

**Island Farm  
Site Wide  
Masterplanning.**

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**Summary of Site  
Investigation Findings.**

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## 1 Introduction.

A number of site investigations have been undertaken within the boundaries of the Island Farm site.

This document provides a summary of the findings of these investigations for use by the Masterplanner when developing the masterplan for the side wide development.

## 2 Investigation Programme.

The main objectives of the investigations were to:

- Identify the potential environmental liabilities at the site associated with any soil and groundwater contamination from past site uses.
- Provide recommendations with regard to likely geo-environmental aspects pertaining to the development, including radon protection measures.
- Determine the likely type, strength and bearing characteristics of the shallow superficial and underlying solid geology based on available information.
- Determine the likely ability of soils to disperse stormwater discharged from the site.

Determine the likelihood of development being affected geo-technical features such as potential natural and man-made cavities.

## 3 The Findings.

### 3.1 Site History

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The history of the site has been traced using historic maps from an Environcheck Report.

Selected editions of the maps are presented separately a summary of the key years is provided below:

#### **1885**

The 1885 edition shows the site to comprise of undeveloped fields with the exception of two small buildings in the east of the site. Three small areas of woodland are positioned in the west of the site, where solution features were observed during the walkover survey. A further area of woodland is positioned near the centre of the site and this may also represent a solution feature although this would need to be confirmed. Ewenny pottery and associated clay pits are positioned approximately 200m southeast of the site. The site is bound on its south-western and western sides by a lane. Fields surround the site. The Ogmore River runs approximately 200m southwest of the site at its nearest point.

#### **1900**

The 1900 edition shows the site to still comprise of undeveloped fields. The Vale of Glamorgan Railway has been developed by this time and this runs along the south-eastern edge of the site. A rifle range is located to the northwest of the site.

#### **1921**

The 1921 edition shows those features mentioned previously.

#### **1941**

By 1941 buildings had been erected in the north of the site including an individual structure named crossways and a series of hostels. The A48 had been constructed by this time. Historic records reveal that the huts were initially constructed to house workers from the nearby Royal Ordnance Factory and was converted into a Prisoner of War Camp later in the Second World War. The remainder of the site was open fields.

#### **1964**

The 1964 edition shows the site to remain unchanged, with the huts and building in the north of the site and fields in the south of the site.

#### **1992/93**

The 1992/93 edition shows the huts to still be present in the north of the site. The Crossways building is identified as a Country Club. Between 1983 and 1993 factories were constructed at technology drive located immediately east of the study site.

#### **1999**

The 1999 edition shows that all the huts had been demolished by this time with the exception of one hut in the east of the site and a large building in the northwest of the site. Crossways country club is

still present.

**2006/2009**

The 2006/2009 editions reveal that Cross Ways country club was demolished by 2006 and that only one hut remains of the former camp. The south of the site remains open fields.



### 3.2 Natural and Man-made Cavities

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The Lower Lias geological unit identified beneath the site is susceptible to natural cavity formation. To the north of the current study site, at least thirteen subsidences were recorded in the vicinity of Nolton Street, Bridgend between 1920 and 1950 with Lower Lias deposits which were, predominantly, overlain by Glacial Sand and Gravel. It has been theorised that natural cavities within the limestone were previously in communication with the surface and that these features were in-filled with superficial glacial deposits at the end of the ice age. Subsequent washing-out of the cavity backfill by groundwater has resulted in the creation of voids which eventually reach the surface. Further subsidence may have occurred in undeveloped areas of this geological unit, but remained unrecorded as housing was not affected.

Three depressions are apparent in the south of the site on Historical maps. A review of aerial images (Google Earth) shows that the largest of these (NGR: 289670, 179190) can be clearly seen to comprise a large depression. The features were explored on 29th June 2009 and were seen to comprise steep sided cone-shaped depressions. The insides of the features were densely vegetated. Unfortunately, the features have been used to dump waste and consequently the bases of the features were obscured, making it impossible to determine whether the bases contained water. Several lesser depressions were noted in the south of the site which likely represent features which have partially subsided or ones which have previously been backfilled and have since settled. The depressions may represent collapses within the Carboniferous Limestone that underlies the Lias.

To the south of the site, significant karstic development is known in the vicinity of Merthyr Mawr House within the Carboniferous Limestone. Merthyr Mawr Sinks abduct water from the River Ogmore at approximately NGR: 288950 178100. The water continues through Merthyr Mawr Cave, located in the base of a large subsidence feature located approximately at NGR: 288870 178070. Significant flooded passageways are known to extend from this feature. The water eventually emerges at Merthyr Mawr Resurges at approximate NGRs: 288700, 177700 and 288600, 177600.

Another significant karstic feature in the vicinity of the site is the Schwyll Rising located within Carboniferous Limestone. The feature lies at approximate NGR: 288760 177100 and comprises of a spring with significant yield.

Mine workings are recorded within the carboniferous limestone at approximately NGR: 289200 177800, approximately 300m southwest of the study site. The BGS Memoir records lead deposits within the carboniferous limestone in the region.

The preserved Hut No. 9, located in the north east of site was the scene of an escape from the PoW camp on 10th March 1945. In Summer 2003 the tunnel was excavated and inspected. The tunnel was found to be open with wooden shoring in-situ. Internet sources (<http://www.islandfarm.fsnet.co.uk>) report the tunnel dimensions as 2.7m below ground level and measuring 0.9m by 0.9m. It was not mentioned whether or not the tunnel was backfilled or left in an open state.

In view of these conditions there is a significant risk of further natural cavities at shallow depth beneath the site which could pose a subsidence risk in the future.

The known Karst features within the site are included on the site plan accompanying this summary.

It should be noted that it is highly likely that other solution features may reveal themselves over time.

### 3.3 Ground Conditions.

For the purpose of discussing ground conditions the site was divided into proposed development zones.

These are based on the areas shown within the attached site plan.

#### Area 1.

The underlying ground conditions were found to be that summarised below.

Summary of Ground Conditions: Area 1				
1.1.2	Depth (m)	1.1.3	T	Stratum
		Thickness (m)		
1.1.4 L	1.1.5 0.35/0.70	- 1.1.6 35/0.70	0.	TOPSOIL: Soft to firm, dark brown, slightly sandy, very occasionally gravelly SILT.
1.1.7 .40/0.70	1.1.8 >6.00	- 1.1.9 5.30	>	1.1.10 SUPERFICIAL: Soft to firm, variably sandy variably gravelly, SILT/CLAY with occasional cobbles and boulders and with band of medium dense sand between 3.10m and 3.90m.
1.1.11 .95		1.1.12	-	1.1.13 POSSIBLE ROCK HEAD: Refusal of CPT 1.1.14 Tests at 6.95m.

Mass excavation has been undertaken within Area 1 to provide a plateau suitable for the future development of a Tennis Centre. in this position. The current cut level was left 1.0 metre above the expected finished floor level of the Tennis Centre.

Two Sinkholes have appeared within Zone 1, one which was mitigated/capped and backfilled and surveyed, the other which has been left open and is fenced off.

**Area 2.**

The underlying ground conditions were found to be that summarised below.

Summary of Ground Conditions: Area 2		
Depth (m)	Thickness (m)	Stratum
GL - 0.30/0.35	0.30/0.35	TOPSOIL : Soft, dark-brown, sandy, very occasionally gravelly SILT.
0.30/0.35 - 1.00/1.80	0.70 /1.50	SUPERFICIAL: Firm, brown to yellow-brown, variably sandy, SILT with occasional gravel
1.00/1.15 - 1.90/1.30 (TP2 and TP4 only)	0.30/0.70	SUPERFICIAL: Firm to stiff, brown, variably sandy, SILT with gravel to cobbles of sandstone
1.00 - >3.30 (TP6 only)	-	SUPERFICIAL: Firm to stiff, brown, slightly gravelly, sandy SILT to silty SAND
1.10/1.90 - >3.50	-	SUPERFICIAL: Medium dense, brown, slightly silty/clayey sandy GRAVEL/COBBLES of rounded to sub-rounded sandstone

**Area 3.**

The underlying ground conditions were found to be that summarised below.

Summary of Ground Conditions: Area 3		
Depth (m)	Thickness (m)	Stratum
GL - 0.20/0.40	0.20/0.40	TOPSOIL : Soft, dark-brown to black, sandy slightly gravelly SILT
0.20/0.40 - 1.60/2.00	1.40 /1.60	SUPERFICIAL: Soft to firm, brown slightly gravelly sandy, SILT
1.60 - 2.20 (TP7 only)	0.60	SUPERFICIAL: Medium dense, brown, silty sandy GRAVEL to COBBLE to gravelly SAND
2.20 - 3.20 (TP7 only)	1.00	SUPERFICIAL: Firm to stiff, brown, slightly gravelly, sandy SILT
2.00/3.20 - >5.00	-	SUPERFICIAL: Firm to stiff, to very stiff, grey to brown to red-brown, variably sandy CLAY with occasional gravel
@5.45	-	POSSIBLE ROCK HEAD: CPT Test Refusal at 5.45m

**Area 4.**

The underlying ground conditions were found to be that summarised below.

Table 4.6 Summary of Ground Conditions: Area 4		
Depth (m)	Thickness (m)	Stratum
GL - 0.30/0.35	0.30/0.35	TOPSOIL : Soft, dark-brown, slightly gravelly sandy SILT
0.35 - 1.30 (TP15 only)	0.95	SUPERFICIAL: Firm, brown slightly gravelly sandy, SILT
1.30 - >3.20 (TP15 only)	1.90	SUPERFICIAL: Firm to stiff, brown, gravelly to very gravelly, sandy SILT with cobbles and boulders of rounded to sub-rounded sandstone
0.30 - 2.65 (TP16 only)	1.35	SUPERFICIAL: Dense, brown, silty sandy GRAVEL to COBBLE of rounded to sub-rounded sandstone with occasional boulders
2.65 - >3.00	-	SUPERFICIAL: Stiff to very stiff, grey, slightly sandy, thinly laminated CLAY with occasional gravel

**Area 5.**

The underlying ground conditions were found to be that summarised below.

Summary of Ground Conditions: Area 5		
Depth (m)	Thickness (m)	Stratum
GL - 0.30/0.40	0.30/0.40	TOPSOIL : Soft, dark-brown, slightly gravelly sandy SILT
0.30/0.40 - 2.50/3.60	2.10/3.30	SUPERFICIAL: Firm to stiff, brown variably gravelly sandy, SILT
2.50 - 3.90 (WS1 only)	1.40	SUPERFICIAL: Medium dense, brown to yellow-brown, silty gravelly SAND to sandy GRAVEL
3.10/3.90 - >6.00	-	SUPERFICIAL: Firm to stiff, red-brown, variably sandy, variably gravelly CLAY
@5.45/6.00	-	POSSIBLE ROCK HEAD: CPT Refusal at 5.45 – 6.00.

**Area 6.**

The underlying ground conditions were found to be that summarised below.

Summary of Ground Conditions: Area 6		
Depth (m)	Thickness (m)	Stratum
GL - 0.30/0.55	0.30/0.55	TOPSOIL : Soft, dark-brown, slightly gravelly sandy SILT.
0.30/0.40 - 2.50/3.60	2.10/3.30	SUPERFICIAL: Soft to firm to stiff, brown variably gravelly sandy, SILT with occasional cobble to boulders. Contains bands of sandy GRAVEL to gravelly SAND in TP10
1.40 - 2.20/3.50 (WS1 only)	>2.10	SUPERFICIAL: Loose to Medium dense, very silty, sandy GRAVEL include boulders

Solution features and suspected solution features are positioned within this area.



### 3.4 Permeability/Filtration.

Filtration tests were undertaken separate from the geotechnical site investigation.

The subsoil's that were found within each trial pit excavated were similar to each other and similar to those described above. These are shown in the trial pit log below.

TRIAL PIT LOG				
Water	Reduced Level (m)	Ground	Depth (m)	Description
	0.00	X X	(0.30)	VEGETATED TOPSOIL
	-0.30	X X	0.30	Soft to firm red brown slightly sandy CLAY
			(1.70)	
	-1.70		1.70	
	-1.90	X X	1.90	Firm red brown slightly sandy CLAY with some cobbles
				Trial pit ends
Not shown to scale				
Additional notes:				

Only four filtration tests yielded results a number of were abandoned as the permeability of the ground in which the pits had been excavated was so poor that the water levels within each of the excavated pits had not reduced by a measurable level within a period of five hours.

The calculated filtration rates measured in those tests undertaken were as follows:

Trial No	Soil Infiltration Rate
Ftrial 1	6.1x10 <sup>-5</sup> m/s
Ftrial 2	4.55x10 <sup>-5</sup> m/s
Ftrial 3	5.61x10 <sup>-5</sup> m/s

The permeability of the subsoils underlying the site is very poor, furthermore there is risk of cavitation occurring within the existing rock formations underlying the site, particularly if stormwater is discharged into the ground.

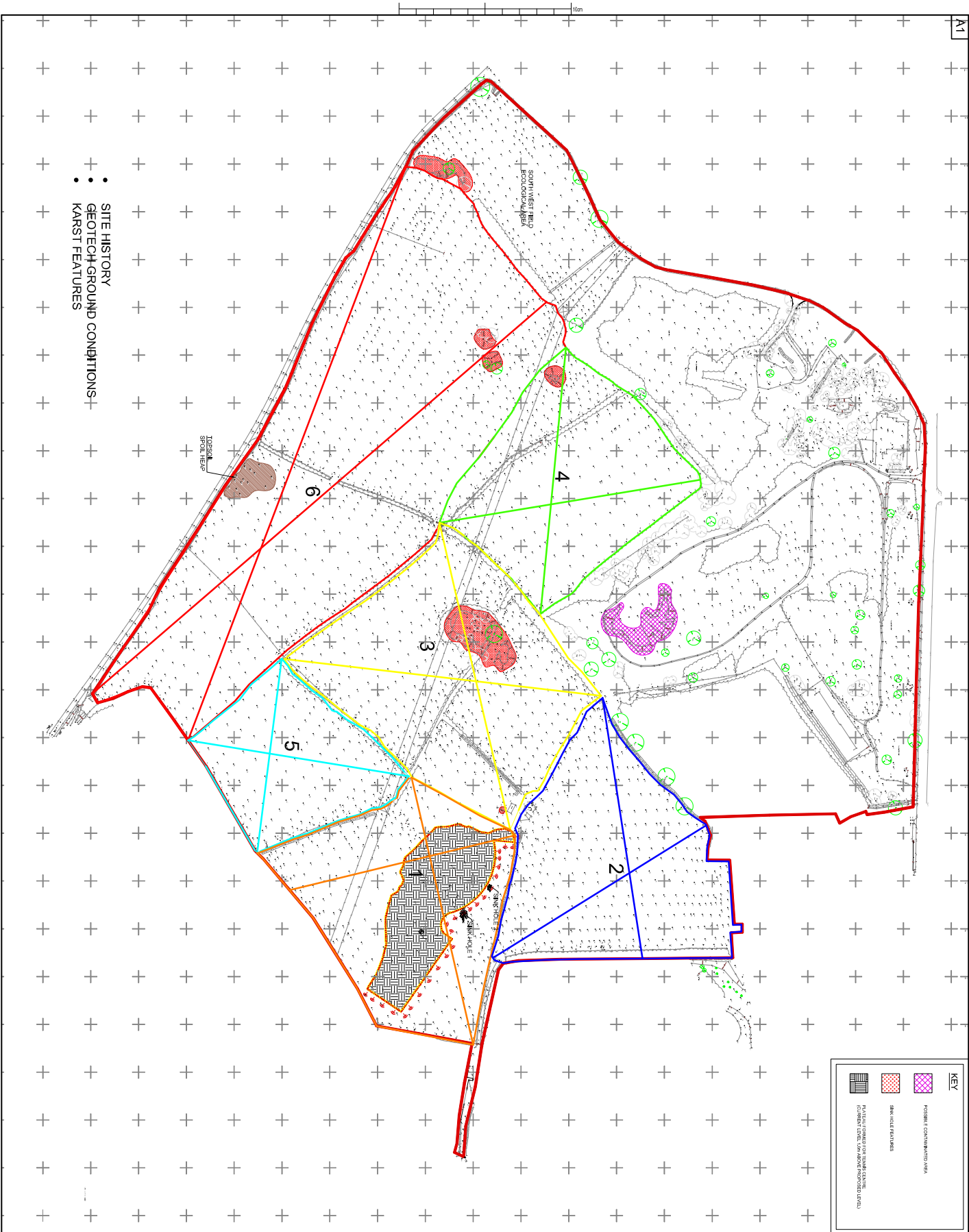
As a result the discharge of stormwater collected from the site into shallow soakaway systems is not an option on this site.

### 3.5 Contamination

Chemical testing of samples of subsoils and groundwater abstracted from site has been undertaken and a site conceptual model of contamination pathways developed and a quantitative contamination risk assessment undertaken the results of which are shown overleaf.

<b>Table 6.1 – Human Health Risk Assessment</b>				
<b>Source</b>	<b>Pathway</b>	<b>Target</b>	<b>Risk Assessment</b>	<b>Mitigation Measures</b>
In-situ Made Ground	Dermal contact with soil/dust Inhalation of soil/dust Ingestion of soil/dust Inhalation of organic vapours	Construction workers	Low risk to site construction workers involved in excavation phase of development	COSHH assessment and good level of PPE/ hygiene by site workers/ staff; dust suppression measures if required
In-situ Made Ground	Dermal contact with soil/dust Inhalation of soil/dust Ingestion of soil/dust	Passers-by/neighbours during construction phase	Low risk during construction phase.	Dust suppression measures should be employed if required
In-situ Made Ground	Dermal contact with soil/dust Inhalation of soil/dust Ingestion of soil/dust Inhalation of organic vapours	Future site users	Risk Assessment indicates no risk to future site users for proposed end uses.	Soil chemical analysis reveals that significant source is not present so based on current results no remediation is required.
Deep Geology	Migration into indoor air	Site end users	BGS Report 211 Reveals BASIC Radon Protective Measures are required	Installation of Basic Radon Protection Measures in new constructions.

An area of fill believed to be arising from huts demolished on the site is located to the north east of Area 4 could well be contaminated. This area of spoil is highlighted on the attached site plan.



- SITE HISTORY
- GEOTECH-GROUND CONDITIONS
- KARST FEATURES

**KEY**

- REGIONAL CONTAMINATED AREA
- KARST FEATURES
- KARST FEATURES
- REGIONAL TROPICAL ECOSYSTEM
- GEOTECH-GROUND CONDITIONS

NOTES:

Rev	Date	By	Check By

Information

HD LTD  
 ISLAND FARM  
 BRIDGEEND

SITE LAYOUT

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