

CHAPTER 7: BUILDING LOD AND GENERATING FILES

BUILDING LAND LOD USING OSCAPE

Land LOD is a simplified representation of the world space landscape shown in unloaded cells.

To generate land LOD I'm going to use a utility called [Oscape](#) which you can download from Nexusmods.

Important: Before we can generate object and tree LOD in xEdit, we need to generate land LOD first to create a .lod file for our world space. Without a .lod file, the world space won't be listed in xEdit.

Launch Oscape x32/Oscape x64.

Go to Game and set it to Skyrim.

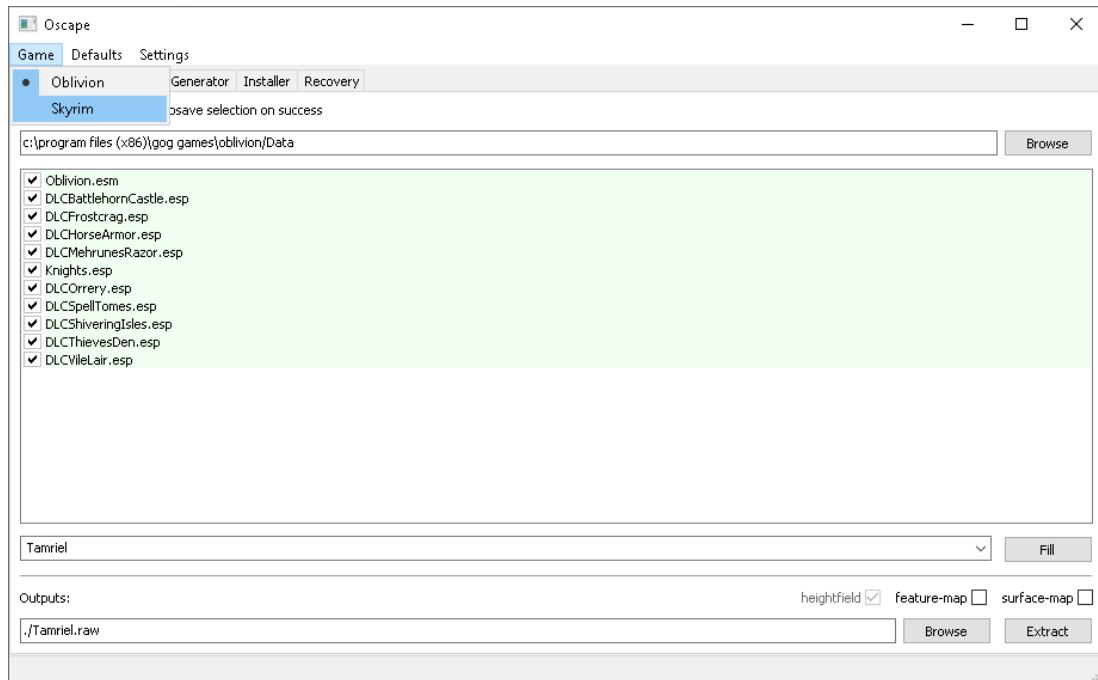


Figure 976 - Set Game to Skyrim.

Tick your mod, tick any dependencies such as Skyrim.esm, then click on the Fill button.

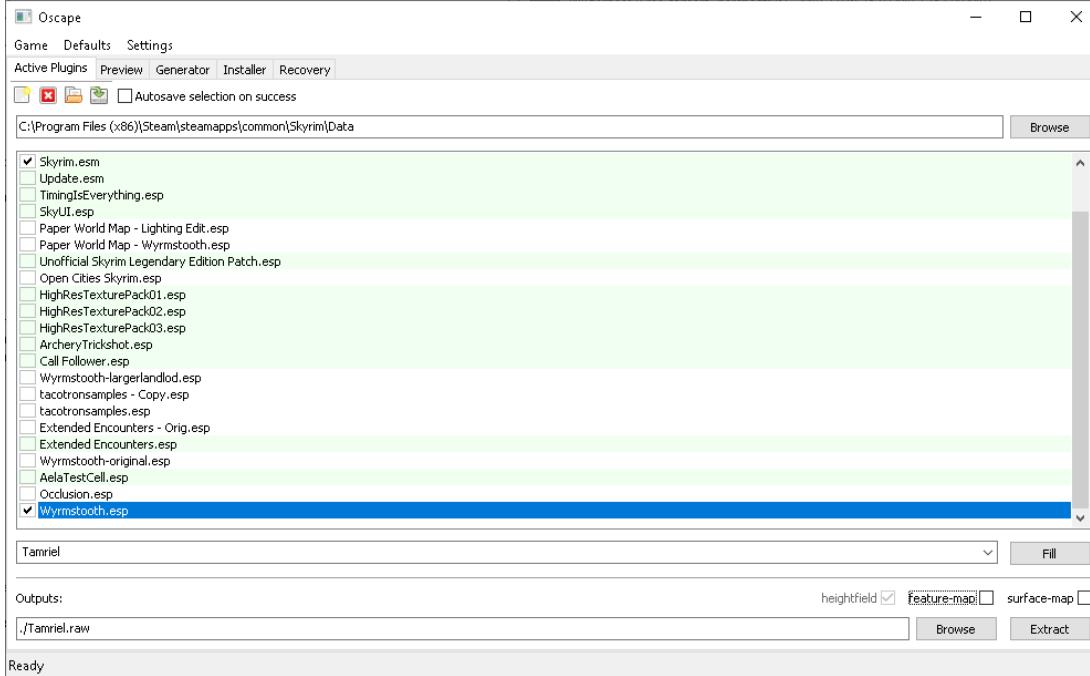


Figure 977 - Selecting our mod.

Select your world space in the drop-down menu next to the Fill button, and change the name of the .raw file in the Outputs text field.

Tick Feature-Map and Surface-Map then click Extract.

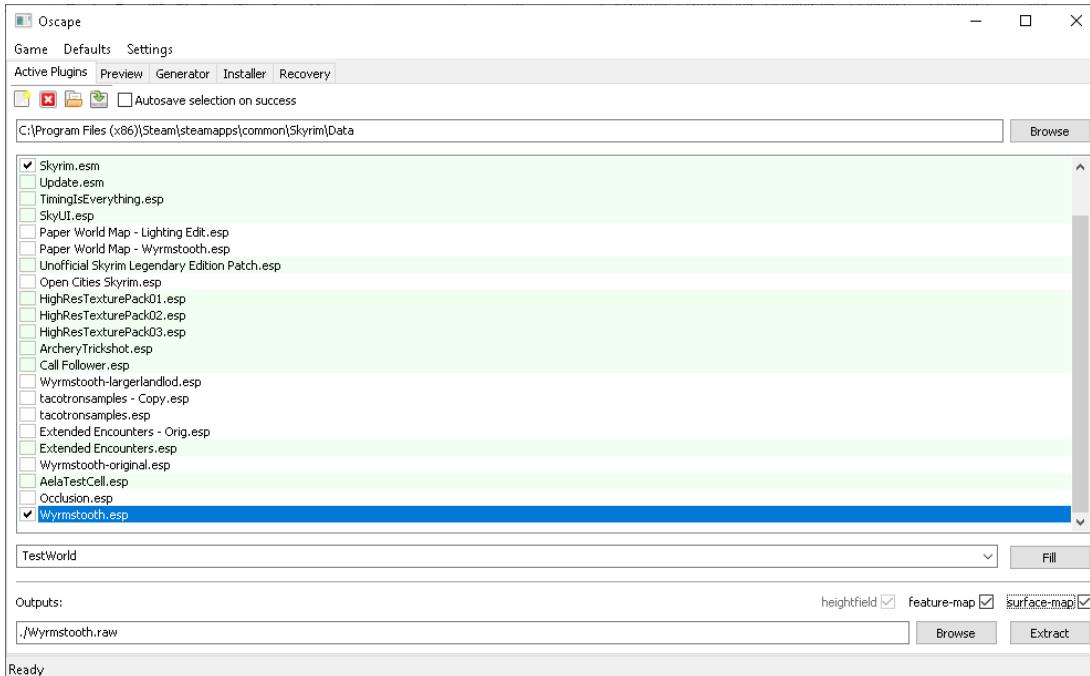


Figure 978 - Selecting our world space.

In the Preview tab, click on the second Browse button and choose a directory to save the generated files to. In my example I just set this to 'C:\Users\Jonx0r\Desktop\Generated Files' for now. You can always move this folder to a better location later.

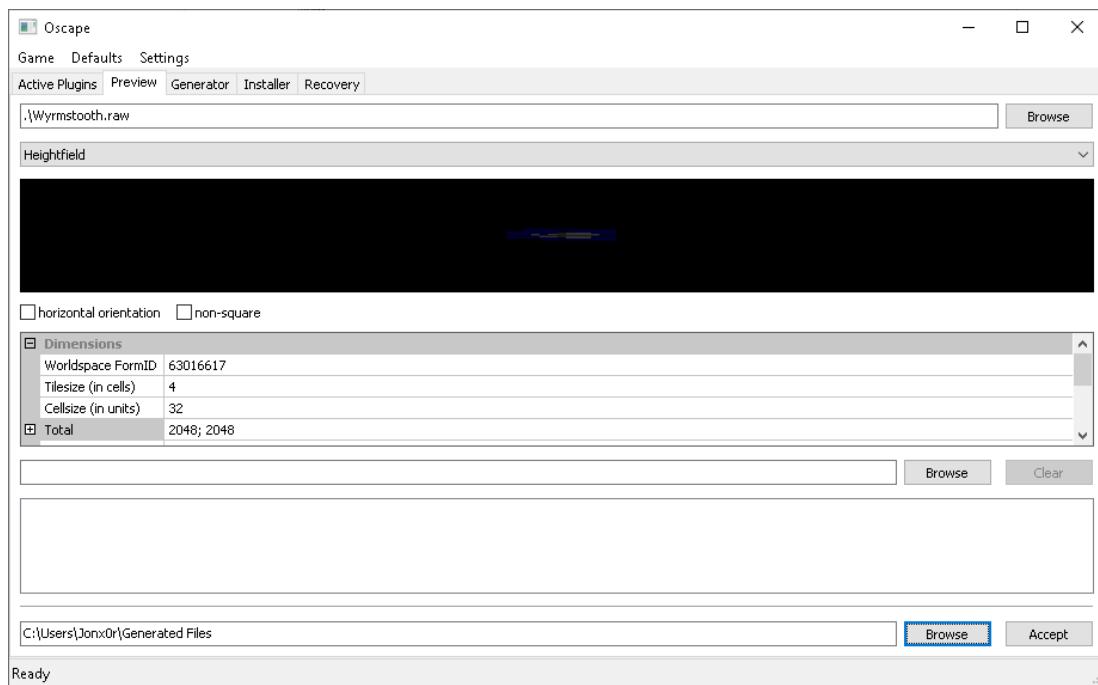


Figure 979 - Preview tab.

Click Accept.

Alright, now to configure our LOD generation settings.

So you should see three tick boxes in the Generator tab; Meshes, Normals and Colors. Meshes and Normals should already be ticked. Go ahead and tick Colors as well.

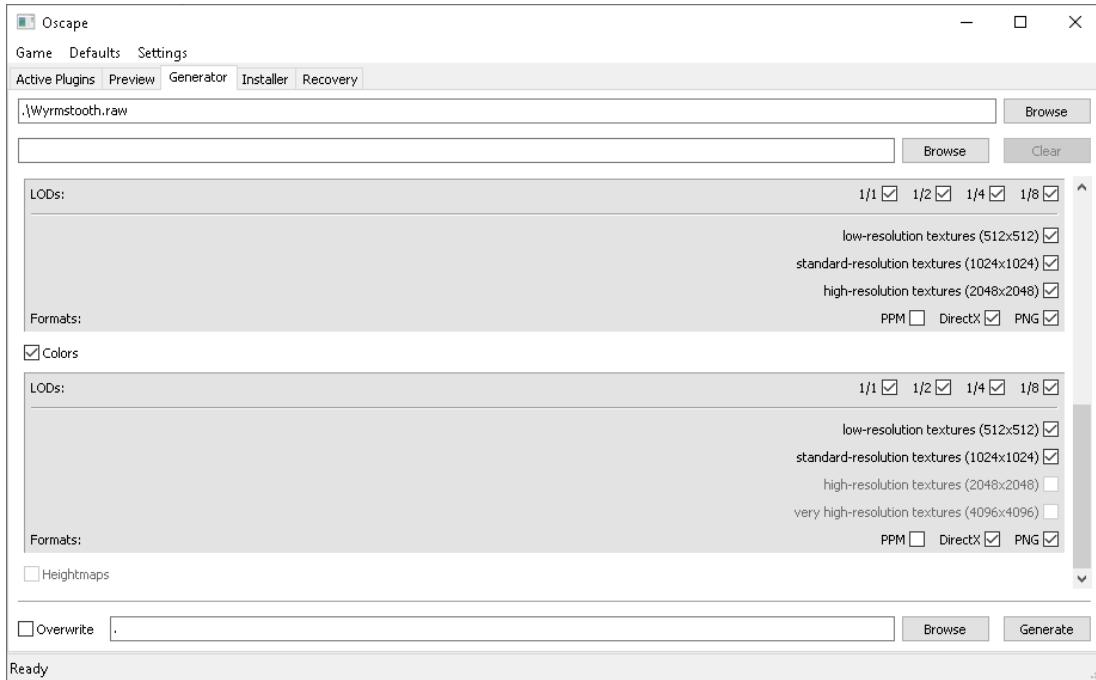


Figure 980 - Colors ticked.

Next, I'm going to set the "Target of max. resolution" drop-down to '256000 (1/1 of 1000 per tile)'.

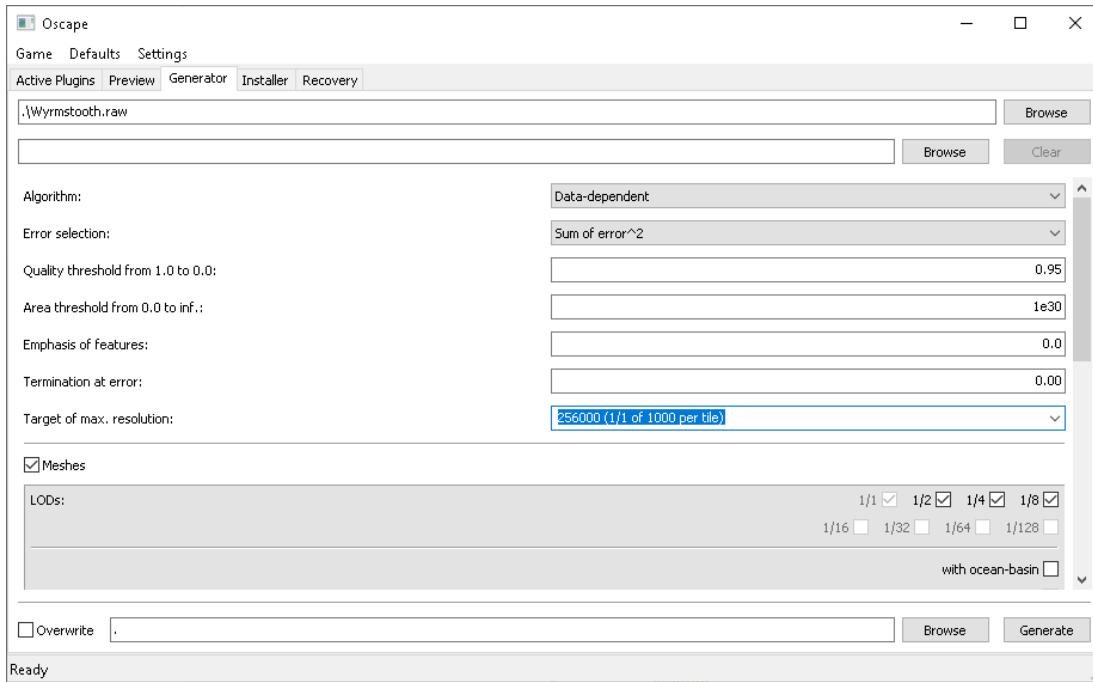


Figure 981 - Target of max. resolution set to 256000.

Important: When your land LOD is building, if Oscape crashes, you'll need to lower the "Target of max. resolution" value.

Under Meshes, tick ‘with ocean-basin’. Make sure only the NIF format is ticked.

Under Normals, untick PNG.

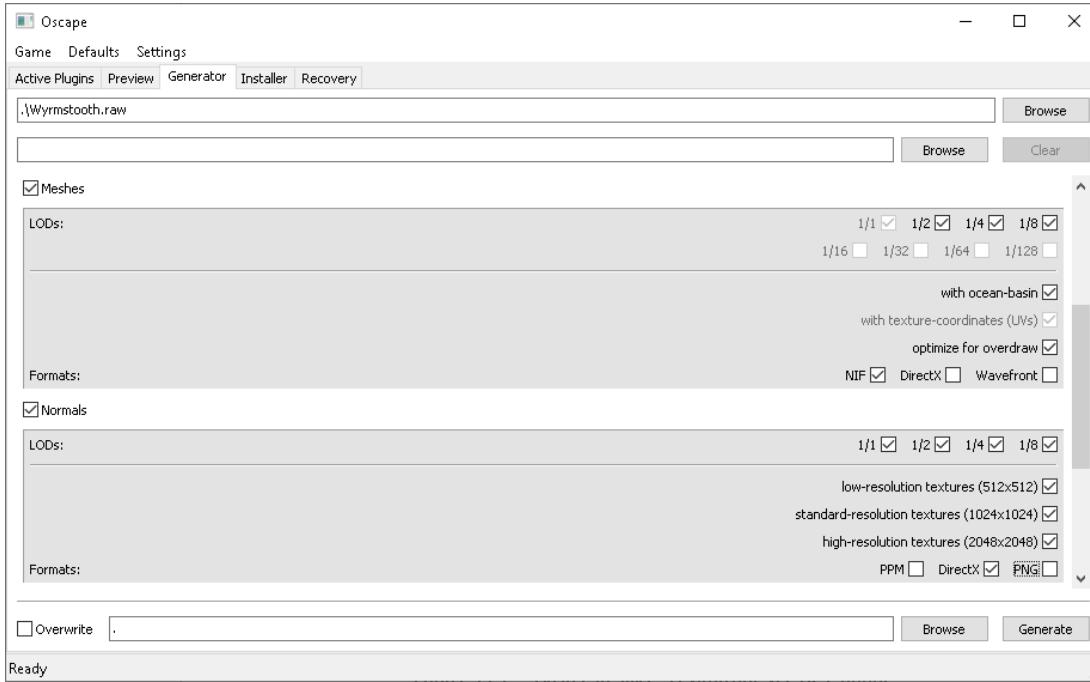


Figure 982 - Configuring Meshes and Normals.

Under Colors, untick PNG.

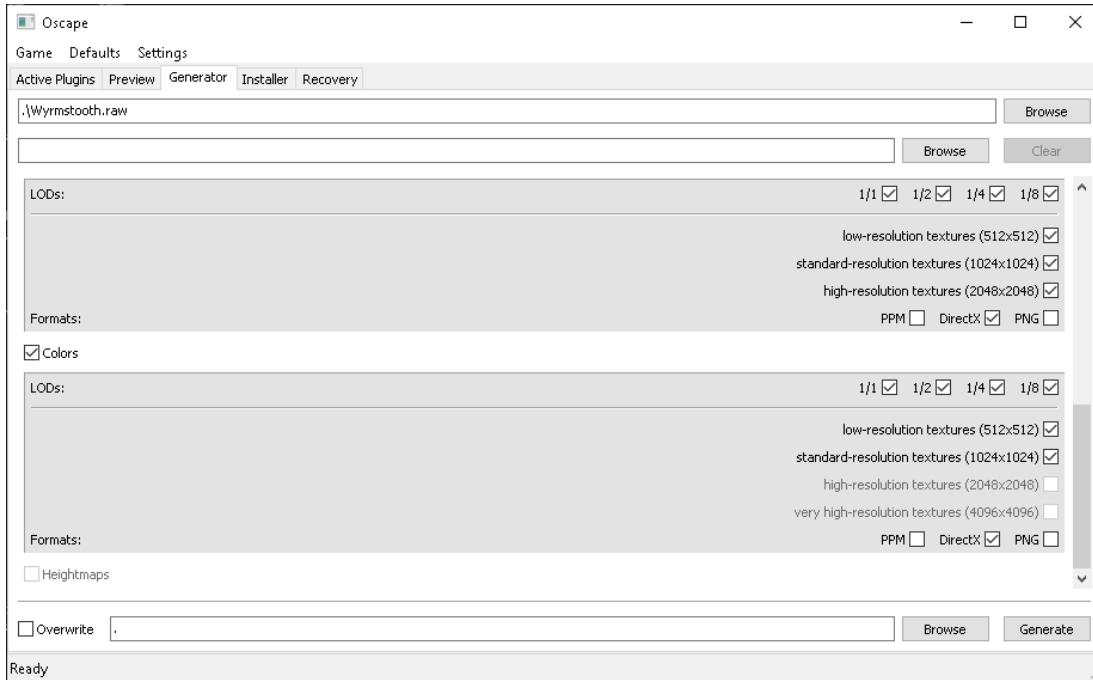


Figure 983 - Configuring Colors.

Click Browse and choose a folder to generate the LOD files in. Again, I just set this to 'C:\Users\Jonx0r\Desktop\Generated Files'

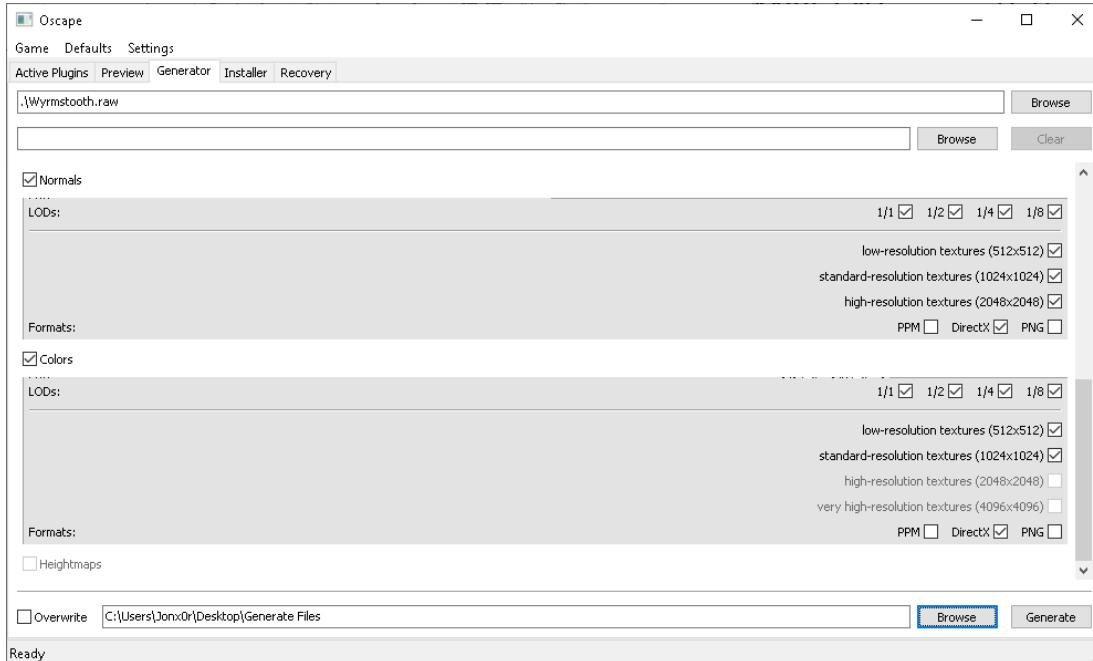


Figure 984 - Choosing a folder to generate the LOD files in.

If you've done this before and that folder already exists, tick Overwrite.

Click Generate to start creating your land LOD files.

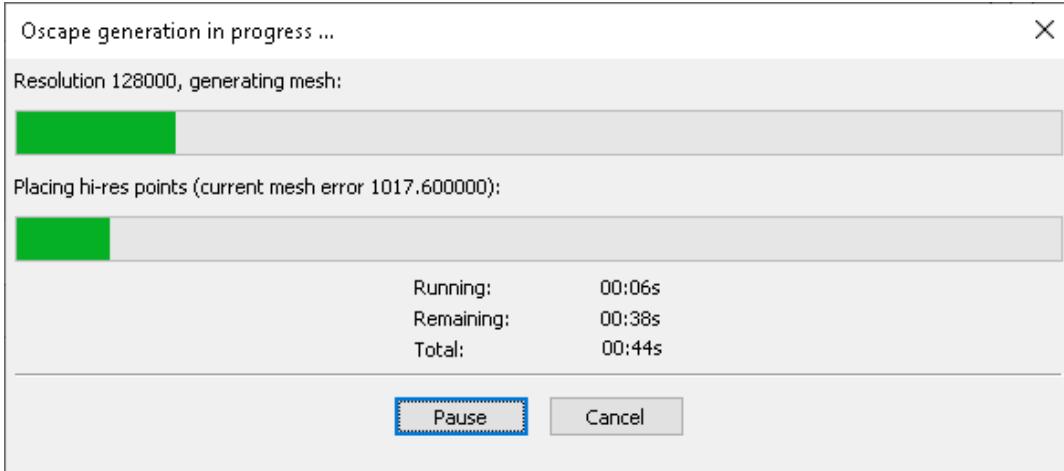


Figure 985 - Oscape generation in progress.

Once it's done generating, you'll be taken to the Installer tab.

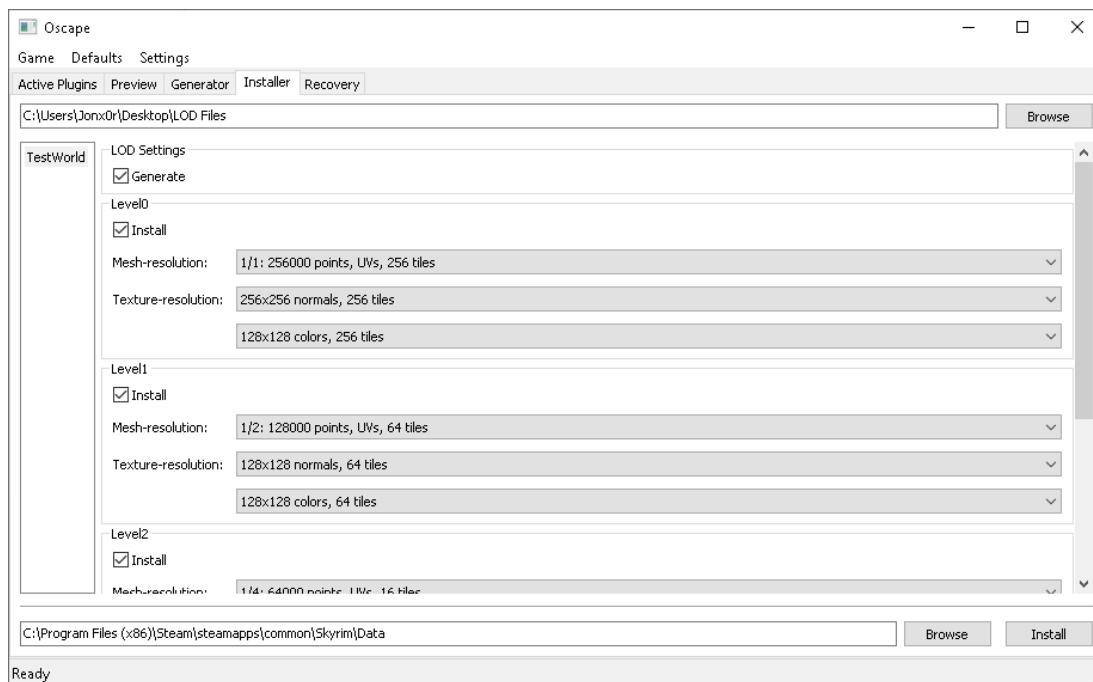


Figure 986 - Installing land LOD files.

Under LOD Settings, tick Generate.

Tick the Install tick box for Level0, Level1, Level2 and Level3.

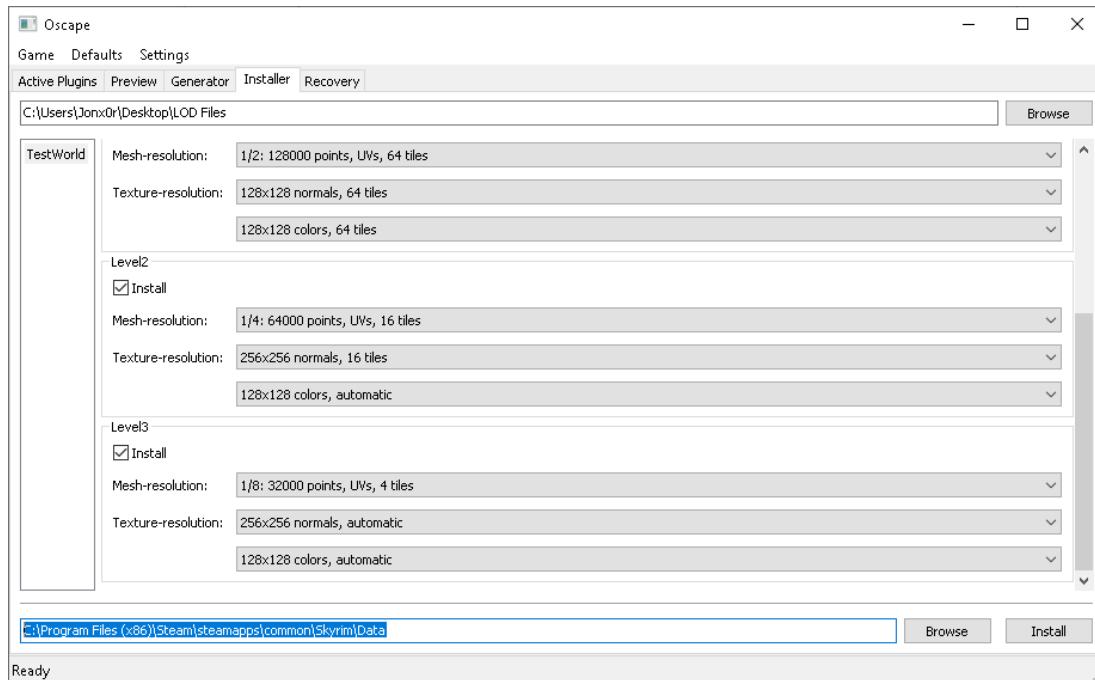


Figure 987 - Setting the install directory.

Make sure the install directory is set to the location of your Skyrim\Data folder.

Click Install to copy the land LOD files to your Skyrim\Data folder.

Confirm the files have been copied to your Skyrim\Data folder.

Go to your Skyrim\Data\Meshes\Terrain\<YourWorldSpaceName> folder and confirm that it contains .btr files prefixed with the name of your world space.

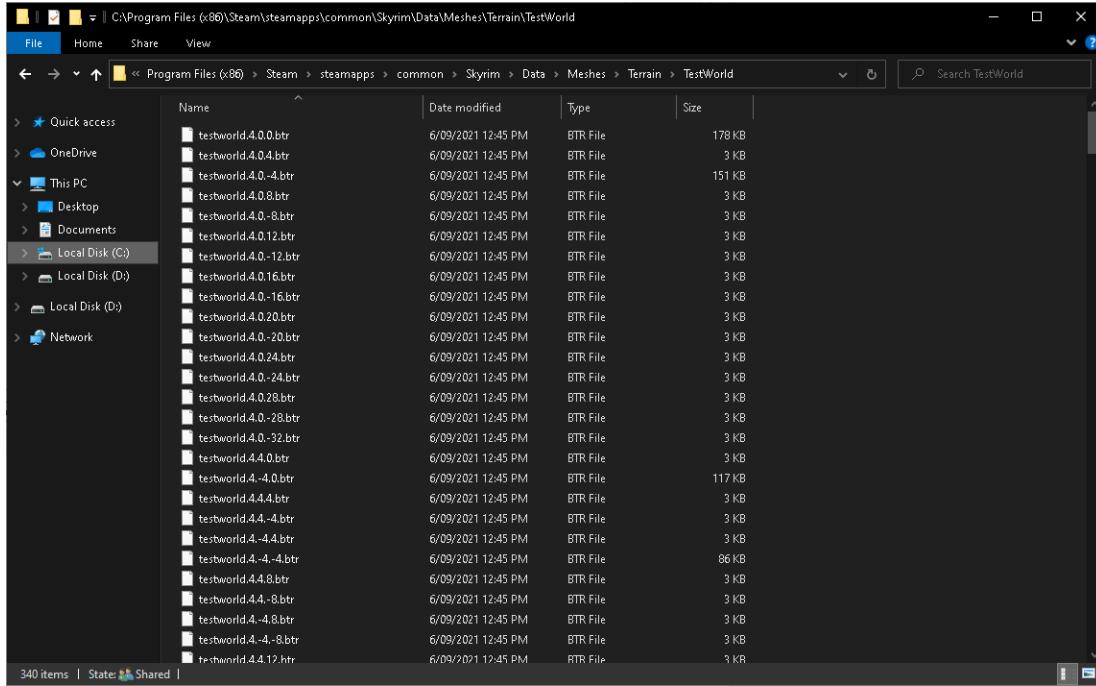


Figure 988 - Land LOD .btr files.

Confirm that the .dds textures were copied to Skyrim\Data\Textures\Terrain\<YourWorldSpaceName>.

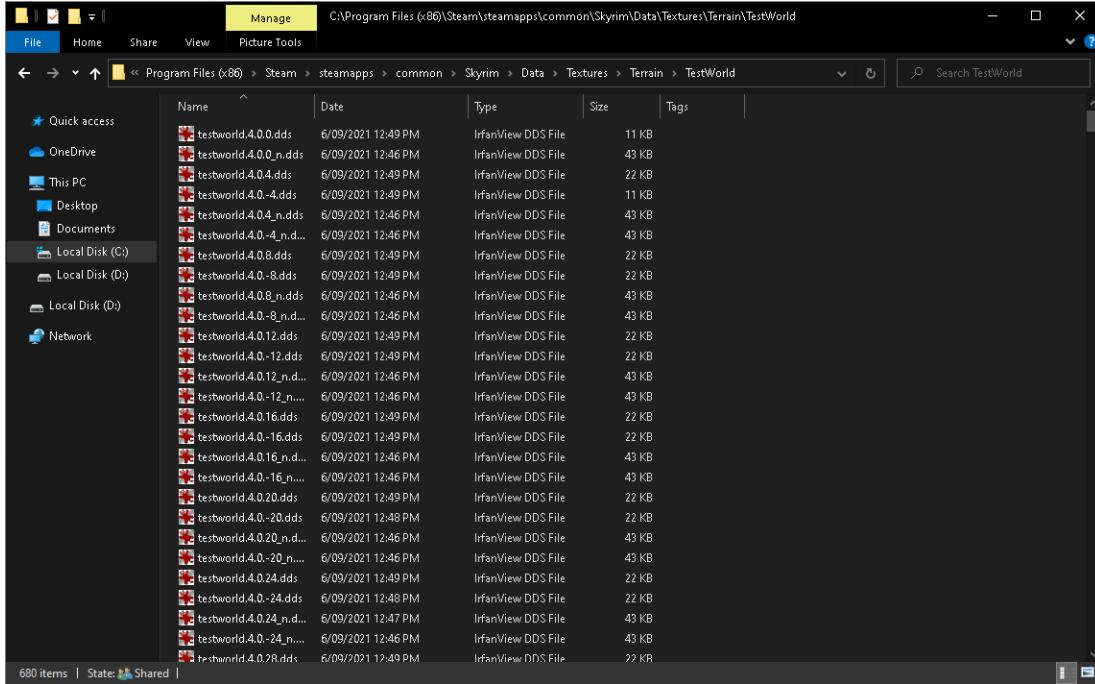


Figure 989 - Land LOD .dds files.

Lastly, confirm a new .lod file exists in the Skyrim\Data\LODSettings folder and is named after your world space.

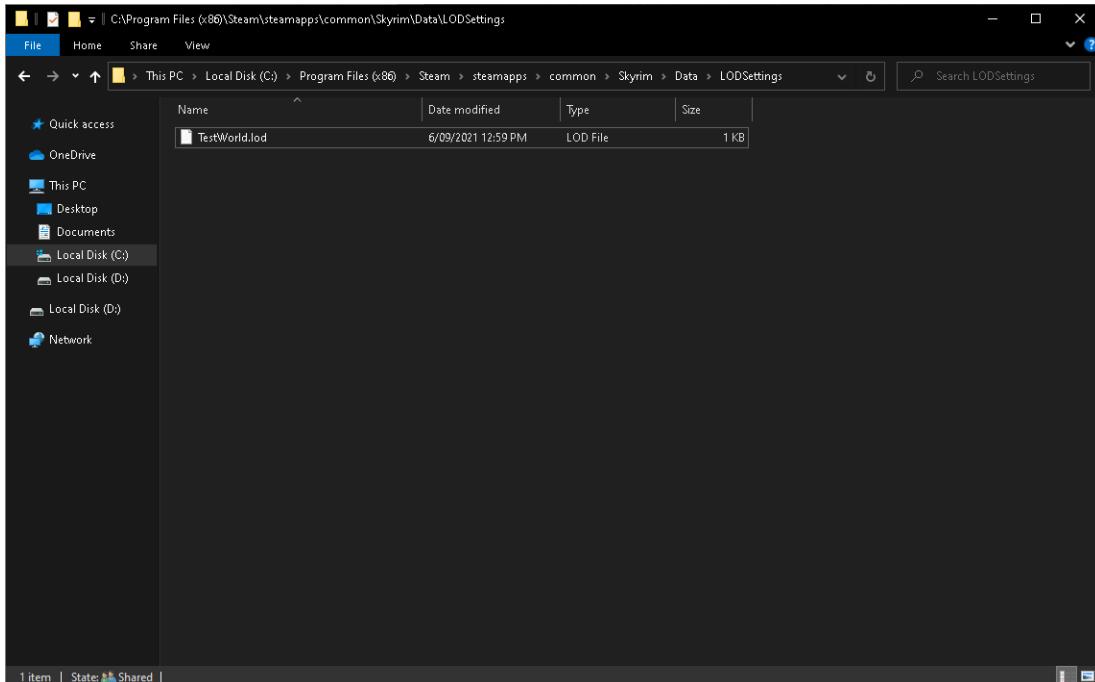


Figure 990 - New LOD Settings file.

Go to your world space in-game and confirm land LOD is present and is textured correctly.



Figure 991 - The test world island from a distance, land LOD only.

We should also be able to see it in the map screen.



Figure 992 - The test world island from the map screen.

Just ignore the hard edges in the clouds on the map screen for now; that can be fixed later.

BUILDING OBJECT LOD USING XEDIT

Object LOD includes objects such as mountain peaks, buildings and city walls seen in the distance.

To generate object LOD we're going to use [TES5Edit/SSEEdit](#) which you can download from Nexusmods.

Important: Before you can generate object LOD in xEdit, you need to have made a .lod file for your world space. This file can be created by Oscape when you generate land LOD.

Launch xEdit.

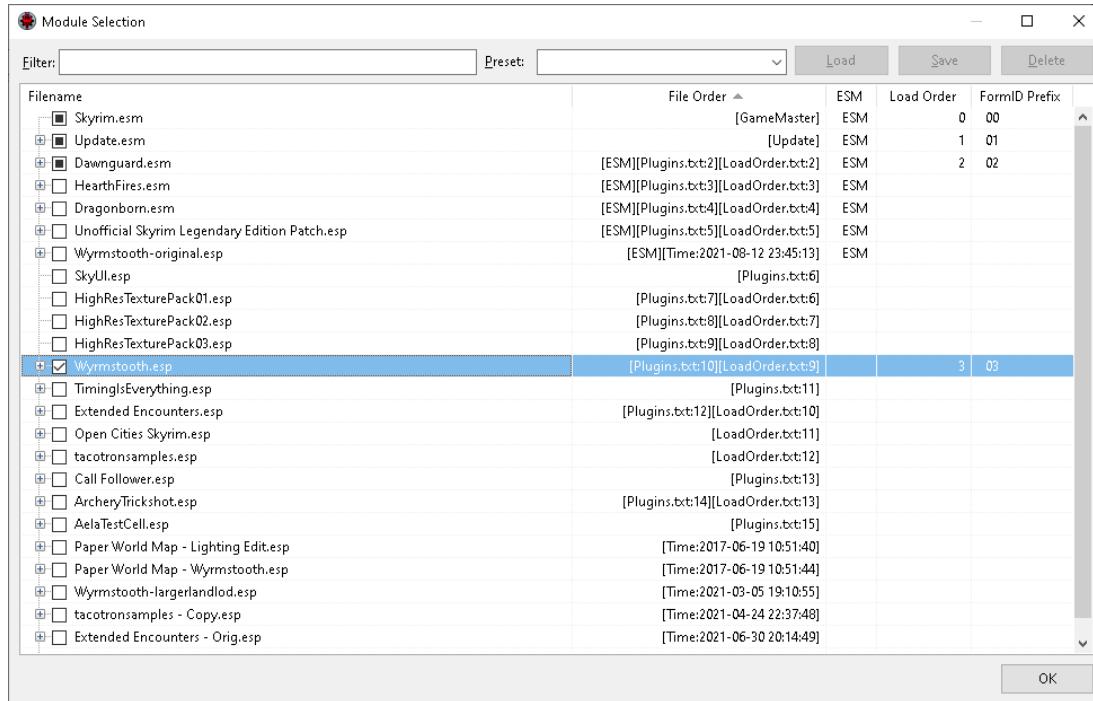


Figure 993 - Select your mod in xEdit.

Select your mod and click OK.

Wait for the background loader to finish.

Right-click on your mod and go to Other > Generate LOD.

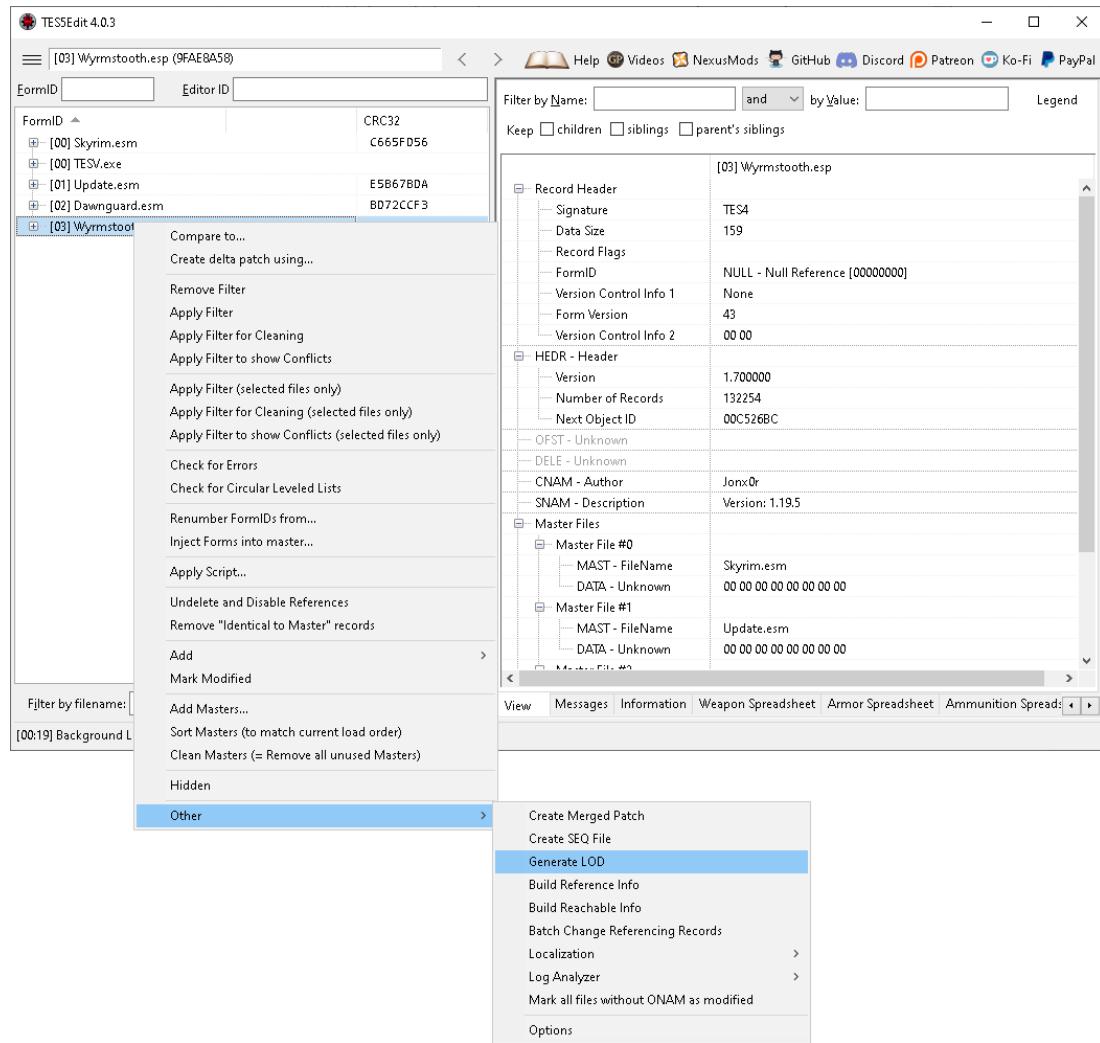


Figure 994 - Generate LOD menu.

Tick the world space(s) you want to generate object LOD for.

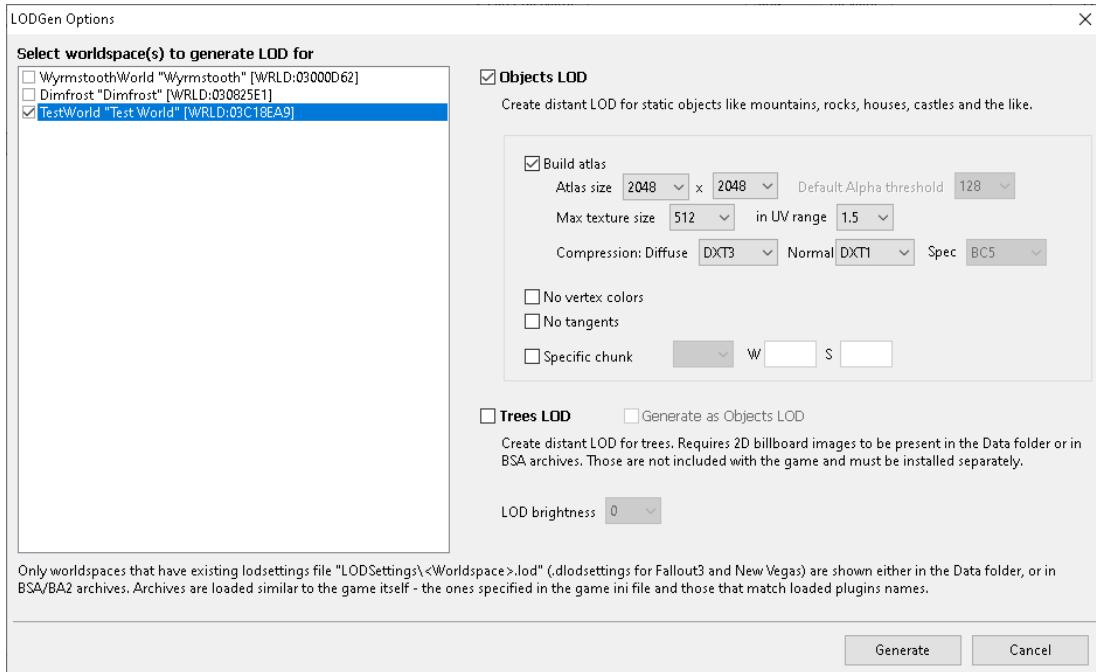


Figure 995 - Selecting the world space to build object LOD for.

Tick Objects LOD.

Click Generate to start building object LOD.

Once it's done, browse to your Skyrim\Textures\Terrain\<YourWorldspaceName>\Objects folder and confirm that it contains .bto files.

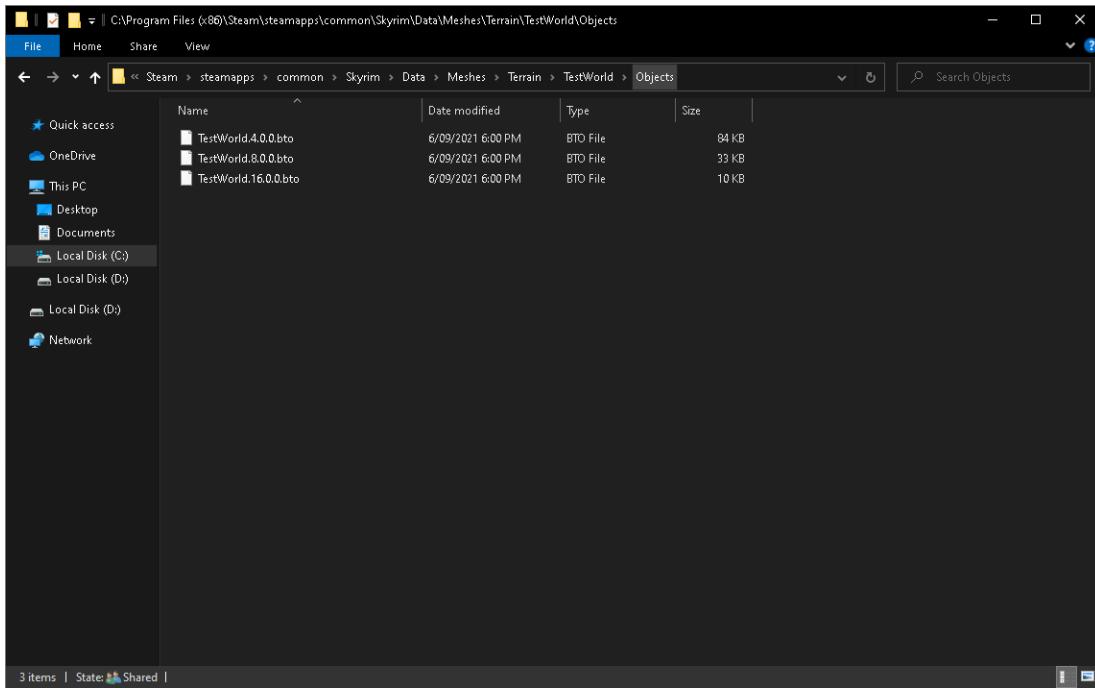


Figure 996 - Object LOD .bto files.

In my TestWorld example, I only have a couple objects with LOD so only a couple files were generated.

Navigate to your Skyrim\Data\Textures\Terrain\<YourWorldspaceName>\Objects folder and confirm it contains two .dds files.

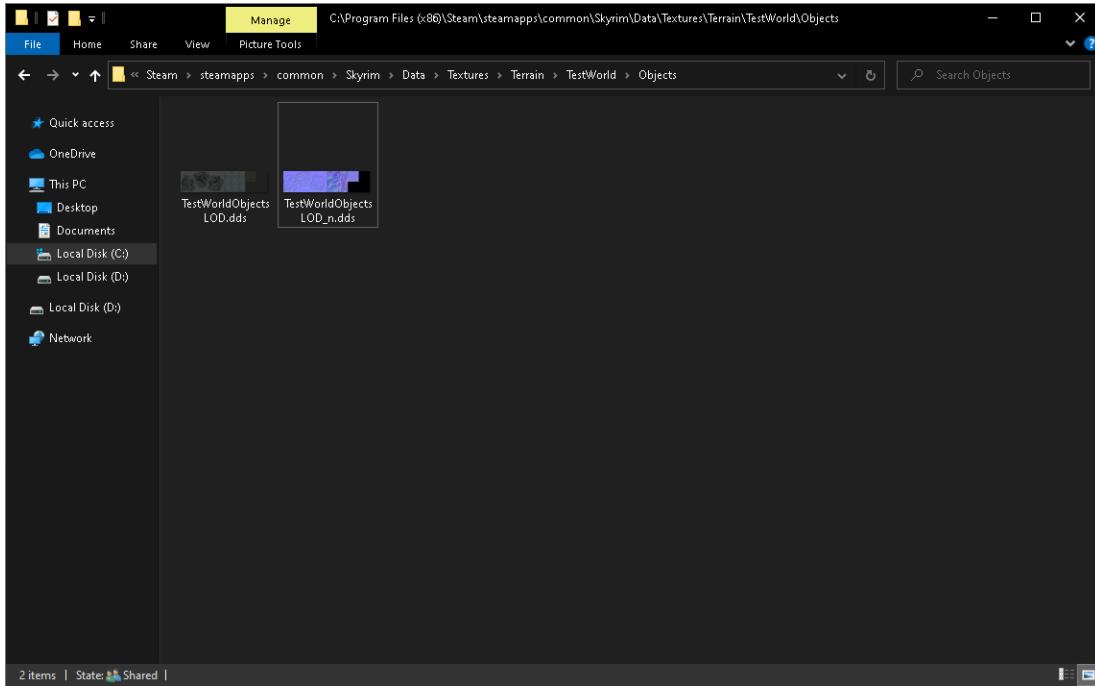


Figure 997 - Object LOD texture index.

Go to your world space in-game and confirm object LOD is present and is textured correctly.



Figure 998 - The mountain peak on our island can now be seen from a distance.

As you can see from the screenshot above, the mountain peak can now be seen from a distance.

It can also be seen on the world map.

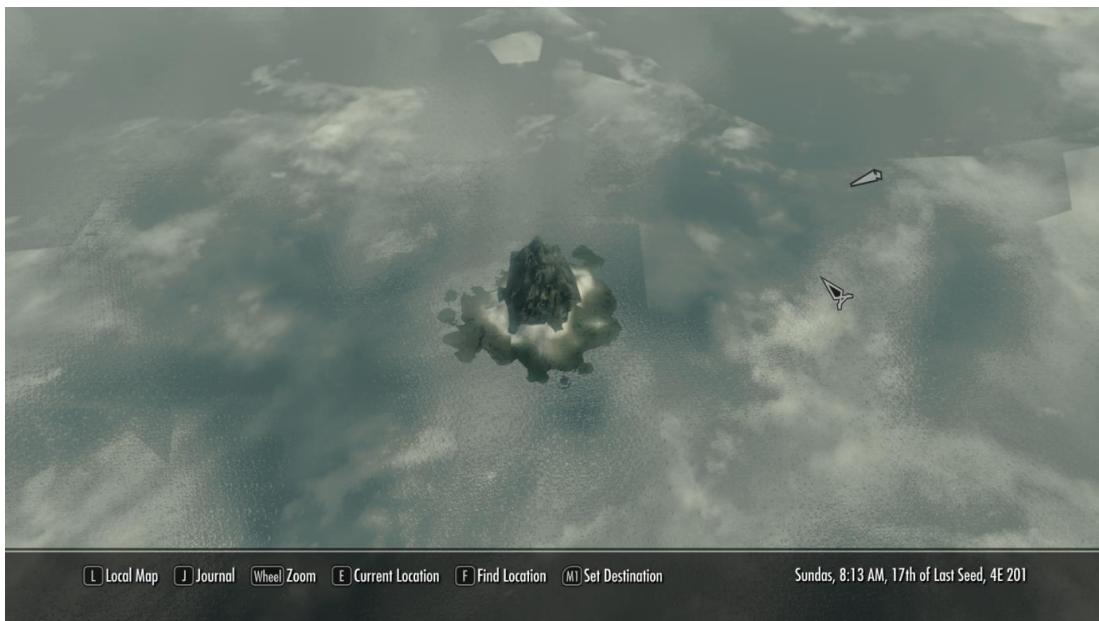


Figure 999 - Object LOD also visible on the world map.

BUILDING TREE LOD USING XEDIT

Similar to object LOD, tree LOD shows distant trees in unloaded cells.

To generate object LOD we're going to use [TES5Edit/SSEEdit](#) which you can download from Nexusmods.

Important: Before you can generate object LOD in xEdit, you need to have made a .lod file for your world space. This file can be created by Oscape when you generate land LOD.

The first thing we'll need to do is download the tree billboards which you can download from the [TES5LODGen](#) page on Nexusmods.

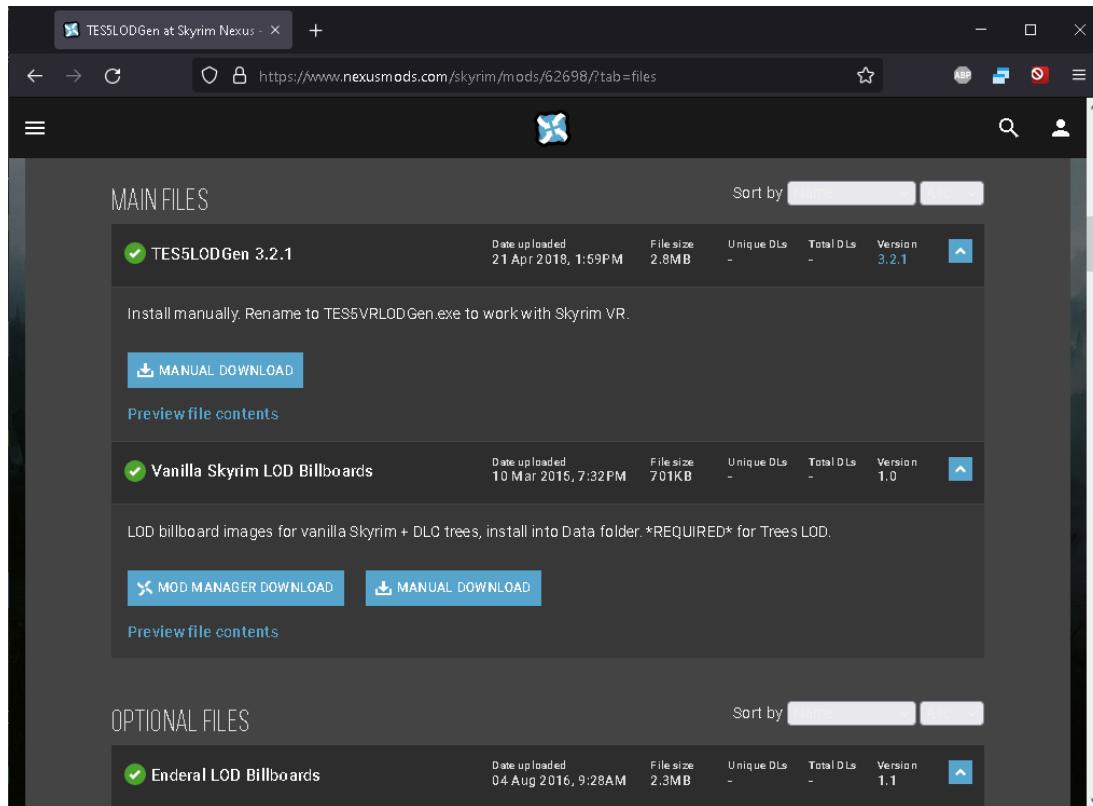


Figure 1000 - Vanilla Skyrim LOD Billboards download source.

Open the .zip archive and extract the textures folder to your Skyrim\Data or Skyrim Special Edition\Data folder.

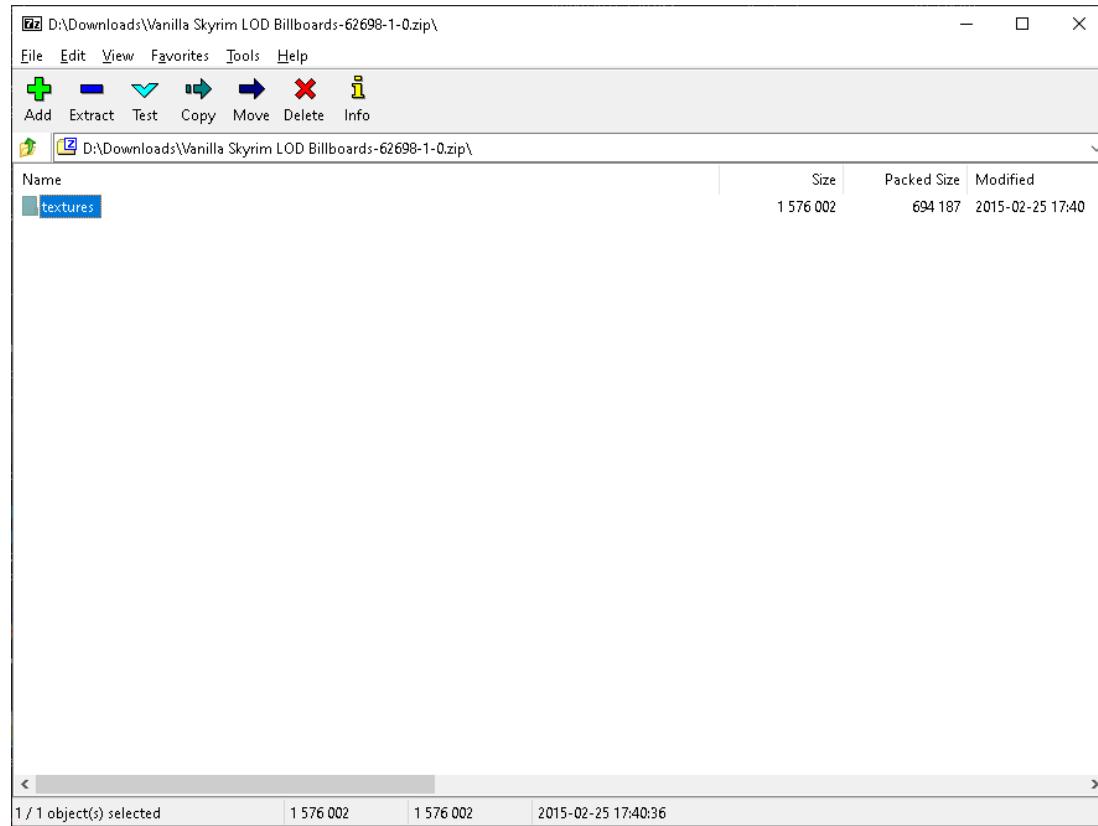


Figure 1001 - Vanilla Skyrim LOD Billboards .zip contents.

Now we can launch xEdit.

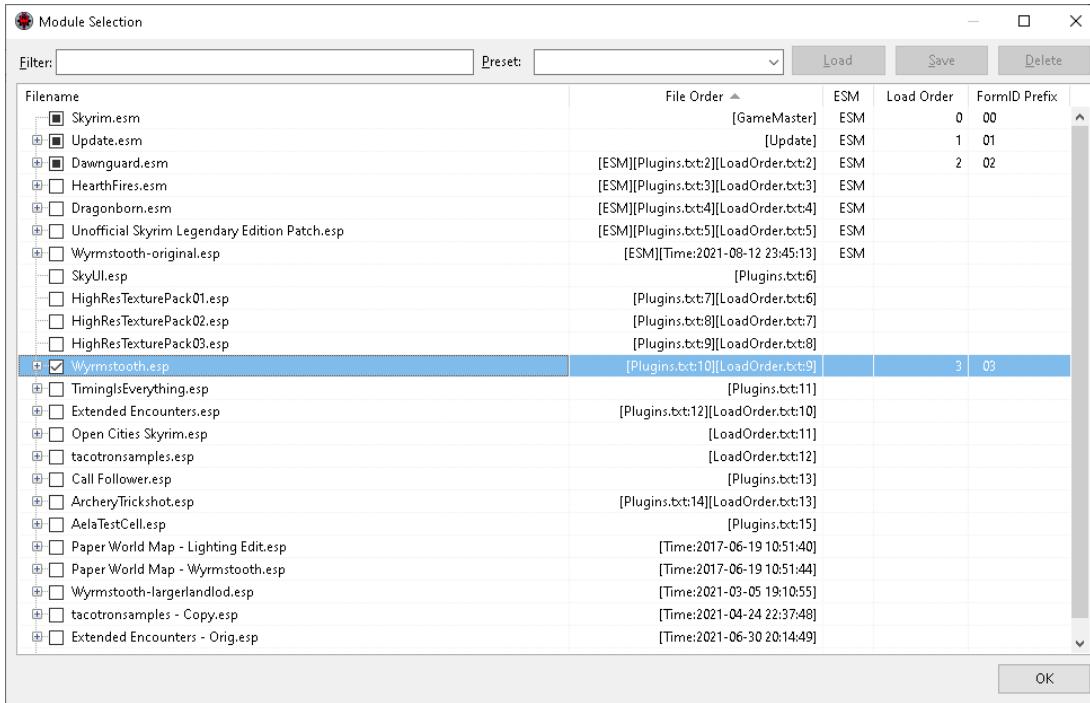


Figure 1002 - Select your mod in xEdit.

Select your mod and click OK.

Wait for the background loader to finish.

Right-click on your mod and go to Other > Generate LOD.

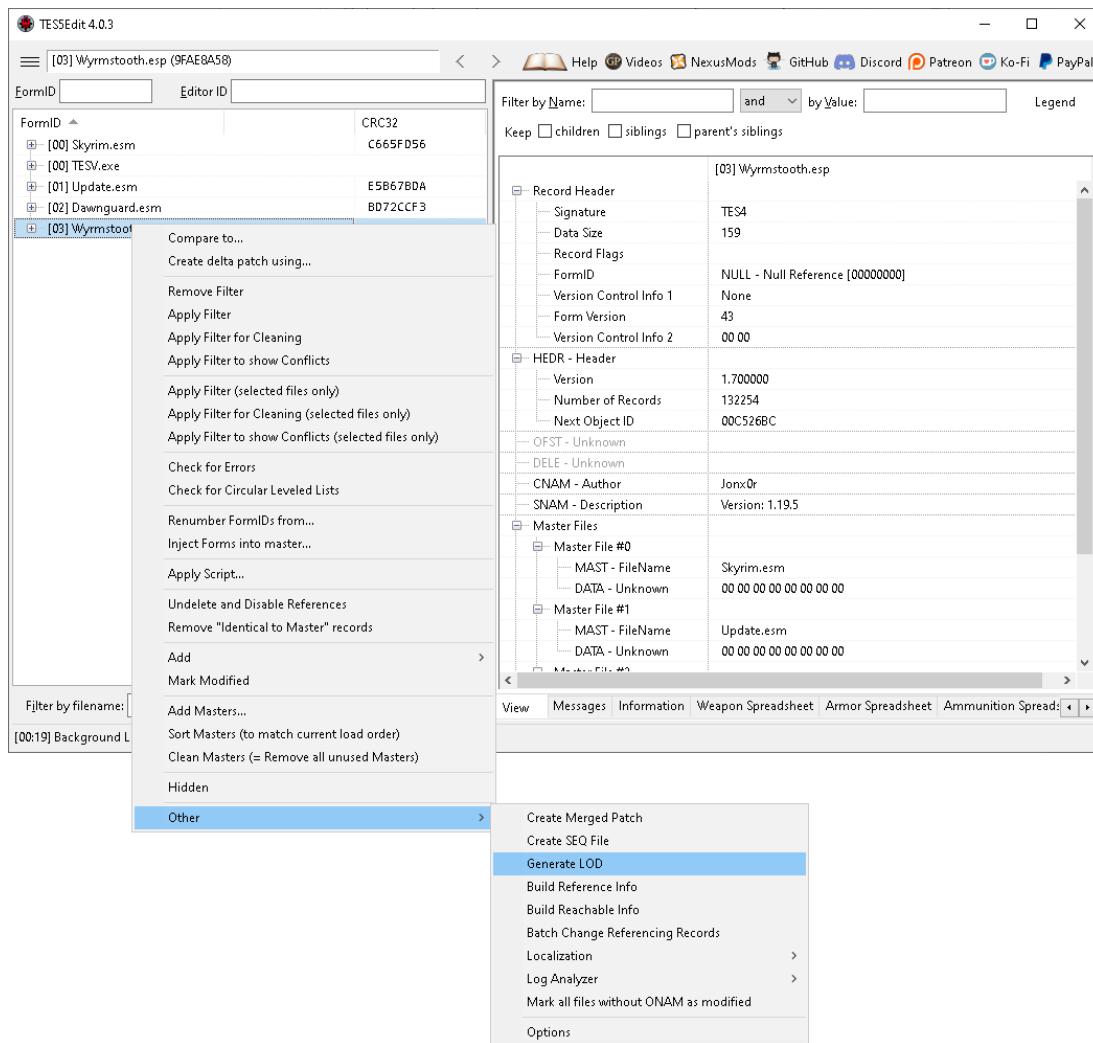


Figure 1003 - Generate LOD menu.

Tick the world space(s) you want to generate object LOD for.

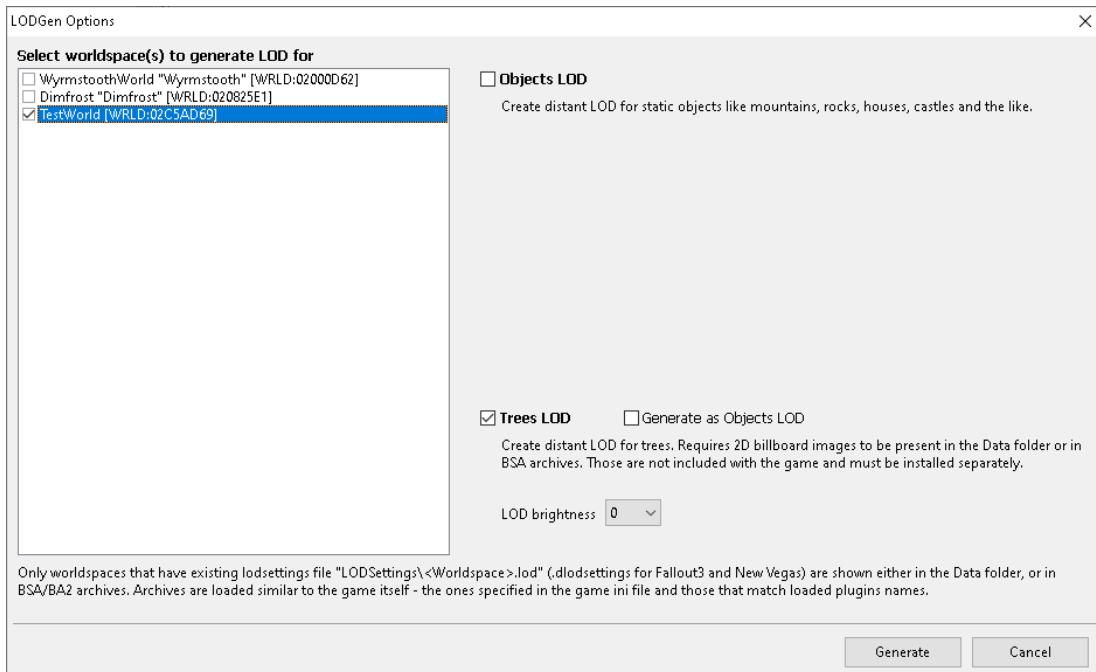


Figure 1004 - Generating tree LOD.

Click Generate to begin generating tree LOD.

Now navigate to your Skyrim\Data\Meshes\Terrain\<YourWorldspaceName>\Trees folder and confirm it contains .btt files.

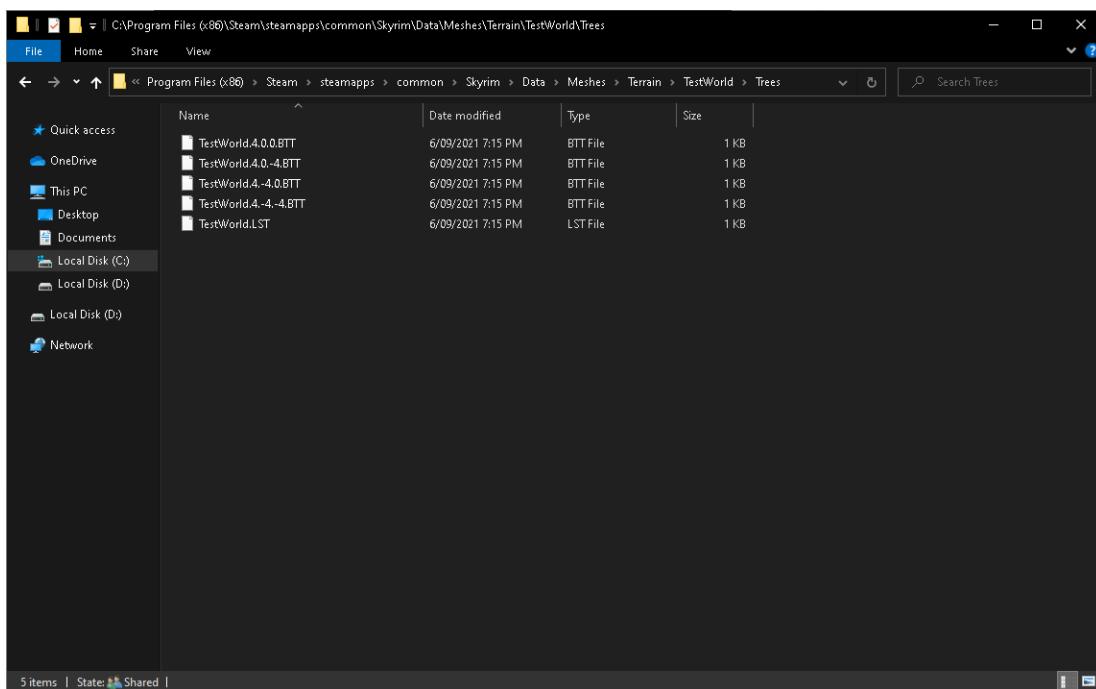


Figure 1005 - Tree LOD .btt files.

Again, I only have a handful of .btt files in the screenshot above because the sample world space I made is very small.

Browse to your Skyrim\Data\Textures\Terrain\<YourWorldspaceName>\Trees folder and confirm you have a <YourWorldspaceName>treetlod.dds file here.

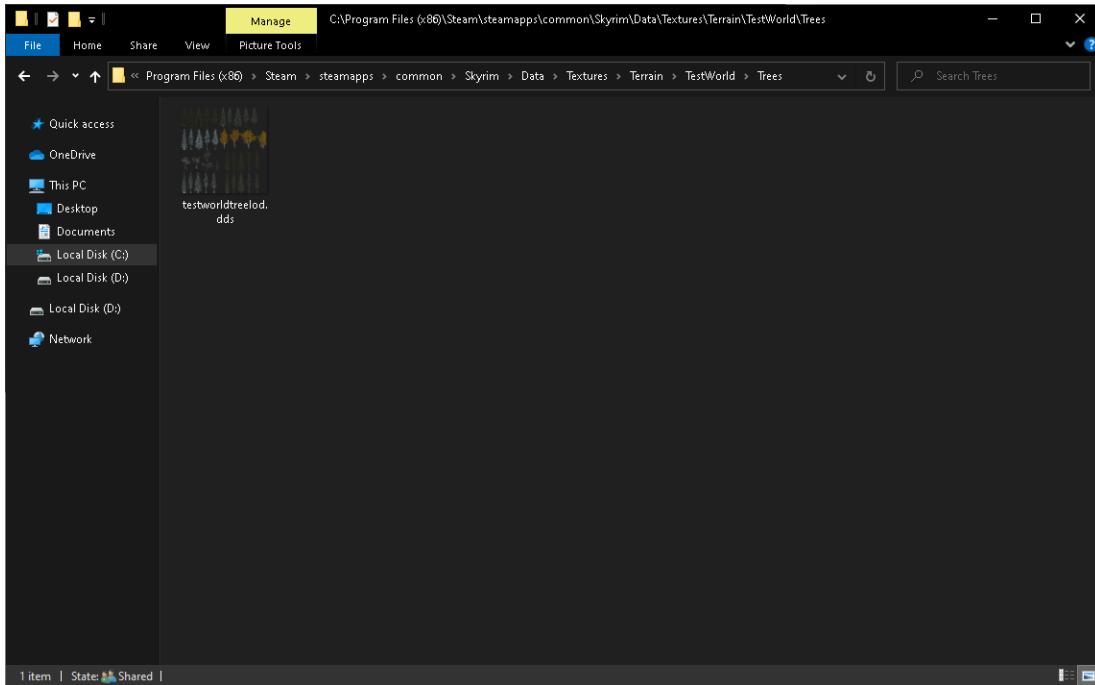


Figure 1006 - Pasting in and renaming tamrieltreetlod.dds.

Go to your world space in-game and confirm tree LOD is present and is textured correctly.



Figure 1007 - Trees can now be seen in the distance on our little island.

You should be able to see trees on the island now from far away.

Important: For Skyrim Special Edition, I would recommend ticking 'Generate as Objects LOD'. The Creation Kit can't pack .lst files into a .bsa archive.

Tree LOD requires an .lst file that's created when generating tree LOD. The problem, however, is that the Creation Kit can't pack this .lst file into a .bsa archive. To work around this problem, you can generate tree LOD as part of object LOD which requires no .lst file.

In order to do this you will need to tick 'Objects LOD', 'Trees LOD' and 'Generate as Objects LOD' as per the screenshot below:

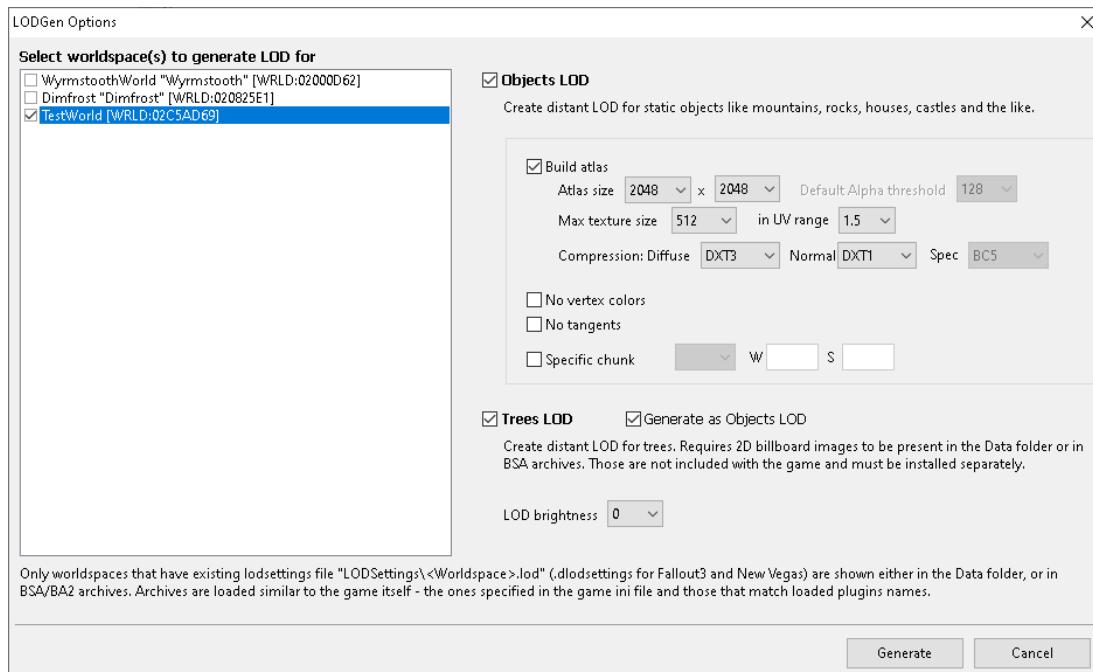


Figure 1008 - Generating tree LOD as object LOD.

FINAL ADJUSTMENTS TO WORLD SPACE SETTINGS

In this section I'll be covering a few final things that need to be changed on a new world space.

The first thing we're going to need to do is create a new cloud layer for our world map. The default cloud map for the Tamriel world space conforms to the shape of that world space, so this needs to be fixed.

The default `skyrimworldmapcloudbank.nif` cloud layer can be extracted from the sky folder in the 'Skyrim - Meshes.bsa' archive.

See [Unpacking the BSA Archives](#) for instructions on exporting assets from the BSA archives.

We'll also need [NifSkope](#), which you can download from their website.

In NifSkope, it will look like this:

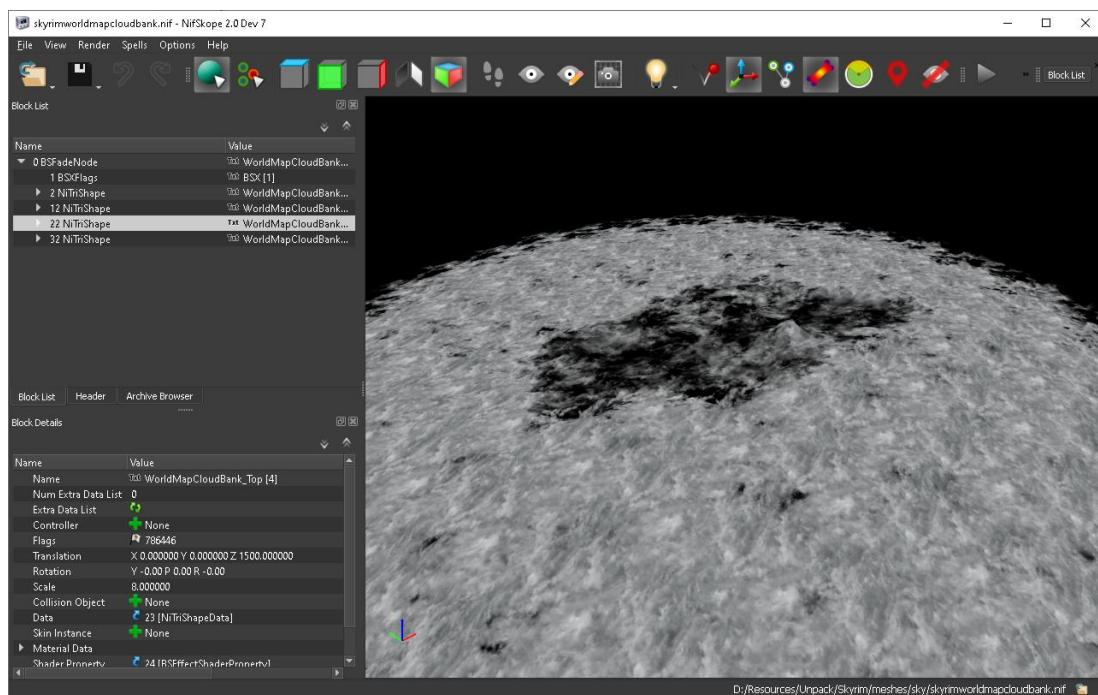


Figure 1009 - Base game cloud layer in NifSkope.

The easiest way to fix this is to weld the vertices. To accomplish this I'll be working with 3ds Max 2017.

The [NIF Export/Import Plugin for 3ds Max 2017](#) is available on Nexusmods. For other versions of 3ds Max, try [NIF Plugin for 3ds Max 2015-2018](#) available on Nexusmods.

Launch 3ds Max.

Go to Import.

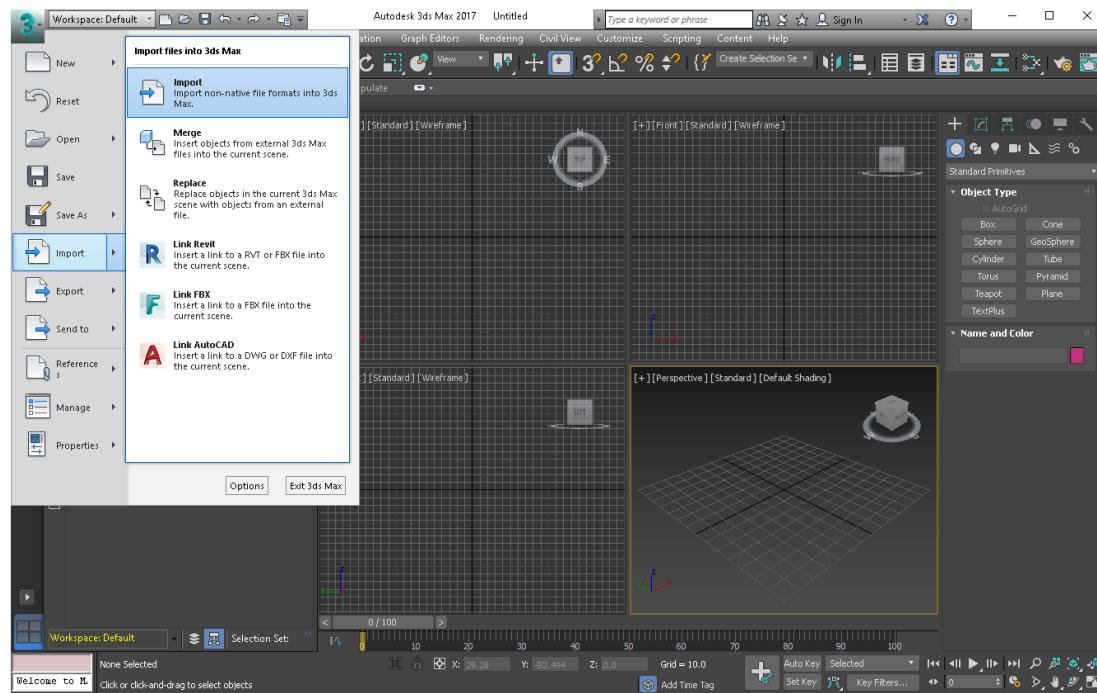


Figure 1010 - Importing a file.

Set the 'Files of type' to 'NetImmerse/Gamebryo (*.NIF, *.KF)' and select the `skyrimworldmapcloudbank.nif` file.

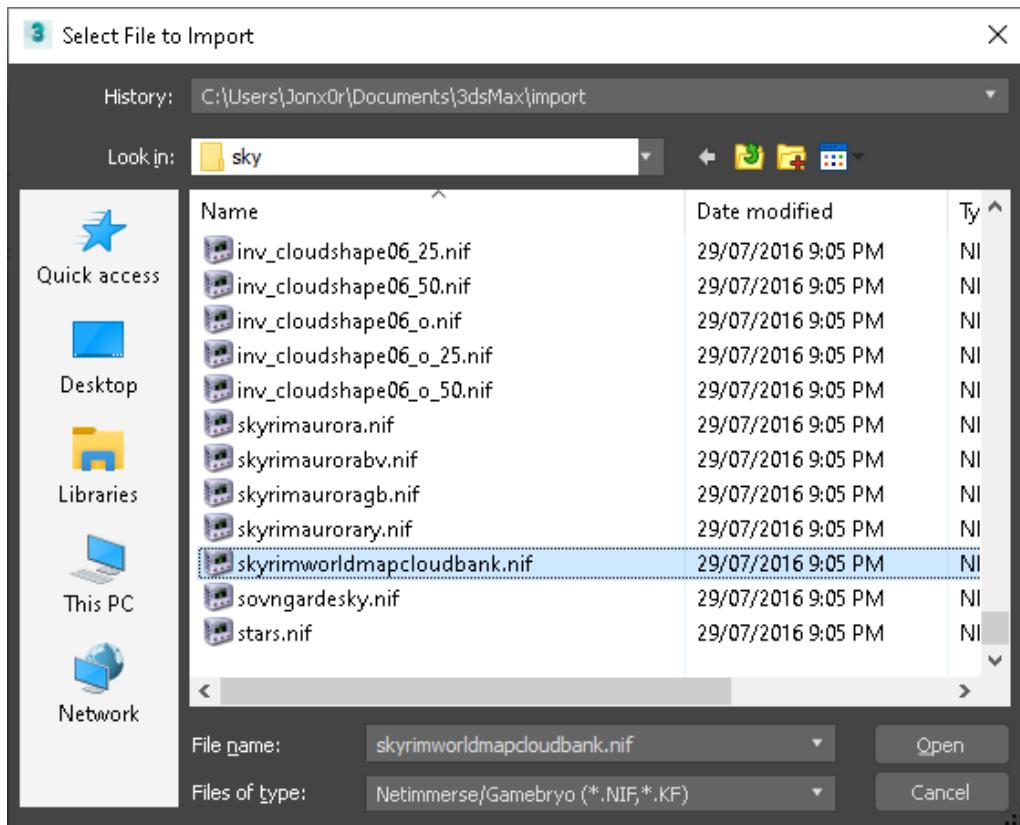


Figure 1011 - Selecting the default cloud bank .nif.

Click Open to import the .nif into 3ds Max.

Set Game to Skyrim.

I unticked the options under Geometry, Animation and Skeleton. I also unticked Flip UV, Ignore User Prop Buffers and Ignore Root Node in Miscellaneous.

Click Import.

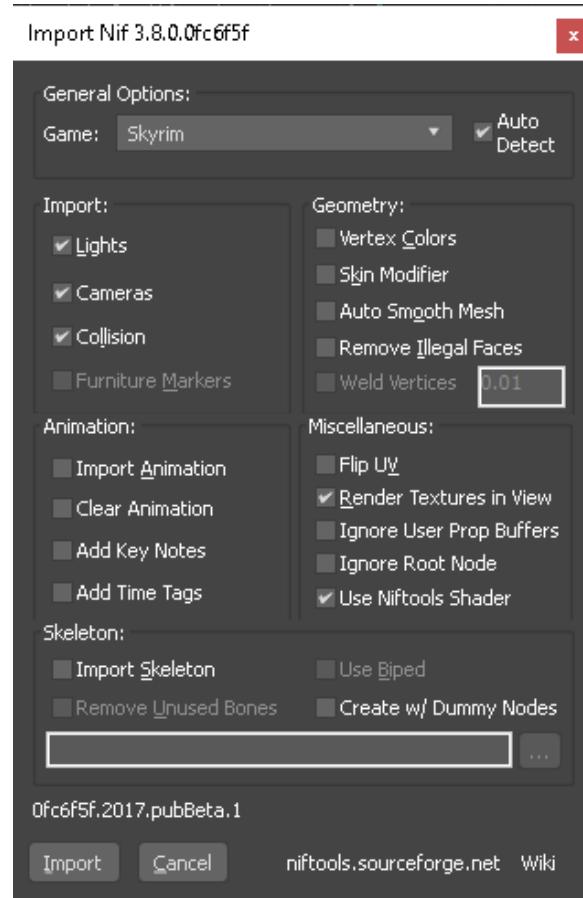


Figure 1012 - Import Nif screen.

The imported .nif should look like this.

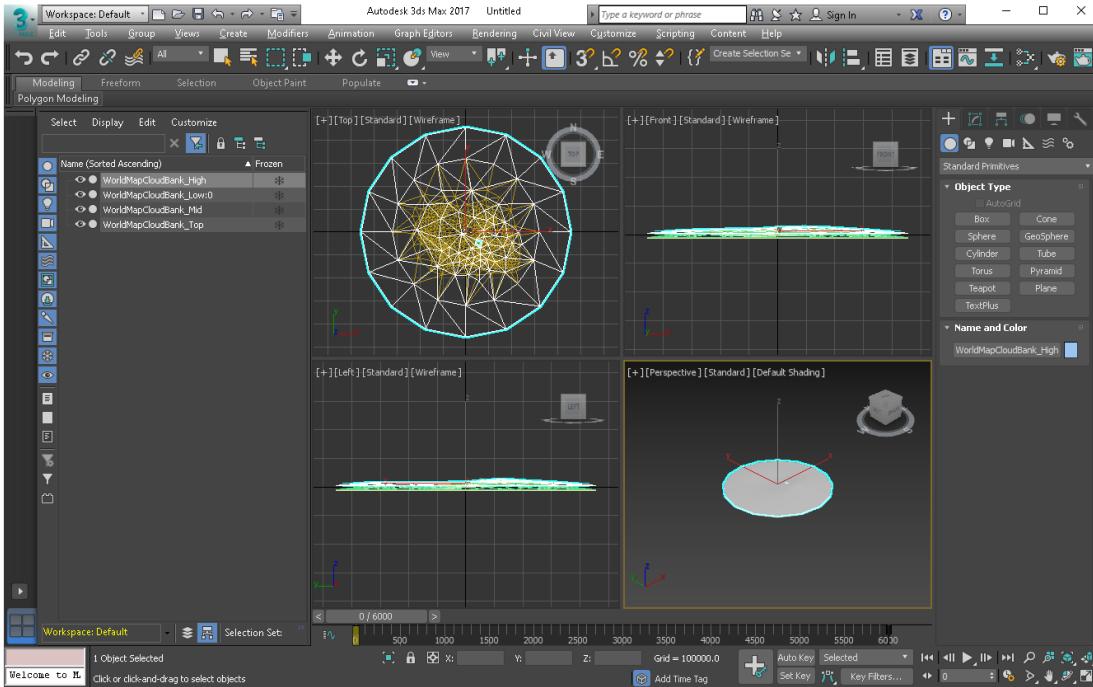


Figure 1013 - The cloudbank .nif imported into 3ds max.

The object is comprised of four circular planes to add multiple layers of clouds to the world map.

We can fix the clipping by welding the vertices within the cloud planes together.

Select the first plane, click on Modify, then click on Vertex mode.

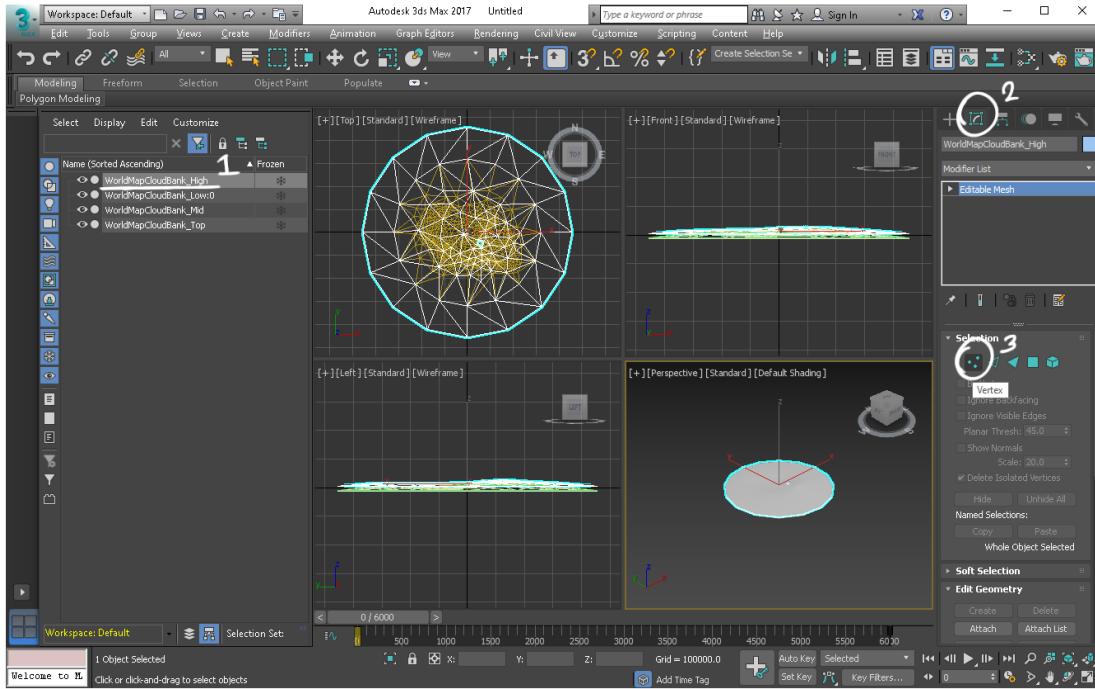


Figure 1014 - Entering vertex mode.

Set the Selection Region tool to lasso.

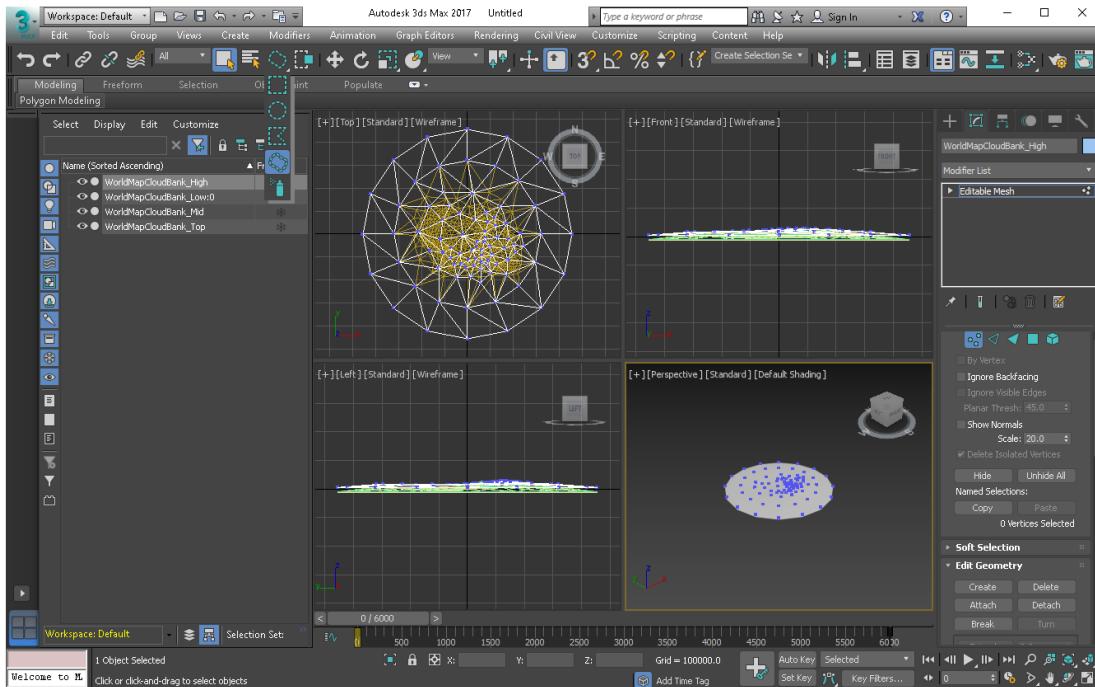


Figure 1015 - Setting the selection region tool to lasso.

In the Top view, lasso the vertices within the plane. Don't lasso the outside edge vertices.

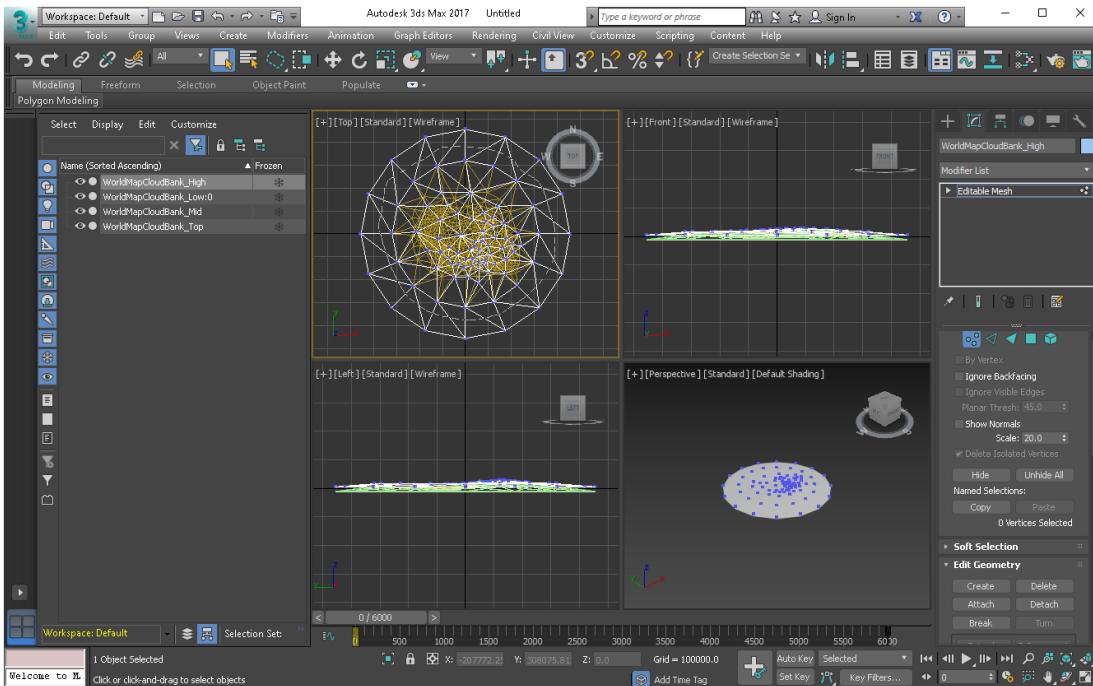


Figure 1016 - Lassoing the vertices.

If you try to weld, you'll probably see a message saying 'No vertices within weld threshold'.

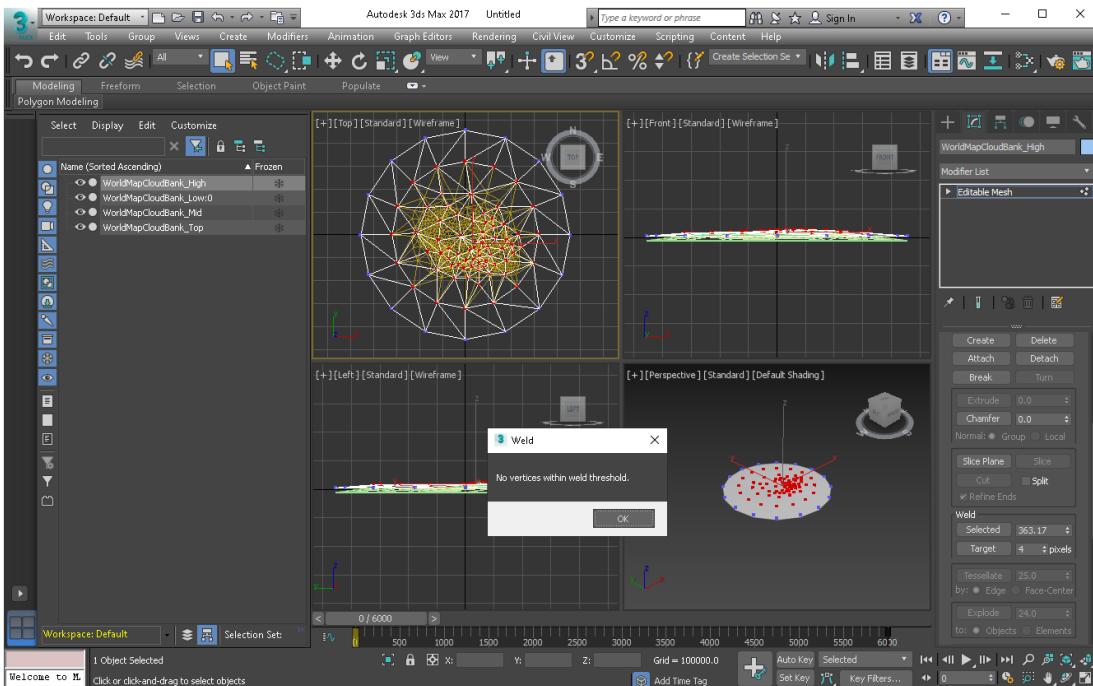


Figure 1017 - Weld message.

Increase the weld value then click Selected to weld all the selected vertices together to a single point.

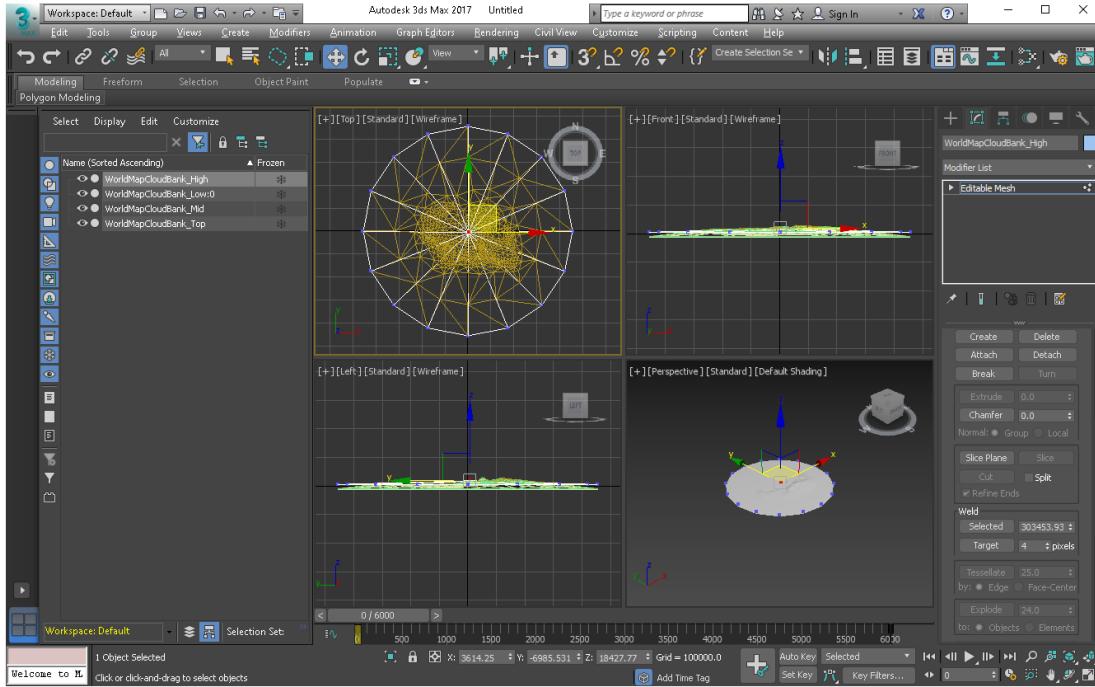


Figure 1018 - Welding all selected vertices.

You can then use the move tool to reposition the central vertex in the centre of the plane.

Repeat these steps for the other three layers.

Next, we'll need to rework the UV map.

If you haven't already, you'll need to add the texture paths to 3ds Max in order to see textures in the viewports. See the section on [Adding Texture Paths to 3ds Max](#) for steps on how to do this.

Select WorldMapCloudBank_High in the object list.

Hide the other layers by clicking on the 'eye' icon next to them.

Then go to Modifiers, click on the Modifier List drop-down and add UVW Map.

Now click on the UVW Map modifier to go to its settings.

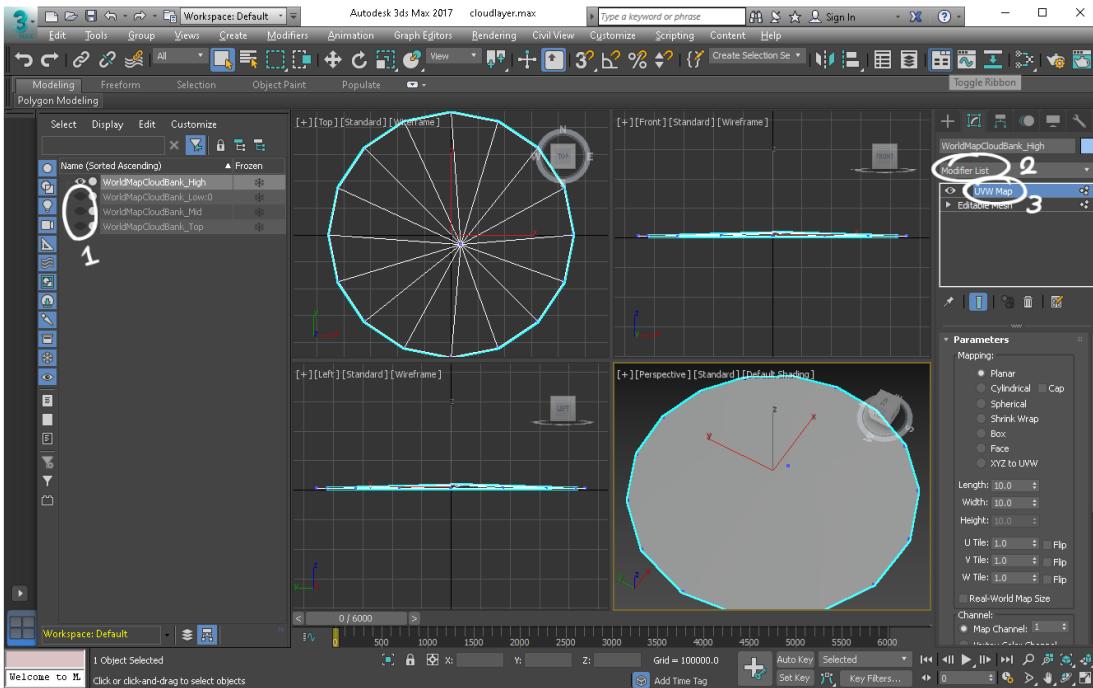


Figure 1019 - Adding a UVW Map modifier.

Firstly, make sure Mapping is set to Planar.

Go down and look for Alignment and set it to 'Z'.

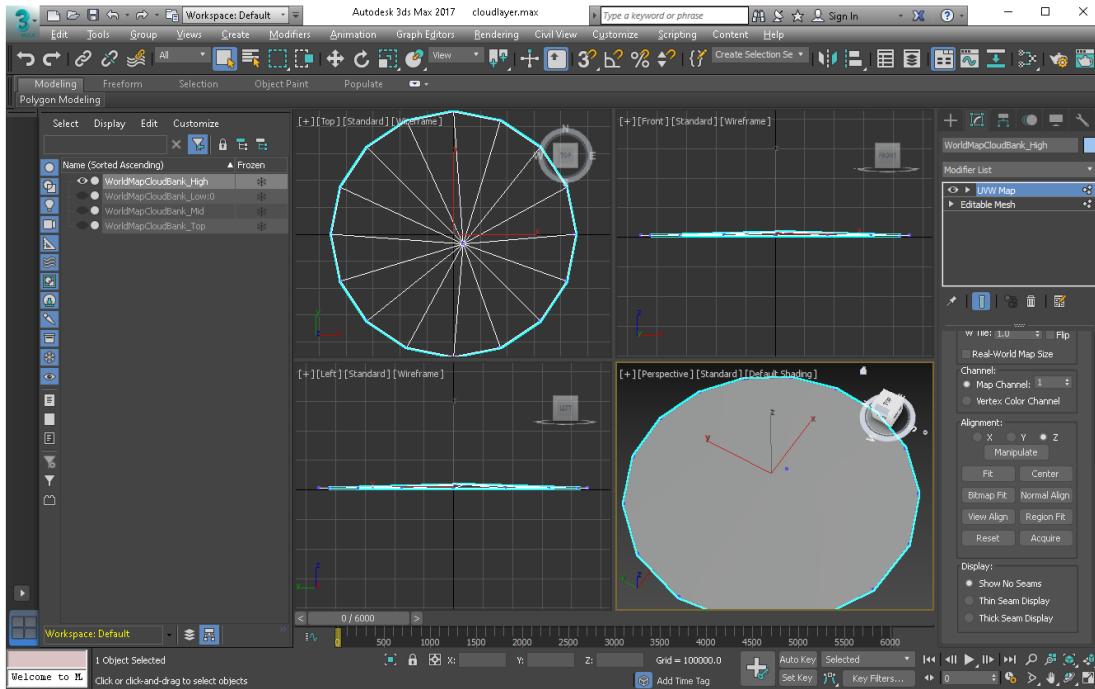


Figure 1020 - Setting UV map alignment.

Now go back up and set Length and Width to 10000.0.

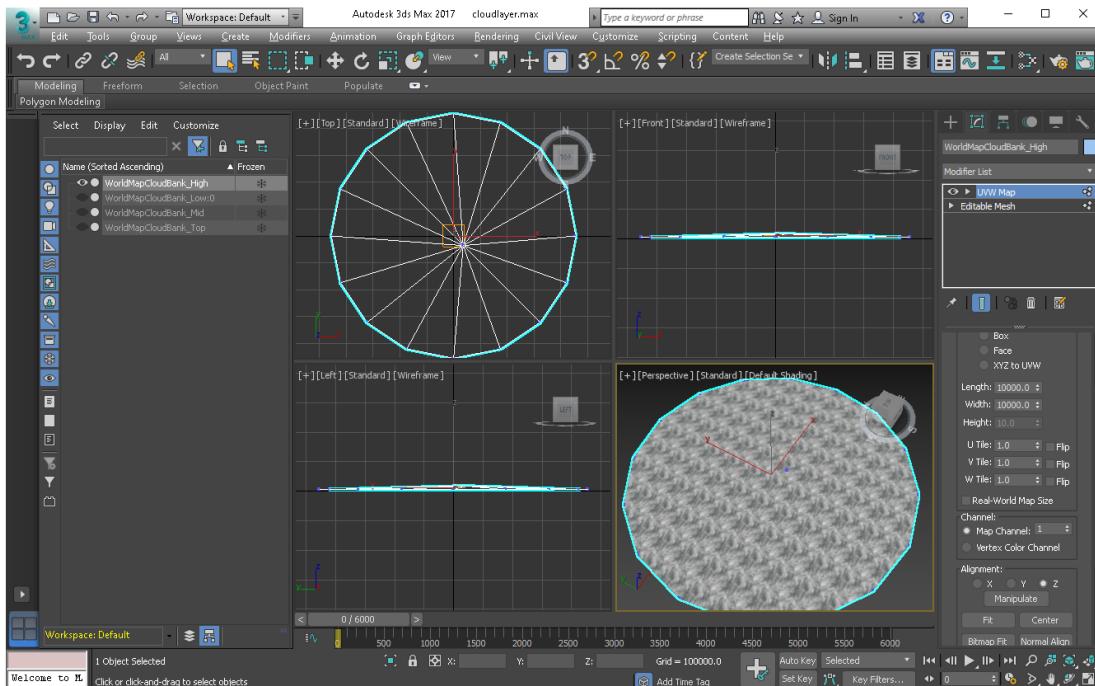


Figure 1021 - Setting length and width.

To export our changes, go to Export.

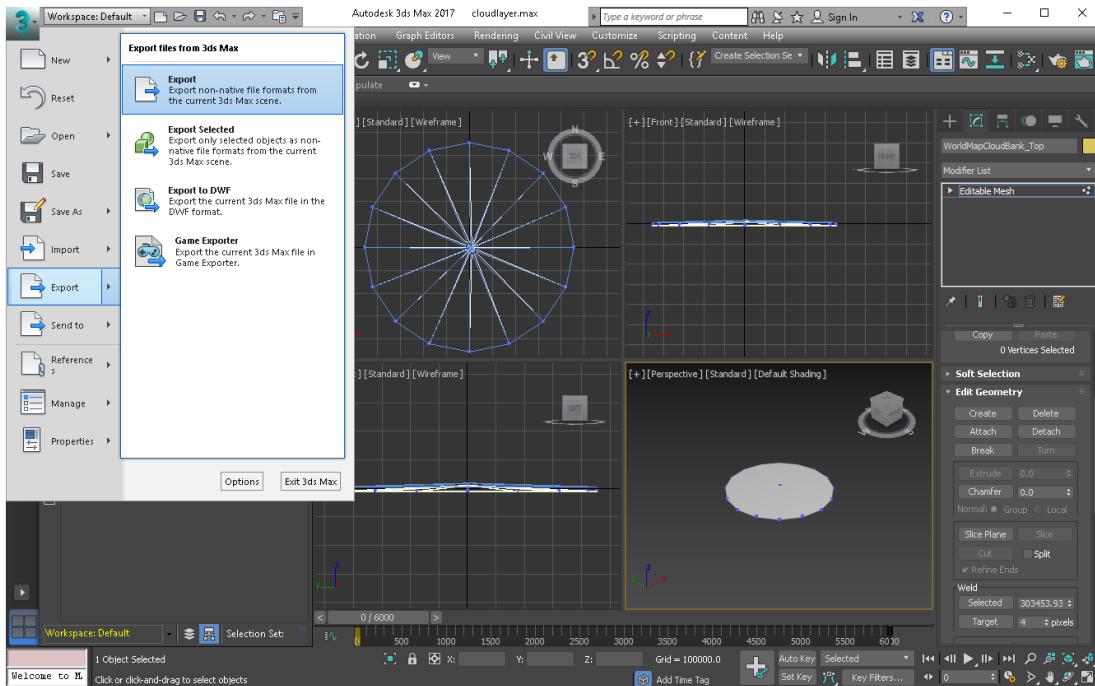


Figure 1022 - Exporting our changes to a new .nif file.

Set the location you want to save the .nif to and set ‘Save as type’ to ‘NetImmerse/Gamebryo (*.KF, *.NIF)’. In my example I just set the file name to testworldmapcloudbank_export.nif.

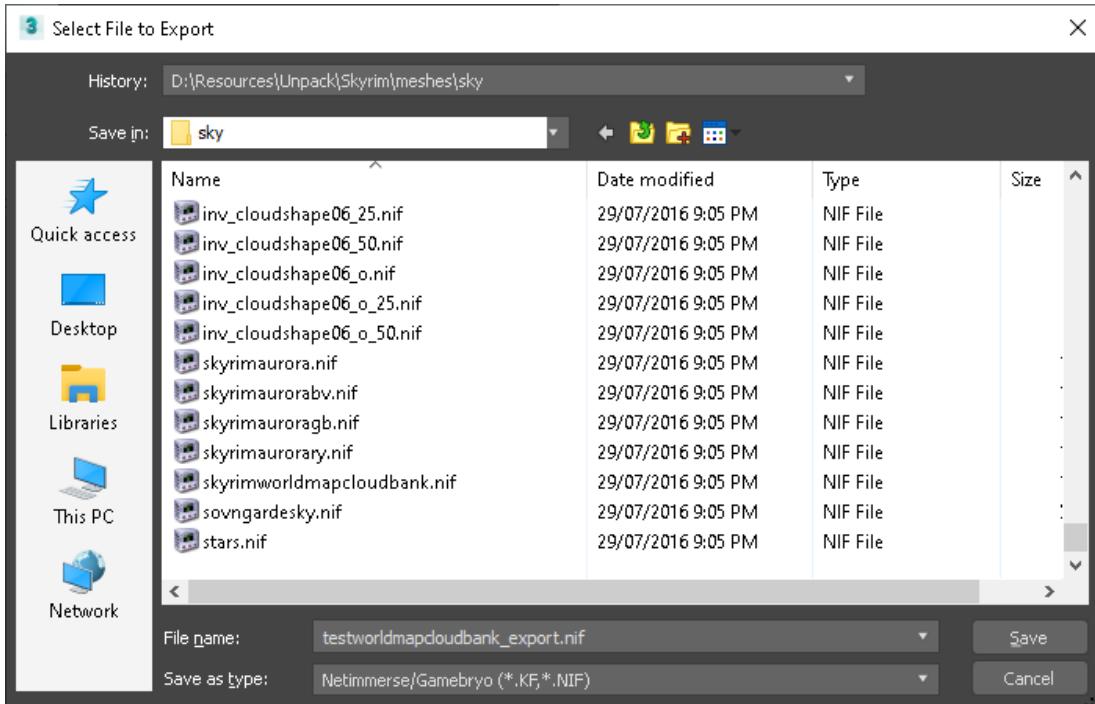


Figure 1023 - Setting the file type and file location.

Click Save.

Make sure Game is set to Skyrim.

Set the Root Node Type to BSFadeNode.

Click Export.

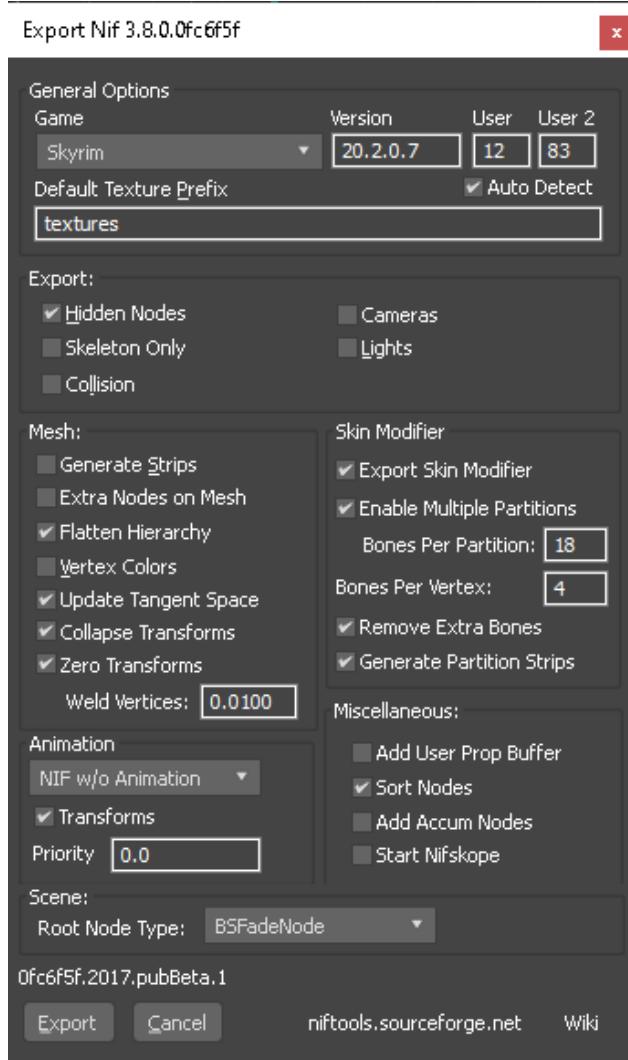


Figure 1024 - Configuring export settings.

Now we can close out of 3ds Max.

If we open our exported .nif in NifSkope, it'll look like this:

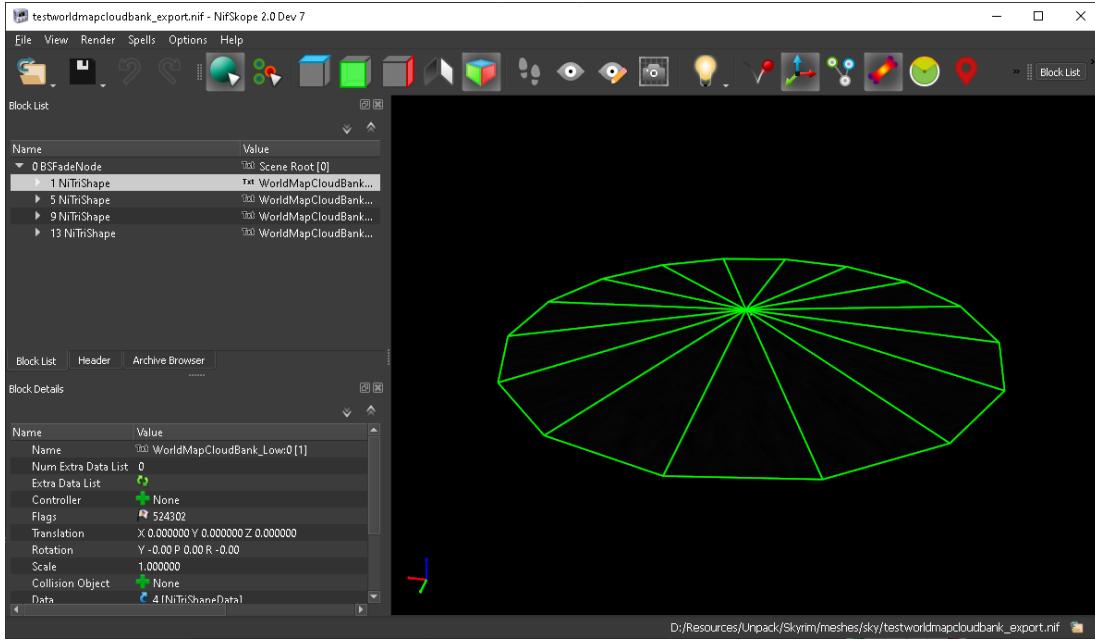


Figure 1025 - Our exported .nif in NifSkope.

It doesn't look like the exporter is able to create a few blocks we need, such as the NiAlphaProperty block. There are also some shader flags that weren't set, but we can fix this with NifSkope.

The easiest way to rectify this situation is to make a copy of the original `skyrimworldmapcloudbank.nif`.

For my example, I renamed it to `testworldmapcloudbank.nif`.

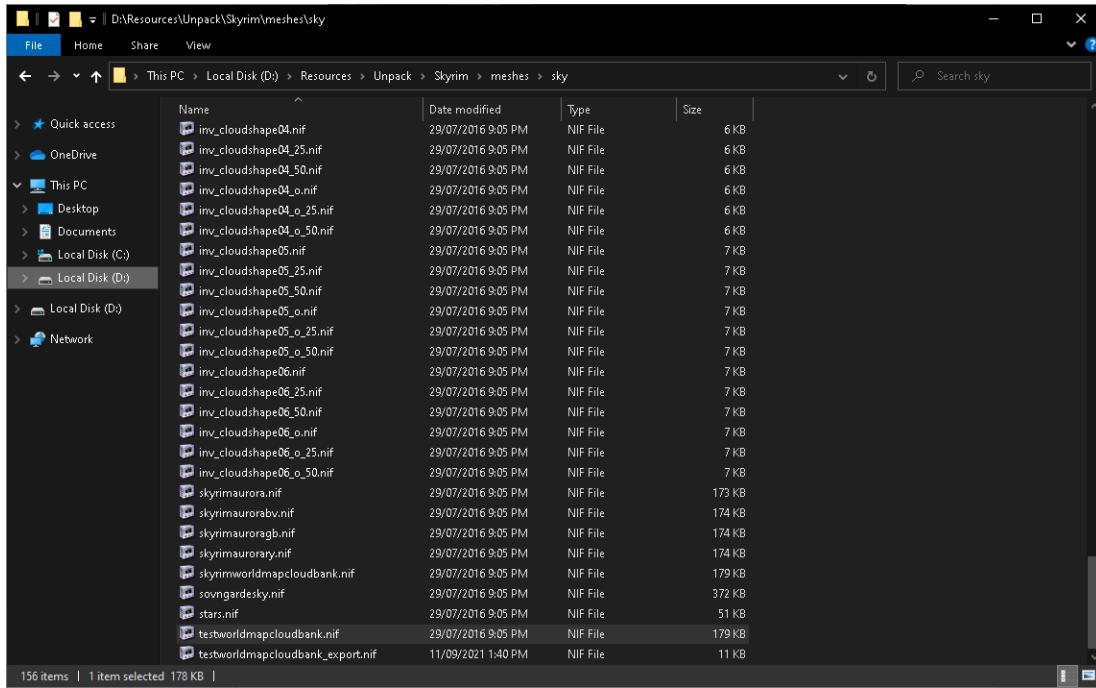


Figure 1026 - Made a copy of the `skyrimworldmapcloudbank.nif`.

Alright, open both `testworldmapcloudbank.nif` and `testworldmapcloudbank_export.nif` in NifScope.

In testworldmapcloudbank_export.nif, navigate to 0 BSFadeNode > 13 NiTriShape > 16 NiTriShapeData.

Right-click on this block and go to Block > Copy.

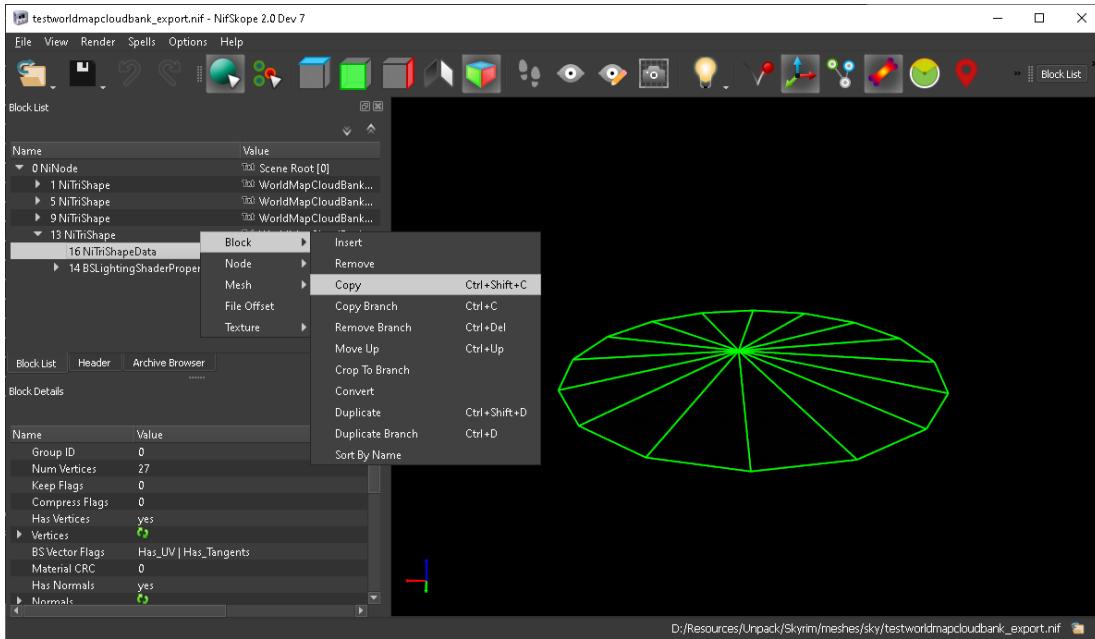


Figure 1027 - Copying the NiTriShapeData block.

Go to testworldmapcloudbank.nif, navigate to 0 BSFadeNode > 2 NiTriShape > 3 NiTriShapeData.

Right-click on this block and go to Block > Paste Over.

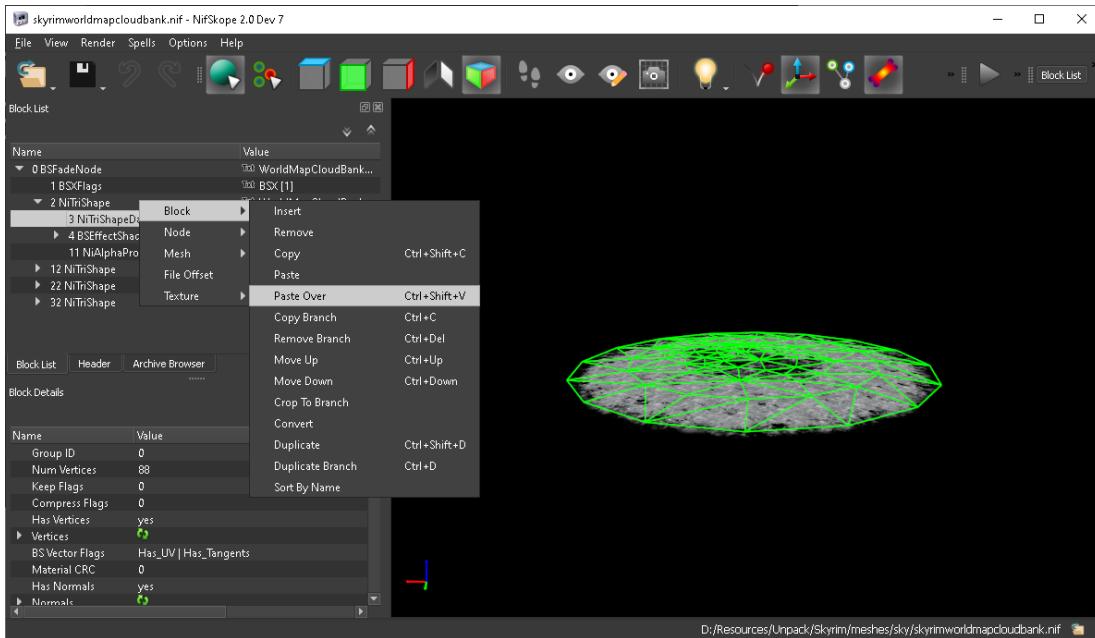


Figure 1028 - Pasting NiTriShapeData from one .nif to another.

It'll appear enormous in the viewport.

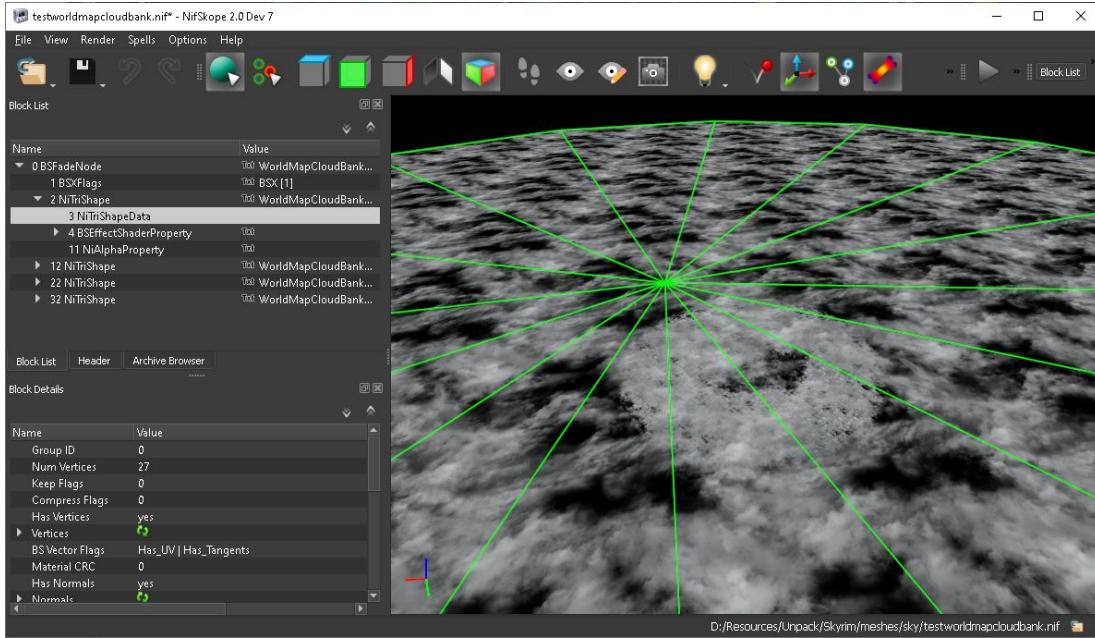


Figure 1029 - Replaced the existing NiTriShapeData block with the one from our export.

To fix that, click on the NiTriShape block above it and in the properties set the Scale to 1.000000.

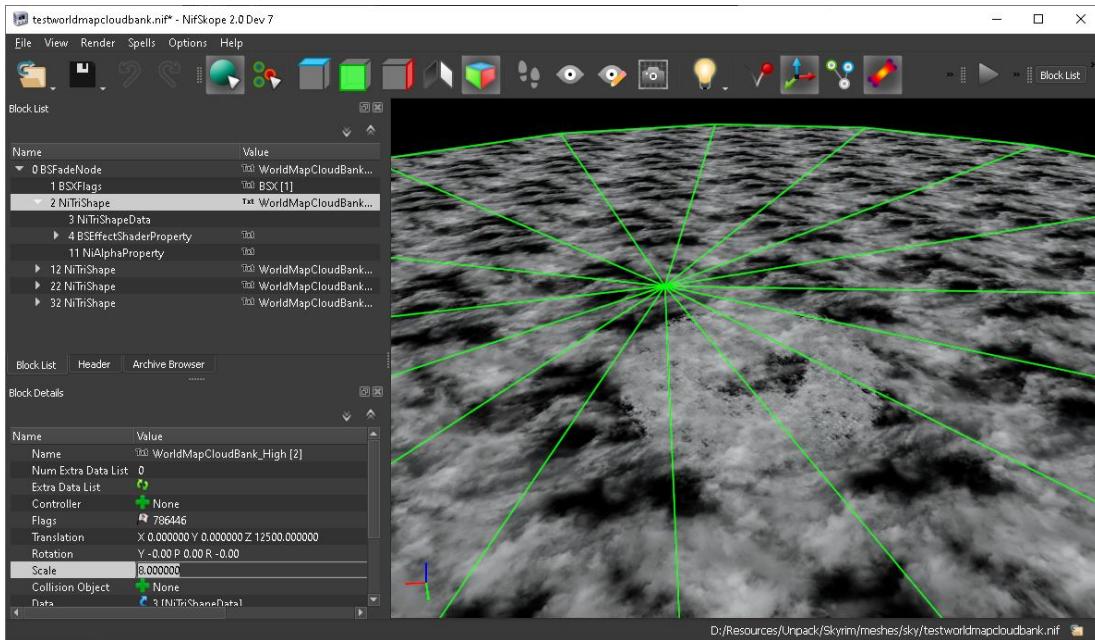


Figure 1030 - Changing the scale of the NiTriShape block.

It's now a more reasonable size.

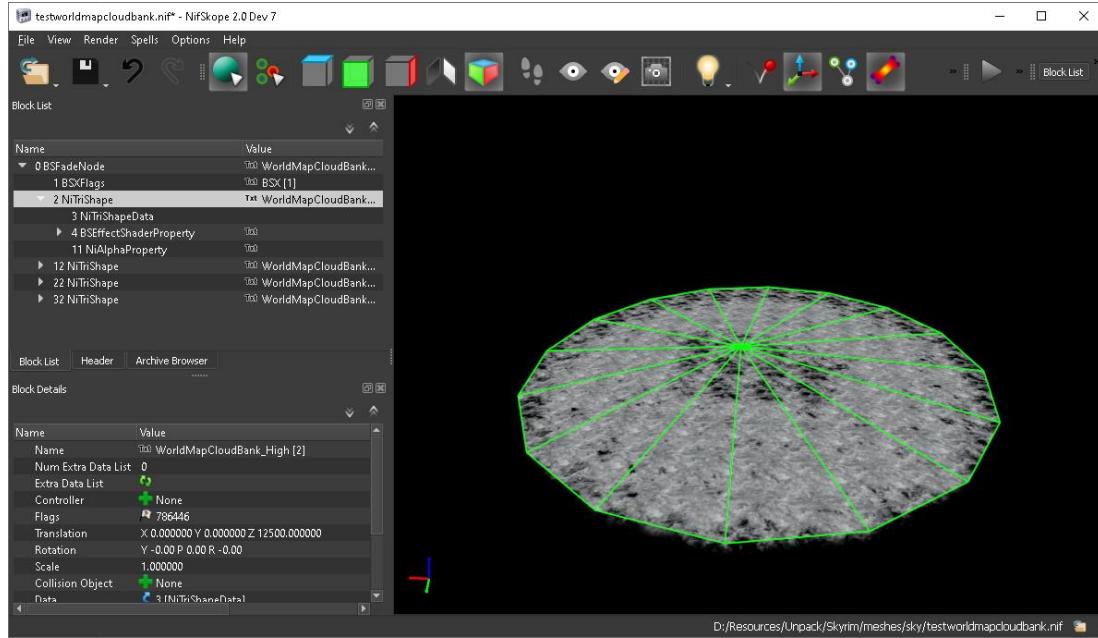


Figure 1031 - Resized the NiTriShape node.

Repeat these steps for the other three NiTriShapeData blocks.

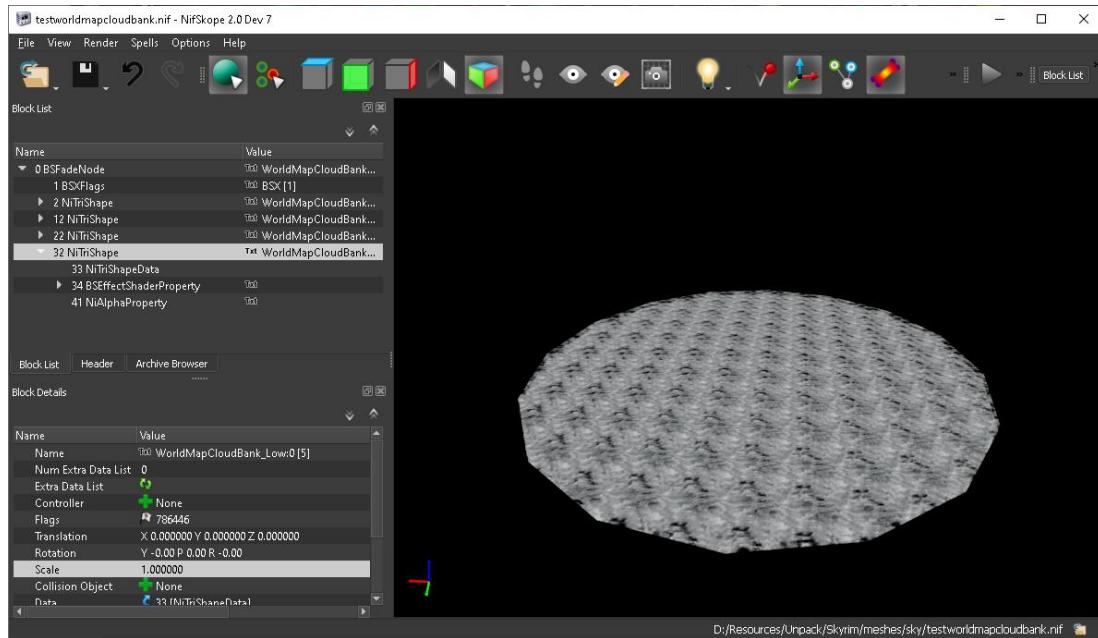


Figure 1032 - All four NiTriShapeData blocks replaced.

To break up that repeating pattern, I added some rotation to each NiTriShape block.

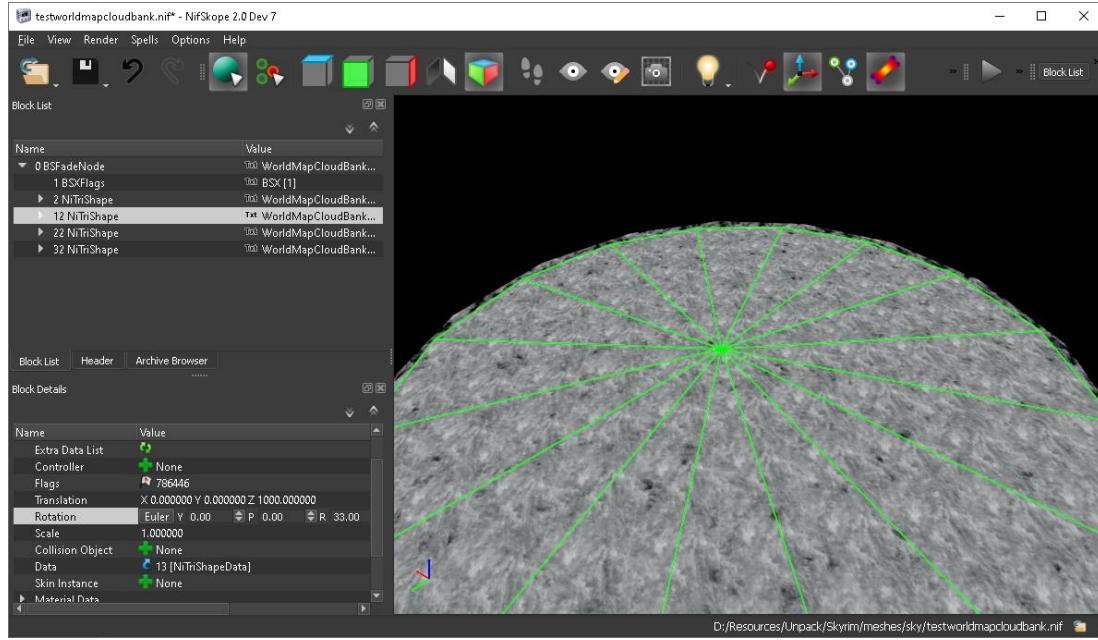


Figure 1033 - Adding rotation.

Double-click on the values next to Rotation and set R to a random number. In my example I set R to 33.00.

Repeat this step for each NiTriShape block.

Let's not completely cover our map with clouds. To clear up the central part of the plane, we'll need to modify the vertex colours.

Browse to 0 BSFadeNode > 2 NiTriShape > 3 NiTriShapeData.

In the properties, expand Vertex Colours.

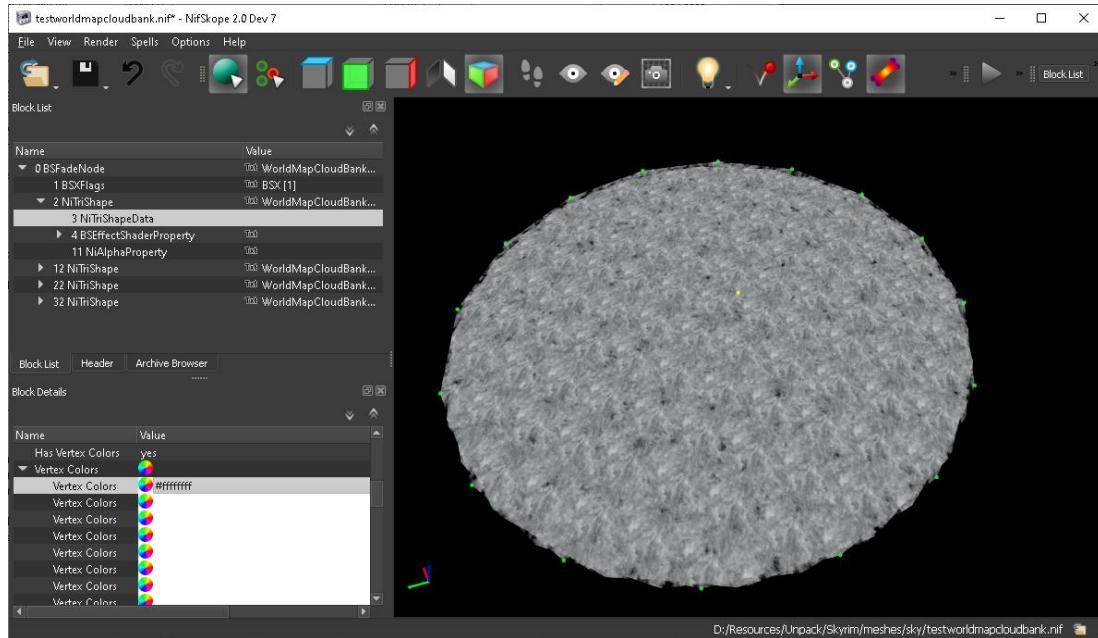


Figure 1034 - Vertex colours.

Vertices are green. The currently selected vertex is yellow. Browse down the Vertex Colours list until the central vertex is highlighted yellow.

Double-click on the value to the right to edit it. Currently it shows #ffffffff.

Set the ‘A’ value to 0.000. This will make the currently selected vertex transparent.

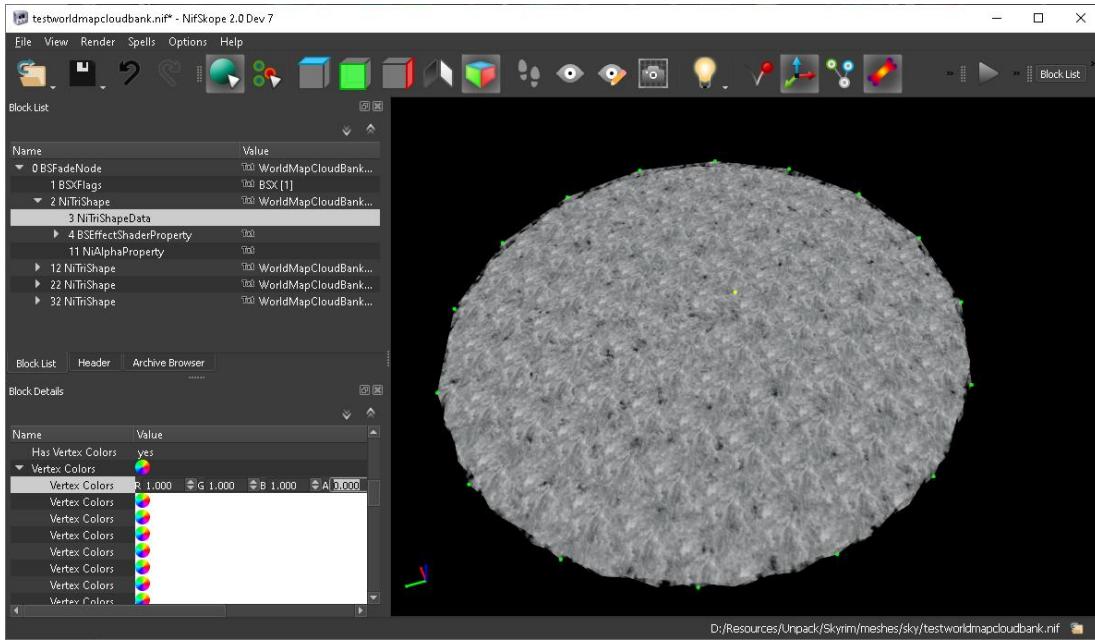


Figure 1035 - Setting the alpha to 0 for the currently selected vertex.

Go down through the list and set the alpha to 0 for the other Vertex Colour entries that highlight the central vertex.

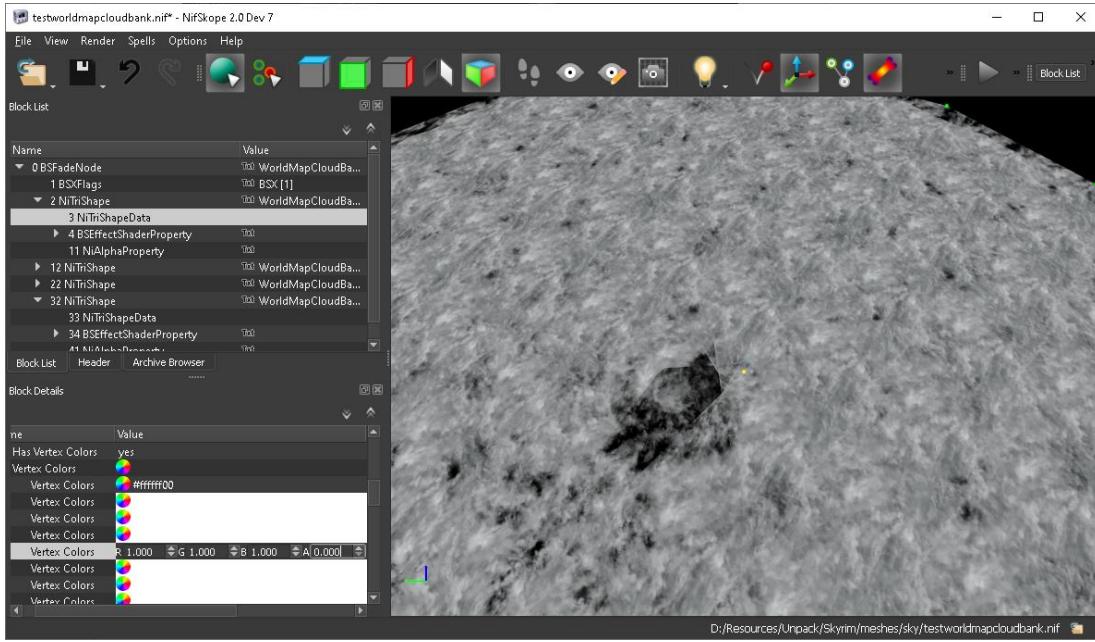


Figure 1036 - Changing the next vertex.

Repeat these steps for the other three NiTriShapeData blocks until all the central vertices for all four layers have their alpha set to 0.

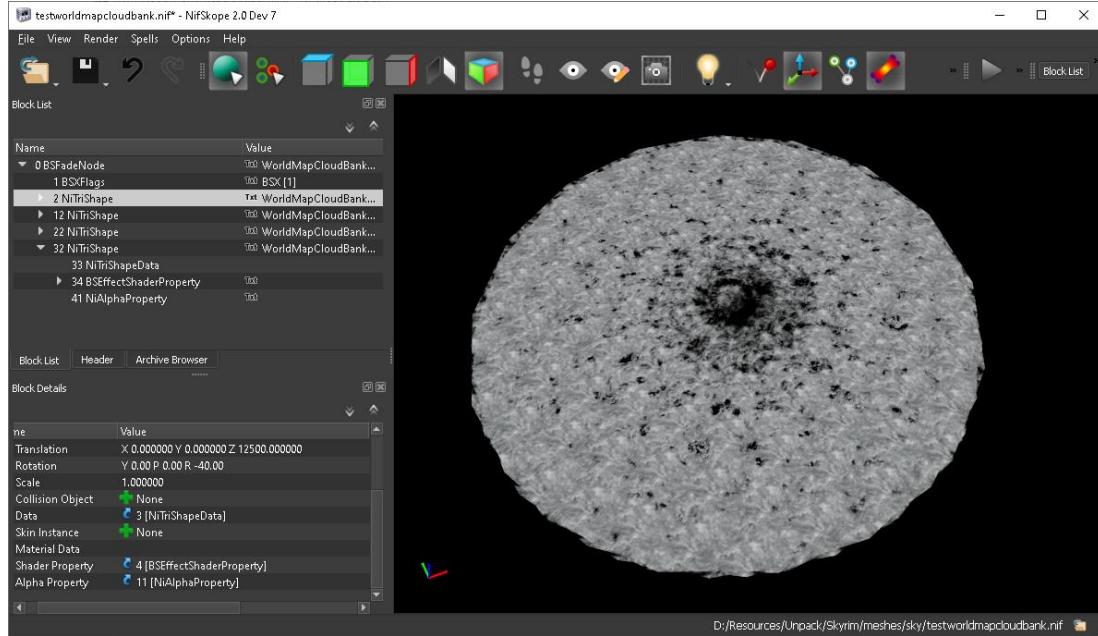


Figure 1037 - A hole in the clouds.

We should now have a hole in the clouds near the centre.

The rest of the cloud plane looks a bit thick, so I'm going to go back at reduce the alpha for the remaining vertices for all four NiTriShapeData blocks as well.

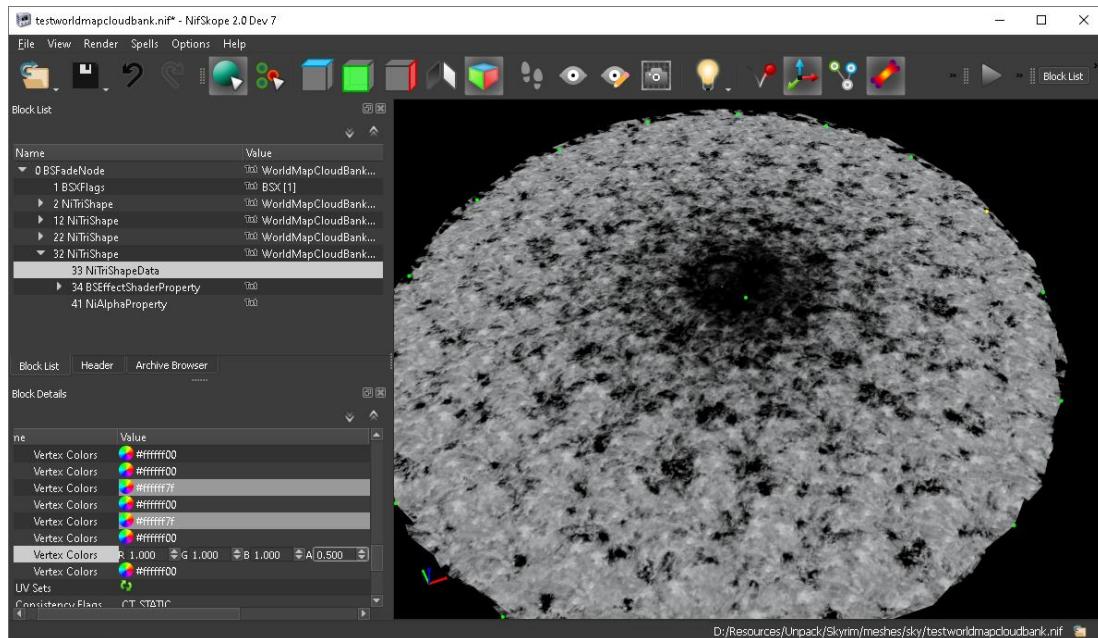


Figure 1038 - Reduced the alpha on the other vertices.

Alright, this looks good enough to try out.

Go to File > Save As.

Save .nif to your Skyrim\Data folder. I'm saving my .nif to Skyrim\Data\Meshes\sky.

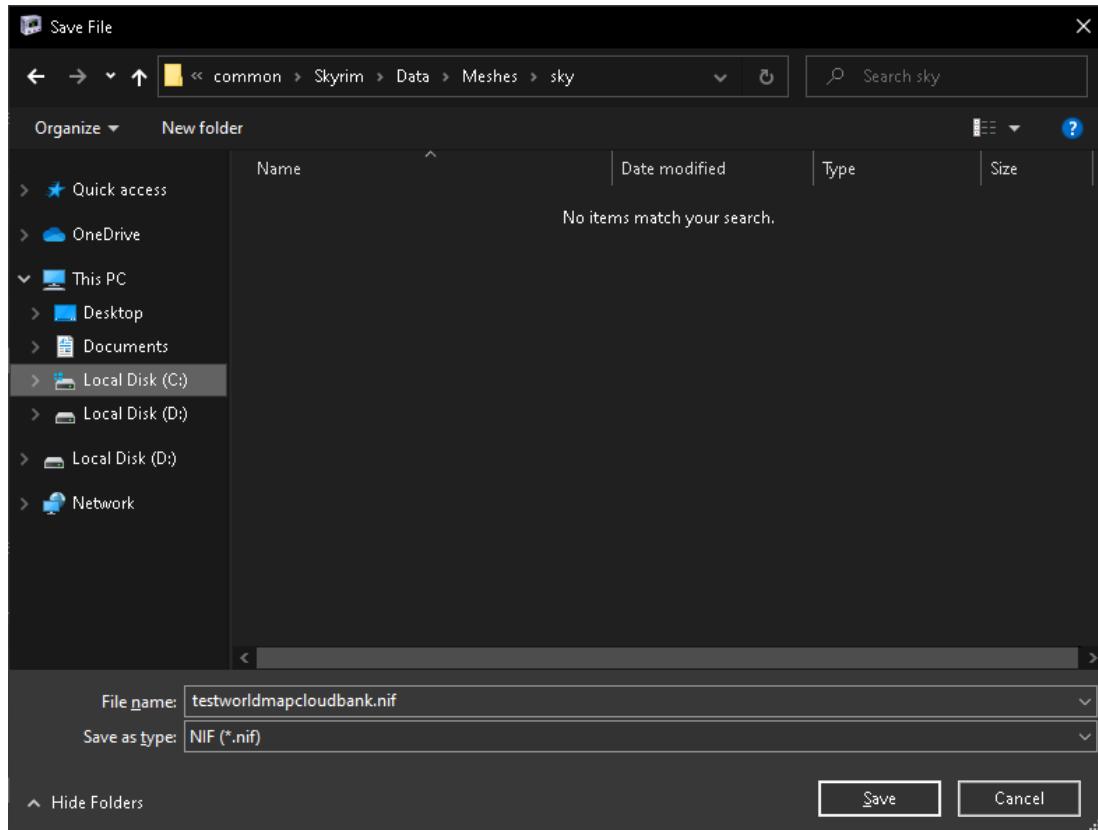


Figure 1039 - Saving our cloud plane to the Skyrim data folder.

Our world space is using testworldmapcloudbank.nif, so the testworldmapcloudbank_export.nif exported from 3ds Max can now be deleted as we don't need it anymore.

Back in the Creation Kit, go to World > World Spaces.

Highlight your world space in the list and click on the Edit button next to Cloud Model.

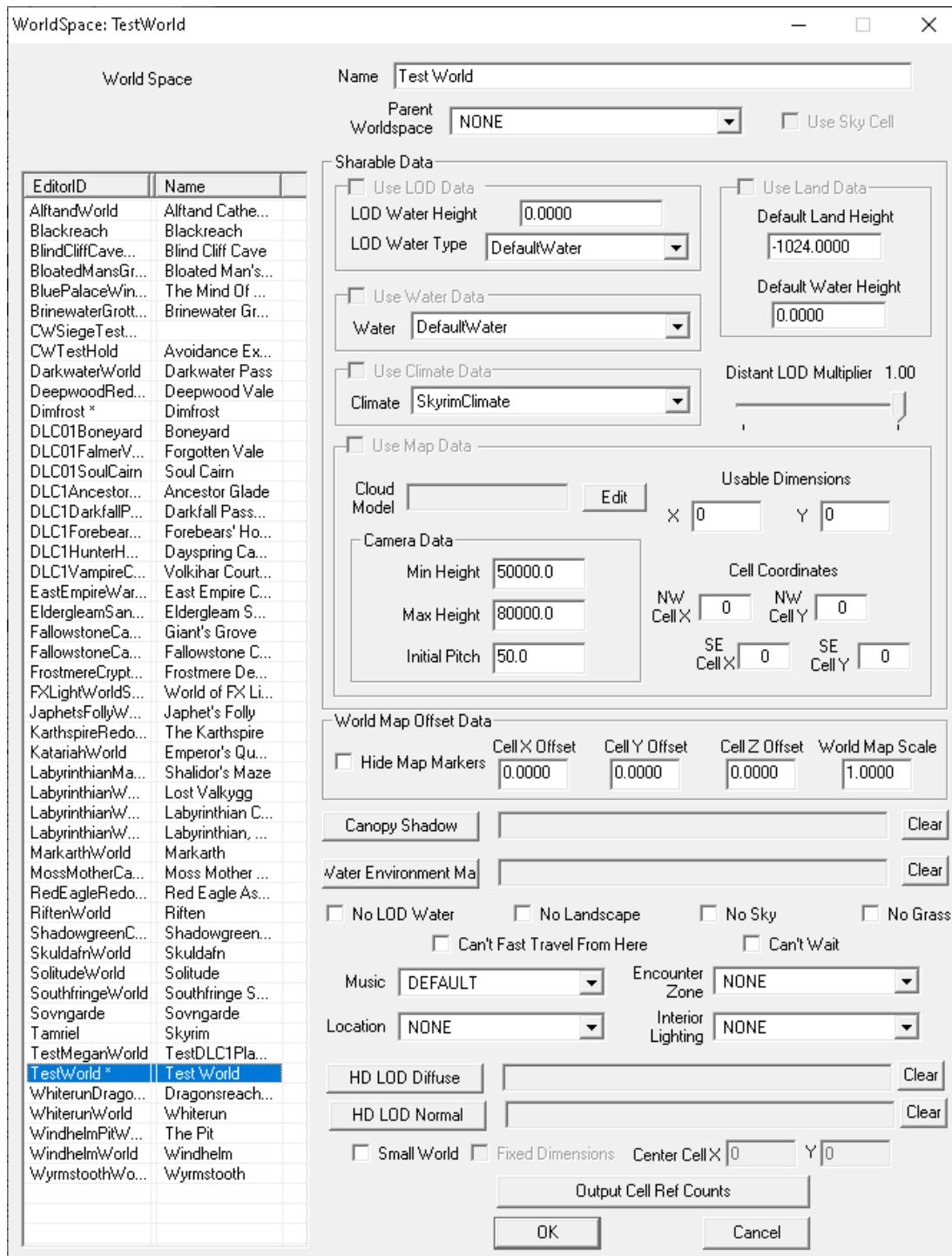


Figure 1040 - Adding a cloud model.

Select the cloud bank .nif you just saved.

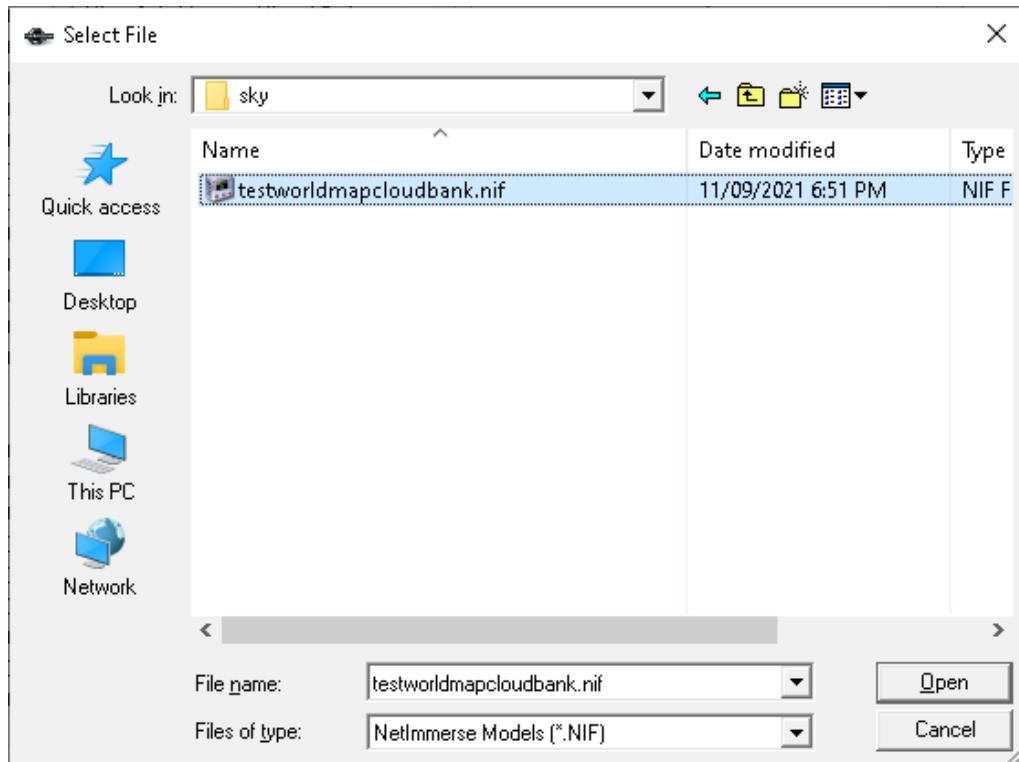


Figure 1041 - Selecting our cloud model.

Click OK to close out of world space properties.

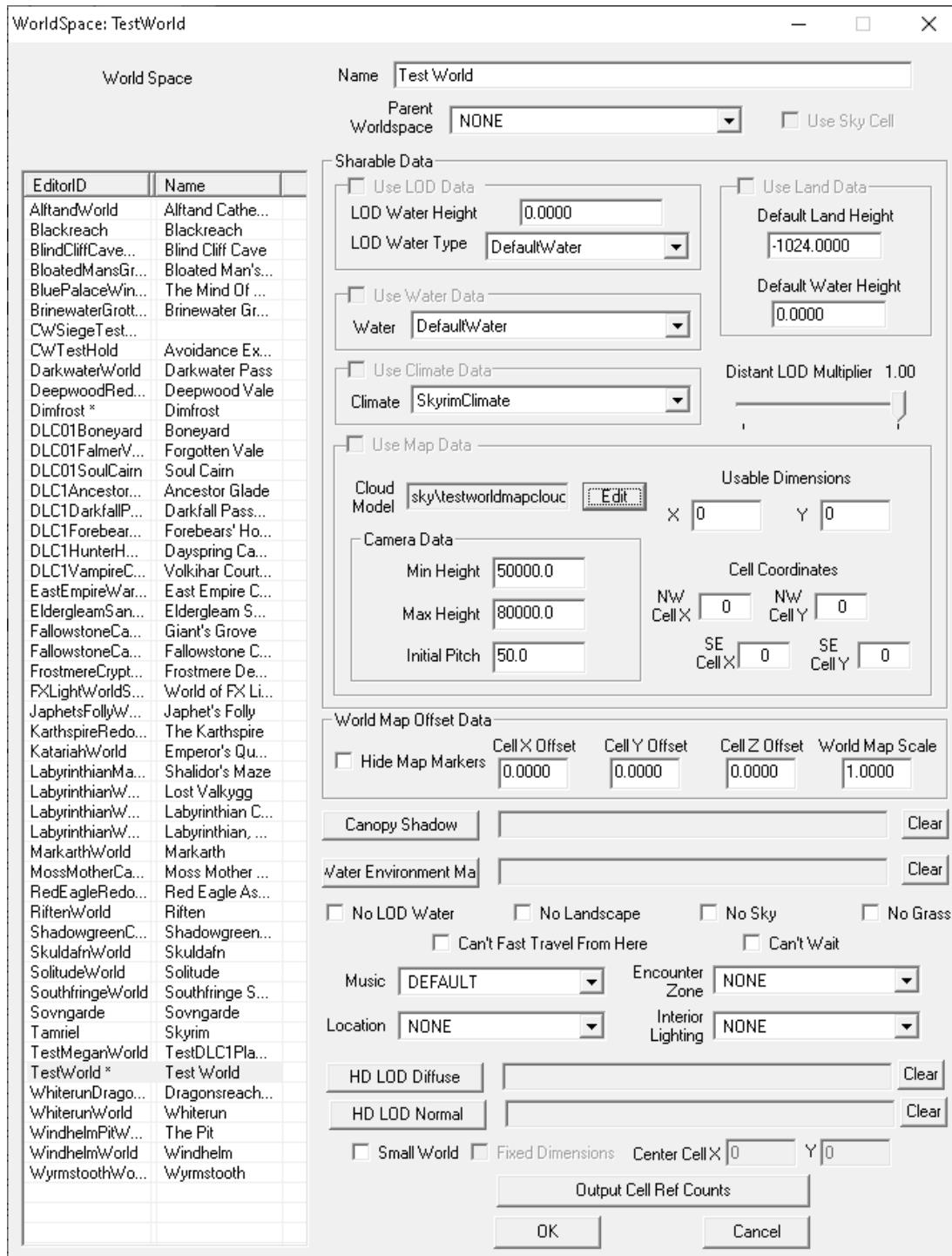


Figure 1042 - Cloud model added.

Now if we go in-game we'll be able to see our new cloud layer on the map screen. No more cloud seams. The clouds are also sparse near the centre of the map so we can see our world space clearly.

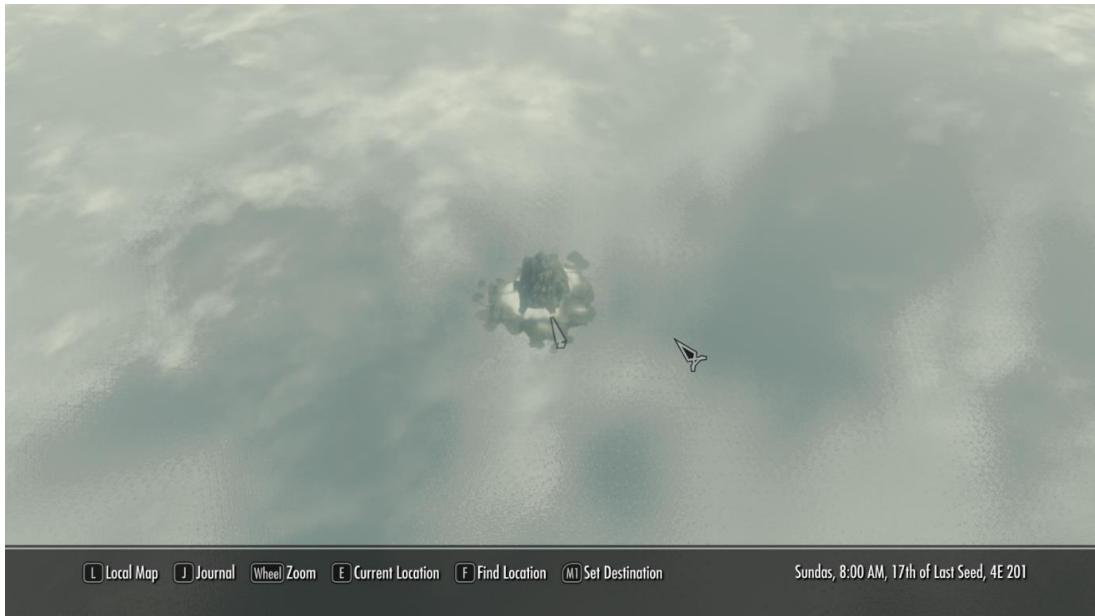


Figure 1043 - Test world map with custom cloud layer.

Lastly, let's look at a couple extra things you might want to change.

If you have a default climate you want to add to your world space, you had add it in the Climate drop-down.

For Wyrmstooth, I created a WTWyrmstoothLocation for the WyrmstoothWorld world space and a WTDimfrostLocation for the DimfrostWorld world space for scripting purposes so I can check the player's current location.

One final thing you might want to do here is tweak the camera data. By Default, the Min Height, Max Height and Initial Pitch values are set up for the Tamriel world space.

For smaller world spaces, you should bring the camera a bit closer to the ground, especially if you have a lot of locations close to each other. Having the camera too high up might make it hard for players to select certain locations to fast travel to.

Note: It also makes the world space seem a bit larger than it actually is, but in my defence Bethesda did it too with the Solstheim world space! ☺

For Wrymstooth, I set the Min Height to 32000, the Max Height to 50000 and the Initial Pitch to 60 which I think is close to how the Solstheim world space is set up in the Dragonborn DLC.

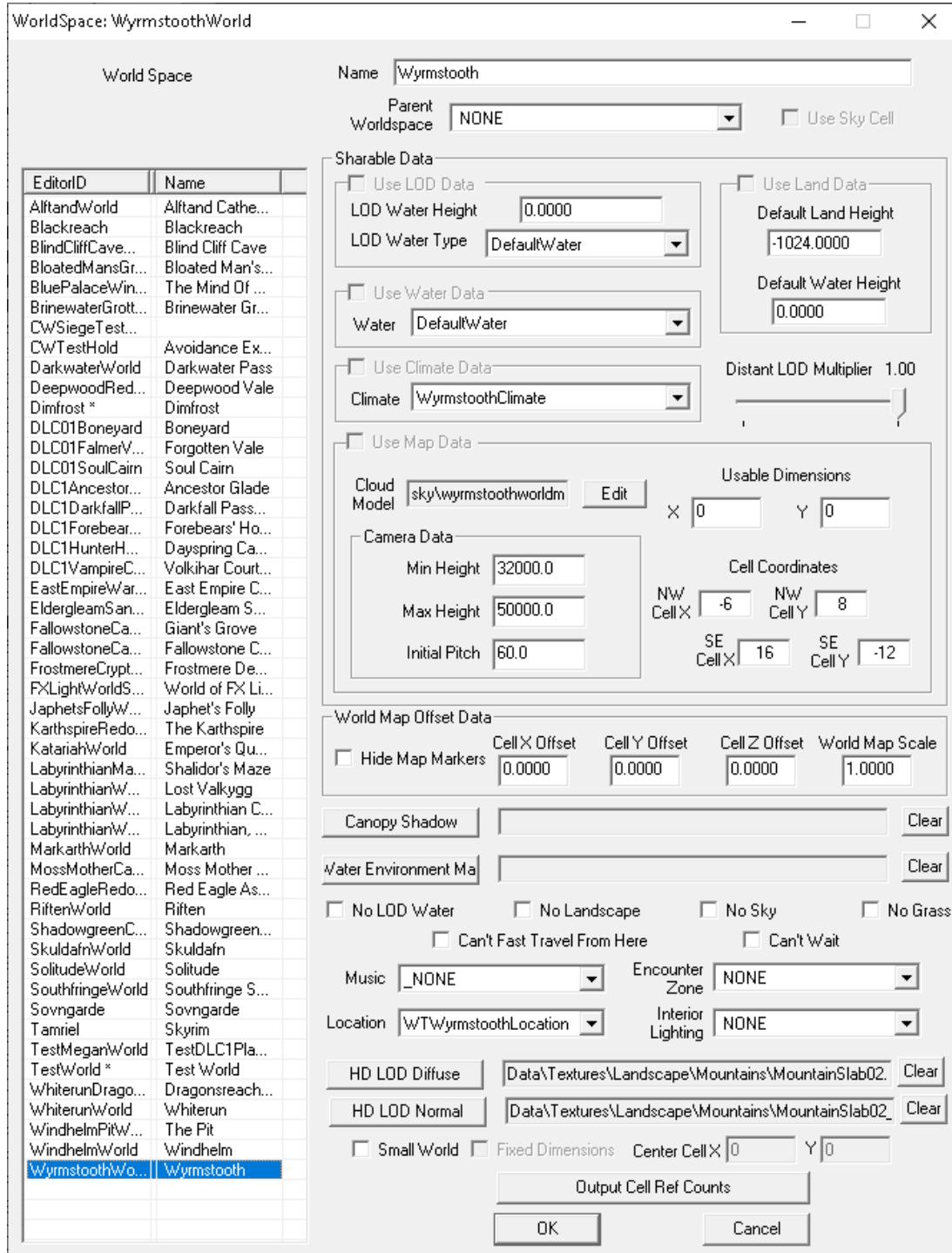


Figure 1044 - Setting the camera data values.

GENERATING MAX HEIGHT DATA

Max height data is used by dragons to prevent them from clipping through objects like mountains and buildings when flying around.

To generate max height data, go to World > Generate Max Height Data for World.

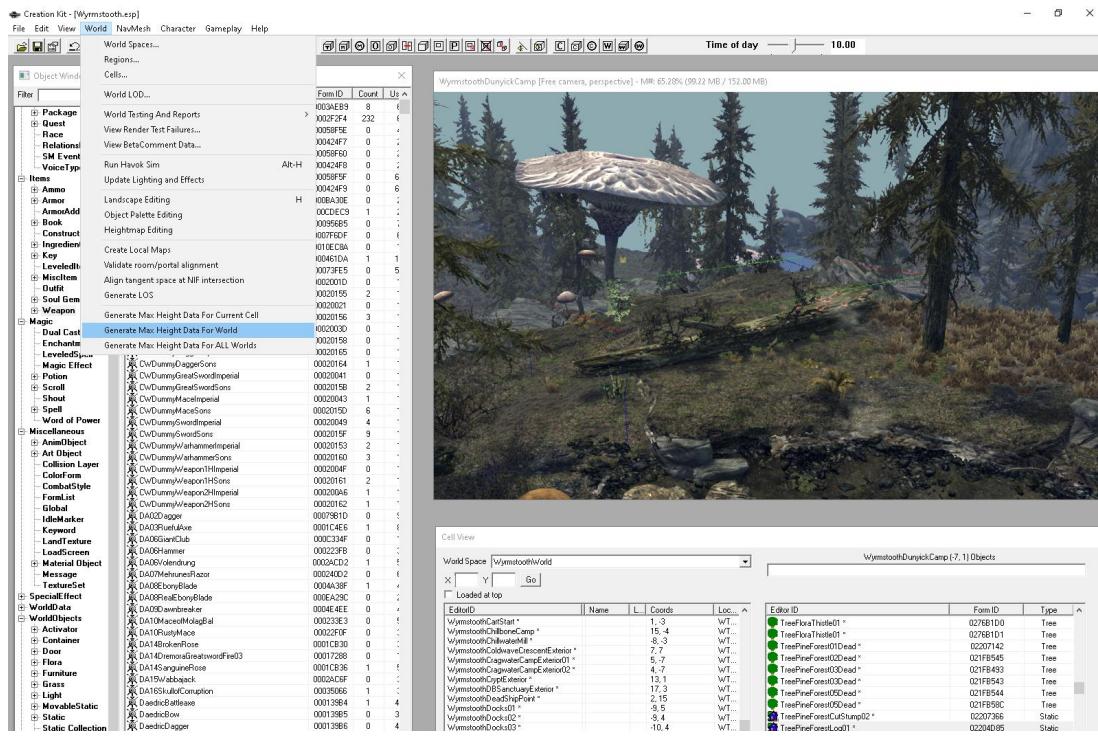


Figure 1045 - Generate Max Height Data.

Select your world space then click OK.

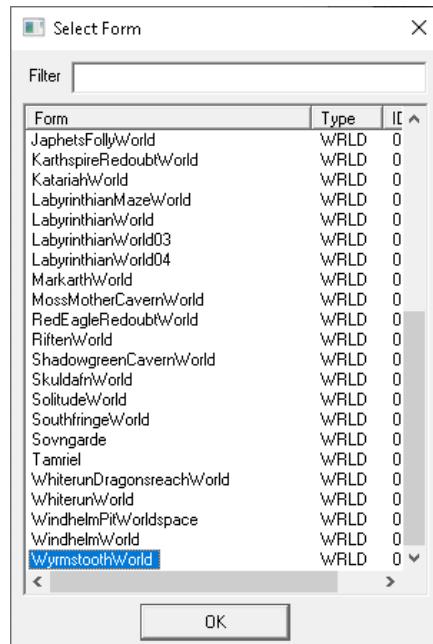


Figure 1046 - Generate Max Height Data world space selection.

Click Yes on the confirmation pop-up to begin the process.

Important: The Creation Kit will lock-up until the process is complete and that may take quite some time depending on the size and complexity of your world space.

Also be aware that this process may sometimes not complete at all. If it's been more than an hour and the Creation Kit is still locked up, use Task Manager to close CreationKit.exe and try again.

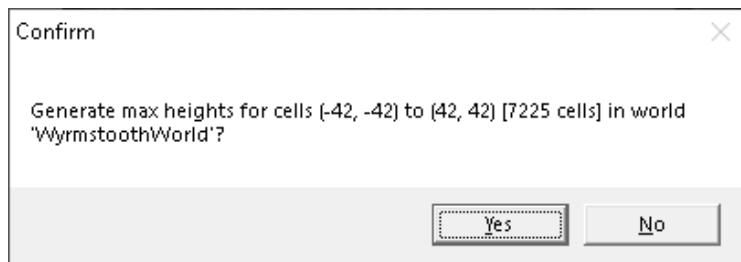


Figure 1047 - Generate Max Height Data world space confirmation.

If you have previously built Max Height Data for that world space, you'll also see the following pop-up window. I'd recommend choosing No to regenerate the data from scratch.

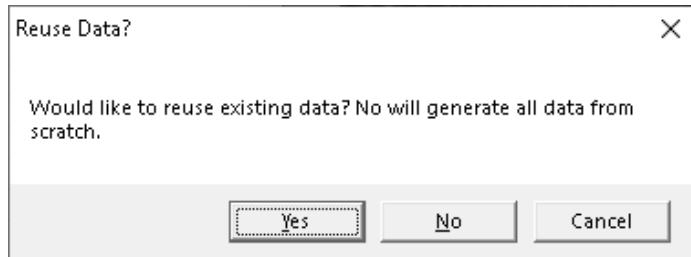


Figure 1048 - Generate Max Height Data reuse existing data confirmation.

If there are multiple world spaces in your mod, I'd recommend doing each one separately, saving in between as this procedure may also potentially crash the Creation Kit.

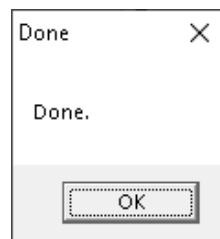


Figure 1049 - Done.

When the process is done, you'll see a pop-up simply saying Done. Click OK.

GENERATING TVDT OCCLUSION

This type of data is used to hide distant terrain models that are occluded by other distant terrain models to improve performance.

Important: While this data *can* be generated in the Creation Kit, from what I've seen it doesn't generate it accurately and will lead to LOD being occluded when it shouldn't be.

So we'll need a copy of the [xLODGen beta](#).

Download and extract it to a folder. Make a copy of xLODGen.exe and rename it TES5Edit.exe/SSEEdit.exe.

Launch xEdit.

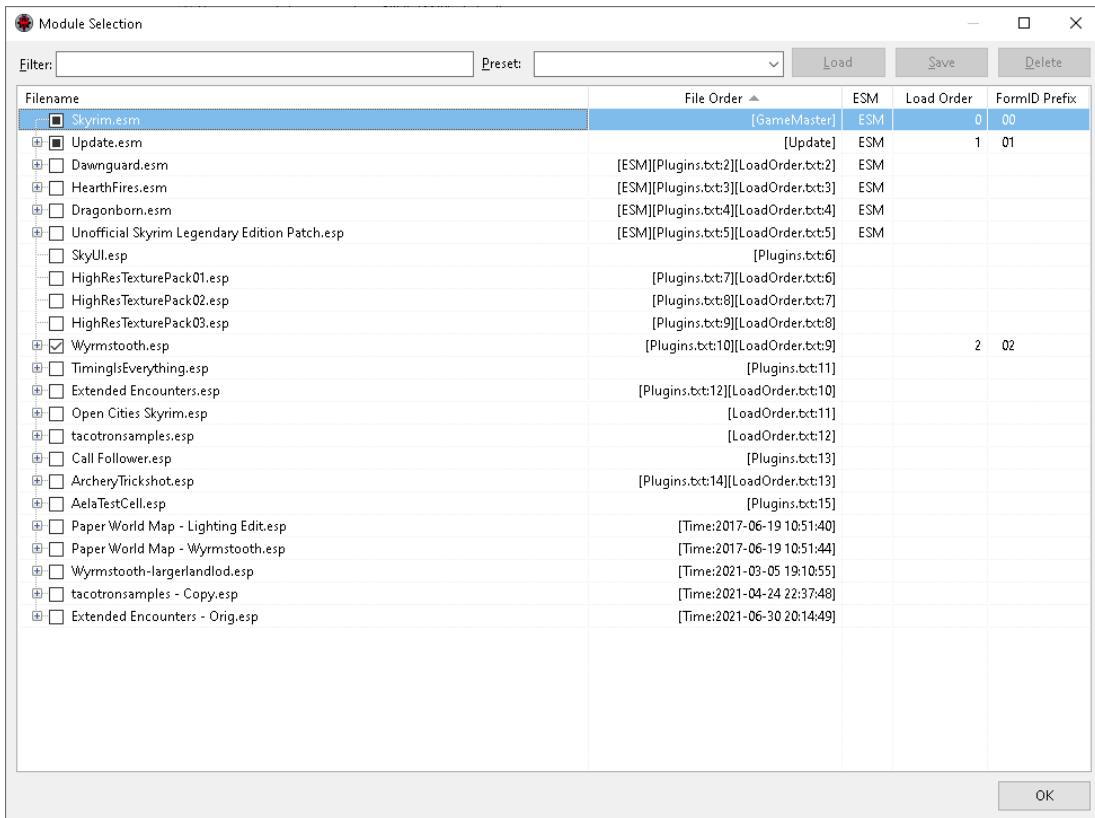


Figure 1050 - TES5Edit Module Selection.

Tick your mod and click OK.

Once the background loader has finished, right-click on your mod and select Other > Generate LOD.

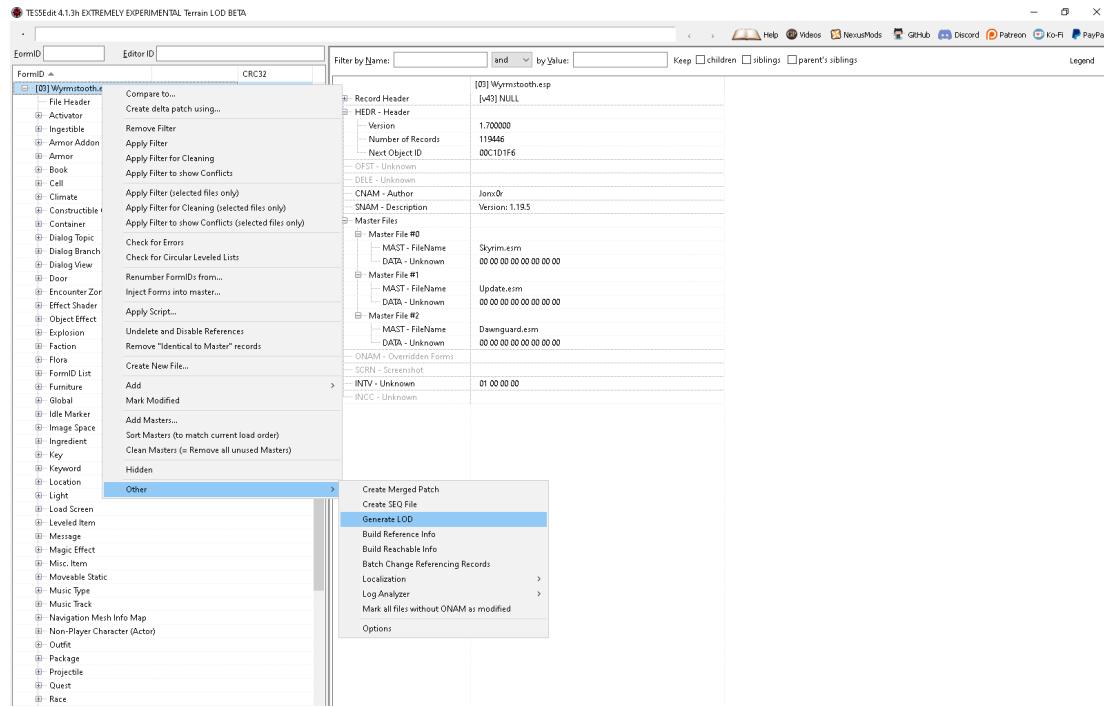


Figure 1051 - Generate LOD menu.

If Objects LOD, Trees LOD or Terrain LOD are ticked, untick them.

Select the world space you wish to generate occlusion for and tick Occlusion.

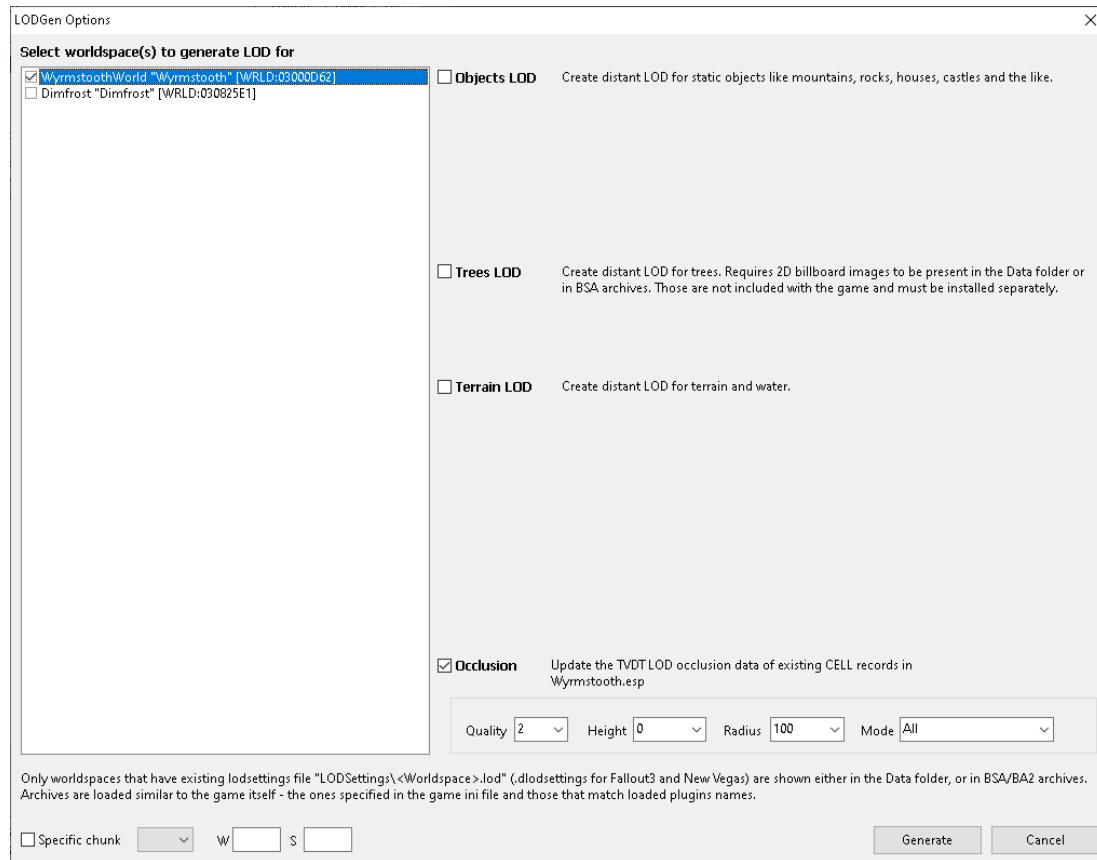


Figure 1052 - World space and occlusion selected.

Click Generate to begin generating occlusion data.

When the process is done, you'll see 'LOD generation complete' in the output.

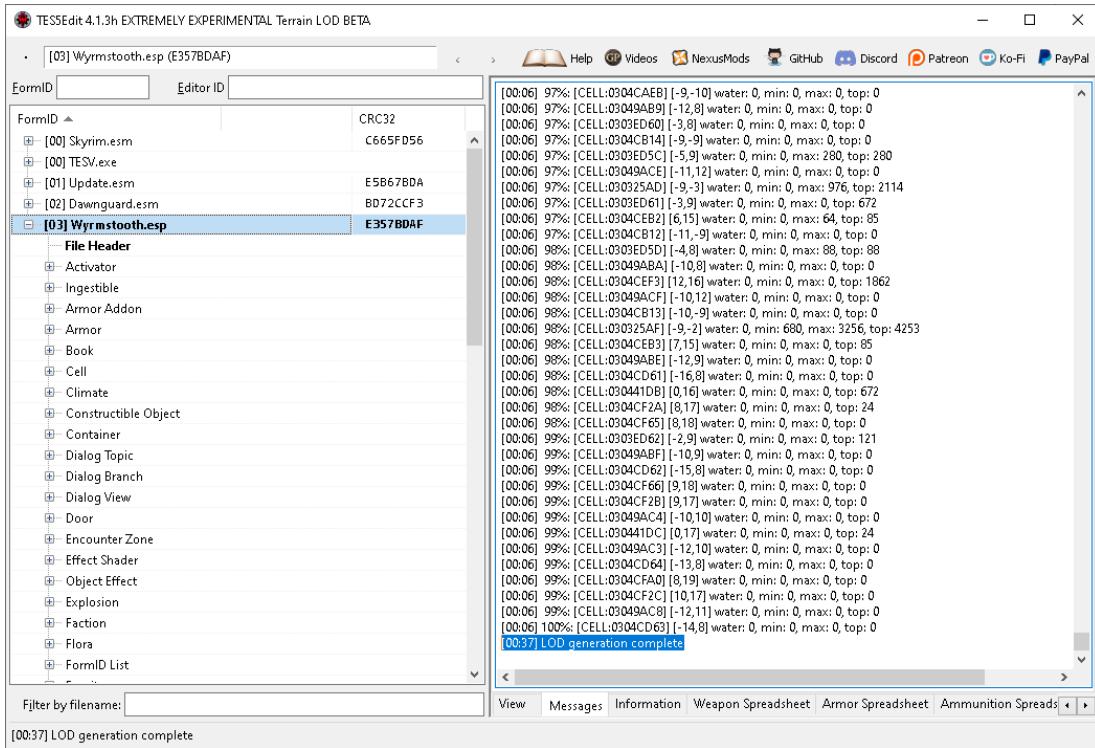


Figure 1053 - Occlusion generation complete.

Go to the Burger Menu at the top left and select Save, or press CTRL + S to save the changes to your mod.

Below is an example of TVDT occlusion at work.

In this screenshot, I used the ‘tfc’ console command to detach the camera from the player character and took the screenshot from high in the air looking down at a low-lying area that was obscured behind a mountain.

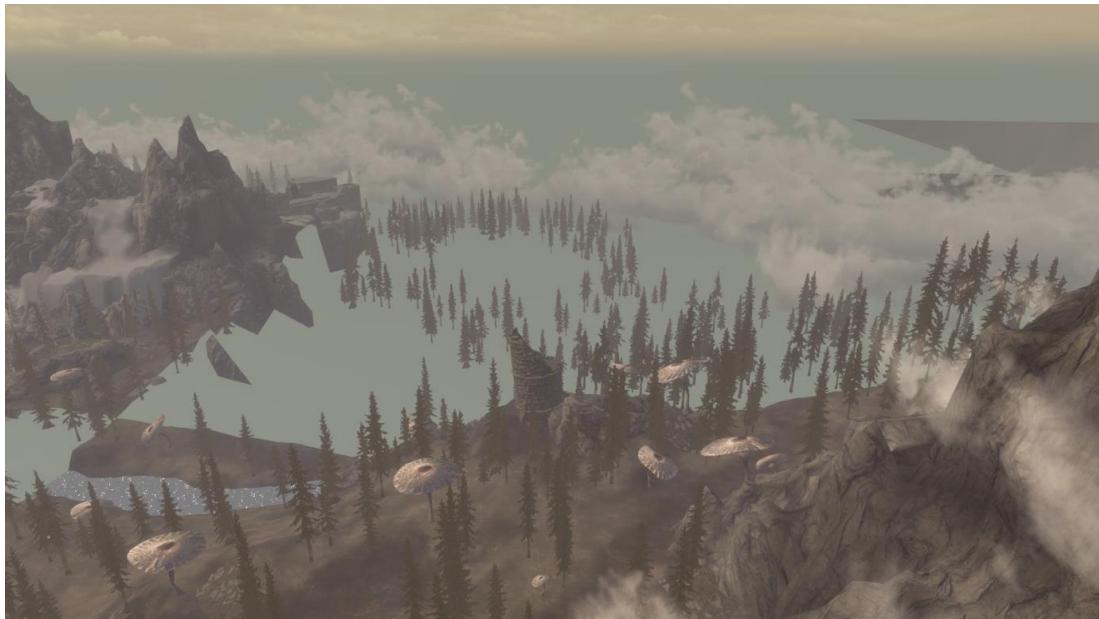


Figure 1054 - LOD objects being occluded.

As you can see, the landscape and object LOD in occluded cells are not being rendered.

Once the player moves into a position where they’ll have line of sight to the cell, the objects within it will be rendered.

From the player’s perspective, this process of hiding and un-hiding objects should never be noticeable.

GENERATING GRASS .GID FILES

By default, grass in your world space won't show up in-game unless you've either generated .gid files for each cell containing grass, or have bAllowCreateGrass=1 added to the [Grass] section of your Skyrim.ini file.

The process of generating .gid files is a bit... different to generating LOD.

To generate the .gid files, open your Skyrim.ini file, go to the [Grass] section and add bGenerateGrassDataFiles=1.



```

Skymir.ini - Notepad
File Edit Format View Help
[General]
sLanguage=ENGLISH

uExterior Cell Buffer=36

[Display]
fShadowLODMaxStartFade=1000.0
fSpecularLODMaxStartFade=2000.0
fLightLODMaxStartFade=3500.0
iShadowMapResolutionPrimary=2048
bAllowScreenshot=1

[Audio]
fMusicDuckingSeconds=6.0
fMusicUnDuckingSeconds=8.0
fMenuModeFadeOutTime=3.0
fMenuModeFadeInTime=1.0

[Grass]
bAllowCreateGrass=1
bAllowLoadGrass=0
bGenerateGrassDataFiles=1

[GeneralWarnings]
SGeneralMasterMismatchWarning=One or more plugins could not find the correct versions of the master files they depend on. Errors may occur during load or save.

[Archive]
sResourceArchiveList=Skyrim - Misc.bsa, Skyrim - Shaders.bsa, Skyrim - Textures.bsa, Skyrim - Interface.bsa, Skyrim - Animations.bsa, Skyrim - Meshes.bsa,
sResourceArchiveList2=Skyrim - Voices.bsa, Skyrim - VoicesExtra.bsa

[Combat]
fMagnetismStrafeHeadingMult=0.0
fMagnetismLookingMult=0.0

[Papyrus]
fPostLoadUpdateTimeMS=500.0
bEnableCulling=1

```

Figure 1055 - Skyrim.ini file.

Now launch Skyrim, teleport to your world space, and walk through every cell containing grass. The .gid files are created as each cell loads, so you'll need to do a bit of walking. ☺

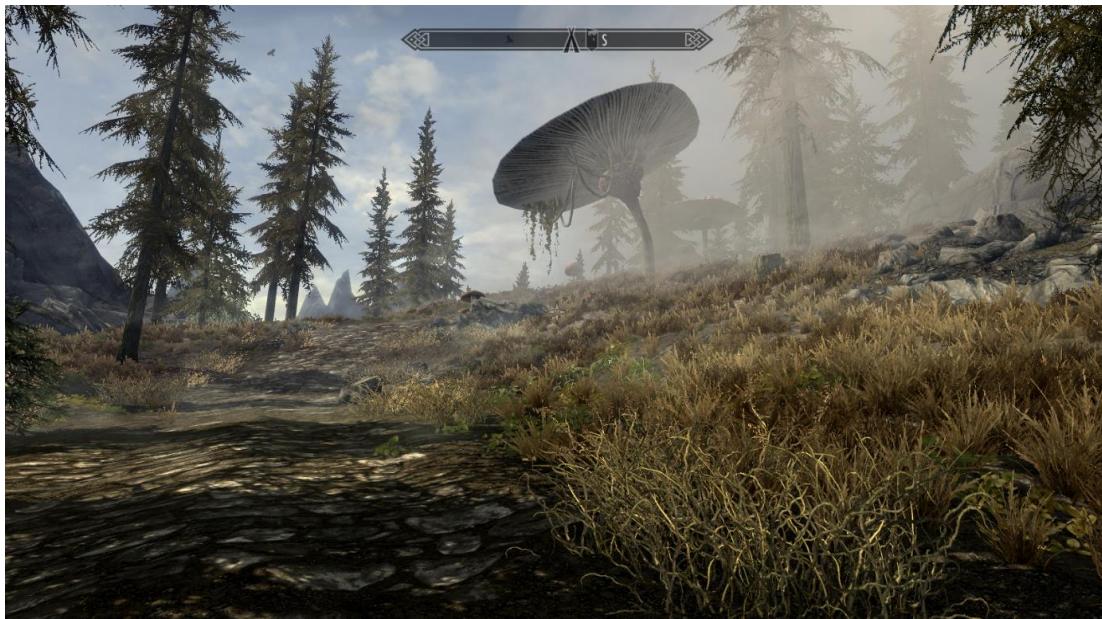


Figure 1056 - Generating .gid files.

I would recommend using the console command ‘player.setav speedmult 300’ to speed up this process.

Once done, you should have a Grass folder in your Skyrim Data directory filled with .gid files prefixed with the name of your world space.

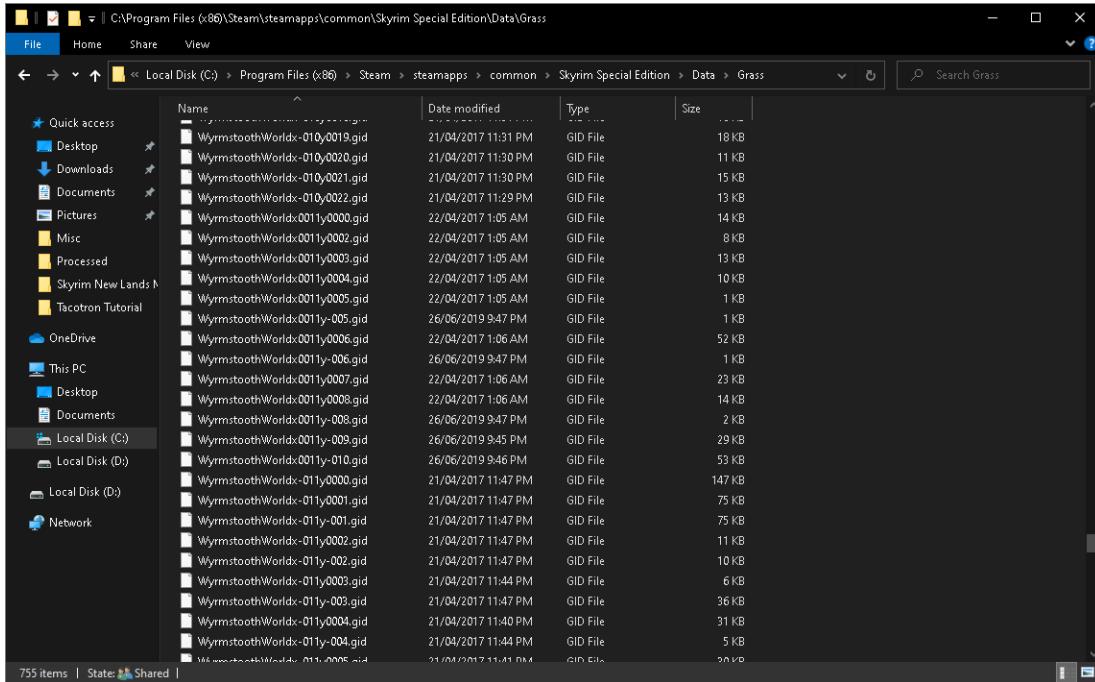


Figure 1057 - Grass folder.

Don’t forget to remove bGenerateGrassDataFiles=1 from your Skyrim.ini file when you’re done.