

# Introduction to Unity3D

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# Game Engines

Game engines are designed for the creation and development of 2D/3D games



## Components

- Renderer
- Physics Engine
- Sound
- Scripting
- Animation
- Artificial Intelligence
- Networking
- Scene Graph





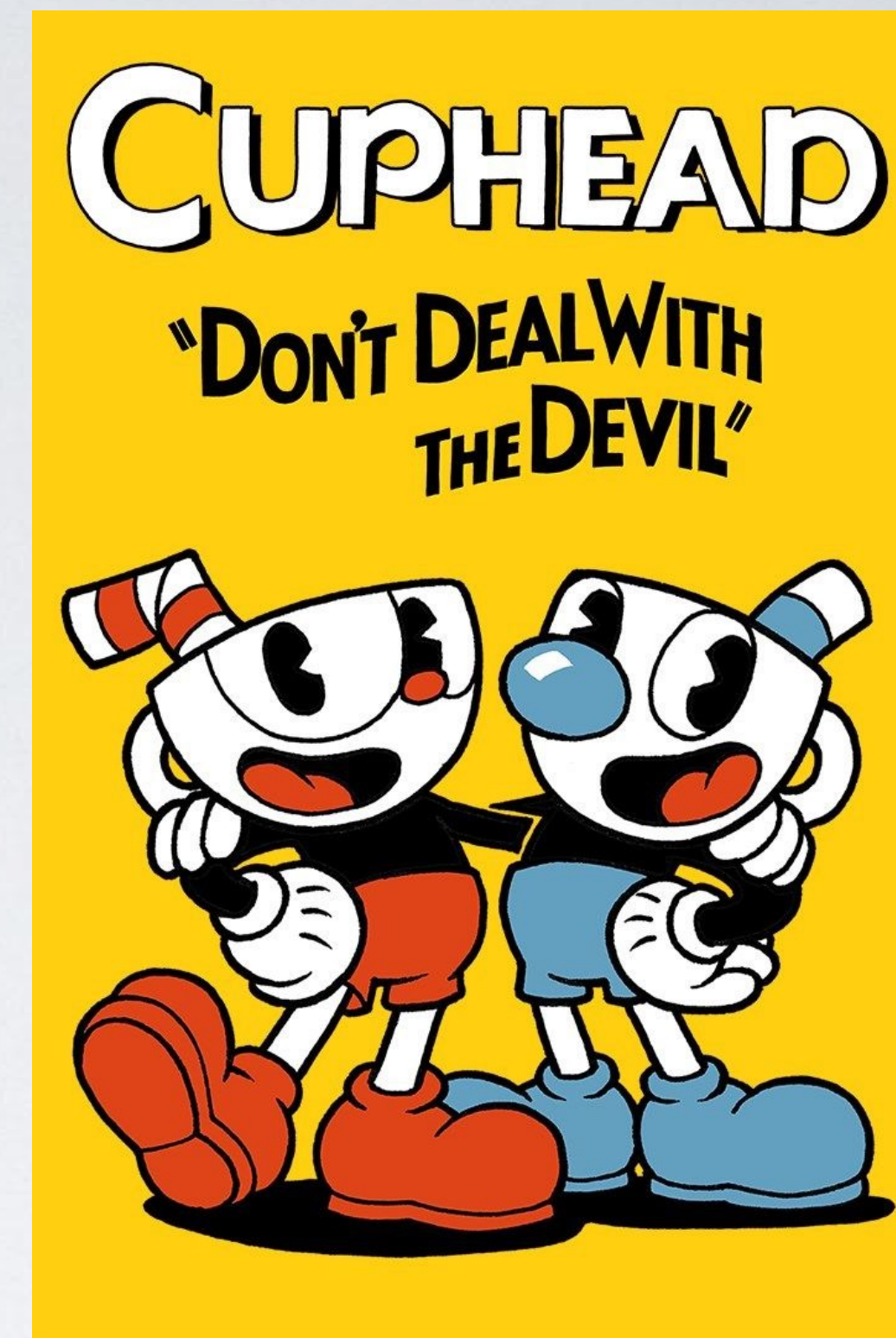
# Unity3D

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- Free game engine
- Provides all the components of any modern game engine
- Cross Platform (PC, Xbox, Tablet, Phone, etc.)
- <http://unity3d.com>





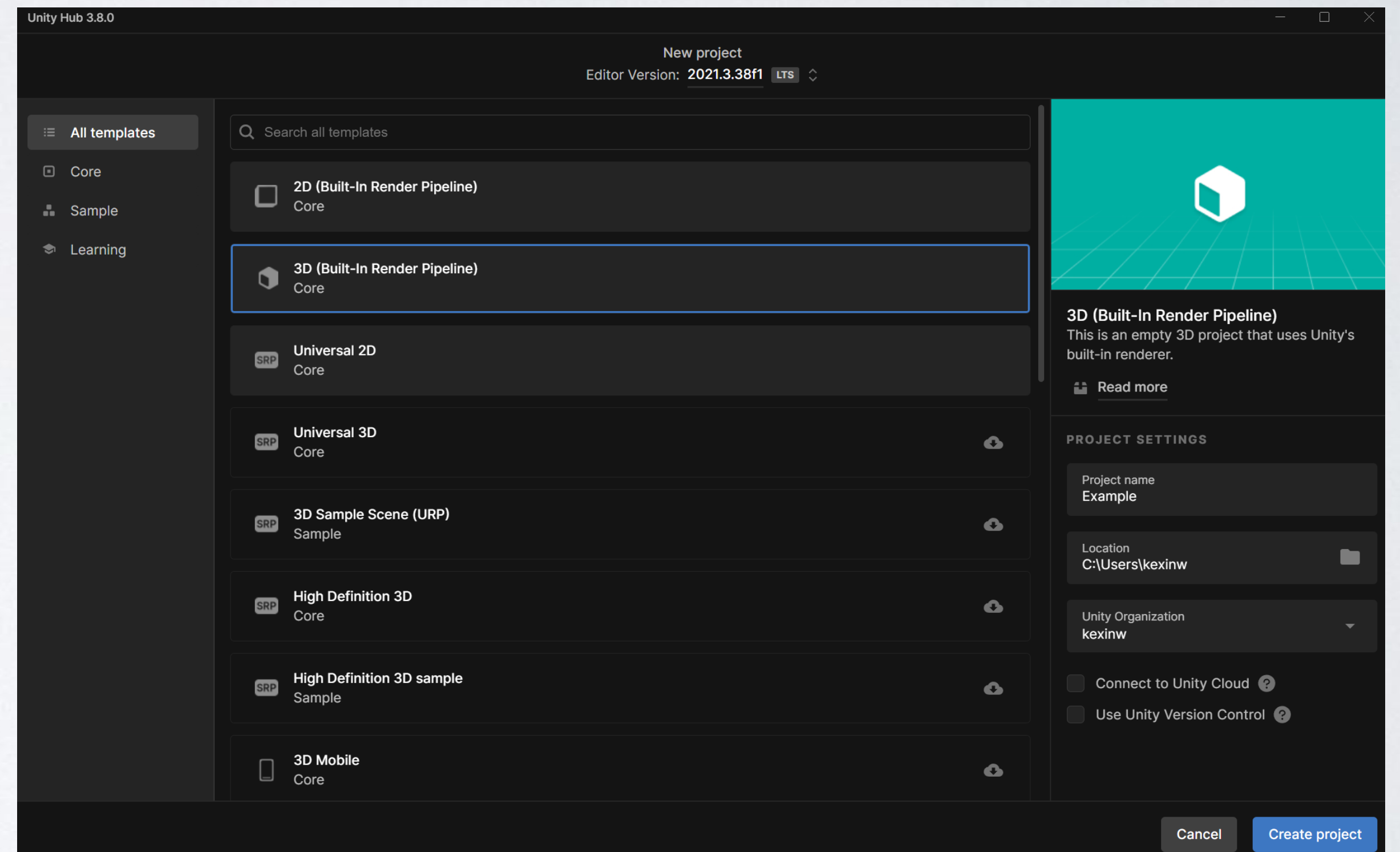




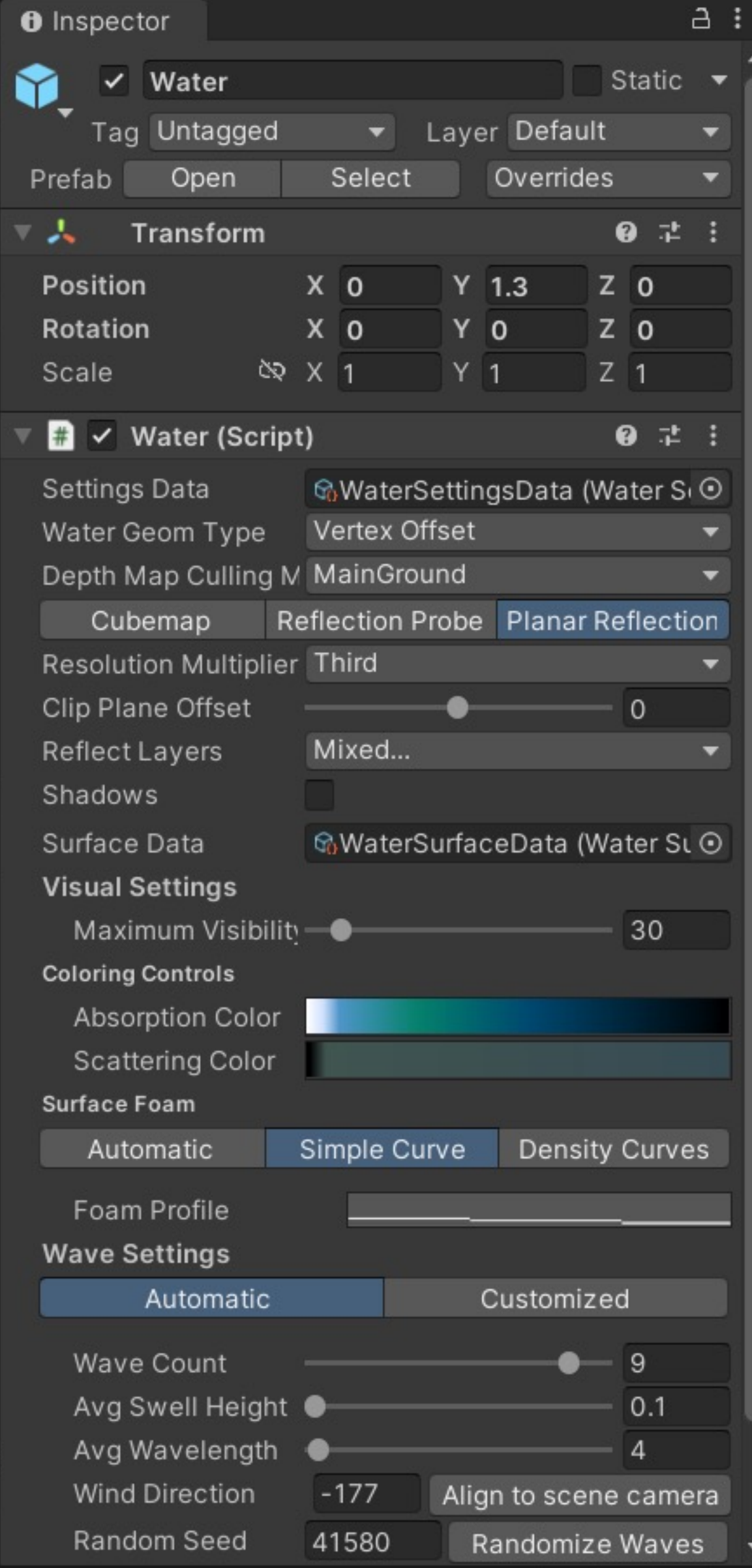
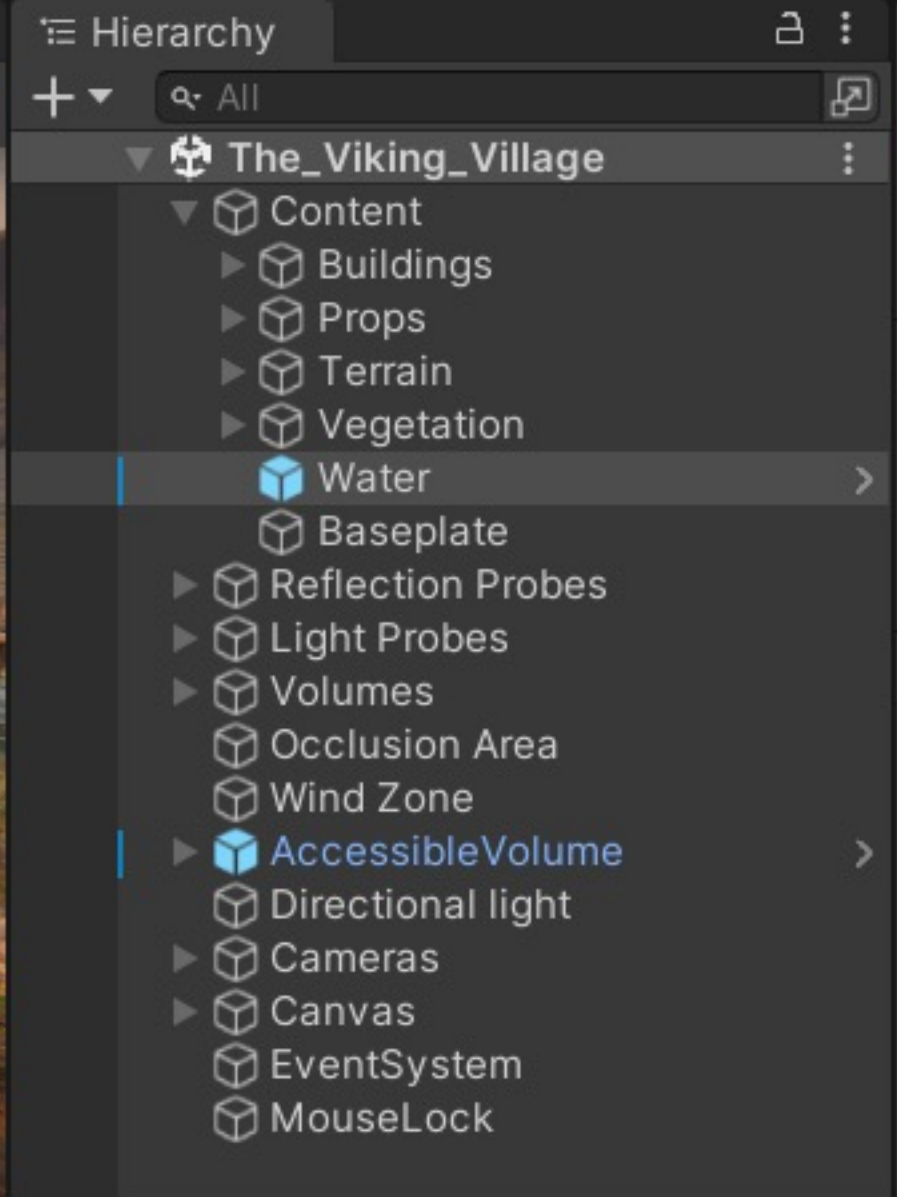
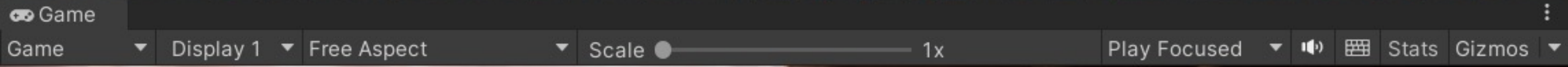
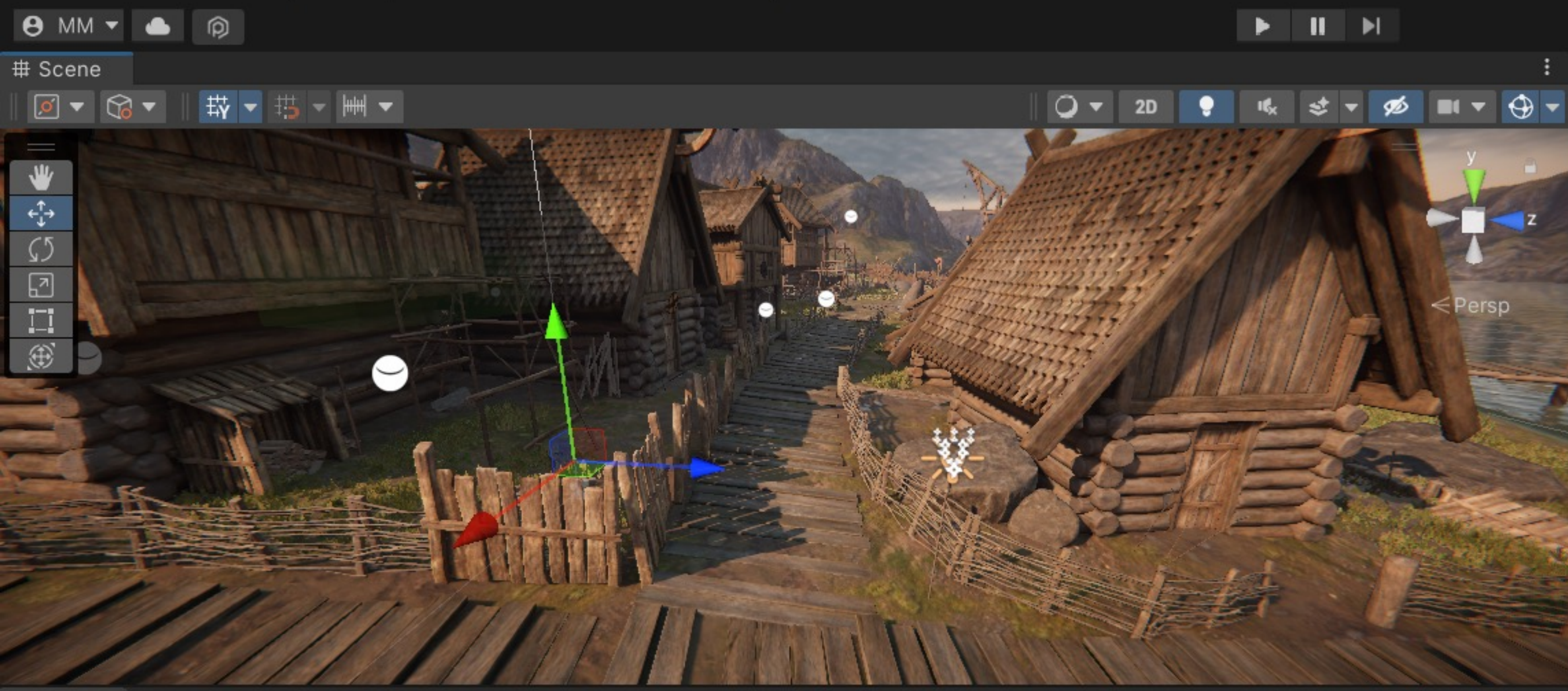
# Activity

◦ Sign in with Google using your @iastate email

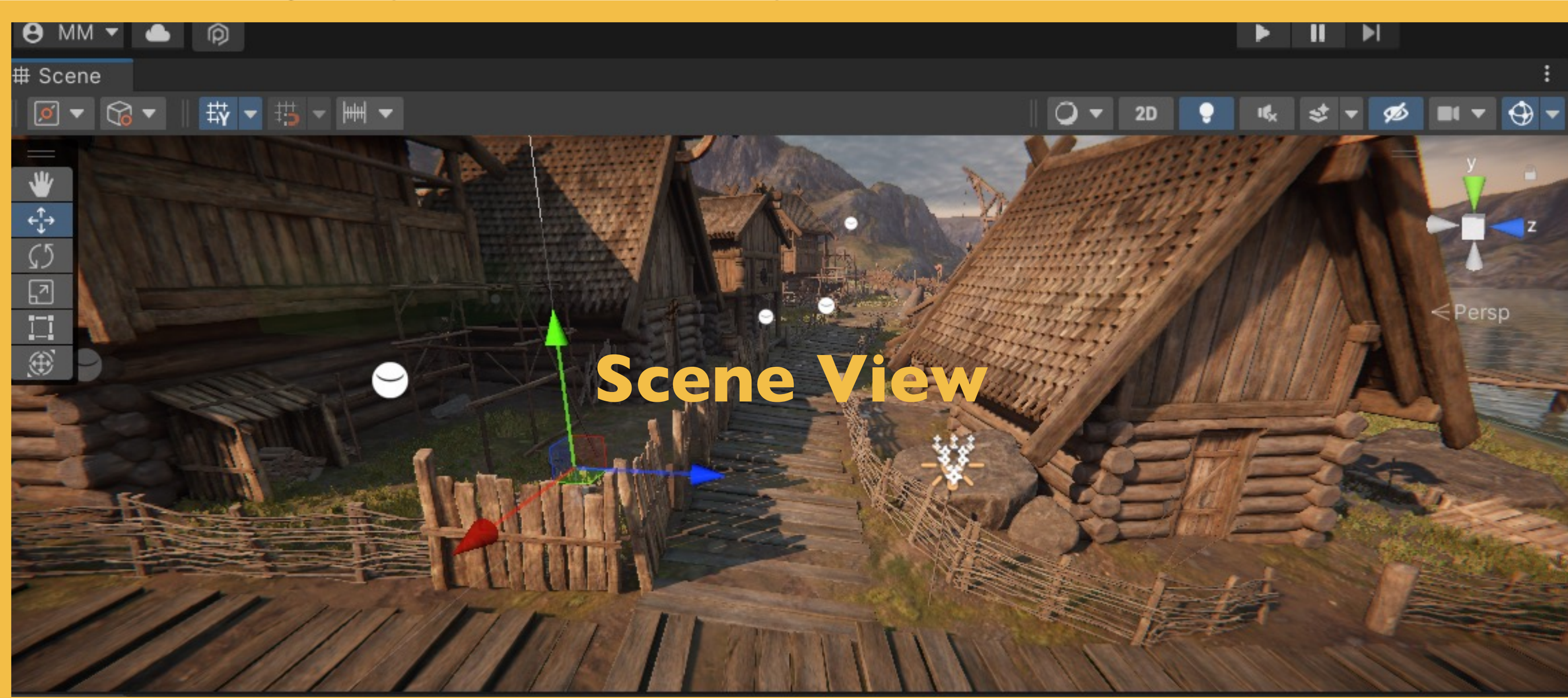
◦ Create a new Unity Project  
- Version: Unity 2021.3.38f1









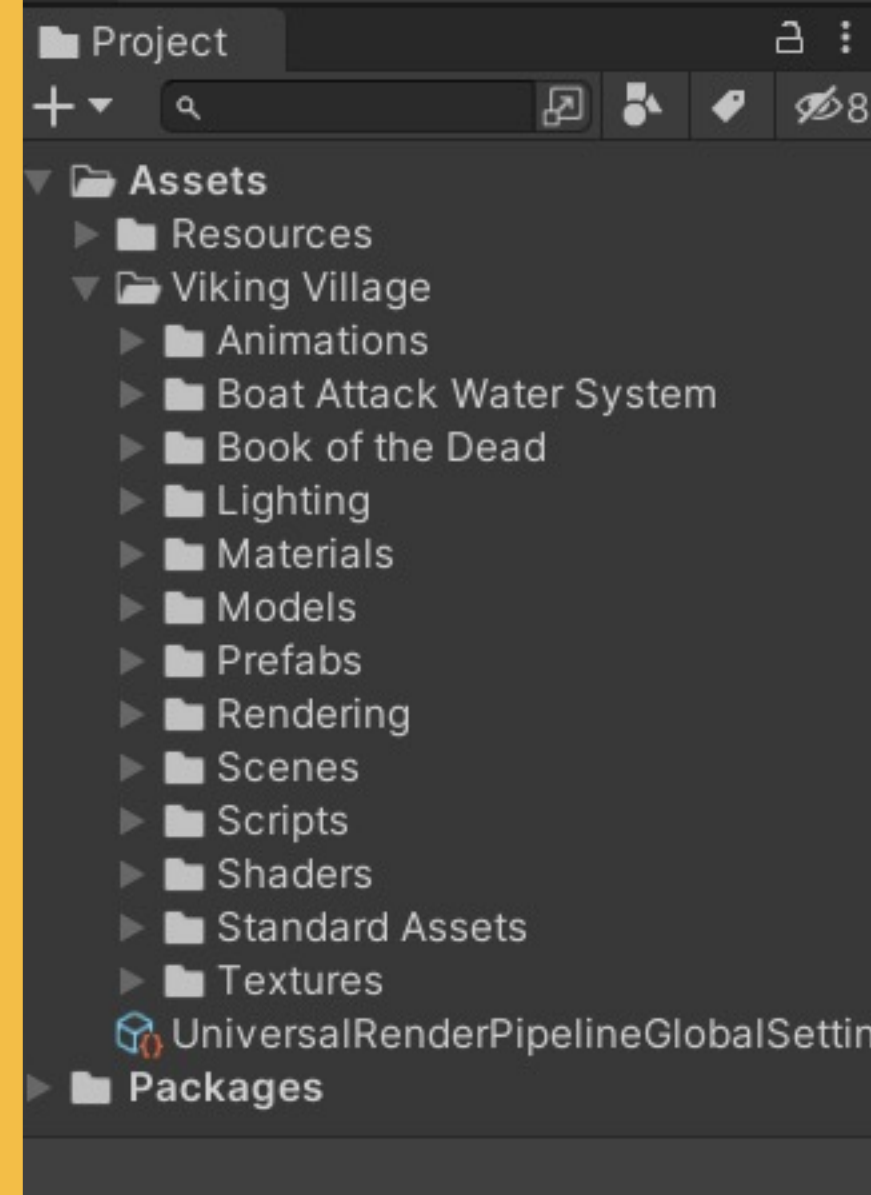
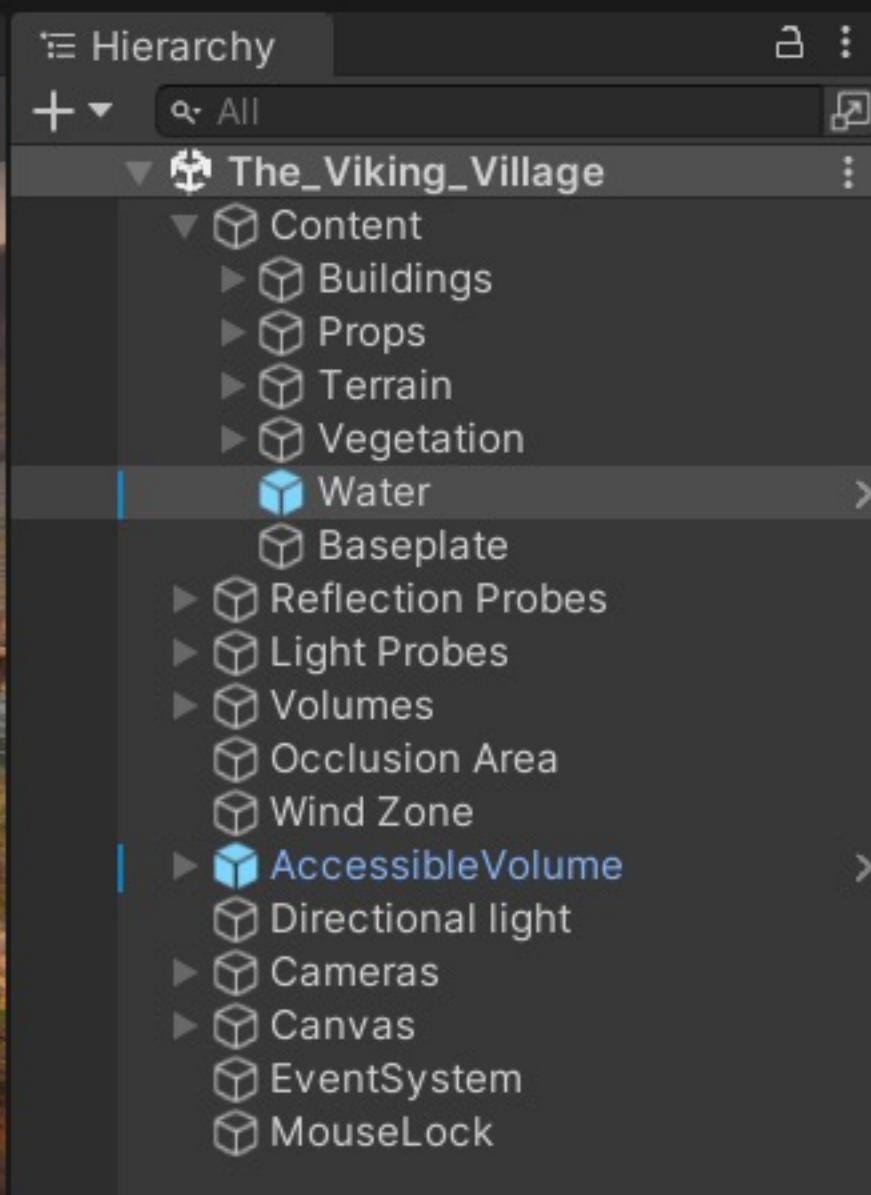
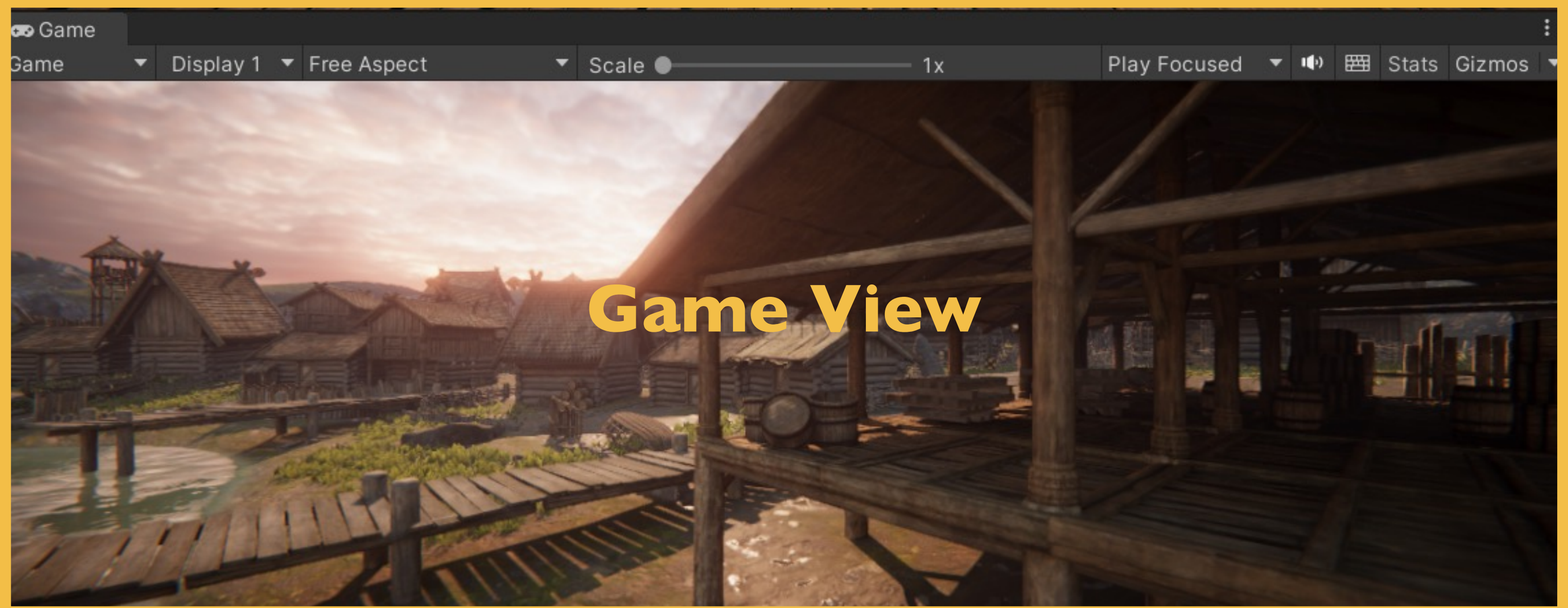
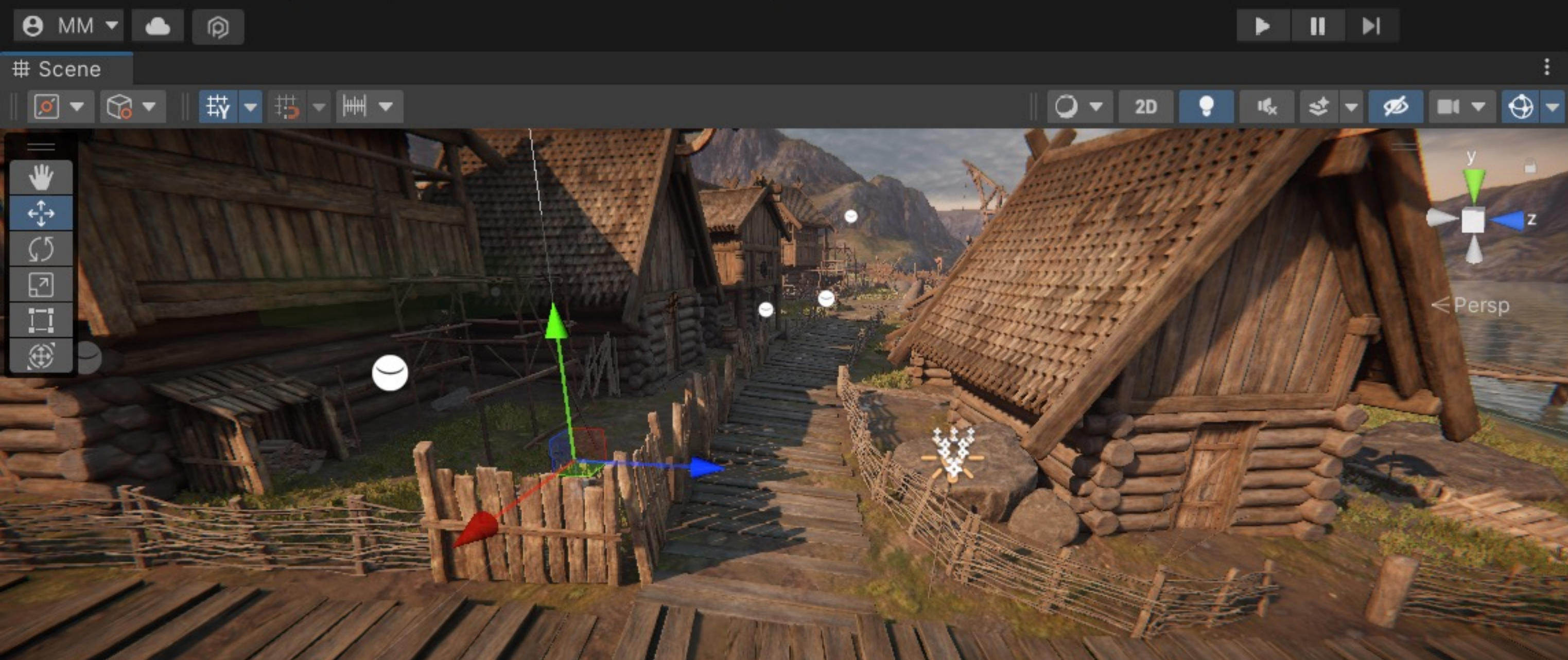


The Hierarchy panel shows the scene structure. The root of the scene is "The\_Viking\_Village". Underneath it are several folders: "Content", "Buildings", "Props", "Terrain", "Vegetation", "Water", "Baseplate", "Reflection Probes", "Light Probes", "Volumes", "Occlusion Area", "Wind Zone", "AccessibleVolume", "Directional light", "Cameras", "Canvas", "EventSystem", and "MouseLock". The "Water" folder is selected, and its contents are visible in the Project panel.

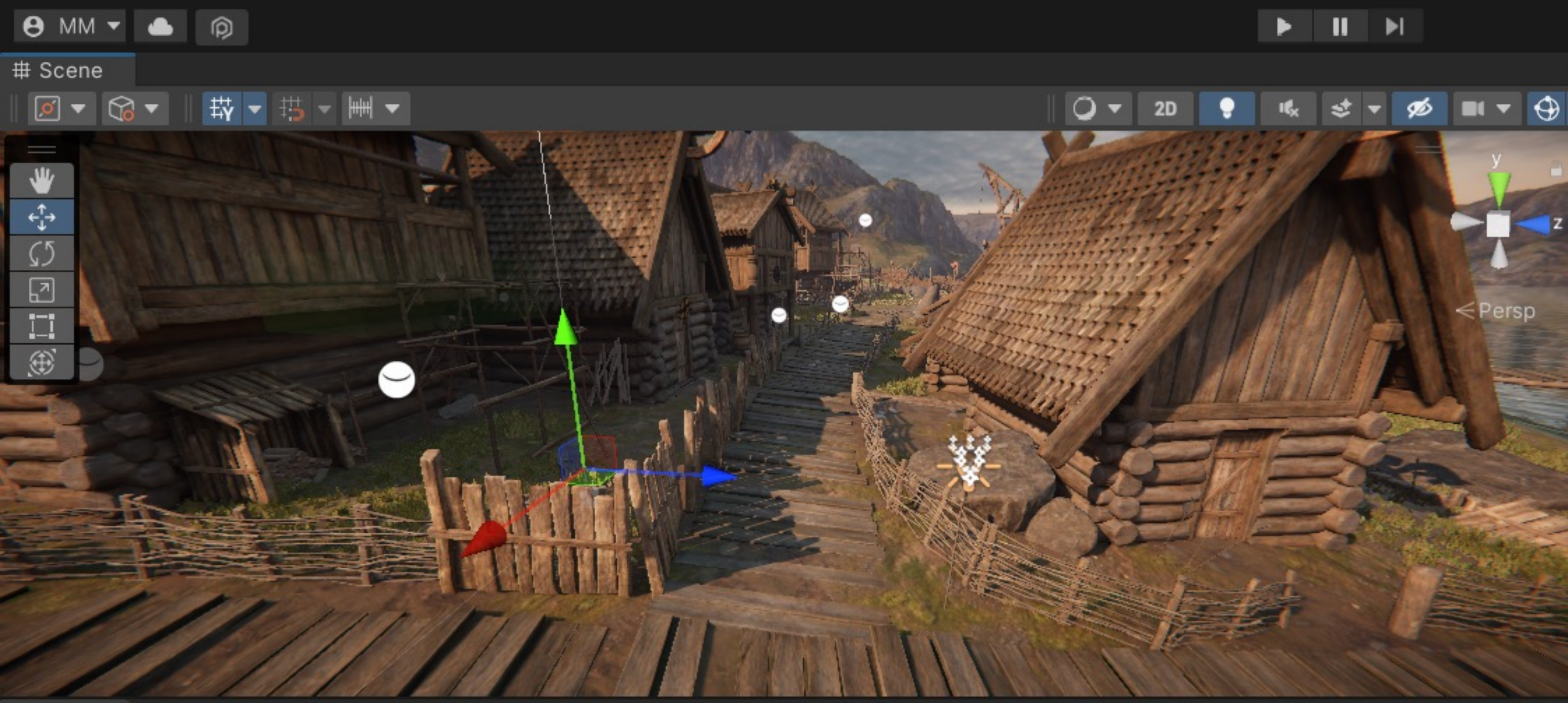
The Project panel shows the asset hierarchy. The root of the project is "Assets". Underneath it are several folders: "Resources", "Viking Village", "Animations", "Boat Attack Water System", "Book of the Dead", "Lighting", "Materials", "Models", "Prefabs", "Rendering", "Scenes", "Scripts", "Shaders", "Standard Assets", "Textures", "UniversalRenderPipelineGlobalSettings", and "Packages". The "Viking Village" folder is selected, and its contents are visible in the Hierarchy panel.

The Inspector panel shows the properties of the selected "Water" object. The "Water" object is a "Water" component. Its properties are: "Tag" is "Untagged", "Layer" is "Default", "Prefab" is "Open", "Select" is "Select", and "Overrides" is "Overrides". The "Transform" component has "Position" (X: 0, Y: 1.3, Z: 0), "Rotation" (X: 0, Y: 0, Z: 0), and "Scale" (X: 1, Y: 1, Z: 1). The "Water (Script)" component has "Settings Data" set to "WaterSettingsData (Water S)", "Water Geom Type" set to "Vertex Offset", "Depth Map Culling M" set to "MainGround", "Cubemap" selected, "Reflection Probe" selected, "Planar Reflection" selected, "Resolution Multiplier" set to "Third", "Clip Plane Offset" set to 0, "Reflect Layers" set to "Mixed...", "Shadows" is disabled, "Surface Data" set to "WaterSurfaceData (Water St)", "Visual Settings" (Maximum Visibility: 30), "Coloring Controls" (Absorption Color: blue-green gradient, Scattering Color: dark blue), "Surface Foam" (Automatic selected, Simple Curve selected, Density Curves selected), "Foam Profile" is a gradient bar, "Wave Settings" (Automatic selected, Customized selected), "Wave Count" set to 9, "Avg Swell Height" set to 0.1, "Avg Wavelength" set to 4, "Wind Direction" set to -177, "Align to scene camera" selected, and "Random Seed" set to 41580, "Randomize Waves" selected.









**Hierarchy View**

- The\_Viking\_Village
  - Content
    - Buildings
    - Props
    - Terrain
    - Vegetation
    - Water
    - Reflection Probes
    - Light Probes
    - Volumetrics
    - Occlusion Area
    - Wind Zone
    - AccessibleVolume
    - Directional light
    - Cameras
    - Canvas
    - EventSystem
    - MouseLock

**Inspector**

**Water**  Static

Tag Untagged Layer Default

Prefab Open Select Overrides

**Transform**

Position	X	0	Y	1.3	Z	0
Rotation	X	0	Y	0	Z	0
Scale	X	1	Y	1	Z	1

**Water (Script)**

Settings Data WaterSettingsData (Water S)

Water Geom Type Vertex Offset

Depth Map Culling M MainGround

Cubemap Reflection Probe **Planar Reflection**

Resolution Multiplier Third

Clip Plane Offset 0

Reflect Layers Mixed...

Shadows

Surface Data WaterSurfaceData (Water St)

**Visual Settings**

Maximum Visibility 30

**Coloring Controls**

Absorption Color [Color Bar]

Scattering Color [Color Bar]

**Surface Foam**

Automatic **Simple Curve** Density Curves

Foam Profile [Slider]

**Wave Settings**

Automatic Customized

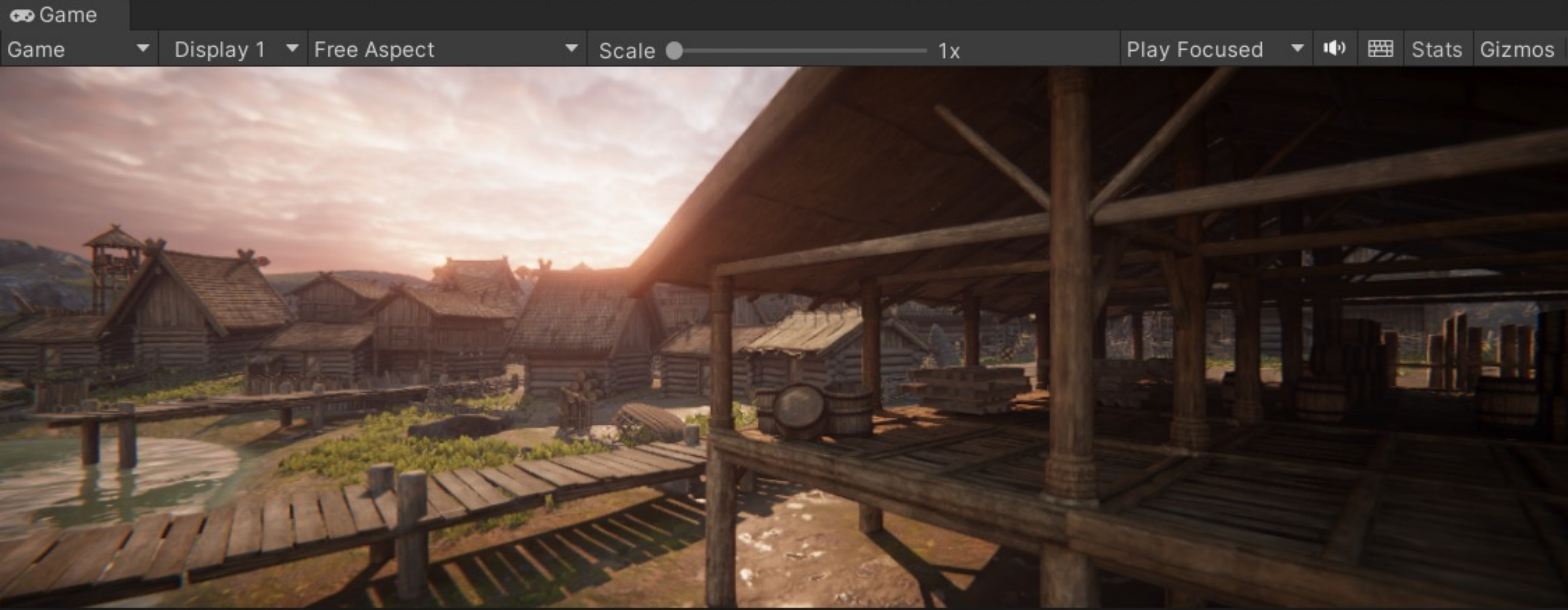
Wave Count 9

Avg Swell Height 0.1

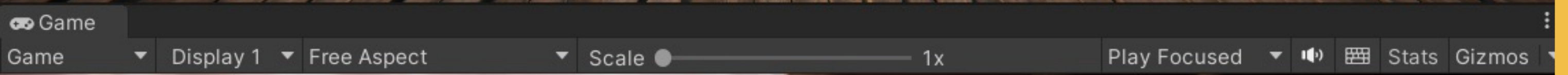
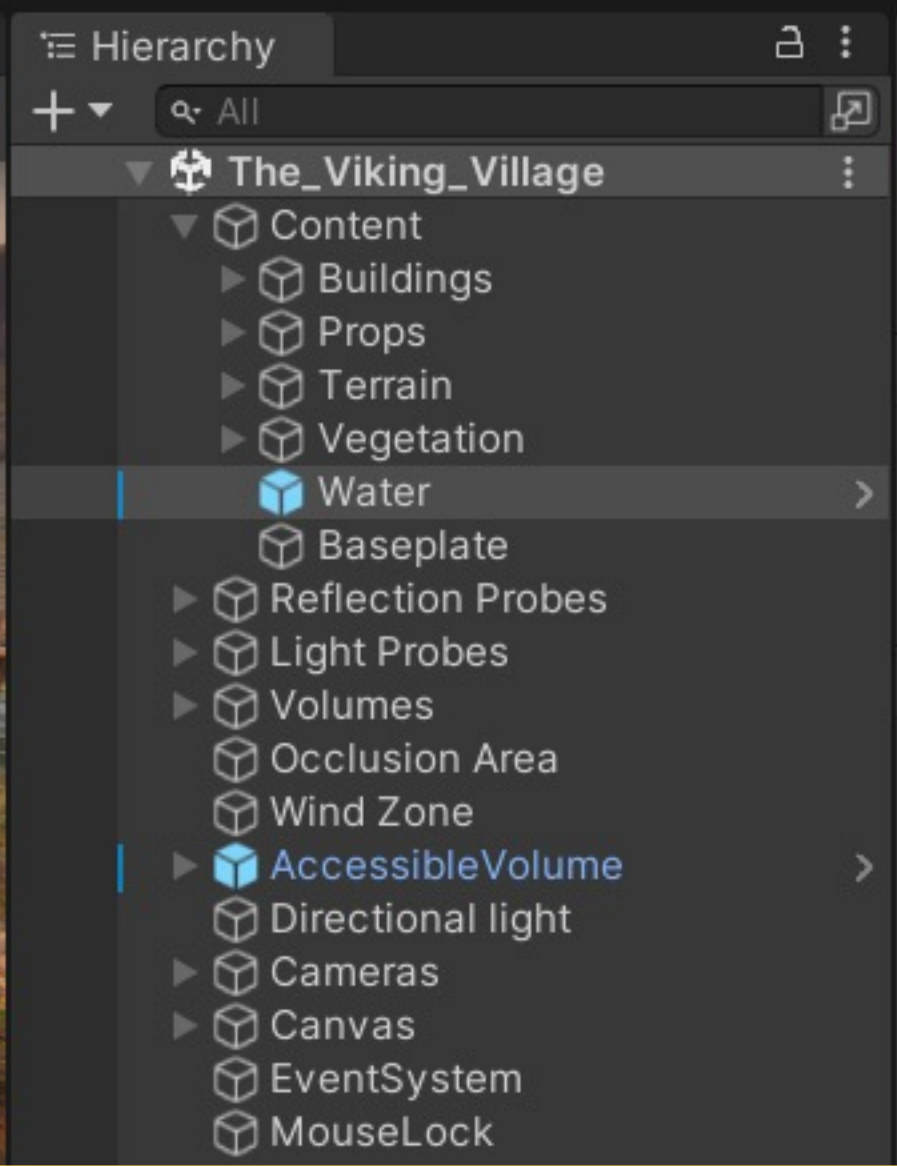
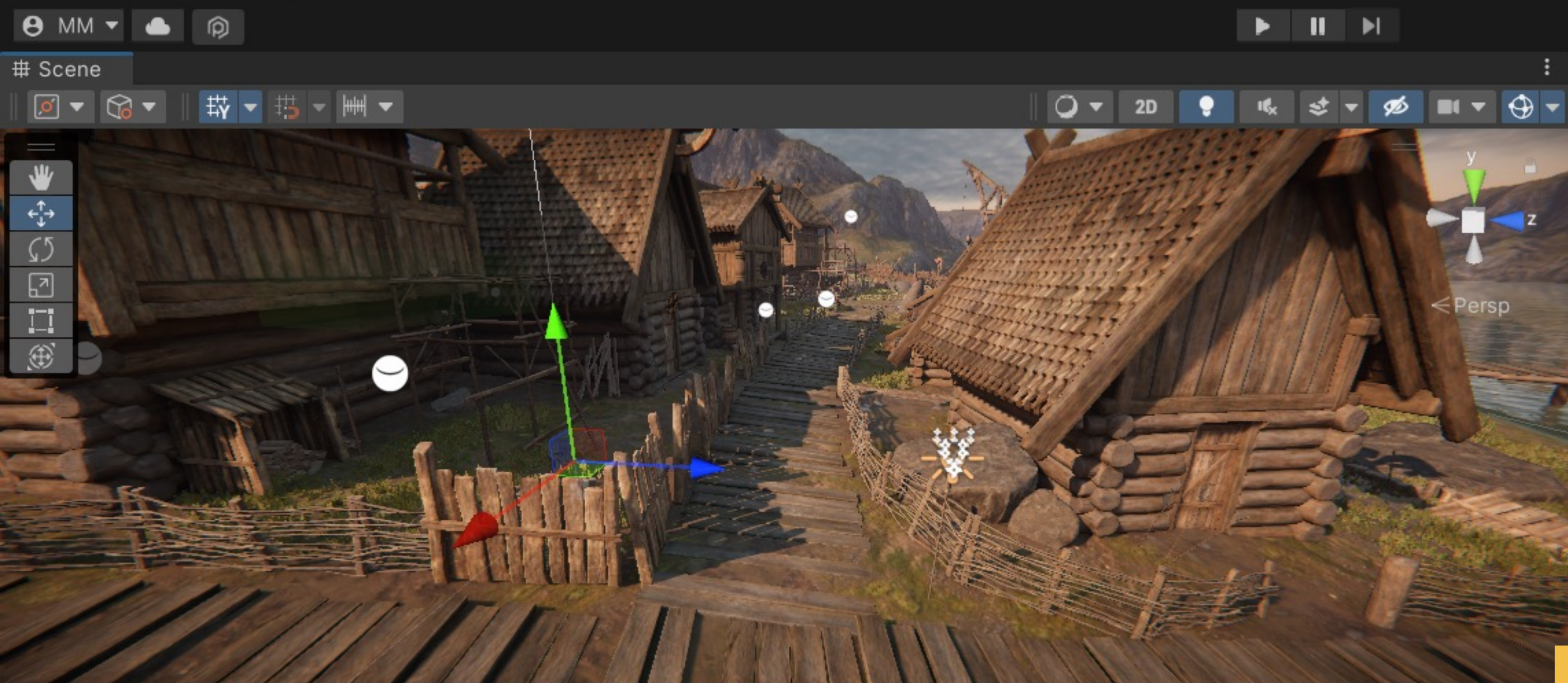
Avg Wavelength 4

Wind Direction -177 Align to scene camera

Random Seed 41580 Randomize Waves

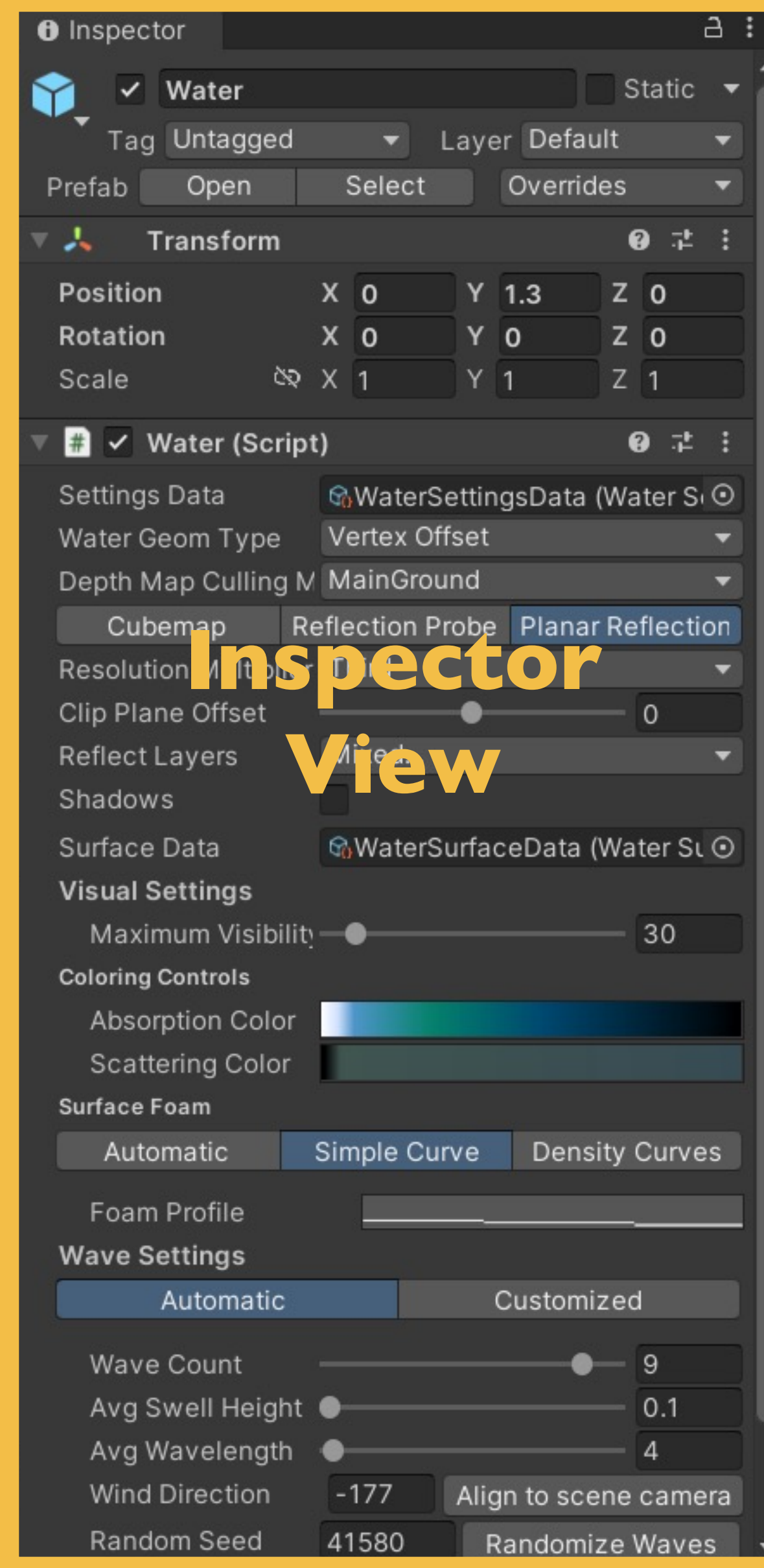
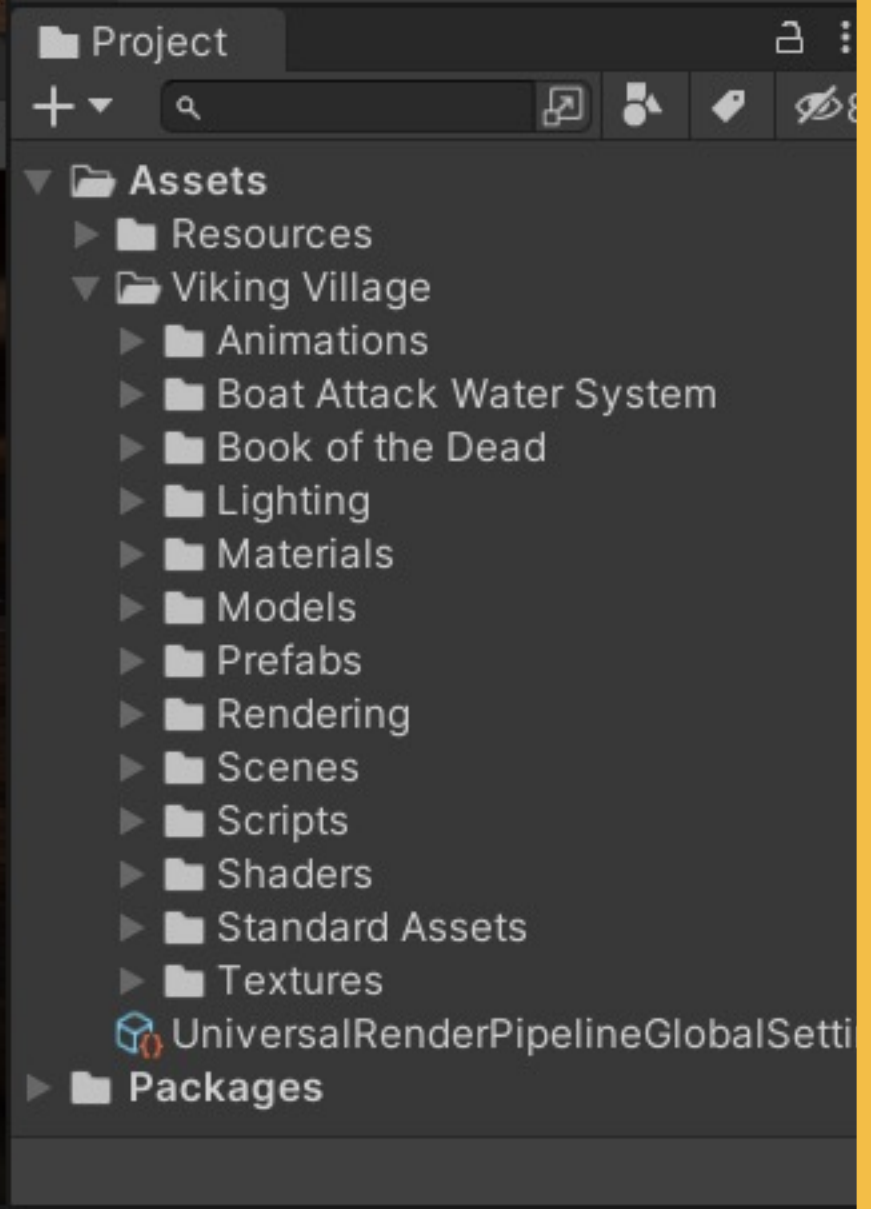
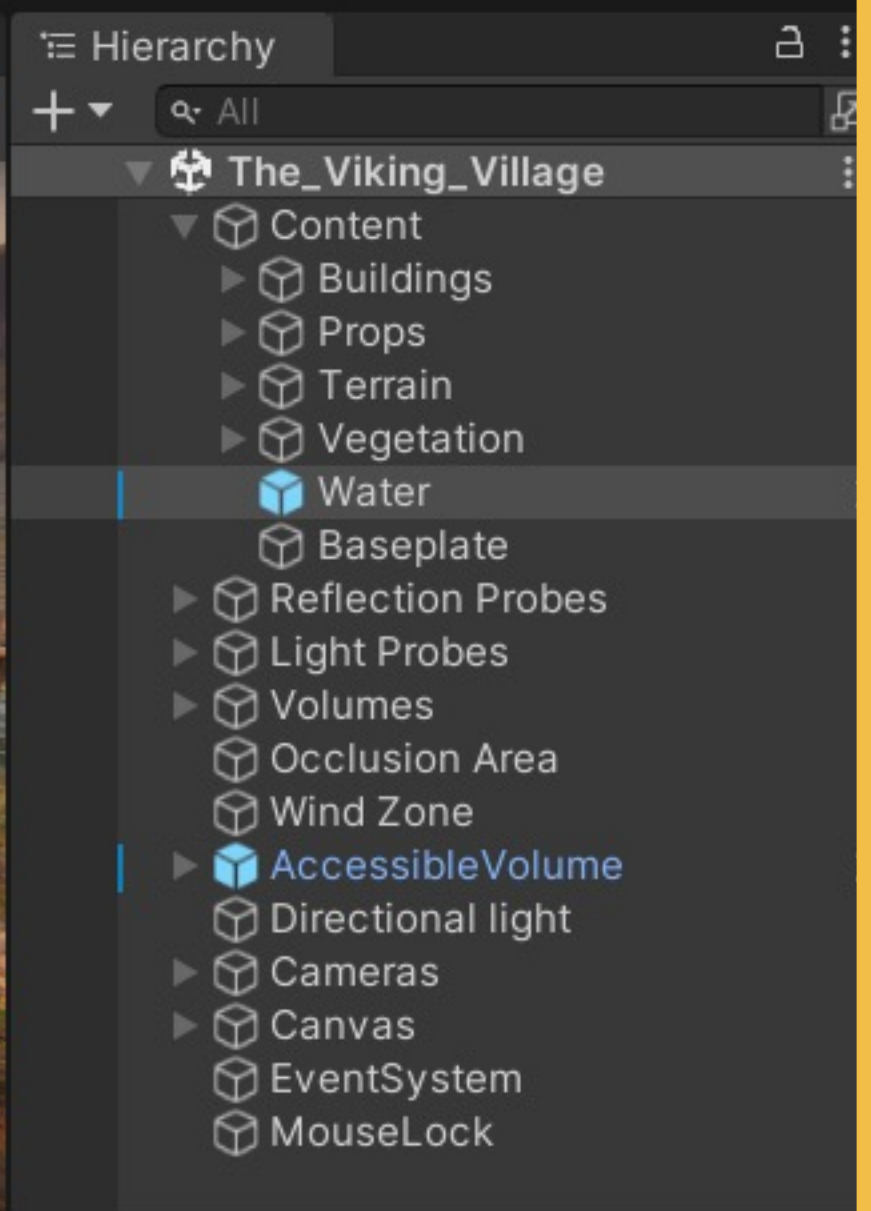
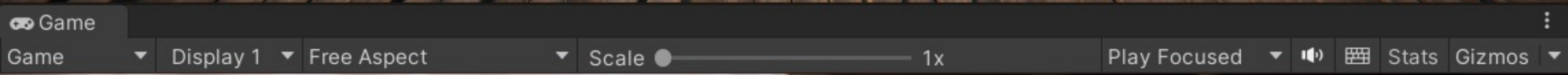
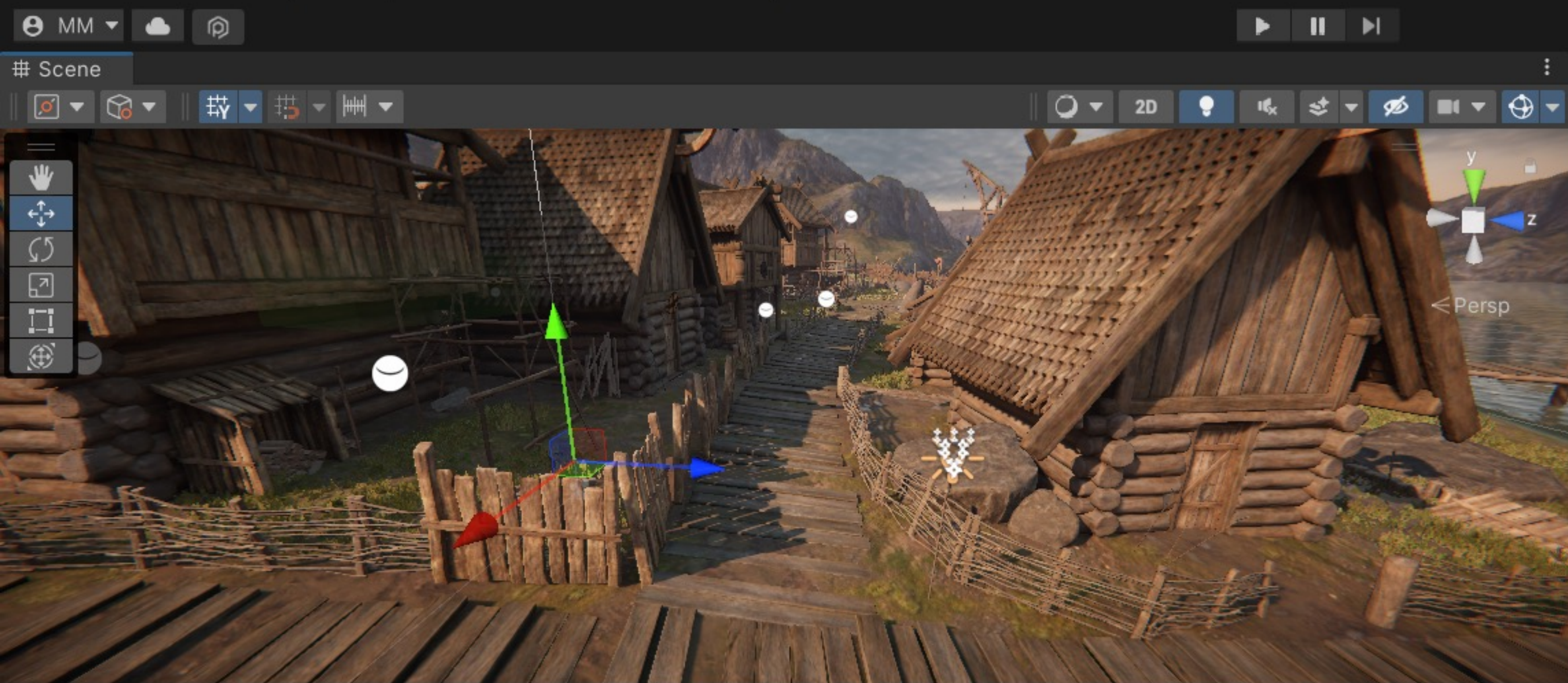






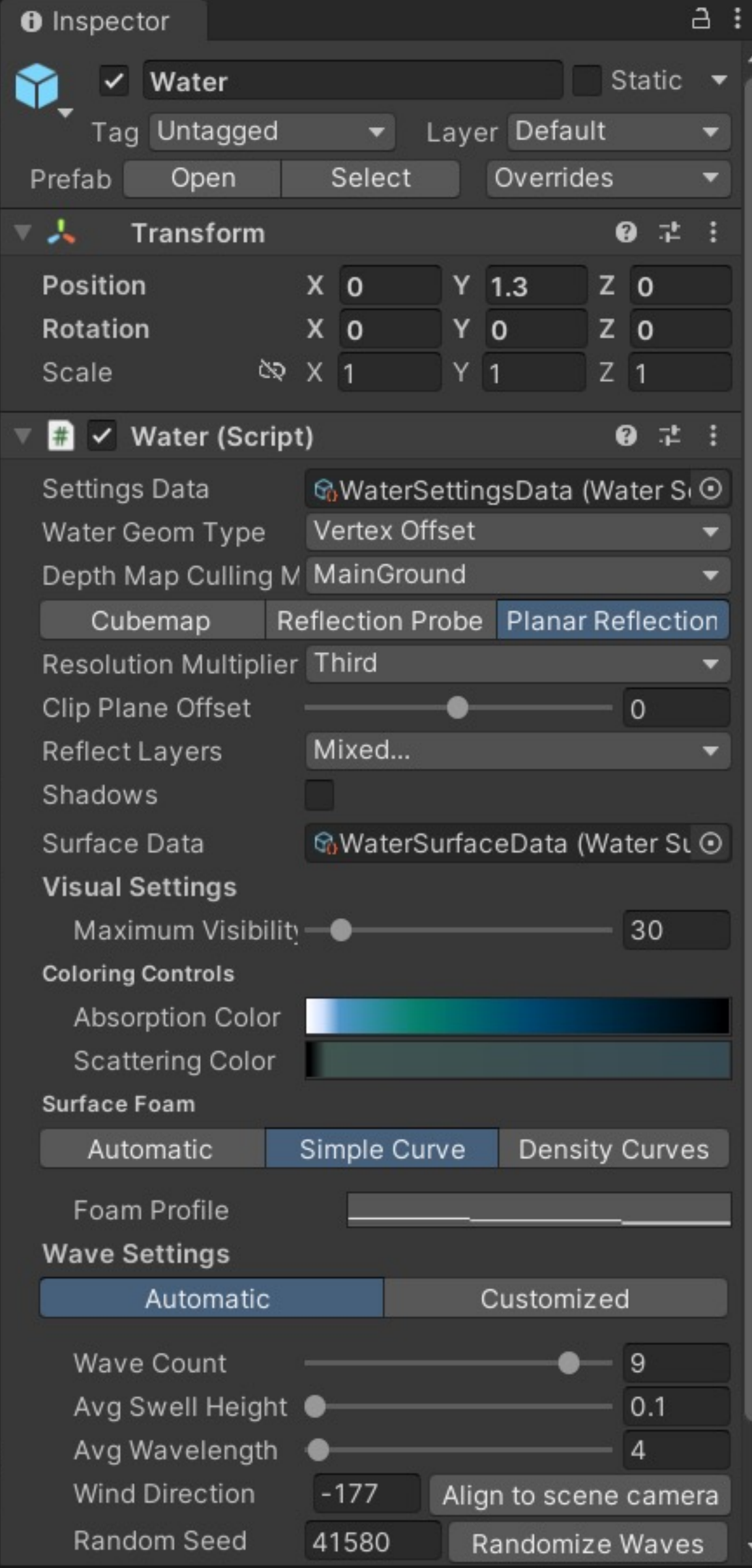
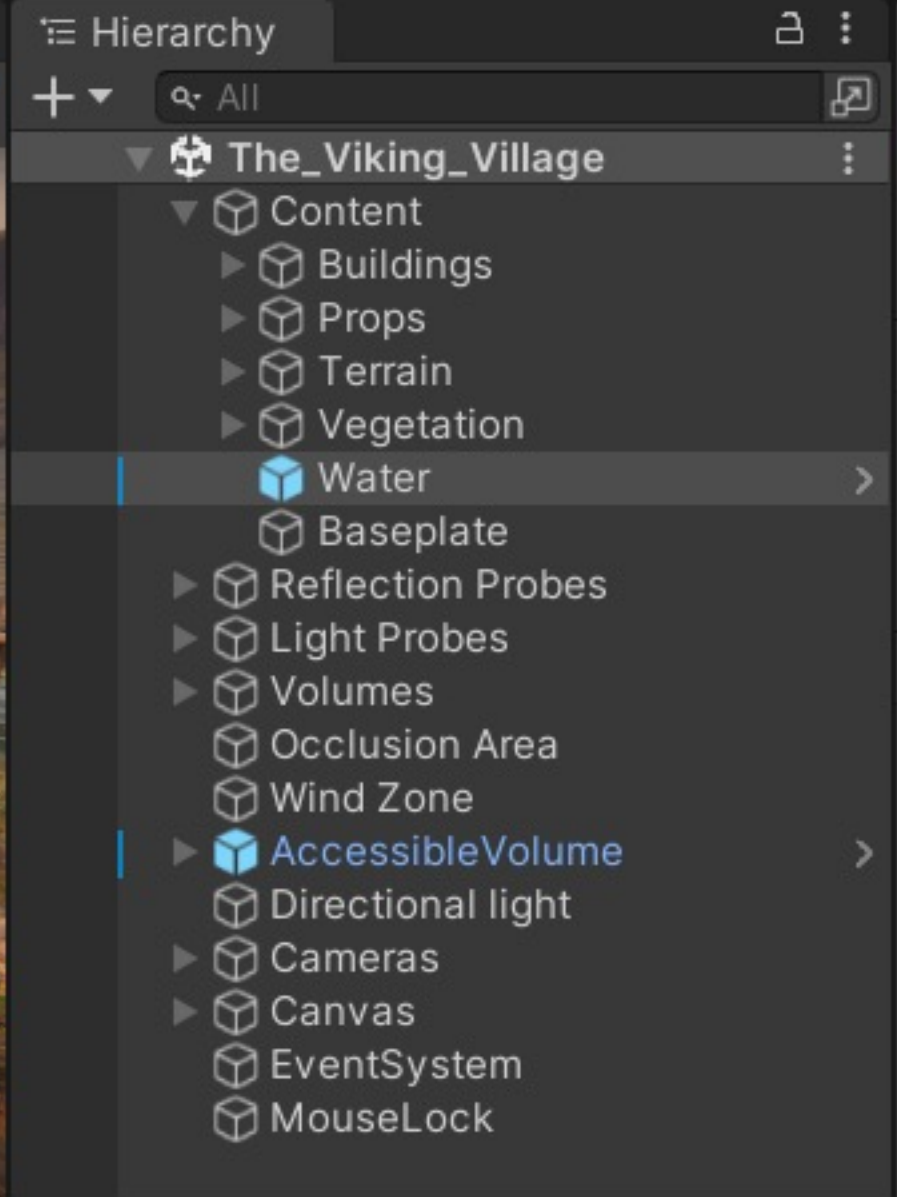
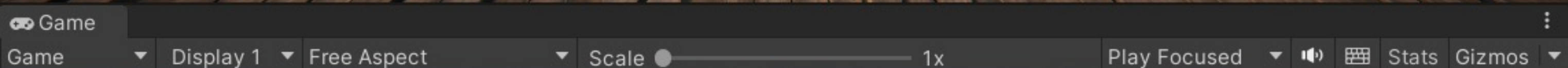
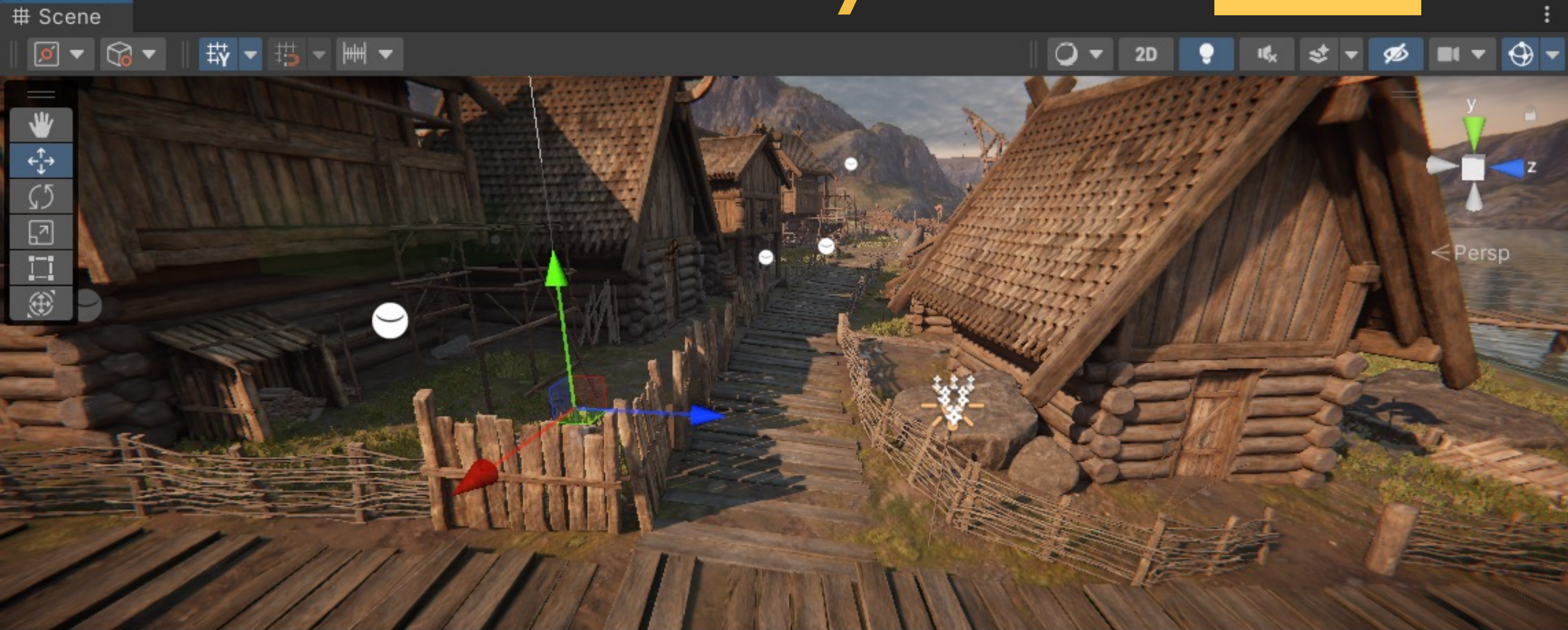
Project View







# Play Controls





# Unity Help Pages

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Scripting Documentation - <https://docs.unity3d.com/Manual/index.html>

Tutorials - <https://learn.unity.com/>

User Forums - <https://forum.unity.com/>



# Basic Unity Concepts

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- Game Objects & Components

- Prefabs

- Tags

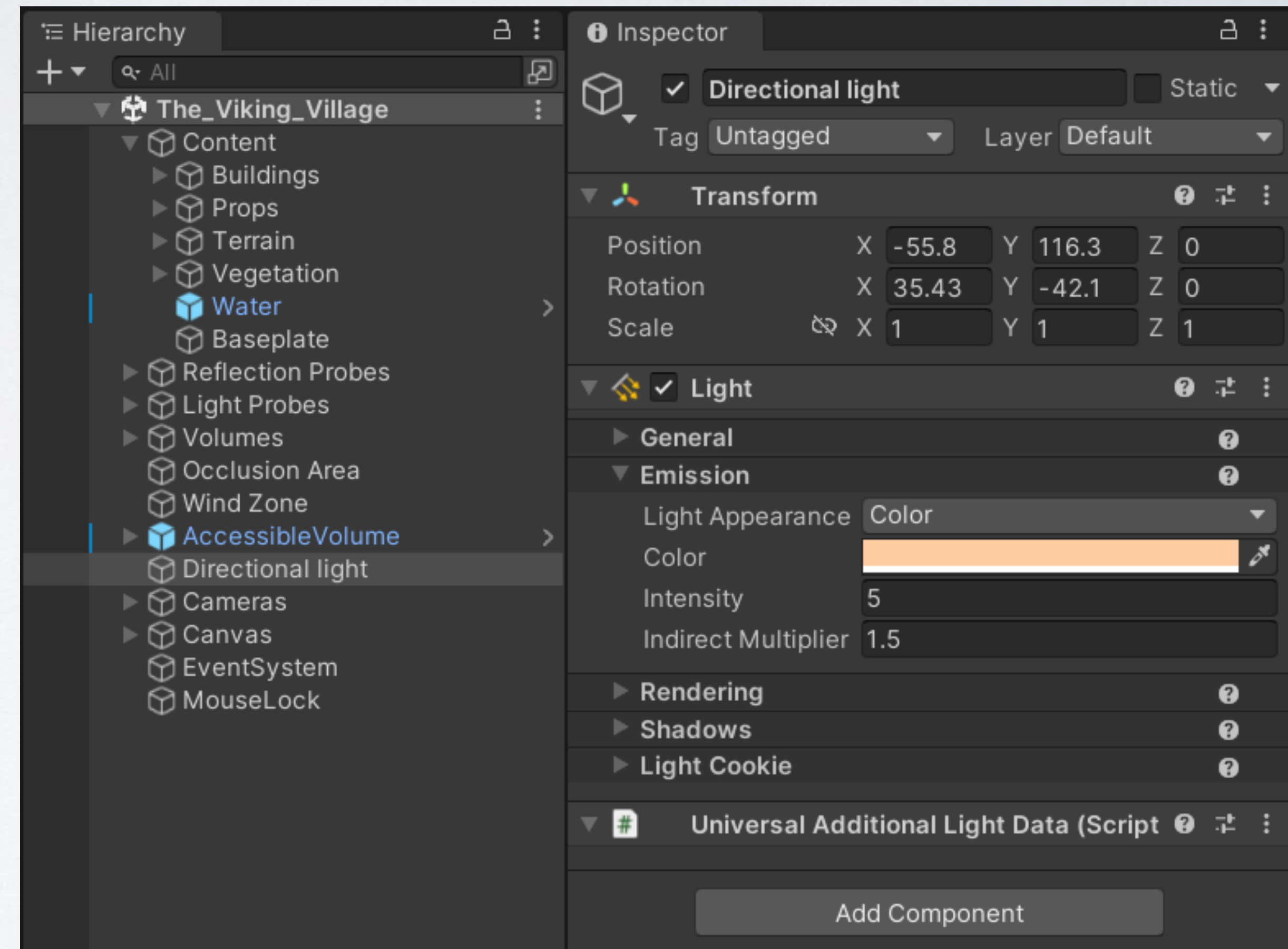
- Layers



# Game Objects & Components

Game Object: Anything within your Unity scene (Hierarchy)

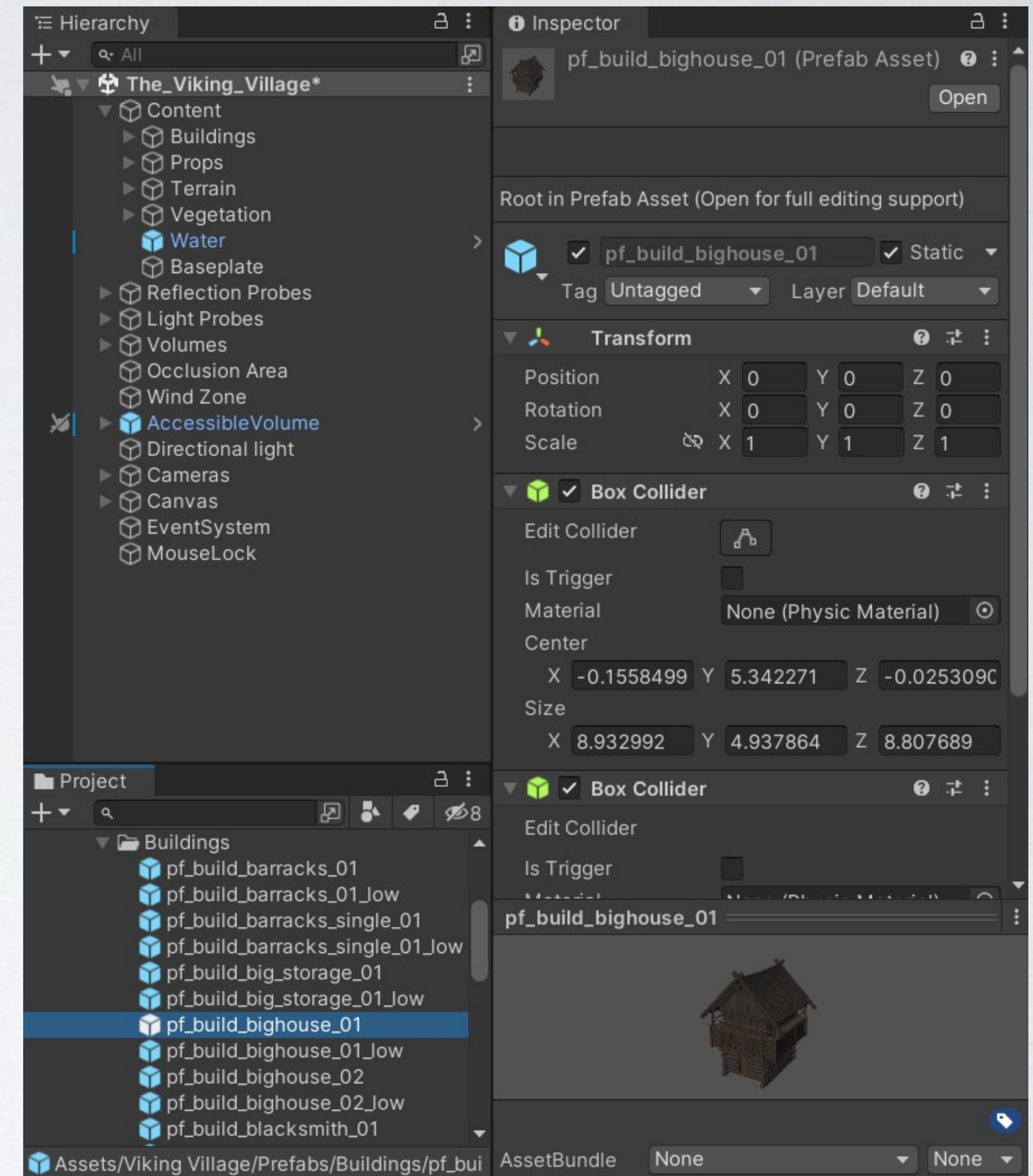
Component: Every Game Object is made up of Components (e.g., Transform)





# Prefabs

- Prefab = Preconfigured Game Object
- Prefabs are something you wish to use over and over again with minor tweaks, such as buildings, characters, levels, cameras, etc.
- Making changes to a Prefab Game Object allows you to push those changes to all other Game Objects of that type if desired

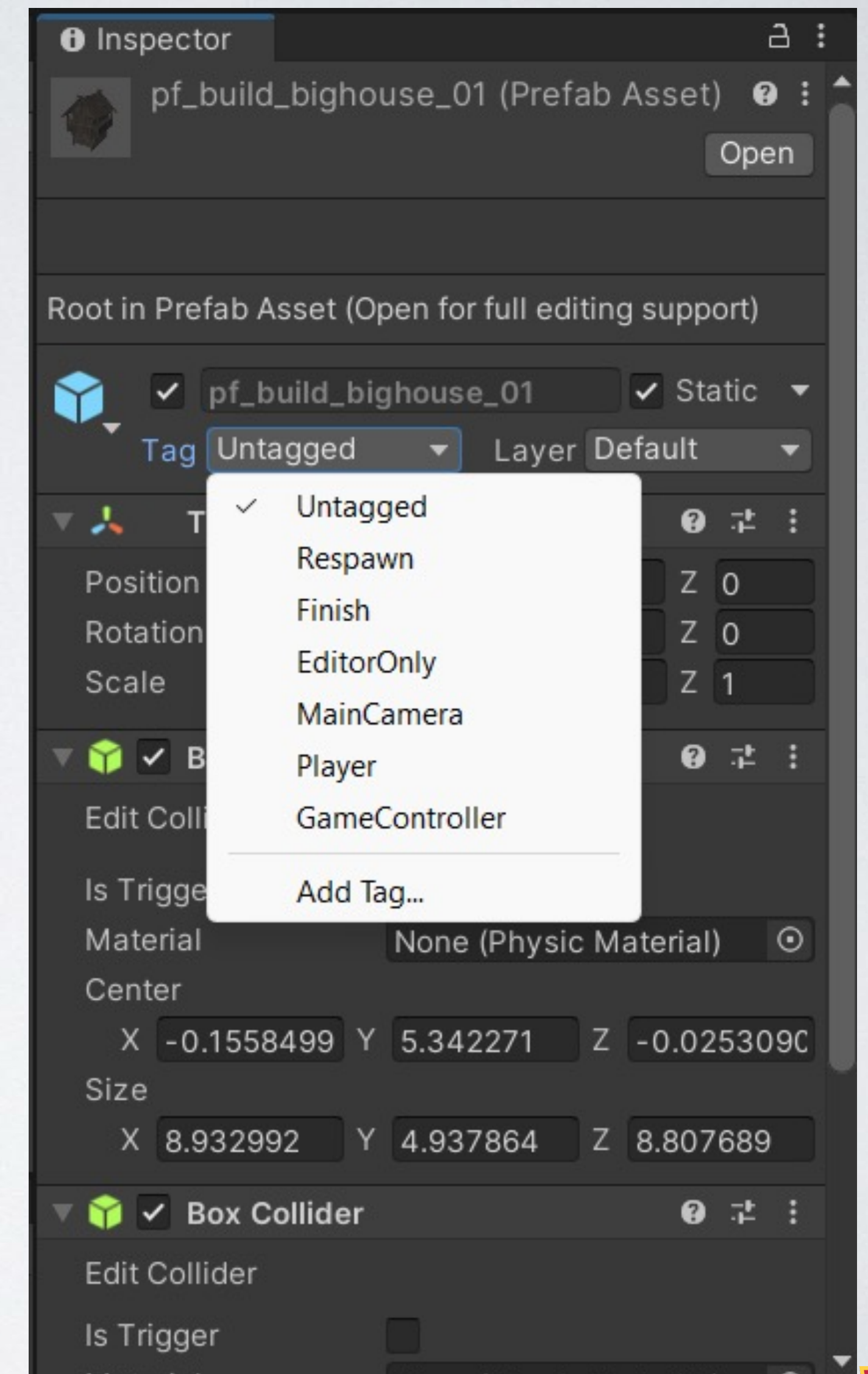




# Tags

Allows you to group Game Objects together (e.g., enemy)

Allows you to search for objects in code



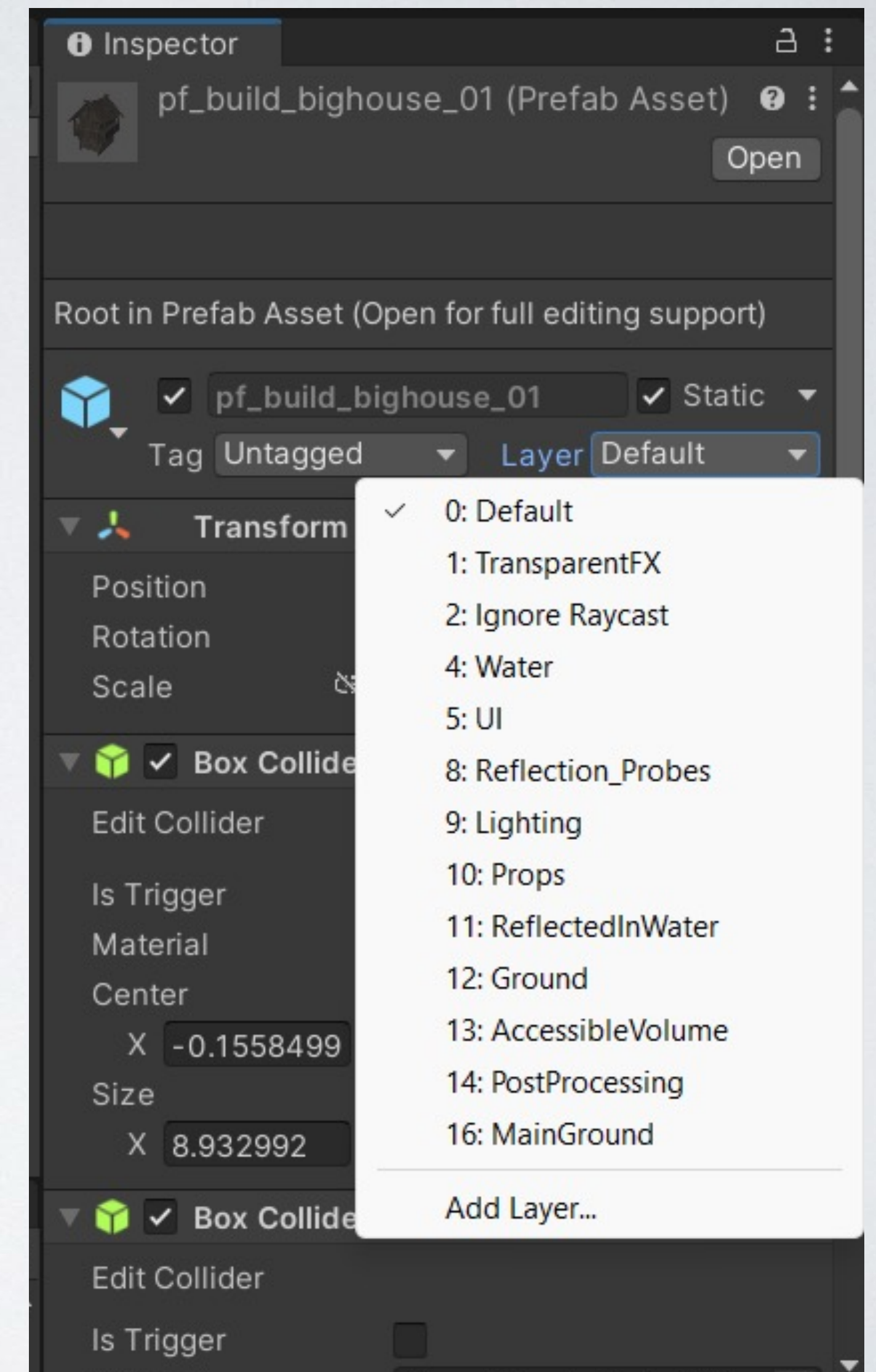


# Layers

Another way of grouping things

You can show or hide layers in the Scene View

Often used to control rendering objects differently





# Navigating Unity

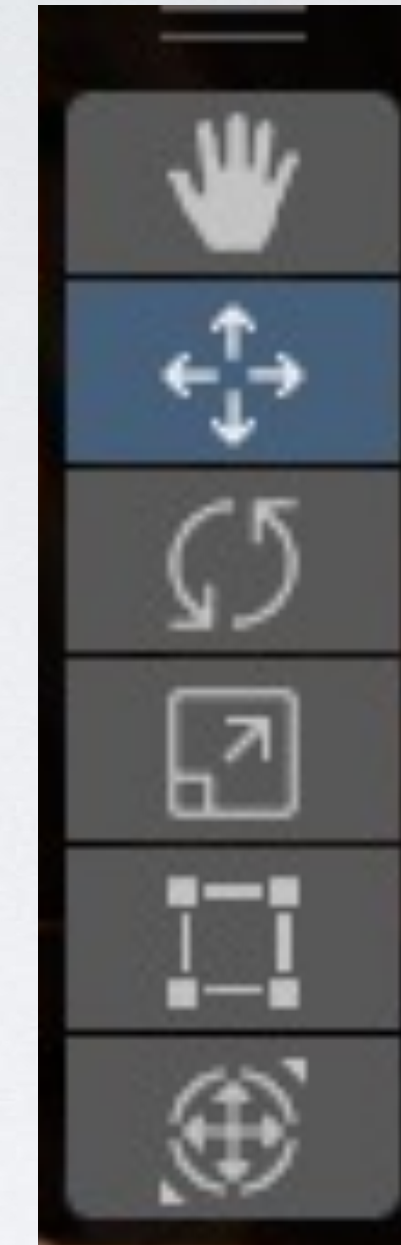
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Pan: Left Mouse Button

Zoom: Right Mouse Button + Alt / Scroll Wheel

Rotate: Left Mouse Button + Alt / Right Mouse

Move: Right Mouse Button + WASD Keys





# Unity Camera

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- Used to render the scene
- Must have one camera but can have more
- Every camera has a View Frustum shown by the pyramid
- Orthographic/Perspective Projection



# Unity Lighting

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- Unity models how light behaves in the real world
- You can add as many lights as you want
- Directional/Area/Spot
- Realtime/Baked lighting



# Activity

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- Create a cube and an empty GameObject
- Make the cube as a child of the empty GameObject
- Turn the entire GameObject into a prefab
- Familiarize yourself with Unity's interface and functionalities



# Importing Models

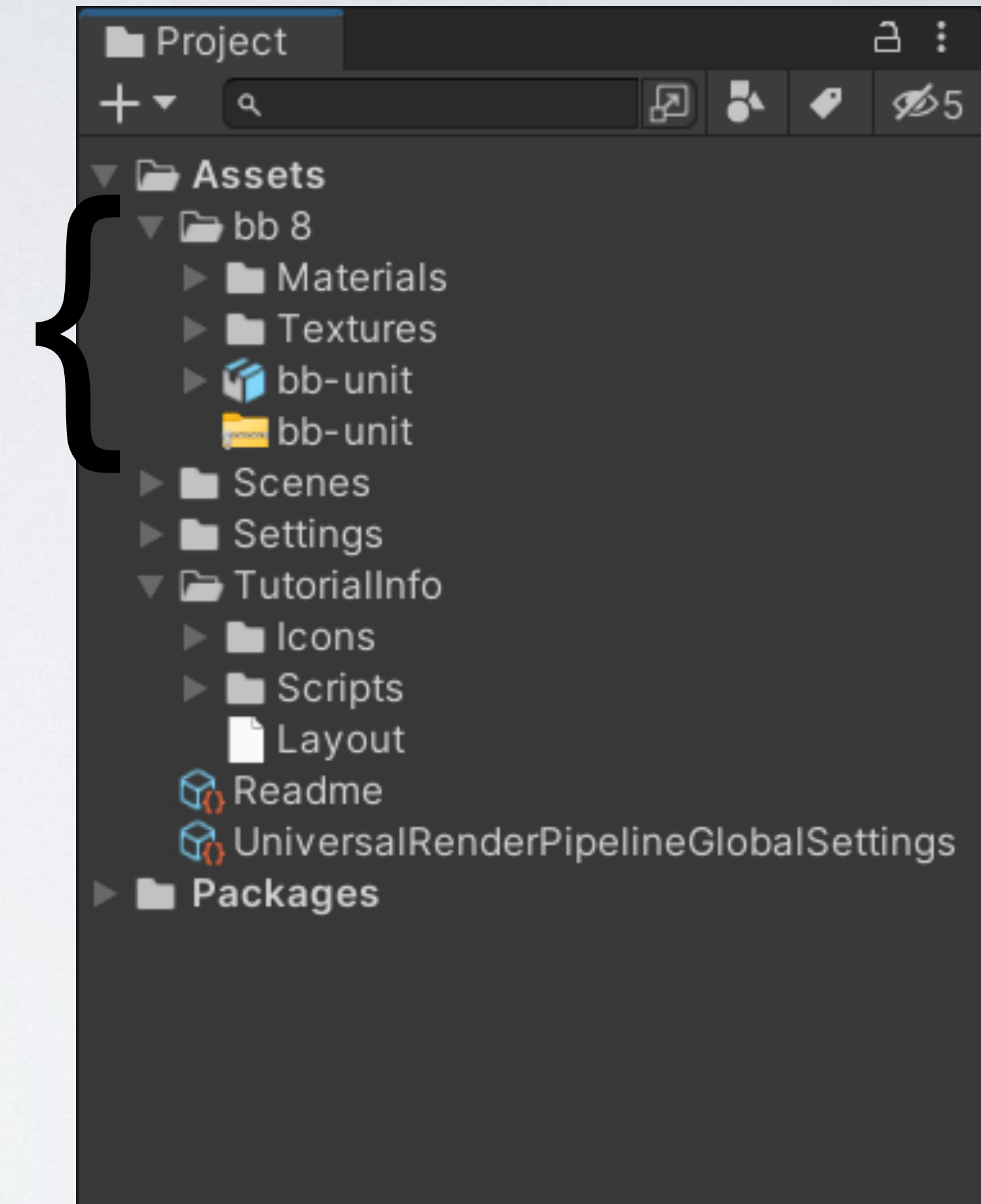
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◦Unity can read

- .fbx, .dae (collada), .dxf, .obj, and .skp files

◦Drag and drop model files into Assets folder

◦Make sure the geometry, materials, textures are dragged and dropped together into Unity project

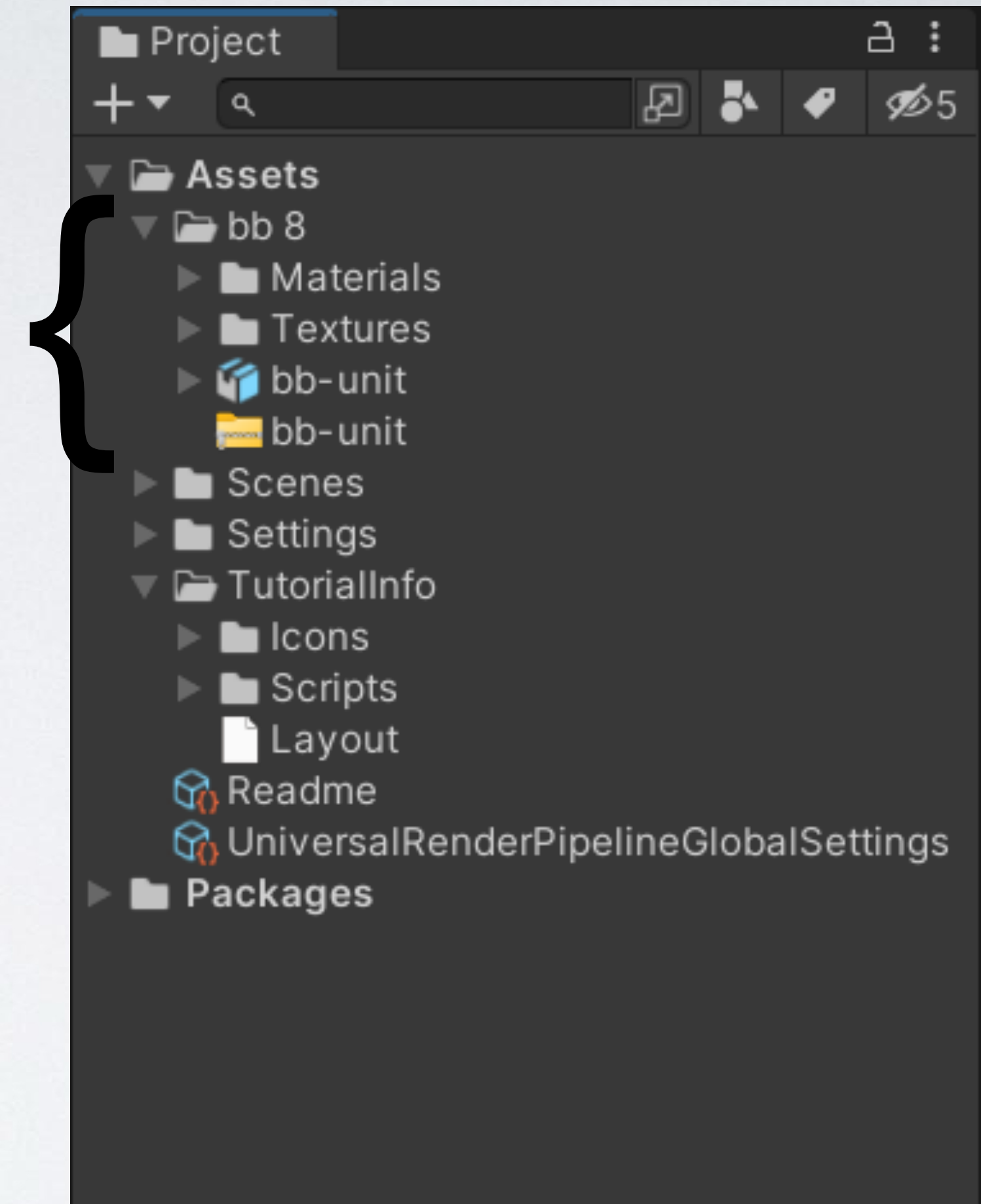




# Importing Models

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- Proprietary application support
  - 3D Studio Max, Maya, Blender, Cinema4D, etc
- Unity converts proprietary files into .fbx during import
- User exported .fbx preferred
- <https://docs.unity3d.com/Manual/3D-formats.html>





# Places to Find Models

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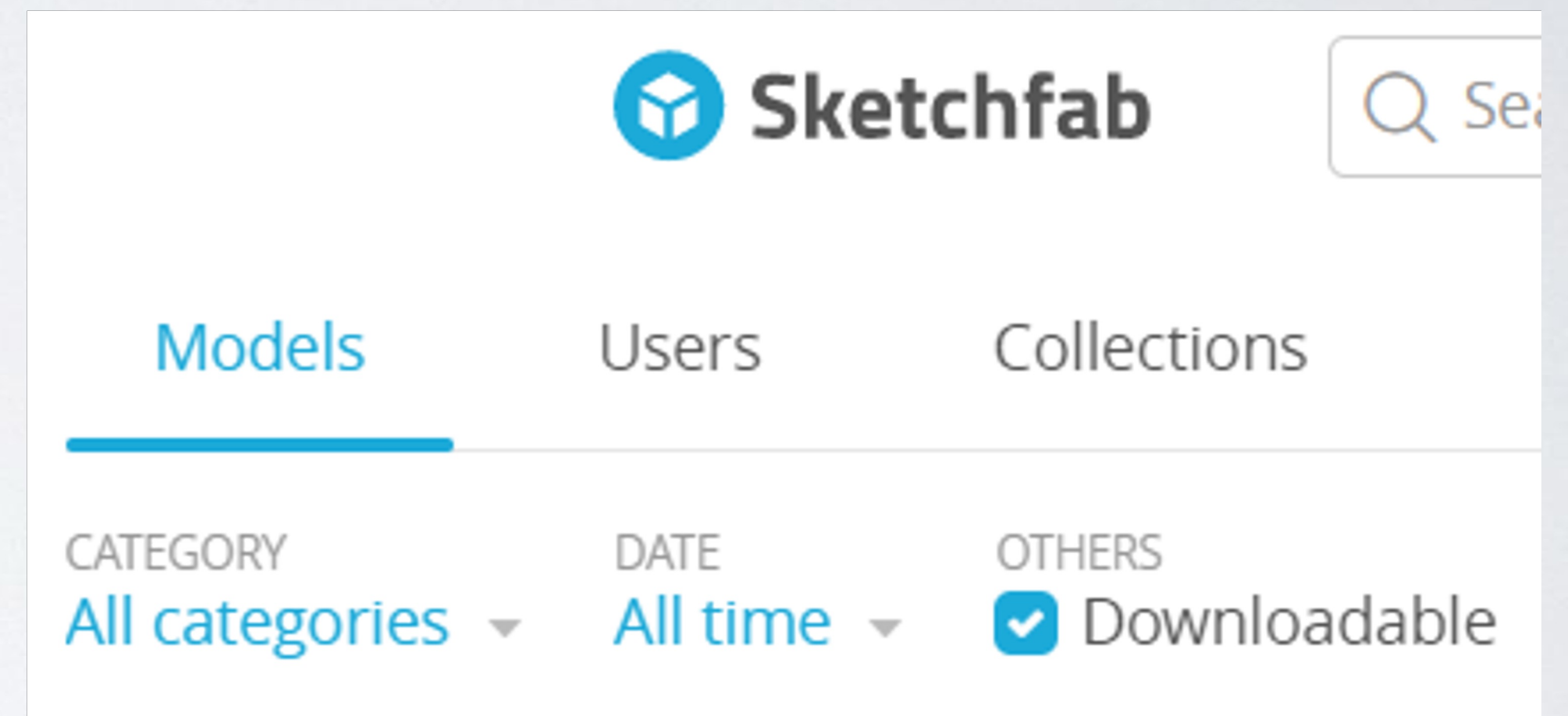
◉ [Sketchfab.com](https://sketchfab.com)

◉ [turbosquid.com](https://turbosquid.com)

◉ [www.cgtrader.com](https://www.cgtrader.com)

◉ <https://3dwarehouse.sketchup.com>

◉ Dozens of others





# Unity Asset Store

<https://assetstore.unity.com/>

◦Models

◦Prefabs

◦Scripts

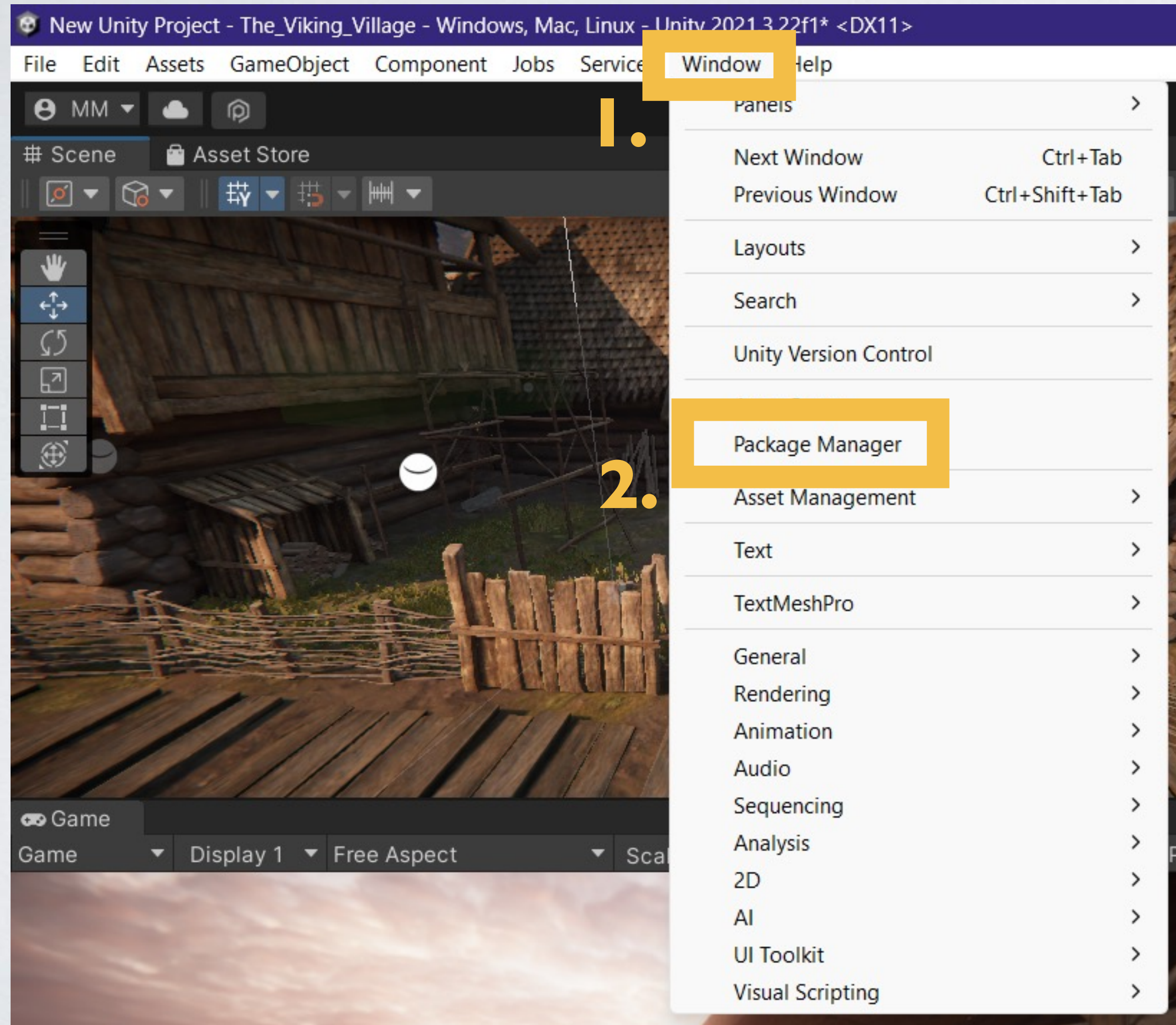
◦Textures

◦Projects

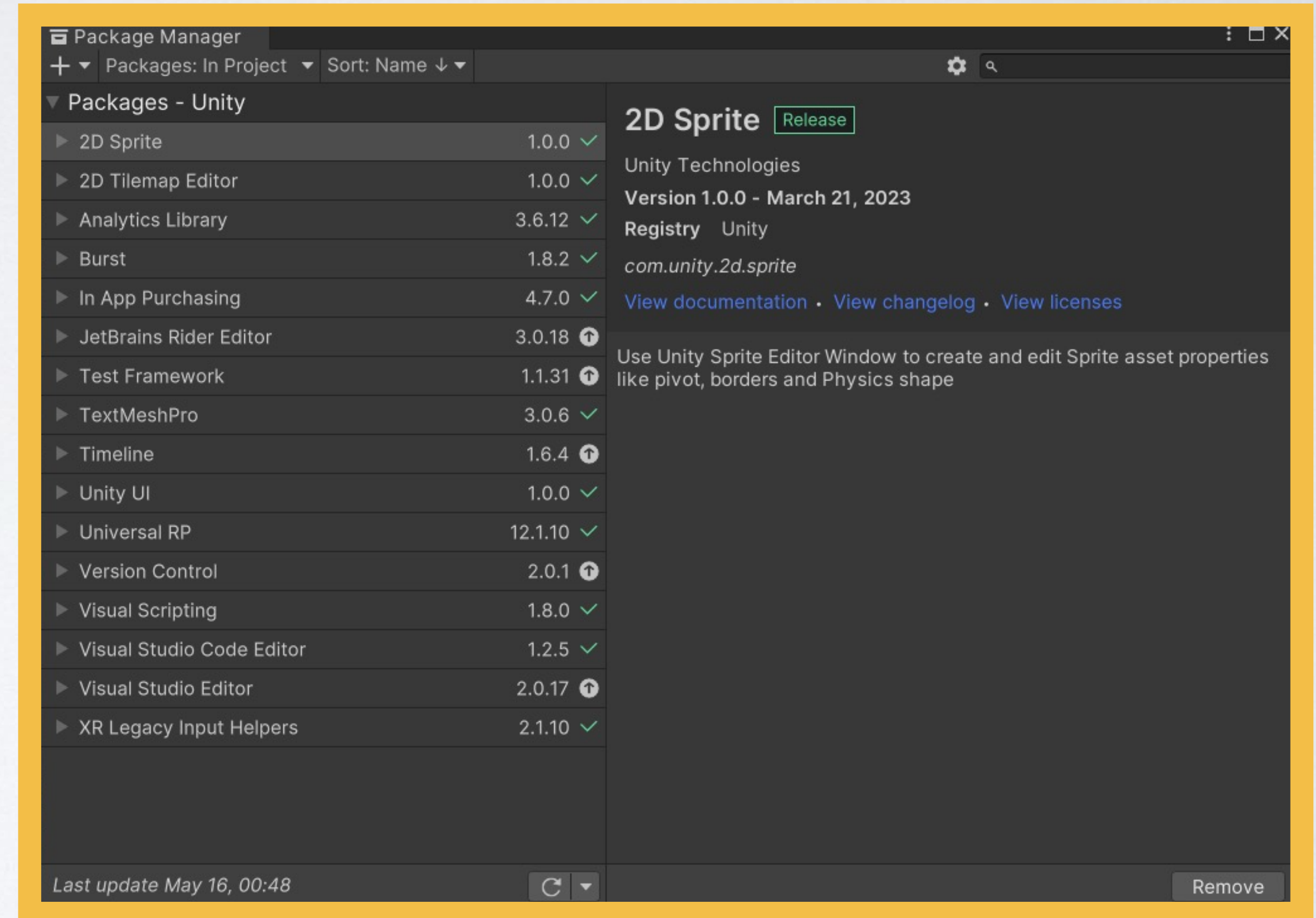
The screenshot shows the Unity Asset Store interface. At the top, there is a search bar and navigation tabs for various asset categories: 3D, 2D, Add-Ons, Audio, Decentralization, Essentials, Templates, Tools, VFX, and Sale. Below the navigation is a row of category filters with icons and counts: Sale, 3D (47073), 2D (11132), Tools (10597), Audio (10189), VFX (3332), Templates (2986), Add-Ons (144), Essentials (50), and Decentralization (14). The main content area is titled "Popular assets" and includes sub-tabs for "On sale", "Top selling", "Top new", "Top free", and "Verified Solutions". A "See more" link is also present. Below the sub-tabs, there is a grid of asset cards. Each card features a thumbnail image, a discount tag (e.g., -50%), the asset name, the creator's name, a star rating, and the number of reviews. The assets shown are: Mesh Baker by Ian Deane (404 reviews), All In 1 Vfx Toolkit by Seaside Studios (38 reviews), Pro Sound Collection by Gamemaster Audio (86 reviews), Shapes by Freya Holmér (71 reviews), Dynamic Bone by Will Hong (648 reviews), and Animation Designer by Fimpossible Creations (36 reviews). A "Add to Cart" button is visible for the Dynamic Bone asset.



# View Unity Store Assets



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# In-class Assignment

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- Add solidworks / blender models to your project
- Have fun and explore!
  - Add new models
  - Add new functionality
  - Break things
  - etc.