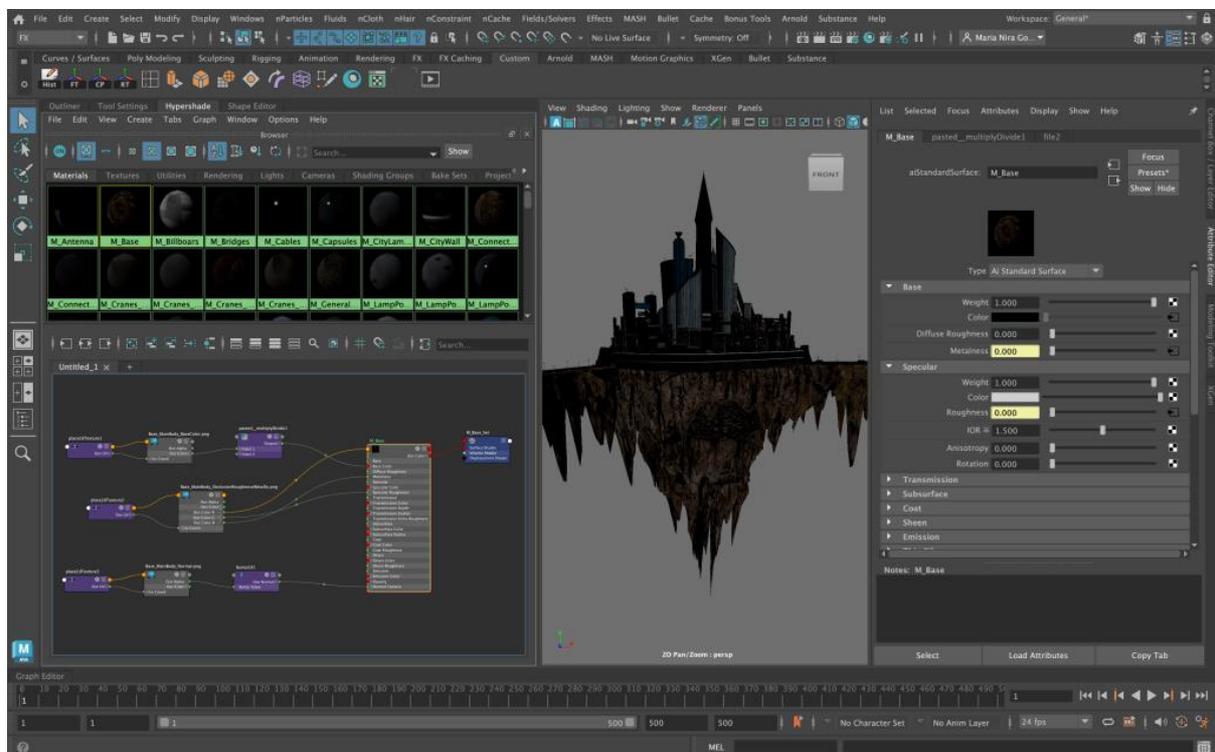


Week 5: Textures Importing & Troubleshooting in Maya & Unreal Engine

This week I linked the textures in Maya, to then import the textured models to Unreal Engine. However, I had some issues with the models and the textures when importing from Maya to Unreal Engine, so I expended this week troubleshooting and fixing these issues.

Linking textures in Maya

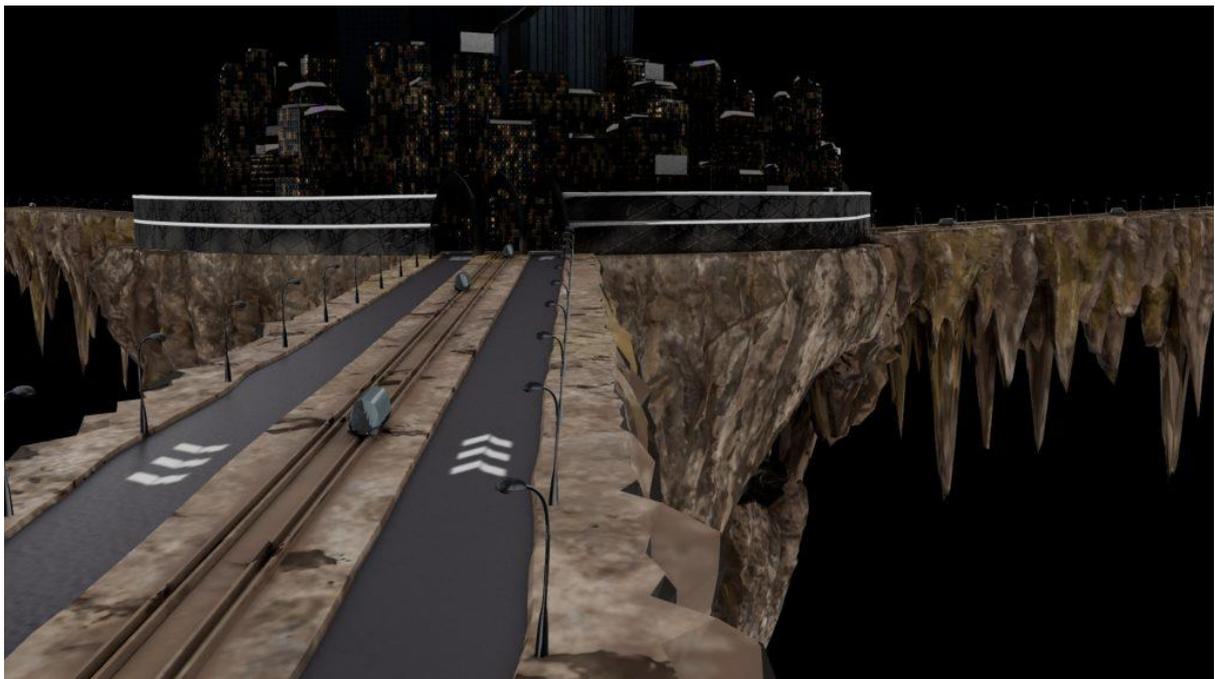
I exported all textures in Substance to 4K resolution for the biggest objects that are going to be visible and to 2K resolution for the smallest details that are not that visible (so render time is optimised slightly). I exported them in Unreal Engine 4 set up which would export the base colour map, the normal map, and a packed map that would have 3 layers grouped in one map (occlusion, roughness, and metalness). Then I imported them in Maya and relinked the texture maps to base colour, metalness, specular roughness, normal map, indirect diffuse, and indirect specular (occlusion map). I added a 'Skydome' light to see how it would look like in low light ambience (nighttime), but the colours in the render would look a bit washed out and without much contrast. I was a bit disappointed, but I also hoped that in Unreal Engine they would look better with the correct lighting conditions.



Textures linked to models in Maya



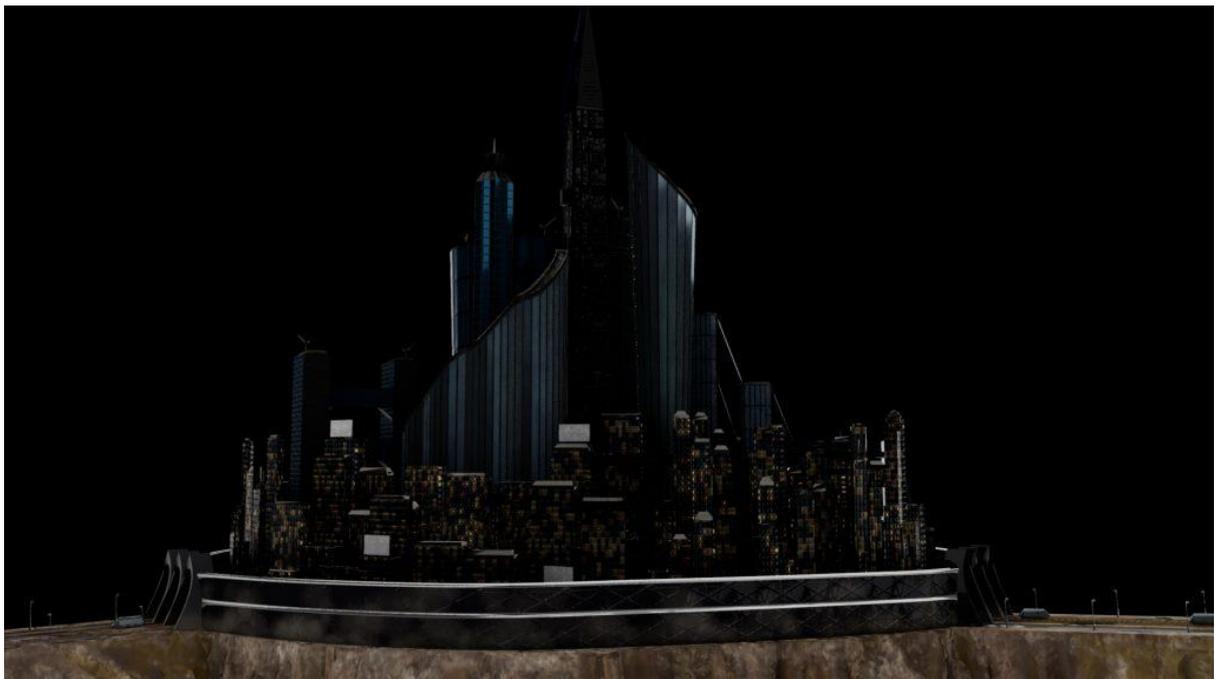
Rocky base colours look washed out and without much rocky texture



Asphalt, and capsules glass look flat



Skyscrapers windows look opaque and buildings windows look flat and unlit



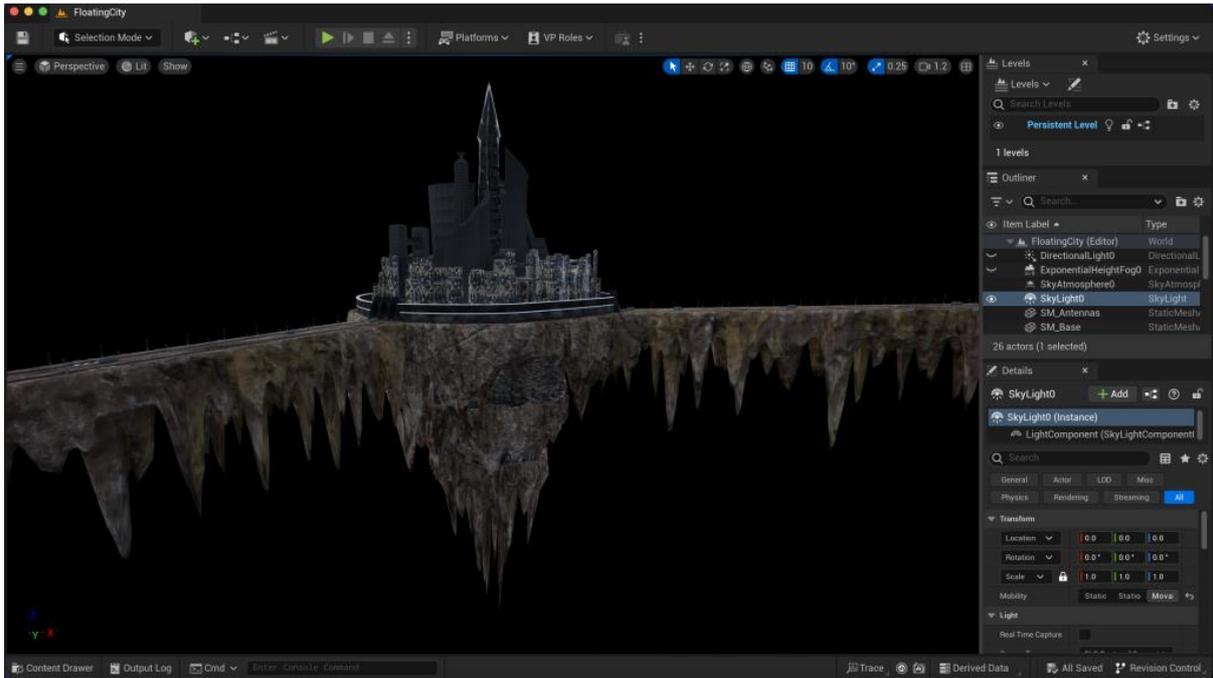
Main tower does not stand out at all



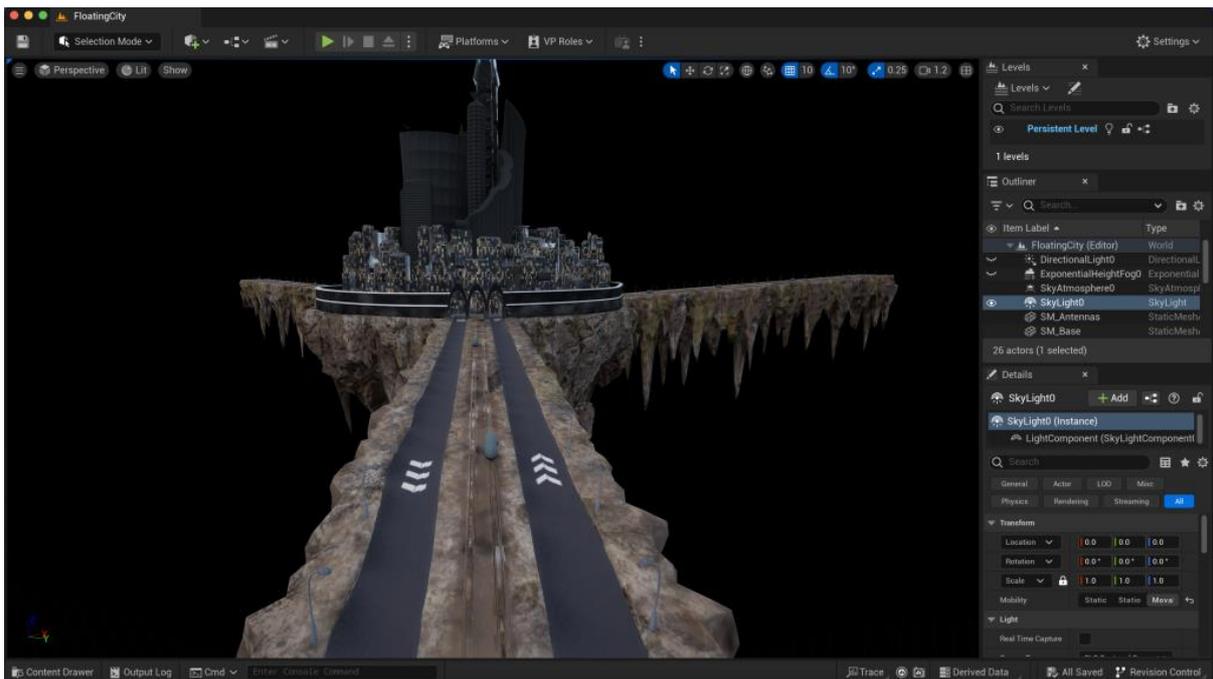
Top city looks really dark compared with rocky base and connections

Importing USD models into Unreal Engine (troubleshooting and experimenting)

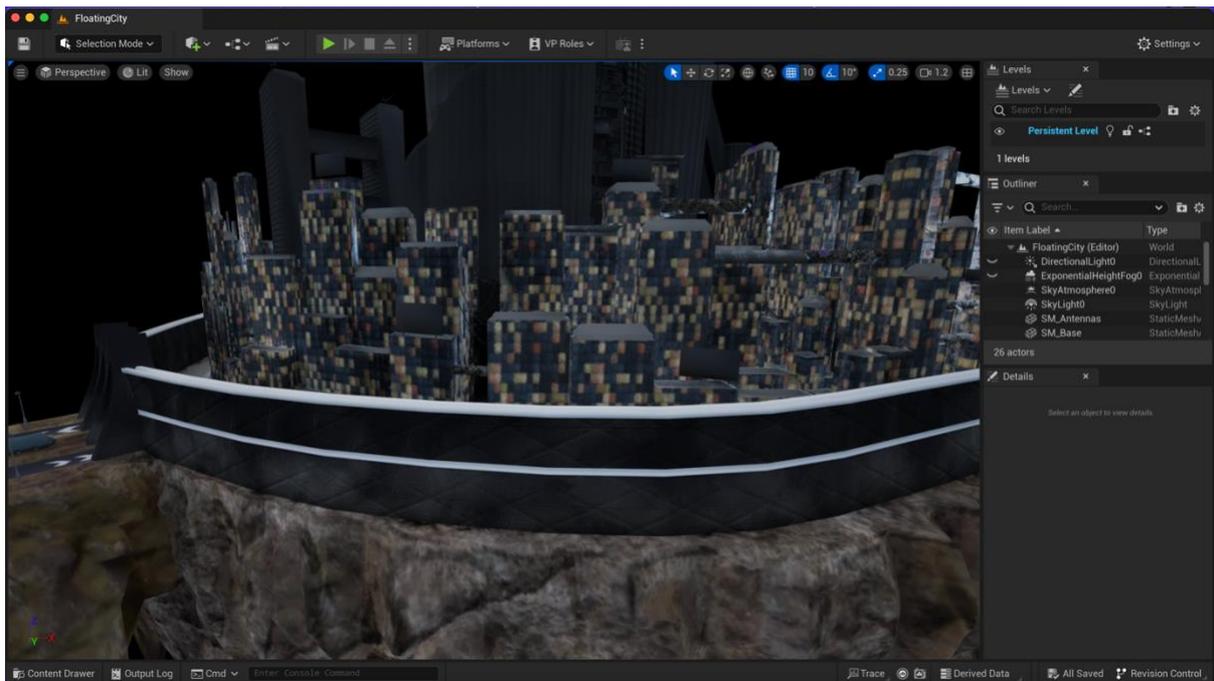
I exported all my models in USD as it is supposed to be the best option for quality and practicality in Unreal Engine. However, when I imported the USD models to Unreal Engine, the texture sets I previously created and carefully named in Maya were ignored, and a bunch of different sets without any naming were created instead. The UV maps were also failing as when I created a material and dragged it and dropped it in a specific part of a model, this was not detecting it and was filling the whole model with that texture. I tried creating a USD stage in Maya and importing it into Unreal all in one scene but, unfortunately, it was also ignoring my texture sets. After discussing my troubleshooting issues with my lecturer Emily, who came up with different solutions I could test, I also tried exporting/importing the model in pieces with textures linked, to double check if there was a problem with the parent group or even to export directly from Maya to Unreal using the 'Send to Unreal' option in Maya, but still no luck.



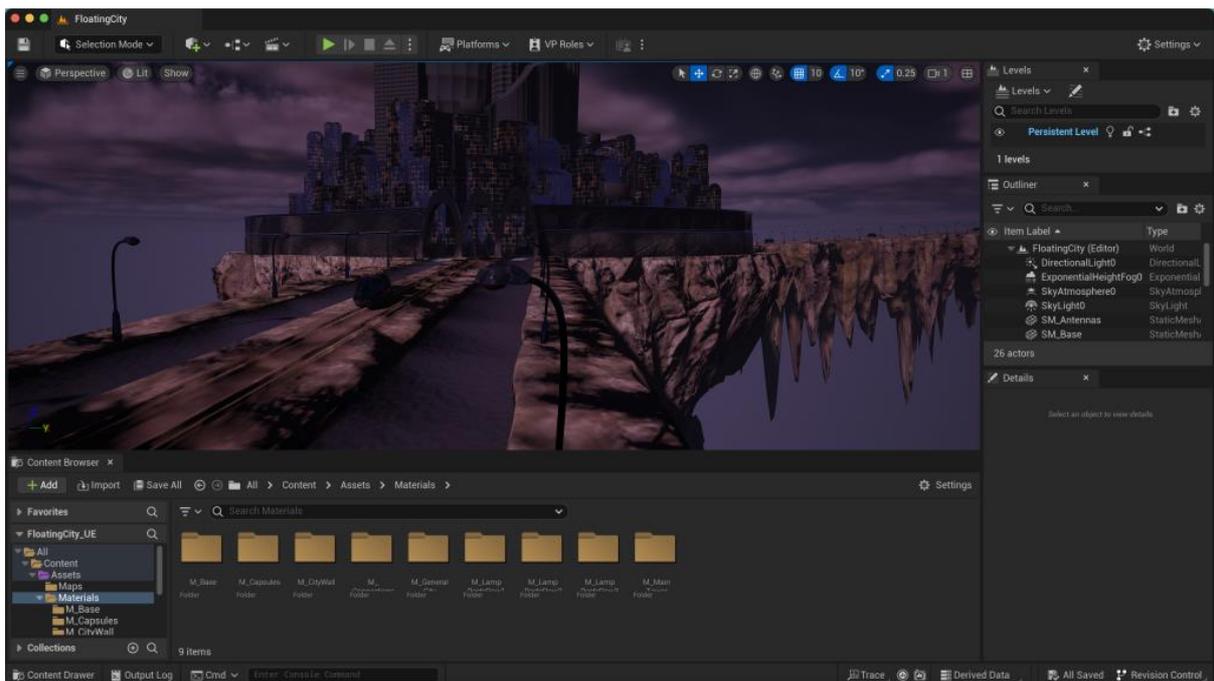
Separated materials created for model which could be added on to parts of the model only if imported by pieces in Unreal, however, this would be a problem as some assets have more than 1 texture set



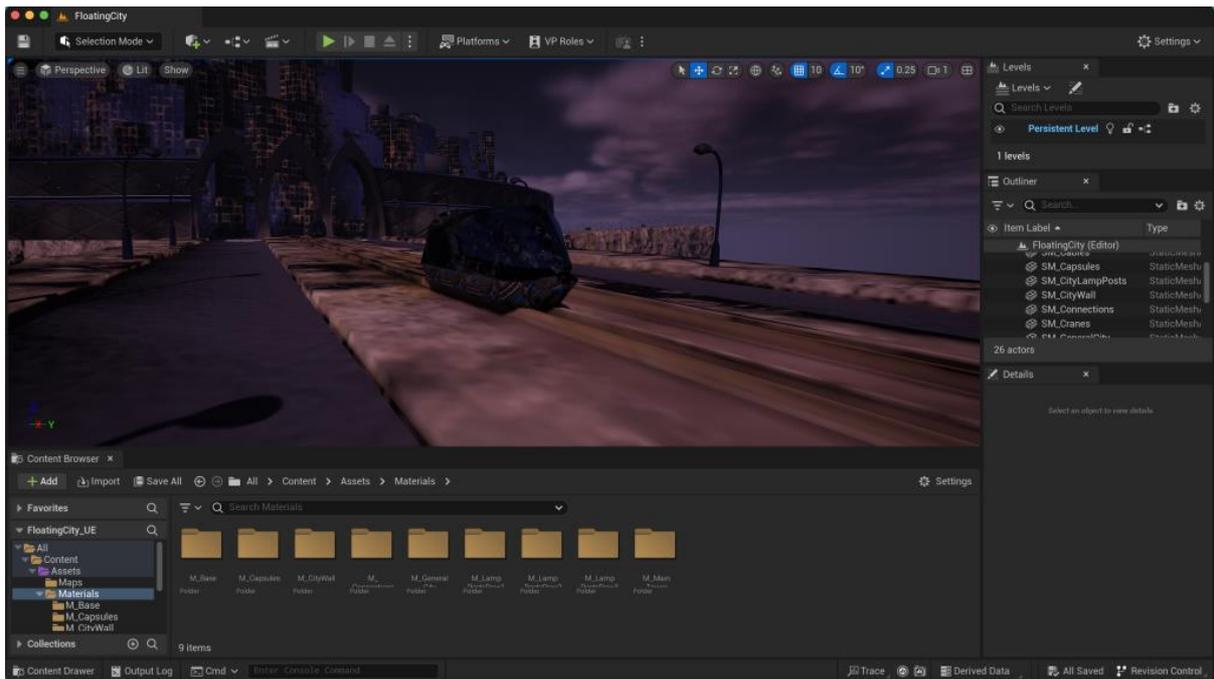
The roads texture could only be added on if I selected the specific faces of the model where this texture was supposed to be on and created a new material with the roads texture



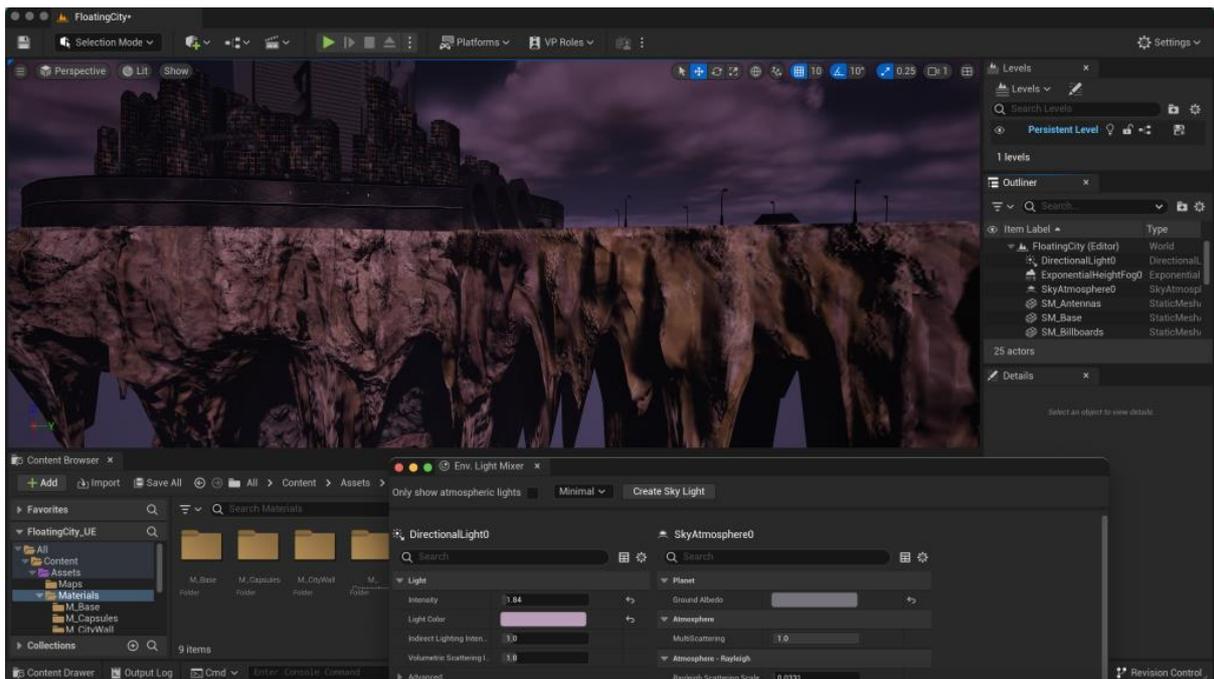
City buildings textures also looked flat and far away from how it was looking in Substance



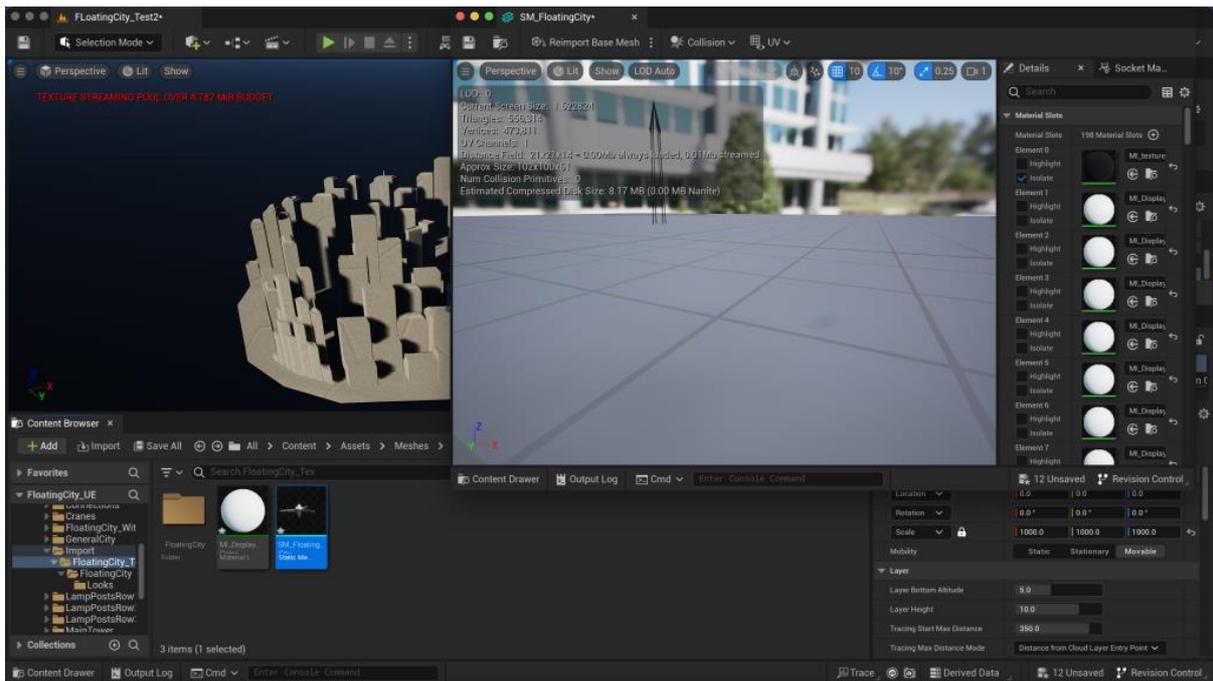
Night time purplish ambient to see how the textures would roughly look like in the lighting colour I want to approach



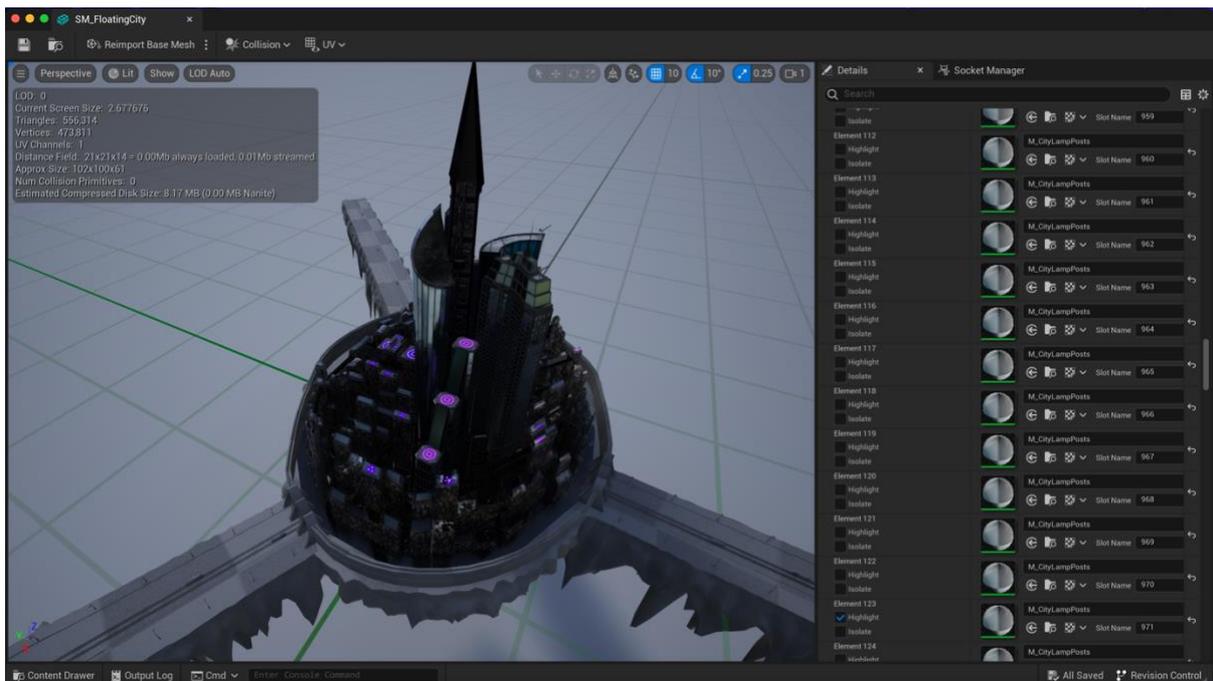
Capsules' glass material is looking completely opaque, but I think this is because I may need to reexport the texture with an opacity map from Substance



The rocky texture looks pretty realistic in Unreal



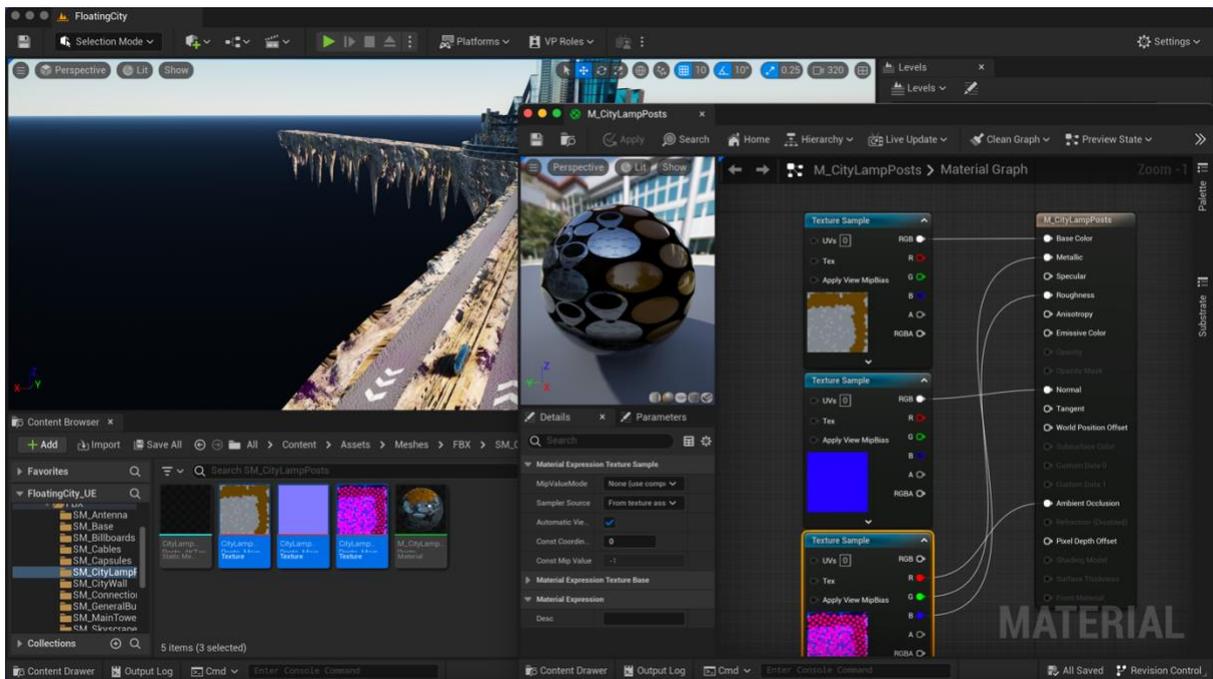
Wrong textures sets recognised by Unreal in many little parts and without any naming/label I added in Maya previously



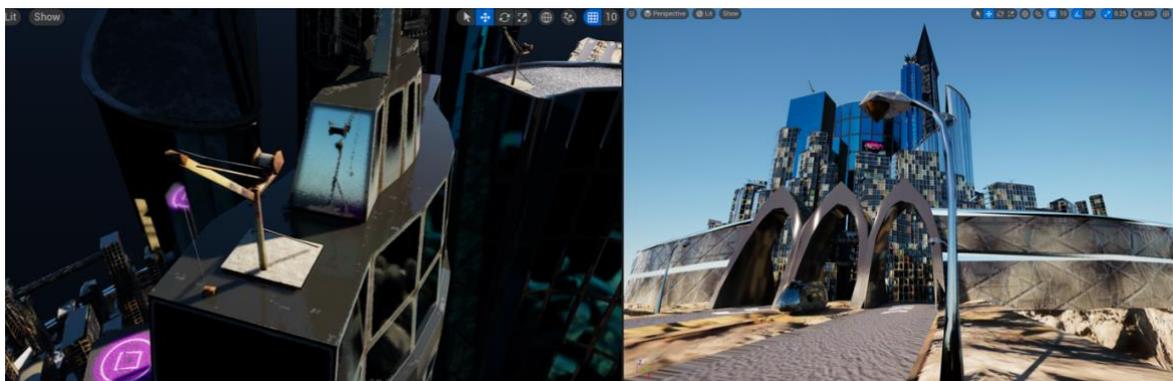
I managed to add the correspondent textures to the city buildings and the skyscrapers, however, every single part of every lamp post is also separated in different material and it did not even detect all of them (hence some mesh does not even have a texture set linked), so this is not going to be my first option to proceed with

Importing FBX models into Unreal Engine (final solution)

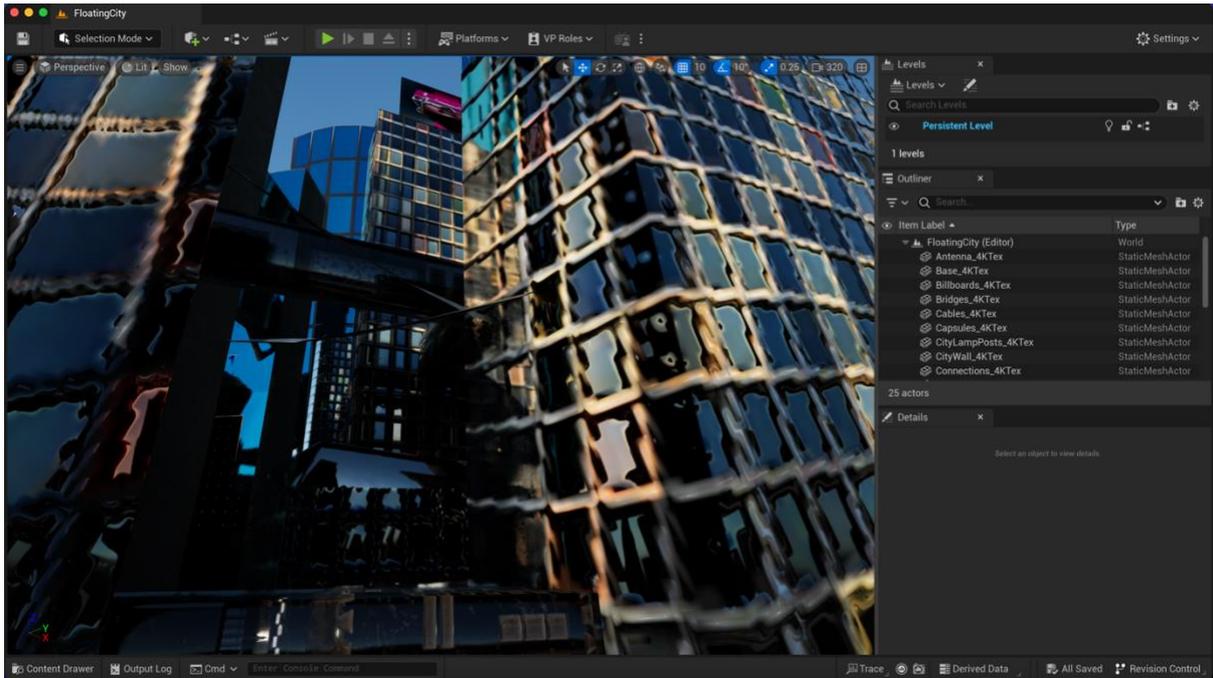
My last resource suggested by Emily was to use FBX instead of USD, and this last was finally showing the textures sets and recognising UV maps. Therefore, after importing the FBX models, I could easily relink all my textures in the materials assigned to each asset. The only issue I encounter with FBX is the fact that some of my models were badly triangulated and there was no roundness in arcs or spheric shapes. This issue was shown in lamp posts and the city wall arcs. Also, some rectangles parts in the rocky flats of the base were showing triangulated. However, since this could be a minor detail that will not be appreciated in the final render, I will let it pass for now and will deal with it later if it happens to be visible in the final sequence.



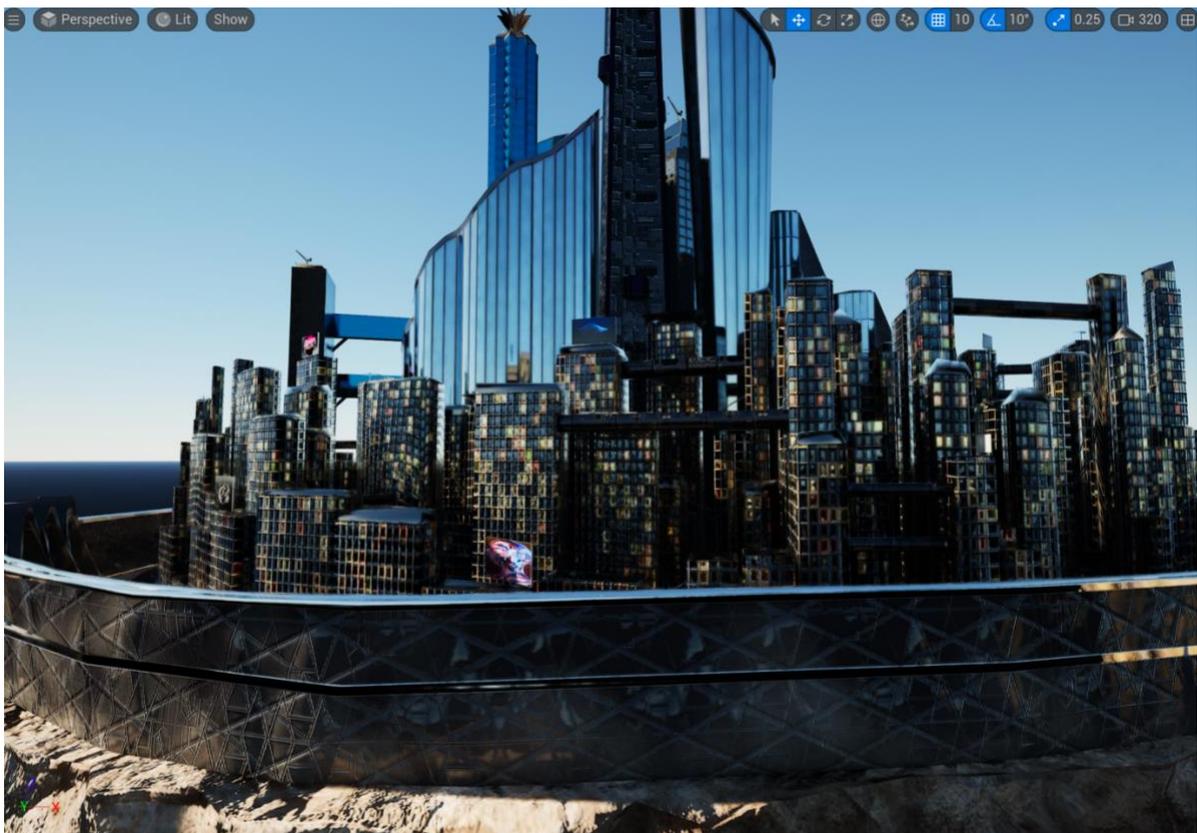
Example of material set - lamp posts textures maps linked in material created when importing to Unreal



Minor details like cranes, lamps posts, and the city wall entrance mesh have been deformed when triangulated by Unreal – this only happened when importing in FBX



Jagged look of buildings texture – this may be a texture issue and not Unreal issue (it did look like this in Maya too)



General look with textures linked



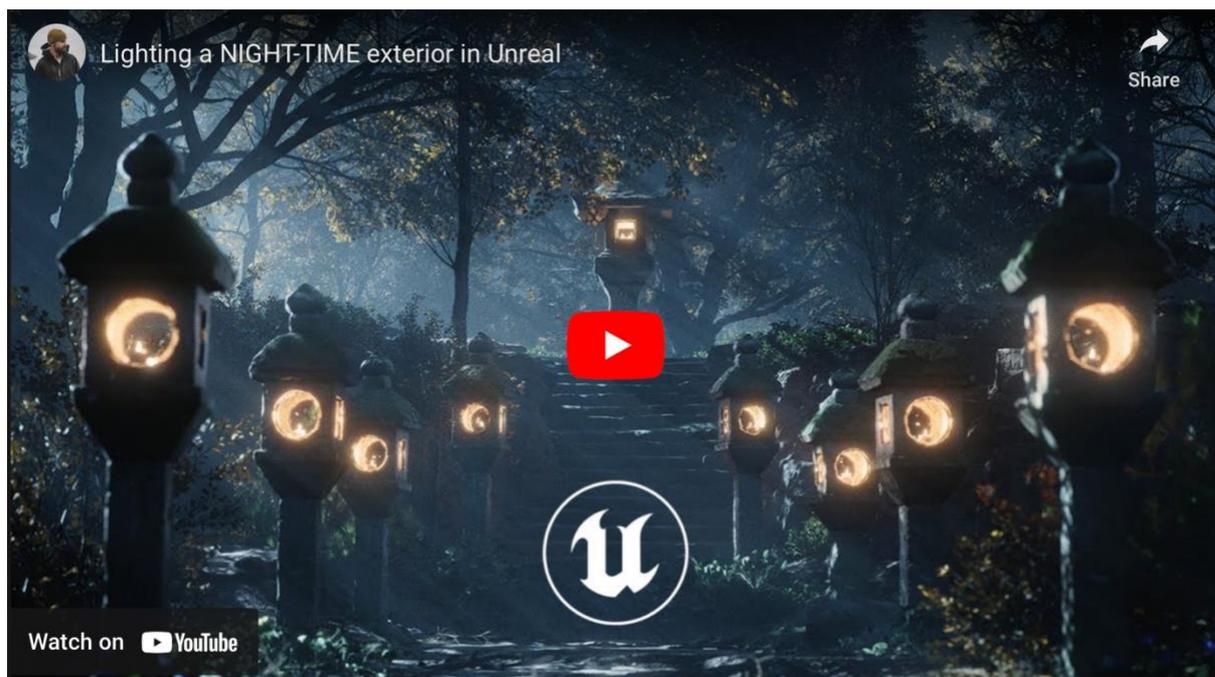
General look with textures linked

Week 6: Lighting, Emission Maps, Neon Signs & Billboards in Unreal Engine

After the models and textures issues were finally resolved, I continued to light the scene and create the overall ambient with emission maps. I also added neon signs and billboards that will show the city businesses and commercials.

Ambient Lighting

As I am new to Unreal Engine, I researched for lighting tutorials in YouTube that explains not only how to set up basic lighting in the programme but also how to set a night time scene lighting with foggy ambient. After a long research I found a really helpful tutorial from William Faucher (2022) channel, in which he uses a blueprint from the engine collection as a base for the overall ambient light and starts building up from there with a 'Directional Light' and an 'Exponential Height Fog'.



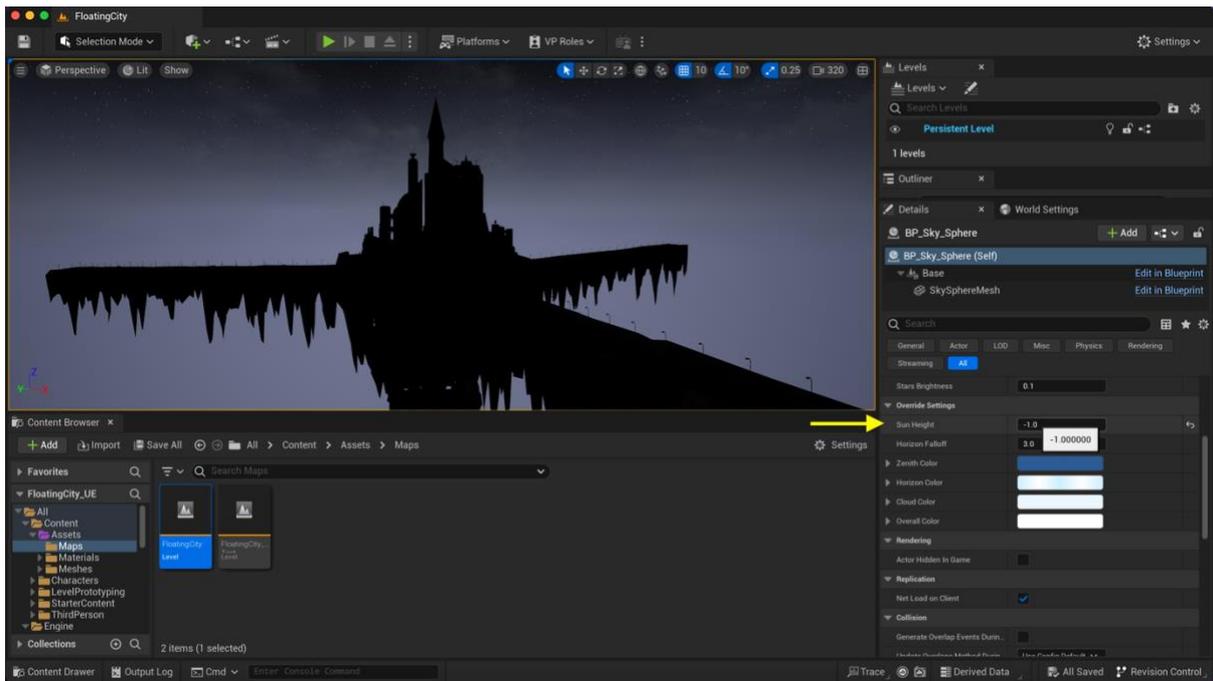
Lighting a NIGHT-TIME exterior in Unreal tutorial by William Faucher (2022)

Following this tutorial I added the 'BP_Sky_Sphere' blueprint to my level. Then, I lower the sun height to -1.0 so the illumination of the scene changes to night time, and I also increased the brightness of the stars slightly. I also added a 'Directional Light', set it as 'Movable' (since I am working with 'Lumen' light settings), and position it on the top and slightly behind of the city so there is enough contrast between highlights and shadows (dramatic lighting). Following this, I added an 'Exponential Height Fog' and turn the colour of the 'Fog Inscattering Colour' and the

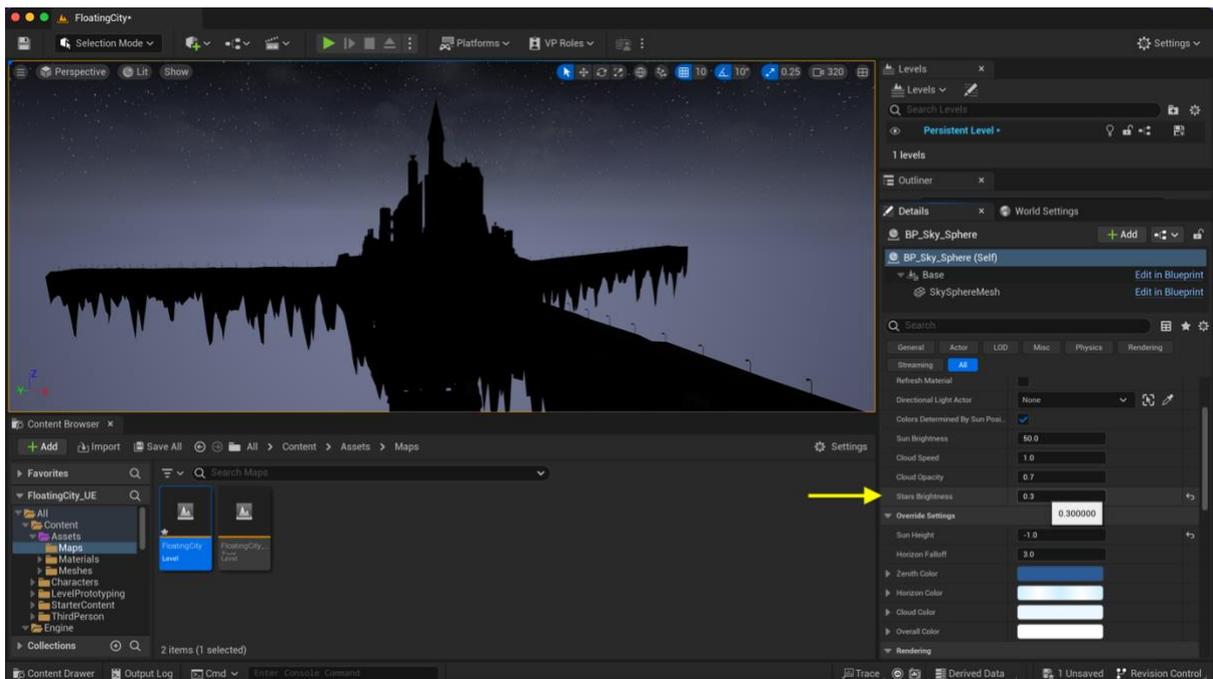
'Directional Inscattering Colour' to black, since the 'Exponential Height Fog' is only additive and I will be using 'Volumetric Fog'. Then, I proceeded to activate the 'Volumetric Fog' and decreased the 'Scattering Distribution' to 0.1 so the fog was focalised in one direction through the buildings and not spread out (values closer to 1.0 show more spread-out rays, whereas values closer to 0.0 focalises the rays in one direction following the directional light of the scene). Also, in my 'Directional Light', I also adjusted the 'Volumetric Scattering Intensity' so the fog rays were more visible. Then, I added a 'Skylight' (also set to 'movable') to help with the bounce lights that will lift the shadows of the scene. In this feature, I set the 'Sky Distance Threshold' to 1.0, unchecked the 'Lower Hemisphere Is Solid Colour' option, and adjusted the 'Intensity Scale' to 0.5 so the shadows do not look too bright. I went back to my 'Directional Light' and made changed the 'Light Color' to light blue so it gives this cold night ambience. Once the ambient light was set, I added the practical lights which are the lights that actual appear in the scene. In this case, this was 'Point Lights' with a yellowish colour that were added to the lamp posts of the connections and the inner city. I also added 'Rectangle Lights' in the rocky base, pointing at the block of flats so it gives some contrast and lifts that part of the model which is in complete darkness at the moment. Lastly, I also added a 'Post Process Volume' to put all the lighting together and enhance the bloom of the neon lights and emission lights.



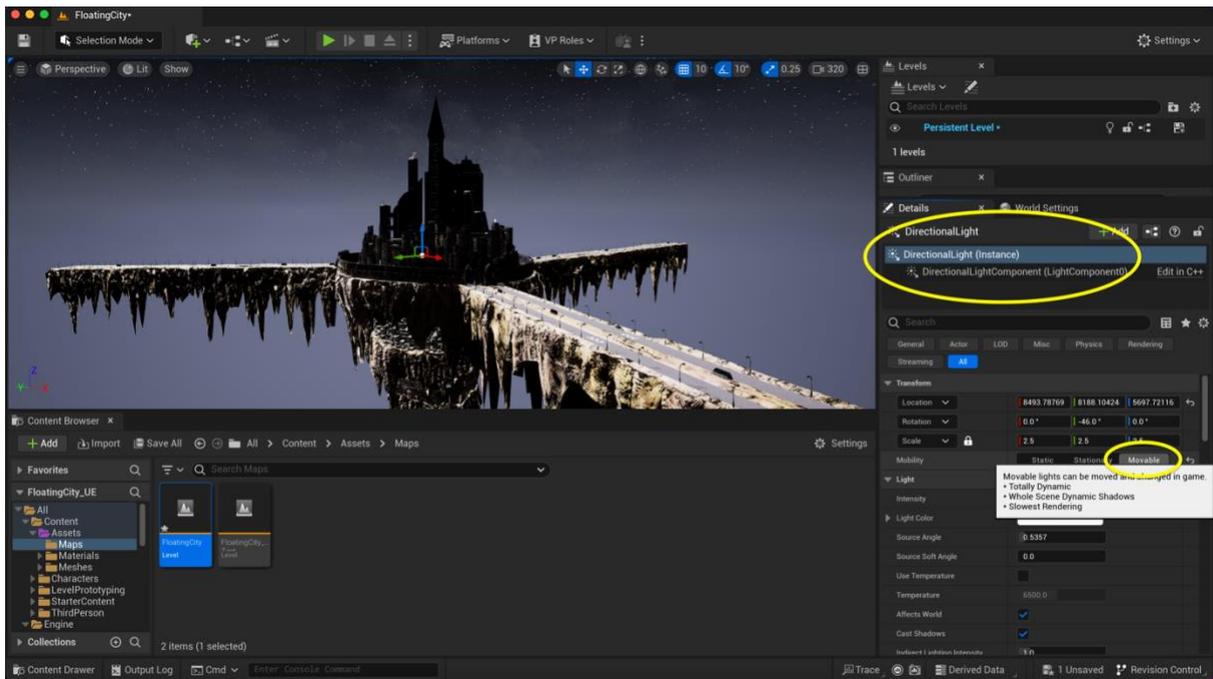
Sky Sphere Blueprint used for base lighting



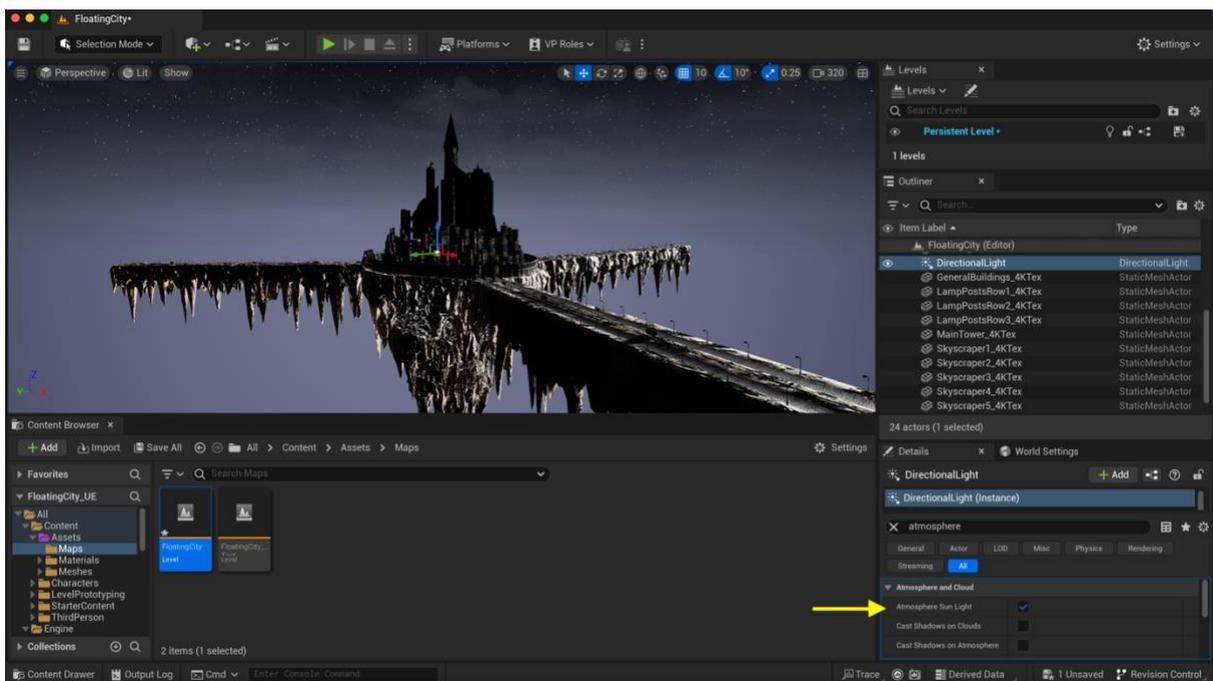
I put the 'Sun Height' in -1.0 so it looks like night time. The sun would be in the bottom of the scene in this case so I turned it off so it does not show when looking down.



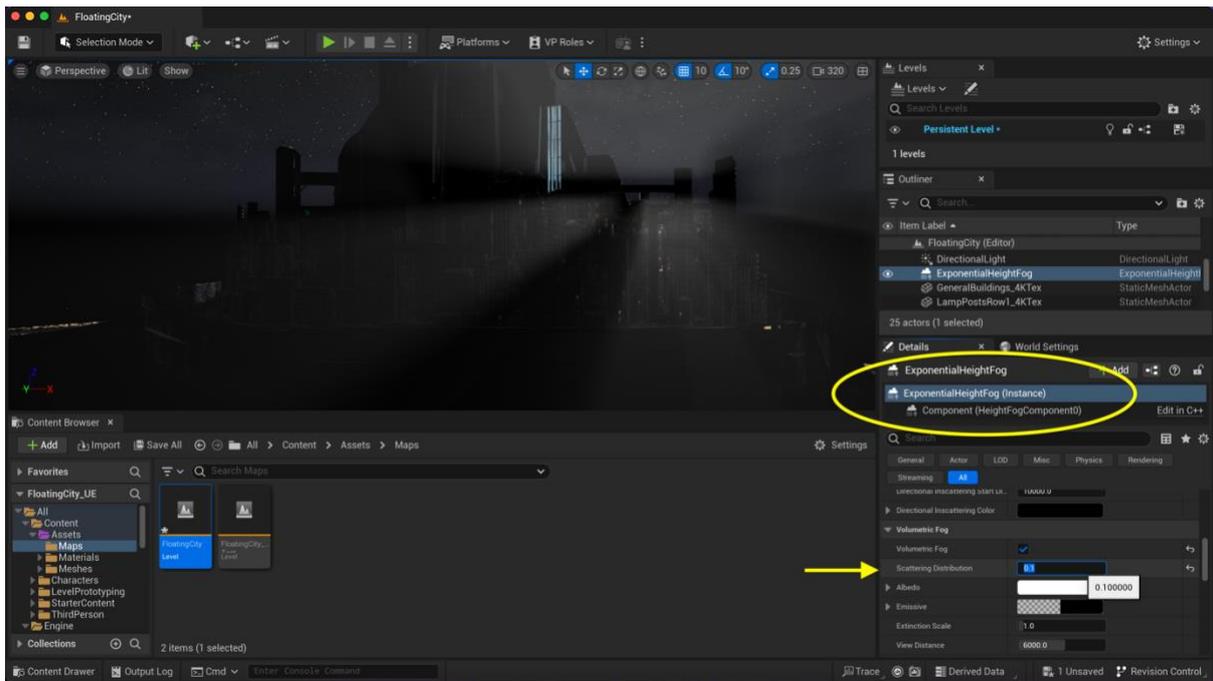
I increased slightly the stars brightness to give more night time ambience. I did not add much as I am planning to add the full moon in the sky too



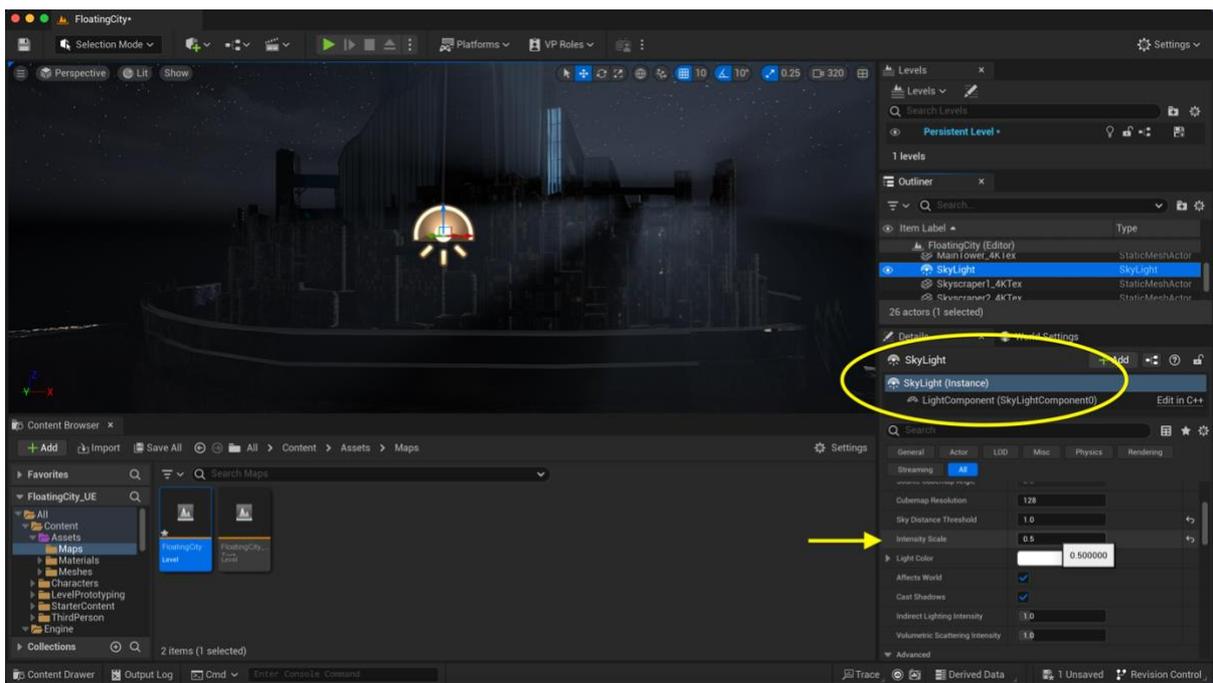
A 'Directional Light' will be the main illumination of the model (set to 'Movable' so it works for Lumen settings)



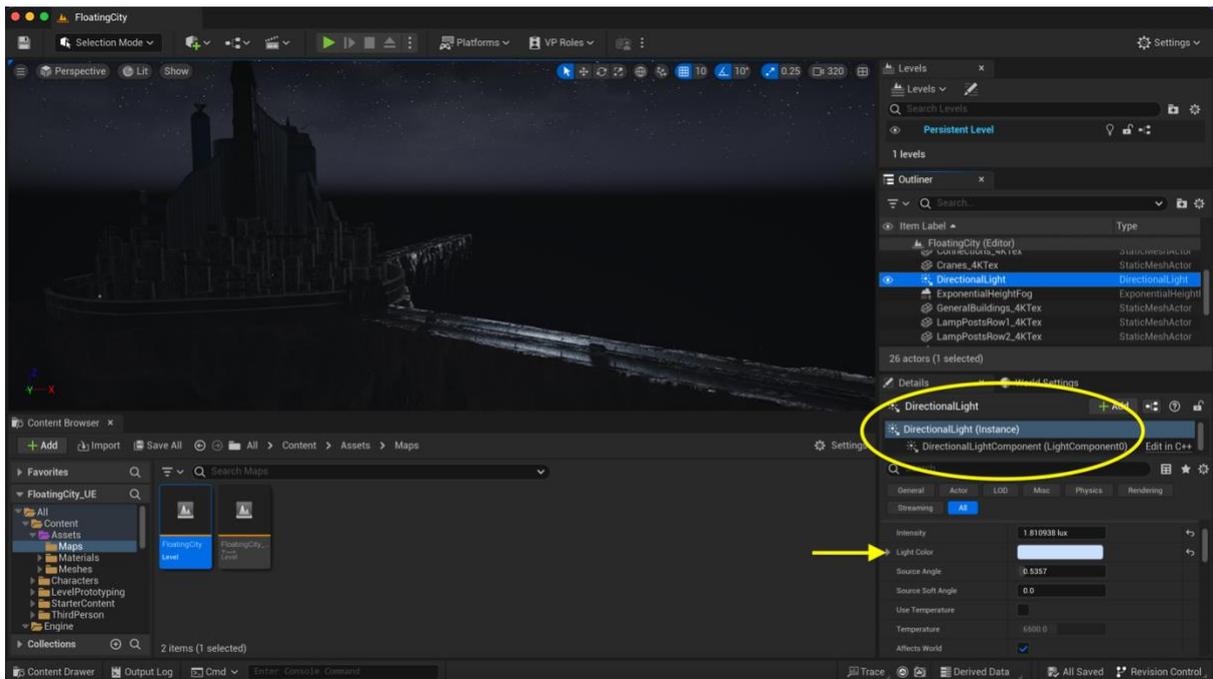
I also set the 'Directional Light' as 'Atmosphere Sun Light' so this light acts as the 'moon light' of the scene



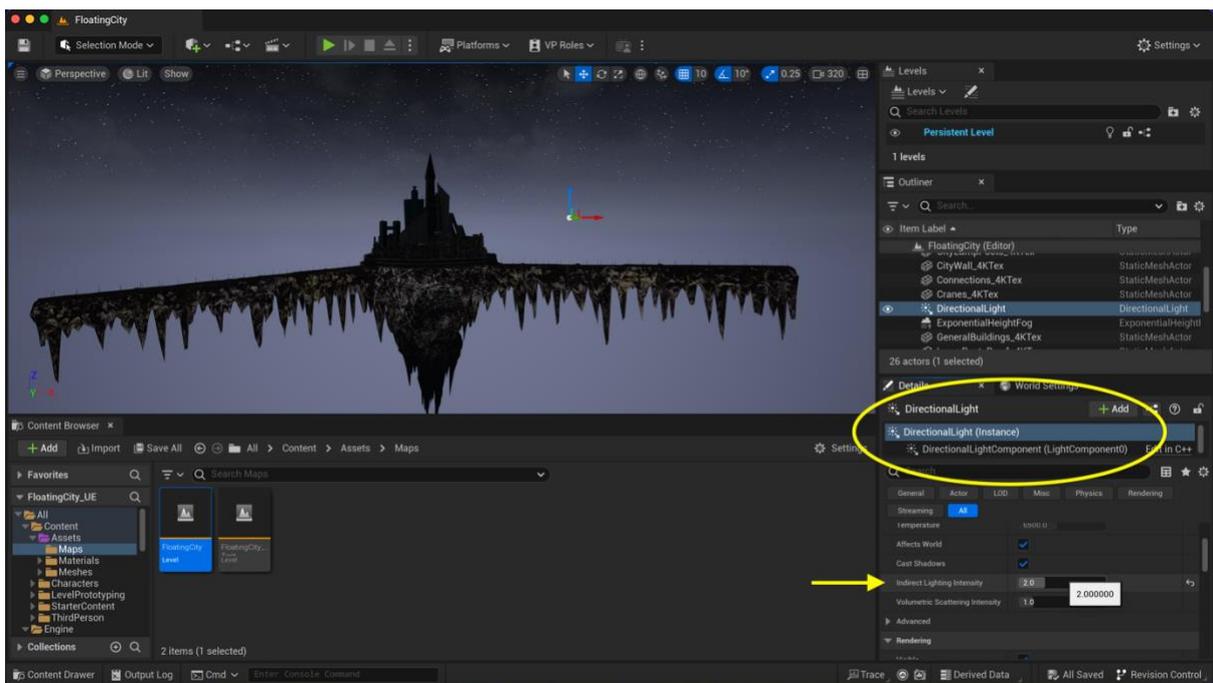
'Exponential Height Fog' was added to give this foggy effect. The 'Scattering Distribution' will determine the distribution of the fog in the space (more or less spread-out)



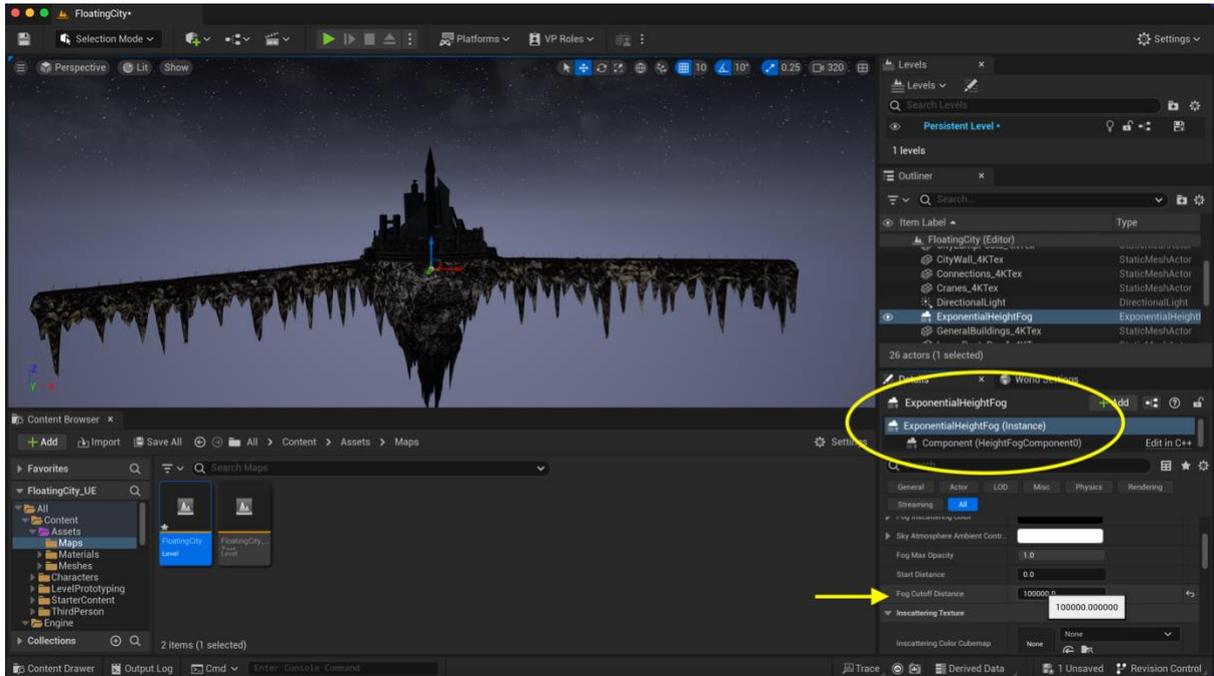
I also added a 'Sky Light' to help improving the shadows, since before adding this, they look too dark. This feature helps to have more bounce lights so there is more shadow variation of colour (not just pitch black)



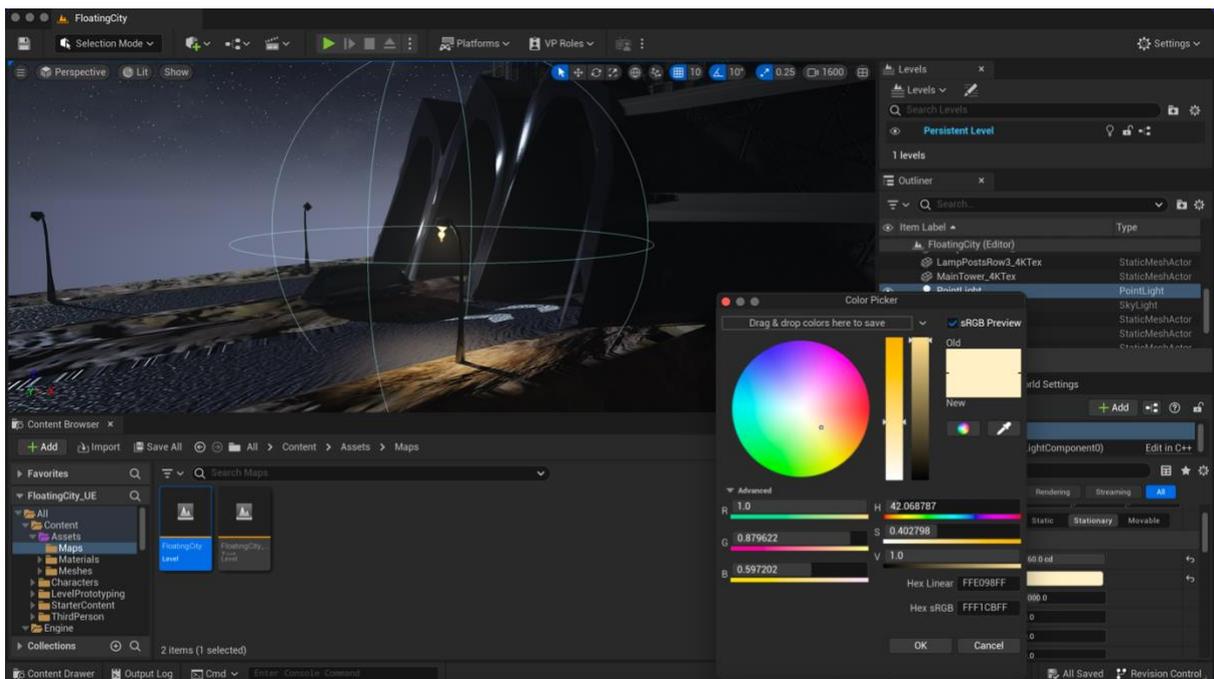
I also changed the colour of the 'Exponential Height Fog' to a light blue so it gives more night cold colours



In the 'Directional Light', I also increased the 'Indirect Lighting Intensity' so there is more bounce light and helps with the shadow grading variation



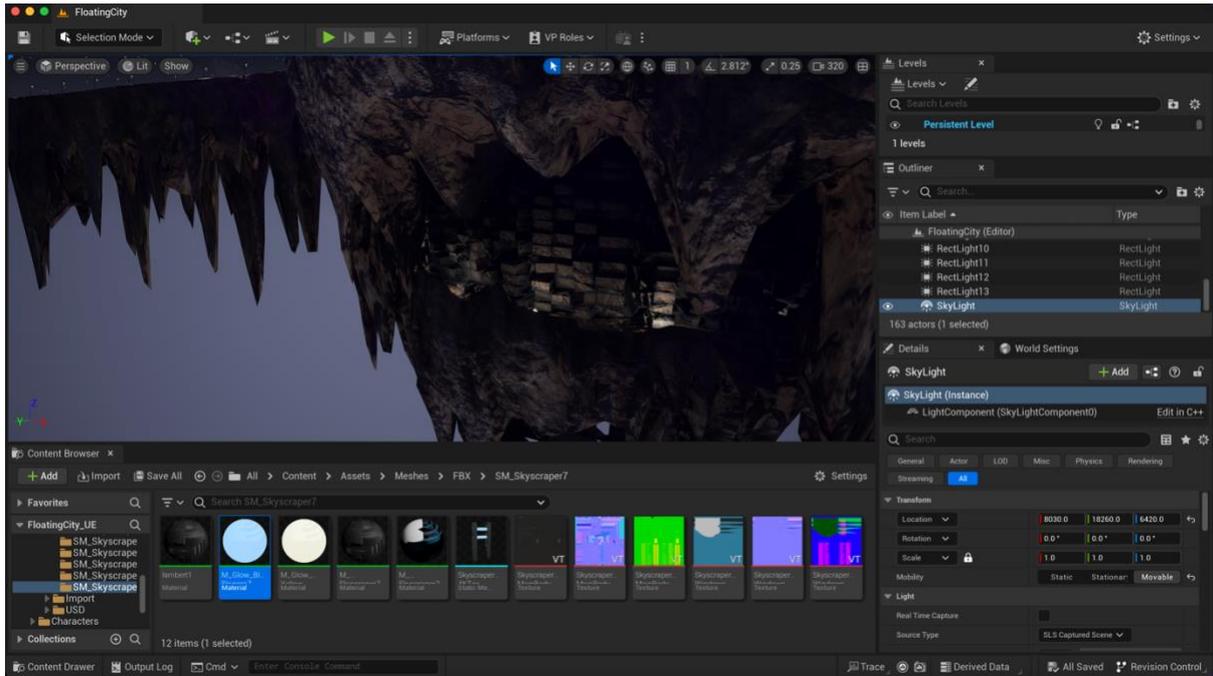
An important feature to adjust is the 'Fog Cutoff Distance' in the 'Exponential Height Fog' so I determined at what level the fog starts to show



I also added 'Spot Lights' in a yellowish colour to the lamp posts



Lamp posts with 'Spot Lights' added



'Rectangle Lights' added in the rocky base to create some contrast (as it was totally dark before)

Skyscrapers, city wall, block of flats, city buildings and bridges emissive materials

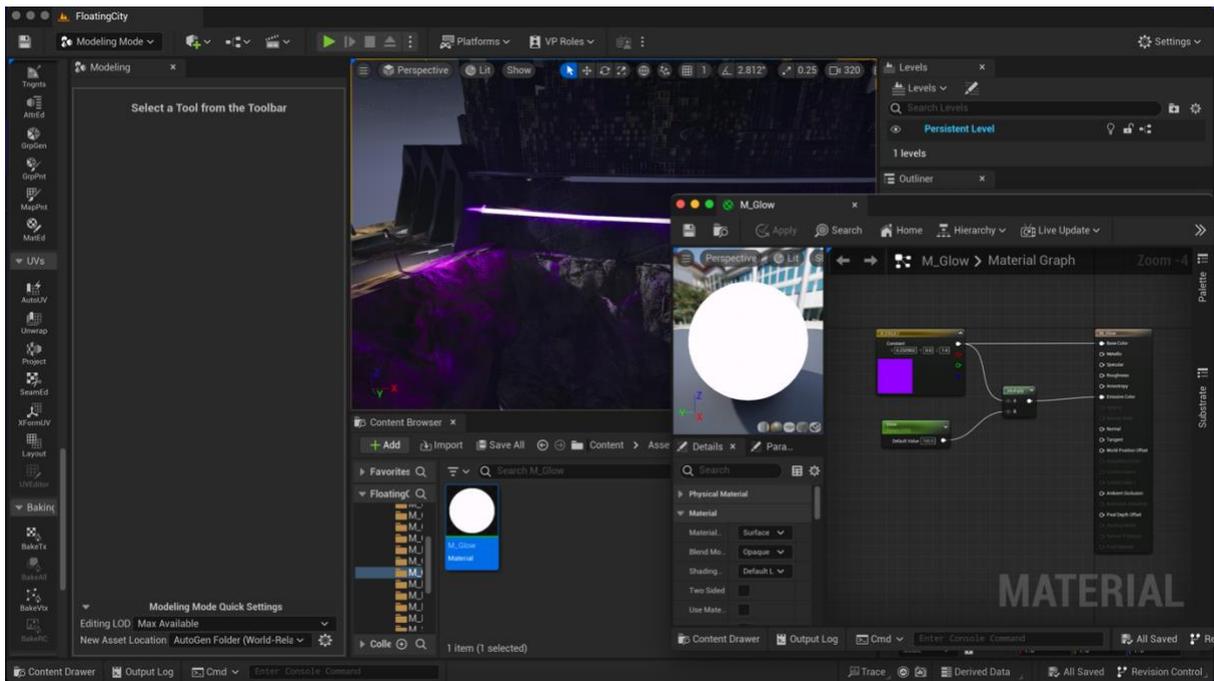
For the skyscrapers, I did not want to lose the metallic texture for the windows that were not going to be lit, but I also wanted to add emission light to the ones that are supposed to be lit. Therefore, I followed a tutorial in YouTube made by *Free Unreal Engine 5 Tutorials UE5 (2021)* channel to create the emission textures for my lit windows.



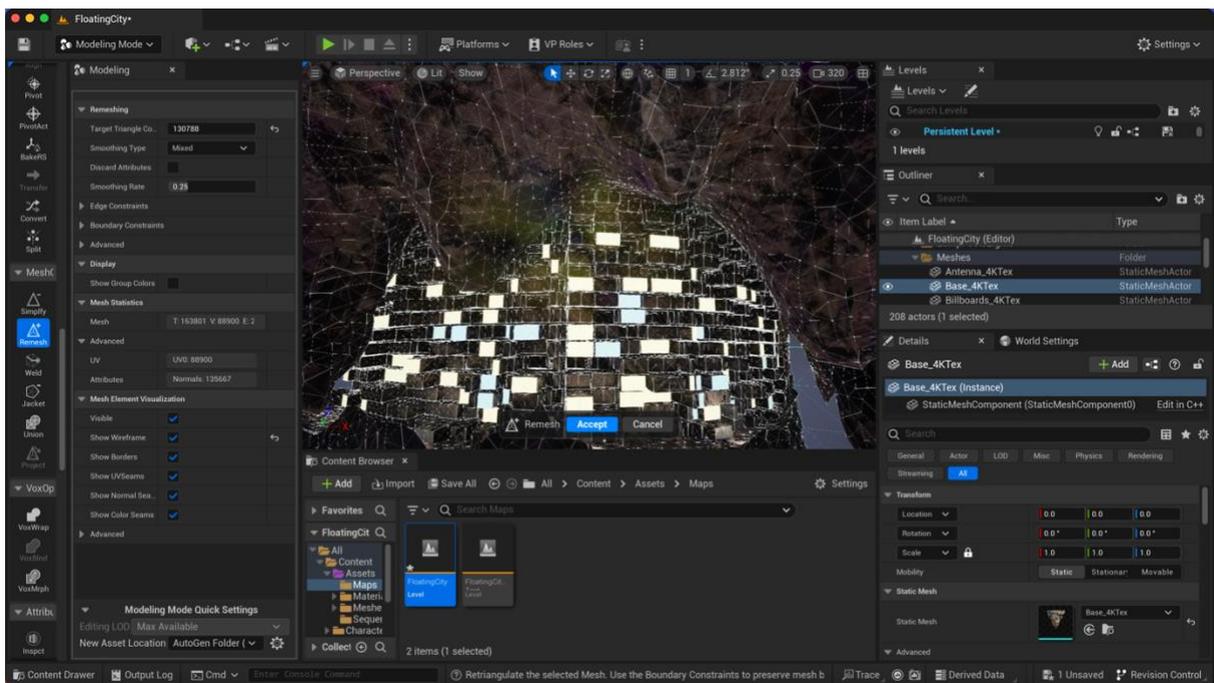
Unreal Engine 5 UE5 Free Tutorial - Making Emissive Materials Pop With Post Processing tutorial by Free Unreal Engine 5 Tutorials UE5 (2021)

After checking this tutorial, I took the Normal and the ORM texture maps of the windows of the skyscrapers for the metallic texture, and then in the same material, I created a 'Constant3Vector' with a yellow, blue, or purple colour, to then take another 'Constant' and converted it to parameter so this can be used to increase/decrease the amount of glow. Then, I plugged these to a 'Multiply' node and this last was plugged to 'Emissive Color'. I also used this method for the rocky block of flats and selected random faces that will show this emission texture. For the skyscrapers that did not have a separation between windows, I created an alpha map in Photoshop alternating white and black stripes of different height. Then, in Unreal Engine, I took this alpha and plugged it into a 'Multiply' node that was at the same time plugged to the previous 'Multiply' node connecting the constant nodes. In order to scale up/down the alpha map, I also connected the 'UV' connector of the alpha map to a 'Texture Coordinate' node and tweak it accordingly. I also used emissive materials for the city wall and the block of flats of the rocky base.

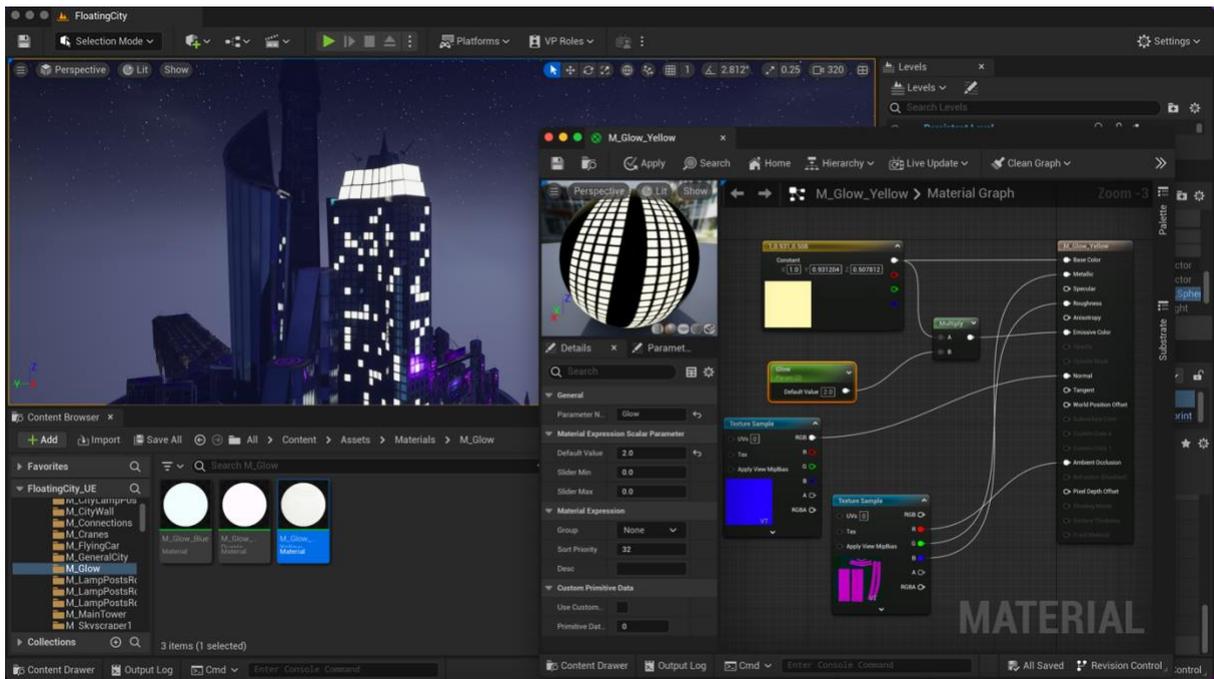
For the city buildings, I went back to Substance Painter and created an emission layer in the buildings texture, to then export/import this from Substance to Unreal and combine this emission map with a 'Multiply' node to multiplied constants as done previously. For the main tower, I also went back to Substance Painter to paint in a soft blue the vents and created an emission layer that will also show the circuit texture of the tower. This last and an emission map of the capsules were also imported in Unreal following same procedure as with the city buildings.



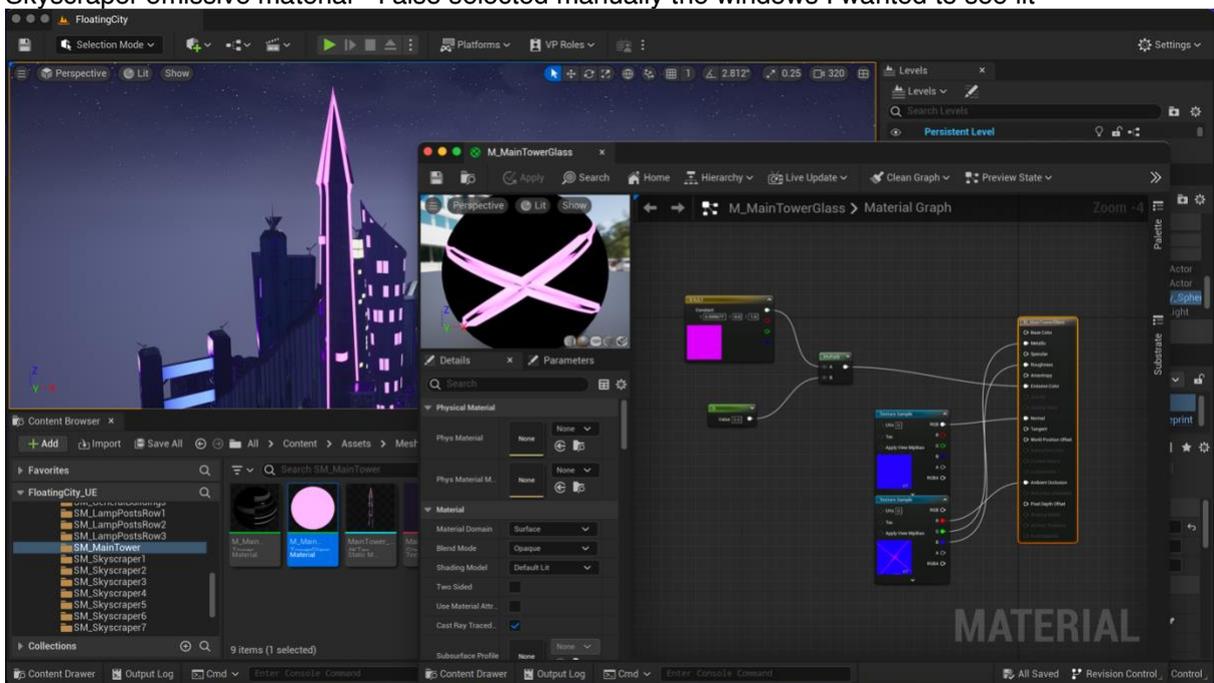
Emissive material to create glow edge in city wall



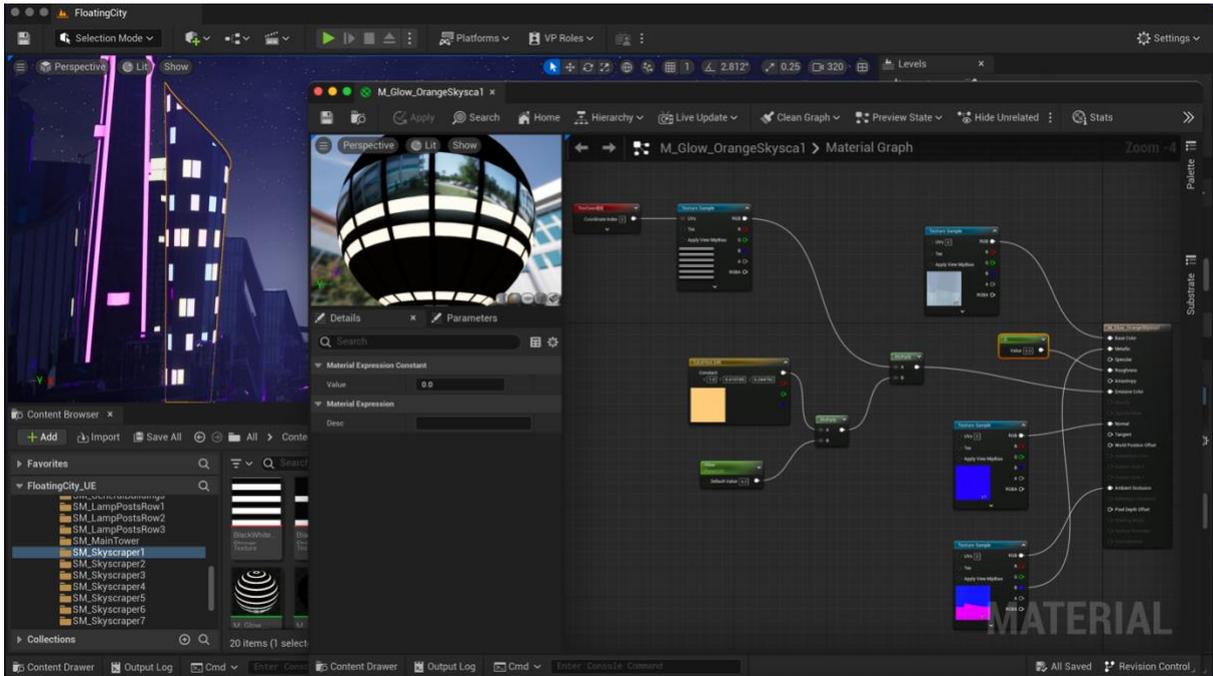
Block of flats in rocky base with emissive material added to manually selected faces



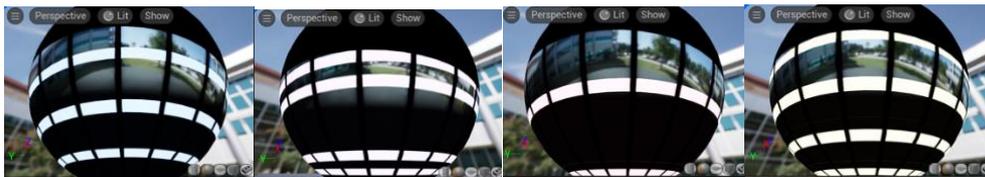
Skyscraper emissive material - I also selected manually the windows I wanted to see lit



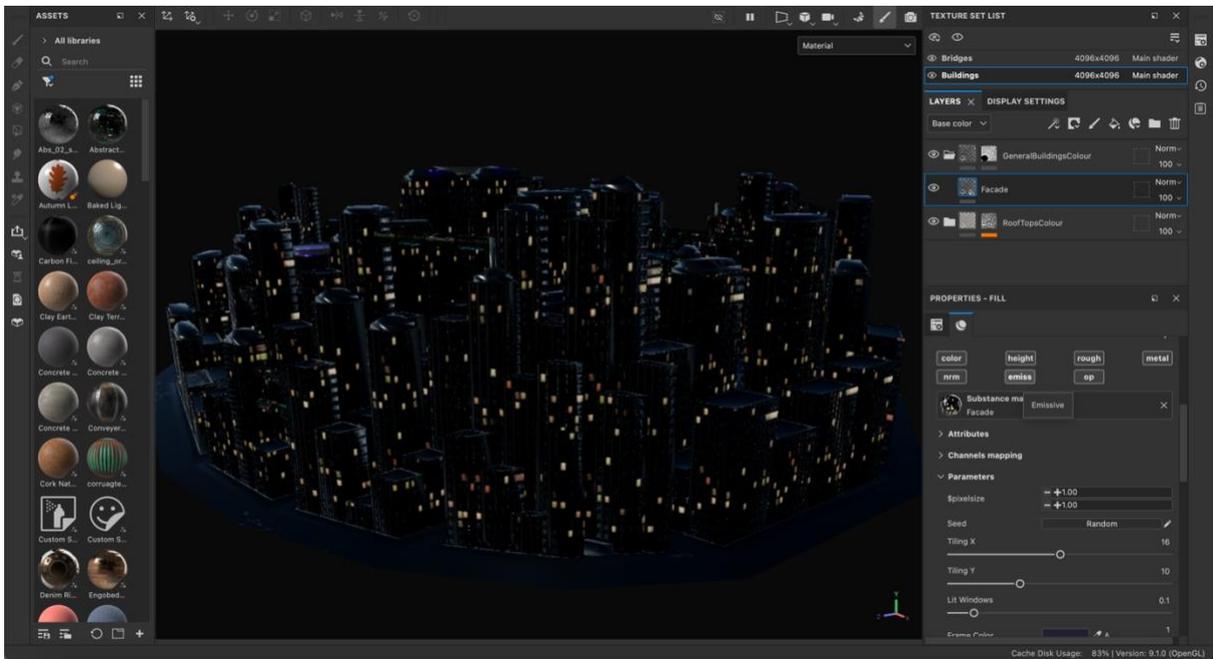
Main tower with emissive material



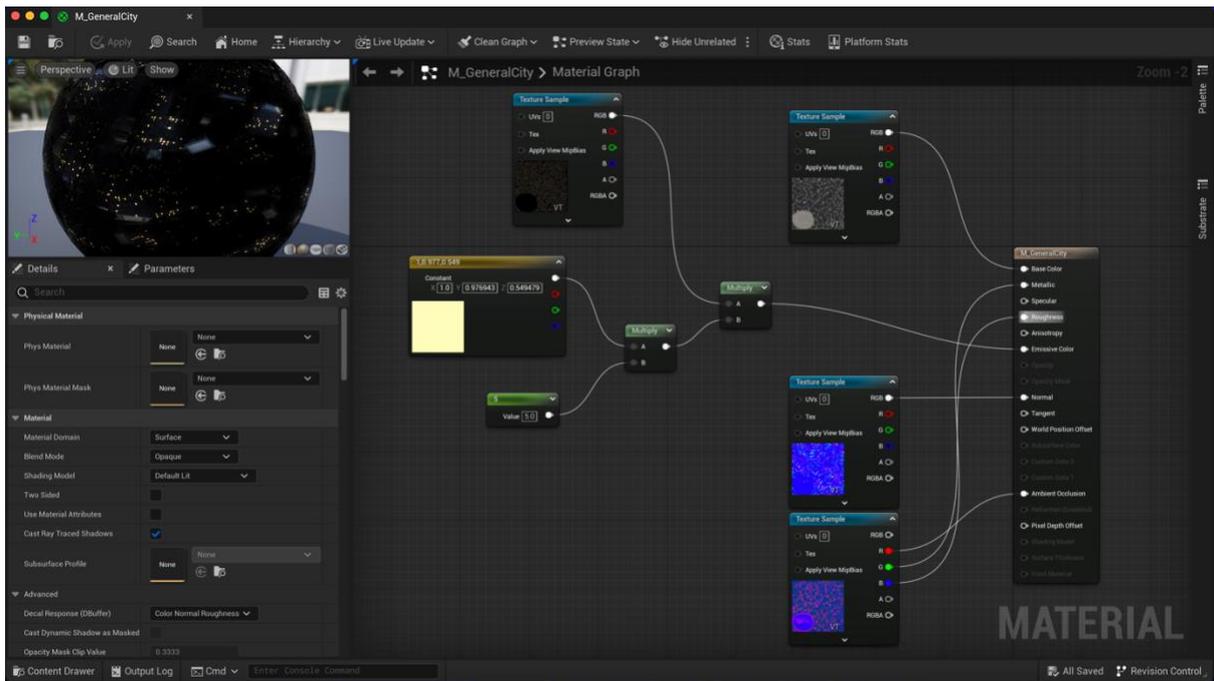
For the skyscraper that did not have windows separations (horizontally), I created a quick alpha in Photoshop with black and white stripe variations. Then, in Unreal I added these and used the different variations by selecting the columns of windows of the skyscraper



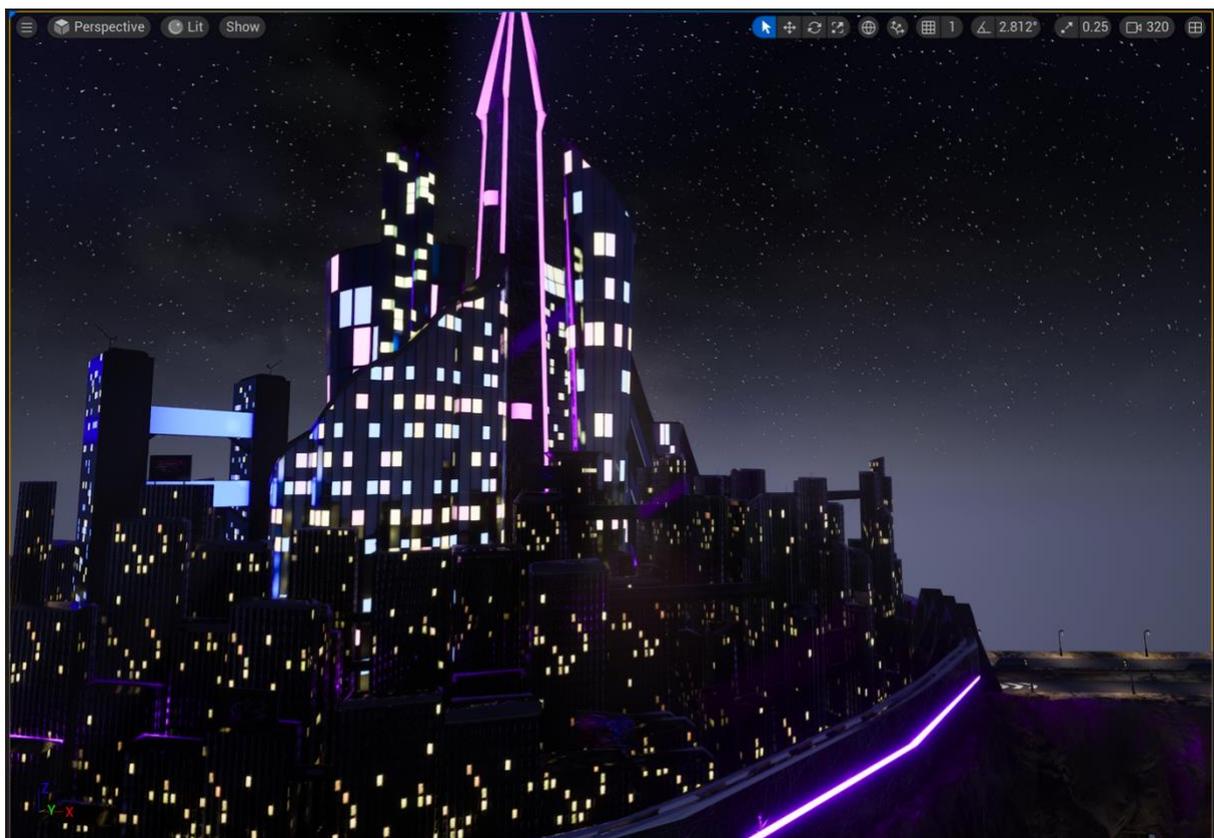
Alphas variations



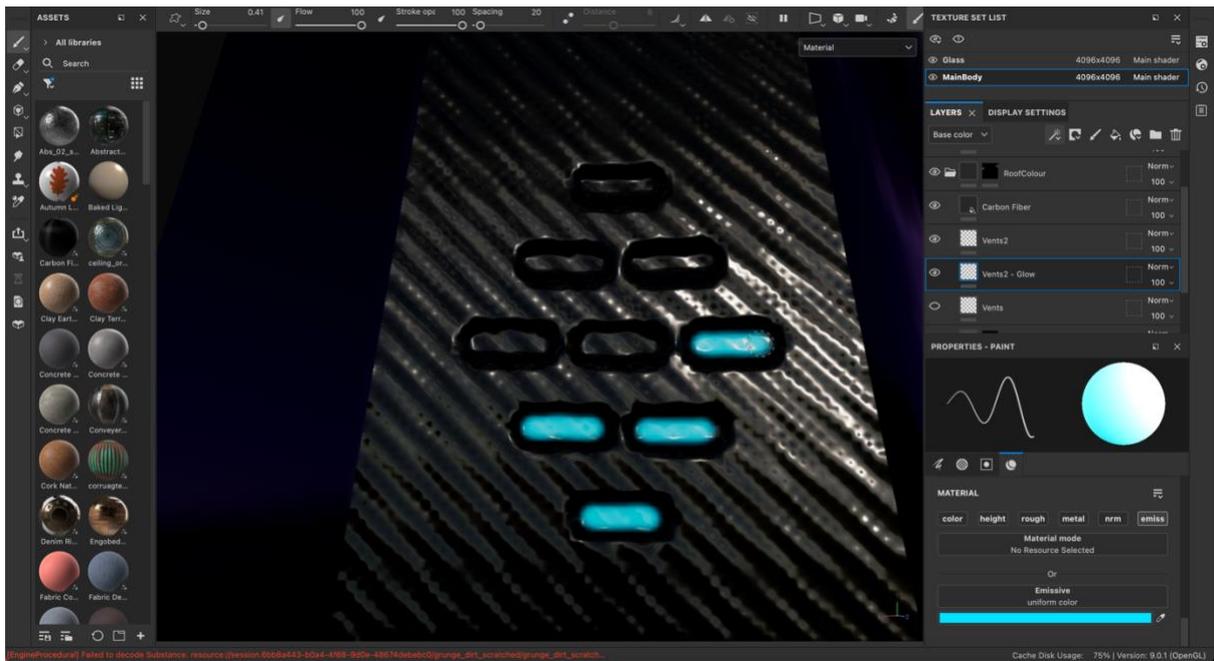
For the general buildings I went back to Substance and exported an emissive layer



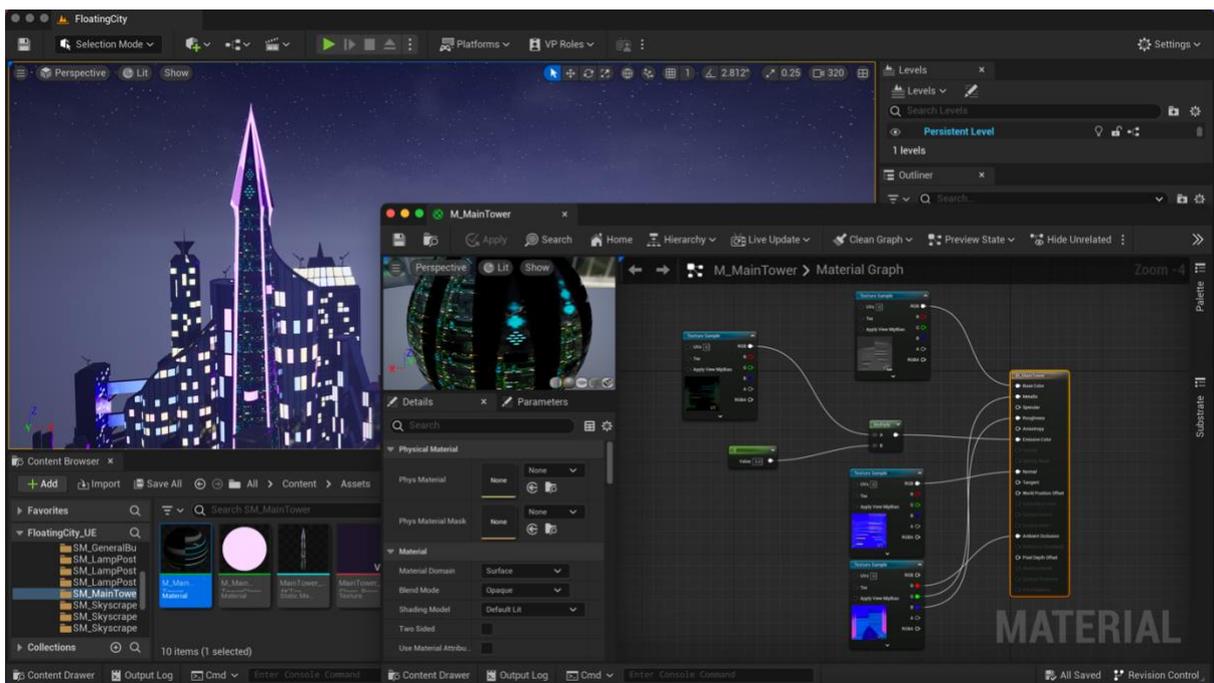
City buildings' material with emission map in Unreal



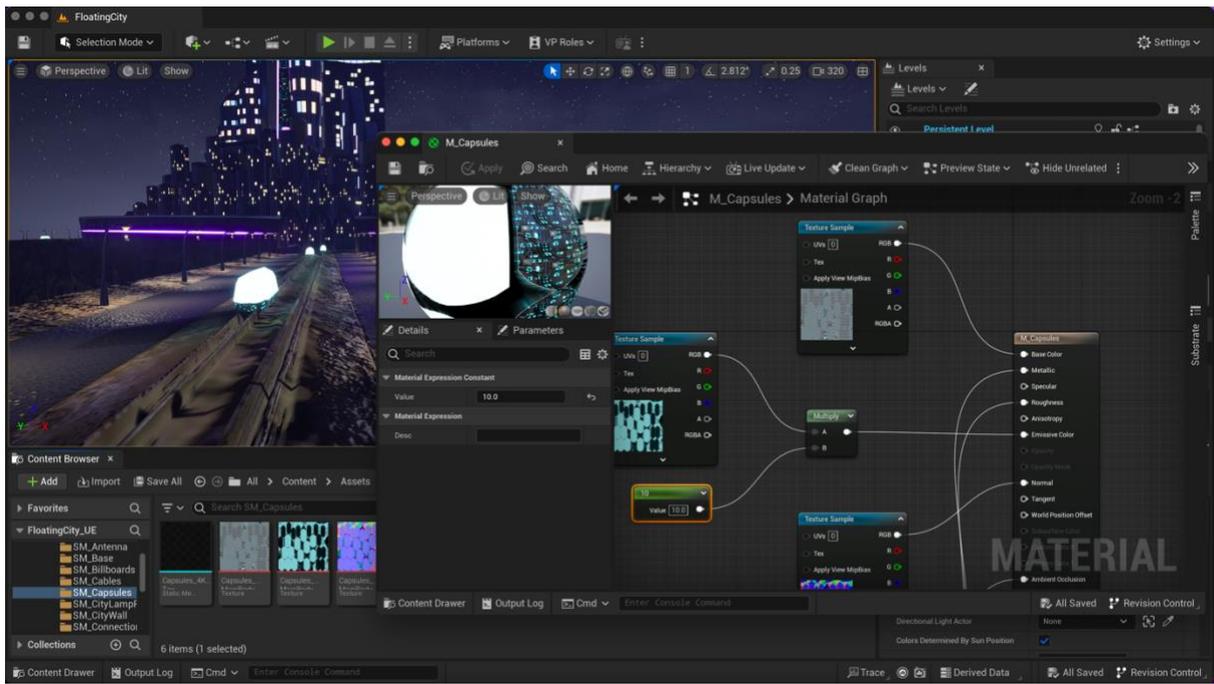
City buildings view with emission map added on



For the main tower, I went back to Substance and manually created an emissive texture of the top vents by painting on them. I also created an emission layer for the main body circuit texture



Main tower with emissive material added on

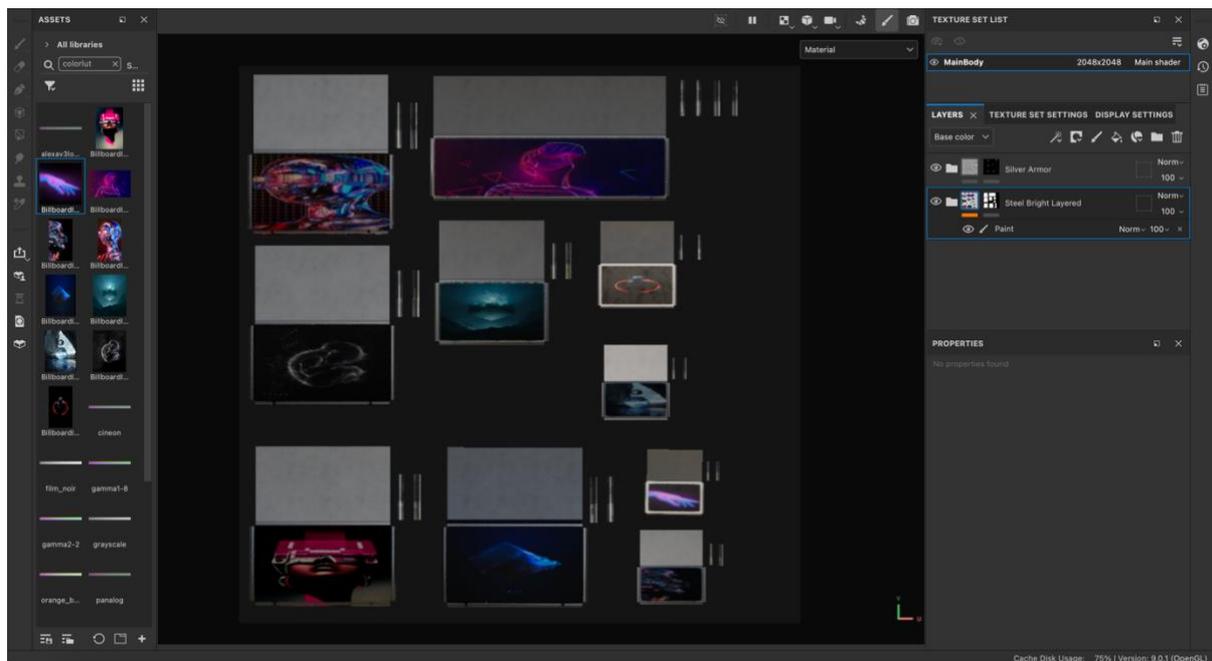


Capsules emissive material

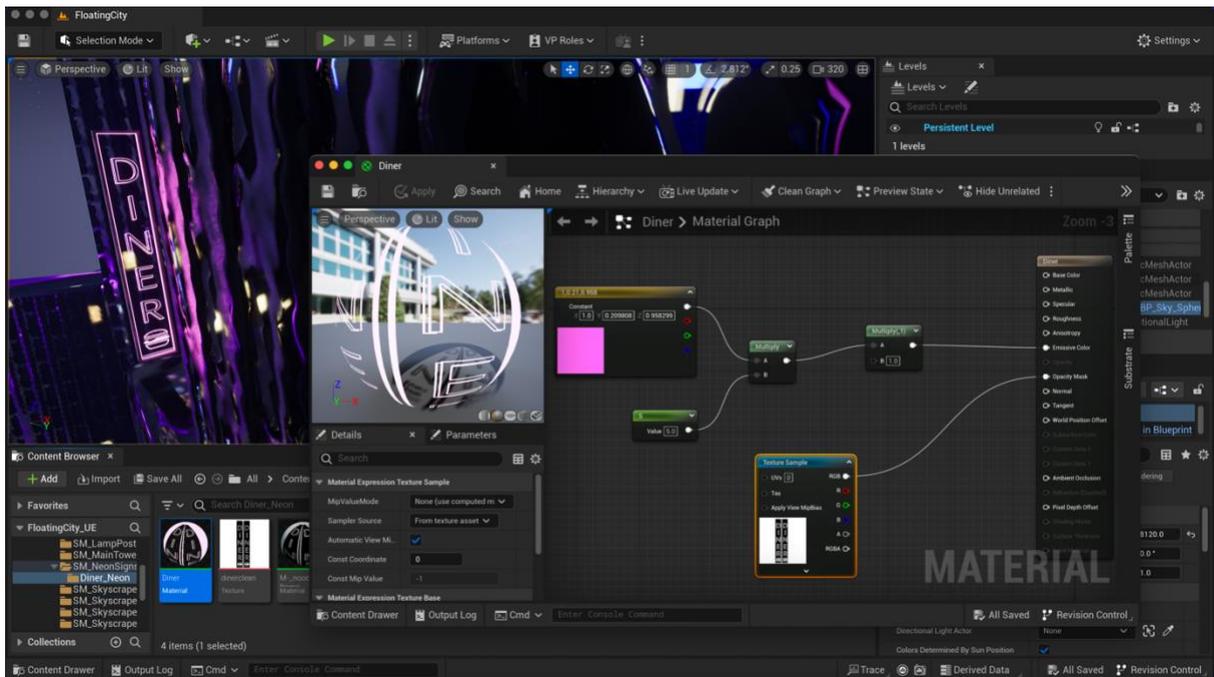
Billboards and neon signs

I decided to model some quick billboards in Maya to then create a quick texture in Substance Painter by taking random royalty free images found online that would look like a commercial. I exported/imported this from Substance to Unreal and apart from the texture, I also added some emission light to enhance the colours (originally they were looking a bit flat). Lastly, I added rectangle lights pointing at the billboards to make them more visible.

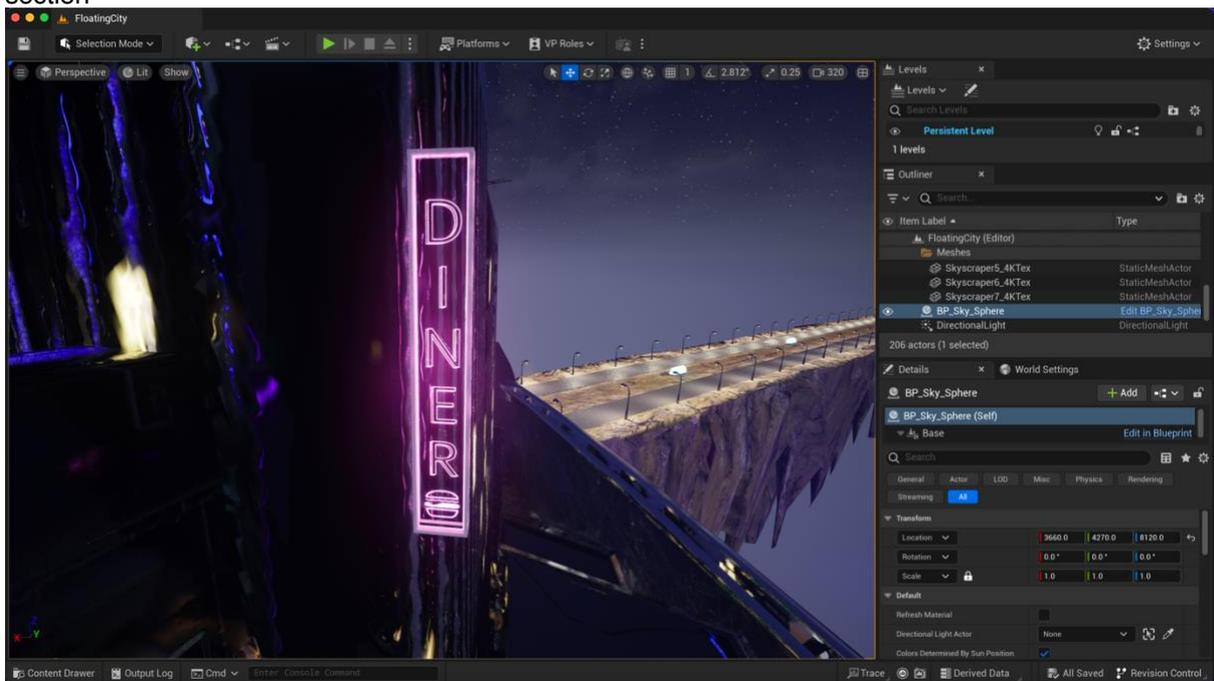
For the neon signs I searched online royalty free alpha maps of simple neon designs. I could have design this myself in Photoshop or Illustrator as I have experience with this, however, due to time constrains, I considered it was going to be quicker to just search for random designs as these are going to be barely visible in the background. Once I found some alpha map designs of neon signs, I created as previously a constant that was plugged to 'Emissive Color', however, this time I changed the blend mode to 'Mask' so I could plug in the alpha map of the neon sign to 'Opacity Mask' option. This way the emission colour will only be visible through the white areas of the alpha map and the neon sign will be visible. I came up with this idea by putting together my Photoshop knowledge of layers and implementing the same logic into Unreal Engine.



Billboards textures made in Substance using some royalty free downloaded images that look like commercials



Diner neon sign made with emissive texture and an alpha that will be linked to the 'opacity mask' section



Diner sign with neon effect



Neon signs



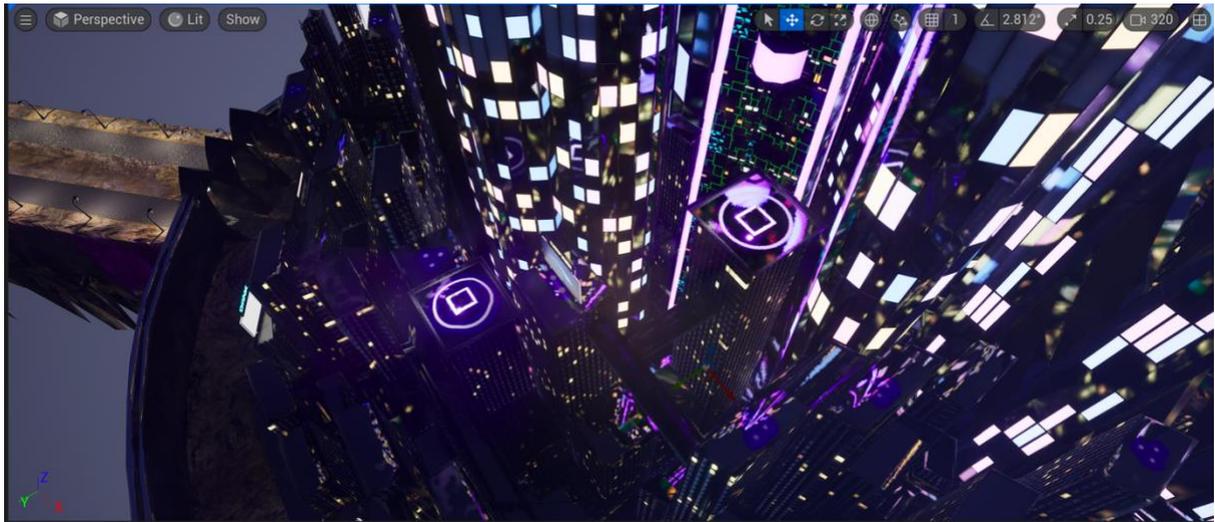
Neon signs



Neon signs



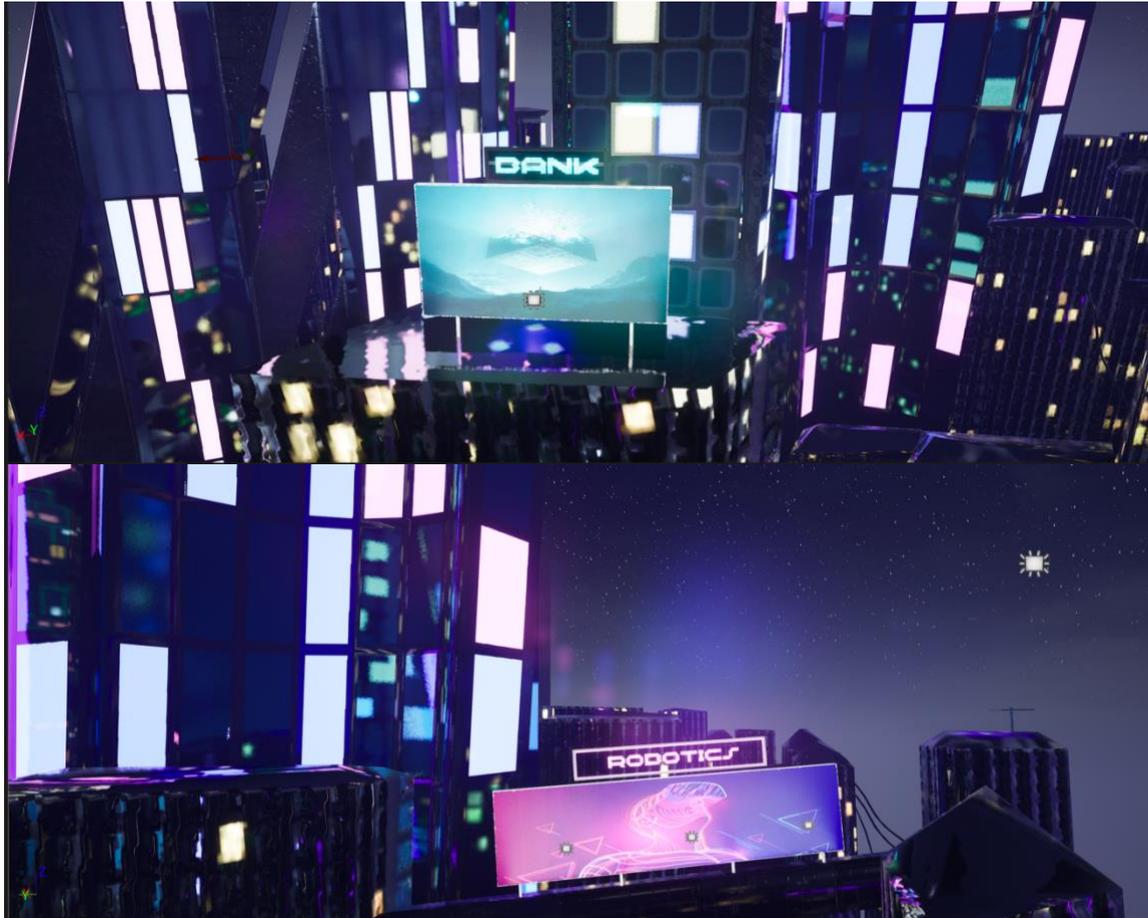
Neon signs



I also used an emission map for the landing signs on the top of the buildings



For the billboards, I used an emissive map to enhance their colours and make them look like they are lit



Billboards with emission map

References

Faucher, W. (2022). *Lighting a NIGHT-TIME exterior in Unreal* (online). Available at: https://www.youtube.com/watch?v=1LfiYtKDsac&list=PLAlv9GvsMvnMCUwPx_gcXaCj_yHYdIPqD&index=42 [Accessed 10th Nov 2023]

Free Unreal Engine 5 Tutorials UE5 (2021). *Unreal Engine 5 UE5 Free Tutorial - Making Emissive Materials Pop With Post Processing* (online). Available at: https://www.youtube.com/watch?v=c_0jOwT4xRc&list=PLAlv9GvsMvnMCUwPx_gcXaCj_yHYdIPqD&index=26 [Accessed 11th Nov 2023]

Week 7: Flying Cars & Capsules Alembic Import from Maya to Unreal, & Foliage, Ropes, Holograms VFX, & Secondary Cities in Unreal Engine

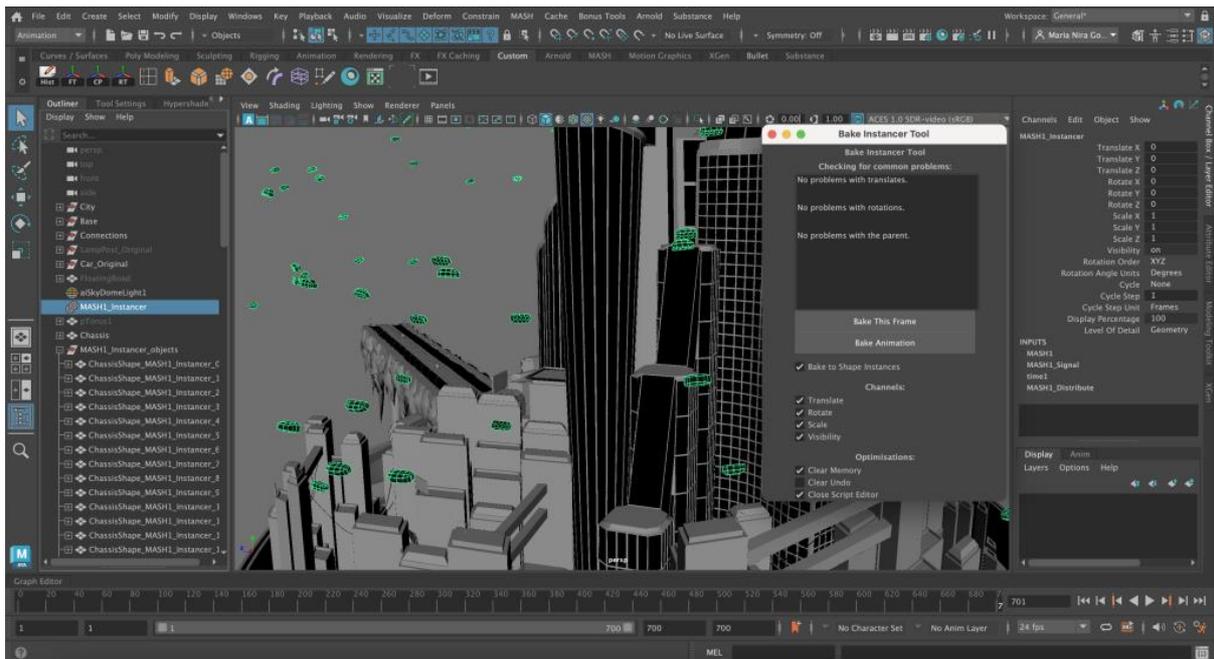
After the lighting was ready, it was time to add the flying cars and capsules animations made in Maya, and to final touches like foliage, ropes, holograms, and secondary cities that will bring the whole scene to life.

Flying cars and capsules animation export/import in alembic from Maya to Unreal.

I extended to 1500 frames the animation of the flying cars that I made previously in Maya using MASH tool, so I have enough to cover the whole video without any cuts in the animation (as this is a randomised car fly animation, it would be really hard to try to loop it, so an extension was the most logical way to go). After finishing the car animation, I used the 'Bake Instancer Tool' to bake the MASH animation and convert it to instanced mesh with key-framed animation. Then, I quickly animated the capsules moving throughout the connections with simple key framing. Once I had my two animations ready, I checked the textures sets where properly name so they are easy to relink in Unreal. Then, I cached the geometry as alembic and imported this into Unreal. When importing to Unreal, I made sure that the import type was set as 'Geometry Cache', the conversion of the animation was set to 'Autodesk 3ds Max', and then the animation was scaled up to 1000 units so it has the perfect positioning and measurements. All of this alembic exporting/importing from Maya to Unreal information was taken from the following tutorial from Voxel Vagrant channel:

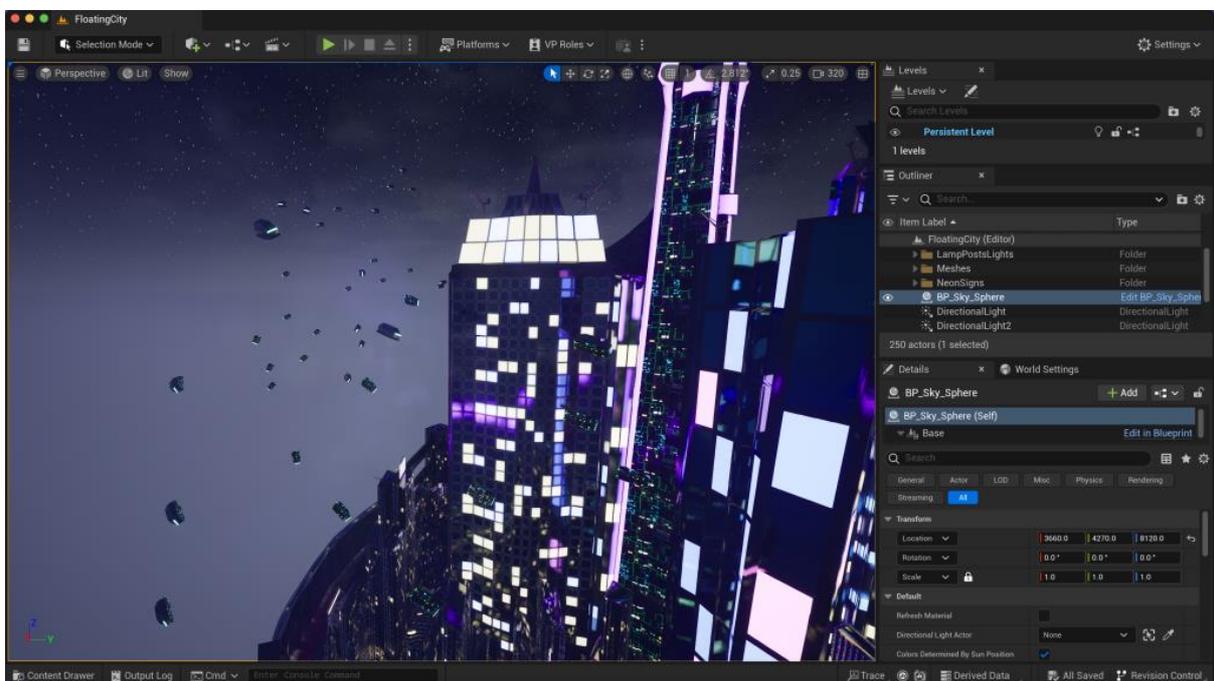


Exporting Alembic From Maya to Unreal [with Materials Assigned] tutorial by Voxel Vagrant (2021)

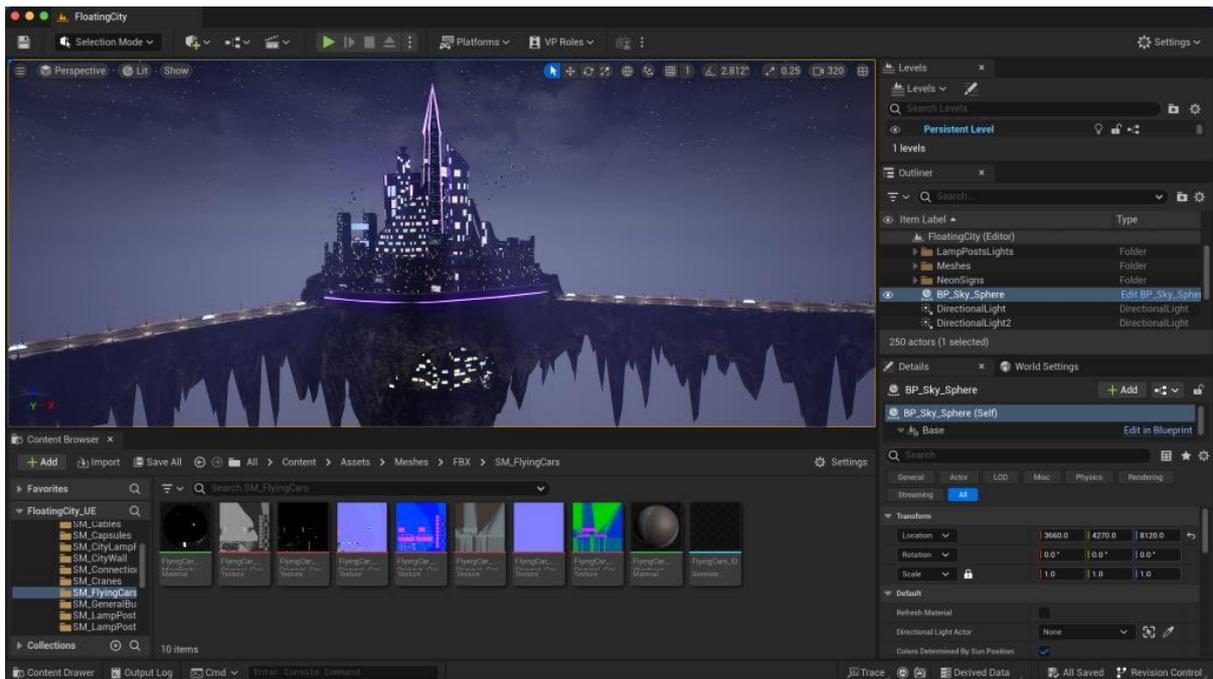


Baking flying cars MASH animation in Maya

Once both animations were imported into Unreal, I relinked the textures easily as the materials of each part of the mesh were already created by the programme. Then I also used the emission map I exported from Substance Painter for the cars and the capsules so I lit the cars' front light and the capsules' windows.



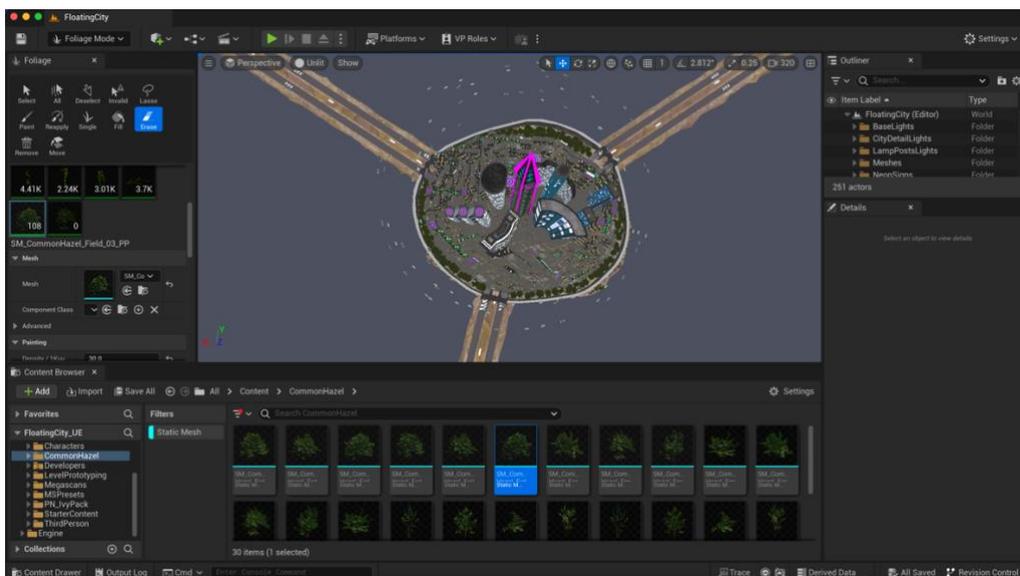
Flying cars with textures and emission map added on front lights in Unreal Engine



Capsules windows with emission map in Unreal Engine

Foliage and city ropes in Unreal

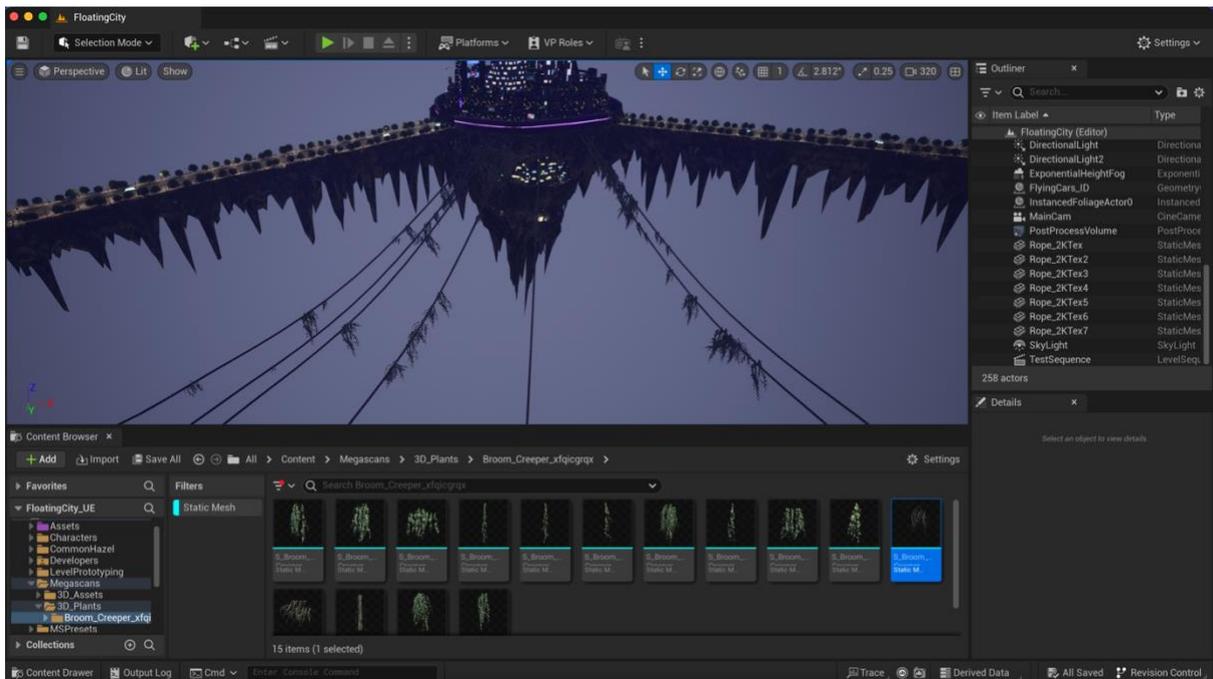
Since the scene was looking a bit deserted, I also decided to add some foliage and ropes hanging from the edges of the rocky base (as if these were attached to a nearby mountain or other floating cities). I downloaded two foliage packages I found in Epic Games Marketplace: one for the trees of the city and connections and hanging plants for the ropes and the edges of the rocky base. I placed them with the 'Foliage' tool in Unreal which turned out really easy to use, as I only had to import the packages and then drag and drop the foliage I wanted in the 'paint' area and then I just adjusted the density and the positioning/scaling randomness from one tree/hanging plant to the other.



Inner city foliage



Connections foliage



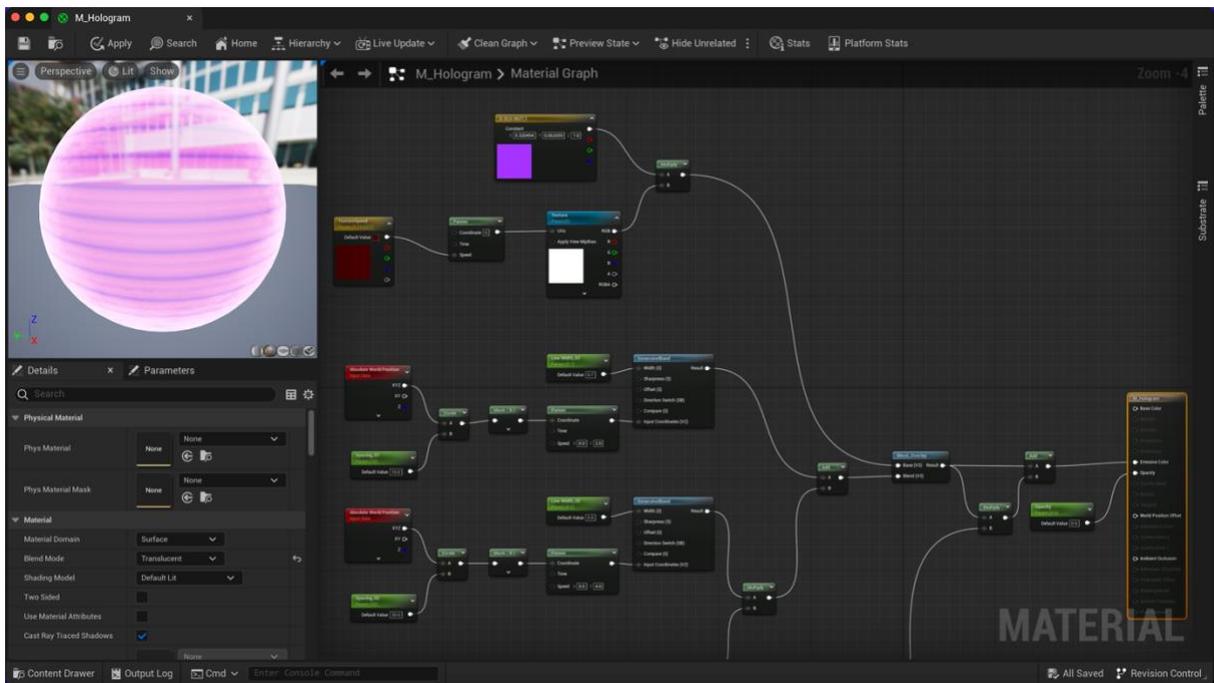
Ropes

Holograms VFX in Unreal

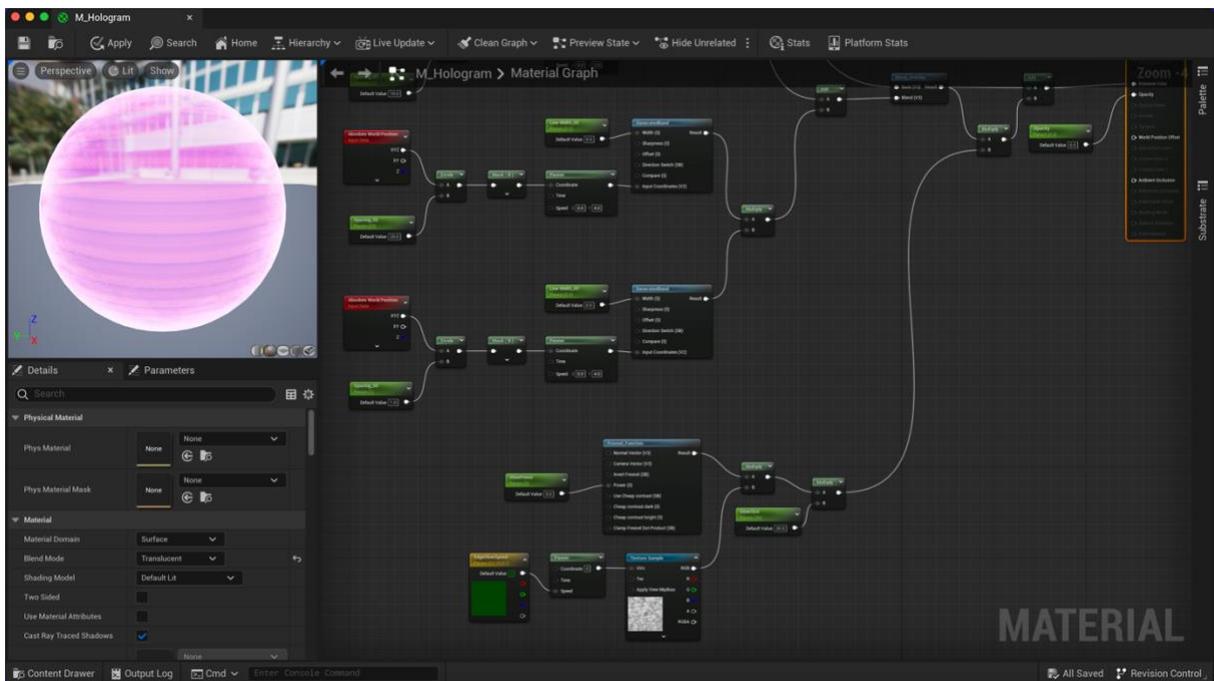
To do the holograms, I found a tutorial that teaches step-by-step how to build the VFX up in Unreal directly by blending 'Generate Band', 'Panner', and 'Fresnel Function' nodes that will create the illusion of a moving hologram by alternating different coloured constants that will act as speed and glow intensity parameters of the effects.



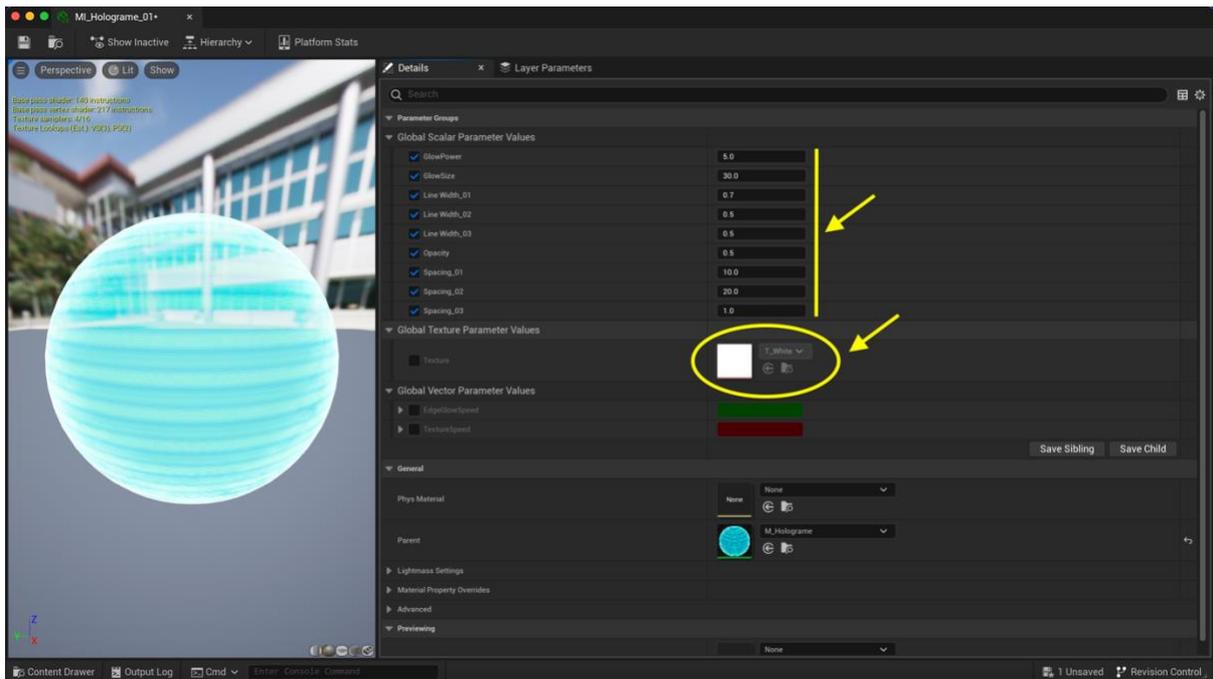
Create a sci-fi HOLOGRAM material shader in Unreal Engine 5 (FREE download) tutorial by tiedtke. (2022)



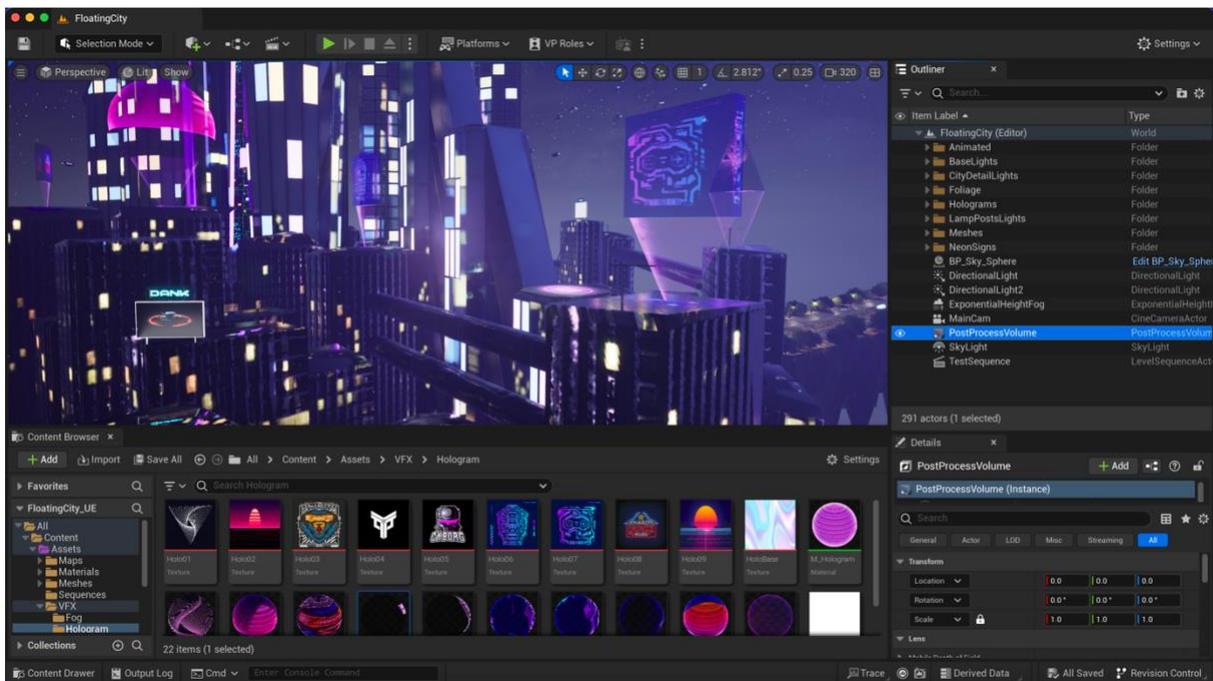
Following a the tutorial above, I built up this hologram material – part 1



Hologram material – part 2



Hologram material instance with parameters created to control the effect directly from here



Holograms look

Secondary Cities

Once the main city was completed, I copied the main features such as general buildings, skyscrapers, bus, city wall, and flying cars, and pasted them at the end of each connection linked to the main city. I did not copy/paste the holograms, the neon signs, nor the city lamp posts as these are not going to be visible from far away and so the scene does not get too heavy for rendering.



General view with all secondary cities added

References

tiedtke. (2022). *Create a sci-fi HOLOGRAM material shader in Unreal Engine 5 (FREE download)* (online). Available at: https://www.youtube.com/watch?v=IWV52h-VHi8&list=PLAlv9GvsMvnMCUwPx_gcXaCj_yHYdIPqD&index=6 [Accessed

Voxel Vagrant (2021). *Exporting Alembic From Maya to Unreal [with Materials Assigned]* (online). Available at: <https://www.youtube.com/watch?v=kSFNGB4PAr8&t=863s> [Accessed 15 Nov 2023]

Week 8: Camera Set Up, Render Queue, Test Renders & Last Corrections in Unreal Engine, & Showcase Poster Design in Photoshop

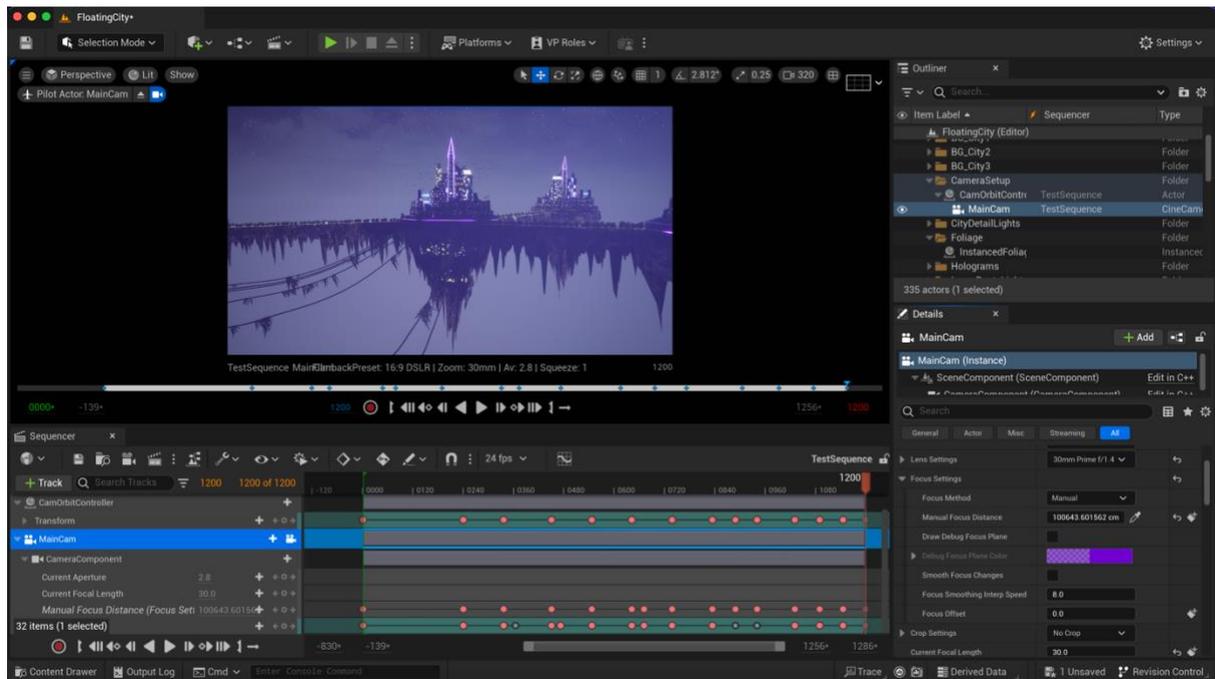
Once everything was set in my scene, I carried on with the camera movement set up in the Unreal sequencer. After setting up the camera movement, I noticed some details that were missing so the scene space makes sense, such as clouds beneath the city and the moon above it. I continued to do some test renders and to tweak the lighting accordingly until I was happy with the result. I also did a render of the best frame of the sequence so I can add it to the poster design of my project in Photoshop for the showcase.

Camera movement set up and sequencer in Unreal

For the camera set up, I follow a nice and simple tutorial explaining how to use a null actor that will act as the camera orbit controller so when I move the camera position, this will always be pointing at the null position. This is useful to do smooth rotating transitions around a main object, in this case, around the floating city. I used keyframes in both the camera orbit controller and the main camera in the sequencer. Then, I also added the animations of the flying cars and capsules and set them to track the geometry cache of each one of them, this way these animations will be included in the render too.



Cinematic Camera Moves in Unreal Engine 5 - The Orbit tutorial by Jon Jags Nee (2022)

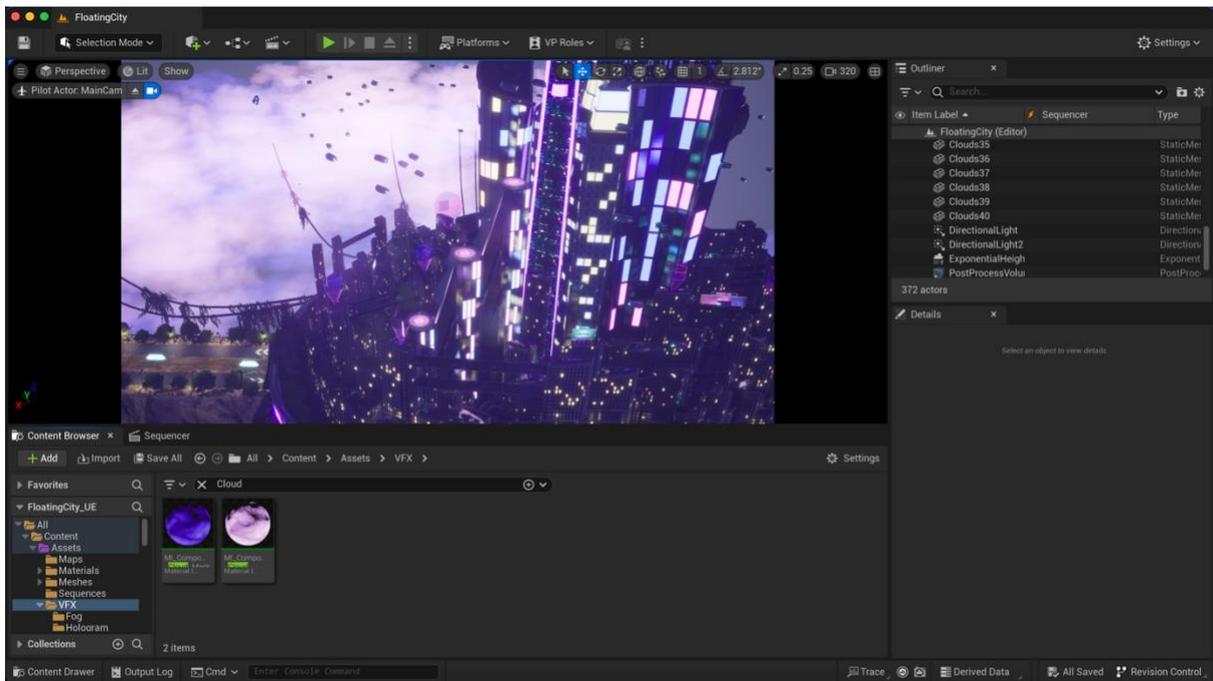


Camera set up in Unreal

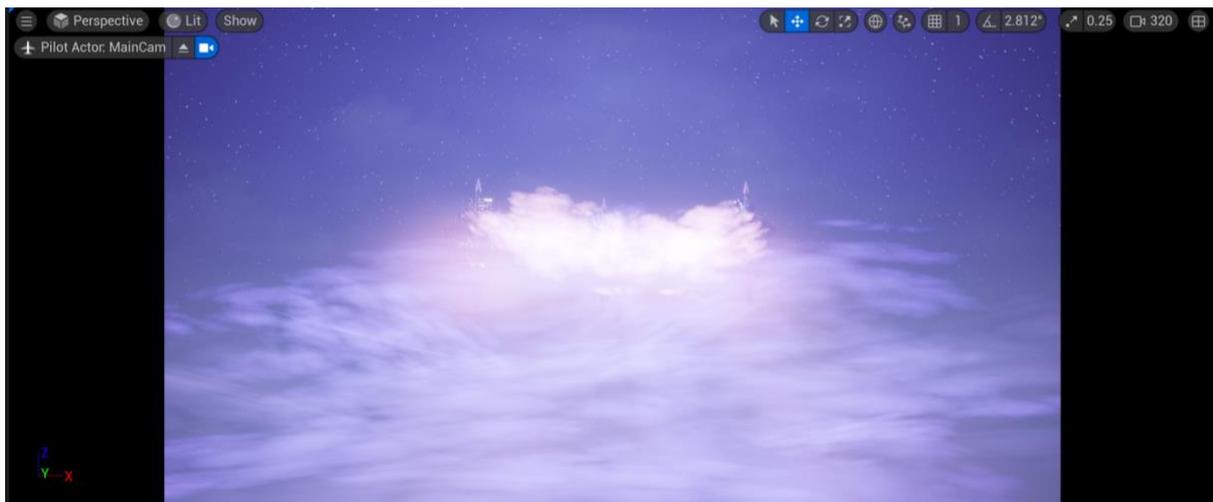
Clouds and moon

After setting the camera movement, I noticed some areas of some frames that looked empty or they did not really felt part of the environment. The city was surrounded by exponential fog which showed a fine mist, but it was missing, in my opinion, some clouds to put this fine mist and the background together. Therefore, I found some clouds in the Engine content and created several instances with different purple colour variations from more saturated to less saturated (depending on the distance were the cloud was placed).

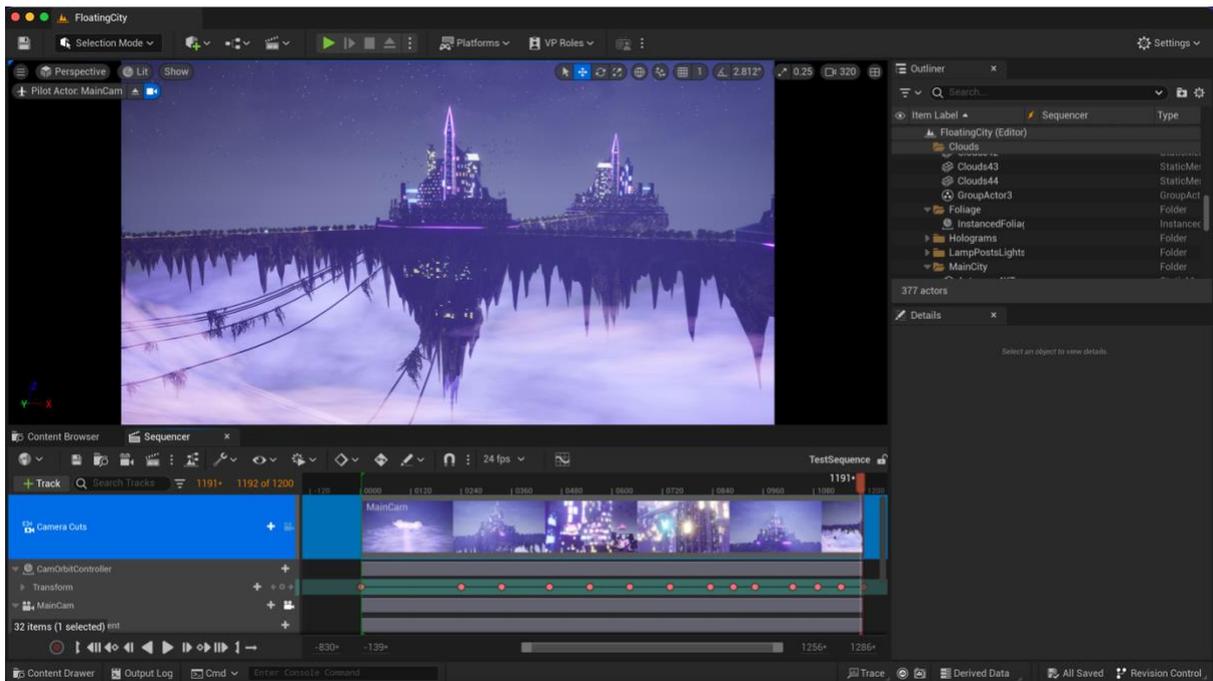
Also, I decided to add a moon manually since the directional light and the exponential fog were creating some foggy rays that were coming from the top of the city and it was only showing an empty space in the sky. Therefore, it made sense to me to add the moon in that spot of the sky with a simple sphere and an emission material. I tried to place it far away so it does not look too defined in the scene.



Clouds added to put background and models together – material instances made from a cloud material I found in the Engine Content



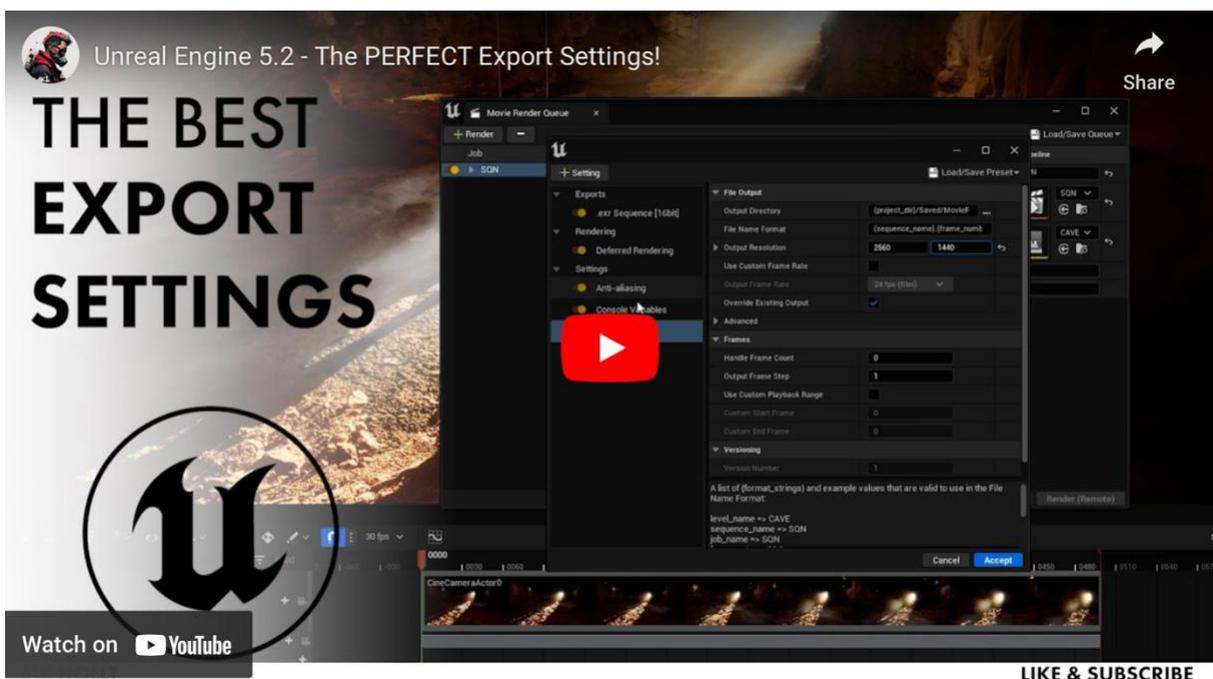
Main camera view of clouds in the beginning of the shot



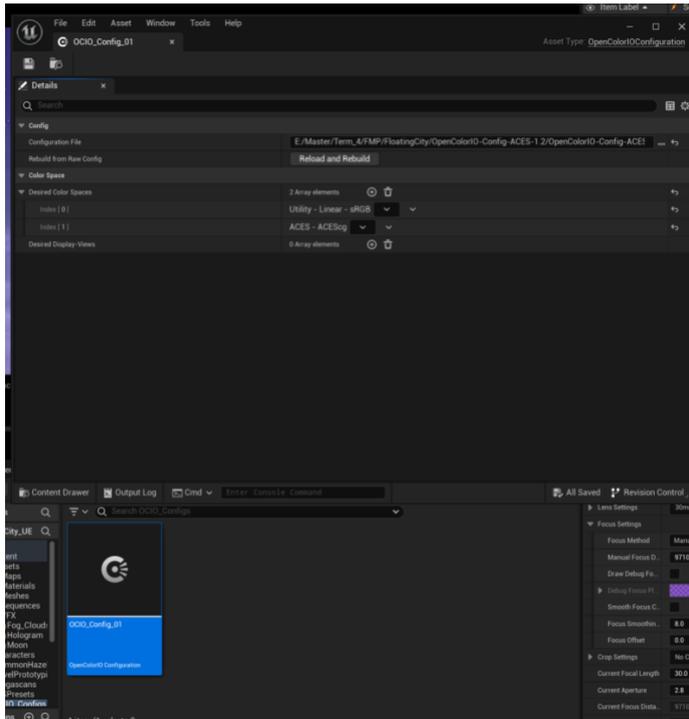
Main camera view of clouds in the end of the shot

Test renders with render queue and corrections in Unreal

For rendering I found several tutorials for specific colour spaces set up, but due to obvious time constrains, I opted for the simplest one which is just the regular settings in EXR 16 bits, Anti-aliasing with 'Spatial Sample Count' set to 36 and 'Temporal Sample Count' set to 6, as advised by Mr. Hollt (2023) in their rendering in Unreal Engine tutorial for best foggy ambient rendering.



Unreal Engine 5.2 - The PERFECT Export Settings! tutorial by Mr. Hollt (2023)



I tried to set my scene to OCIO ACES colour configuration, but this changed the colours I already had set as I should have done this before starting to light the scene. Therefore, I decided to go with linear sRGB Rec709 which is Unreal preset colour space



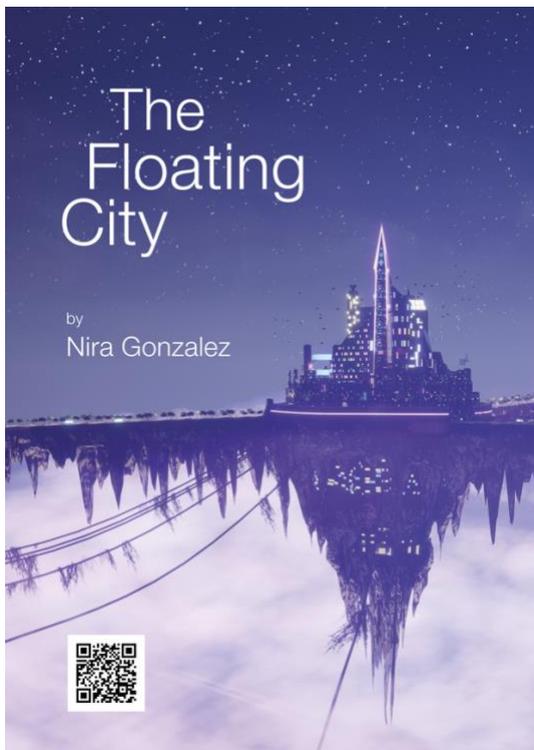
Test render sample with darker and less dense clouds



Test render sample with lighter and denser clouds

Showcase poster design in Photoshop

While test rendering, we were asked to pick a picture of our project to added to the pre-designed poster template for the showcase. Since I had my own idea already on mind, I decided to design my own in Photoshop. The one below is the design I came up with:



References

Jon Jags Nee (2022). *Cinematic Camera Moves in Unreal Engine 5 - The Orbit* (online). Available at: https://www.youtube.com/watch?v=29QM-Ky7TTQ&list=PLAlv9GvsMvnMCUwPx_gcXaCj_yHYdIPqD&index=5&t=313s [Accessed 23 Nov 2023]

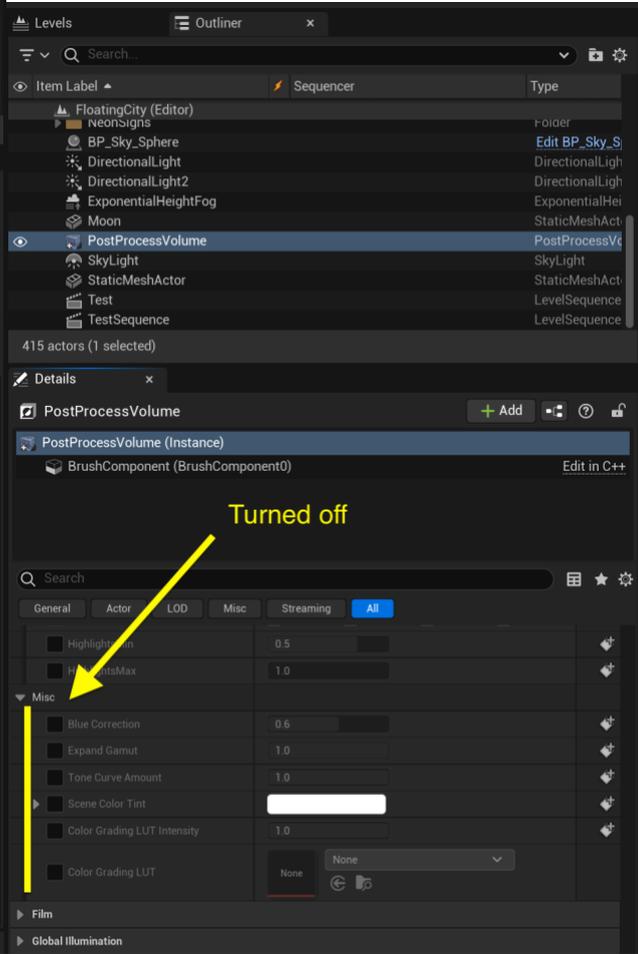
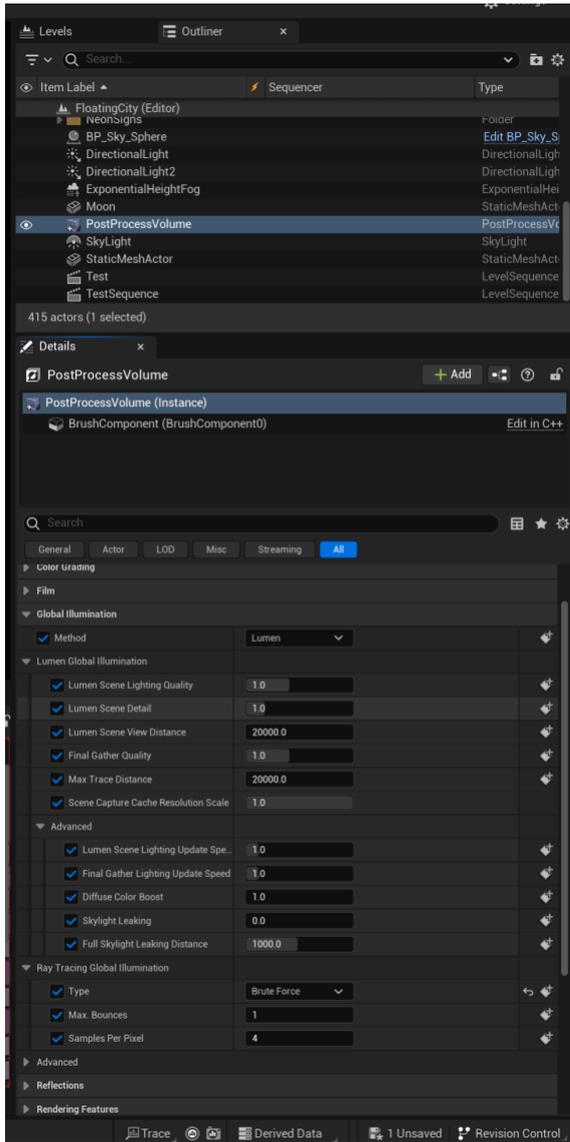
Mr. Holtt (2023). *Unreal Engine 5.2 - The PERFECT Export Settings!* (online). Available at: <https://www.youtube.com/watch?v=Uy3b3Wh216w> [Accessed 26 Nov 2023]

Week 9: Final Render, Post-Production in Nuke/After Effects, & Showcase Organisation (Layout & Projection Mapping)

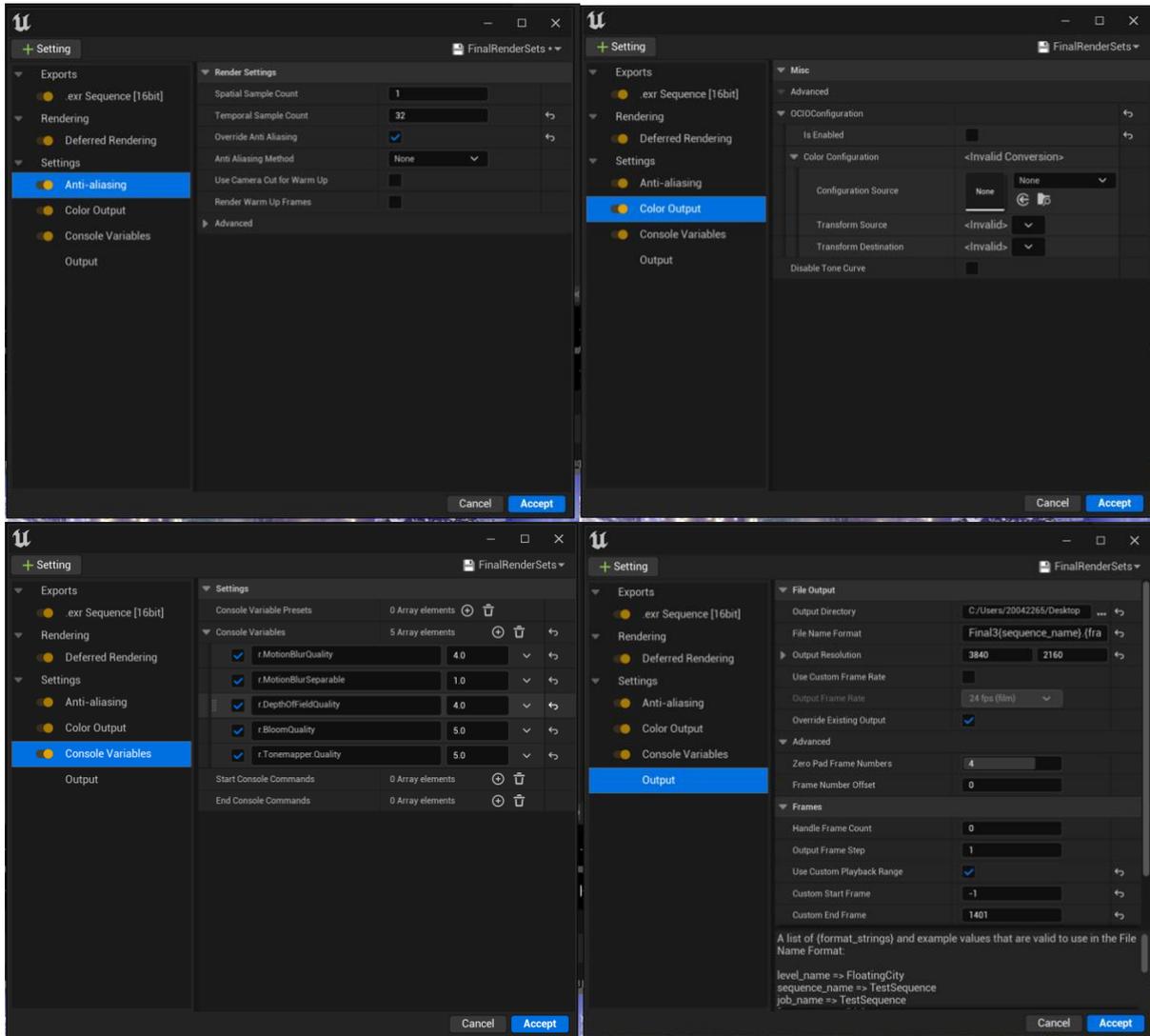
This last week, I fixed some issues I found in the test renders and re-rendered the whole scene. I also colour corrected the scene and added some extra glares reflections in Nuke to then add the music and sound effects in After Effects. Lastly, I have also been involved in the showcase organisation by planning the layout and projection mapping we want to do.

Final render, colour and god rays corrections in Nuke, and final video editing with music and sounds effects in After Effects

For the final render I had some issues with Unreal Engine as suddenly, when I opened the project that was ready for render, this was showing completely white in 'lit' mode. All settings were the same and nothing was changed. After asking the technicians and Emily, they assumed that my file was corrupted. Therefore, Emily suggested to create a brand-new project in Unreal and to migrate all the content folder to that new project. Thankfully, this solved my issues, and I could render my final outcome. Given that we were supposed to show our project in a big 4K screen, these are the settings I used for a 4K high resolution render:

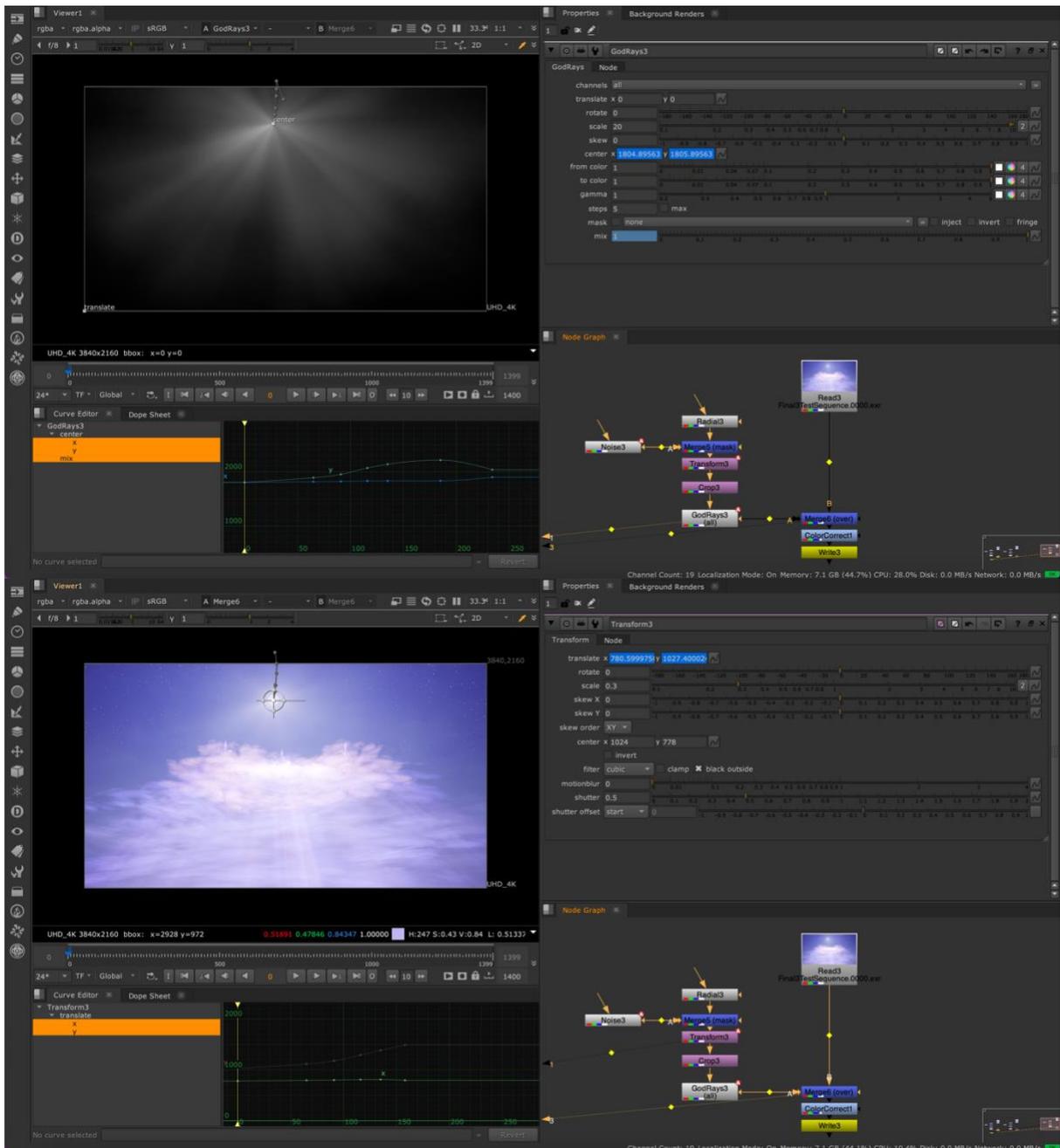


'Post Process Volume' extra settings for high resolution render



Render settings for high resolution outcome

After rendering, I imported it into Nuke so I could correct the moon's god rays and colour grade the scene to a darker and more contrasting tones. The god rays were done by keyframing the centre, translate and mix of the effect.

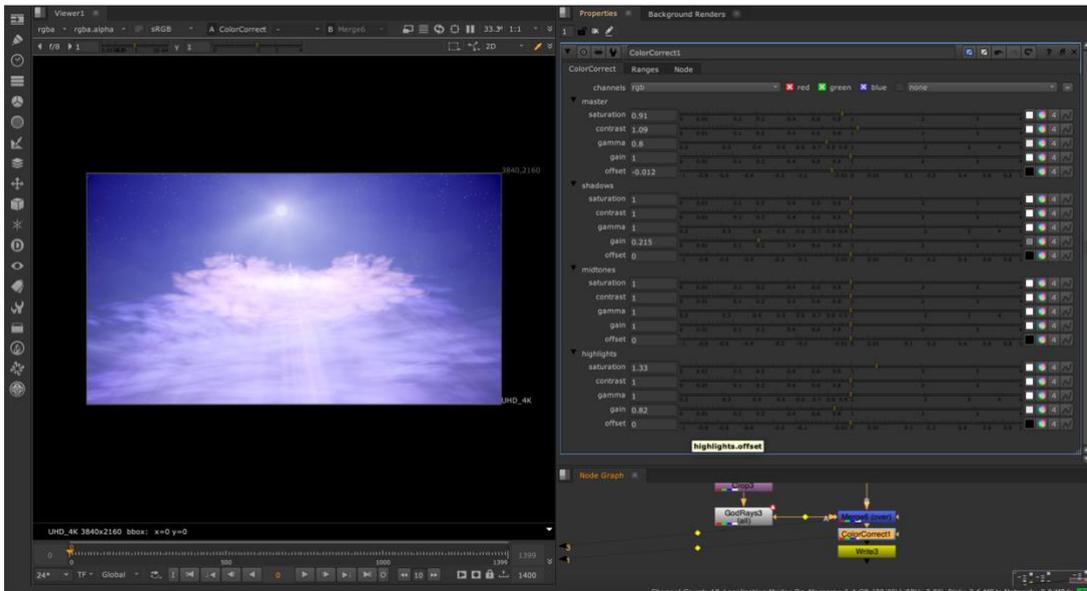


God rays added in Nuke



Before adding god rays

After adding god rays





Colour correction in Nuke

Then I searched royalty free music and sound effects and edited the final video in After Effects. The following video is the final result of the floating city project:



The Floating City final video - <https://youtu.be/VIXI-XLkHyo>

Showcase organisation

For the showcase, I am in charge to do the projection mapping that we will project on top of a platform on the wall we designed and crafted (mainly Roos and Martyna, but I helped with the design and craft). I will be using Mad Mapper programme to do this projection mapping and we will add several videos of the different projects of the classmates by masking and positioning them in the part of the structure we want them. We will possibly require only one projector to cover the whole structure but we can get a second one for support just in case.