

Swansea Mumbles Road Development – Phase 1 Preliminary Study

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Introduction

This study goes through and looks at the reliability of redeveloping the swansea mumbles road tesco site turned into a five story hotel , restaurant and business centre. It includes a historical background of the area , highlights recommendations for the ground investigation and presents a starting design informed by geotechnical borehole data. Through these findings it showed unsuitable ground at shallow depths underneath the dense graels and bolder clay which shows the need for a deep piled foundation system. The report addresses regulatory compliance (e.g., BS 5930, BS 10175, BS 8004) , sustainability measures , potential contamination risks, and construction phasing. The information given are in line with Swanseas regeneration strategy ,making sure to focus on environmental responsibility , engagement with the locals and community and structural stability. the aim of this report is to give information on a full ground investigation and to provide a foundation choice best suited for the area by looking at geotechnical data , environmental constraints such as protected species in the area and historical development. the importance of reliability , sustainability and to comply with regulations is necessary for this project to undergo.

Historical Background

A desktop study shows that the Swansea Mumbles Road site has changed a lot over the past two centuries. Ordnance survey maps and old photos show the transformation from a coastal beach ecosystem into a strong developed urban area.(WalesOnline2021).

Early History

In the early 1800s Swansea was shown to be a widely open and undeveloped use of land mainly used for fishing and coastal walks.



Figure 1

Ordnance survey maps from 1880 show natural environments such as vegetation booming in the area (UK map centre), However by the 2000s the beginning of rail structures that allowed more access to Swansea marked the beginning of an upbringing.

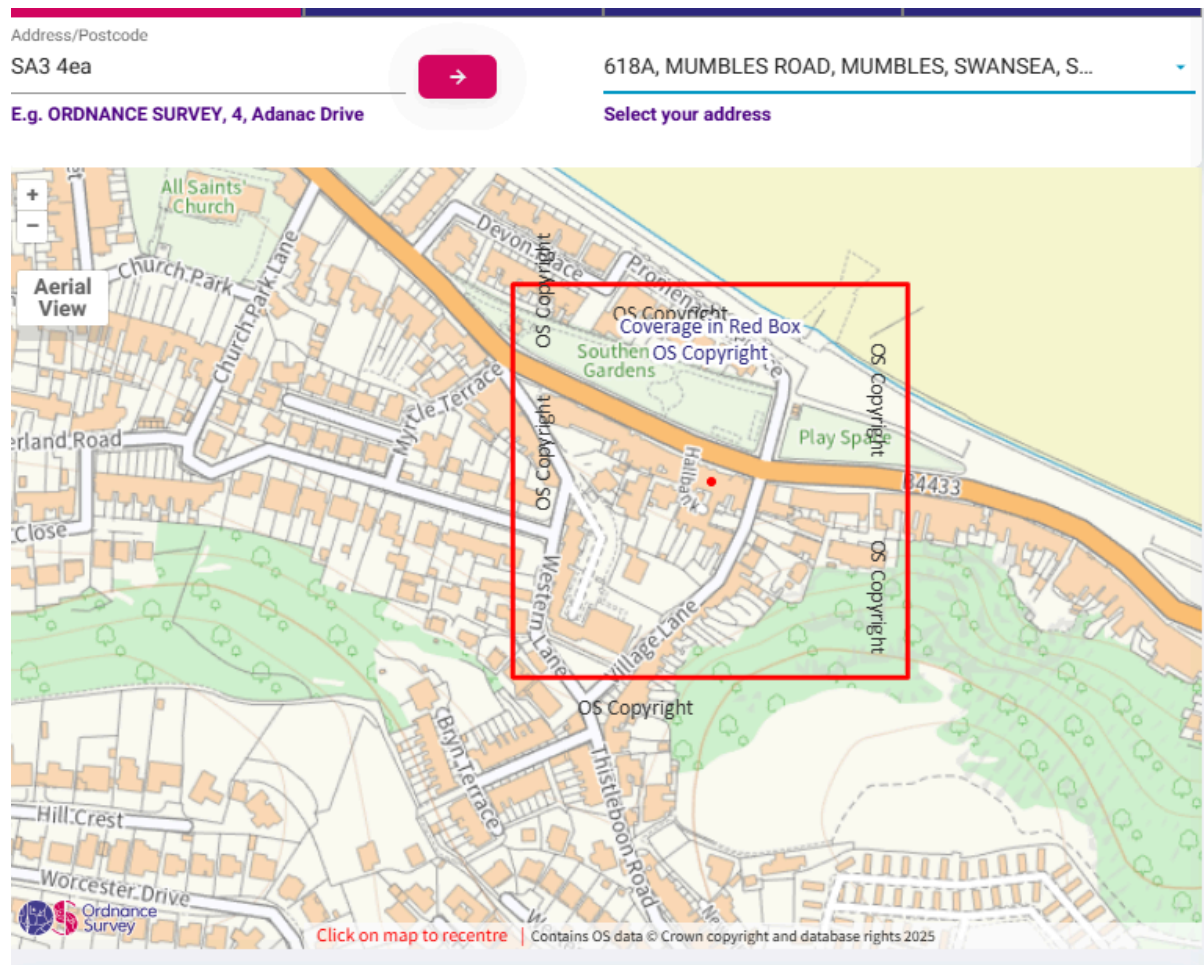


Figure 2.

This Ordnance survey map shows Swansea after its development over the years , its noted that there are still pockets of vegetation but most has been industrialised compared to figure 1

Industrial and Commercial Development

Up until the 1950s the post war economic uprising led to the increase of retail and industry usage. A tesco was constructed which had a large car parking facility. Infrastructure nearby had improved their accessibility to further support commercial activity and the construction of the lc2 and other leisure buildings that have been constructed in the past years have shifted the area more towards a tourism potential.

Regeneration idea

Swansea council regeneration efforts place the mumbles road area as a key factor in Swansea's tourism attraction. The site's location is key as its near the centre and opposite the LC2 building which makes it in the ideal place to support venues and corporate events

Site Investigation Recommendations

This part goes through the investigations that need to be done to check if the site is okay to build on. The recommendations are backed up by British Standards. Right now, the information is based on a desktop study and one borehole. The made ground can be very different across the site, and old records might miss some past contamination. More boreholes and lab testing are needed to lower risks when construction starts.

Ordnance Survey Coordinates

The site's exact coordinates are SS616899 and 51.591549 , -3.9982651 longitude and latitude (OSMap,2025). These are important for mapping, flood risk checks and linking up with GIS systems (GOV.UK, 2024).

Contamination Risk Assessment

Because of the old gas works around the area, there's a high chance the ground could be contaminated. Any investigation should follow BS 10175 – Investigation of Potentially Contaminated Sites , and should include sampling for hydrocarbons, heavy metals , asbestos as well as groundwater testing to see if anything dangerous can spread through water

Flood Risk and Drainage

The site is next to Swansea Bay which puts it in a tidal flood risk zone. Previous tide levels and storm surge information from Natural Resources Wales show the area can sometimes flood badly during storms or bad weather such as thunderstorms (Natural Resources Wales, 2024). With sea levels rising from climate change, having good drainage is key. Flood solutions should include SuDS and flood defences made directly for the site. These should be built into the layout and foundation design from the start to keep the site safe for the long term.

The site is nearby to a Swansea Bay and could be prone to floods. A look at the Natural Resources Wales (NRW) flood maps shows it sits in a tidal flood zone (Natural Resources Wales, 2024). The site should follow BS 8533 – Flood risk management as well as the use of SuDS systems for drainage.



Figure 3

(Afallen Wales Underwater)

Unlike places inland like Cardiff that mostly deal with river flooding from rivers like the Taff, the Swansea Mumbles Road site is more exposed to tidal and coastal flooding because it's right next to Swansea Bay (Natural Resources Wales, 2024). Swansea uses different flood defences such as tidal barriers, sea walls and coastal embankments — these aren't really used in central Cardiff. These certain coastal protections, along with SuDS made specifically for the site, are crucial in dealing with flooding from storms or sea level rise (GOV.UK, 2024).

The fact that the site is exposed to tidal flooding shows that it's not just a one time design issue. Coastal defences may not be under the developer's control, which could make insurance more expensive or increase the risk later on. Every plan needs to follow regulations and also think about future climate change problems.(Natural Resources Wales, 2024).

Unexploded Ordnance (UXO)

Because Swansea was active during WWII, it's important to do a UXO desk study. Even though there's no direct proof of bombs or military waste on this exact site, it's still best to get a specialist to assess it just to be safe (Natural Resources Wales, 2024).

Archaeological Sensitivity

The site has a long history linked to the coast and past settlements, so an early-stage archaeological survey should be done, especially during the first stages of digging.

Mining and Ground Stability

Looking at the coal mining records , it shows there's a small risk. A proper ground stability check must be completed by following BS 5930 – Code of Practice for Ground Investigations to make sure there's nothing like old mine shafts or weak spots under the site that could disrupt the building.

Existing Services

A full check for underground services like water pipes, sewer lines, electricity and gas should be done before demolition starts. Using Ground Penetrating Radar (GPR) or cable tracing is recommended to avoid any damage or delays.

Environmental and Community Considerations

Because the site is close to the Swansea Bay SSSI ecosystem , nearby homes and residential areas , local businesses and schools. It's important that the following steps are taken , to put in place proper noise and dust control, follow the rules under the Considerate Constructors Scheme,keep working hours between 08:00 and 18:00 only, have a community liaison officer to keep locals informed, and to promote the use of temporary access routes and set traffic plans to avoid disruption (Natural Resources Wales, 2024).

Foundation Type Recommendation

Overview

Based on the borehole data, it is recommended that a piled foundation system be adopted.

Summary of Soil Layers

Depth (metres)	Materials used	Information
0 - 4.99	Used ground - bricks , clay ,etc	Not good load bearing
5- 7.99	Sand , Gravel	OK load bearing
8- 9.99	Dense Sand	Strong and can compact
10 - 18.99	Boulder Clay	Ideal foundation
19.00 - 23.00	Grey Mudstone	Stable bedrock

Foundation Recommendation

A bored cast-in-situ piled foundation system is recommended for this project because it will , avoid the weak made ground at the top , reach into the strong boulder clay or mudstone , handle hydrostatic pressure and changes in groundwater and lower the chance of uneven settlement

The BH2 log (see Appendix, Figure 5) shows around 5 metres of made ground made up of mixed clay, broken brick and loose fill, which is not suitable for shallow foundations. Below

this, dense sandy gravel and very stiff boulder clay are recorded. The strong boulder clay and mudstone layers between 10–23m provide the ideal founding strata for a deep piled foundation. No shallow load-bearing layer exists within the top 5 metres, and there is possible groundwater present around 6–7m. This supports the need for a bored cast-in-place pile that bypasses weak ground and resists hydrostatic pressure

Design Compliance

The design should follow these standards and regulations- BS 5930:2015 – Site Investigations, BS 8004:2015 – Foundations , BS EN 1997-1:2004 – Geotechnical Design , and the Approved Document C – Site preparation and resistance to contaminants (GOV.UK, 2024).

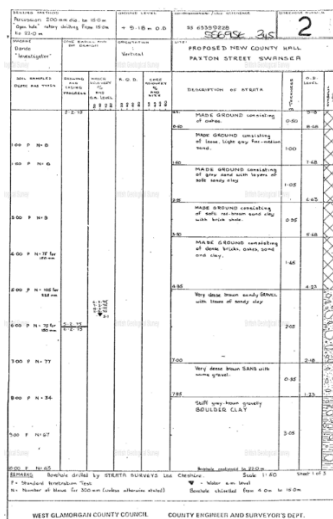


Figure 4
Appendix

If you only look at just one borehole (BH2) it is possible to be incorrect about other parts of the space as only one can make it difficult to be fully confident about the ground across the whole site as its only evidence in one specific location of the site. Without more data, there's a chance of overdesign or hitting unexpected weak spots during construction. Even though bored piles can be expensive, they're needed here to avoid the soft made ground and reach the stronger layers underneath. Phase 2 ground investigations should be used to check if the ground conditions are consistent and to find out more about groundwater behaviour so that the final design can be confirmed.

Field Reconnaissance and Ground Observations

Before doing any drilling or lab testing, a pre construction walk of the site should be done first. This helps back up what was found in the desktop study and gives extra details that might have been missed, Things to look at for this include:

Topography – Check if the land is sloping. Looking at how rain water runs off the site, most important if its towards the water.

Vegetation – The types of plants and how dense they are can show how much water the soil is holding or if there are drainage problems in the surrounding area.

Surroundings – See how close the site is to buildings, roads, paths, and underground services.

Site Conditions – Look for old structures, signs of damage like cracks or uneven paving, or anything that suggests the ground is sinking.

Access – Make sure there's enough space for machines to work safely and get around the site.

These checks are very important to make sure drill rigs and testing gear can get in and be used safely. They also help to locate the best areas for boreholes and where to set up machinery during the next stages (Water Treatment Services).

Testing Methods and Soil Behaviour

To get a better understanding of the ground, several field and lab tests should be carried out. These will help assess how the soil acts under load and how it might behave during construction.

Some tests such as Atterberg Limits this is to find out how plastic the fine soils are and how they change with moisture. Another one is a moisture content test this measures how much water is in the soil, which affects how strong it is. The next is the Standard Penetration Test (SPT) - Gives info on how dense and strong the soil is , along with the Cone Penetration Test (CPT) which Gives a better view of the soil layers and how much weight they can take. The Grain Size Distribution tells you how much sand, silt or clay is in the soil. Permeability Testing - Shows how water moves through the ground, which links to drainage and foundation planning

These tests are important for working out soil strength, how much it compresses under weight, if it'll settle over time, and how well it drains.

Foundation Comparison and Justification

When looking at the best foundation for this site, there are three main choices that could be looked at , these being shallow strip foundations, raft foundations, and deep bored piles. Shallow foundations are normally used on small buildings, but they wouldn't work here as

the ground at the top is weak and could lead to uneven settlement. Raft foundations help to spread the load over a wider area, but they still need to have solid ground underneath to stabilise, which this site doesn't have because of mixed fill and possible water issues. The best option is a deep bored pile system because it goes through the weak top layers and reaches into the strong boulder clay and mudstone underneath, which were found in the BH2 borehole Figure 5. Even though it costs more and takes much longer to build, it gives much better support for a big building like a hotel and handles problems like water pressure or soft ground better. This is especially important for the Swansea Mumbles Road site, where the BH2 borehole showed around 5 metres of loose ground and groundwater around 6–7 metres deep, making shallow or raft options too risky and problematic for the long-term.

Sustainability Considerations

One of the main goals of this project is to support Swansea's long-term sustainability targets. That means the groundworks need to include the Use of low-carbon materials like GGBS to reduce emissions along with reusing the materials from the site to become environmentally friendly. As well as this using SuDS and permeable paving to reduce surface water and flooding (Natural Resources Wales, 2024). Monitoring dust and noise levels are crucial to making sure local residents are informed to support social sustainability as well to also avoid receiving any complaints.

By including all of this it may help the project to meet its BREEAM goals and become in line with Swansea's wider planning strategy.

GGBS is a good way to lower carbon emissions, but it can slow down times and affect the build schedule. To make it work, the team will need to plan around things like supply, curing, and keeping the right quality on-site.

Over time there could be the chance of settlement issues when starting construction on mixed material land. The study also shows that using shallow foundations in areas like this often leads to uneven settlement and high maintenance costs within the first 10 years.

Sustainability early on in the ground design of any given project is crucial to prevent later problems. Their study shows that swapping normal Portland cement with GGBS (ground granulated blast-furnace slag) in piled foundations can cut down embodied carbon by around 40% without losing strength. Using this kind of method at the Swansea site could help hit BREEAM targets and support the council's goals to lower carbon — which matters more here since the project is high profile and will be seen by the public.

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