3.0 GEOLOGY AND HYDROGEOLOGY

3.1 Methodology

The Geological Survey of Ireland (GSI) publication "Geology of South Cork" was consulted to establish the nature of the bedrock lithology and Quaternary sediments. Sheet 25 of the 1:100,000 scale map series was used to identify lithologies in the site vicinity. Subsoil and soil information was also obtained from the Teagasc Irish Forest Soils (IFS) database of subsoil and soil classifications. The Institute of Geologists of Ireland (IGI) Guide ***'Geology in Environmental Impact Statements'*** (2002) was consulted to ensure a comprehensive assessment methodology was applied.

The Geotechnical Investigation Report is attached in Appendix 4.

3.2 Existing Environment

General Geology

The oldest lithology of the region is the Devonian Old Red Sandstone. The Youghal area falls between the Cork and Ardmore Synclines. Typically Carboniferous limestones are exposed on the synclines and Old Red Sandstone on the anticlines.

Bedrock Geology

In the area of the site the bedrock consists mainly of the Waulsortian Limestones of Carboniferous age (c. 300 million years ago). The formation consists of massive, unbedded mounds of calcareous deposits in the form of mudstones, wackestones and packstones. Devonian rocks in the area comprise the Ballysteen and Gyleen formations, part of what is termed the Old Red Sandstone.

Synclinal folding associated with the Variscan orogeny means that these limestones are surrounded on all sides by progressively older rocks, as can be seen on Fig. 3.1 Bedrock Geology. Local lithologies are outlined in Table 3.1.

	Geological Unit	Description
Carboniferous	Waulsortian Limestones (WA)	Massive calcareous mudstones, wackestones and packstones
	Ballysteen Formation (BA)	Dark grey well-bedded fossiliferous muddy limestone
	Crows Point Formation (CP)	Massive and thick-bedded grey sandstone
Devonian	Gyleen Formation (GY)	Green to grey and purple mudstones and sandstones
	Ballytrasna Formation (BS)	Purple mudstone and pale red, fine to medium grained sandstone

Table 3.1 Lithological Units in the Site Vicinity

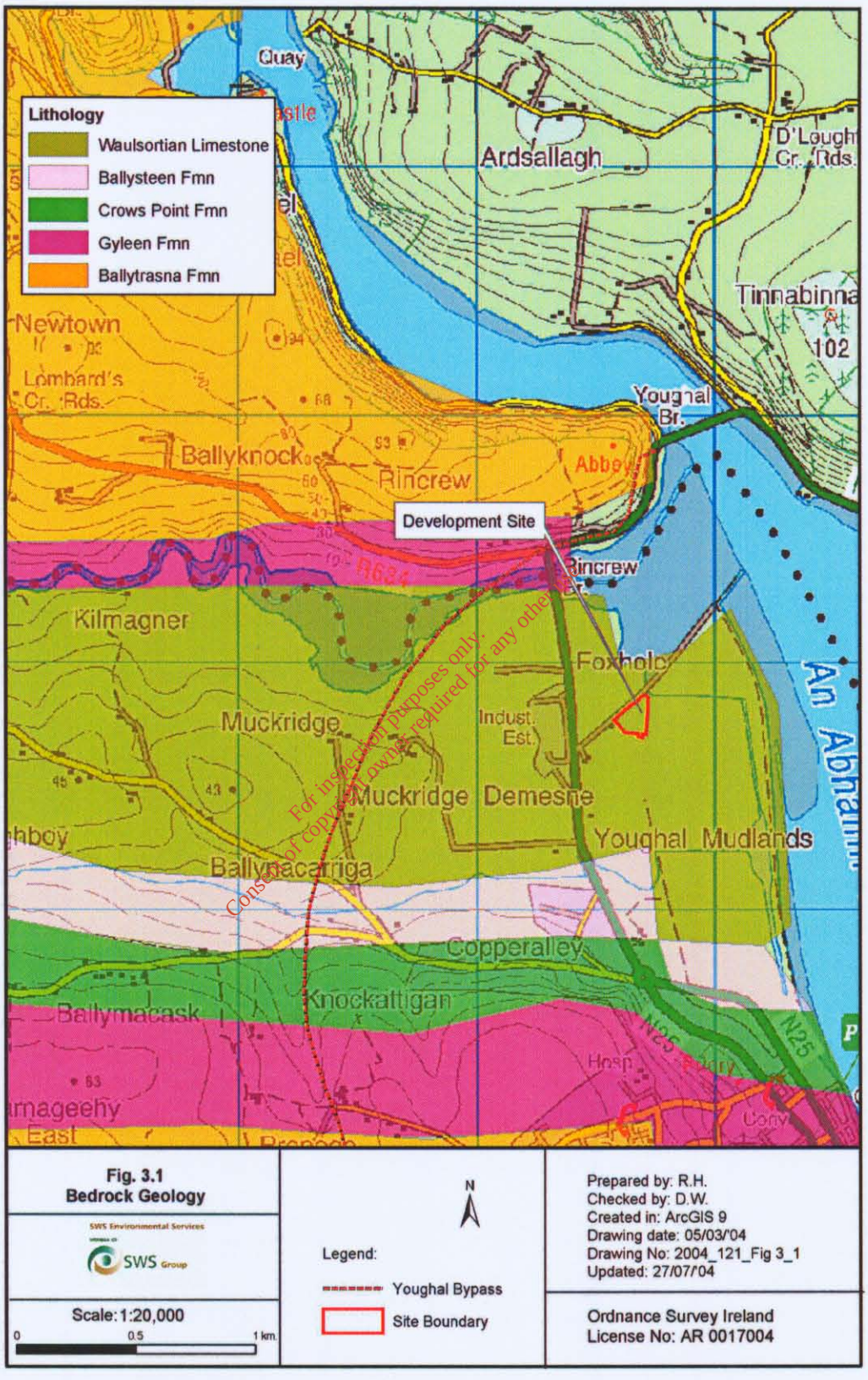

Figure 3.1 Bedrock Geology

Overburden Geology

The predominant subsoil in the vicinity of the site is a glacial till, containing weathered Old Red Sandstone components. Brickfields and potteries operated up to 1935, in the area to the North of Youghal town. These industries availed of a thick deposit of brickclay in the area to the west of the proposed development.

Historical reclamation work on the adjacent Youghal Mudlands, has led some infill of the site. The site geotechnical investigation suggests this varies in depth from 0.2m to 2.3m across the site.

The dominant soil type of the locality is the Acid Brown Earths/Brown Podzolics.

Hydrogeology

The hydrogeology of the site's Dinantian limestones is considered highly vulnerable according to the GSI's National Aquifer Classification Map. The provisional aquifer classification given for the lithology is Rk^d, i.e. a regionally important aquifer, karstified and with diffuse flow (refer to Table 3.2 Matrix of Groundwater Resource Protection Zones).

VULNERABILITY RATING	RESOURCE PROTECTION ZONES					
	Regionally Important Aquifers (R)		Locally Important Aquifers (L)		Poor Aquifers (P)	
	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	Rk/E	Rf/E	Lm/E	Ll/E	Pl/E	Pu/E
High (H)	Rk/H	Rf/H	Lm/H	Ll/H	Pl/H	Pu/H
Moderate (M)	Rk/M	Rf/M	Lm/M	Ll/M	Pl/M	Pu/M
Low (L)	Rk/L	Rf/L	Lm/L	Ll/L	Pl/L	Pu/L

Table 3.2 Matrix of Groundwater Resource Protection Zones

The subsoils of the site are described in the site geotechnical report (refer to Appendix 4) as sandy, slightly gravely clay and clayey, slightly gravely sand with thicknesses of 7.5-11.6m approx.

Using the Aquifer Vulnerability Characterisation (refer to Table 3.3 Aquifer Vulnerability Characteristics) provided by the GSI, moderate permeability can be assumed for these strata. This yields an aquifer vulnerability rating of High. However, the scale of these strata and proximity to the coast limits their potential as an aquifer.

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Table 3.3 Aquifer Vulnerability Characterisation

Though the limestones of the Youghal syncline are considered a major or regionally important aquifer (GSI, 1994) and they are classified as amongst the most productive in the country, due to the coastal location of the site, the risk of saline intrusion to the groundwater, limits its potential for potable use (GSI, 1994). Groundwater in the area, therefore, is not likely to be considered suitable for extraction.

The site geotechnical investigation indicated that depth to groundwater across the site varied between 1.9-7.7m. Groundwater flow was determined to be in a northerly direction and is likely to be strongly influenced by the tidal regime.

3.3 Impact Assessment

Potential Impacts

The proposed development at Foxhole may require the excavation of small quantities of soil from the site for the construction of the proposed buildings and storage areas. The development will increase in the amount of hardstanding at the site; this will increase the amount of surface water run-off. However, all site run-off will be collected through the storm water and interceptor drainage system.

Impacts during Construction

The construction of the site buildings, will require material to a depth of no more than 3m to be removed from the site for strip foundations and piling. The geotechnical site investigation report (Appendix 4) describes the subsoils as sandy/gravelly clays; as such these materials have little economic value.

Impacts during Operation

The site is not intended to deal with hazardous materials or putrescible waste. Therefore, potential contamination during the operation of the facility should be minimal. Furthermore the hardstanding area of the site will divert surface water run-off and all storm waters will be collected and monitored prior to discharge.

Groundwater recharge loss, from the collection of the site surface waters will have an undetectable effect of the groundwater levels.

Fuels on-site will be stored in bunded areas; to present any potential contamination of soils and groundwater. Foul waters also represent a potential threat. It is intended to collect, monitor and treat these potential contaminants thus eliminating any potential impact.

Impacts during Decommissioning

The main potential impact associated with the decommissioning of the facility would pertain to where contaminants had been stored on-site. Potential contaminants to be stored on-site will include fuels such as light diesel oil, which will be contained in bunded areas. The operator of the site has prepared a Decommissioning Plan attached in Appendix 11. Therefore the control and management of the facility during decommissioning means that any potential risk is reduced.

3.4 Mitigation Measures

Impacts during Construction

During the construction phases of the development, the main impact will be associated with the removal of soil/overburden from the site. It is intended to use this soil/overburden for landscaping purposes on-site.

Impacts during Operation

The site is not intended to deal with hazardous materials or putrescible wastes. A quarantine area will be established on-site to temporarily store such materials should they unintentionally arrive on-site, thereby controlling, preventing and managing any potential risk.

The entire operational area of the site will be concreted. This measure should protect the sub-surface from any potential contamination.

Surface run-off will be directed from the site with the installation of hardstanding throughout the facility. Run-off from all site surfaces will be collected (see Chapter 5 Water), thereby further reducing the pollution potential of the site.

Class 1 Oil interceptors and grit collectors or similar type equipment will be included in the site drainage system thereby limiting any potential of pollution of groundwater.

Fuels storage areas will be bunded to prevent potential pollution. These bunds will be subject to integrity testing.

Foul waters from the Administration Building will be treated in the waste water treatment plant, reducing the potential impact for pollution from the site.

Impacts during Decommissioning

All care will be taken during decommissioning, to ensure that potential contaminants will not be released from the site. Activities associated with decommissioning will be conducted as outlined in Appendix 11 Decommissioning Plan.