showing you the available configuration options.
20. As you hover over a layer you will see the **Hide layer** button .
21. You can configure the symbols used on the map in the **Symbology** section of the *Settings toolbar*. Click **Edit layer style** when a layer is selected.
22. You can configure the pop-up using the Pop-up Pop-ups pane in the *Settings* toolbar.
23. Click Title. Notice that the layer title is included. Click the { } button at the bottom right corner. You can add any attribute field to be the title by selecting it.
24. Click **Fields List** Fields list 10/17 fields. Here you can configure which fields are visible in the pop-up.
25. Click the Fields button Fields in the *Settings* toolbar. Here you can configure the readability of the attribute field names. Edit the names of the fields.
26. At the top left, click the Home drop-down menu ☰ and select Content. This takes you to your Content page which displays all the maps, feature layers and apps you have created.

3.9 Developing Web Applications using the Web App Builder

ArcGIS Web AppBuilder is an intuitive what-you-see-is-what-you-get (WYSIWYG) application that allows you to build web apps without writing code.

STEPS:

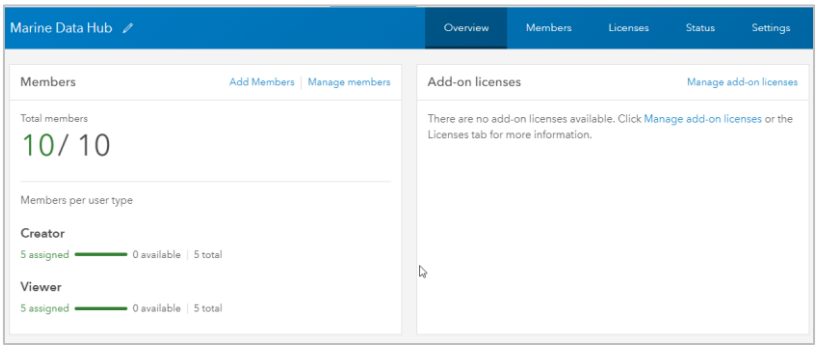
1. On the **My Content** tab of the content page, click **Create**, choose **Web AppBuilder**, and select **2D** or **3D**. Alternatively, you can open the item details of a map, click Create Web App and choose **Web AppBuilder**.
2. Fill in the tags, summary and select the folder where the app will be saved.
3. Configure the look and feel of the app by choosing a theme. A theme includes a collection of panels, styles, layouts, and preconfigured widgets.
4. Select a map or a scene you've created or choose one from your organization. If you open Web AppBuilder with a map or scene already selected, you can change it, if needed.
5. Widgets give your app functionality, such as the ability to print an overview map. Each theme has its own preconfigured set of widgets, and you can add more widgets.
6. Configure attributes to customize your app banner with a logo, title and hyperlinks.
7. You can preview your app with popular device screen sizes (2D apps only). When you've completed the previous steps, save and launch your new app. You can view and edit your app later by accessing it in your Content page.

Module 4: Marine Data Hub Administration

This module will describe core administrative tools and functions necessary for managing the MDH.

4.1 Overview of the MDH GeoPortal Organisation Page

The Organization page is divided into tabs to help you perform a variety of administrative tasks. The Overview tab provides key information about your organization, such as subscription details, credit status, total members, and available add-on licenses.



The **Members** page allow administrators to view members added to the portal. Administrators are responsible for inviting members to join or adds members directly. Members can be added automatically, or you can send an email invitation for users to accept. You can add multiple members automatically by uploading a CSV file of names and email addresses. Administrators can assign and unassign add-on licenses, change a member's user type, and reset their password. You can also enable accounts for Esri access and delete the member from the organization.

As an administrator or member with privileges to manage licenses from the **Licenses** page, you use ArcGIS Online to specify which members have access to licensed apps that aren't already included in their assigned user type.

In the **Status** tab, you can view status reports for the organization. You can access interactive, detailed usage reports and see general information. Reports are organized into three categories: content, members and groups.

From the **Settings** tab you can configure the organization’s profile. This includes options for a name, logo, and summary for your organization. This information is displayed for organization members and visitors to your website. You can set your organization's default region, language, number and date format, and short name. You can also choose the administrator or administrators who will be listed as points of contact.

4.2 Creating and Managing Roles

A role defines the set of privileges assigned to a member. Once assigned, roles can be changed by administrators and those with privileges to change member roles. When you assign a role, it must be compatible with the member's assigned user type.

STEPS:

1. At the top of the site, click **Organization** and click the **Members** tab.
2. Search for members by name or username.
3. To change the role of one member, click the **Role** drop-down arrow and choose a new role.
4. To change the role of multiple members at once, check the box next to the name of each member whose role you want to change, above the list of members, click **Manage user types**, in the window that appears, search for the role you want and select it. Click Save.

4.3 Creating New User Roles

You can also create a more fine-grained set of privileges by creating custom roles.

STEPS:

1. To create a role, at the top of the site, click **Organization** and click the **Settings** tab.
2. Click **Member roles** on the left side of the page.
3. Click **Create role**. In the Create role window, provide a name and description for the role. The name must be unique within your organization and can contain up to 128 characters. They are not case sensitive. Administrator, Publisher, User, Data Editor, and Viewer cannot be used as names for custom roles. The description can have up to 250 characters.
4. You can change the privilege compatibility setting and review the compatible user types and available privileges. Or you can **select Set from existing role** and import settings from an existing role or template on which to base the new custom role.
5. Select the privileges for the custom role.
6. Click **Save**.
7. Assign the custom role using the steps in the previous section as a guide.

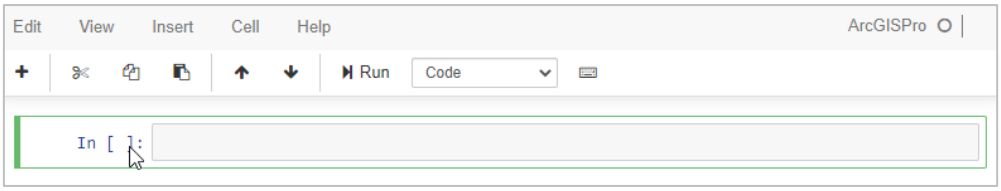
4.4 Automating Administrative Tasks using ArcGIS Notebooks

ArcGIS Notebooks is built on Jupyter Notebook, which is an open-source web-based IDE (integrated development environment). ArcGIS Notebooks is specifically customized to work the ArcGIS platform allowing you to take advantage of the benefits of Python while using the ArcGIS environment. Using ArcGIS Notebooks allows you to collaborate, automate and document your workflows.

Notebooks can be used in ArcGIS Pro, ArcGIS Online and Portal for ArcGIS.

STEPS:

1. Login to IMA' Portal or ArcGIS Online site.
2. Click **Notebook** in the menu at the top of the page.
3. Click **Esri sample notebooks**. Here you can find notebooks with instructions on how to perform tasks with Notebook.
4. Open the **Administration: Manage and allocate credits** notebook.
5. A notebook is made up of cells. There are three main types of cells: code cells, output cells, and markdown cells. The default option is "Code"; Python code is written in these cells. Human-readable text cells should use the "Markdown" type. Use these cell types to document or explain your code. Output cells should the results of the code executed.



N.B. Additional sample notebooks have been provided to you in the Sample Notebooks folder. New notebooks are periodically available on Esri's Github.

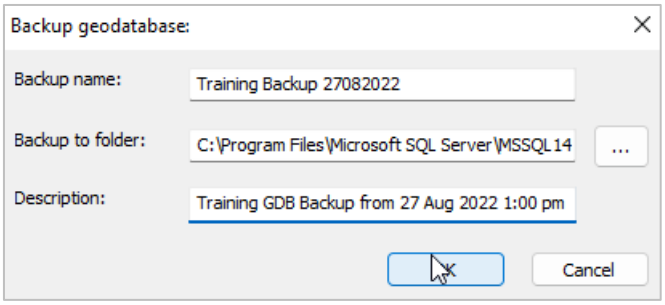
6. You can use code from the sample notebooks or by other users to create customised notebooks.
7. Open the sample notebooks with Jupyter Notebooks on your local machine – Jupyter is installed on any computer that has ArcGIS Pro installed. The code can be copied to a notebook on ArcGIS Online or Portal for ArcGIS. **N.B. ArcGIS Online Notebooks does not have access to overwriting local files**. You can use the ArcGIS API for Python in Jupyter to access data.
8. Navigate to folder that be your notebook directory.
9. Click **New** and select **Python 3** to create a new notebook.
10. Using this technical article as a guide, a notebook that allows you to backup online feature classes locally.

4.5 Backing up and Restoring Geospatial Data

A backup is a copy of a geodatabase that can be restored if a problem occurs. Geodatabases on database servers use SQL Server simple backup and recovery.

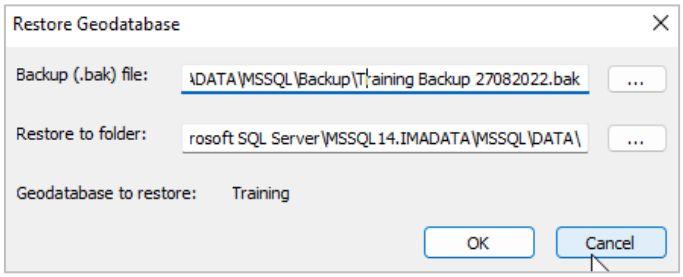
STEPS:

1. Log in as a server administrator or geodatabase administrator, start ArcMap, and open the Catalog window.
2. Double-click the database server that contains the geodatabase for which you want to create a backup. This connects you to the database server.
3. Right-click the geodatabase for which you want to create a backup file, click **Administration**, and click **Backup**.
4. The backup file is created in a default location. Change this, type the path or browse to the new location to which you want to save the backup file. Note, you can only browse to a different location if you are a server administrator. If you are a geodatabase administrator, you must type the path to the location.



5. Click Ok. Note that the Administration tab of the Geodatabase Properties dialog box indicates the name of the last backup file and the date when a backup was last performed for the geodatabase.

6. Navigate to the backup location, you should see an .bak file.
7. To restore a geodatabase, right click the database server then click **Restore**.
8. Navigate to the backup location and select the appropriate .bak file.



9. Click Ok. Note that you cannot have multiple geodatabases with the same name on a database server.

4.6 Troubleshooting and Using ArcGIS Server Manager Log Files

Monitoring server logs helps you identify errors, troubleshoot problems, and address issues with your site. When an event occurs in your site, the event is captured and recorded in the logs. To view messages associated with the event, you'll need to query the logs. The URL for ArcGIS Server Manager is **https://mdh.ima.gov.tt/server/manager**. Alternatively, you can open Manager from the operating system shortcut that is installed with ArcGIS Server.

STEPS:

1. Open Manager and sign in as an administrator.
2. Click **Logs** > **View Logs** to review the current logs. Some messages are returned along with additional information.
3. If you suspect there is an issue with the server, or a user reports a problem, you'll need to reproduce the event, capture the event with the logs, and query the logs to obtain information about the event. All events record specific information, such as the log level, the time at which the event occurred, and the machine on which the event occurred. All of this information can help you troubleshoot your server more effectively. By default, only the Level, Time, Message, and Source properties display in the log message window. ArcGIS Server can only retain 1,000 logs at a time. Only the most recent 1,000 logs are retained.

Resources:

https://support.esri.com/en/technical-article/000018326

https://enterprise.arcgis.com/en/documentation/install/database-server/10.8/intro-workgroup-database-server-installation.htm

https://enterprise.arcgis.com/en/server/latest/manage-data/windows/workgroup-geodatabases.htm

https://gis.stackexchange.com/questions/400854/back-up-feature-services-with-a-script

https://gis.stackexchange.com/questions/420300/exporting-fgdb-from-arcgis-enterprise-using-arcgis-python-api

https://support.esri.com/en/technical-article/000018909

https://support.esri.com/en/technical-article/000022524

https://github.com/highered-esricanada/arcgis-notebooks-tutorial/blob/master/notebook_basics/arcgispro_notebook.ipynb