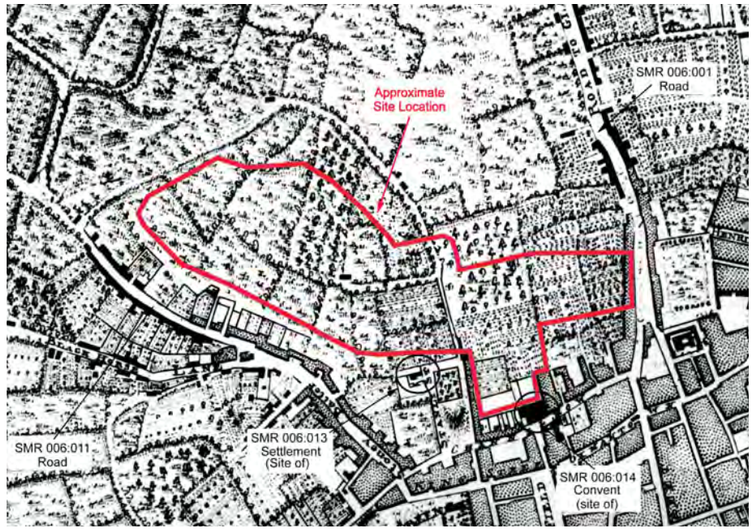
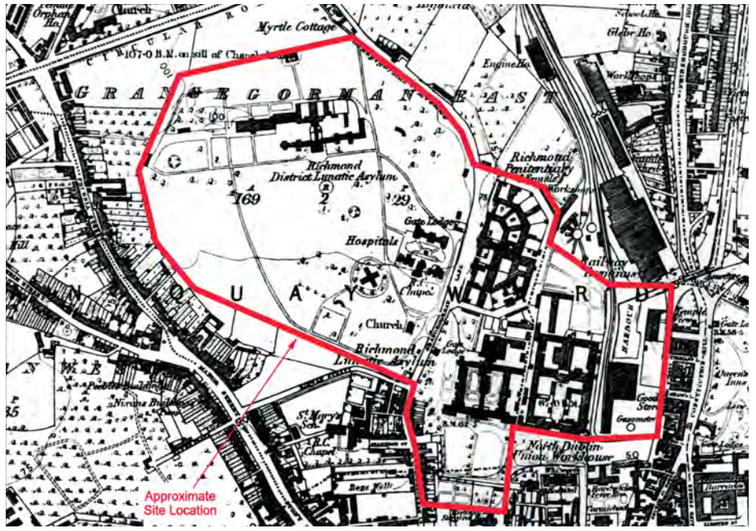
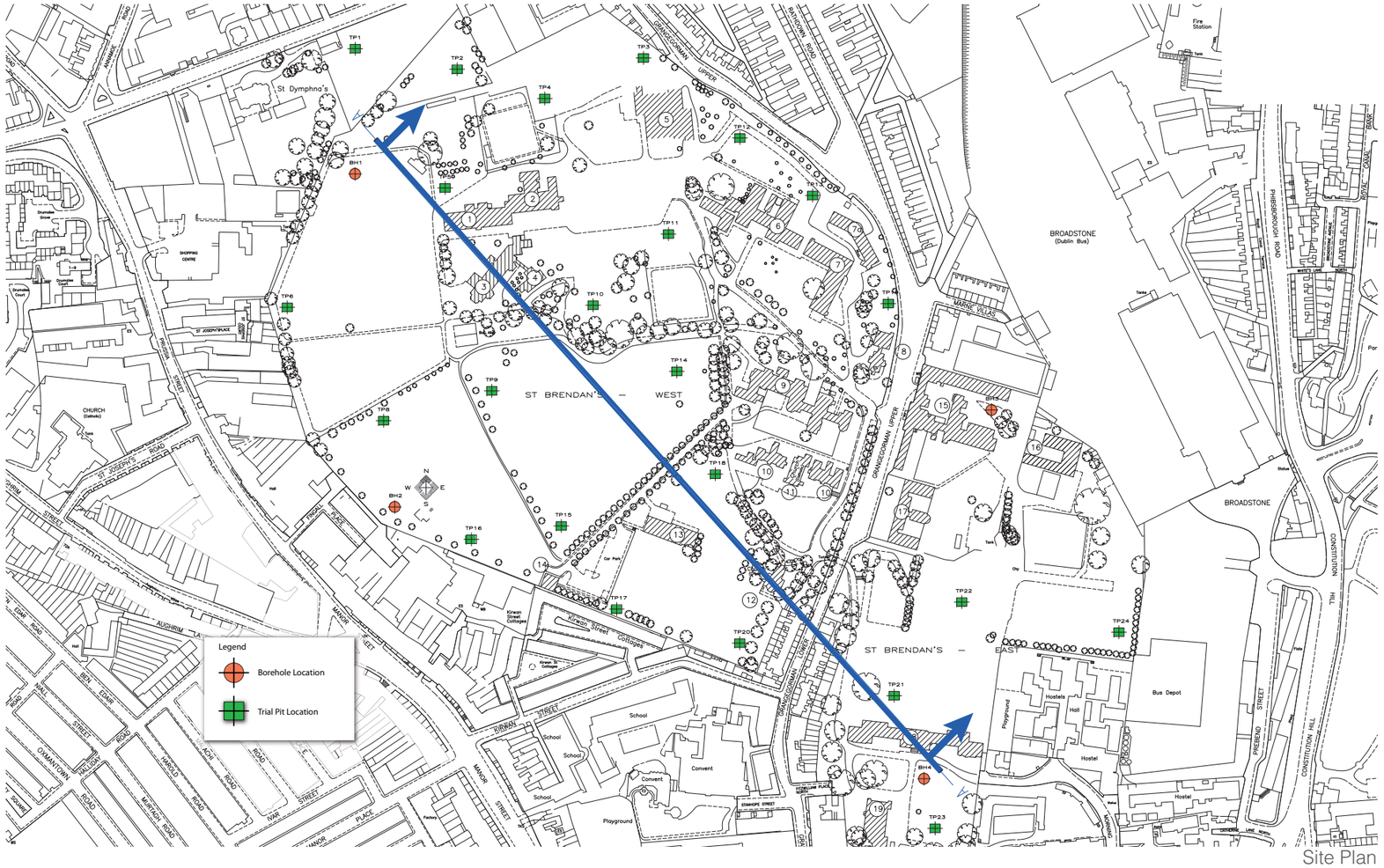
G_ground conditions



Historical Map - John Rocque 1756



OS Historical Map - 1876



Site Plan

site history and geotechnical issues

The purpose of this section is to outline the site's history, to identify typical ground conditions in the area and to highlight potential geotechnical issues with regard to the redevelopment of the site.

The site measures approximately 73 acres and lies between 16.8 and 27.2 m OD Malin.

The main sources of information for the Desk Study were:

- Historical maps of Dublin
- A History of St Brendan's Hospital, Dublin by Dr Brian O'Shea and Dr Jane Falvey
- Grangegorman Campus, Historical Sequence of Development
- Ordinance Survey maps
- Soils of Dublin, Farrell & Wall (1997)
- Rivers of Dublin, Sweeney (1991)
- Previous site investigations
- Geological Survey of Ireland (GSI) 6" Drift Maps
- GSI ground water information

The history of development at the Grangegorman site dates back to 1775 when the House of Industry was established. Prior to this time the land had mainly been used for agricultural purposes. After the establishment of the House of Industry, the Government at the time decided to construct the Richmond Asylum and Richmond Penitentiary (1810). Remains of these buildings exist today.

In 1832 the Penitentiary Gardens were incorporated as part of the Richmond Asylum site and it is mentioned that they were dedicated as a burial ground for a cholera epidemic in the same year. These gardens lay to the west of the current Grangegorman site.

The Grangegorman Campus, 'Historical Sequence of Development' notes the existence of a tunnel between the Church of Ireland and the Asylum ground to the east of the site. This tunnel was used to transfer patients between the two areas and is still in existence.

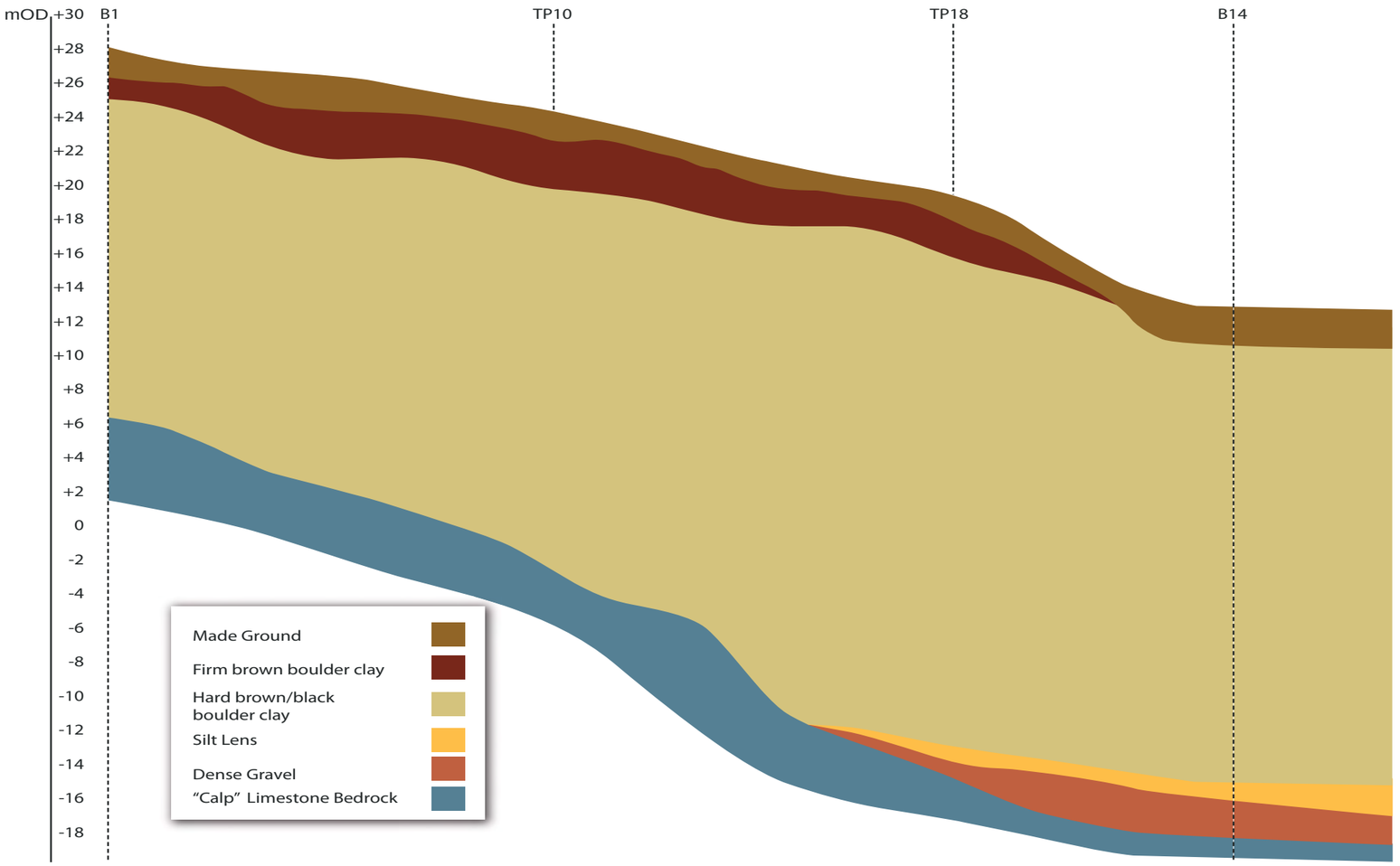
Geology

The ground conditions at Grangegorman are typical of the Dublin area. The overburden geology is strongly influenced by the glacial period and consequently there is a thick mantle of glacial tills overlying the bedrock. These tills which were essentially formed at the bottom of the ice sheet typically consist of intermittent layers of stiff brown black silty sandy gravely clay (boulder clay) and dense sandy sometimes silty gravels.

Bedrock

The GSI 1:100,000 bedrock geology map of Ireland shows Dublin city centre to overlie the Carboniferous Calp formation that consists of both limestone and shale. However the thickness of the limestone bed, grain size, colour and proportion of shale was found to vary widely across the area.

A draft copy of bedrock levels in Dublin from the GSI indicated bedrock to be dipping from -15mOD to -30mOD from the west section of the site to the east



Indicative Geological Cross Section

with a steep rise from -30m to approximately -20m OD. A trough could be present in the bedrock due to the steep dip and rise in bedrock to the eastern side of the site. Farrell & Wall show the bedrock at the site to lie roughly 20m below ground level (BGL).

Table 3.1: Appropriate Ground Conditions on Site

Strata	Approx thickness (m)	Approx depth to top of stratum (m)	Notes
Made Ground	0.6 – 2.35	0	Further investigation required
Firm-stiff brown boulder Clay	2	0.6 – 2.35	Variable quality for foundations and use as fill
Stiff-hard black boulder Clay	> 20	2.5 - > 3.8	Generally good for foundations and use as fill
"Calp" Limestone Bedrock	-	> 20	Strong to very strong, dark grey to black LIMESTONE

Overburden

The boulder clays are very stiff and would be suitable for normal pad foundations. Any deep excavations shall be relatively economical due to the strength of the clays. Farrell & Wall (1970) state that the boulder clays are generally found near the surface and are underlain by glacial and post glacial gravels. Areas of alluvium along the site boundary associated with the Bradoge River, if present, may require dewatering as they are likely more permeable and water bearing. The brown and black boulder clays are generally impermeable and consequently extensive pumping of groundwater from excavations is not likely to be required; however rainwater runoff would have to be pumped.

Generally the information gathered from maps and reports into the area correlated well with the information obtained from a previous site investigation and interpreted ground conditions can be found in Table 3.1. The section illustrates the strata described above in a geologic cross-section that runs diagonally across the proposed site.

The presence of man-made obstructions should be anticipated, in terms of old foundations, potential basements, buried services, tanks, etc which will require detailed investigations to identify.

Foundations for relatively light structures may be carried by the upper firm-stiff brown boulder clay or alternatively carried down to the stiff-hard boulder clay stratum. Piles should be anticipated for heavy structures.

Environmental Considerations

As part of prior ground investigations exploratory trial pits were excavated across the site. Made ground was encountered at all exploratory locations during the course of the investigation. Chemical analyses were carried out on soil samples from two of the exploratory locations. Further ground investigations will be necessary to determine the extent and nature of the made ground prior to its excavation and removal.

This material is likely to be unsuitable for engineering purposes and will have to be disposed of in a suitable landfill. In addition, a geophysical survey has identified some anomalies that may represent backfilled pits and as such should be subject to further investigation.

Hydrogeology

As previously discussed the ground conditions consist primarily of brown and black boulder clay. These materials have very low permeability and hence would be an aquitard. However given the possibility that there is a weathered zone at the interface with the overburden the underlying bedrock is a potential aquifer. It is also common to encounter silt, sand or gravel pockets or lenses within the boulder clay deposits, which would be water bearing.

Groundwater

Sources

The aquifer classification map for Ireland shows Dublin to lie on a poor to minor aquifer which is locally productive. The GSI National draft bedrock aquifer map describes the bedrock aquifer in Dublin as a locally important aquifer which is generally moderately productive in local areas. The GSI Vulnerability map carried out as part of an interim study of Dublin city centre found the vulnerability to range from high to low.

Quality

A previous site investigation of groundwater has yielded pH values of 7.7 to 8.4 and electrical conductivity ranging from 446 to 1067 µS/cm indicating that groundwater at the site is fresh. Further investigation of the groundwater is necessary to determine if the water is suitable for human consumption or other uses. The only potential source of groundwater for use on-site would be from fracture zones within the limestone bedrock.