LSS MANAGER v1.1

Windows PC

Contents

Introduction

LSS Manager Unity Plugin will allow you to import LSS3D files directly into the Unity Engine Editor from where you can review and alter your model's data within Unity.

The following section will take you through the process of exporting your LSS survey model ready to be imported into Unity.

Exporting LSS Model

With your LSS dongle plugged in to your machine and with the latest version of LSS installed, load up your LSS survey that you wish to export into Unity.
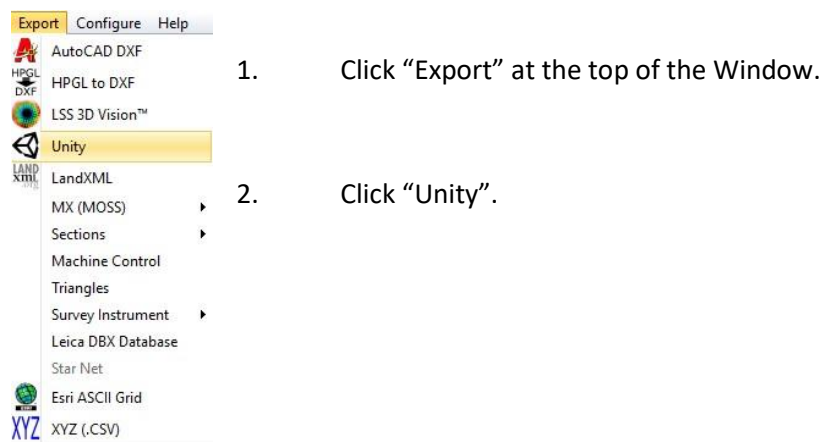

1. Click "Export" at the top of the Window.

2. Click "Unity".

Figure 1: Exporting LSS Survey for Unity.

You will then be presented with a "Export Unity" window as shown in the following image:
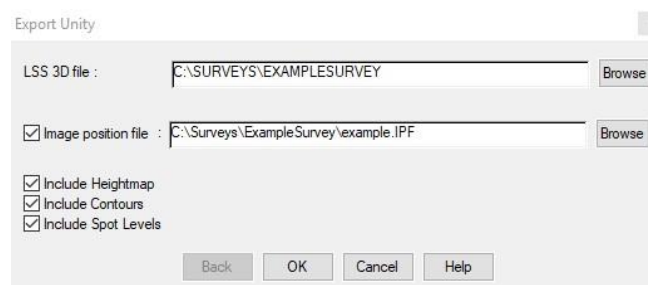

Figure 2: LSS Export settings for Unity.

1. Save your project within your surveys folder.
2. If you have an image position file - tick the box for it and enter the file path within your surveys folder.
3. Tick Heightmap.
4. Tick Contours.
5. Spot Levels (optional to be ticked, creates green spheres in Unity)
6. Click "OK".

Your LSS3D file is now ready to be imported into Unity.

What is Unity?

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005. The engine can be used to create three-dimensional, two-dimensional, virtual reality, and augmented reality simulations and other experiences.

Unity Specification Requirements

LSS Manager has been developed for the latest official version of Unity (not alpha/beta) Windows PC and will take roughly **3 gigabytes of storage space** (with all options ticked off in the installer); system requirements for PC can be found on the Unity site below:

https://unity3d.com/unity/system-requirements

Unity Hub

The Unity Hub is where you can create and hold all of your Unity Projects and also where you can download updates of Unity.

The following link will download Unity's Hub: https://public-
cdn.cloud.unity3d.com/hub/prod/UnityHubSetup.exe

Once the Unity Hub has downloaded, open it and follow the installation instructions.

Near to the end of the installation leave the tick box checked to "Run Unity Hub", as shown in the image below:
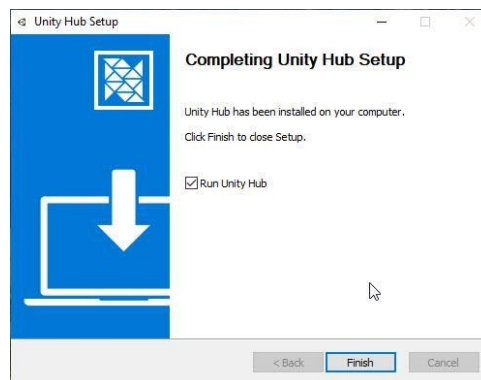

Figure 3: "Run Unity Hub" ticked.

Unity Licenses and Activation

In the Unity Hub (as of this setup guide Unity Hub ver 2.01) you are prompted (and required in order to continue with the setup) to create a Unity license - if you don't have one, this doesn't need to cost anything unless you require Plus/Pro editions of Unity which doesn't affect/restrict your experience with the LSS Manager either way. The following image shows the Unity Hub without a Unity licence:
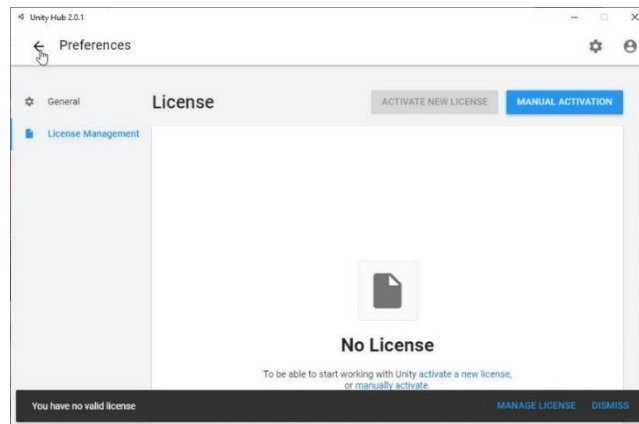
Figure 4: Create a Unity License to continue.

If you don't have a license with Unity follow the instructions in the link below:

https://docs.unity3d.com/Manual/OnlineActivationGuide.html

Once you have obtained your license from Unity, in the top right corner of the Unity Hub is the account button, click it followed by sign in and enter you details. The following image shows the icon to click:
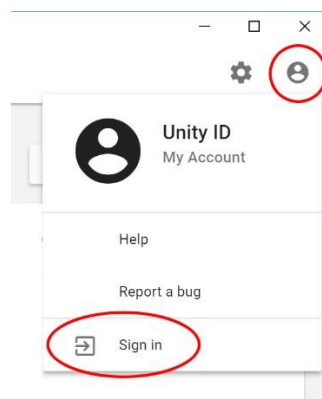

Figure 5: Sign-In

Now we can move onto installing Unity.

Download Unity

So, you've downloaded Unity Hub, created and applied your Unity license, the last step before we load up Unity is to download the latest "official" release of Unity.

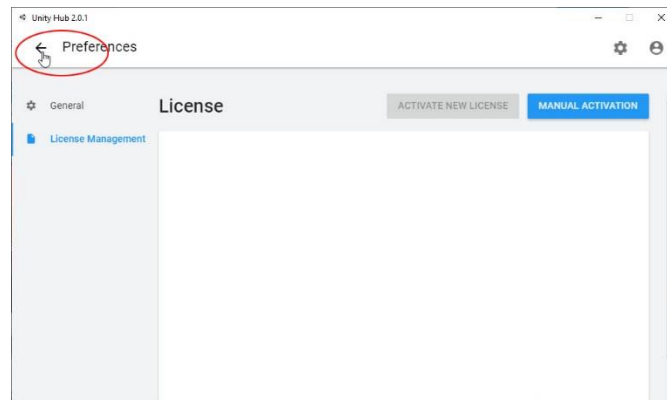In the Unity Hub head back to the main menu (if you are not already) as shown in the image below:

Figure 6: Click the back button to go back to Main Menu.

1. Select "Installs" on the left side bar. As you can see we are notified "No Unity version." Is installed. So, lets "ADD" a version by clicking the button in the top right corner as shown in the following image:
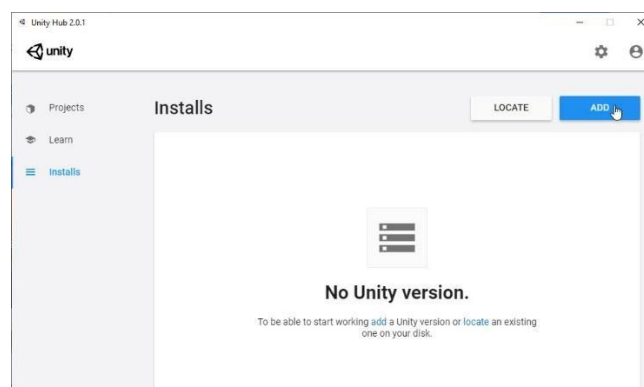

Figure 7: "ADD" a version of Unity.

2. You will now be presented with a list of different Unity downloads, as previously mentioned LSS Manager will only support the latest *official* Unity PC build. That means from the list any title with the letter "f" is an official full Unity release. As of this installation guide the latest official release is "Unity 2019 1.5f1" you will see a higher number build to download.
3. Once you have selected the version of Unity you want click "Next".

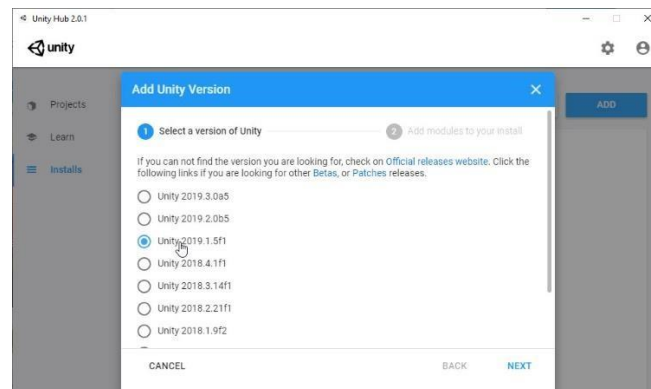The following image shows a list of Unity downloads:

Figure 8: Select a Unity release with an "f".

4. Next, uncheck all tick boxes (unless you specifically want to add something), we can always amend these at later date depending on the specific build/setup you are after, then click "DONE" as shown in the following image:
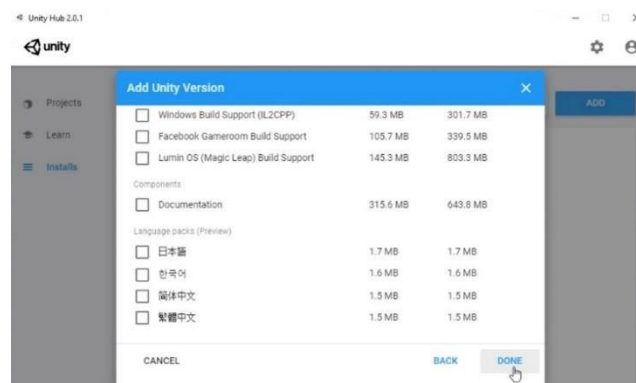

Figure 9: Accept default settings and click "DONE".

5. You will be taken back to the Unity Hub Install Menu from where the version of Unity is displayed along with a progress bar above it. Depending on your internet connection speed this will typically take between 15-20 minutes. Image below shows the Unity Hub installing a copy of Unity:
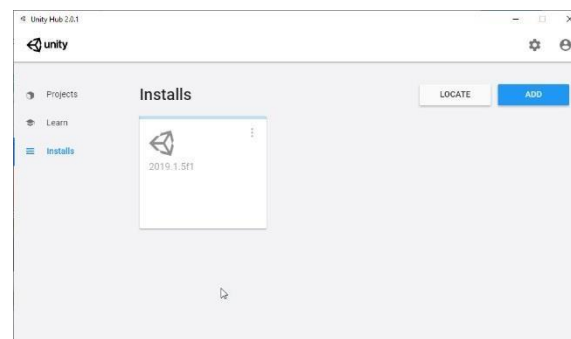

Figure 10: Unity installing.

6. Once the progress bar has filled and disappeared Unity is ready to run. The following image shows Unity is installed via the Unity Hub:
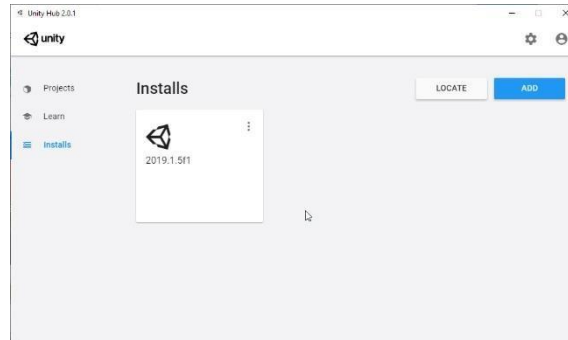
Figure 11: Unity installation complete.

We can now move on and start a new Unity project to import our LSS model in to the editor.

Create and Start a New Project

To create a new Unity project, do the following:

1. Click the "Projects" tab on the left of the Unity Hub Main Menu and click the "NEW" button in the top right as shown in the image below:
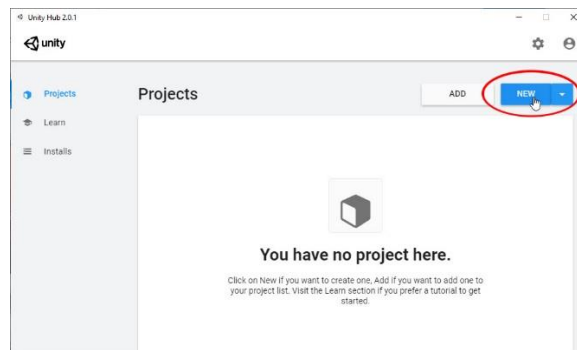

Figure 12: Creating a new project.

2. Finally, we are going to set our project up to be "3D", make sure it is selected. Give your project a name, I've called mine "Survey00", and locate where on your system you would like to store your project files, mine is located "C:\LSS User\Survey00".

3. Click "CREATE" in the bottom right corner. Your blank project will start being setup.

Figure 13: Setting up a 3D project, name and location
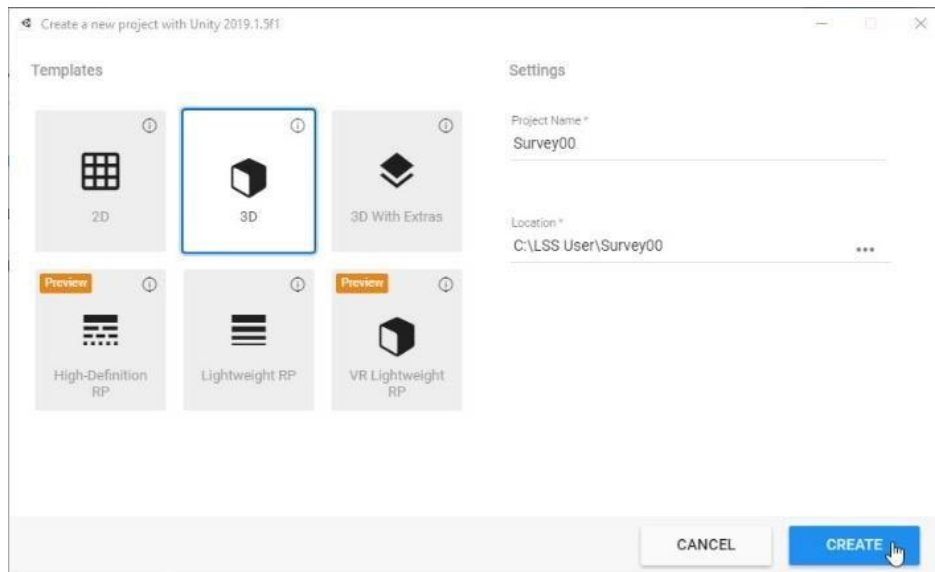
4. Now that Unity has been setup hopefully there were no issues. If you need more information on the setup, a link from Unity is available here: https://docs.unity3d.com/Manual/GettingStartedInstallingUnity.html

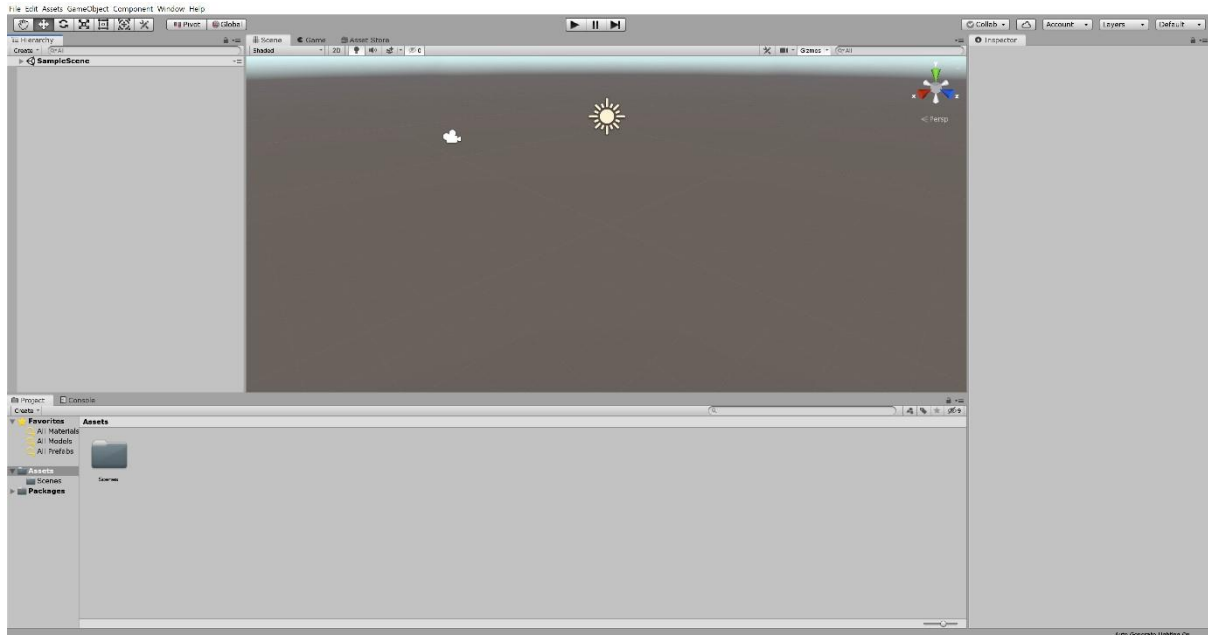The following image shows when the Unity Editor loads up for the first time:

Figure 14: The Unity Editor

Let's get familiar with the basic Unity Editor layout.

Basic Unity Layout

It isn't a vital step as the majority of your work will be within the docked windows in Unity:

- LSS Manager plugin
- Scene View
- Game View

But if you're interested to understand more of Unity's layout click the link provided below:

https://docs.unity3d.com/Manual/UsingTheEditor.html

Before we install our LSS Manager plugin we need to install our Post Processing package.

Package Manager

LSS Manager takes advantage of Unity's Post Processing capabilities to improve and customise the users visual experience within the Unity Editor and mainly with your project's final presentation. Post Processing will be covered in a later chapter but if you would like to know more about it now check the link to Unity's official documentation:
https://docs.unity3d.com/Manual/PostProcessingOverview.html

As a requirement the post processing package ***must be installed*** before the LSS Manager plugin.

To install Post Processing follow these steps:

1. At the top of the Unity Editor click "Window" and then "Package Manager" as shown in the following image:
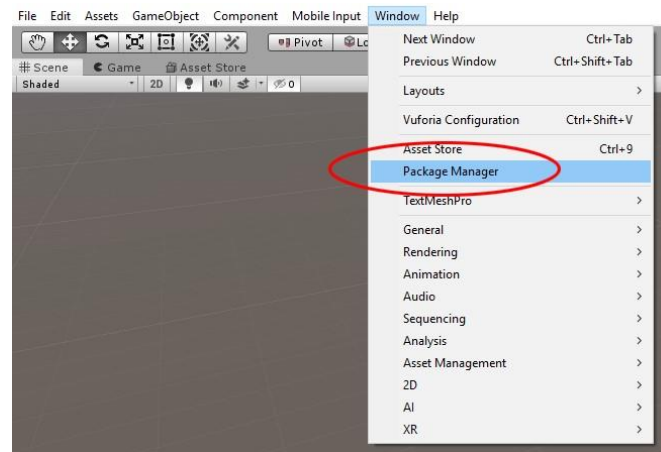

Figure 15: Select Package Manager

2. The Package Manager opens with a list of packages on the left side to show what Unity has already installed. To view the entire package selection list be sure the top left selection says "All packages" if not click "In Project" in the top left corner of the Window. Followed by "All packages" as shown in the following image:
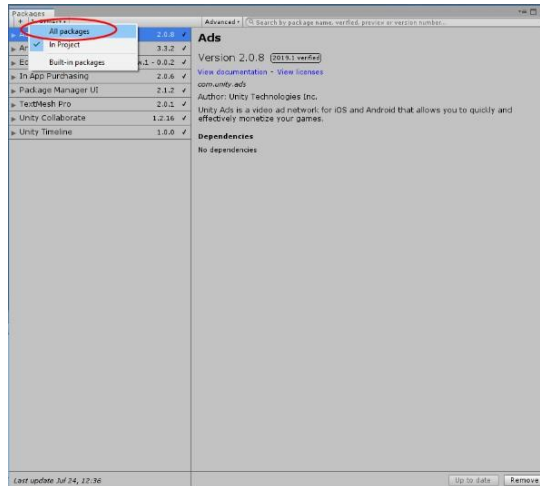
Figure 16: Selecting All packages

3. More packages will be displayed in the list (this can sometimes take a minute to display depending on your system), scroll down until you see "Post-Processing", select it.
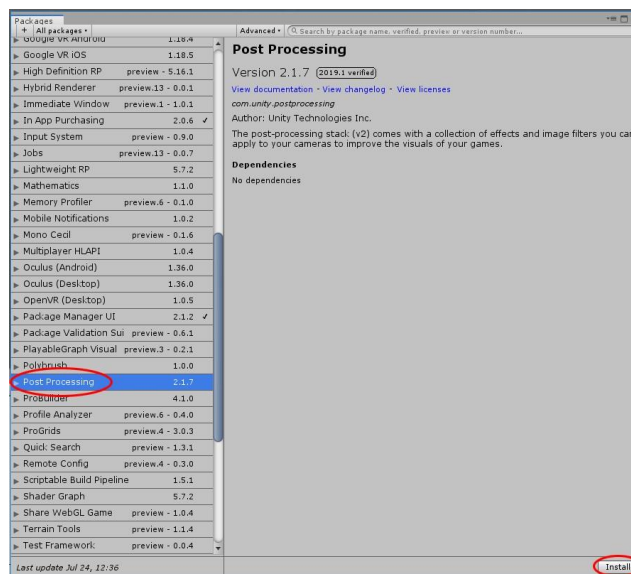4. Click the "Install" button, as shown in the following image.

Figure 17: Installing Post Processing

5. Close the package manager window.

You have now installed the Post Processing package; now we can install the LSS Manager plugin.

Installing LSS Manager

To install the LSS Manager plugin, do the following:

1. Click "Assets" at the top of the Unity Editor.
2. Then click "Import Package".
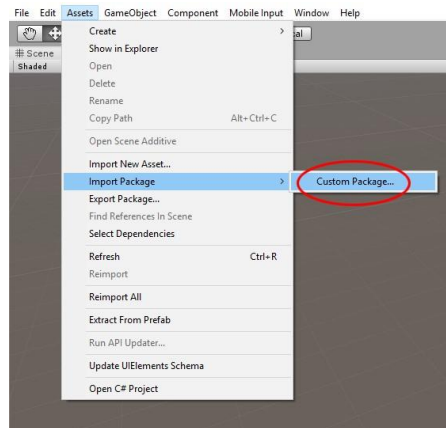3. Followed by "Custom Package…" as shown in the following image.

Figure 18: Importing LSS Manager

4. Windows Explorer will appear, locate your LSS Manager package and click "Open".
5. A list of assets will appear in a window, all of these files and folders will be ticked as default.
6. Click the "Import" button in the bottom right of this window.
7. Once imported, you now have LSS Manager in your project.
8. Finally, to turn LSS Manager on, click "Window" at the top of the Unity Editor followed by "LSS Manager".
9. You are now in "LSS Manager Mode".

Unity's "Hierarchy", "Inspector" and "Project" windows have been closed and the "LSS Manager" window appears. Unity's "Console" window remains (The window docked at the bottom of the Editor) this will give information on your data and if any possible warnings or errors occur.

The other windows that have automatically been closed typically won't be required whilst in "LSS Manager Mode", you can however load them back into the Editor if required by going to the top of the Unity Editor window and clicking, "Window", "General" and you are presented with a choice of windows to load back.

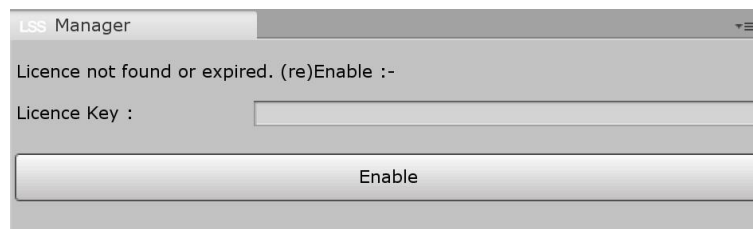To "Enable" LSS Manager enter your LSS Licence key provided by LSS.

Figure 19: License Key

Your "LSS Manager" window maybe located in a different place, mine is in the middle of the screen – as shown in the following image. We can dock this window into a better place that suits our workflow.
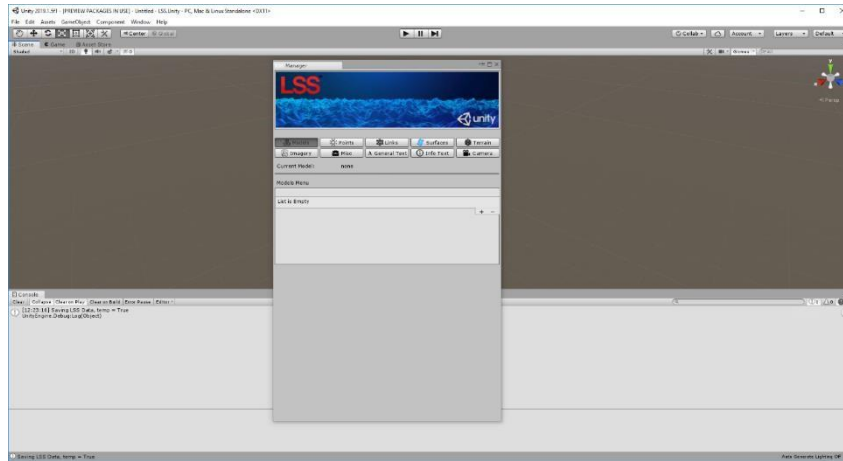
Figure 20: LSS Manager and Console Window in the Unity Editor

Dock Windows

In the Unity Editor you can have free floating windows or snapped to the side of each window. I'm going to dock the "LSS Manager" window to the far left of the Editor.

To dock the window, do the following:

1. Click and hold the "LSS Manager" tab and drag it to the left of the screen.
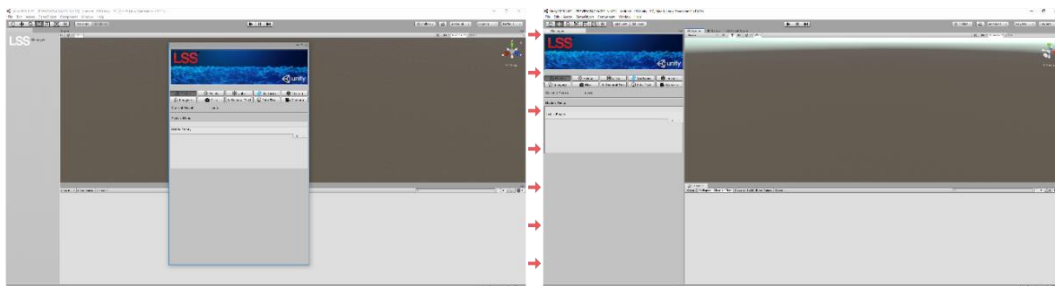2. From there you are given a preview where it's going to be placed.

Figure 21: "LSS Manager" preview dock on the left, LSS Manager docked on the right.

3. Finally let go of the mouse button and drag the edge of its window out until you feel you have a good enough space.

As we are getting more familiar with Unity's windows you may be curious of Unity's 3D navigation.

Unity Navigation

Move, pan around, zoom, rotating can be found at the Unity official manual page:

https://docs.unity3d.com/Manual/SceneViewNavigation.html

Next, we will start looking into the LSS Manager plugin into more detail.

LSS Manager Layout

All options of LSS Manager are contained within one window.

Here are the following options:

Models

To import a LSS3D model into the Unity Editor, click:

1. "Models" button
2. Models Menu "+"

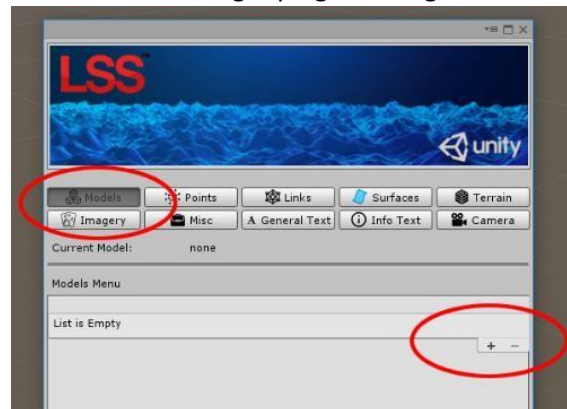The following image shows the LSS Manager plugin adding a model survey to the Unity scene:

Figure 22: Loading an LSS3D model

3. "Select a Model" window will appear
4. Locate the LSS3D file and select it.
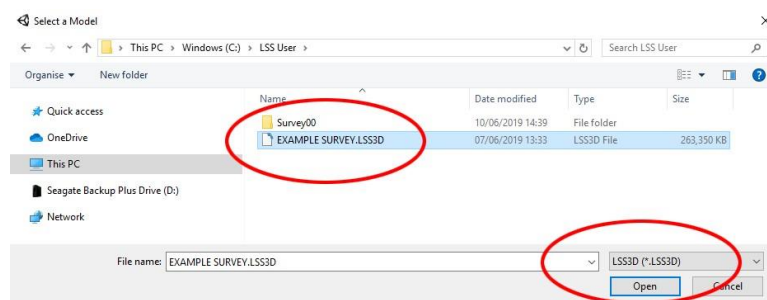5. Click the "Open" button, as shown in the following image:

Figure 23: Locate and open LSS3D file

Once the survey model has been imported into your Unity Editor scene the LSS Manager will have it labelled near the top of the plugin in the "Current Model" field as shown in the following image:
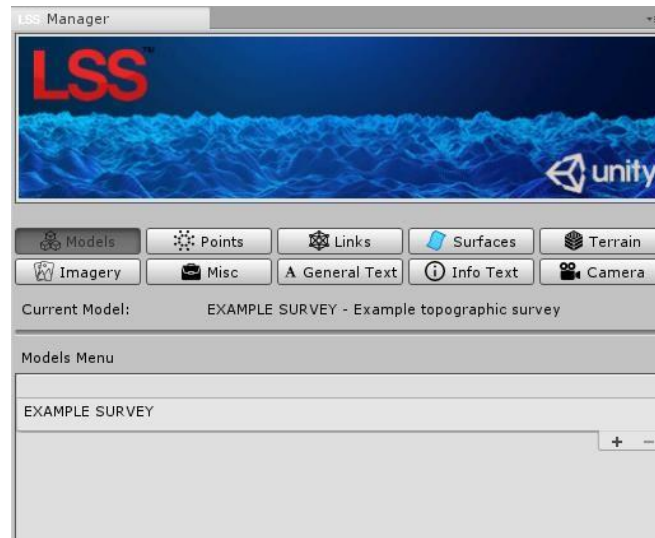

Figure 24:LSS3D Model imported into the scene

With your survey model imported into the scene, depending on its world space location we may struggle to find it. In the next section we will go through a troubleshoot in case we can't find the survey in our scene.

Locate model

With the model imported into your scene you may not be able to view the model in the "Scene" window. If you can see the model, skip this heading and move onto the "Points" heading, otherwise there are 3 possible reasons/ways of solving this:

1. You might be in 2D mode in the Unity Editor.
2. Or/and your model is in a different location within the scene.
3. Make sure you have exported the model correctly from LSS.

1. 2D Mode Fix

First thing to check is your "Scene" camera is viewing in 3D and not 2D. Sometimes this can happen from where a project has been set up in 2D instead of 3D.

In the top right corner of the "Scene" window is a "gizmo", I have drawn a red arrow pointing to it in the following image. Also, be sure the gizmo is marked as "Persp" and not "Iso" by clicking it. This will stop our model looking "flat":
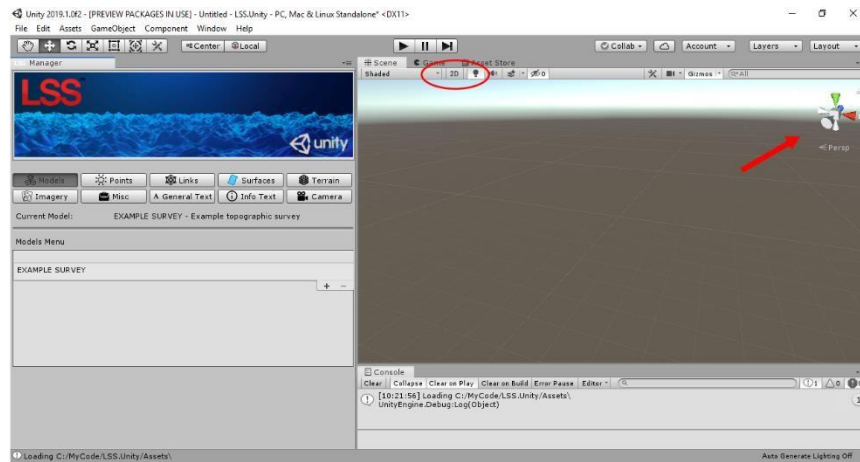
Figure 25: Red arrow pointing to the Unity Gizmo

If you can't see this, that means you are in 2D mode. To get out of 2D mode press "2" on your keyboard or click the "2D" button at the top of the "Scene" view, as highlighted in the previous image.

2. Navigate to model

It is a possibility that your camera is away from the model, try zooming out from the scene (scrolling the mouse wheel towards you) then panning with the middle mouse button pressed down. If you see the model you can auto zoom to it by left clicking the model in the "Scene" window and hitting the "f" key on the keyboard. The following image shows our survey model in the "Scene" window and our LSS Manager plugin on the left.
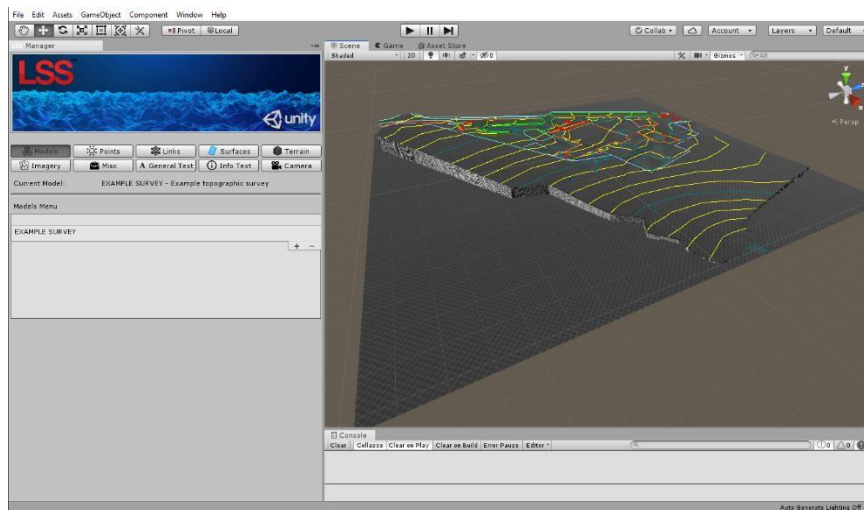

Figure 26: Imported model in the scene view.

3. Checking LSS model export is correct with LSS

Be sure you have exported your survey correctly from LSS; maybe try a different survey model to confirm the problem repeats.

Points

If your model contains point codes you can view and edit them by clicking the "Points" button, circled at the near top of the LSS Manager as shown in the following image:
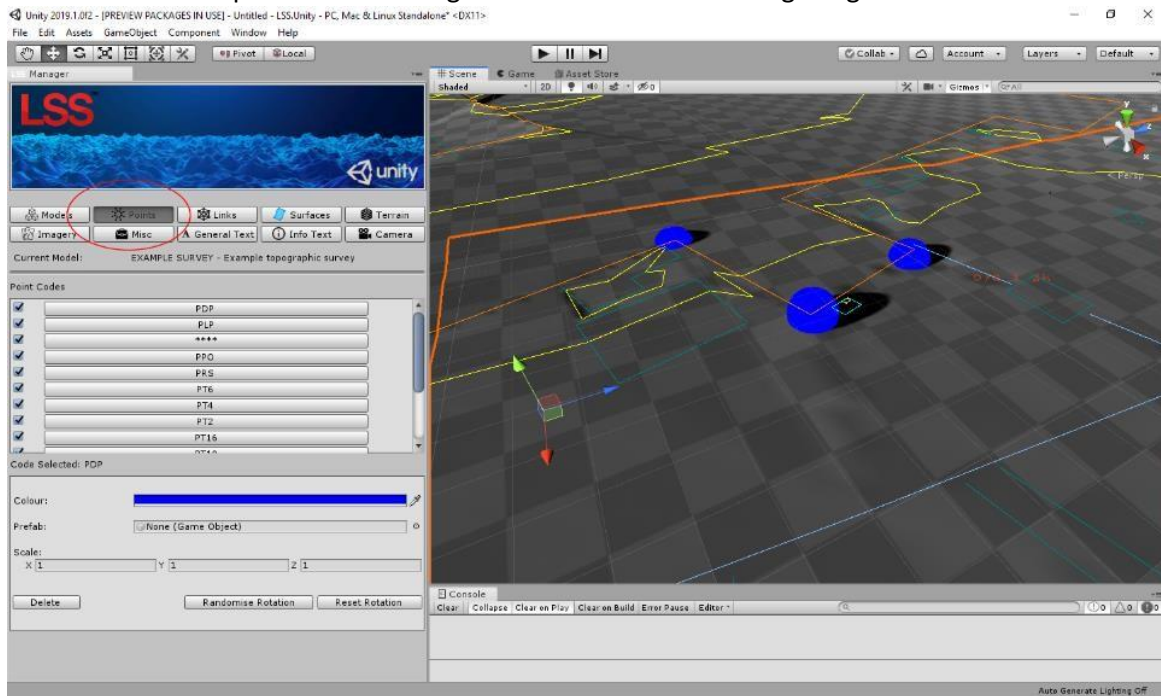

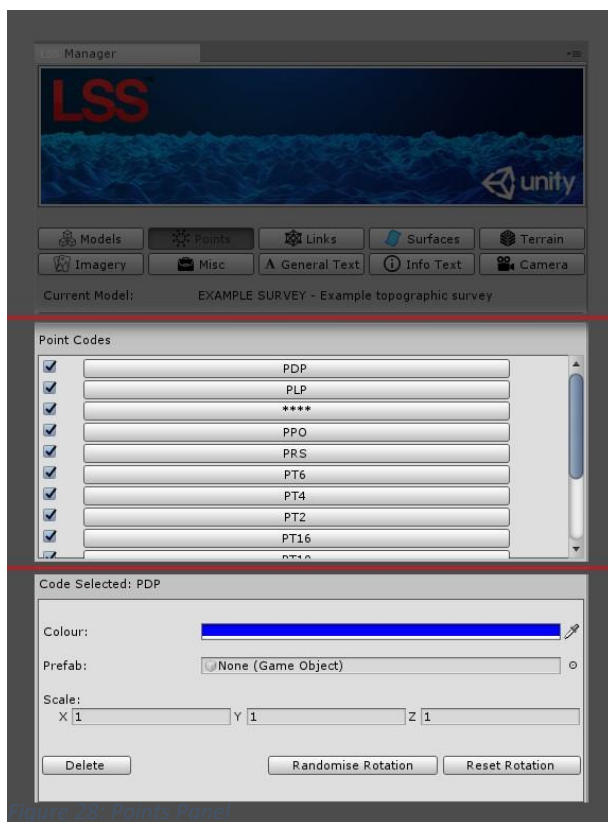*Figure 27: Three blue Point Codes in the "Scene" Window*

Figure 28: Points Panel

The "Points" panel has two sections:

The top half is a list of point codes that can be scrolled through (if available), select and hide point codes in the "Scene" window with the check box by the left side of its name.

When a point code is selected the bottom half of the panel will contain information about the selected point code group.

The bottom half in detail: -

Colour: Change the colour of the selected point code group.

Prefab: Replace a point code group from the standard allocated sphere to a custom 3D prefab model of your own, information about prefabs can be found here: https://docs.unity3d.com/Manual/Prefabs.html **Scale:** Change the X, Y and Z scale of a 3D point code.

Delete: Remove the entire point code group.

Randomise Rotation: Alter the rotation of each point code within the group. Ideal for prefabs to create a variance of 3D models not facing the same direction.

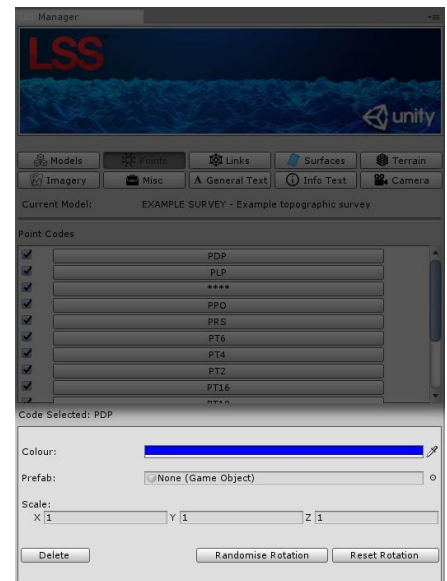**Reset Rotation:** Bring all rotations within the point code group back to their zero position.

Figure 29: Selected Point Code.

The next button on the LSS Manager is the "Links" panel.

Links

If your model contains link codes you can view and edit them by clicking the "Links" button as circled near the top of the LSS Manager plugin as shown in the following image:
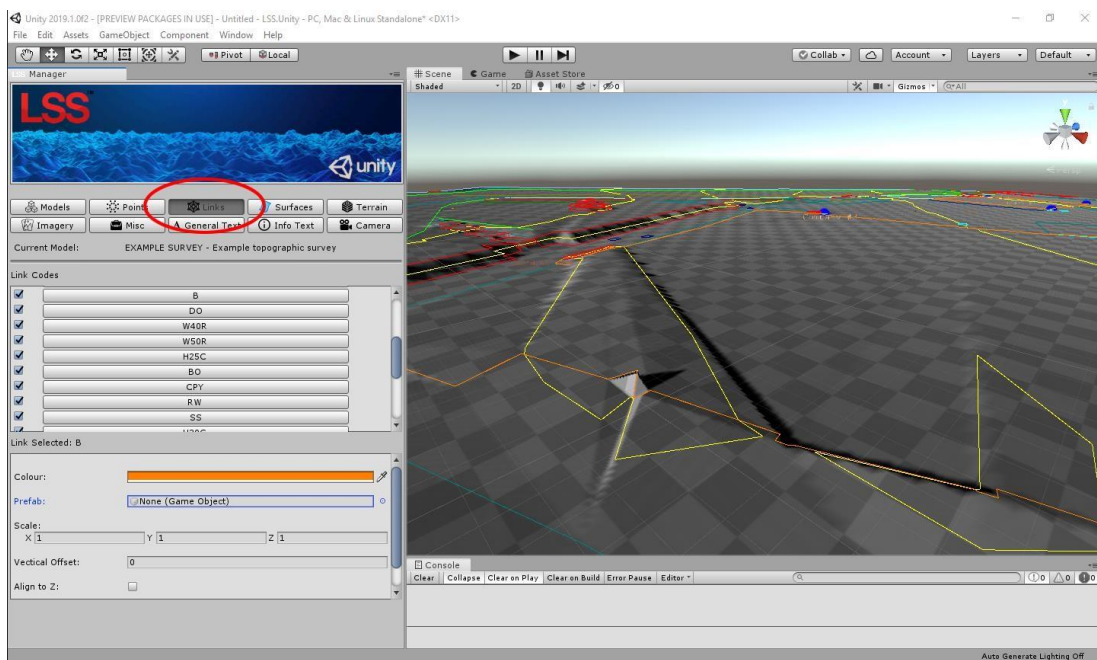
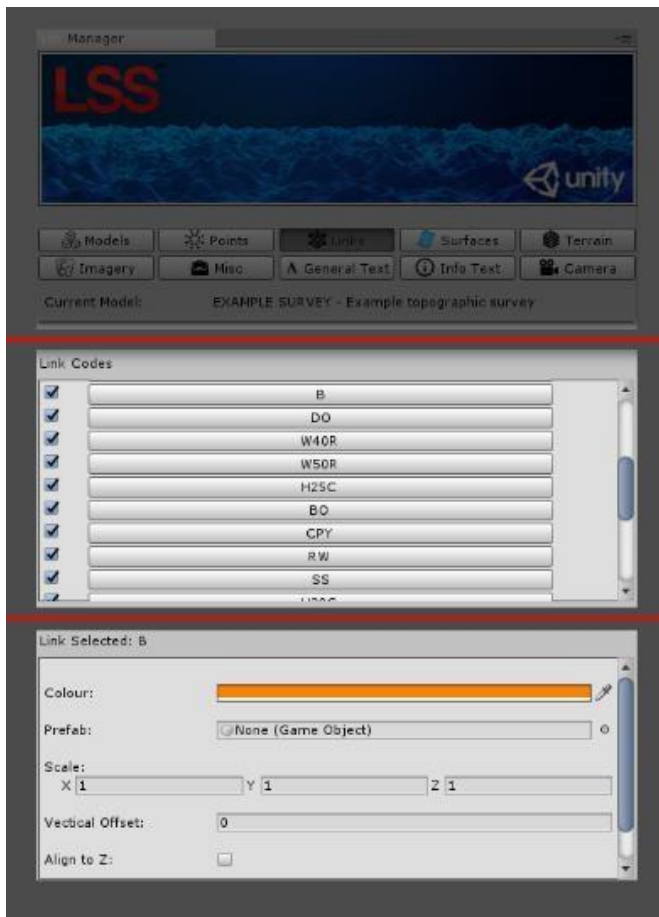*Figure 30: Loading Link Code options.*

The Link Code panel is split into two sections:

The top half of the Link Codes has a list of the survey models link codes and given name with a check box to turn the left of each button to make them visible or not in the "Scene" window.

The lower section expands on the selected Link Code:

Figure 31: Link Codes

Colour: Change the colour of the selected link code group.

Prefab: Replace a link code group from the standard allocated coloured line to a custom 3D prefab model of your own, information about prefabs can be found here: https://docs.unity3d.com/Manual/Prefabs.html

Scale: Change the X, Y and Z scale of a 3D link code (only valid when a prefab is allocated).

Vertical Offset: Raise/Lower a link code group on its Z axis (only valid when a prefab is allocated).

Align to Z: The "Prefab" will align to the path of the link code.
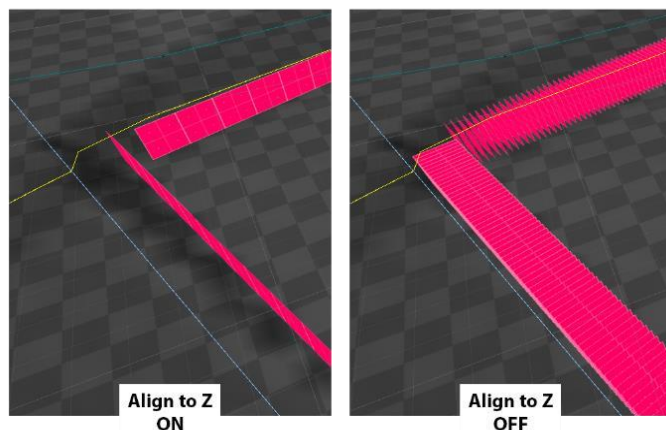

Figure 32: Align to Z option.

Surfaces

If your model contains surface codes you can view and edit them by clicking the "Surface" button near the top of the LSS Manager plugin, circled in the following image:
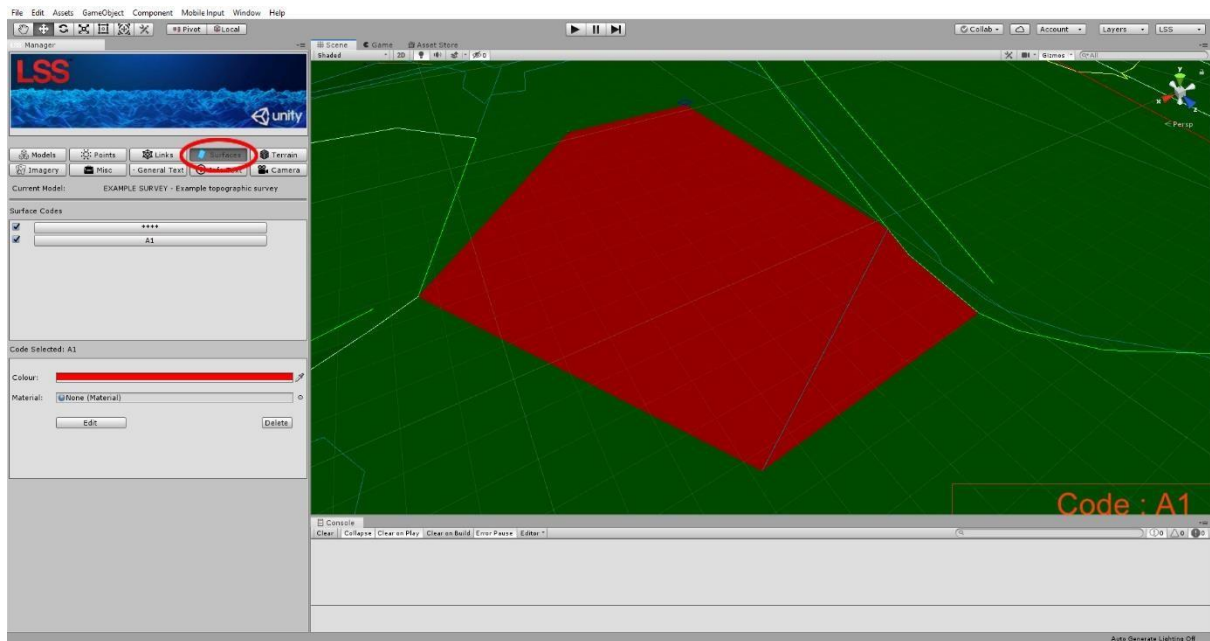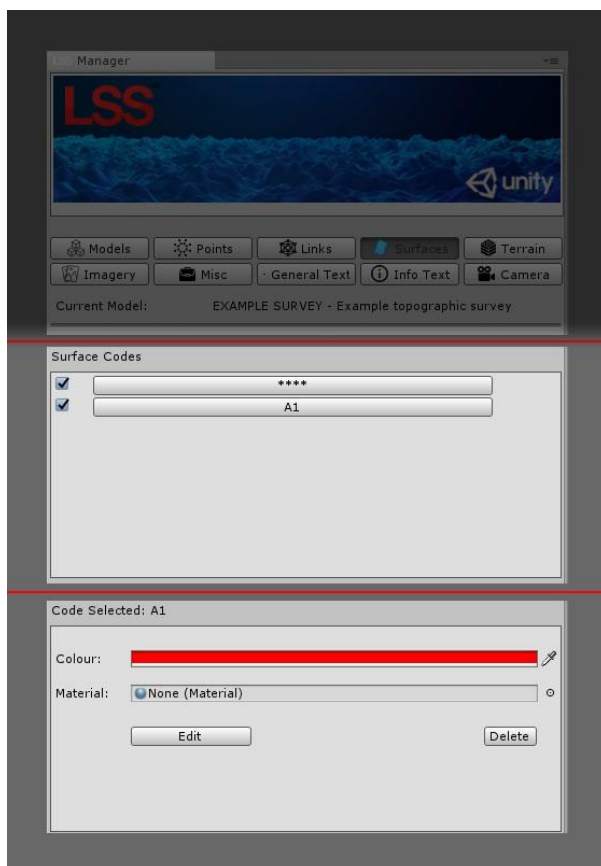

Figure 33: Loading Surface Code options.

The Surface Code panel is split into two sections:

Top half shows available surfaces codes along with a check box to turn each surface code on/off in the Scene view.

The lower section expands upon each surface code selected from above along with the name of the surface code selected.

Figure 34: Surface Codes panel.

Colour: Change the colour of the selected surface colour.

Material: Add a custom material to replace the surface colour, as shown in the image below. The water is free to download from the Asset Store titled "Standard Assets". More about the Asset Store can be found here: https://support.unity3d.com/hc/en-us/articles/210142503-What-is-the-UnityAsset-Store-and-how-do-I-purchase-Assets-

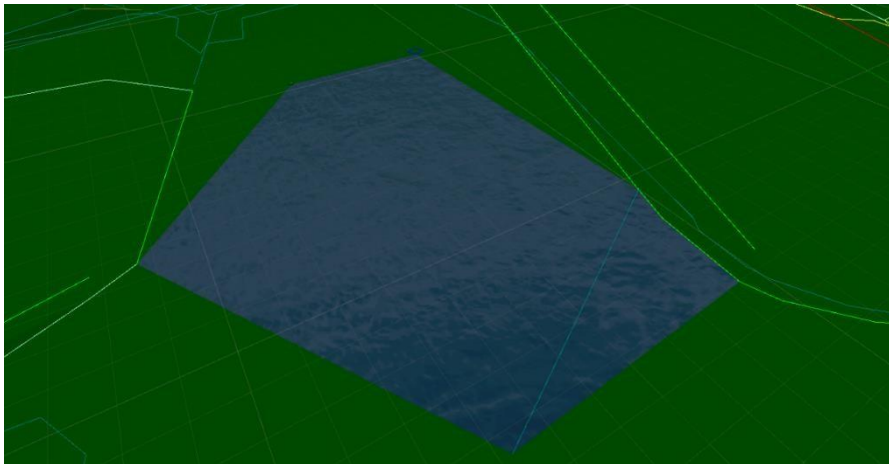The following image shows a Surface Code replaced with a water material.

Figure 35: Water Material applied to surface code.

Edit: Once a material has been applied the "Edit" button becomes available. Once pressed this will direct you to Unity' Material Editor. More about Unity's Material Editor can be found here: https://docs.unity3d.com/Manual/class-Material.html

The following image shows the properties of the water material being brightened.
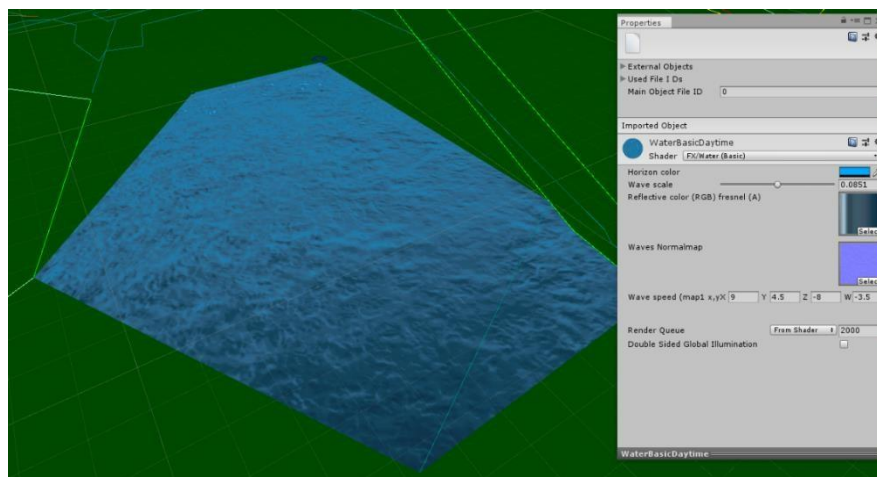

Figure 36: Material Editor Properties.

Delete: This will permanently remove the Surface Code but leave the game object within the Scene view.

Misc.

The Misc panel currently holds two categorises, Contours and Point Cloud. Let's look at the "Contours" option first.

Contours

If your survey model has contour lines this option will give you the ability to turn their lines off or on. In the following image shows on the left yellow contour lines and the right no contour lines:
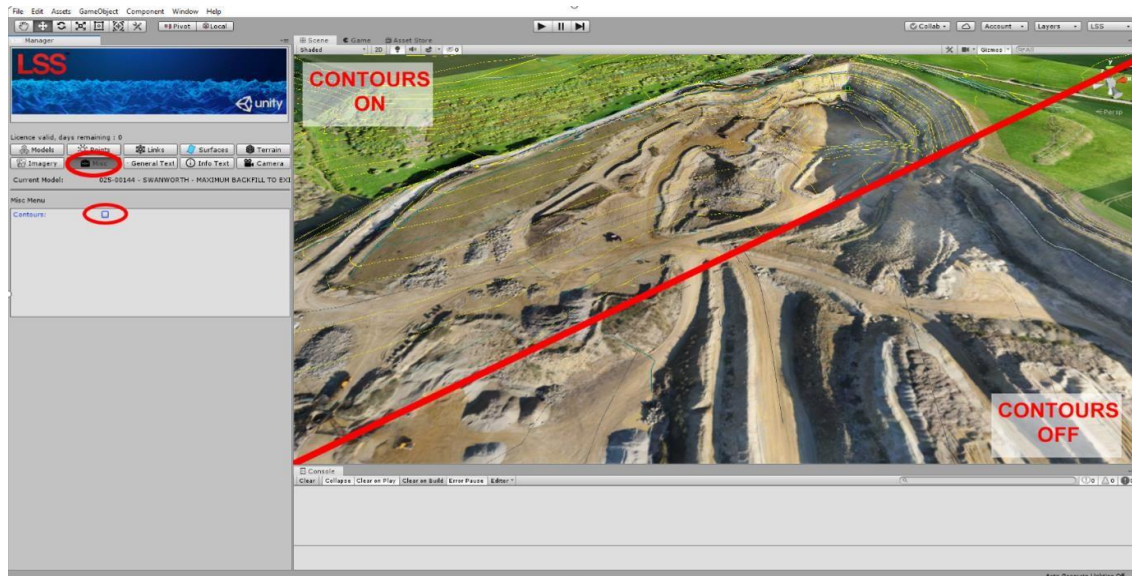

Figure 37: Turning Contours on/off

Figure 38: General Text Window

General Text

To select and edit the properties of your text in your project click the "General Text" button at the top of the LSS Manager plugin. You will now be presented with a list of all available text components in your scene. The image below shows the general text button selected with a list of general text imported from the survey.

To hide each individual text in the editor, click its tick box on the left side of its button.

If a text button is clicked a second window will appear that will show the settings for that particular text. This may be a little overwhelming with properties and it's likely you wouldn't need to focus on the majority of them. The image below shows an example when a text button is selected.
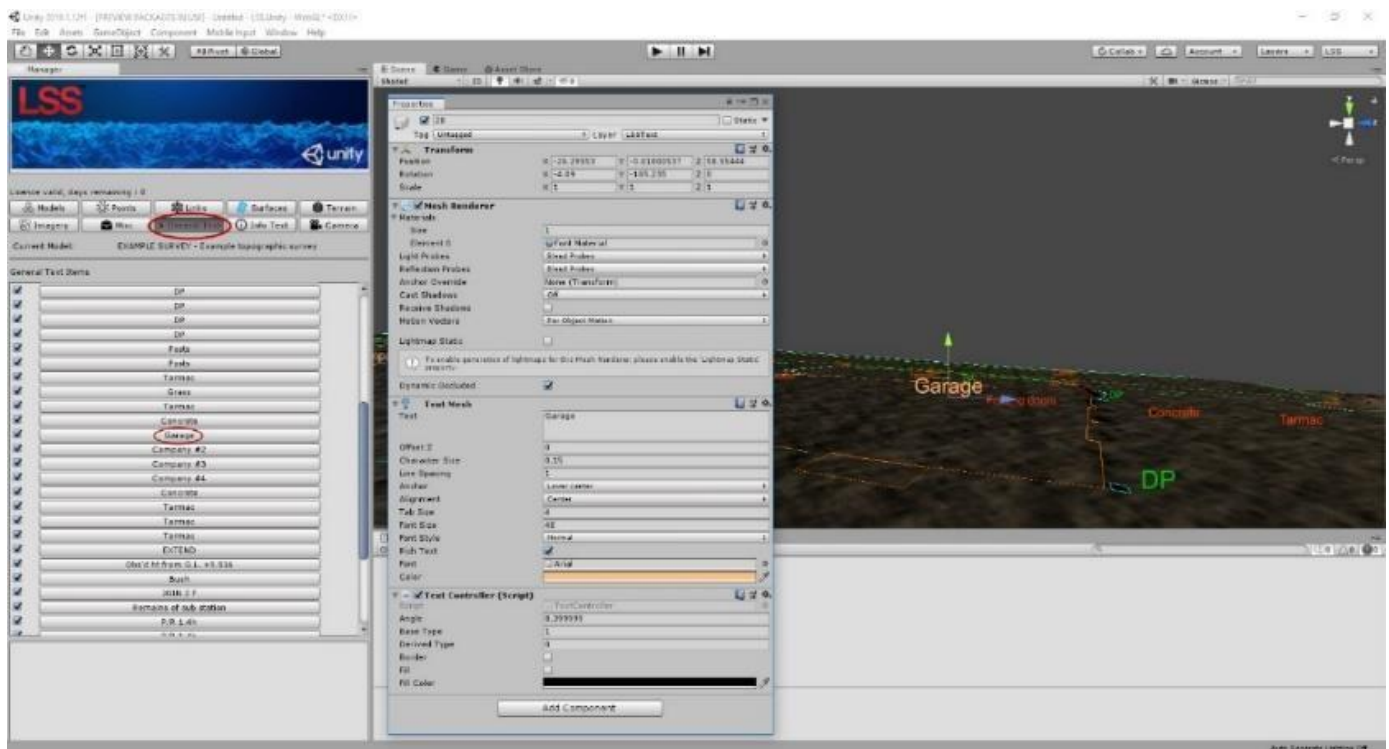
Figure 39: Secondary Text Window

With these general text properties there is a total of four components:

- Transform
- Mesh Renderer
- Text Mesh
- Text Controller

Let's break down what each component does:

Transform:
This component controls the texts position, rotation and scale. A good use of this component would be if your text is clipping into the ground and you need to slightly raise it. Increase the Y position would fix this.

Mesh Renderer:
It's likely you wouldn't need to alter the settings for this component. If you are an advanced user with Unity you may want to swap out this textures material and change it so it looks more custom.

Text Mesh:
The Text Mesh component gives a list of properties that can be done to this particular text. These are standard Unity properties that will change the content of the text, its font type this component is already documented at Unity's site: https://docs.unity3d.com/Manual/class-TextMesh.html

Text Controller:

This component contains the editable following:

- **Border**: Tick box to add a border.
- **Fill**: Fill the background of the border.
- **Fill Colour**: Change the fill colour of the background.

The image below shows an altered text from the properties we just spoke about:
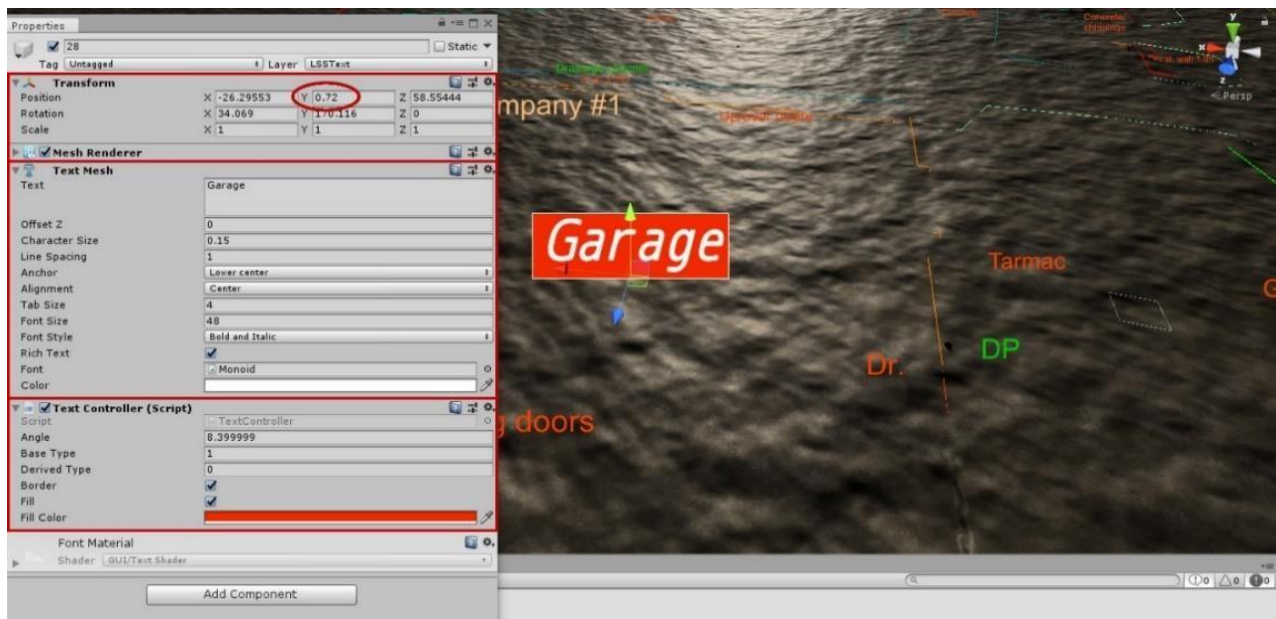

Figure 40: Text Controller properties

Info Text

If your survey model contains information boxes you can view and alter visual properties with the "Info Text" which is located at the top of the LSS Plugin selection. The following image shows an example of a "Info Text" box.
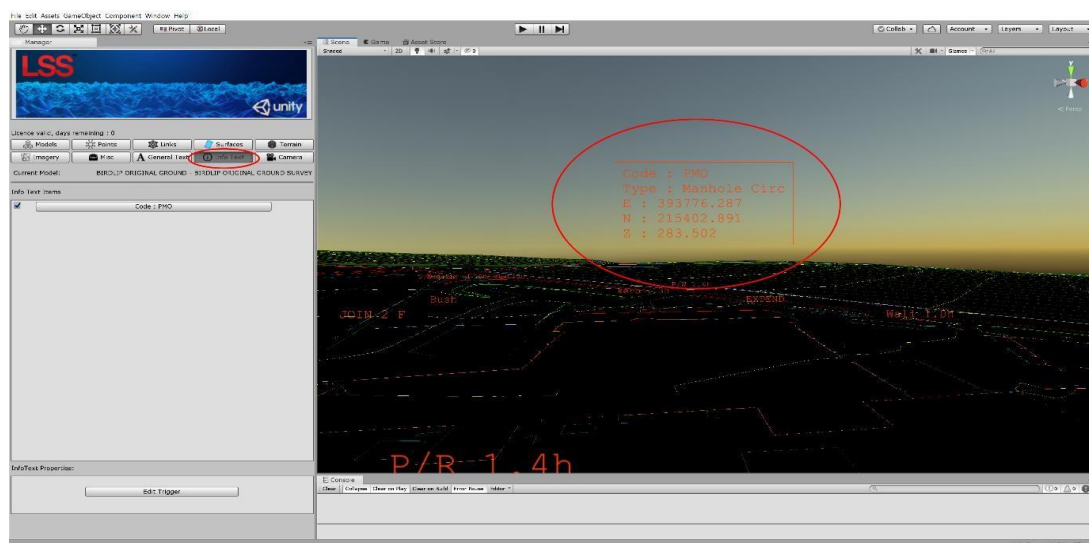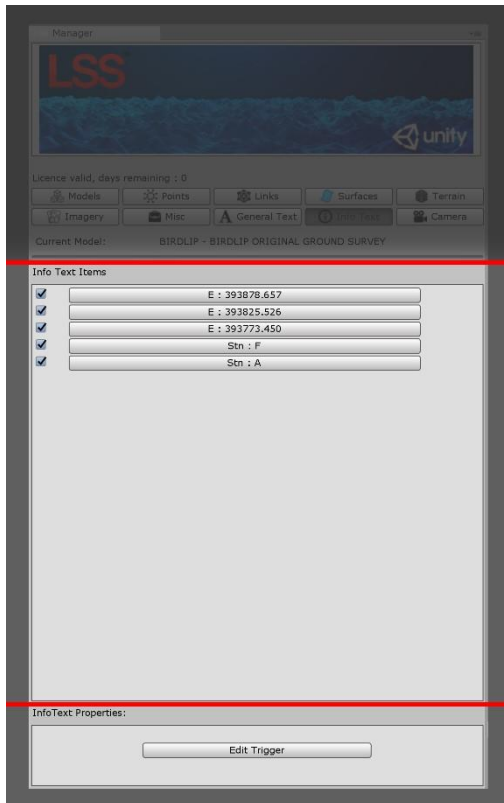

Figure 41: Info Text Properties

In the following image we will take a closer look at the Info Text panel:

Within the Info Text panel, we have the "Info Text Items" list which offers a list of descriptive buttons (if your survey contains Info Text) about each information box in the scene. Once clicked the properties window will appear showing more details that you can manipulate with its information box.

This part of the panel gives the user access to the information boxes collision detection.
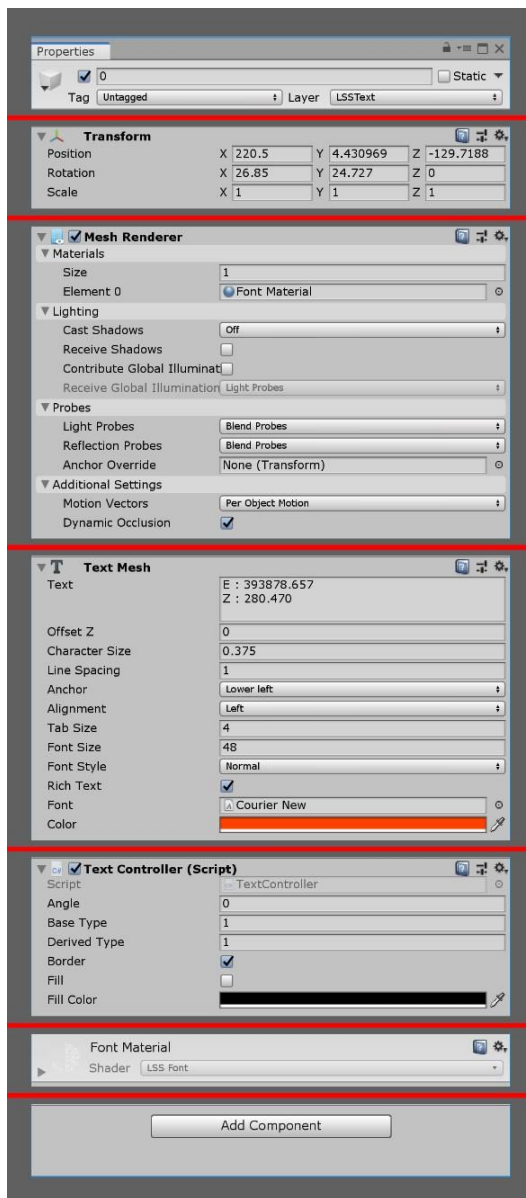
Figure 42: Info Text Panel

Info Text Items

Similar to the "General Text" properties, when an "Info Text item" is selected from its list you will be presented with its "Properties" window which will give you a series of options to alter the text and its surrounding border. A combination of different info text items are highlighted in the following image:

Figure 43: Different "Info Text" in a scene.

Following into the "Properties" window I have split its components up to explain each one:

Object Name: The number of the info box item selected, for example "0".

Transform: Location of the info box item in the project scene.

Mesh Renderer: This component handles the properties of the material of the font. Likely this will not be required unless you are familiar with Unity.

Text Mesh: Holds the output values for the text including its alignment, size, font and colour. For more information about Text Mesh: https://docs.unity3d.com/Manual/class-TextMesh.html

Text Controller: Options to the border for the text are found here; "Border" giving an outline to your text, "Fill" to apply a background colour, "Fill Color" to alter the background colour.

Font Material: These settings are automatically set for you similar to the "Mesh Renderer" and likely not required to be altered.

Figure 44: Info Text Panel Properties

Info Text Properties

At the bottom of the "Info Text" panel is the "Info Text Properties" with the an "Edit Trigger" button. This button will bring up a "Properties" window which will give you options in altering the size of its collider box. The collider box is used so that when we navigate around our model in the "Game" window these Info Text will appear depending on how close we are to them. The bigger the collider the more likely you will see the Info Text.

To alter the Info Text colliders, do the following:

1. Within the Info Text panel selected, click the info text button from the list that you want collider you want to manipulate.
2. Click the "Edit Trigger" button at the bottom of the LSS Manager, this will update the "Properties" window as shown in the following image:
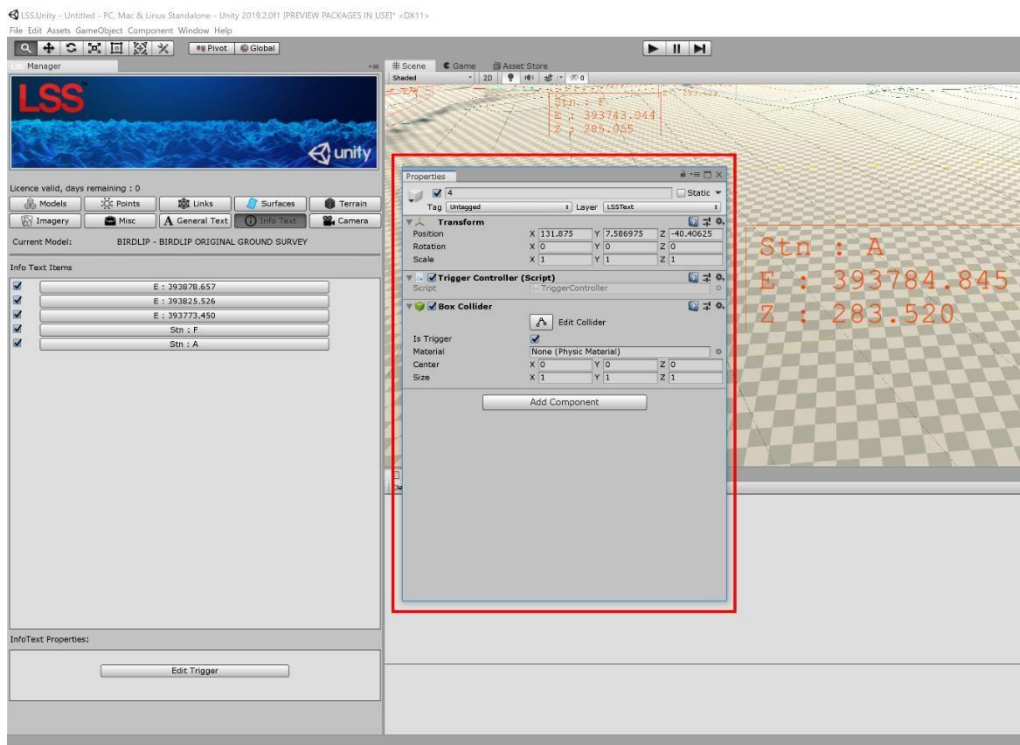
Figure 45: Info Text Controller

3. Hover the mouse in the "Scene" window and press "F" on the keyboard, this will zoom us to the collider we want to manipulate.

4. Now alter the "Size" in the "Box Collider" component in its X, Y, Z position. In the following image I have changed mine to X: 20, Y: 20, Z: 20 which has given a large Info Text box detection.
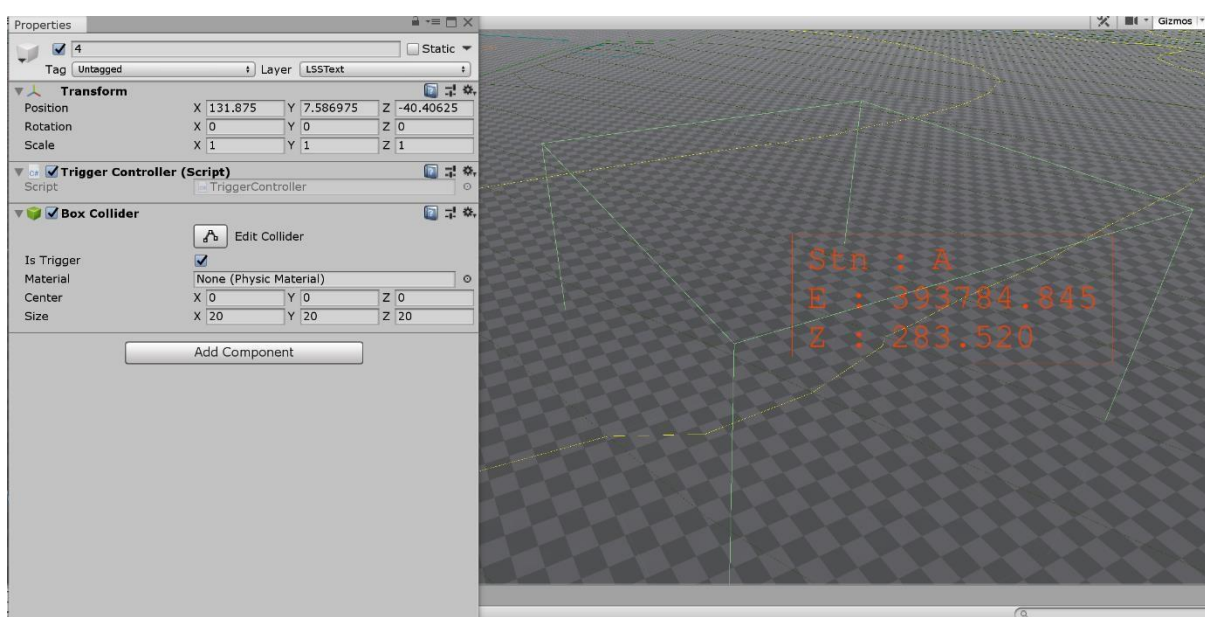

Figure 46: Setting Box Collider Size

Terrain Painting

Once you have imported your survey model into the Unity Editor; it is ideal to set any 3D models into your point and link code models before you begin to paint.

Prepare to Paint

If your survey model contains large surface codes they may clash with your terrain, the following image shows a survey model that contains terrain and surface codes sitting on top of each other.
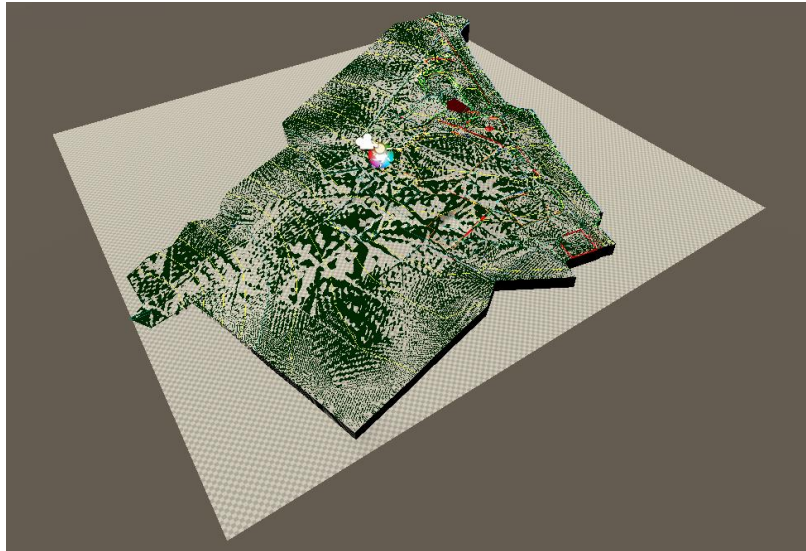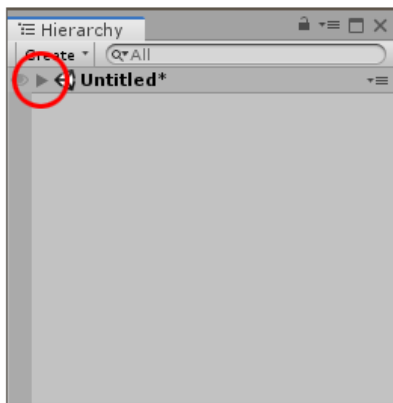

Figure 47: Surface Code clashing with Terrain

To solve this, we can hide the surface code from our Unity Editor "Hierarchy" window:
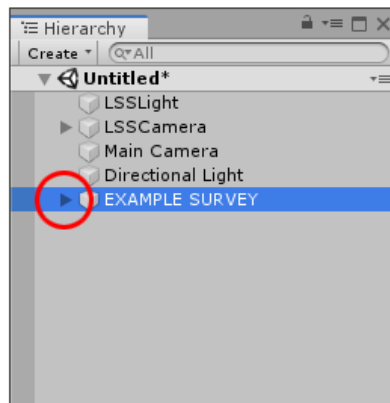
Press CTRL + 4 on your keyboard to bring up the Hierarchy window.

1. Click the arrow to left of the title of your scene to expand what the scene holds, as shown in the following image.
2. Next, in your Hierarchy expand your survey.
3. Finally, locate your "Surface Codes" and click in the grey bar on the left to hide it.
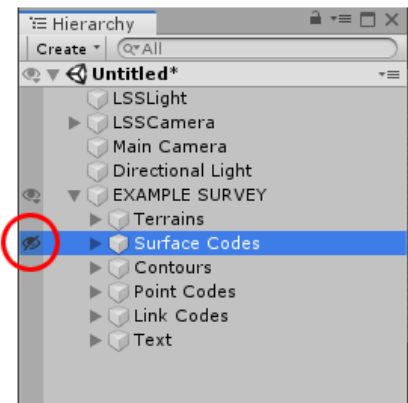

Figure 48: Hiding Surface Codes

Your survey model will now have no clashing with the surface model, you can now close the Hierarchy window if you so wish. Following image shows what the survey model now looks like:
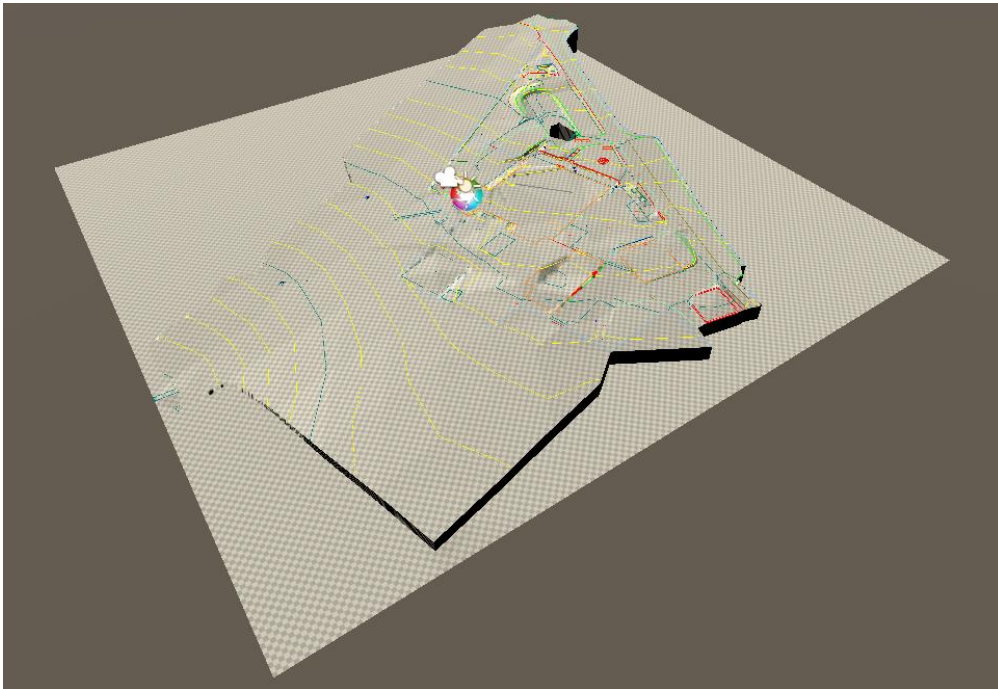

Figure 49: Hidden Surface Codes

Loading Unity's Terrain Panel

To load up Unity's Terrain Panel we need access to the Unity Editor "Inspector" window, to do this press CTRL + 3 on your keyboard.

It is likely you will be painting your survey model for a good period of time, so at this point it is recommended to dock the "Inspector" window to the right-hand side of the window.

To dock your "Inspector" window follow these steps:

1. Highlight the "Inspector" tab with your cursor.
2. Click and hold the left mouse button and move your cursor to the right of the screen. Until you see the outline where your "Inspector" will dock.
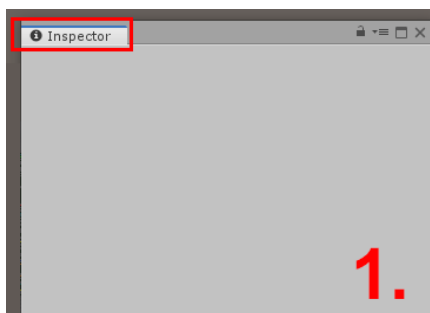

Figure 50: Click and drag the "Inspector" window by its tab

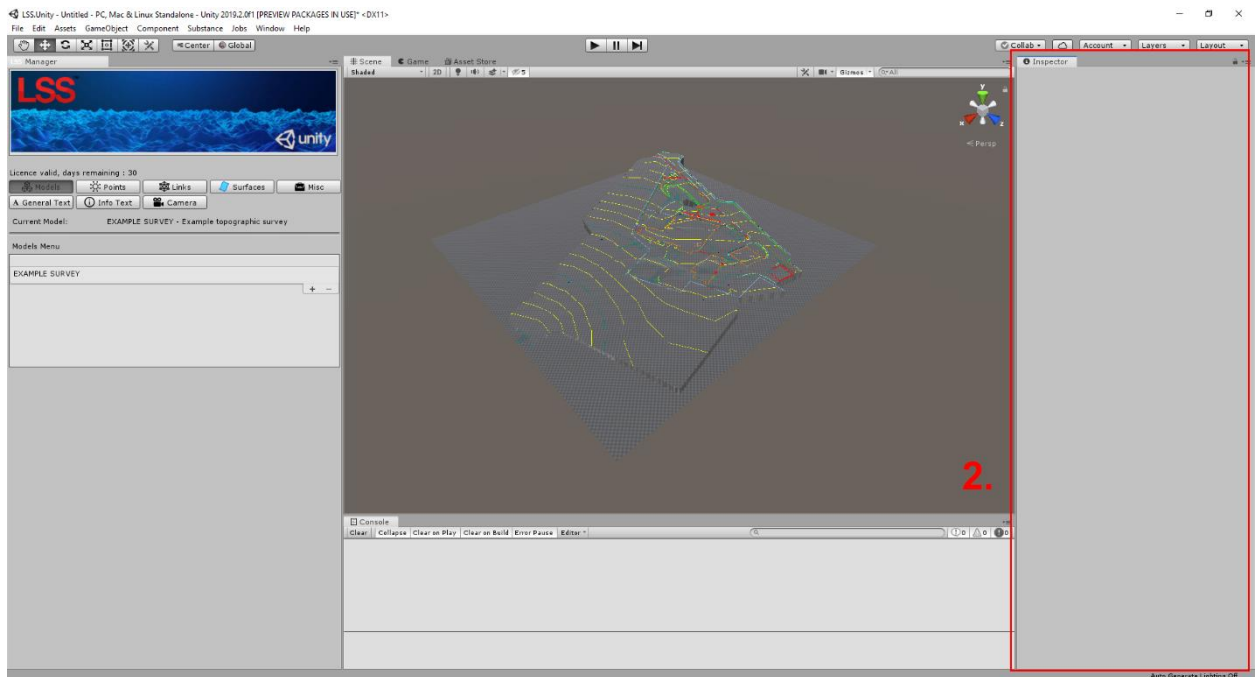This following image shows the location of where the "Inspector" window is docked in the Unity Editor.

Figure 51: Inspector docked

Before we start painting we need a texture to paint with, lets now go through the two possible ways of obtaining textures.

Importing Textures

There are two main ways off adding textures to your project; you can drag and drop files into your project folder or use Unity's Asset Store and import a package similar to what you did with installing LSS.

Importing Textures via the Asset Store

To access the Asset Store either click on the "Asset Store" tab at the top of the window from where the Asset Store will load.

1. When the "Asset Store" loads up be sure you are signed in with the same details as your Unity License. Following image shows the sign in button:
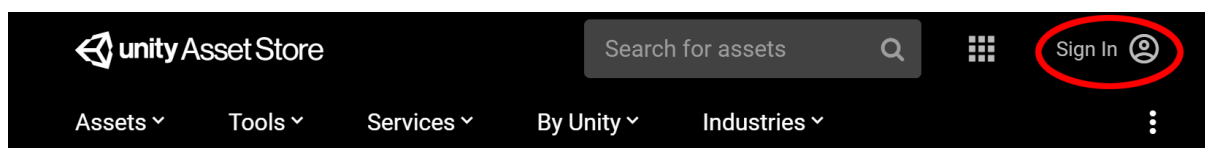

Figure 52: Sign-in to the asset store

2. Once signed in at the top of the Asset Store window you will have "Search for assets", type in something like "Terrain Textures" (you can also adjust the pricing range on the right of the store) as shown in the following image:
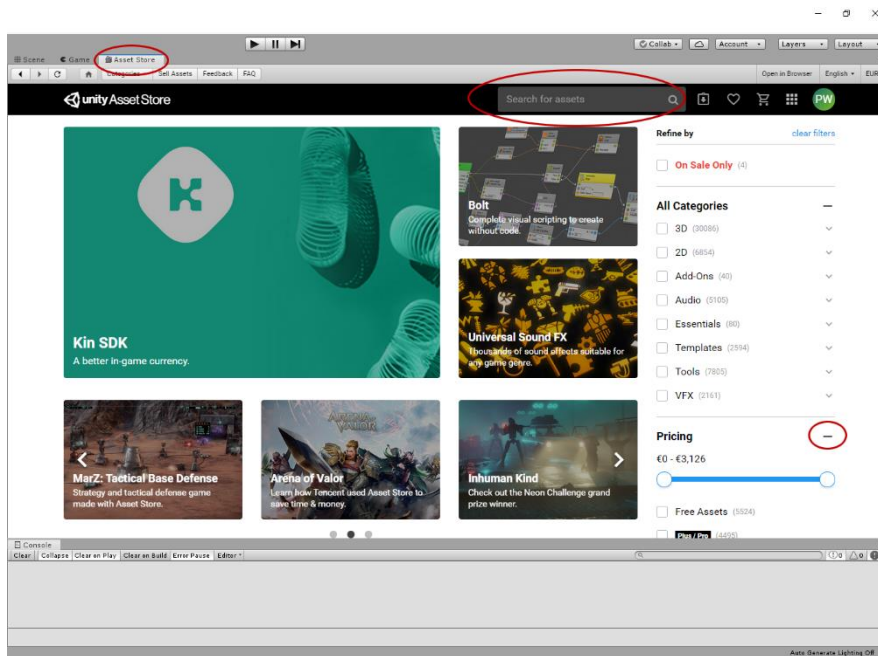

Figure 53: Search for assets in the asset store

3. A selection of textures is given to you, I'm going to select the first option (because its free) as shown in the following image:
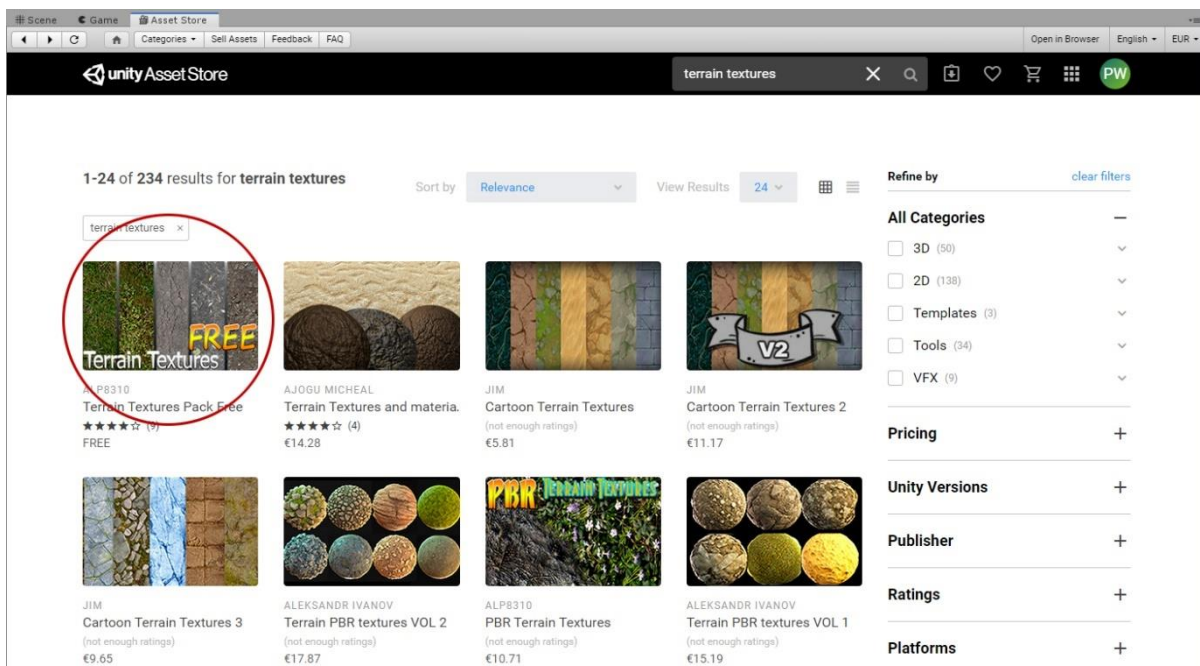

Figure 54: Finding and selecting a texture pack

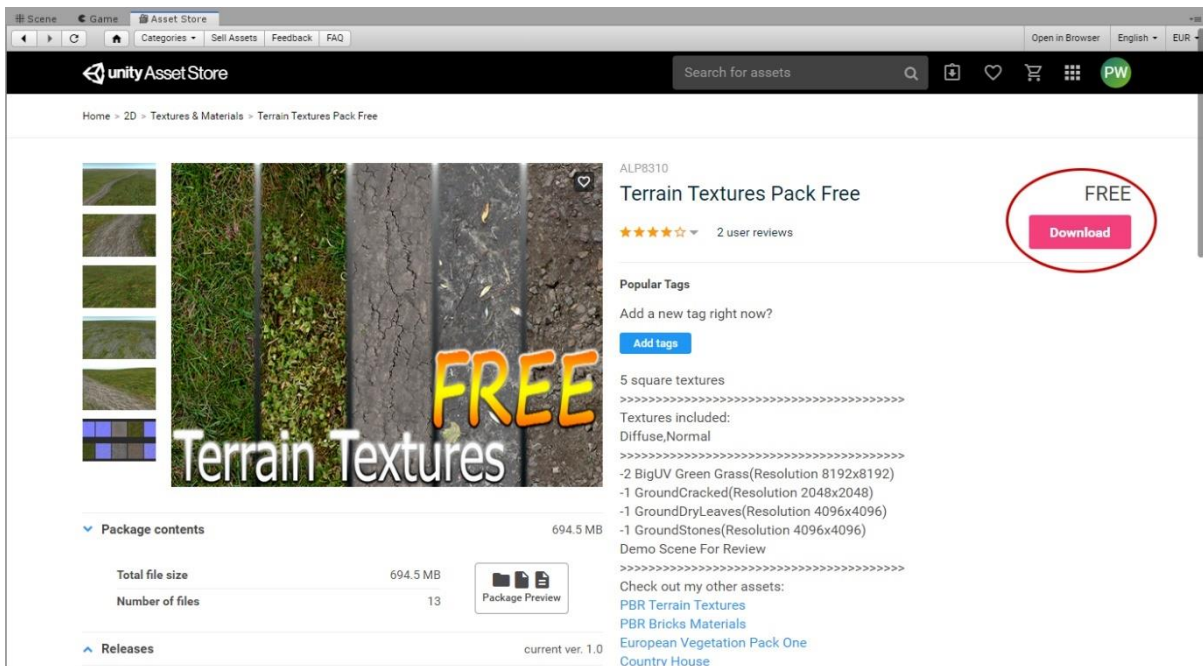4. Click the "Download" button as shown in the following image:

Figure 55: Downloading the free asset

5. Once downloaded, the same button will change to "Import", click it.
6. A list will appear of ticked assets you are going to import into your project.
7. Click the "Import" button in the bottom right of this window.
8. To go back to your scene, click the "Scene" tab at the top or use the shortcut "CTRL+1".

Adding Projects to your Project Folder Manually

The alternative way of getting seamless textures into your project is by downloading them from sites like www.textures.com who offer a large range of free seamless textures including other maps like "Normal maps" which support your diffuse/albedo textures to give the illusion of depth without affecting the terrains geometry. More about normal maps can be found here further on under the heading "Terrain Layer Painting – Normal Maps".

If you have downloaded maps other than the asset store to move your maps into your project we first need access to Windows Explorer.

1. At the top of the Unity Editor click "Assets".
2. Followed by "Show in Explorer".
3. A windows explorer window will appear.
4. Create a folder, give a name like "Textures" within your "Assets" folder.
5. Copy and paste your textures into the new folder.
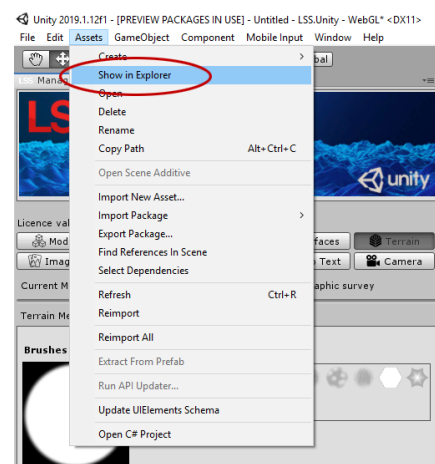6. The files will now be in your Unity project.

Supported Terrain Layer File Formats

Unity supports a variety of file formats to be added to your Terrain Layer.

A list of file formats can be found in the official Unity docs in the link below:

https://docs.unity3d.com/Manual/ImportingTextures.html

Select a Texture and Start Painting onto our Terrain

In this section we will select a texture and paint onto our survey model terrain. To confirm our current setup, we have achieved the following:

- Imported a survey model.
- Have at least one texture in your project.
- Hidden "Surface Codes" that overshadow your terrain.
- Docked the "Inspector" window in the Unity Editor.

We now need to choose where we want to paint by selecting the terrain in the "Scene" window as shown in the following image:
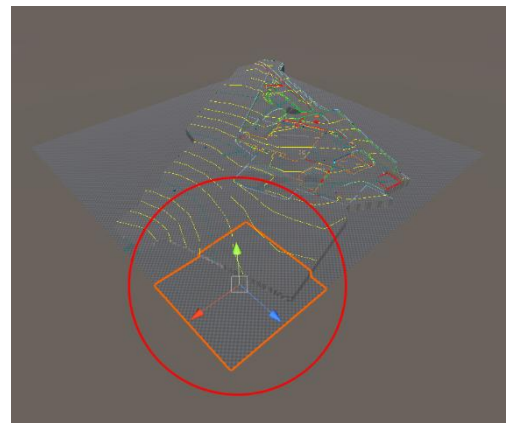

Figure 57: Select a piece of terrain

With your terrain selected our "Inspector" window has come alive and is filled with options for our terrain. To paint we need to select the brush in the Terrain panel as shown in the following image:
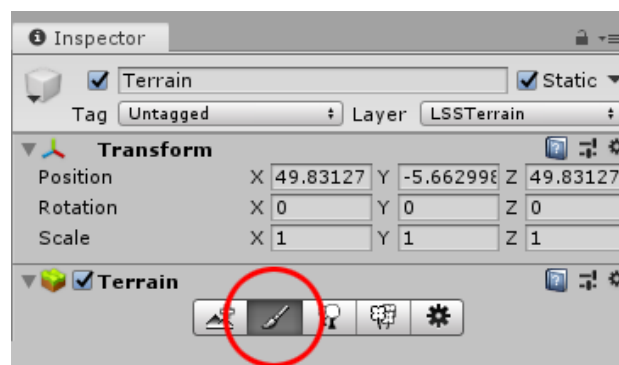

Figure 58: Select the terrain brush to paint

We now need to apply anyone of the textures from our project that we would have downloaded from the Unity Asset store or copied our own files earlier.
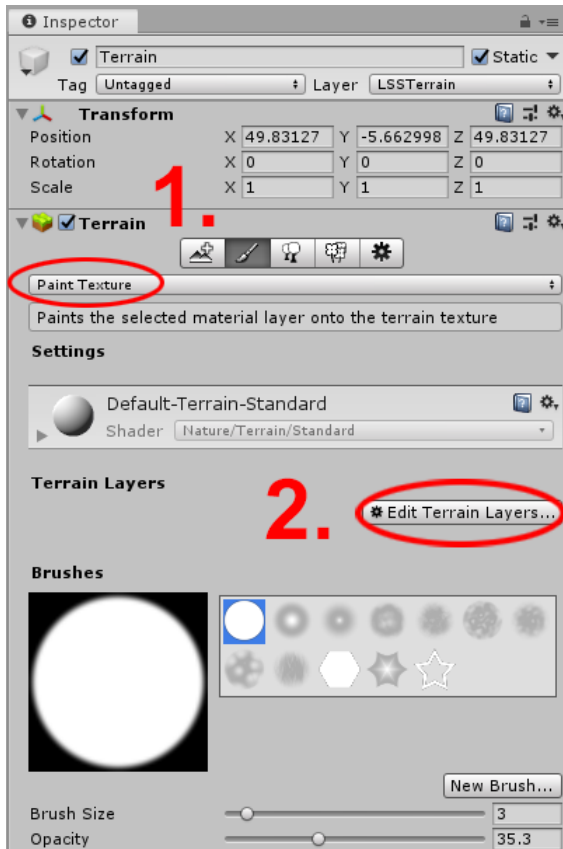
To create a terrain layer, do the following:

Figure 59: Terrain Panel

1.   Make sure just below the paint brush icon we just clicked we have "Paint Texture" selected from the drop-down tab.

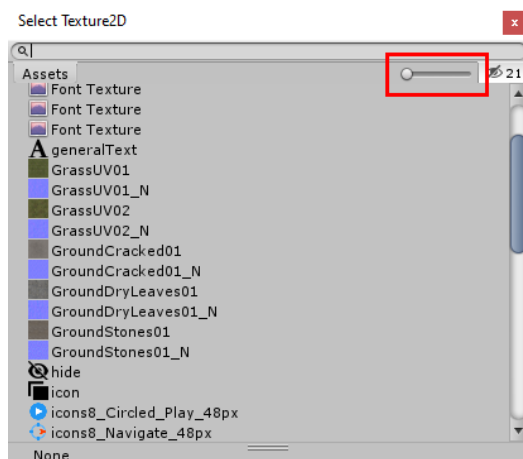2.   Select "Edit Terrain Layers…", a drop down will appear, select "Create Layer…".

Figure 60: Texture selection

As soon as you've clicked "Create Layer…" a window will appear with a list of your available textures for the project. To increase the thumbnail of each file, click the circle in the top right corner and move it to the right.

Once you know which file you want to paint with double click the file. The window will disappear and our "Inspector" window will be updated with the texture you've selected.

The following image shows the grass texture I selected from the list is now in the "Terrain Layers" section.
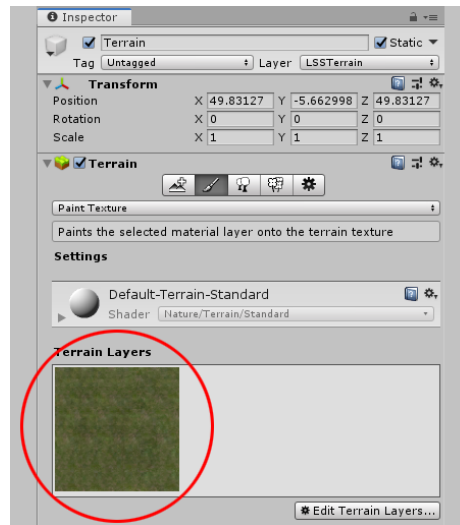

Figure 61: Select Terrain Layer to paint

Select the grass by clicking on it and move your cursor over the selected terrain, hold the mouse button down and begin to paint.
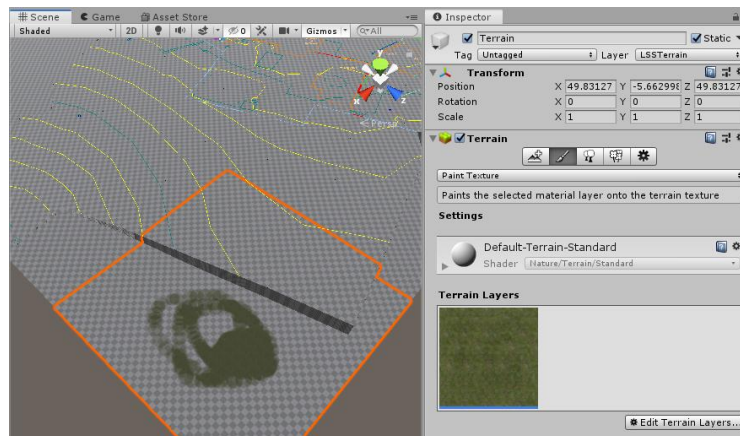

Figure 62: Painting our survey model

If you would like to view your terrain without the scene light and use the Unity default light click the lightbulb at the top of the Unity Editor window. This will not affect any object properties in your scene.
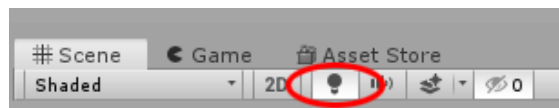

Figure 63: Scene lighting

In the next section we will go into further detail with the Terrain Painting properties.
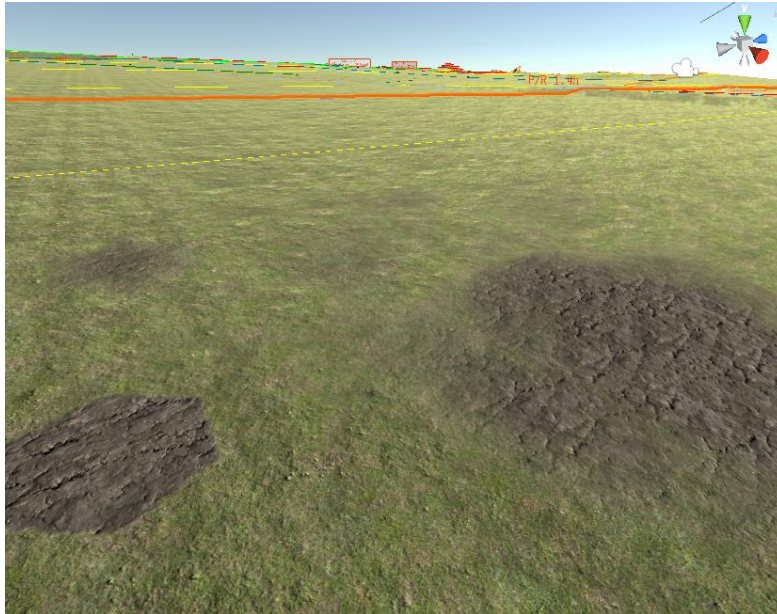
Figure 64: Survey model with two terrain layers, different brush types, normal maps, opacity and size

Going Further with the Terrain Panel

In this section we are going to look at adding multiple terrain layers, brushes and normal maps. It is likely you will be using more than one terrain layer to paint and blend into your survey model, you may also want to add extra details to your terrain texture. So, let's start by adding another terrain layer to our current scene.
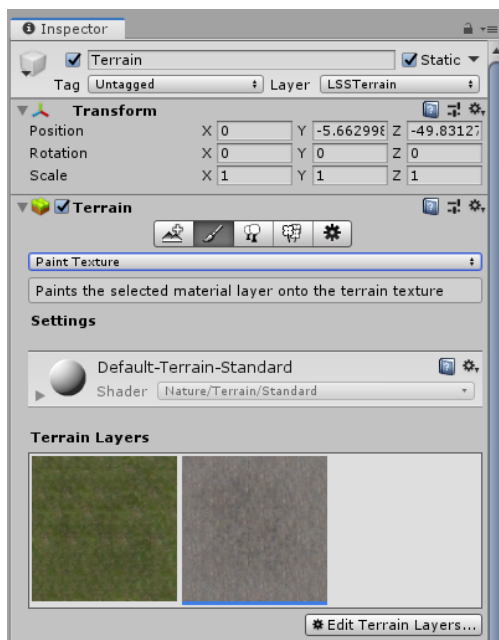

Figure 65: Adding another terrain layer

To add another terrain layer, follow the same steps from the previous section ("Select a Texture and Start Painting onto our Terrain")

Select the newly added terrain layer and begin to paint on your terrain.

Lets now look at our brushes and see what else we can do with our survey model.

Brushes

The brushes panel is only used for terrain painting within the Unity Editor.

To access your terrain brush controls, do the following:

1. Select a terrain in your "Scene" window.
2. Select the "Paint Terrain" button.
3. Make sure the drop down below the "Paint Terrain" button is set to "Paint Texture".
4. Scroll down until you see your "Brushes" panel.

If you need more details about navigating to this check the section "Select a Texture and Start Painting onto our Terrain".

The brushes panel is where we store and add our types of brushes, size and opacity; The brush size and opacity can be changed with either slider. We recommend you use the shortcut keys to keep your work flow more focused.

Brushes Shortcut Keys:

"**[**" or "**]**" - Increase/decrease brush size.

"**-**" or "**+**" - increase/decrease brush opacity.

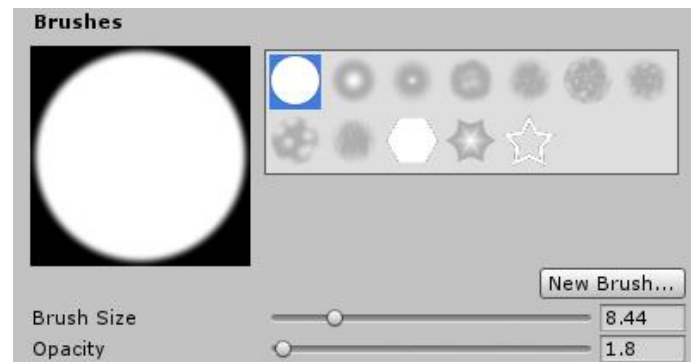"**<**" or "**>**" - ascend/descend brush selection.

Figure 66: Brush Panel

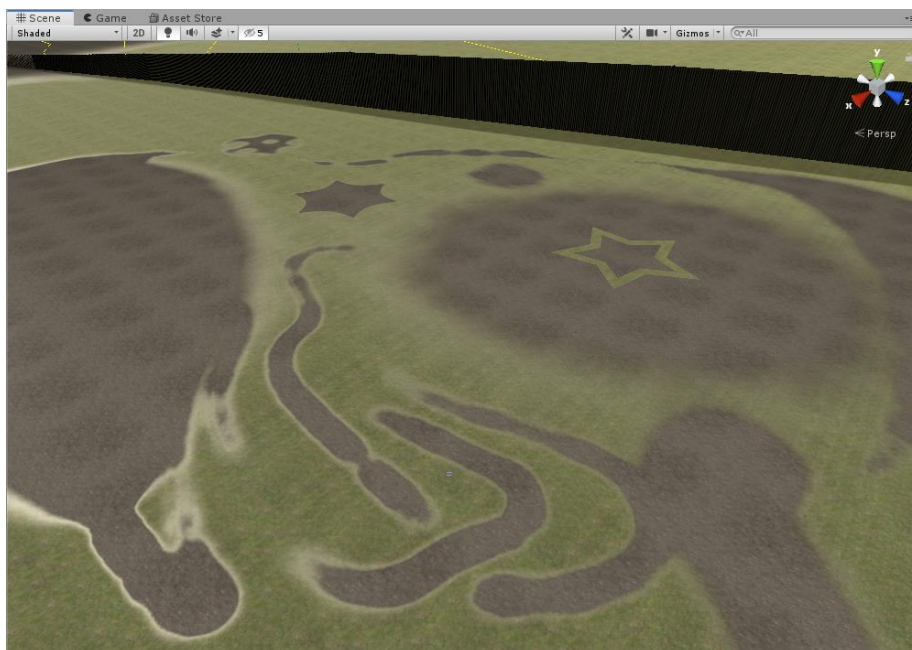The following image shows painting with altering brush sizes, opacity and changing the brush type:

Figure 67: Brush size, opacity and type

In the next section of terrain painting we are going to cover adding normal maps to our terrain layers to give more detail. The following image shows the same diffuse texture but one with and without a normal map.
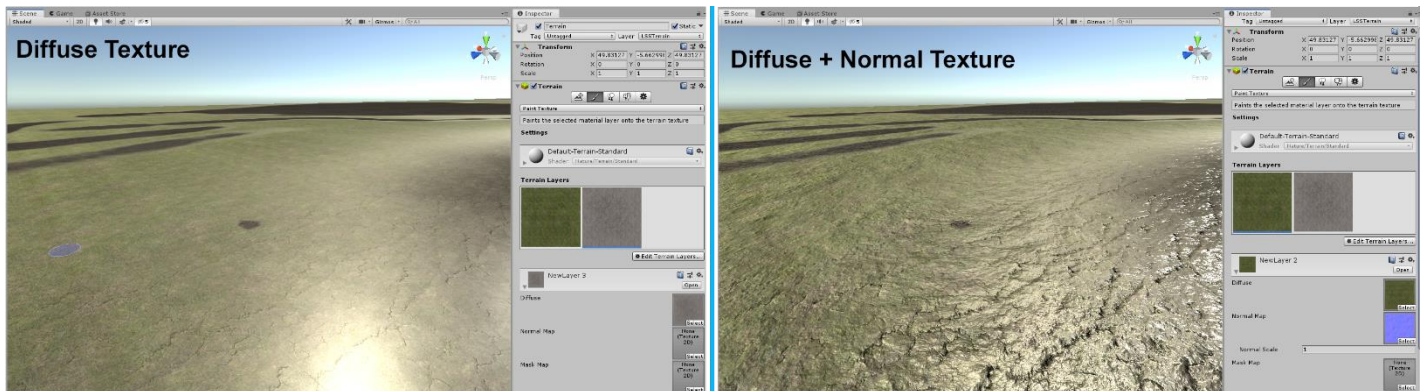

Figure 68: Diffuse vs Diffuse + Normal map

Terrain Layer Painting – Normal Maps

Normal maps are an effective way of creating more detail and depth onto a texture. This is also possible with terrain painting. The following image shows a 3D stone wall both with the same texture diffuse maps applied but different normal map strengths added. We can achieve such effects with our terrain painting.
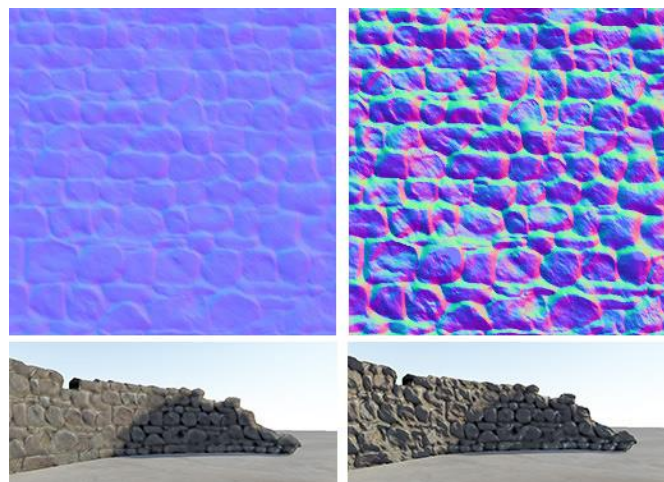

Figure 69: Different strength normal maps

If you want to add a normal map to your terrain layer the normal map must be related to the diffuse or it will add depth and creases in unrelated places. As mentioned www.textures.com will typically hold "Flat Maps" that will offer free seamless (repeats in a pattern for painting) textures.

The image below is a screen shot of their website with an albedo (similar to diffuse but with no shadow details) texture on the left and a normal map for it on the right (https://www.textures.com/download/pbr0426/137222?q=grass).
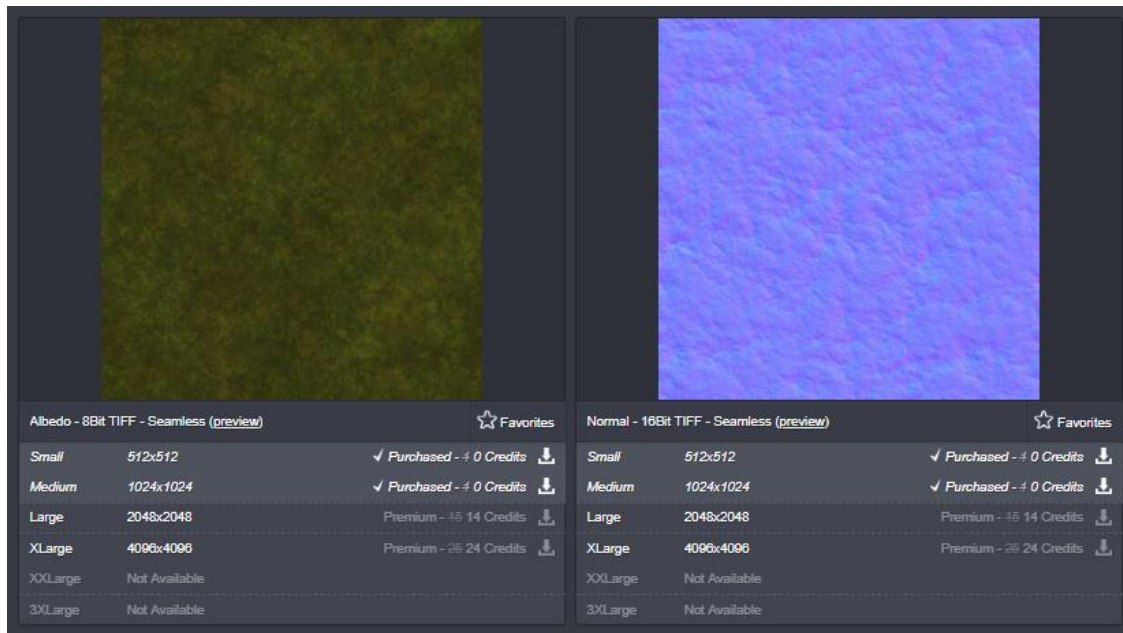

Figure 70: Diffuse/Albedo map on the left, it's Normal map on the right

If you download their textures be sure Unity recognises them as normal maps. I will explain how to do this next.

Applying Normal Maps Correctly to your Terrain Layer

A normal map is typically applied to an already made Terrain Layer that is ideally in your "Terrain Layers" selection grid in the "Inspector" window as shown in the following image:
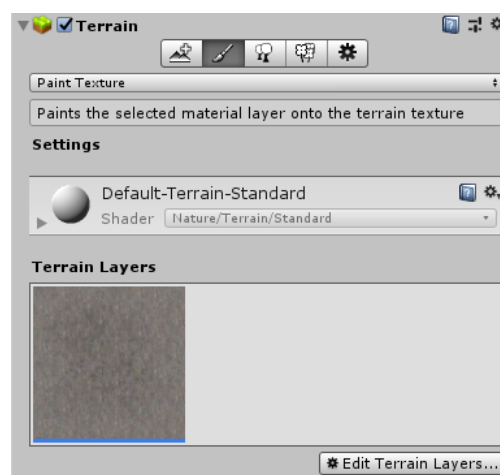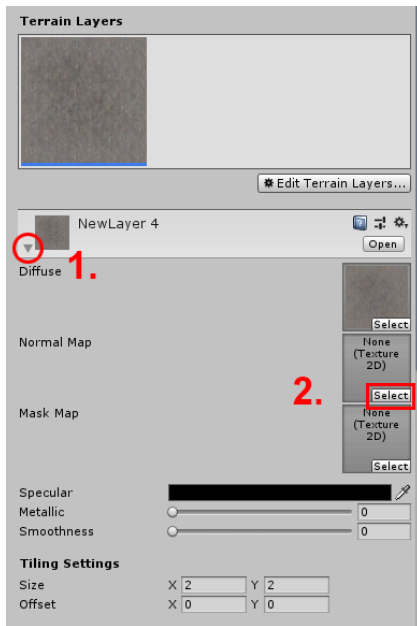

Figure 1 71: Terrain Layer selected

As this is our only terrain layer in the selection grid it is automatically selected, as you can tell with the blue bar below its picture. Because this terrain layer is selected we also now have access to its "Map" properties as shown in the following image:
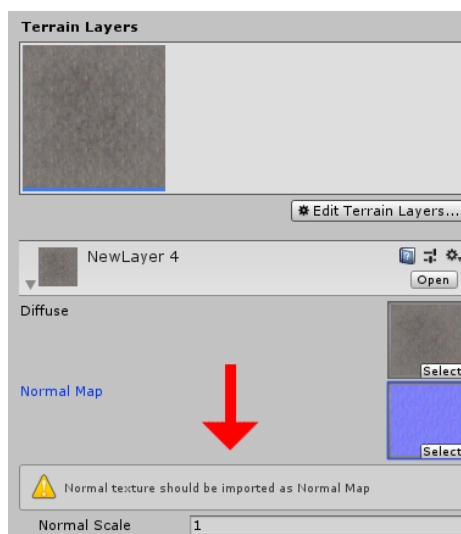
If you have selected the terrain layer and can't see the map thumbnails as in the image shown. Click the dropdown arrow, highlighted with a red circle (1.).

Next, to add our "Normal Map" to the current terrain layer, click the "Select" button which is located under the "Normal Map" thumbnail (2.).

A list of your available textures will appear, select the normal map that is created for the diffuse texture. Typically, the name of the normal map file will be similar to the diffuse and the thumbnail will be look purple.

Figure 72: Selecting a normal map

The image shows that our terrain layer has been updated with a "Normal Map". If you have already painted with this terrain layer you may notice there is more detail to the texture, especially if the light catches it.

If you have a warning sign stating "Normal texture should be imported as Normal Map" this means Unity is struggling to recognise the file. To fix this do the following (only follow these steps if you do have a warning sign, if you don't ignore the following steps):

Figure 73: Normal Map Warning

1. Press Ctrl + 5 on your keyboard to bring up the "Project" window.
2. Click the normal map icon in the "Maps" section. This will *ping* (highlight yellow) the location of where your normal map is in your "Project" window.
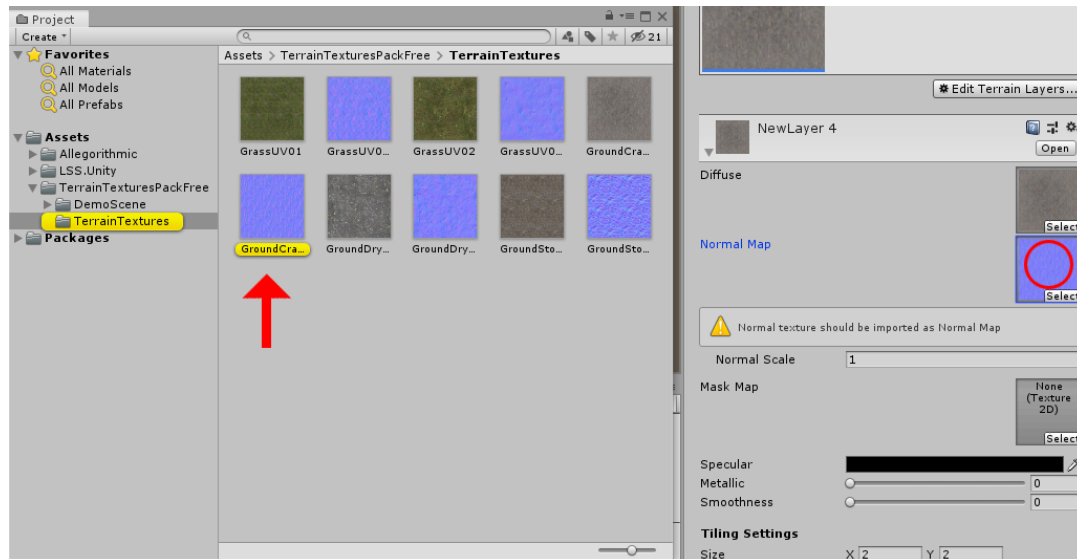

Figure 73: Finding the Normal in the Project window

3. Click the normal map that Unity located in the "Project" window.
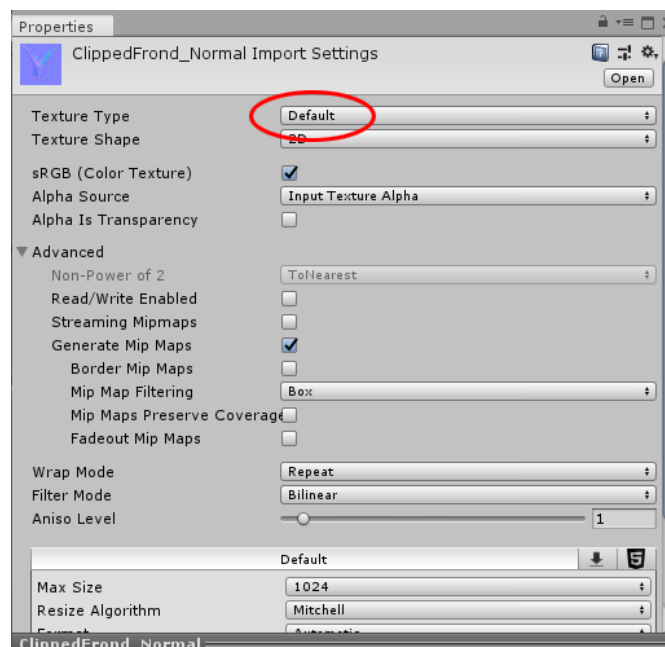4. This will change the "Properties" window to the normal map's properties.

Figure 74: Changing Texture Type

5. Click and change the "Default" (or whatever it's currently on) value to "Normal Map".
6. Scroll down to the bottom on the window and click the "Apply" button.
7. You can now close the "Project" window.

8. Your normal map will now be behaving properly. To double check you can check the warning message has gone. If the warning sign is still in the "Terrain Layers" panel, click select and choose the normal map again from the list as we did at the start of this section.

Normal Scale

Back in your Terrain Layer we have the "Normal Scale" which as you can imagine changes the strength of the normal map. Below is an example of a mud diffuse map with a cliff normal map applied.
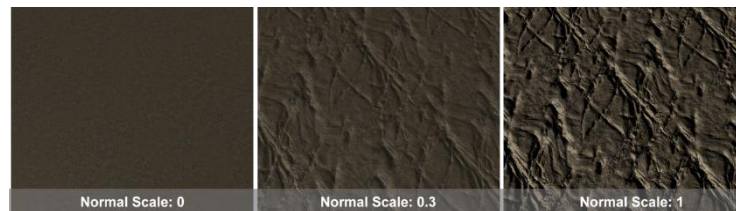

Figure 75: Normal Map Scale in Terrain Panel

Figure 76: Changing the normal map scale

The Normal Scale can also go into negative numbers which will invert dents, cuts etc…As previously mentioned this doesn't physically alter the terrain, only creates the illusion of marks in the diffuse texture.

Camera

The Camera panel introduces you to alternative views, sensitivity settings and animation. The following images shows where the "Camera" button is located.
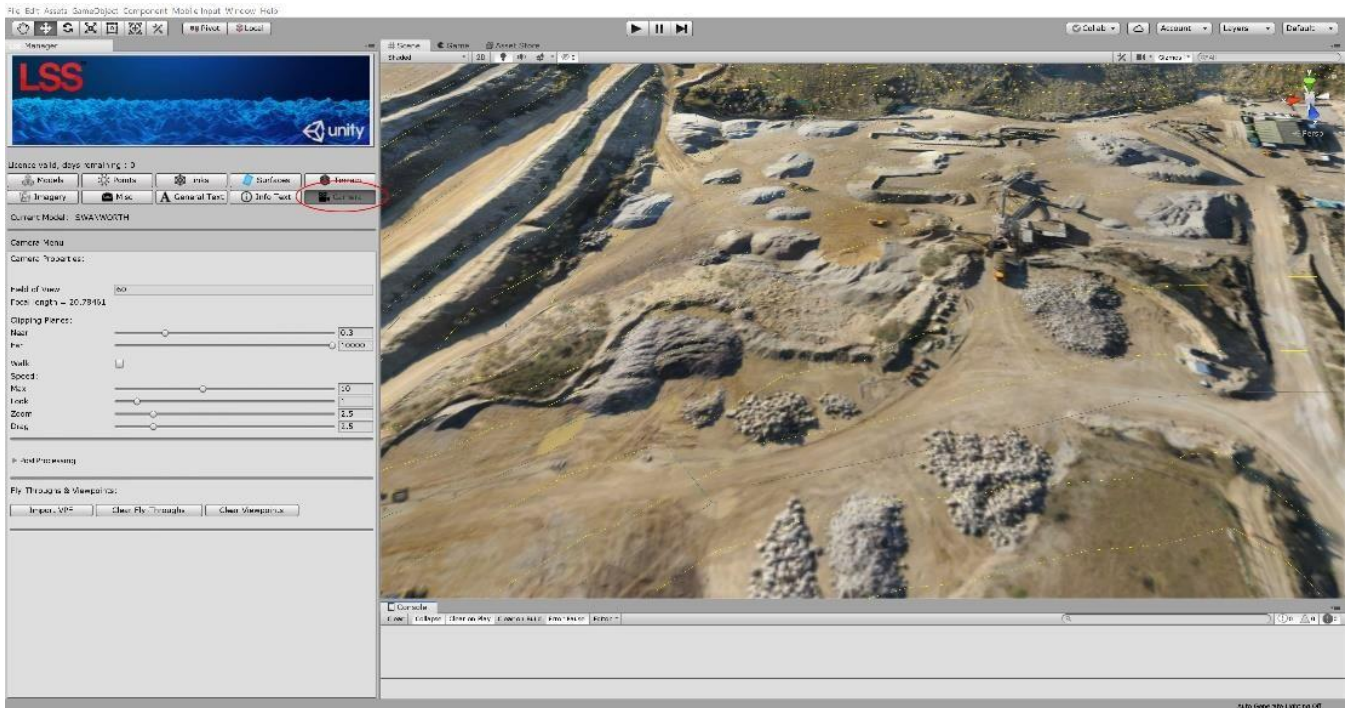

Figure 78: Camera Panel selected.

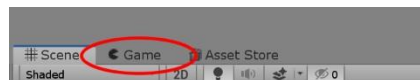Within the Camera Panel you given options to the properties of the camera that you control in the "Game" window.

Figure 79: "Game" tab.

As a recap the "Game" window can be found at the top of the editor. You can also click and drag the "Game" tab into the sides or against other windows to snap into place.
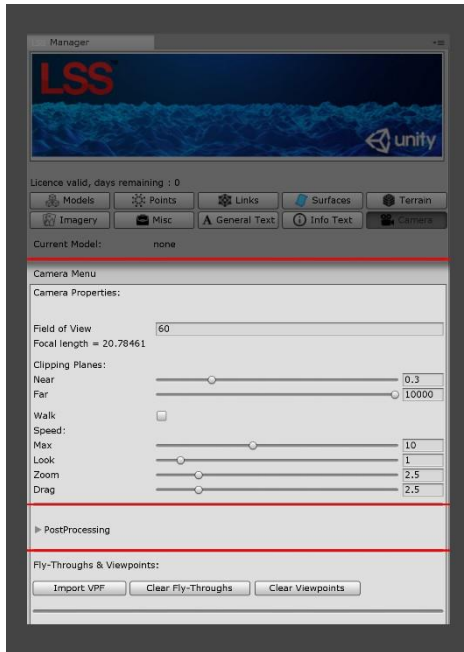
Figure 80: Camera Panel.

Camera Properties:

Field of View: The width of the Camera's view angle, measured in degrees along the local Y axis.

Focal length: Distance in millimetres between the camera sensor and the camera lens.

Clipping Planes: Distances from the camera to start and stop rendering.

Near: The closest point relative to the camera that drawing will occur.

Far: The furthest point relative to the camera that drawing will occur.

Walk: Choose between camera modes flying or walking.

Speed

The following settings alter the speed/sensitivity to your camera.

Max: Set maximum speed level.

Look: Sensitivity in looking around.

Zoom: Sets sensitivity in moving forwards and backwards quickly.

Drag: Alters the sensitivity when click and holding the middle mouse button.

PostProcessing

Post-processing applies full-screen filters and effects to a camera's image buffer before the image appears on screen. It can drastically improve the visuals of your application with little set-up time. The following image shows the post processing panel highlighted with a red border, (click on the "PostProcessing" name to expand it) and our scene view showing some post processing effects applied:
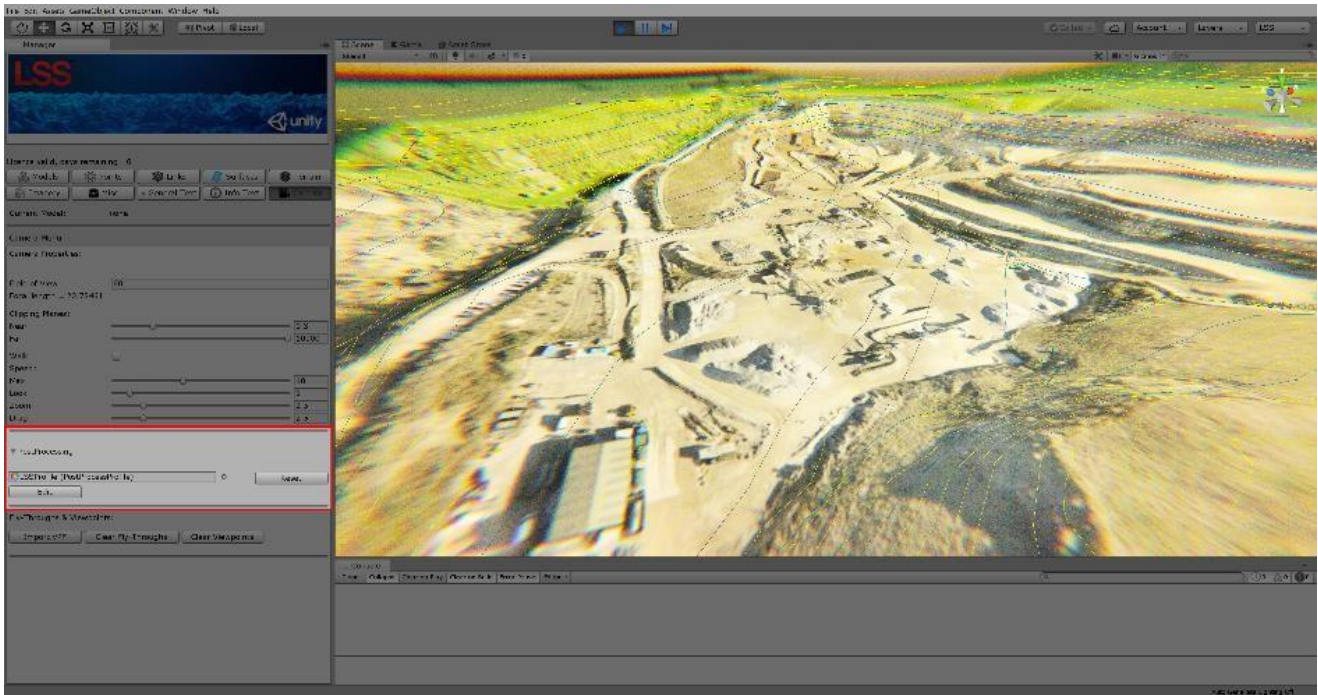

Figure 81: Post Processing section within the Camera Panel.

Looking closer at the post processing panel we have two buttons:

"Edit" – This will give us access to each individual property to our post processing settings.
"Reset" – Will reset the post processing settings back to default.

All effects are fully displayed in the "Game" window, let's check what these effects can briefly do:
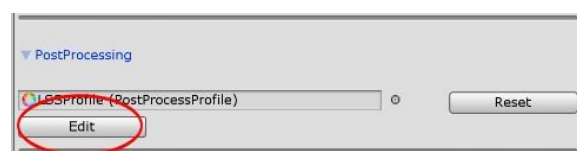
Click the "Edit" button.

Figure 82: Change Post Processing settings.

Another window will appear giving a list of effects:

Figure 83: Post Processing options

Clicking on either arrow will show the properties of each effect, to find out more about post processing and its effects check out the following link:

https://docs.unity3d.com/Manual/PostProcessingOverview.html

Alternatively, you could experiment with the settings:

1. Open either effect drop down (clicking on the arrow next to the name).
2. Click the word "All", this will tick all boxes in this property. As shown in the following image.
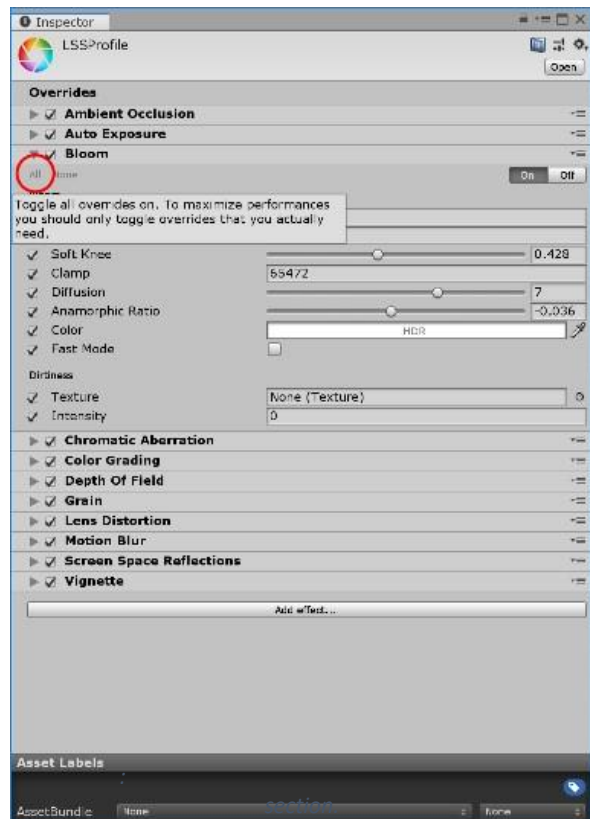3. Experiment with each setting keeping an eye on the "Game" window.

Figure 84   Expanding Properties on each Post Processing

All settings within each effect have tooltips, so you can hover your mouse over the settings for more details. Remember you can click the "Reset" button back on the Post Processing panel at any point to go back to the post processing's default settings.

Fly-Throughs & Viewpoints

In this section we will be going through the process of importing our VPF ("Virtual Position File") in order to view sections of our survey model and/or to fly through with our stored animation coordinates in our "Game" window.

At the bottom of the Camera panel we have our "Fly Thoughs & Viewpoints" section as shown in the following image:
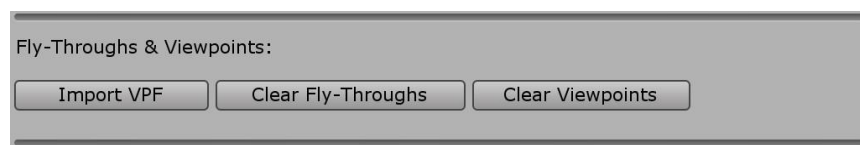

Figure 85: Camera Options

Import VPF

There are two different types of VPF's that can be imported into our scene, we will go through the process of importing a fly-through and viewpoints:

VPF Viewpoints:

If you have a viewpoint VPF you would like to import to view the different points of your survey do the following:

1. Click the "Import VPF" button at the near bottom of the Camera panel.
2. Window Explorer will appear, navigate and select your VPF file, an example is shown in the following image:
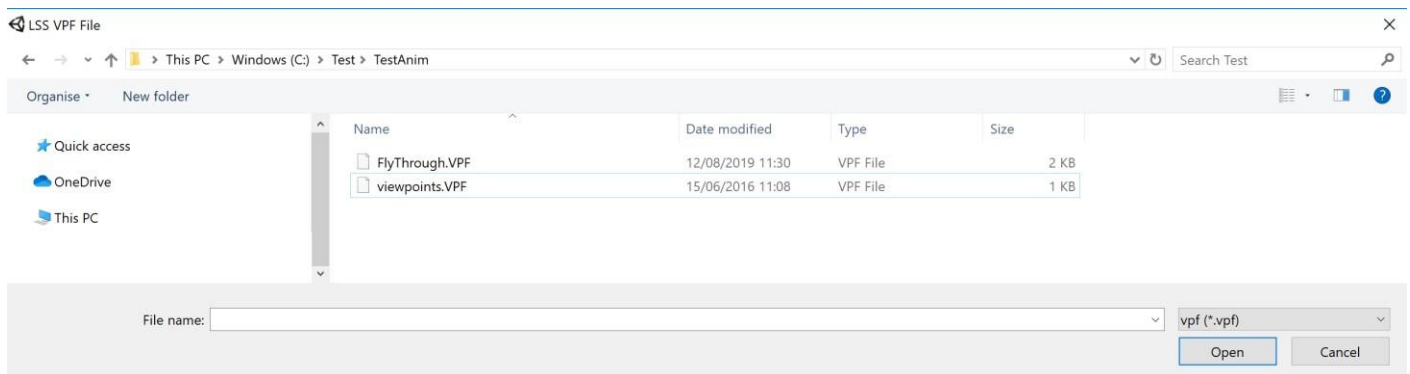

Figure 86: "LSS VPF File" window explorer

3. Click the "Open" button.
4. Back in the Unity Editor select the "Game" tab if you haven't already.
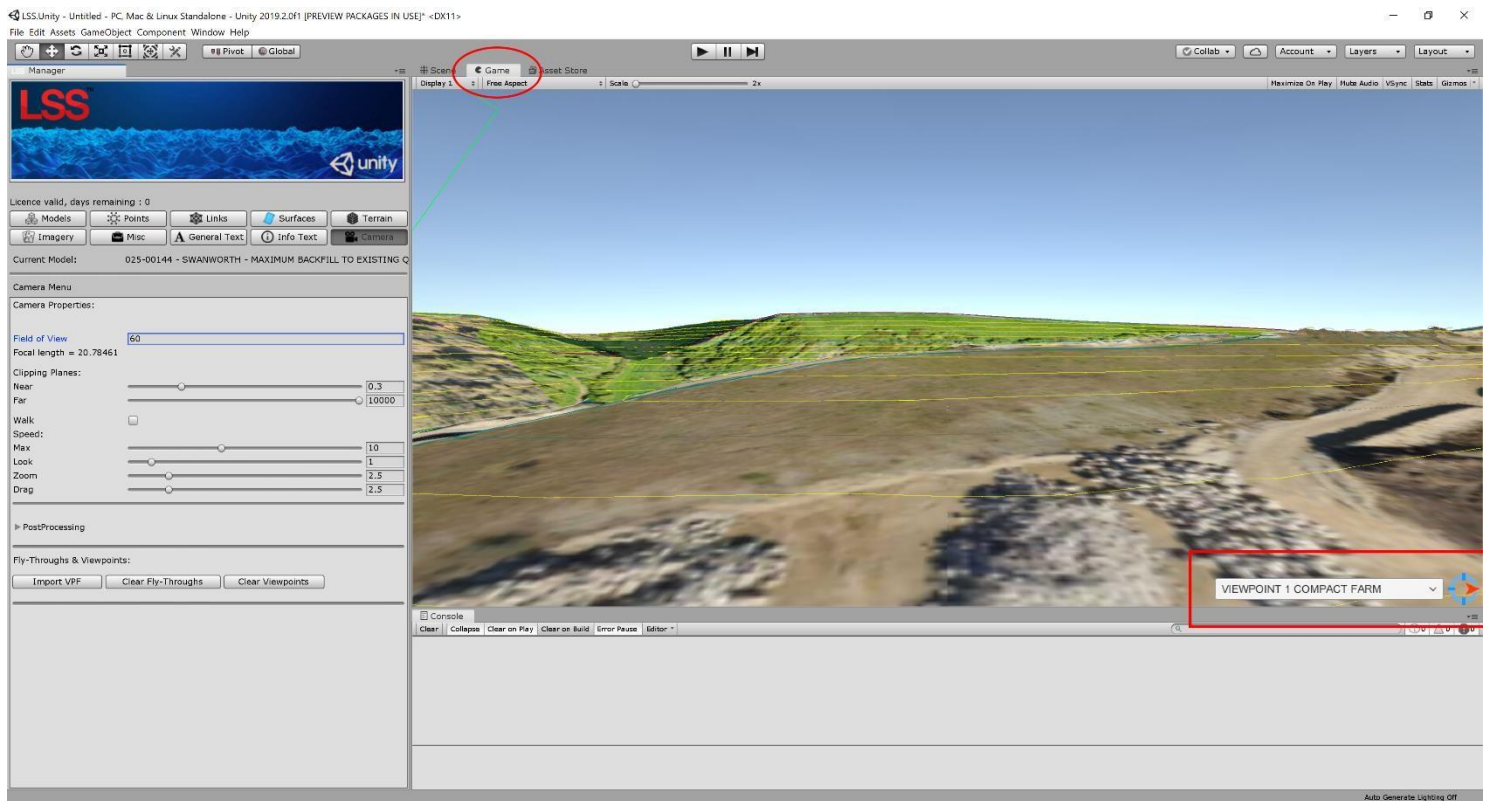5. We can now see some new interface controls on the screen as shown in the following image:

Figure 87: "Game" tab selected & Viewpoint interface circled in the bottom right.

6. To make use of the viewpoints click the "Play" button in the top middle of the Unity Editor.

7. If Unity takes you back to the "Scene" window click on the "Game" tab again.

8. Now you can click the viewpoint name of the "Game" windows interface in the bottom right as shown in the previous image, make your selection from the drop down.

9. Then click the circular/arrow button to the right to take you to that particular location.

VPF Fly-Throughs:

To import your fly through animation for your survey model follow these instructions:

1. Click the "Import VPF" button at the near bottom of the Camera panel.

2. Window Explorer will appear, navigate and select your VPF file, an example is shown in the following image:
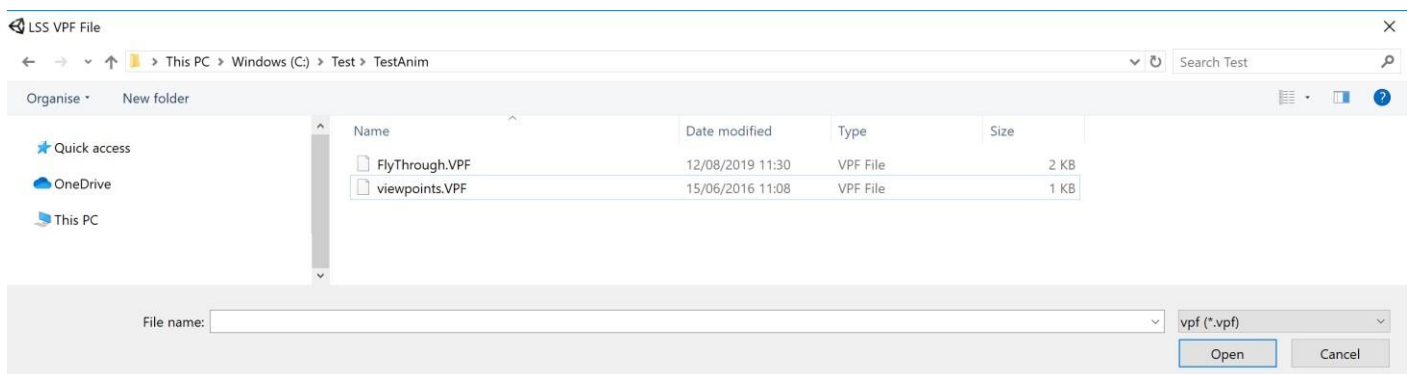

Figure 88: "LSS VPF File" window explorer

3. Click the "Open" button.
4. Back in the Unity Editor select the "Game" tab if you haven't already.
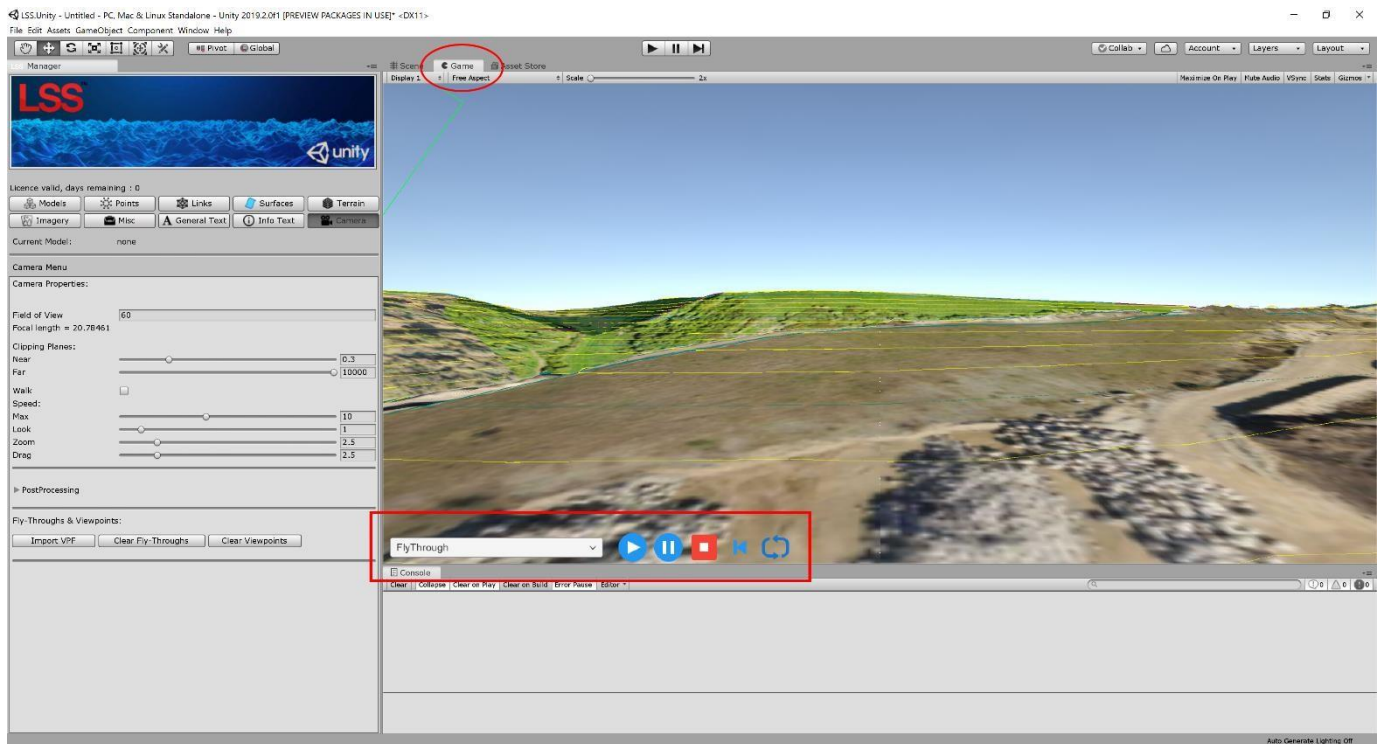5. We can now see some new interface controls on the screen as shown in the following image:

Figure 89: "Game" tab selected & Viewpoint interface circled in the bottom right.

6. To make use of the viewpoints click the "Play" button in the top middle of the Unity Editor.
7. If Unity takes you back to the "Scene" window click on the "Game" tab again.
8. You can now play, pause, stop, rewind and repeat your fly through animation.

Clear Fly-Throughs
Clears imported Fly Through animation and interface controls on the "Game" window.

Clear Viewpoints
Clears imported viewpoints and interface controls on the "Game" window.

Build to PC

If you would like to create your project as a final build so that other users can view and navigate around your survey model without having a copy of Unity installed on their PC follow these instructions:

1. With your survey model imported and setup to how you want it in your scene click "File" at the top of the Unity Editor.
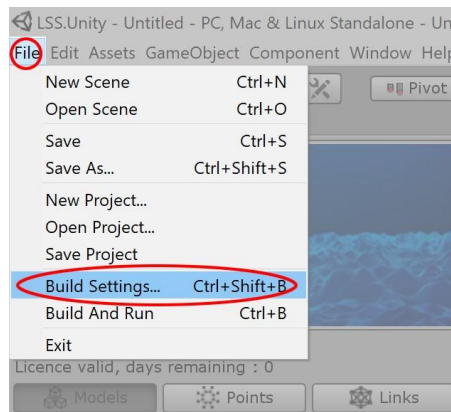2. Then click "Build Settings" as shown in the following image.

Figure 90: Build Settings

The "Build Settings" window will appear giving a list of "Platforms" you would like to create. As default our build settings will be directed towards "PC, Mac & Linux Standalone". The following image shows this is selected with the Unity icon to the right of the selection.
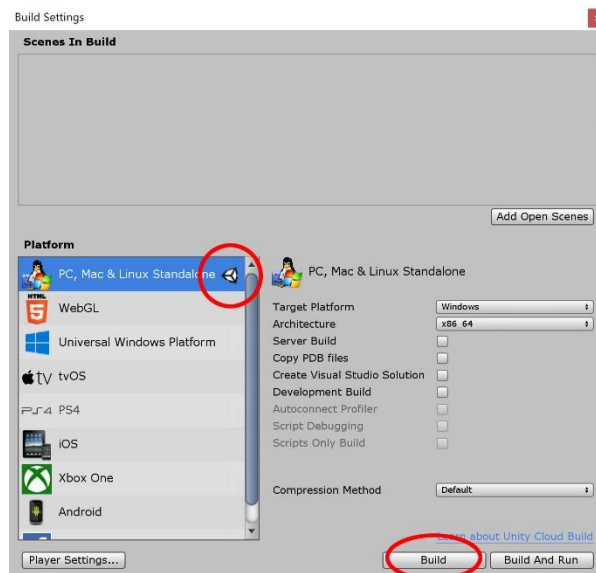

Figure 91: Build Project

3. Click the "Build" button for Unity to start creating your final build.
4. A "Build Window" will appear, this is where you need to create/select an empty folder for your build files to go in. Once located click "Select Folder".

5. A progress bar will appear which depending on the size/detail of your survey model as well as the performance of your PC will take roughly 5 minutes.

6. Finally, we will be presented with your folder containing your Unity build files. The entire content of this folder is required to run.

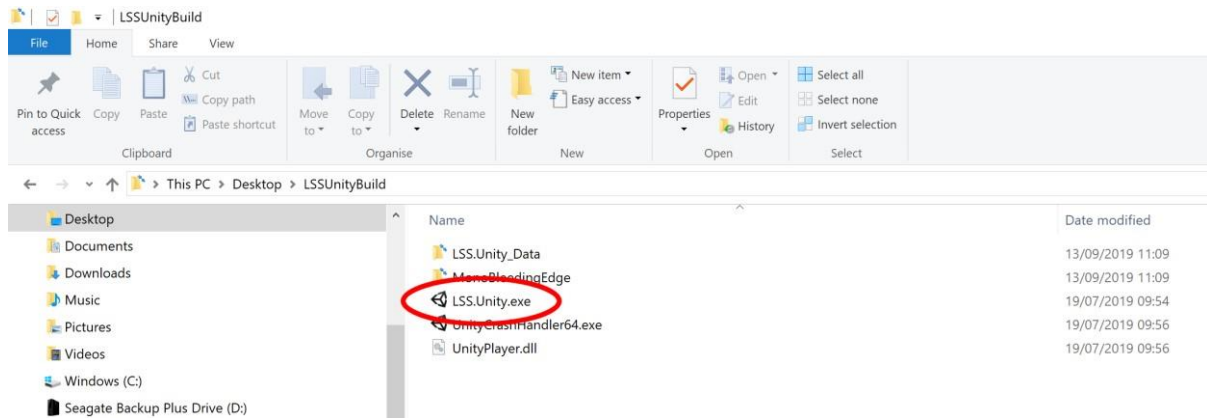7. To run your application, double-click on "LSS.Unity.exe".

Figure 92: Run Program
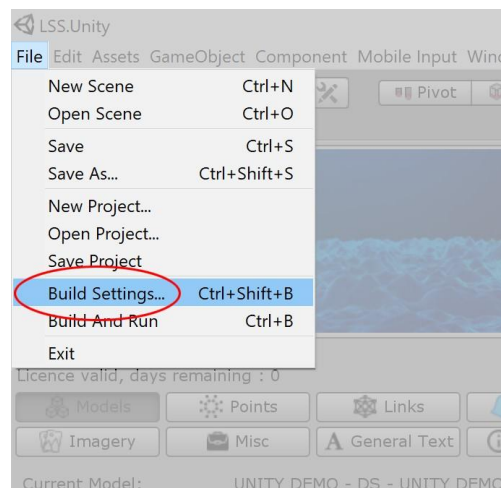
Experienced Unity User (Experimental)

This part of the documentation refers to what you can do with Unity that isn't officially supported with our plugin (yet).

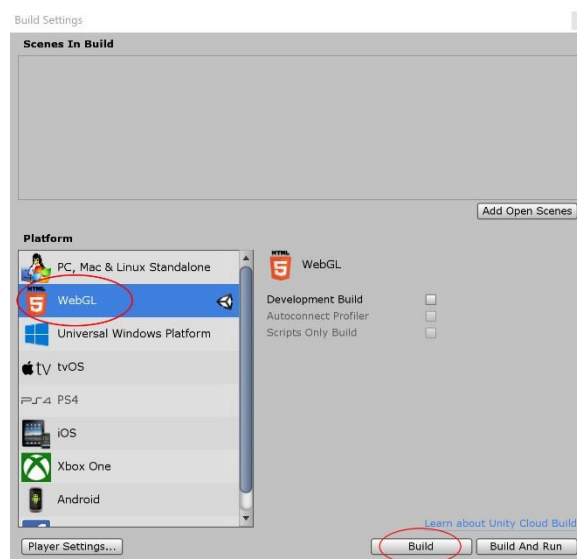## View Survey Model with a Web Browser

When you have imported your survey model into Unity, you can also build this project out to a web browser (without the point cloud). Then anyone with an internet connection can view and navigate around your survey model.

With your imported survey model do the following:

1. At the top of the Unity Editor Window click "File".
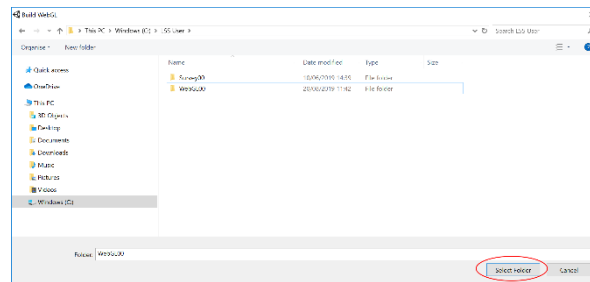2. Then click "Build Settings…"

3. The Build Settings window will appear.
4. Select "WebGL".
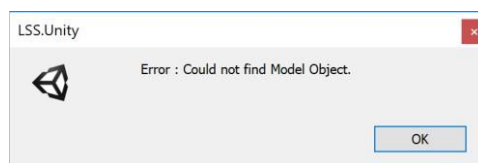5. Then click "Build".

1. The "Build WebGL" button will appear.

2. Create a folder, give it a name.

3. Select your created folder and click "Select Folder".

4. A loading bar will appear showing its progress.

5. Depending on the size and detail of your survey this process can take from 10 to 20 minutes with several popup message boxes looking like this:
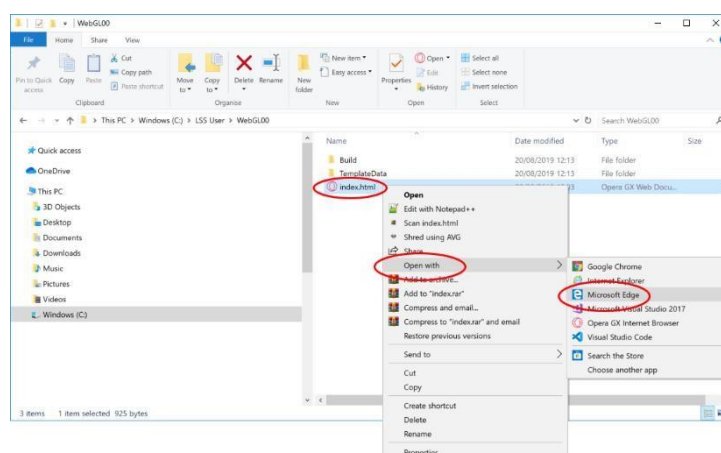

6. Click "OK" if this message appears.

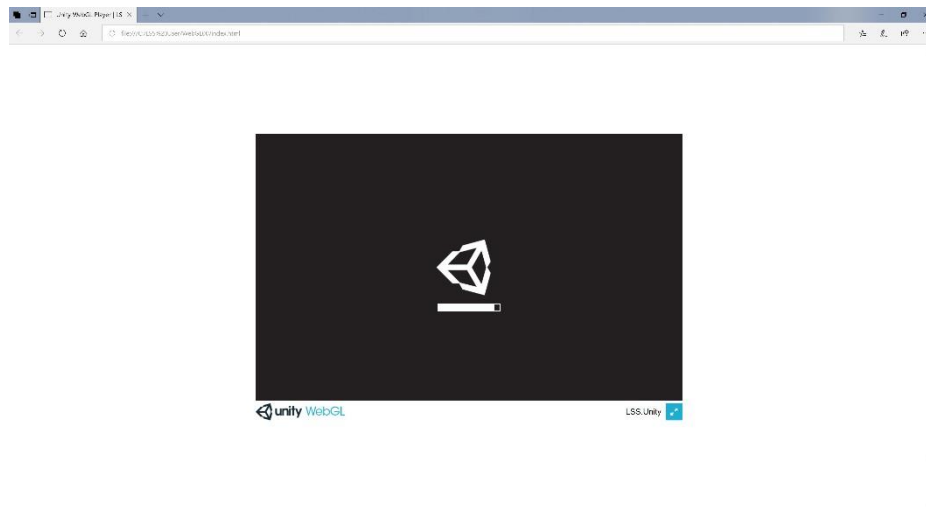7. The loading bar will also freeze, but this is normal.

Once the loading bar completes your chosen folder will be filled with your Web GL project. To check its contents, do the following:

1. Open the folder your WebGL content is in.

2. Open "index.html" with Microsoft Edge (right click the file, "Open with…" and then select either browser).

3. The browser will open with a Unity loading screen, this will take several minutes depending on your system.

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4. Once your survey has loaded into the browser it is recommended to enlarge the screen so that the browser doesn't interfere with the navigation controls which is what we are going to discuss next. Click the blue button in the bottom right corner as show in the following image.

WebGL Navigation Controls

The majority of the controls for the browser are done with the mouse, they carry a resemblance to the Unity Editor controls. Here are the controls:

- **Zoom In/Out** – Mouse wheel backwards and forwards.
- **Pan** – Click and hold middle mouse button (do this in fullscreen mode).
- **Rotate** – Hold right mouse button.
- **Escape FullScreen** – Esc button.