

Exercise 1: Explore tools and apps for GIS and BIM integration

Technical note

1. You will make full use of web mapping services throughout this course. You will need a robust web connection to complete this exercise and the exercises that follow.
2. Use the latest version of Google Chrome, Mozilla Firefox, Apple Safari, or Microsoft Edge. Other web browsers may not display your maps and apps correctly.

Note: For information on supported web browsers for ArcGIS Online, go to ArcGIS Online Help:

Supported browsers
(<https://esriurl.com/browsers>).

Note: For information on supported web browsers for ArcGIS StoryMaps, go to ArcGIS StoryMaps Help: ArcGIS StoryMaps system requirements
(<https://esriurl.com/storybrowsers>).

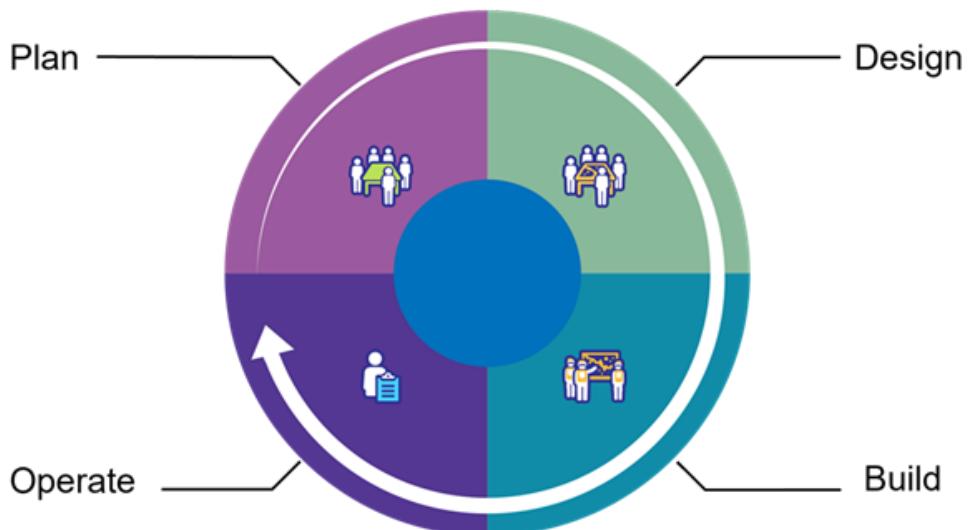
Software requirements

- An updated internet browser

Introduction

Within the architecture, engineering, and construction (AEC) industry, there is a continued focus on the integration of building information modeling (BIM), CAD, and GIS. As engineers, architects, and other users of BIM and CAD technologies strive to include the natural environment in their planning and design, GIS analysts likewise continue to see the value and utility of including the built environment available from AEC technology. There are many new tools and apps available to help combine these two elements into a holistic picture of an AEC project and ultimately of the environment in general.

An AEC project, whether building new infrastructure such as roads or bridges or constructing new buildings, follows a similar life cycle.



The first two phases are planning and design. When a project is ready to leave the "drawing board," it moves into the building phase of production. Finally, as a project is completed and is turned over, the result of the project moves into the operations phase.

Historically, CAD and BIM have been the primary tools for these types of AEC projects. But now, as architects, engineers, and construction professionals strive to create more sustainable infrastructure, integrating CAD data and building

information models with GIS technology and workflows can ensure that the natural and built environments are considered together. This integration will lead to better decision-making, stronger collaboration, revelations of pivotal insights, and solutions to critical problems at key points during a project.

Esri provides many applications that help integrate GIS and AEC-design-oriented workflows. One of these apps is Esri Story Maps. Esri Story Maps lets you combine authoritative maps with narrative text, embedded web apps and tools, images, and multimedia content to tell a story.

Esri UK has created a story that combines these elements to provide a holistic presentation of how the ArcGIS system aids in the integration of GIS and BIM throughout an AEC project.

In this exercise, you will learn about more of these apps, like Esri Story Maps, and other tools to help integrate your workflows. You will get to explore some of these embedded web apps on your own as you encounter them through your reading. After you complete this exercise, you will be familiar with several tools available to you that can be used to integrate GIS and BIM into the four phases of an AEC project.

Note: The exercises in this course include View Result links. Click these links to confirm that your results match what is expected.

Scenario

In this exercise, imagine that you are a project lead at an engineering firm wanting more information about the various tools and apps available for GIS and BIM integration for a fictitious building project. You will explore various tools available within the ArcGIS system that can be used to help bring these two sides of the industry together.

Estimated completion time: 50 minutes

Expand all steps ▾

Collapse all steps ▲

- Step 1: Explore the four phases of an AEC project

In this step, you will be introduced to an Esri Story Map created by Esri UK named *ArcGIS Tools for BIM*.

- Go to ArcGIS Tools for BIM to open this story in your web browser.



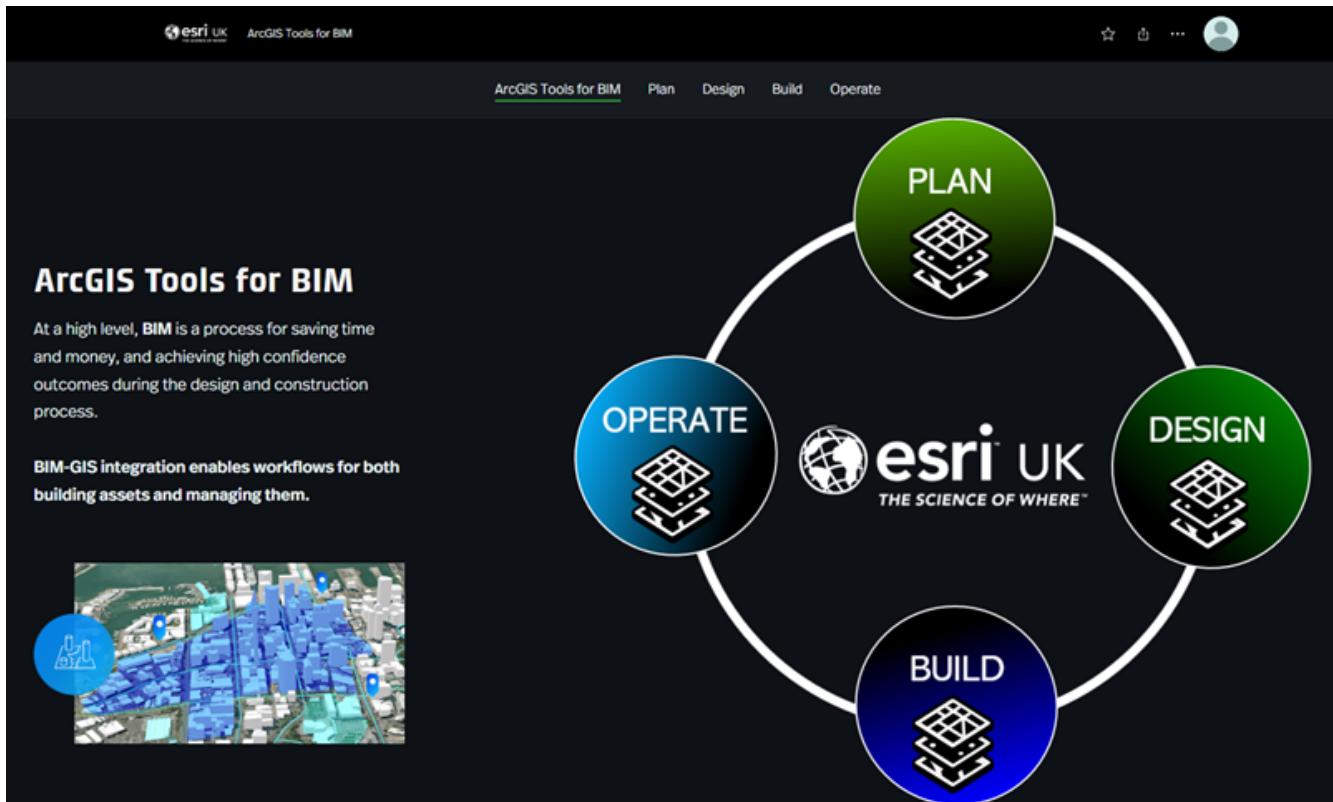
*Step 1a***: Explore the four phases of an AEC project.*

This story is divided into four main sections. Each section corresponds with a stage of the life cycle of project development: Plan, Design, Build, and Operate. To tell this story and highlight specific tools and applications that

can be used in each one of these stages, the fictional development of Esri UK's Head Office Millennium House in Aylesbury is used as the example.

The tools and apps that you will learn about are used for different tasks within the life cycle of an entire project. It is not necessary to use all the tools for every project; you may only use a few depending on what is being built, constructed, or operated. Similarly, while different apps or tools are listed individually here, many can be used and, in fact, will be used across the entire life cycle of your project. This story will show you what is possible and create awareness for your own use and integration of this technology into your workflows.

- b In your web browser, scroll down and read the ArcGIS Tools For BIM section, and then answer the following questions.



*Step 1b***: Explore the four phases of an AEC project.*

? Which two advantages can ArcGIS provide to users who have incorporated BIM data into their workflows? (Choose **two**.)

- Replaces traditional CAD software
- Provides geographical context for BIM data
- Provides a range of tools and applications
- Eliminates the need for the BIM life cycle

? What are some workflows within the AEC project life cycle that you can think of that could benefit from geographic context?

- Answer

Answers will vary but can include things such as understanding the watershed or flood-risk of an area, understanding soil composition and its impact to a building site,

reviewing possible line of sight constraints, proximity to known animal habitat locations, and many others.

Note: Feel free to share your ideas for workflows within the AEC project life cycle in the forum and be sure to include the #GeographicContent hashtag in the posting title.

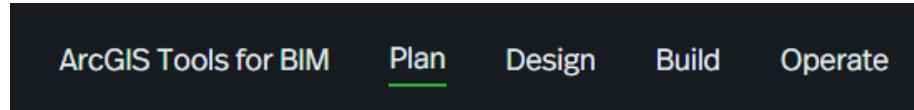
You will now learn about some of these tools that can be used within each phase of a project life cycle.

- Step 2: Examine planning with GIS and BIM

The Plan phase of a project includes many tasks that ArcGIS tools and applications can support, including site identification, analysis of area demographics, evaluation of the existing natural and built environments, and so on. In this step, you will examine how you can use ArcGIS apps in the planning phase of an architecture, engineering, and construction (AEC) project.

This story includes a banner with clickable options for section navigation.

- In the story banner, next to ArcGIS Tools For BIM, click Plan.



*Step 2a***: Examine planning with GIS and BIM.*

Note: When you click a section title, a green line will underline it to show you which section of the story that you are in.

- Scroll down to the Tools For Planning: ArcGIS Pro component.

A screenshot of the 'Tools for Planning' section of the ArcGIS Tools for BIM story. At the top left is the 'esri UK' logo and 'ArcGIS Tools for BIM' text. The top navigation bar shows 'ArcGIS Tools for BIM', 'Plan' (underlined in green), 'Design', 'Build', and 'Operate'. The main content area has a dark background. On the left, there's a heading 'Tools for Planning' and a section titled 'ArcGIS Pro' with a brief description. Below that is a large blue hexagonal icon containing a white globe. At the bottom left, there's a note: 'ArcGIS Pro gives you the power to examine relationships, test predictions, and ultimately make better decisions.' On the right side, there's a large image of a computer monitor displaying a complex 3D map with various layers of data, including terrain, buildings, and possibly hydrology or traffic flow. The monitor sits on a desk with some papers.

*Step 2b***: Examine planning with GIS and BIM.*

The first section highlights several ArcGIS tools and applications that can be used during the Plan phase of a project. There are interactive examples of the tools and apps with context for the fictional Millennium House development project.

As you explore the descriptions and examples, think about your current workflows and how these tools and applications could benefit the work that you do. You will have additional opportunities to work with some of these tools and apps throughout this MOOC.

- c In the lower-left corner of your web browser window, locate the 01 / 05, as shown in the following graphic.



- d Click 01 / 05 to expand the component menu.



Step

*2d***:*

*Examine
planning
with GIS
and BIM.*

This expanded menu acts as a selector that allows you to easily navigate between each of these components.

- e Click each number in the component menu to navigate to each of the five examples of tools for the Plan phase.

These five components are as follows:

1. ArcGIS Pro
2. ArcGIS Living Atlas of the World
3. ArcGIS Pro: Using ArcGIS Pro and Living Atlas layers to derive a potential flood map
4. ArcGIS Pro: Sharing content to ArcGIS Online
5. ArcGIS Business Analyst

- f On your own, read the descriptions for each of these components, and then answer the following questions.



Which online app could you use to view and manage content, such as maps or GIS layers, shared from ArcGIS Pro in an AEC project?

- Answer

ArcGIS Online is a complete cloud-based GIS mapping app that allows users to view and manage content and even perform analysis on spatial data shared from ArcGIS Pro.



Where can you retrieve curated GIS data, as well as various apps and even maps, to help support analysis and other components of the planning phase of an AEC project?

- Answer

ArcGIS Living Atlas of the World is the foremost collection of geographic information from around the globe, including maps, apps, and data layers available online to support your work.



Which app allows you to manage complex jobs across teams and provides you with powerful analytic tools to standardize and even automate workflows and processes?

- Answer

ArcGIS Pro is a powerful desktop app that provides tools for creating, importing, and analyzing spatial data. Additionally, any of the workflows performed in ArcGIS Pro can be standardized and automated to help your team during the planning phase of an AEC project.

g In the lower-left corner of your web browser window, expand the component menu, if necessary, and click 4.

The screenshot shows the ArcGIS Tools for BIM interface. At the top, there's a navigation bar with 'esri UK' and 'ArcGIS Tools for BIM'. Below it, a secondary navigation bar has tabs for 'Plan', 'Design', 'Build', and 'Operate', with 'Plan' being the active tab. The main content area is titled 'Tools for Planning' and features a section for 'ArcGIS Pro'. It describes ArcGIS Pro as a shared knowledge resource that enables tailoring of maps for end users. It mentions that a map was shared from ArcGIS Pro to an online organization within ArcGIS Online. Below this text is a large blue hexagonal icon containing a white cloud and three overlapping 3D cubes, representing ArcGIS Online. To the right of the text is a detailed map of a city area, likely London, showing streets like Walton Street, Kings Road, and Highgate. Overlaid on the map are several blue shaded areas representing flood-risk zones. A specific red polygon highlights a particular area of concern. The bottom left of the interface shows a vertical component menu with numbered buttons 1 through 5, where button 4 is highlighted. The bottom right corner of the map area includes standard zoom and navigation controls.

*Step 2g***: Examine planning with GIS and BIM.*

This component contains an embedded ArcGIS Online web map.

A web map is an interactive display of geographic information that can help tell a story and answer questions. Web maps contain a basemap, often a set of data layers (many of which include interactive pop-up windows with information about the data) and extent, and navigation tools to pan and zoom.

As part of the planning for this project, a flood-risk analysis was conducted to determine which areas might be susceptible to flooding. Using various GIS layers from ArcGIS Living Atlas of the World, such as a terrain file of slope values (derived from an elevation layer) and rivers, and then incorporating potential flood parameters and tools available in ArcGIS Pro, GIS analysts can create an analytical product showing the potential impact of the natural environment on the built environment. After the analysis is complete, it can be shared directly to ArcGIS Online, as you can see here, and embedded as part of a story.

You can interact with this web map here in this story.

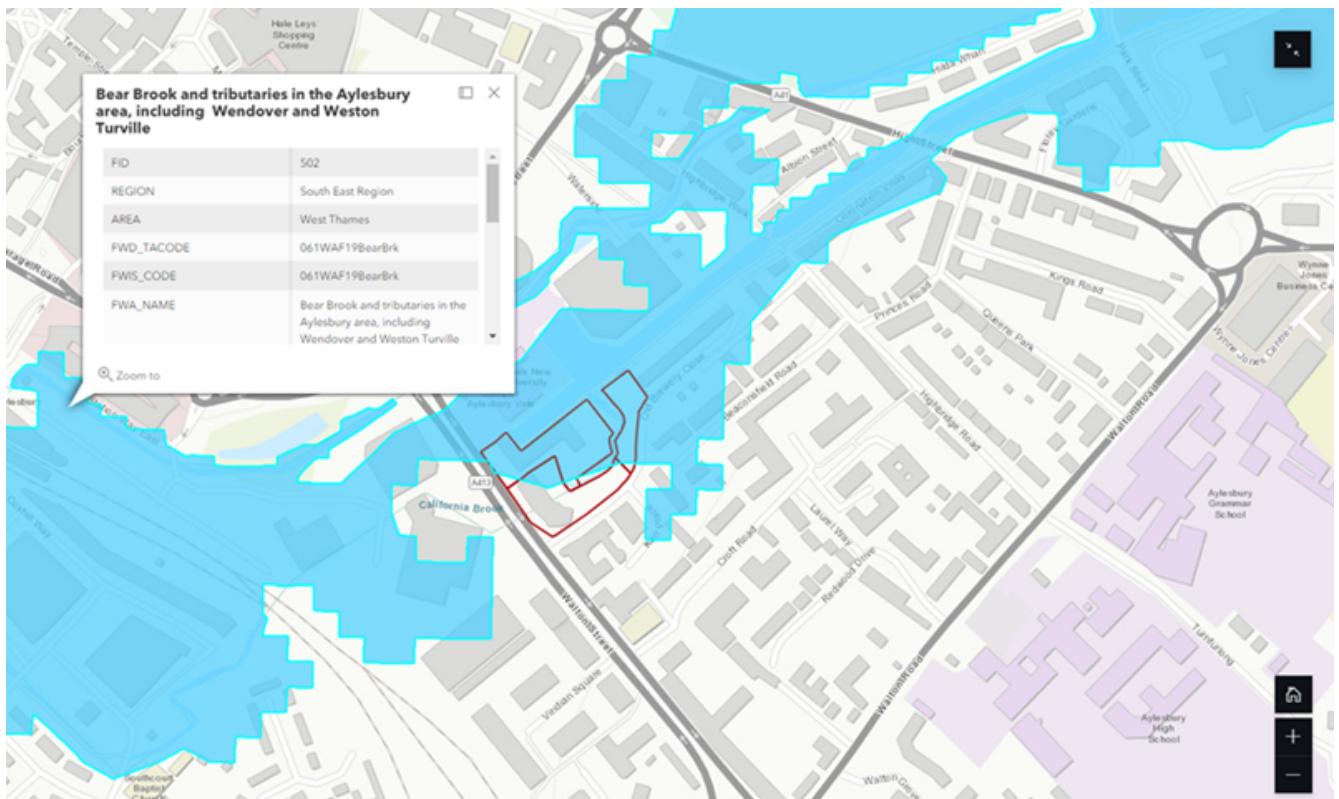
- h Move your cursor into the web map, and then click and drag to pan through the map.
- i Use the Zoom In button  and Zoom Out button  to zoom in and out of the map.

You can use these navigation tools to explore the Aylesbury area and examine the impact that the natural environment has on the built environment in this region.

- j After exploring the Aylesbury area, click the Home button  to return to the default view of the map.

The blue polygon represents areas of potential flood risk. This type of GIS layer has attribute information associated with it that is accessible in this web map.

- k In the web map, click anywhere in the blue polygon.



*Step 2k***: Examine planning with GIS and BIM.*

The pop-up contains attribute information about the areas of potential flood risk derived during the analysis. You can scroll through the information to learn more about potential flood risk areas.

- l Scroll through the attribute information to answer the following questions.

? According to the attributes, what is the hydrologic region and area of this flood-risk area around Aylesbury?

- Answer

The region is the South East Region, and the area is West Thames.

? What is the river system of concern for flooding?

- Answer

Bear Brook and its tributaries



What county is Aylesbury located in?

- Answer

Buckinghamshire

- m Close the pop-up.

Because the flood-risk assessment used ArcGIS Living Atlas layers, such as the Open Rivers data, other river systems and their flood risk were included in the analysis. This type of GIS analysis therefore adds a full geographic context to an overall project plan. Ultimately, integrating the built environment with the natural environment helps provide actionable information for decision makers and stakeholders well before any formal designing or building—that is construction—occurs.

- n Use the navigation tools to zoom out, and then answer the following question.



What is the river system and flood-risk zone immediately north of Aylesbury (as indicated in the following graphic)?

- Answer

River Thame and Chalgrove Brook



- Hint

Click the blue polygon to access the attribute information.

Most GIS layers contain attribute information of some type. When providing geographic context for a construction project, either through maps or from analytical products (such as this flood-risk assessment), this information about the natural environment can be very helpful. The ability to see and understand the environmental considerations necessary for construction help with building a more sustainable future.

Now that you have viewed some of the tools and apps available that can be used during the planning phase of a project life cycle, you will next look at how GIS and BIM integration are achieved during the Design phase.

During the Design phase, ArcGIS tools and applications can be used to support project visualization, communication and sharing with stakeholders, monitoring of design plans, evaluation of the existing geographic and built environment considerations, available imagery, utility lines, and much more.

Many tools and apps are available to support integrated and collaborative workflows in the Design phase of a project. In fact, because of the partnership between Esri and Autodesk, many data formats can be used interchangeably in apps such as ArcGIS Pro and ArcGIS Online, contributing to greater efficiencies.

In this step, you will continue to explore the story, with a focus on the Design phase. You will learn about Esri's partnership with Autodesk and the synergies between their products. As you read through this step, keep in mind that apps such as ArcGIS Pro and ArcGIS Online can also be used during the Design phase of your projects.

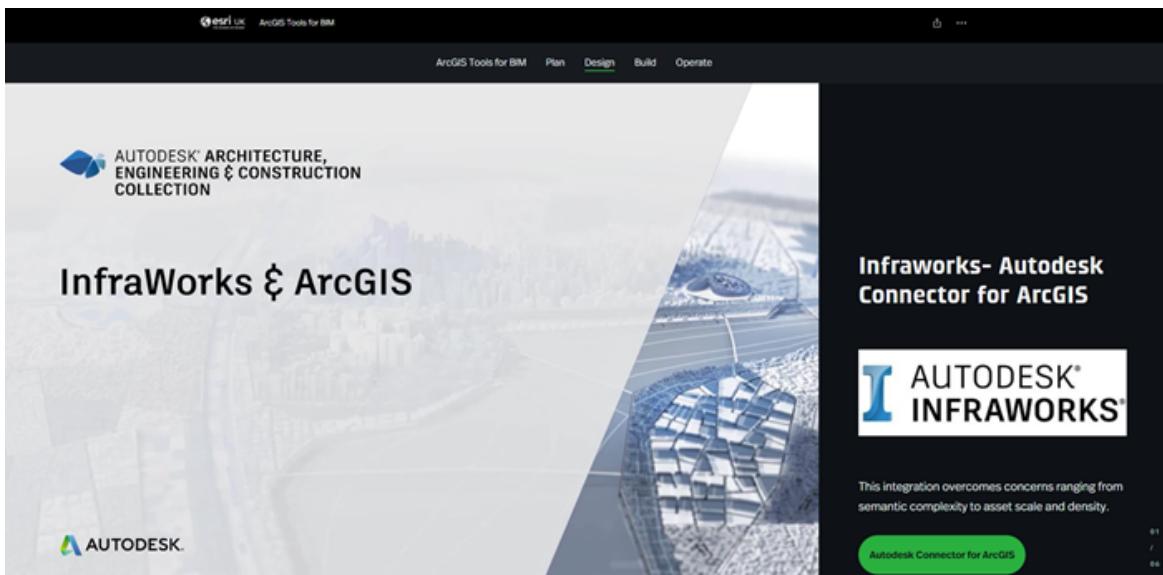
- a In the story banner, click Design.

The screenshot shows a web-based story banner for 'ArcGIS Tools for BIM'. At the top, there is a navigation bar with the Esri UK logo, the text 'ArcGIS Tools for BIM', and three icons. Below the navigation bar, there is a horizontal menu with five items: 'ArcGIS Tools for BIM', 'Plan', 'Design' (which is underlined, indicating it is the active section), 'Build', and 'Operate'. The main content area has a dark background. The title 'DESIGN' is centered in large, bold, white capital letters. Below the title, there is a paragraph of text in white. At the bottom of the content area, there is a large, semi-transparent graphic featuring a globe on the left and a city skyline on the right, with the text 'GIS + esri + AUTODESK. BIM' overlaid in white.

*Step 3a***: Explore design tools for AEC projects.*

The Design section of this story highlights the synergy between GIS and BIM technologies and the partnership between Esri and Autodesk. Each component in this story's section shows examples of apps that can be used together to allow for a more integrated design experience.

- b Scroll down to the Infraworks - Autodesk Connector For ArcGIS component.



*Step 3b***: Explore design tools for AEC projects.*

With the Autodesk Connectors for ArcGIS, architects, engineers, and planners can better utilize GIS layers within the Autodesk suite of tools. Similarly, ArcGIS for AutoCAD gives GIS practitioners the ability to easily incorporate CAD drawings seamlessly into their maps alongside other GIS layers.

- c As in the previous step, scroll down, and then in the lower-right corner of your web browser window, expand the component menu.

This section contains six components. Several of these are for Autodesk products (Infraworks - Autodesk Connector for ArcGIS, Revit, and Civil 3D), and some apps are for use with ArcGIS (ArcGIS for AutoCAD, Scene Viewer, and ArcGIS GeoBIM). Each component within this section can be viewed as either a short animation or as an image to provide a representative graphic example of the app or tool.

You can get an idea of how these tools can benefit an AEC project in design by viewing the examples of the fictitious Aylesbury building project. You will have an opportunity to work with several of these apps and data in this MOOC.

- d On your own, read the descriptions for each of these components, and then answer the following questions.



Which apps provide collaborative environments and links so that data integrity can be maintained between GIS and BIM data?

- Answer

ArcGIS GeoBIM and Autodesk Connectors for ArcGIS both provide seamless connections for users to work with GIS and BIM data when designing elements for an AEC project.



What are some Autodesk product formats that can be used in their native formats in ArcGIS Pro and ArcGIS Online?

- Answer

Revit and Civil 3D can both be used directly in either ArcGIS Pro or ArcGIS Online. Additionally, with the ArcGIS for AutoCAD plug-in, CAD drawings can be used as ArcGIS basemaps.

- e Scroll down to the Tools For Design - City Engine component.

 ArcGIS Tools for BIM

ArcGIS Tools for BIM Plan Design Build Operate

Tools for Design - City Engine



CityEngine for ArcGIS is an advanced 3D modelling software for creating huge, interactive and immersive urban environments in less time than traditional modelling techniques.

As a standalone desktop application, **City Engine** fully supports the Esri file geodatabase, and can be connected to ArcGIS Online to publish your 3D scenes in the cloud.

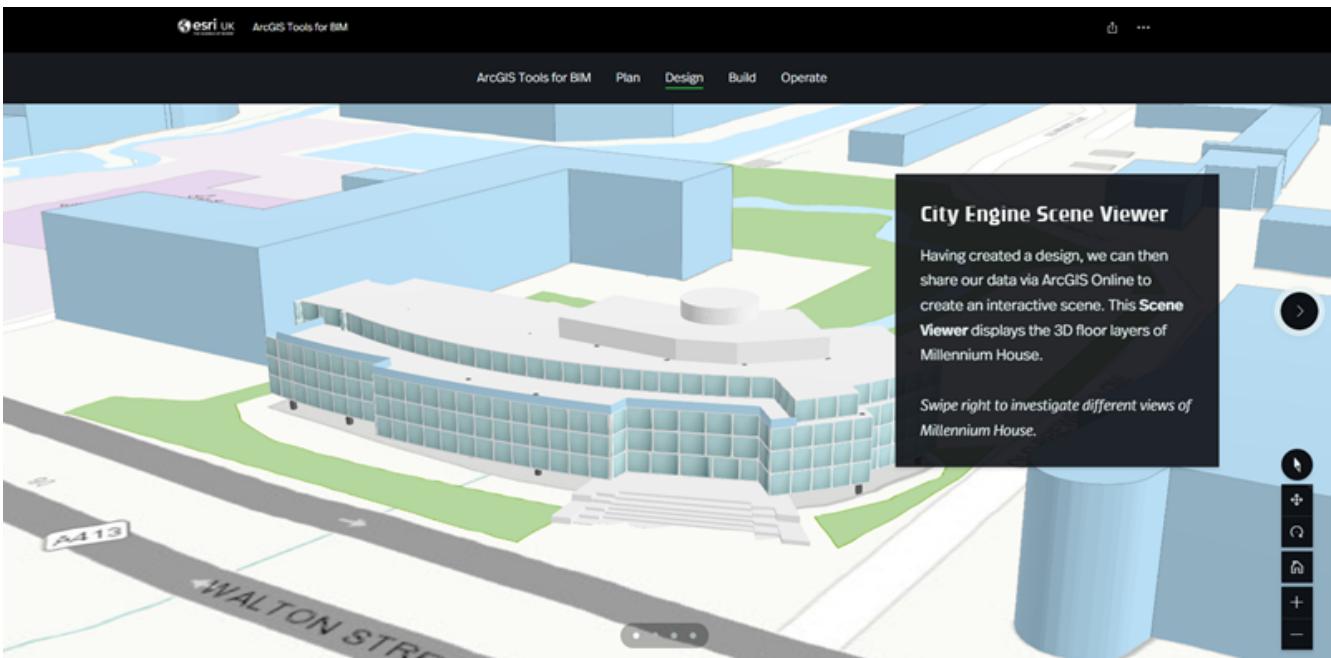
City Engine delivers these tools within a design environment early in the design phase, but design models can be imported into ArcGIS Pro and analysed at any stage. To make the results more accessible they can be shared in a 3D web scene, like the one below.



*Step 3e***: Explore design tools for AEC projects.*

ArcGIS CityEngine gives engineers, architects, and urban planners more options in the Design phase. You are no longer restricted to a single building model or GIS layer. With CityEngine, you can create large and immersive urban environments and publish these 3D scenes to ArcGIS Online. CityEngine allows you to maximize integration with various compatible formats, including CAD as well as with selected Autodesk formats.

- f Scroll down to view the entire City Engine Scene Viewer.



City Engine Scene Viewer

Having created a design, we can then share our data via ArcGIS Online to create an interactive scene. This **Scene Viewer** displays the 3D floor layers of Millennium House.

Swipe right to investigate different views of Millennium House.



*Step 3f***: Explore design tools for AEC projects.*

Scenes allow you to experience geographic information similarly to the way that you would in the real world—in three-dimensional space. This functionality helps you understand large and complex data and spatial relationships by representing it as real-world objects that can be visualized and analyzed in a scene view, which is a 3D view of a map. You can incorporate 3D real-world elements into your content, highlighting influences such as the movement of the terrain and the 3D extent of features like trees, buildings, and even subsurface geology. Additionally, the display of quantitative GIS content, if available, can often be communicated with 3D attributes

providing a different and unique view of the data. Just like maps created in ArcGIS Pro can be shared online, scenes created in ArcGIS Pro can be shared using ArcGIS Online, too.

When using ArcGIS Online, Scene Viewer allows you to view and interact with these 3D views. Because ArcGIS CityEngine also leverages a 3D environment, when this content is shared, it is available in Scene Viewer.

This app contains four predefined scene views generated at different angles using CityEngine as part of an embedded app presentation for the Millennium House project stakeholders. Within the Scene Viewer app, you can freely navigate within each predefined views.

- g On the right side, click the Advance button  to move through and read each slide.

Note: You can also navigate through the progression of views through the slide menu , which is located near the bottom of the scene view.

You can navigate in this scene using several of the tools in the lower-right corner of the app, or you can also navigate using your mouse buttons. The Zoom In button  and Zoom Out button  will zoom at set incremental steps. Alternatively, you can use the mouse and scroll wheel to zoom in and zoom out with finer precision. The mouse buttons operate differently if you are in Pan  or Rotate  mode. When you click either tool, the mouse button becomes the primary navigation, and the right mouse button becomes the secondary navigation. For example, in this app, Pan  is set as the default. The mouse button will pan through the scene, and the right mouse button will rotate the scene.

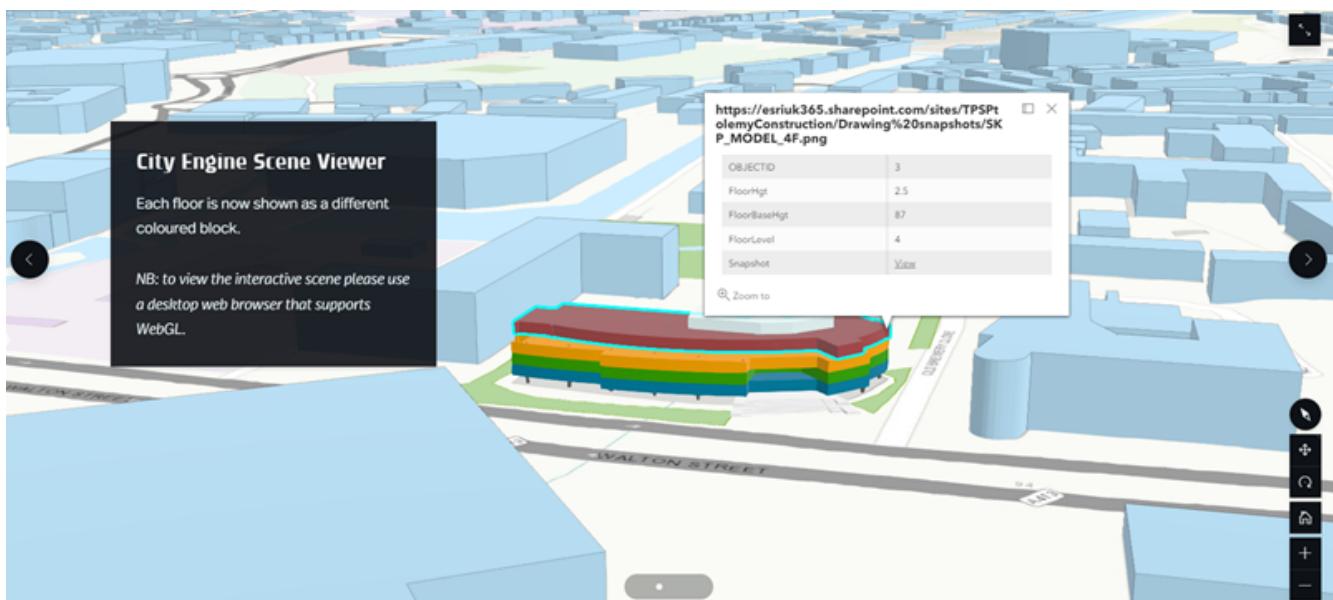
- h On your own, click inside the scene view and experiment with the navigation tools.

To learn more about Scene Viewer, go to ArcGIS Online Help: Get started with Scene Viewer, and to learn more about navigating in a 3D scene, go to ArcGIS Online Help: Scene navigation.

Note: If you become disoriented in the scene view or lose your place, you can click the Advance button  to go to the next predefined view, or you can click the Default Map View button  to return to that view's starting point.

As with the flood-risk assessment layer that you observed earlier, these 3D models are also selectable. In fact, each floor in the Millennium House is selectable and has attributes associated with it.

- i On your own, in the scene viewer, click the top floor of the building to examine its attributes.



*Step 3i***: Explore design tools for AEC projects.*

Because this view is a proof-of-concept view, the surrounding buildings do not contain full attribute information nor are the models fully rendered as photorealistic buildings. The natural and built-up environments that are modeled using CityEngine can be as detailed or as simplistic as your project needs require.

In this step, you explored some of the apps available that allows integration between GIS and BIM. The partnership between Esri and Autodesk allows for smooth and easy transitions between the two environments, allowing for stronger project cohesion with all stakeholders.

In the next step, you will look at some of the ArcGIS apps that can be used during the Build phase of a project.

- Step 4: Examine tools for building

When construction begins, more stakeholders become involved. In addition to the architects and planners, now engineers, construction workers, delivery drivers, and many others rely on timely information. Integrating GIS and BIM and sharing this information to those in need becomes paramount.

In this step, you will examine some of the tools that can be used to help with this integration and sharing. As with the design phase of a project, previous tools that you explored and encountered can also be used in the building phase of an AEC project.

- In the story banner, click Build.

The screenshot shows the ArcGIS Tools for BIM interface. At the top, there's a navigation bar with the Esri UK logo and the text "ArcGIS Tools for BIM". Below the navigation bar, there are tabs: "ArcGIS Tools for BIM", "Plan", "Design", "Build" (which is highlighted in green), and "Operate". The main content area has a large title "BUILD" in bold capital letters. Underneath the title, there are two sections of text: "ArcGIS web apps" and "ArcGIS field applications". The "ArcGIS web apps" section describes how they provide direct and secure access to data via web applications. The "ArcGIS field applications" section describes how they work on mobile devices like smartphones and tablets, allowing offline operation. At the bottom left of the main content area, there's a dark sidebar with the text "Tools for Building". To the right of the sidebar is a map titled "Logistics Planning to Millennium House". The map shows a route from various locations in a town or city center to a destination. The route is highlighted with blue and purple lines, and there are several blue circular markers along the path. The map includes labels for streets like Castle Street, Vale Retail Park, and Kings Road, as well as landmarks like St Mary's Church and Biners Square Shopping Centre.

*Step 4a***: Examine tools for building.*

During the Build phase of a project, it is critical to communicate with various teams and stakeholders to maintain an efficient project schedule. Several of the apps that you will learn about in this step provide this ability to share information with various team members.

- Scroll down to the Tools For Building - ArcGIS Routing Services component.

esri UK ArcGIS Tools for BIM

ArcGIS Tools for BIM Plan Design Build Operate

Tools for Building

ArcGIS Routing Services

At all stages in a project, but especially during **construction**, it is important to check that the view of the world provided by the data matches the real world, and that those onsite can safely go from one area to another.

One issue is creating clear logistic routes so people and other assets can move between sites. By using the **ArcGIS Routing Services** (available in ArcGIS Online), you can **manage fleet planning**, and ensure a multitude of transport services all use the most efficient routes to their destination.

You can then use **Web App Builder for ArcGIS** to create an application for those construction workers to see and check they are on the best route. See the example to the right.

*Step 4b***: Examine tools for building.*

This section contains information on three apps that can be used in the Build phase of a project. You will examine an embedded web app showing how ArcGIS routing services can be used during the construction project. You will explore how ArcGIS Dashboards aids in statistical analysis of your project and provides a holistic view of progression. Finally, learning about ArcGIS Field Maps will show you how you can share information about your project to mobile devices used by on-site staff in the field.

- c On your own, read the descriptions for each of these components, and then answer the following questions.



What are some uses for ArcGIS Field Maps in a construction project?

- Answer

ArcGIS Field Maps allows you to view and mark up maps, collect and input data using smart forms, and track mobile workers in the field.

- You can activate and connect to your device's location service, making it easy to locate yourself on the map.
- Identify places on your map for further review using the markup tool.
- Take measurements against your plan or design files.
- Share your marked-up map with field staff or members of your organization.



Which two apps could you use to help with fleet management or to help with real-time logistics of materials delivery? (Choose **two**.)

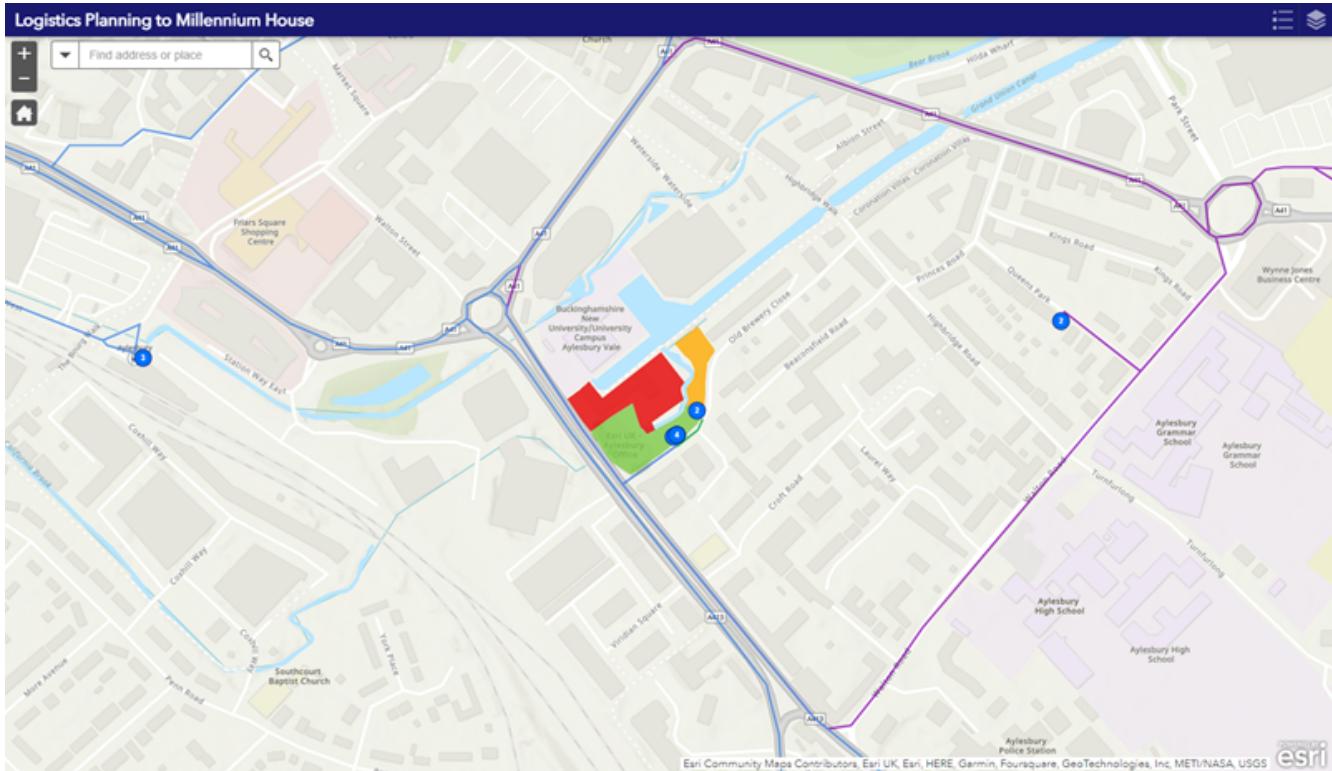
- ArcGIS GeoBIM
- ArcGIS Dashboards
- ArcGIS CityEngine
- ArcGIS routing services

? Which app would you use to help monitor supply-side status and risks?

- Answer

Tools, maps, and charts available with ArcGIS Dashboards provide you with statistical analysis and monitoring capabilities to help track progress and summarize risks.

- d If necessary, expand the component menu and click 1 to return to ArcGIS Routing Services component.
- e In the Logistics Planning To Millennium House web app, near the upper-right corner, click the Open Live Content In A New Tab button .



*Step 4e***: Examine tools for building.*

The web app opens in a new web browser tab. Web apps are an effective way to share information. The web app is a customized user interface that focuses your map or scene for a specific purpose, message, and audience. For example, if you only want to showcase your map, your map only needs a few basic navigation tools. However, if your web app will be used to collect feedback from outside your organization, it will need specialized data editing tools and instructions for you to enter the information in addition to your original map and GIS layers.

In this example, the web app is designed to show different delivery routes to the Millennium House construction site. Additionally, there is information about drop-off points and potentially information on delays or other information being delivered using the ArcGIS Routing Services.

For more information on web apps, go to ArcGIS Online Help: Share apps, and for more information on how you can create various web apps that you can include in stories, go to Esri Product Guide: ArcGIS Web AppBuilder.

- f In the web map, click the magenta route along Walton Road, and then answer the following questions.

Note: The feature color will change to cyan, indicating that it is selected.

? What is the name and number of this route?

- Answer

Lorry Route 1 (Truck Route 1)



How long is the route in kilometers and how long is the expected travel time along the route?

- Answer

The route is 2.52 kilometers and will take approximately 5.88 minutes.

These attributes visible in the pop-up are associated with the GIS layers in your map. Routing information like in this example, derived from ArcGIS Routing Services, can be very helpful when coordinating deliveries of supplies for a construction project. This information can also be shared to other members of your organization and accessed using their mobile devices.

g Close the pop-up.

The GIS layer associated with the construction site is divided into three zones: a Red Zone, a Green Zone, and an Amber Zone, based on accessibility and delivery times.

h On your own, and using previously learned skills, interact with these features in the GIS layer, and then answer the following questions.



Which zone is accessible to drop off materials only?

- Green Zone
- Red Zone
- Amber Zone
- All zones



What are the accessible hours for the Red Zone?

- Answer

Delivery drivers are only allowed access to this zone Monday through Wednesday between 9:00 a.m. and 1:00 p.m. (09:00 - 13:00).



What is the accessibility of the Green Zone in the construction site?

- Answer

The green zone is fully accessible Monday through Friday between 9:00 a.m. and 5:00 p.m. (09:00 - 17:00).

ArcGIS provides the tools to create GIS layers like in this example, which can be used with an AEC project and made available widely across your team. As conditions change, this information can be updated and pushed across an organization so that all team members share the revised data. In this example, if delivery access changes for any of these zones, updates can be shared and provided to drivers in real time to help with efficiencies and maintain your project schedule.

i Close the Logistics Planning To Millennium House web browser tab.

In this step, you explored a web app using ArcGIS Routing Services as part of the building phase of an AEC project life cycle. In the next step, you will examine a few more apps that can be used during this critical stage of a project.

- Step 5: Review more tools for building

Monitoring progress throughout the building phase of a project is critical to ensure that schedule and milestone dates are met. First, you will examine a dashboard that uses red, amber, and green status indicators to assess project milestone completions, progress, and delays for the Millennium House project. Then, you will review some of the uses and applications in ArcGIS Field Maps.

- In the ArcGIS Tools For BIM web browser tab, in the Build section, expand the component menu and click 2 for the ArcGIS Dashboards component.

Project RAG Status Manager

OID	Project Number	Project Name	Del
1	1	HS2 Tunnel, Wendover	C
2	2	Millennium House, Aylesbury	C
3	3	QEII Conference Centre, London	S
4	1	HS2 Tunnel, Wendover	C
5	1	HS2 Tunnel, Wendover	I

Project Managers

Name	Score
Alexander Hirsch	3.0
Craig Everard	2.0
Emma Sanderson	1.0
Jack Dangemond	2.0
Richard Munkofsky	1.0
Ruben Appelhof	2.0
Samia Czajkowski	0.5

More detailed info on project delays

Map of Europe showing project locations with colored dots corresponding to the RAG status.

*Step 5a***: Review more tools for building.*

- In the Project RAG Status Manager dashboard, click the Open Live Content In A New Tab button

Project RAG Status Manager

OID	Project Number	Project Name	Description	St
1	1	HS2 Tunnel, Wendover	Materials delivered to site	C
2	2	Millennium House, Aylesbury	Electricals installed	C
3	3	QEII Conference Centre, London	Funding arrived for phase 3	S
4	1	HS2 Tunnel, Wendover	Contractors onsite	S
5	1	HS2 Tunnel, Wendover	Insurance sign off	C
6	4	Stantander Cycle Docking Stations	Planning permission accepted?	D

Project Managers

Name	Score
Alexander Hirsch	3.0
Anna Kelly	1.0
Craig Everard	2.0
Emma Sanderson	1.0
Jack Dangemond	2.0
Richard Munkofsky	1.0
Ruben Appelhof	2.0
Samia Czajkowski	0.5

More detailed info on project delays

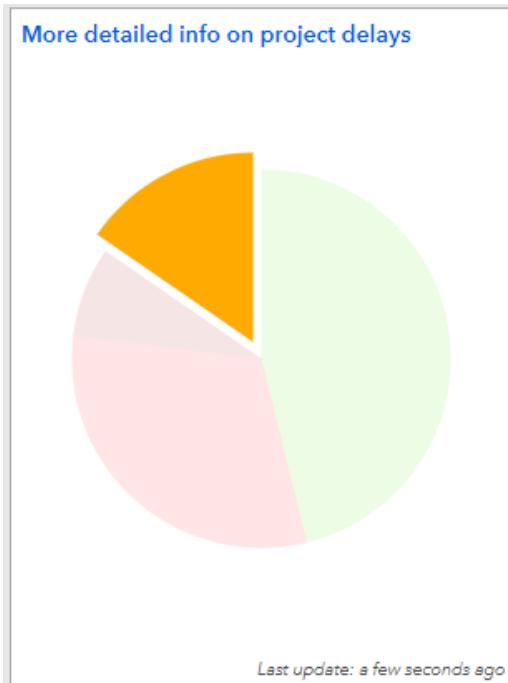
Map of Europe showing project locations with colored dots corresponding to the RAG status.

*Step 5b***: Review more tools for building.*

RAG is an acronym meaning Red (serious delays), Amber (in progress), and Green (completed projects), which corresponds to the colors used in the Project RAG Status Manager dashboard.

ArcGIS Dashboards conveys information to users by presenting location-based analytics and statistics as intuitive and interactive visualizations. Dashboards are visual displays that present data in an easy-to-read format. All relevant information can be seen on a single screen, thus facilitating an easy understanding of otherwise disparate data. Whether strategic, tactical, operational, or merely informational, dashboards provide key information during the building phase of an AEC project.

- c In the Project RAG Status Manager dashboard, in the More Detailed Info On Project Delays pie chart, click the amber wedge, and then make observations to answer the following questions.



*Step 5c***: Review more tools for building.*



What happens to the features on the map after you select the amber wedge?

- Answer

Only the two short-term delayed features appear on the map.



Who are the project managers for these two projects?

- Answer

Alasdair Hind and Emma Sandison

- d In the Project Managers bar graph, click Alasdair Hind, and then make observations to answer the following questions.



Step 5d*: Review more tools for building.**

You can click the bars in the graph indicating individual project managers to view the location of their projects and interact with the elements in the dashboard to gain more information.

? What is the geographical location of the project that Alasdair Hind is managing with this delay?

- Answer

This delay is at Millennium House, Aylesbury.

- Hint

In the map, you can click the remaining feature to see associated attribute information for the site.

? What is the project task?

- Answer

It is for an office refit and design of the fourth floor breakout room.

? How long is the delay?

- Answer

This project is delayed for six months.

Dashboards can be as complex or as simple as your project need's dictate. For instance, if a supply chain incident is causing delays to subsequent project tasks, these can be represented not just as graphs and charts but also on maps to capture any geographical components. The linked nature of these incidents can be holistically represented in a dashboard. This information can help project managers and decision makers understand how best to address delays and see completed progress.

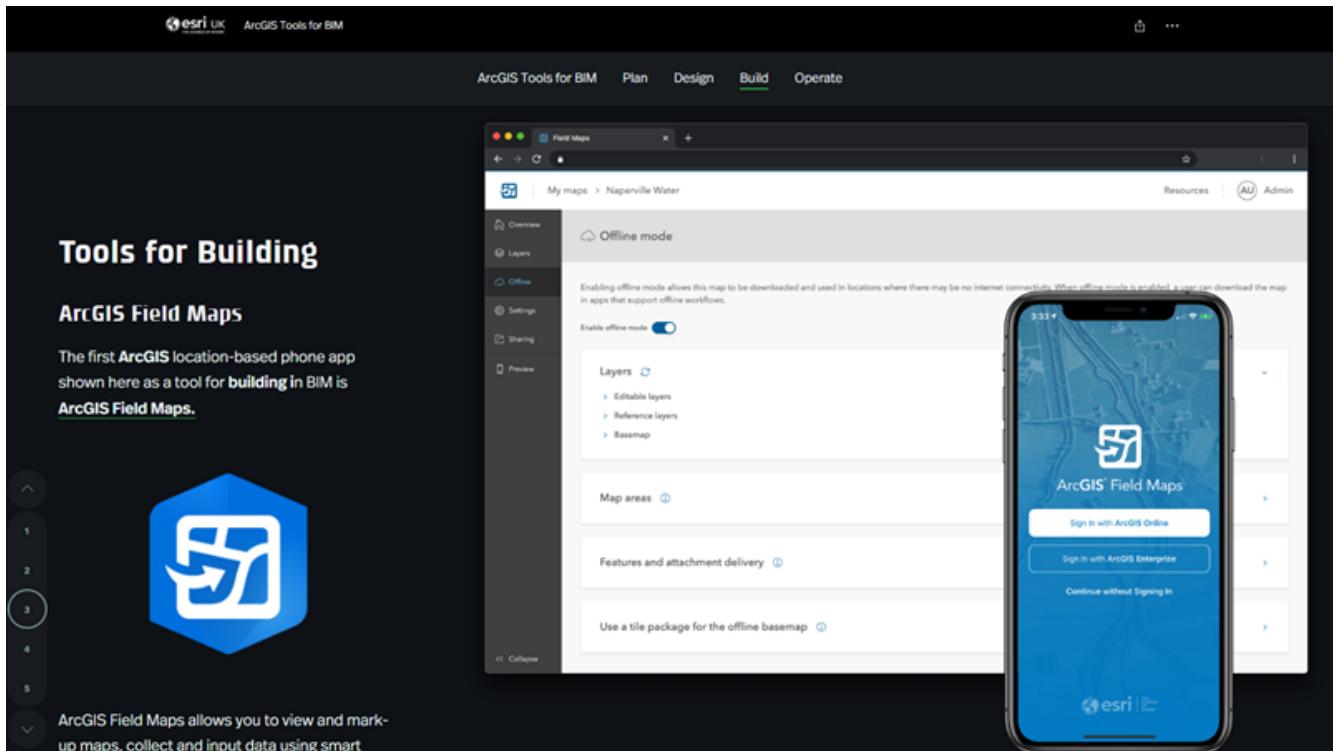
- e On your own, explore some of the other projects represented in this dashboard.

Note: The projects that Jack Dangermond is overseeing are located in Redlands, California, and San Diego, California. You can use your navigation skills in the map to check on the status of Jack's projects.

f Close the Project RAG Status Manager dashboard web browser tab.

Next, you will review uses and applications of ArcGIS Field Maps for in-the-field access to maps and data related to the project.

g In the ArcGIS Tools For BIM web browser tab, in the Build section, expand the component menu and click 3 for the ArcGIS Field Maps component.

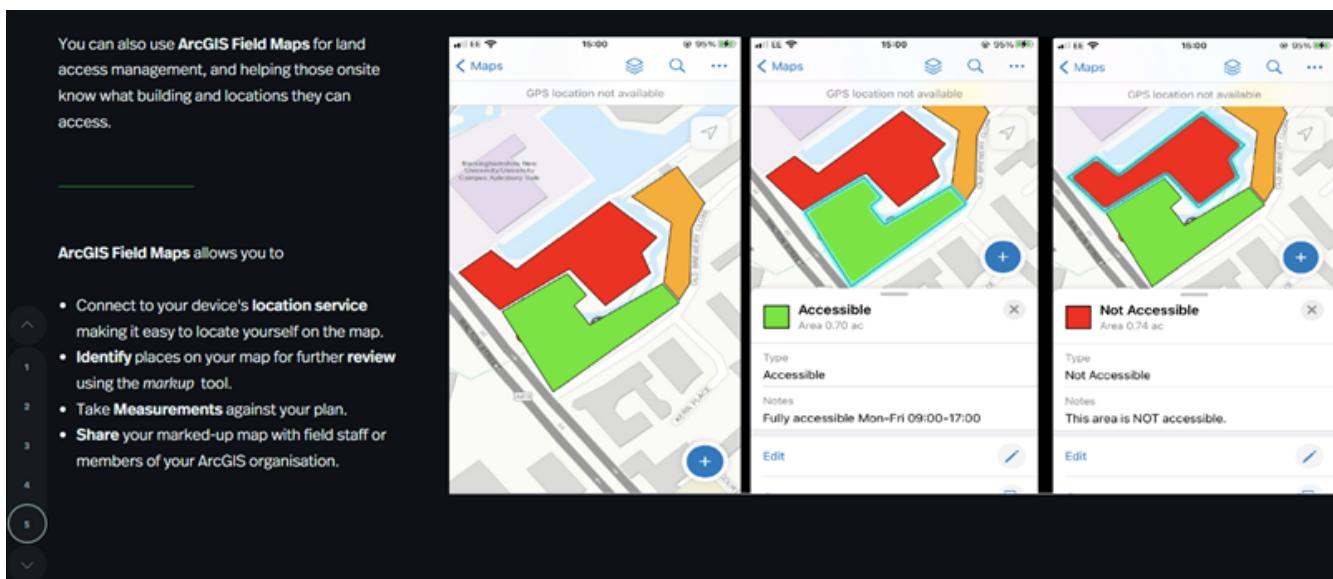


*Step 5g***: Review more tools for building.*

ArcGIS Field Maps provides project team members in the field or at a job site access to information, data, and maps that you share online. Depending on how administrators set up GIS layers to be used online, project staff in the field can edit layers, reference layers, and—as you will see in the next step—even collect and input data.

In the Build section, components three, four, and five provide examples of some of these.

h In the component menu, click 5.



*Step 5g***: Review more tools for building.*

This example shows representations of a driver's mobile view of the online map of accessible and inaccessible delivery locations near the Millennium House project that you previously explored. As information in the web app is updated, it can be shared and is then viewable by anyone with access in the field.

In the next step, you will continue to explore ArcGIS Field Maps and how they can be useful during operations phase of a project life cycle.

- Step 6: Explore tools for operations, maintenance, and sustainment

In the Operate phase, ArcGIS tools and applications can be used to manage and track resource usage, provide a means for logging real-time maintenance issues from the field, monitor building operations, and other tasks associated with building upkeep.

In this step, you will continue to explore ArcGIS Field Maps for use in the Operate phase of your project. Additionally, you will see how ArcGIS Workforce, ArcGIS Navigator, and ArcGIS Survey123 provide an integrated link between desktop apps and mobile apps for construction project teams and field staff.

- a In the story banner, click Operate.

The screenshot shows a dark-themed web page for 'ArcGIS Tools for BIM'. At the top, there are navigation tabs: 'ArcGIS Tools for BIM', 'Plan', 'Design', 'Build', and 'Operate', with 'Operate' being the active tab. Below the tabs, the word 'OPERATE' is prominently displayed in large white capital letters. A descriptive paragraph follows: 'The operate phase is by far the longest part of the project. ArcGIS field applications can be used to improve asset management and share information with better operational oversight. In the office, web apps and ArcGIS for Desktop support a range of tasks.' To the right of this text is a photograph of a person's hands holding a smartphone, which displays a mobile application interface for 'Hydrant Inspection Number'. The app includes fields for 'INSPECTION INFORMATION', 'Inspector', 'Inspection Date', and 'HYDRANT FLUSH'. A blue signal icon is visible above the phone. On the left side of the main content area, there is a sidebar with the heading 'Tools for Operating' and a section titled 'ArcGIS Field Maps for data collection' with the subtext 'ArcGIS Field Maps can also be used to collect'.

*Step 6a***: Explore tools for operations, maintenance, and sustainment.*

- b Scroll down to the Tools For Operating - ArcGIS Field Maps For Data Collection component.

The screenshot shows the ArcGIS Tools for BIM website with the 'Operate' tab selected. On the left, there's a section titled 'Tools for Operating' with a sub-section 'ArcGIS Field Maps for data collection'. It includes a description of how ArcGIS Field Maps can be used to collect and input data on mobile devices. Below this is a blue hexagonal icon with a white 'S' shape. To the right is a large image of a person's hands holding a smartphone, wearing a yellow safety vest. The phone screen displays a mobile application for 'Hydrant Inspection Number' with fields for 'Inspector', 'Inspection Date', and 'HYDRANT FLUSH' status. A small inset shows a close-up of the phone's screen with a keyboard overlay.

*Step 6b***: Explore tools for operations, maintenance, and sustainment.*

When construction is complete, the project enters the Operate phase. Building operations, maintenance, and sustainment workflows can be supported with ArcGIS tools to increase operational efficiencies. This section of the story includes apps and examples of ArcGIS tools used to support the Operate phase of the fictional Millennium House project.

In this section, you will discover how you can use ArcGIS Field Maps for operations and maintenance, and you will read about how you can use ArcGIS Workforce, ArcGIS Navigator, and ArcGIS Survey123 when a project is completed and the building or asset is turned over to the client or stakeholder.

Each component has a graphic that shows an example of the app in use.

- c On your own, read the descriptions for each of these apps and how they can be integrated into an AEC project, and then answer the following questions.



How can ArcGIS Field Maps be used to facilitate the transition from the Build phase to the Operate phase of an AEC life cycle?

- Answer

This story provided an example of a new asset, such as a water fountain. When the building construction is completed, new information can be collected, or existing records can be updated based on As-Built conditions. This information can be supplemented with photos or other attachments and provided to operations and maintenance staff.



Which two apps could you use to replace paper forms used by field staff to provide information and data on the health and safety conditions of a building? (Choose **two**.)

- ArcGIS Survey123
- ArcGIS Field Maps
- ArcGIS Workforce
- ArcGIS Dashboards



How do ArcGIS Workforce and ArcGIS Navigator work together to help with the maintenance of a building when it is completed?

- Answer

ArcGIS Workforce provides a common view of data and work assignments that can be tasked directly to the staff members. When the staff members have received their duties for the day, ArcGIS Navigator helps them pick up assignments, navigate to them, and collect data all in one workflow.

- d After exploring the components outlining these three apps for asset and facilities management, scroll down to the Tools For Operating - ArcGIS Dashboards section.

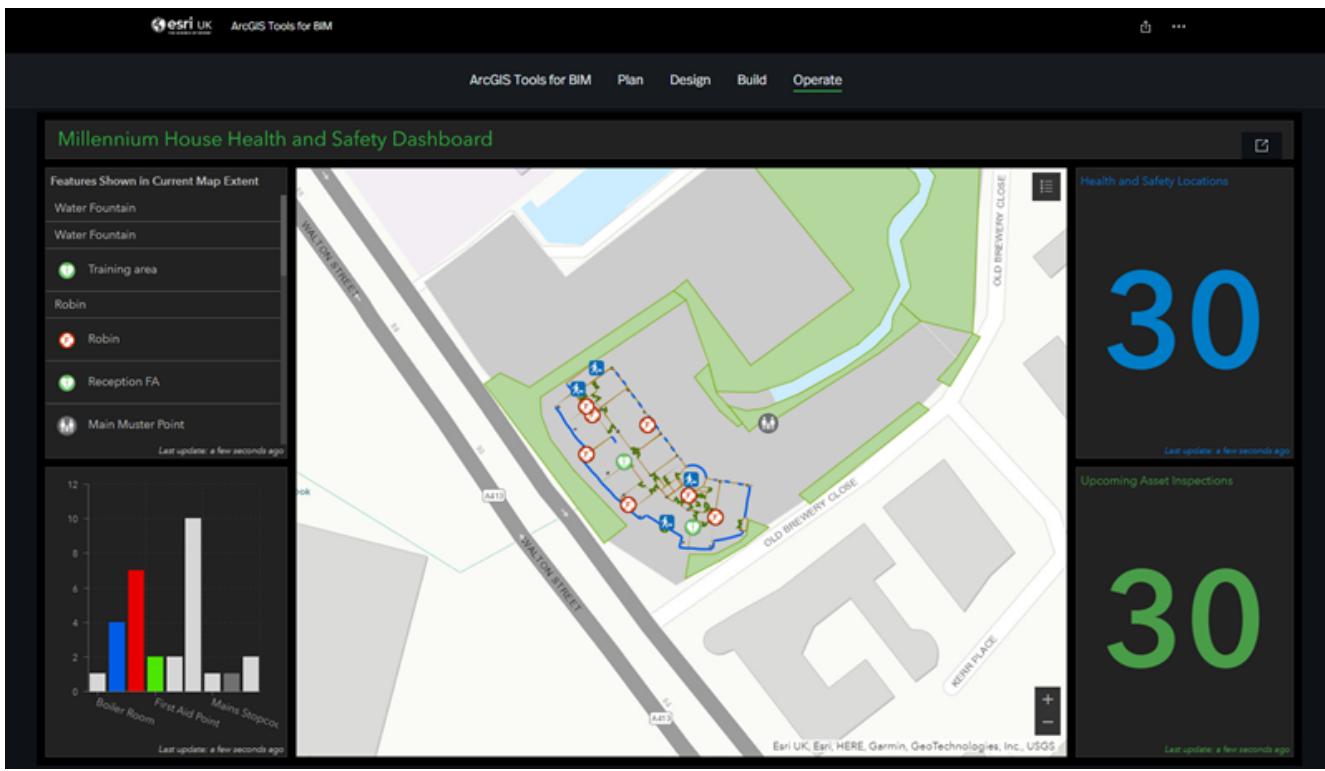
The screenshot shows the ArcGIS Tools for BIM website. At the top, there's a navigation bar with the Esri UK logo and the text "ArcGIS Tools for BIM". Below the navigation bar, there's a secondary navigation menu with tabs: "ArcGIS Tools for BIM", "Plan", "Design", "Build", and "Operate". The "Operate" tab is underlined, indicating it's the active section. The main content area has a dark background and features a large heading "Tools for Operating". Below this, there's a sub-section titled "ArcGIS Dashboards". A brief description follows: "ArcGIS Dashboards is a configurable web app that brings together location-aware data from a variety of sources to provide real-time operational visualisations of an organisation." To the left of the text is a yellow hexagonal icon containing a stylized white 'C' shape. To the right of the text is a detailed description of what an ArcGIS Dashboard can do: "Each ArcGIS Dashboard is able to manage a number of different sources of data, that contribute to an incoming knowledge feed for a particular site. Within this web application, you can use charts, gauges, maps, and other visual elements to reflect the status and performance of BIM builds, assets, and services in real time. Using a dynamic dashboard, you can view the activities and key performance indicators most vital to meeting objectives." At the bottom of the section, there's a note: "Below is an example dashboard showing a fictional operational view for Millennium House. Try clicking on different parts of the dashboard to explore the information in more detail."

*Step 6d***: Explore tools for operations, maintenance, and sustainment.*

Dashboards can be built at any phase during an AEC project life cycle. The one that you viewed previously focused on building and the regional supply-side delivery of materials and potential project delay during construction.

Next, you will view a dashboard that shows operational information about the Millennium House project.

- e After reading this section, scroll down and locate the Millennium House Health And Safety Dashboard.



*Step 6e***: Explore tools for operations, maintenance, and sustainment.*

This dashboard is built to be used during operations and maintenance of the building post construction. This dashboard is a fictional representation of different health and safety points located about the building, including fire extinguishers, building entry and exit points, elevators (lifts), first aid points—including ones with and without an automated external defibrillator (AED)—and even a muster point outside.

You will get a chance to examine and interpret more dashboard examples later in the MOOC.

- f On your own, explore the Millennium House Health And Safety Dashboard.

Note: You can open the dashboard in a new web browser tab or interact with it directly in the story.

- Hint

Click the Legend button  in the map to help identify symbols used in the map.

- g When you have finished exploring the dashboard, scroll down to the final section: GIS Informs BIM. BIM Fuels GIS.

For more information on how to increase collaboration throughout project life cycles and how ArcGIS can be incorporated into various AEC business areas, go to Esri Industry Guide: Architecture Engineering and Construction (AEC).

Note: The clickable Discover Esri ArcGIS & BIM Here button at the end of the story will take you to the same industry information on the Esri UK website.

- h If desired, bookmark this story as a reference and guide for use with future projects.

This final section of the story provides a recap of some of the information that you have explored in this story and encountered throughout this exercise.

- i Close your web browser.

In this exercise, you explored several examples of GIS and BIM integration for a fictional AEC project. You were introduced to ArcGIS tools and apps, including ArcGIS Pro, ArcGIS Online, web apps, and dashboards, that support workflows throughout the project life cycle. Additionally, you saw how you can use both Esri and Autodesk apps and data interchangeably through various technology connections.

You will have an opportunity to work with some of these tools, apps, and data throughout this MOOC.

Now that you have seen what is possible, think about how your projects can be transformed with this type of technology.

For more detailed information on GIS and BIM integration, including case studies, go to Esri Industry Guide: GIS and BIM.