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ACBA 4001

HND Civil Engineering

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1. Summary of Report

1.1. Askham Civils & Construction, has been asked to design and tender for a new ice-cream parlour and restaurant with accommodation for the manager. The proposed development is situated between the Swansea County Council offices and the Marriot hotel on the Swansea Bay waterfront and the development is a joint venture by Swansea County Council and Marriot hotels.

1.2. This report sets out the results of a desk based assessment and walkover survey of the site, and makes a number of recommendations for further site investigation works. The report also sets out a proposed foundation design and substructure details for the development in the context of the development site. A series of annotated sketches illustrate the proposed materials and methods of construction for roof, wall and floor structures.

2. Desktop Survey of Existing Information

2.1. Askham Civils & Construction have thoroughly investigated existing historic and recent information regarding the proposed development site, and present our findings below.

2.2. The development site is allocated as strategic development land in the Swansea Local Development Plan (LDP) 2010-2025: Deposit Plan (City and County of Swansea, 2016). Swansea maritime quarter specifically identified as being valuable for tourism and the economy of the city. Commercial tourism development here is in line with the LDP.

2.3. The site's topography has been evaluated using historic Ordnance Survey maps (OS) and the most recent open source OS mapping.

2.4. From the maps we can see that the site is approximately 5m above sea level and appears to be reasonably flat, with a few earth mounds with trees on. The site is bordered on the north side by the road Duvant Place, to the east by the Marriot Hotel (Hotel), to the south by a seafront promenade and to the west by the Swansea County Council Offices (County Office)

2.5. Open Source Ordnance Survey mapping and Google Earth aerial photography show the proposed site's proximity to the beach which is expected to be busy during nice weather, and reasonably close residential properties along with the County Offices and Hotel, it does also show that there are no overhead obstacles to deal with, including power lines or telecommunication wires. See Figures 1 and 2 in appendix A.

2.6. A review of the British Geological Survey (BGS) website shows the underlying geology to be the South Wales middle coal measures formation made of Mudstone, Siltstone and Sandstone (British Geological Survey website). There are also a number of borehole scan logs showing and there is a free one available to view (see Figures 6, 7 & 8) on which the proposed site is situated

2.7. Welsh Water can provide maps of water mains and public sewers and an application to Cadent would enable any gas and electric networks to be located also.

2.8. Examination of historic mapping has shown that there were no mine or mineral workings in the local area, so this is not expected to be an issue.

2.9. The land has historically been used for industry with the railway industry having an engine shed and lines on the site in the past; there was also a canister factory on the site (as depicted on the 1919 3rd Edition 1:2500 Ordnance Survey map). Further examination of ordnance survey mapping has shown that there was a contagious hospital approximately 200 metres to the west of the site and that the site itself was open land crossed by rail lines at the time of the 1879 1st Edition Ordnance Survey map. By the time of the 1899 2nd 1:2500 Edition Ordnance Survey map a timber yard is evident in the northern most part of the site and an engine shed, as noted above, is apparent in the west of the site. By the time of the 1919 1:2500 3rd Edition Ordnance Survey map a canister factory has replaced the timber yard in the north.

2.10. It is unlikely that there will be any significant archaeological constraint to development in this area, however early consultation with the local authority's archaeological advisors is necessary to scope any requirements for work during development.

2.11. An online search has not brought up any articles regarding pollution on the land but due to the former industrial use of the land it is expected that there will be some, see relevant British standard.

2.12. An online search regarding World War Two (WW2) bombing of Swansea by the German Luftwaffe has not brought up anything specific regarding the proposed site location. However a report by BACTEC for Atkins Limited of an Explosive Ordnance Threat Assessment in respect of the Swansea Docks to Swansea Burrows area, which is to the eastern side of the River Tawe, does highlight some areas of the docks area to be a high risk zone in respect to unexploded ordnance (UXO) so

this is something that should be factored into the detailed site investigation (BACTEC, 2014).

3. Site Walk Over

3.1. A site walk over was undertaken on 10/12/2018 to check out the accuracy of the desk top survey and the following was observed;

3.2. The land is as relatively flat as shown on the topographical maps and aerial photos, with the earth mounds and trees that are visible on the photos, however we did notice that there is a private right of way across the site that cuts through the earth mounds. This right of way is noted by a metal plaque on the ground which references the 1980s highways act, and names the West Glamorgan County Council (Figure 3).

3.3. The seafront promenade and beach was quite heavily used during the time we were there, and it is to be expected that during the warmer months that it will be used even more.

3.4. The car park for the county offices was used by more people than the car park for the hotel, as the visit was on a week day it is possible that the reverse might be true on the weekend.

3.5. There are a few manholes on the proposed site boundary of the promenade and county office car park; these appear to be for sewerage services.

3.6. The proposed site boundary on the eastern side as mapped in the clients information pack looks like it will cut through a compound area for the hotel. During the walkover survey it wasn't possible to access the interior of this compound; however it appeared to be used for storage by the Marriott Hotel. It is advised that the client seeks permission from the Marriott Hotel to check the exact nature of this compound and agrees any changes to access or use that may be required as a result of the development proposals (Figures 4, 5 & 6).

4. Detailed Site Investigation Recommendations

4.1. Our recommendations for the detailed site investigation are as follows and should be carried out to the recommended British Standard (BS) BS5390:2015 (British Standards Institute, 2015).

4.2. Due to the proposed developments proximity to Swansea Docks which was bombed heavily during the Second World War, before any intrusive investigations are started we highly recommend that an (UXO) investigation is undertaken.

4.3. CIRIA C681 is a guide for the construction industry on Unexploded Ordnance (UXO) and this document lays out the recommended procedures for these types of investigations, stating in Section 3 pages 19 - 22 the client's responsibilities regarding UXO's under the latest regulations (CIRIA, 2009).

4.4. A review of the Swansea Council planning portal has shown that any publicly available records relating to the development of the adjacent Marriott Hotel, have either been archived or disposed of, therefore it is not possible to ascertain any information directly relating to that development.

4.5. However the history of the site is known from desk based research, which has included a review of historic ordnance survey mapping and a review of publicly available borehole log records as well as geological survey information. As such it is possible to predict with some certainty the likely make up of the ground here, including the nature of any contaminants and provide an assessment of the need for the requirement for further detailed ground investigations ahead of development. The site has had been used in the past as railway land for an engine shed and a canister factory, and as shown in a previous borehole (Figures 6, 7 & 8) that the top 4.9M is made up ground (anthropogenic ground) it is to be assumed that there will be contamination present, this could potentially contain asbestos as a contaminant, as this was heavily used in the railway industry. CIRIA C765 details good practice in the investigation of asbestos in made ground (CIRIA, 2017).

4.6. It is recommended that preliminary non-targeted sampling of soil is undertaken at regular intervals across the site on a grid pattern to conform to BS10175:2011+A2 2017. This document sets out standards and procedures for the testing of former industrial land. The results of this preliminary investigation will provide a basis from which any further exploratory or detailed investigation be devised should this be necessary. British Standard BS10175:2011+A2 2017 states it is important when designing a sample pattern to bear in mind that “contamination with sharply defined boundaries rarely exist.” (British Standards Institution, 2017, p. 42). As such given the currently available information about potential contamination across the site the proposal to undertake preliminary non-targeted soil sampling at regular intervals on a grid across the site provides the most appropriate means by which to investigate potential contamination at this stage.

4.7. If the results of the preliminary sampling show that it is possible to develop the site safely, then once the building's location is agreed upon and the buried services located on a map, then trial pits should be dug to prove the location of buried services alongside bore hole sampling in the location of the proposed foundations to check the underlying ground conditions across the foundation area (Figure 9). This will allow our engineers to finalise the details of a foundation plan for the development.

4.8. As noted above, it is recommended that the client seeks early consultation with local authority's archaeological advisors to establish the scope of any archaeological work which may be required. As the site has been historically used for industry, it is possible that there may be remnants of former buildings as foundations below ground, and these may need to be recorded. Bore hole logs for the area surrounding the site show a presence of underlying peat deposits which can hold significant water logged archaeological remains which may need to be investigated should they be likely to be disturbed by the digging of deep foundations.

4.9. No specific ecological concerns have been identified in the course of the desk based research, however it is advised the client seek early consultation with the local authority's ecology team in order to confirm that there are no protected flora or fauna or other limiting ecological factors to development here.

5. Foundation and Sub-Structure Recommendations (Figure 11)

5.1. Preliminary investigations and review of M J Tomlinson's book Foundation Design & Construction show that a bearing pile foundation is likely to be the best option as the uppermost layers of the ground here are made ground (anthropogenic) (Tomlinson, 1995, pp. 37, Figure 2.4(b)). Further the probable asymmetrical design of the super structure means there will be an uneven loading across the foundation and substructure

5.2. With the site located so close to a hotel and office block, it considered that the best approach will be to use a Continuous Flight Auger (CFA) piles, the main reason for using CFA is the low vibration produced when compared to a driven pile system, CFA also offer a time advantage when compared to conventional bored piles.

5.3 The ground beam will be pre-cast reinforced concrete units brought into site, this is in order to cut down on the amount of material stored on site, speed up the construction of the sub-structure and as the product will be made in a controlled environment it will be easier to ensure that the foundation will conform to BS 8004:2015 (British Standards Institute, 2015).

6. Ground Floor and Super Structure Specification Recommendations (Figure 12)

6.1. Where possible it is intended to make use of precast concrete sections for the floors and walls, this is as stated earlier in relation to the ground beam in order to reduce the amount of materials stored on site and in response to the exposed location of the adjacent to the sea. The site lends itself to a modular construction approach due to the speed of this construction technique which can proceed even in wet weather which Swansea can suffer from

6.2. The ground floor will be constructed of 150mm thick precast reinforced hollow core concrete floor planks, which will span from the external wall of the foundation on the long elevation to sleeper walls, which it is anticipated at this stage will be located at halfway across the width of the proposed building at a 5m centre. Consultation with a technical representative at Bison Precast Limited confirmed that the planks on a 5M span can take a loading of 7.5 KN/m², at this stage this is deemed to be suitable as there is to be no vehicular traffic in the building. Any areas which could be subject to higher loading must be taken into account at an early stage to make sure any alterations to the plan can be accommodated in any further design. A suitable vapour barrier installed between the planks and the overlying layer of insulation, on top of which a layer of 150mm thick reinforced concrete will be installed, which will have a power floated finish.

6.3. The first and second floor will also have the same construction with the exception of the insulation as this will not be required on those floors.

6.4. The external walls over the three floors will also be made from precast reinforced concrete panels of 150mm thick, with a power floated finish on the sides which will become the internal face. This can offer a reduced amount of time needed to apply finishes to the walls due to the smooth surface area which in most cases can have the final finish applied directly to them.

6.5. The exterior finish of the building will be of rendered insulation (type and thickness to be determined upon completion of U value assessment), which will be

fixed directly to the concrete wall sections. Consultation with Structherm Ltd provided a series of different finish options. These range from an acrylic based top coat which can be of a colour choice suitable to the client, brick or stone effect renders or a combination of these, all of which confirm to BBA specifications and are suitable for marine environments.

7. Roof Structure and Weathering Recommendations (Figure 13)

7.1. Consultation with Bison Precast Limited confirmed that the same hollow core planks can also be used for the roof structure. A layer of 50mm of a concrete screed shall be laid on top of the hollow core planks prior to the installation of insulation. This will enable the inbuilt camber of the planks to be covered as well as enabling the formation of the necessary fall to help shed rainwater. A suitable vapour barrier will be installed between this layer of concrete and the insulation. Consultation with Celotex confirms that a layer 180mm of XR4000 insulation will meet the current requirements for new build construction. A layer of reinforced concrete of 100mm thick will then be applied to form a solid surface which can then be topped with a rubber membrane which will form the waterproof layer.

8. Site Set Up, Required Plant and Equipment (Figure 14)

8.1. As can be seen in Figure 10 site is accessed from the north side through the car park of the Marriott Hotel which is accessed from Dunvant Place.

8.2. The area of the site on the car park nearest to the Marriott Hotel is to be used as vehicular access and the raised patio area is to be removed to facilitate a storage area for materials.

8.3. The new building is expected to be located as close to the southern boundary of the site as possible, adjacent to the promenade.

8.4. The site offices and welfare facilities are to be located on the western side of the site making use of the car park area. All welfare facilities will be inside the site boundary, use will be made of the sewerage drains on that side of the site to facilitate the welfare facilities.

8.5. Plant required will include;

- Any UXO testing equipment should it be deemed necessary,
- A borehole rig for the exploratory holes and sampling taking,
- A mechanical excavator with a digging arm and shovel
- A dumper truck to facilitate spoil removal,
- A CFA piling rig for the installation of the piles
- A concrete pump for pumping concrete to where it is needed
- Concrete mixing wagons
- A telescopic handler for unloading and loading of material
- A mobile crane of suitable size for the installation of the precast sections.
- Site operatives are expected as far as is reasonably practicable to provide their own tools specific for their work.

Appendix A - Figures

Figure 1: Site location general view

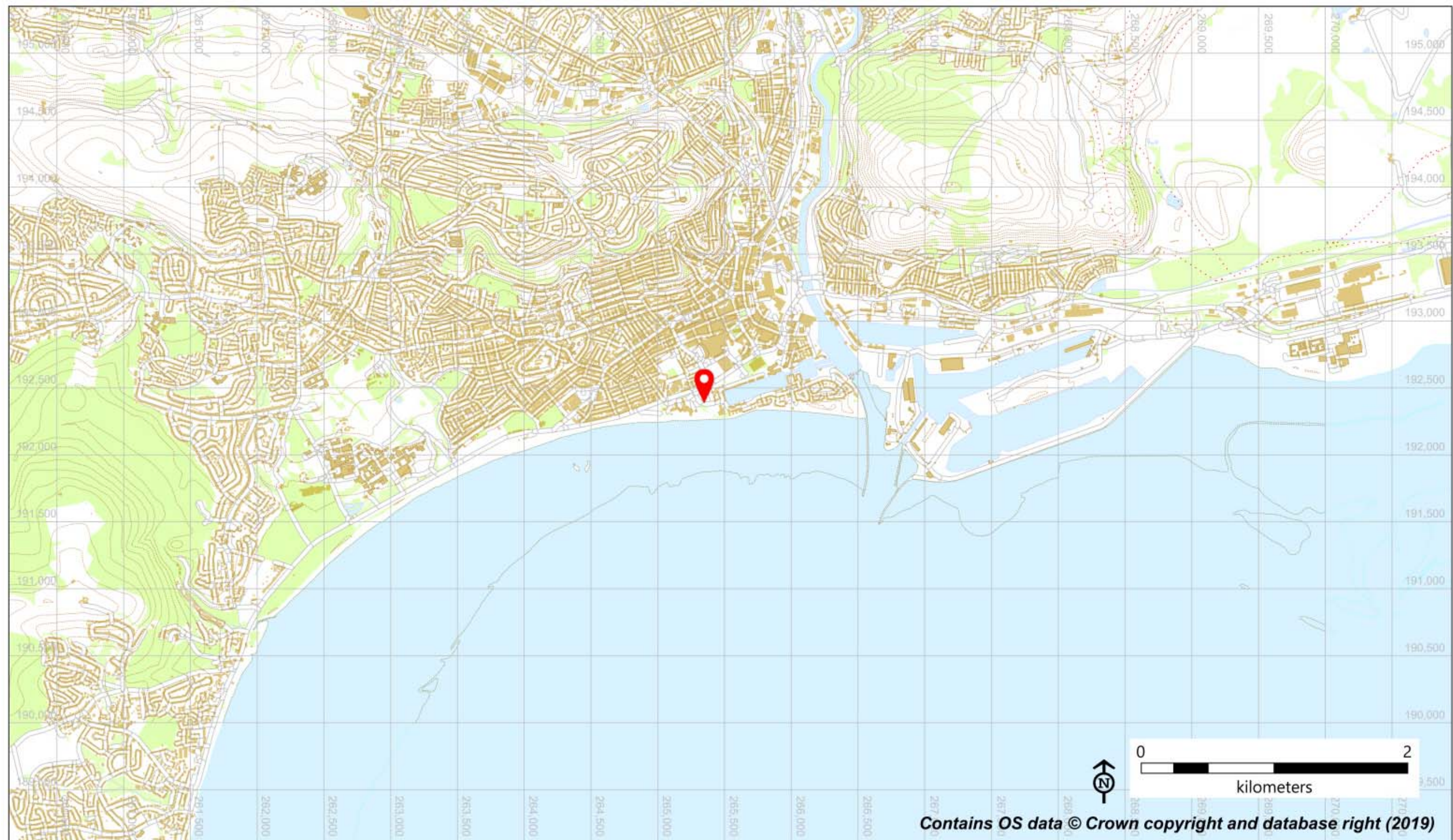


Figure 2: Aerial photo © Google (2019)

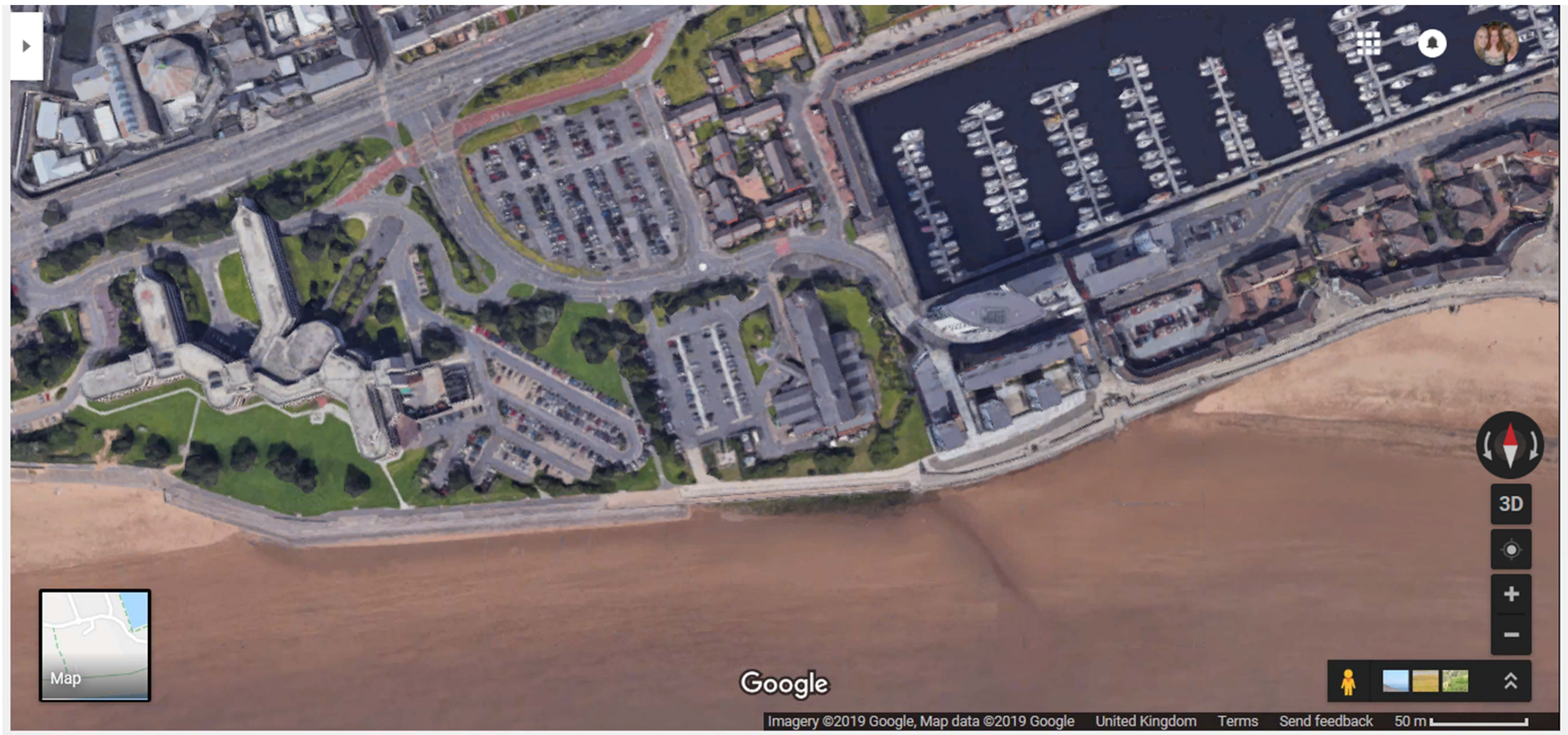


Figure 3: Rights of way plaque



Figure 4: View of site to north showing Marriott Hotel car park



Figure 5: View of site to west showing Civic Centre



DRILLING METHOD		UNGROUND LEVEL		DATE OF SURVEY		SHEET NO.	
Percussion 200 mm dia. to 15.0 m "Open hole" rotary drilling From 15.0 m to 22.0 m		+ 9.18 m O.D.		55 65399228 556956		2	
MACHINE		CORE BARREL AND BIT DESIGN		ORIENTATION		SITE	
Dando "Investigator"				Vertical		PROPOSED NEW COUNTY HALL PAXTON STREET SWANSEA	
SOIL SAMPLES DEPTH AND TYPE	DRILLING AND CASING PROGRESS	WATER LEVEL AND A.M. LEVEL	R. Q. D.	CORE RECOVERY % AND SIZE	DESCRIPTION OF STRATA	THICKNESS m	O.D. LEVEL
100 P N=8	5-2.75				MADE GROUND consisting of ashes.	0.50	5.18
150 P N=6					MADE GROUND consisting of loose, light grey fine-medium sand.	1.00	6.68
300 P N=8					MADE GROUND consisting of grey sand with layers of soft sandy clay	1.05	7.68
400 P N=75 for 150 mm					MADE GROUND consisting of soft red-brown sand clay with brick shale.	0.95	8.63
500 P N=105 for 225 mm					MADE GROUND consisting of dense bricks, ashes, sand and clay.	1.45	9.68
600 P N=75 for 150 mm	5-2.75 6-2.75	6-2.75 7-2.75 8-2.75 9-2.75 10-2.75 11-2.75 12-2.75 13-2.75 14-2.75 15-2.75 16-2.75 17-2.75 18-2.75 19-2.75 20-2.75 21-2.75 22-2.75 23-2.75 24-2.75 25-2.75 26-2.75 27-2.75 28-2.75 29-2.75 30-2.75 31-2.75 32-2.75 33-2.75 34-2.75 35-2.75 36-2.75 37-2.75 38-2.75 39-2.75 40-2.75 41-2.75 42-2.75 43-2.75 44-2.75 45-2.75 46-2.75 47-2.75 48-2.75 49-2.75 50-2.75 51-2.75 52-2.75 53-2.75 54-2.75 55-2.75 56-2.75 57-2.75 58-2.75 59-2.75 60-2.75 61-2.75 62-2.75 63-2.75 64-2.75 65-2.75 66-2.75 67-2.75 68-2.75 69-2.75 70-2.75 71-2.75 72-2.75 73-2.75 74-2.75 75-2.75 76-2.75 77-2.75 78-2.75 79-2.75 80-2.75 81-2.75 82-2.75 83-2.75 84-2.75 85-2.75 86-2.75 87-2.75 88-2.75 89-2.75 90-2.75 91-2.75 92-2.75 93-2.75 94-2.75 95-2.75 96-2.75 97-2.75 98-2.75 99-2.75 100-2.75 101-2.75 102-2.75 103-2.75 104-2.75 105-2.75 106-2.75 107-2.75 108-2.75 109-2.75 110-2.75 111-2.75 112-2.75 113-2.75 114-2.75 115-2.75 116-2.75 117-2.75 118-2.75 119-2.75 120-2.75 121-2.75 122-2.75 123-2.75 124-2.75 125-2.75 126-2.75 127-2.75 128-2.75 129-2.75 130-2.75 131-2.75 132-2.75 133-2.75 134-2.75 135-2.75 136-2.75 137-2.75 138-2.75 139-2.75 140-2.75 141-2.75 142-2.75 143-2.75 144-2.75 145-2.75 146-2.75 147-2.75 148-2.75 149-2.75 150-2.75 151-2.75 152-2.75 153-2.75 154-2.75 155-2.75 156-2.75 157-2.75 158-2.75 159-2.75 160-2.75 161-2.75 162-2.75 163-2.75 164-2.75 165-2.75 166-2.75 167-2.75 168-2.75 169-2.75 170-2.75 171-2.75 172-2.75 173-2.75 174-2.75 175-2.75 176-2.75 177-2.75 178-2.75 179-2.75 180-2.75 181-2.75 182-2.75 183-2.75 184-2.75 185-2.75 186-2.75 187-2.75 188-2.75 189-2.75 190-2.75 191-2.75 192-2.75 193-2.75 194-2.75 195-2.75 196-2.75 197-2.75 198-2.75 199-2.75 200-2.75 201-2.75 202-2.75 203-2.75 204-2.75 205-2.75 206-2.75 207-2.75 208-2.75 209-2.75 210-2.75 211-2.75 212-2.75 213-2.75 214-2.75 215-2.75 216-2.75 217-2.75 218-2.75 219-2.75 220-2.75 221-2.75 222-2.75 223-2.75 224-2.75 225-2.75 226-2.75 227-2.75 228-2.75 229-2.75 230-2.75 231-2.75 232-2.75 233-2.75 234-2.75 235-2.75 236-2.75 237-2.75 238-2.75 239-2.75 240-2.75 241-2.75 242-2.75 243-2.75 244-2.75 245-2.75 246-2.75 247-2.75 248-2.75 249-2.75 250-2.75 251-2.75 252-2.75 253-2.75 254-2.75 255-2.75 256-2.75 257-2.75 258-2.75 259-2.75 260-2.75 261-2.75 262-2.75 263-2.75 264-2.75 265-2.75 266-2.75 267-2.75 268-2.75 269-2.75 270-2.75 271-2.75 272-2.75 273-2.75 274-2.75 275-2.75 276-2.75 277-2.75 278-2.75 279-2.75 280-2.75 281-2.75 282-2.75 283-2.75 284-2.75 285-2.75 286-2.75 287-2.75 288-2.75 289-2.75 290-2.75 291-2.75 292-2.75 293-2.75 294-2.75 295-2.75 296-2.75 297-2.75 298-2.75 299-2.75 300-2.75 301-2.75 302-2.75 303-2.75 304-2.75 305-2.75 306-2.75 307-2.75 308-2.75 309-2.75 310-2.75 311-2.75 312-2.75 313-2.75 314-2.75 315-2.75 316-2.75 317-2.75 318-2.75 319-2.75 320-2.75 321-2.75 322-2.75 323-2.75 324-2.75 325-2.75 326-2.75 327-2.75 328-2.75 329-2.75 330-2.75 331-2.					

Figure 6: Borehole log sheet 1

SITE PROPOSED NEW COUNTY HALL PAXTON STREET SWANSEA					SHEET 2 OF 3		BOREHOLE NUMBER 556956 35 2	
SOIL SAMPLES DEPTH AND TYPES	DRILLING AND CASING PROGRESS	WATER RECOVERY % AND O.M. LEVEL	R.Q.D.	CONC RECOVERY % AND SIZE	DESCRIPTION OF STRATA	THICKNESS	O.D. LEVEL	SYMBOLIC LOG
11-00 P N=75 for 150mm	6-2-75 7-2-75				11-00 Very stiff grey gravelly BOULDER CLAY		-1.82	
12-00 P N=75 for 150mm	7-2-75 10-2-75							
13-00 P N=75 for 150mm								
14-00 CP N=75 for 75mm								
15-00 CP N=105 for 150mm	10-2-75 11-2-75					7-60		
16-50 CP N=75 for 150mm								
18-00 CP N=75 for 150mm	11-2-75 12-2-75				18-60 Grey MUDSTONE (Driller's description)		-5.42	
"Open hole" drilling due to pebbles falling in hole - coring not possible.						3-40 (penetrated)		
REMARKS P= Standard Penetration Test CP= Standard Penetration Test - solid cone N= Number of blows for 300 mm (unless otherwise stated)								
WEST GLAMORGAN COUNTY COUNCIL COUNTY ENGINEER AND SURVEYOR'S DEPT.								

Figure 7: Borehole log sheet 2

SITE PROPOSED NEW COUNTY HALL YATTON STREET SWANSEA					SHEET 3 OF 3		BOREHOLE NUMBER 345 2	
SOIL SAMPLES DEPTH AND TYPES	DRILLING AND CASING PROGRESS	WATER RECOVERY % AND O.M. LEVEL	R.Q.D.	CORE RECOVERY % AND SIZE	DESCRIPTION OF STRATA	THICKNESS m	O. D. LEVEL	SYMBOLIC LOG
		2 4 2 8	2 2 3 8	2 2 5 8				
British Geological Survey					British Geological Survey		British Geological Survey	
	12.2.74				22.00		-12.62	
					Bottom of hole			
British Geological Survey			British Geological Survey		British Geological Survey			
British Geological Survey			British Geological Survey		British Geological Survey			
British Geological Survey			British Geological Survey		British Geological Survey			
British Geological Survey			British Geological Survey		British Geological Survey			
British Geological Survey			British Geological Survey		British Geological Survey			
British Geological Survey			British Geological Survey		British Geological Survey			
British Geological Survey			British Geological Survey		British Geological Survey			
REMARKS On completion of the borehole the casing was withdrawn and a standpipe inserted to 6.50 m with a cement-bentonite plug from 5.0m to 6.0m.								
WEST GLAMORGAN COUNTY COUNCIL					COUNTY ENGINEER AND SURVEYOR'S DEPT.			

Figure 8: Borehole log sheet 3

Figure 9: Proposed detailed site investigation works



Figure 10: General site view showing existing access



Figure 11: Foundation and Sub-Structure Recommendations

Figure 12: Ground Floor and Super Structure Specification Recommendations

Figure 13: Roof Structure and Weathering Recommendations

Figure 14: Site Set Up, Required Plant and Equipment

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