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1. Introduction

The City and County of Swansea, in partnership with Marriott Hotels, have joined together and proposes the development of a new restaurant, café bar/ice cream parlour along with managers apartment on the Swansea foreshore, located as per the image below. The site lies between County Hall and Swansea Marriott Hotel, overlooking the Swansea Bay promenade.

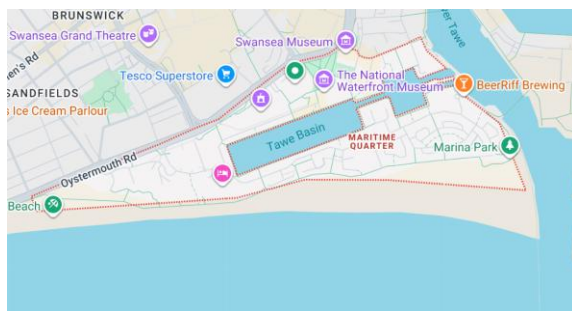


This report is a preliminary desktop study and structured geotechnical review to inform at the feasibility stage of the project. The study will include, archival maps of the local area, analysis of the historical land use, and borehole data from the Meridian Tower development in the area.

2. Historical Background and desktop study

2.1 Industrial Expansion 19th Century to Early 20th Century

Swansea's Maritime Quarter (Located in image from google maps below) developed rapidly, with docks, quays and industrial activity, specifically copper smelting, coal mining and iron production booming in the area. The construction of the docks and land reclamation massively altered the Swansea foreshore appearance (*Walsh, R. 2025*).



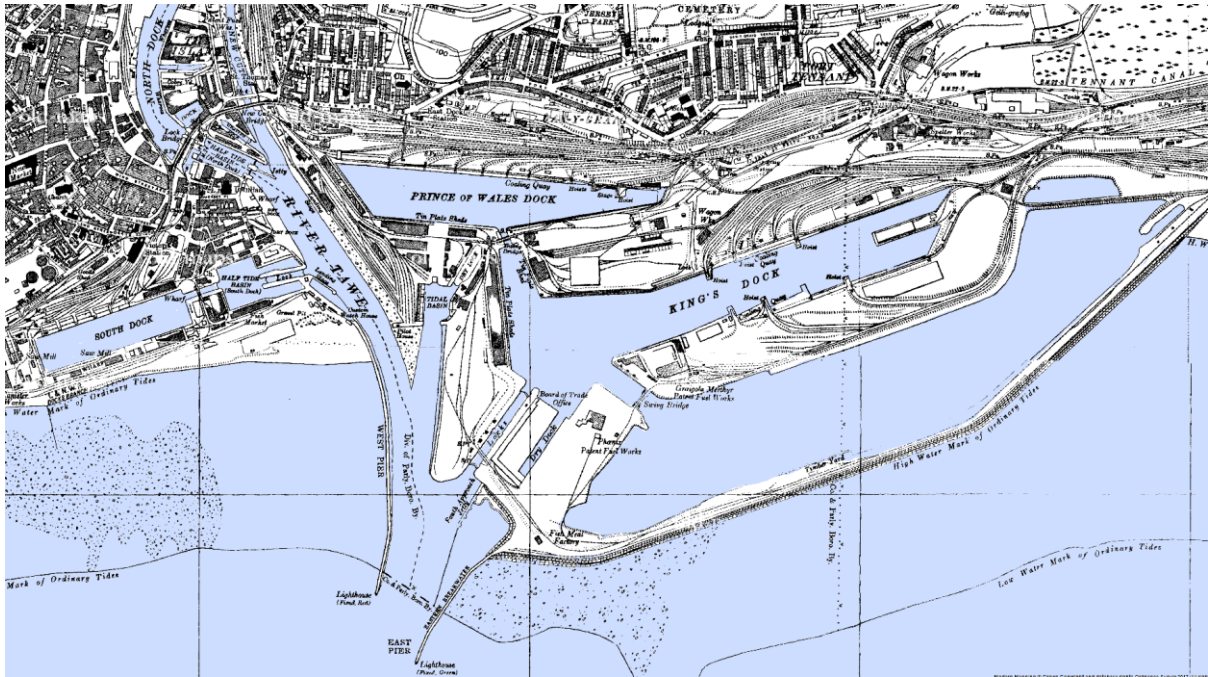
Swansea Docks (1920)

Images taken from Google Maps & <https://www.swansea.ac.uk/law/istl/llm-degrees/maritime-tradition-at-swansea/>

Research on Victorian dockland reclamation indicates that controlled compaction was not often undertaken. This often resulted in large areas being built on made ground (industrial waste and slag etc) which caused subsidence and structural failures (*Waters et al 2005*).

2.2 Twentieth Century Development

During the 20th Century, dock infilling continued along with installation of reinforced concrete slabs, culverts and underground services. The effect of land reclamation increases the likelihood of buried structural obstructions and inconsistent fill strength, causing varying levels of soil strength, as well as heavily contaminating the land (*SwanseaDocks.co.uk 2026*). Brownfield redevelopment literature identifies heavy metals, hydrocarbons and sulphates as common contaminants associated with industrial docklands (*Waters et al 2005*).



Ordnance Survey Map image taken from (Jlb2011.co.uk. 2026)

2.3 Marina renovation and modern context

During the 1980's – 1990's came the regeneration of the Swansea Marina, transforming the docklands. Construction of residential flats and commercial buildings, pubs and restaurants and other amenities were established in the area. The County Hall building, which is located right next to the proposed site, was also built in 1982 (Youle, R. 2018).

Image of Swansea Marina Maritime Quarter in 1989. Stretch of residential flats built in the early 1980's:



Photo taken from <https://www.geograph.org.uk/photo/2572689>

This transition from the industrial setting to this mixed urban environment is a dramatic change, especially given the ground conditions remaining problematic. Deep foundations would have been required, and considerations to groundwater management and contamination would have been implemented (*Site-remediation.co.uk* 2026).

3. Detailed Site Investigation Recommendations

A full intrusive investigation should be undertaken to reduce the uncertainty and provide the most reliable data for engineering design.

3.1 Intrusive Investigation Techniques

Boreholes:



Images taken from <https://dragondrilling.co.uk/what-is-borehole-drilling/> & <https://privatewatersupplies.org.uk/borehole-drilling/>

Boreholes are essential to gain an understanding of the conditions of the subsurface conditions up to the required depths. The process identifies the thickness and composition of the made ground and provides samples for analysis in lab testing. The boreholes in this instance should be evenly and strategically located across the site to capture the spacial variability. Given the high-risk area, right on the coast near a dock area, the boreholes in this area, should be bored down to a dept of approximately 25 metres. They should also be a minimum of 6 metres away from the waters' edge (*Davidwebb2095* 2026).

Based on other local ground conditioning surveys, the area in general has variable made ground, with a mix of Industrial fill, slag, sandy gravel which ranges from 1.5m to over 6m in depth. Other things to consider, are groundwater, ground gas, and contamination at depth (*Richard Shambrook et al 2019*).

Without sufficient borehole data, there would be a huge risk of foundation failure which would compromise the structural integrity of the building.

Trial Pits:



Images taken from <https://www.ags.org.uk/2020/07/working-at-height-during-trial-pitting-how-far-is-so-far-as-reasonably-practicable/> & <https://learninglegacy.hs2.org.uk/document/360-degree-trial-pit-photography/>

Trial pits can work alongside boreholes, by giving you a visual inspection of the shallow soils. This is usually more important in urban areas where there has been previous development works, where you would be more likely to find buried obstructions like old foundations, or other services that may not be mapped properly. The average depth of trial pits is 1 – 4 Metres and you may need structural measures in place to protect the workers entering the pit given the risk of collapse. Trial pits are usually far cheaper than bore holes, but given the depth of foundations required, this may not be the most suitable method. (*Mayla 2022*).

3.2 Laboratory testing and Soil Behaviour:

The field samples taken from the trial pits and boreholes are key for engineering data.

Tests undertaken include:

- Triaxial shear tests (for strength)
- Consolidation tests (For settlement prediction)
- Chemical testing (For contamination)

The results of these tests will define the foundation type. For example, if the made ground has high compressibility, this would indicate a high risk of settlement, which would reinforce the need for deep foundations (*Lees, A. 2020*).

3.3 Contamination Risk Assessment:

Given the area and the local history, contamination should also be considered of the most critical risks. A planned risk assessment would be the best approach. There are three phases to this risk assessment:

1. Preliminary Risk Assessment. Desktop study, researching the local area site history and try and develop an initial CSM (Conceptual Site Model).
2. Intrusive Investigation and Sampling. If your desk study indicates risks, this phase involves collecting soil samples, ground water, or gas samples to clarify the nature and extent of the contamination.
3. Quantitative risk assessment. Data from your sampling is compared to a certain criteria to decide whether the risks are unacceptable.

(*Environment Agency 2020*)

3.4 Types of potential contamination to the local area

Heavy Metals:

Given the industrial past of the local area, metals such as Lead, Copper and Zinc are likely to be found in the area. These can last in soils for decades and pose a significant risk to human health and ground water (*Waters et al 2005*).

Hydrocarbons:

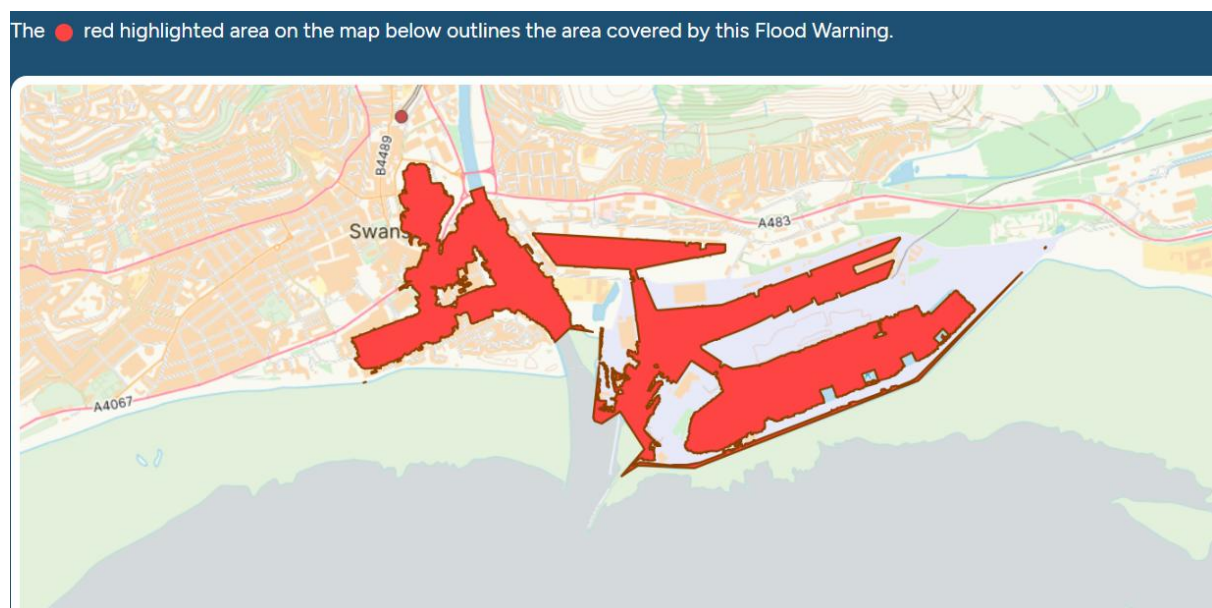
Hydrocarbon ground contamination is also a high risk for the area, again, due to the industrial legacy, with smelting works and oil refineries for example. Contaminants such as PAH (polyaromatic hydrocarbon) and TPH (total petroleum hydrocarbons) often found in the area. This could cause reduction of the air quality to the local area (*Perkins, W.A. 2011*).

Ground Gases:

Ground gases in the area provide a relatively low to moderate risk in the form of Methane and Carbon Dioxide for example. Breakdown of organic materials, colliery spoil, or landfill sites can produce hazardous ground gases (*Richard Shambrook et al 2019*).

3.5 Flood Risk

The SA1 area of Swansea, the Marina and properties local to the Marina area is a designated floor warning area, classified as high risk, particularly from the tidal/sea and river sources. The River Tawe also poses a significant flood risk. Given it's a low-lying coastal area, and the weather Wales endures, it's open to the elements, especially in the winter.



(Image taken from *Floodassist.co.uk*. 2022).

There is also a surface water risk. The area is part of the “Lower Swansea Valley Flood Risk Area” which can be susceptible to surface water floods, especially when there is heavy rainfall in the area which can overload the local areas drainage and sewer systems (*Swansea. Lower Swansea Valley flood risk area 2021*)

3.6 Potential Underground Mines

Given that Swansea and the South Wales area has a vast history of coal mining, there is a high risk that there could be potential underground hidden hazards. These uncovered mines could cause voids, and potential collapses and unexpected ground conditions during your intrusive ground investigations.

I would recommend either undertaking a Coal Mining risk assessment or obtaining one to the local area prior to undertaking any ground investigation works (*Admin 2022*).

Land in former coal mining areas is also at risk of subsidence given the historic workings, potentially resulting in collapse of old workings, settlement of previously backfilled shafts. Use of heavy plant and equipment could also trigger subsidence. A mining report would usually assess these kinds of risks prior to any development. (*GOV.UK. (n.d.). Find out if a property is affected by coal mining*).

4. Borehole Data



British Geological Survey

BGS ID: 370246 : BGS Reference: SS69SE345
British National Grid (27700) : 265390, 192280

DRILLING METHOD		GROUND LEVEL		GRID REFERENCE / GRID REFERENCE		BOREHOLE NUMBER	
Percussion 200 mm dia. to 15.0 m "Open hole" rotary drilling From 15.0 m to 22.0 m		+ 9.15 m O.D		SS 65390228 SS6956 345		2	
MACHINE		CORE DRILL AND BIT DESCRIPTION		ORIENTATION		SITE	
Danda "Investigator"				Vertical		PROPOSED NEW COUNTY HALL PAXTON STREET SWANSEA	
SOIL SAMPLES DEPTH AND TYPES		DRILLING AND CASING PROGRESS		WATER RECOVERY % AND Q.M. LEVEL		R. Q. D.	

This borehole data shows us the importance of undertaking intrusive investigation where deep made ground and its variable geology can influence the foundation design and construction planning.

The borehole data can be found at the below web address. BGS ID is: 370246
<https://mapapps2.bgs.ac.uk/geoindex/home.html?layer=BGSBoreholes#:~:text=Records%20of%20boreholes%2C%20shafts%20and,Well%20water%20levels>

5. Regulations & Framework

5.1 Building Regulations

A new build in this site location must comply with Welsh Building Regulations, ground investigation standards (BS 5930, BS 10175, BS EN 1997 Eurocode 7) (*Swansea. 2021 Building regulations guidance*).

The Welsh Building regs apply to all new builds and are statutory requirements. Swansea Council confirms that these cover structure, fire safety, energy conservation, access, drainage and contaminants. Given that this property is primarily an eatery, these are extremely important factors to consider, especially the potential contamination in the area. Key approved documents that are specifically relevant to ground investigation include:

- Part A – Structure (requires adequate ground bearing capacity)
- Part C – Site preparation & resistance to contaminants and moisture
- Part H – Drainage & waste disposal
- Part L – Energy efficiency
- Part M – Accessibility

(GOV.WALES (n.d.). *Building regulations*).

5.2 Codes of Practice

BS 5930 – Code of practice for ground investigations

This code of practice defines methods for Boreholes, trial pits and sampling. Groundwater monitoring and reporting requirements (*British Drilling Association 2020*)

BS EN 1997 (Eurocode 7) – Geotechnical design

Required for a geotechnical risk assessment, laboratory testing. And foundation design parameters (*eurocodes.jrc.ec.europa.eu. n.d.*)

BS 10175 – Investigation of potentially contaminated sites

This is highly relevant because the Swansea Marina has historic docklands with potential contamination (*Kennedy, K. 2026*).

5.3 Local Authority Involvement

Some key contact details for any local authority involvement are below.

Swansea Council – Building Control

Email: bcon@swansea.gov.uk

Telephone: 01792 635636

Swansea Council – Planning Department

Address: Civic Centre, Oystermouth Road, Swansea SA1 3SN

Natural Resources Wales

Email: permittingconsultations@naturalresourceswales.gov.uk

Website: <https://naturalresources.wales/?lang=en>

6. Foundation Recommendations



Image taken from <https://www.tensar.co.uk/resources/articles/what-are-the-types-of-piles-and-their-construction-methods>

For the construction of the proposed building, I would recommend using a piled foundation system. Given the dense granular deposits, boulder clay and mudstone at depth, piled foundations would be the most suitable way forward for this site. The borehole records for County Hall records “made ground down to depths of around 5 comprising of ashes, loose fine-medium sand, sandy clay layers, and large quantities of construction debris,” beneath which “very dense granular deposits, then stiff boulder clay, finishing with mudstone down to 22m.”

The upper ground is highly variable, compressible and unsuitable for shallow foundations, whilst the deeper strata provides a more reliable bearing, and a reduced settlement risk. Piles also help bridge potential voids from historic mining and mitigates differential settlement in reclaimed dockland fill. The piling method also limits potential disturbance in a likely contaminated coastal setting.

5. Conclusion

The preliminary desktop study shows a complex reclaimed dockland site with variable made ground, contaminations risks, flood risks, and possible uncovered mining hazards. The historical borehole data analysis informs us that the upper made ground is clearly unsuitable for shallow foundations, however, the deeper, more dense and granular layers (Boulder clay and mudstone) provide us with far more suitable conditions, that would be most suited to piled foundations.

Using piled foundations mitigates the risk and addresses the geotechnical uncertainty, long term settlement, and regulatory requirements for a coastal restaurant/café development of this scale.

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