

Phase 1 Geoenvironmental Appraisal

Georges Dock & Quay Dublin

for

Urban Architecture

N17397

July 2019





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Urban Architecture

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1	10.05.19	Client comments & layout change	SHJ	AC
2	22.05.19	Additional client comments	SHJ	AC
3	24.07.19	Revised layout	SHJ	AC

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Executive Summary

Site Description	A 1.5 Ha plot of land identified as George's Dock, Dublin. The site comprises two areas. The dock was previously utilised as a temporary entertainment venue and the building fronting onto the River Liffey is council offices. The dock has been partially infilled and a temporary platform constructed during the early 2000s.		
Site History	The original dock and quay were constructed in the 1800s and have remained up to the present day. During the 1990s some buildings associated with the dock in the surrounding area were demolished to make way for the new financial district. The dock was partially infilled during the early 2000s.		
Geology	Superficial deposits are indicated to comprise predominantly glacial deposits of stiff clay and dense gravels.		
	Bedrock comprises limestone of the Lucan Formation anticipated between 10-15m bgl.		
Mining & Natural Cavities	A low risk of the site being affected by mining and natural cavities.		
Contamination	The risk of significant contamination on site is considered to be low to moderate. A risk of contaminant migration through tidal flushing exists which could impact both fresh and saline waters.		
Environmental	 Solid Geology: Locally Important Aquifer. Superficial Geology: Urban (Made Ground). 		
Ground Gas	The risk of the site being affected by ground gas is considered to be moderate.		
	Radon protection measures may be required to be installed as a precautionary measure to any enclosed structures or following radon testing, the provision of appropriate ventilation measures may be required.		
Flooding	The site is not within an area of previous flooding. A flood risk assessment has been prepared under separate cover.		
Soakaway Drainage	Soakaways are not considered appropriate for this site at this stage.		
Foundations	Deep foundations such as pile or vibro stone columns subject to proposed loads (Dock and Quay), or alternatively re-engineering of the dock infill to a known specification to allow construction of reinforced shallow spread foundations (rafts/ pads). Subject to favourable ground deep cast mass foundations with cantilever slab for new quayside building.		
Recommendations for Ground	Trial pits to obtain samples of the dock infill for laboratory analysis (Chemical and geotechnical).		
Investigation	Cable tool and possibly rotary drilling to confirm depth to competent bearing stratum.		
	Installation of gas and groundwater monitoring standpipes and monitoring over an appropriate period of time.		
	Laboratory chemical and geotechnical testing of soils.		

The above summary should not be used in isolation and reference should be made the full report which provides a detailed assessment of the risks affecting the development.



1.0 Introduction

1.1 Commission

Patrick Parsons Ltd (PPL) was commissioned by Urban Architecture (UA) on behalf of Dublin City Council (DCC) to undertake a Phase I Geoenvironmental Investigation for a proposed white-water rafting course at George's Dock, Dublin. A site location plan is presented as Drawing No. N17397-701 in Appendix A.

1.2 Proposals

It is understood that UA and DCC propose to construct a multi-purpose water based recreational facility at George's Dock and Custom House Quay, Dublin 1, which will include the following:

- provision of a white water rafting course utilising the existing George's Dock basin, which is a protected structure, including;
 - a. a central flat water training facility including water polo amenity,
 - b. white water slalom course,
 - c. kayak/raft conveyor,
 - d. pumping station and water treatment plant,
 - e. a mechanical control centre and electrical substations,
 - f. enhancement of existing public lighting and provision of low illumination level floodlighting for waterbased activities; and
 - g. swift water rescue centre with floodable urban street with mock enclosures forming a 'rescue village'.
- The demolition of former Dublin Docklands Development Authority office building and removal of 6 no. existing trees at Custom House Quay. Construction of two new quayside buildings with a combined total floor area of 763.98 m² and maximum height of 5.5m. The east building incorporating land based activities including changing rooms, reception, staff amenity area, equipment storage. The west building comprising replacement offices and conference room for the use of Dublin City Council Docklands office. Ancillary landscaped public open space between these proposed quayside buildings including surface water attenuation area and quayside walkway;
- Reconfigured and resurfaced public open space where necessary to the existing plaza at Georges's Dock, including the removal of 4 no. existing trees, making good any damage caused by construction work, and the provision of temporary construction compound. Connection to public surface water drainage system; and
- Conservation and protection works to the lock gate and quay walls together with retention and protection of the triumphal arch on site and the partial removal of the timber boardwalk and insertion of access structures to the canal channel at the sea wall.

1.3 Objectives

The objectives of the investigation were as follows:

• Assess the land-use history using available historical plans;



- Describe the environmental setting of the site, including details of the geology, hydrogeology and hydrology;
- Provide information on ground conditions using published data;
- Assess potential impacts of past mining;
- Review whether the site had previously been used for a purpose that may have given rise to significant ground contamination;
- To assess the potential for hazardous ground gas.

This report presents the factual information available during this appraisal, interpretation of the data obtained and recommendations with respect to future development. It has been assumed in the production of this report that the site is to be redeveloped for a commercial end use.

1.4 Sources of Information

The study has included an inspection of historical maps, a review of environmental data held on publicly available registers and other sources as appropriate:

- 1. Online historical mapping Ordnance Survey Ireland
- 2. Environmental Protection Agency online viewer (https://gis.epa.ie/EPAMaps/)
- Geological Survey Ireland National Geotechnical Borehole Database online viewer (<u>http://spatial.dcenr.gov.ie/GeologicalSurvey/GeoTechnicalViewer/index.html</u>)
- 4. Geological Survey Ireland Public Data Viewer (<u>https://dcenr.maps.arcgis.com/apps/MapSeries/index.html</u>)
- 5. The Office of Public Works (OPW) Flooding http://www.floodmaps.ie/View/Default.aspx.

1.5 Limitations

This report has been prepared for UA and their appointed agents only and should not be relied upon by any third party without the written permission of PPL. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill. This report is based on and limited to an assessment of the information and ground conditions identified here. PPL is not responsible for ground conditions not revealed during these investigations.



2.0 Site Details

OS Grid Reference	117313E 391988N.	
Area	Watercourse & Plaza - Approximately 1.09 hectares (2.69 acres) Quayside Buildings – Approximately 0.18 hectares (0.46 acres).	
Location	The site is identified as George's Dock and land at Custom House Quay Road, Dublin situated in Dublin city centre within Dublin's financial district.	
Description	The course location site forms a roughly square plot, formed by the George's Dock basin (a non-working dock) and is approximately 100m long and 80m wide. The basin previously contained a timber and steel platform constructed in 2004 (now removed) to host outdoor events. Two dock access channels are present to the north and south, with the northern most connecting with a larger dock (Revenue Dock) beyond Georges Dock Road and the southernmost connecting with the River Liffey beyond Custom House Quay Road.	
	To the west of the basin, commercial buildings (AIB House, IFSC House and La Touche House), separated by an area of grassed and paved public open space are present. To the north and the east, further commercial buildings including the CHQ Building (east) and Harbour Master Place (north) are present.	
	The proposed quayside building is presently occupied by the DCC offices building and is situated to the north of the River Liffey, east of the Sean O'Casey Bridge, south of Custom House Quay road and west of a river landing stage.	
Adjacent Land Use	North: Docks and commercial buildings. South: River Liffey. East: Commercial buildings. West: The Custom House and further commercial buildings.	



3.0 Geoenvironmental Information

Historical OS maps are included in Appendix B

3.1 Site History

A brief summary of the salient points relating to the history of the site is presented below. It is not the intention of this report to describe in detail all the changes that have occurred on or adjacent to the site or its component areas, only those pertinent to the objectives of this investigation.

Dates	On-Site Off-Site	
1762 — 1820s	Site is indicated to be occupied by vacant land/ housing	Fields/ agricultural land is noted to the north with the River Liffey noted to the immediate south. A second 'old dock' is noted to the west but is later infilled. A timber yard is recorded to the east.
1820s – 2004	Georges Dock is constructed by the 1820s and remains largely unchanged until the early 2000s when the dock is partially infilled to accommodate the present platform. A 'Transit Shed' is situated behind the quay wall (Custom House Quay) which is later replaced by the present DCC offices prior to 2003.	Development of the docklands area expands eastward from Dublin centre during this period. Buildings surrounding the dock are identified as warehouses for the storage of tobacco (later grain (east)), sugar (later wines and spirits (west)) including transit sheds immediately bordering the site to the west. By the 1990s, several buildings to the north and east are demolished and replaced by newer structures
2004 - Present	The platform is present within the dock from 2004 until removal recently, little further significant change occurs up to the present day.	Little significant change



3.2 Geology and Mining

Made Ground	Made ground is recorded on the GSI interactive viewer. Borehole records within and immediately adjacent to George's Dock and the River Liffey behind the quay wall, record made ground to depths of up to 7.5m bgl comprising limestone blocks and boulders. Further deposits are anticipated due to infilling of the dock during the 1990s/ early 2000s. This fill is conjectured to comprise a layer Of 500mm sized stone overlain by 200mm sized stone, possibly comprising demolition rubble from development during the late 1990s.	
Superficial Geology	GSI interactive maps do not record the presence of superficial soils beneath the site due to the urban nature of the site. However, glacial till and glacial sands and gravels are recorded to the immediate west of the site. Boreholes undertaken within and in the immediate surrounding area record the presence of very stiff to hard glacial till to depths of 10m bgl in the north, with medium dense to dense glacial gravel with boulders recorded mainly in the south to depths of up to 11m bgl.	
Solid Geology	Carboniferous Limestone and Calcareous Shale of the Lucan Formation. BGS Ireland borehole information within the dock and the immediate surrounding area confirms the presence of limestone alternating with mudstone at depths of approximately 10-15m bgl.	
Mining & Natural Cavities	The site is not indicated to be located within a mining area.	
Faults	None recorded on or immediately adjacent to the site.	
Quarrying	None recorded on or immediately adjacent to the site.	

3.3 Hydrology and Hydrogeology

Watercourses	The River Liffey lies immediately adjacent to the south of the quayside building and 65m to the south of the dock. The dock has access to the River Liffey.
Flood Risk	The site lies adjacent to the River Liffey. Flood mapping obtained from the OPW in relation to flood events at, or near the site indicates that the site and its immediate surroundings have not suffered from flooding in the recent past. A flood risk assessment has been prepared and is reported under separate cover.
Groundwater Classification	Solid Geology: Locally Important Aquifer (moderately productive only in local zones).



Source Protection	No public supply protection zones recorded within 500m.	
Zones		
Springs / Wells	None recorded on or immediately adjacent to the site.	
Licensed Surface	None recorded within 1km.	
Water Abstractions		
Licensed Groundwater	None recorded within 500m.	
Abstractions		
Discharge Consents	Several discharge points are recorded on the EPA online viewer.	
	However, no details on discharge consents are noted.	

3.4 Landfill and Waste Management

Landfill Records	No landfill records within 250m. No BGS landfill records within 500m. No Local Authority / Historical landfill records within 500m.
Other Waste Transfer,	None recorded within 250m.
Treatment or Disposal	

3.5 Environmental Licences, Permits and Registers

Historical IPC	None recorded within 500m.
Authorisations	
Part A (1) and IPPC	None recorded within 500m.
Authorised Activities	
Petrol Filling Stations	A fuel station is located 475m to the north (Top Service Station).
(Historical and	
Current)	

3.6 Radon

The EPA online viewer assesses radon risk using data supplied by the Geological Survey Ireland and the Radiological Protection Institute of Ireland.

The viewer indicates that the site does not lie within a High Radon Area as between 1% and 5% of homes are above the reference level. In accordance with EPA guidance, appropriate testing will be required to confirm actual radon concentrations, or appropriate radon barriers or redundancy should be constructed into all proposed buildings or enclosed areas.

3.7 Other

There are no Designated Environmentally Sensitive Sites within 1000m of the site.



4.0 Conceptual Site Model

4.1 Background

Risk to human health or environmental receptors is based on an assessment of one or more source-pathway-receptor linkages. The 'source' is any substance which has the potential to cause significant harm to a relevant receptor and the 'pathway' is any route by which contamination may travel to impact on a 'receptor'.

The Conceptual Site Model (CSM) summarises the principal contaminant sources, pathways and receptors for this site and the likelihood of the existence of a pollutant linkage. The assessment is based on a presumed commercial end use.

4.2 Contaminants of Concern

The site history indicates that no significant contaminative processes have operated on or near to the site. However, the dock and quay have been partially infilled with unknown materials which could be of significant thickness and which may present a source of potential contamination impacting on both fresh and saline waters. The following contaminants of concern may be anticipated on site:

• Heavy metals, Polyaromatic hydrocarbons, total petroleum hydrocarbons (TPH) and asbestos.

4.3 Potential Gas Risk

In addition to the above, the made ground deposits and alluvial deposits may provide a source of ground gas which has the potential to migrate into confined spaces within the proposed development.

Radon and volatile organic vapour may also be present associated with the underlying natural geology and within the made ground.

4.4 Phase 1 CSM and Environmental Risk Assessment

The significance of the potential source-pathway-receptor linkages identified in the CSM can be assessed using the following criteria:

- Low risk not likely to cause significant harm to human health or controlled waters. Remedial measures are not likely to be required;
- Moderate risk it is possible that significant harm to human health or controlled waters could occur depending on site specific circumstances. Remedial measures may be required to mitigate potential risks;
- High risk it is likely that significant harm to human health or controlled waters will occur unless appropriate remedial measures are incorporated into the development.

The potential pollutant linkages pertaining to the site and the assessed significance are summarised in the CSM table below.



Source	Pathway	Receptor	Pollutant Linkage: Assessed
			Risk
Human Health	1		
Made ground from backfilling of dock and behind the quay wall	Direct contact and ingestion/inhalation of contaminated soil and dust	Construction workers	Low to Moderate: Mitigated by use of appropriate PPE and good site practice
	Direct contact and ingestion/inhalation of contaminated soil and dust.	End users	Low: Proposed development will be hardcover. However, mitigation measures may be required as part of the final development to prevent end users coming into contact with made ground soils.
Off-site sources of contamination: hydrocarbons from adjacent properties	Lateral migration through made ground or permeable natural soils	End users	Low: The repeated flooding and draining of the dock may have diluted any contaminants within the site.
Ground gas associated with made ground deposits, radon or volatile vapour	Vertical and lateral migration into confined spaces. Inhalation	End users	Moderate: Gas monitoring will be required to confirm the ground gas regime
Controlled Waters			
Made ground from backfilling of dock and behind quay wall potentially	Vertical and lateral migration	River Liffey	Low to Moderate: Possible direct pathway (access channel) to River Liffey contaminating fresh and saline tidal waters with potential contaminants.
contaminating fresh and saline waters		Locally Important Aquifer (Bedrock).	Low: Site anticipated to be underlain by low permeability superficial deposits.



5.0 Conclusions

The following assessment should be considered as preliminary until it can be verified by geotechnical and chemical data obtained from a suitably designed ground investigation. Ground investigation proposals will need to be mindful of the scheduled construction period and will also be required to included in the construction management plan.

5.1 Contamination and Remediation

The risk of significant contamination being present on this site is considered to be low to moderate based on the previous known site uses and backfilling of the dock.

It should be noted that the following comments on potential remediation are based on the findings of this desk study and should be confirmed by intrusive investigation and chemical analysis:

- Subject to proposed site levels, excavation and off-site disposal of dock infill may be required. Capping may be required in areas of soft landscaping.
- Permanent sealing of the channel from the dock to the River Liffey to prevent tidal flushing.
- Gas protection measures may be required.

5.2 Foundations

Note that the precise nature and depth of foundations to the proposed structures at the dock and quayside will be dependent on the detailed site geology, including:

- Bearing capacity and nature of the natural strata.
- Groundwater levels.
- Depth of made ground.
- Proximity to trees where potentially shrinkable soils are present.
- Obstructions in the form of previous foundations which may be present within the dock and beneath the existing DCC quay offices.

In the absence of any engineering details or specification for the backfilling of the existing basin, a preliminary assessment of the likely ground conditions within the dock area suggests that deep foundations may be required for the high load areas of the development such as the central island, mock buildings and pump housings. Depending upon investigations, in-situ and laboratory testing deep foundations may be required beneath the entire course. Alternatively, and to minimise off-site disposal, re-engineering of the basin infill soils to an approved engineering specification may provide an appropriate engineering platform upon which reinforced rafts or pad foundations could be constructed.

Due to the thickness of made ground present behind the river quay wall, the quayside building may also require deep foundations. This also be dependent upon the results of investigations, in-situ and laboratory testing. Such foundations will be required to penetrate through any made ground and into competent natural bearing strata which is likely to comprise either stiff glacial clay, dense glacial gravel or rock head. However, if ground conditions are suitable, deep cast in-situ mass foundations with cantilever slab could be used.



The potential for significant in-ground obstructions (limestone blocks, piles) and difficult ground conditions (dense gravels) should be anticipated during ground investigation design in both the dock and quayside and appropriate investigation techniques may need to be adopted to overcome these issues.

5.3 Floor Slabs

Ground bearing floor slabs may be feasible subject to re-engineering of the dock infill. Alternatively, suspended floors may be required to occupied enclosed structures where the thickness of the made ground is greater than 600mm thick.

5.4 Mining

The site is not within a mining or area impacted by natural cavities.

5.5 Hazardous Gas

There is considered to be a moderate risk from ground gas arising from made ground and a ground gas risk assessment for enclosed structures/ spaces will be required. The site lies within an area in which radon testing or radon protection measures may be required.

5.6 Recommendations for Ground Investigation

In order to establish the geotechnical conditions and environmental risk based on the findings of the Conceptual Site Model, the following works are recommended:

- Intrusive ground investigation in the form of trial pits to assess the shallow ground conditions within the dock and depth to its base, to determine the thickness of stone and concrete forming the base to the existing platform and undertake in-situ testing obtain samples for laboratory analysis.
- Boreholes (8 No. Cable percussion methods) to average depth of 10m subject to ground conditions to investigate the depth to competent bearing stratum initially using cable percussive boreholes, with rotary open hole follow on if required (subject to proposed loads).
- Installation of 4 No. gas/groundwater monitoring standpipes and monitoring for a minimum of 6 visits over a 3 month period.
- Laboratory geotechnical analysis of soils to assess engineering suitability and to assist with foundation design.
- Laboratory chemical testing of up to 12 No. soils to confirm or otherwise the findings of the Conceptual Site Model and enable a generic quantitative risk assessment to be carried out.
- Waste acceptance criteria (WAC) tests on up to 6 No. samples of soil (made ground, stone and dock sediment for classification for offsite disposal purposes.
- Factual and interpretative reporting, providing recommendations for the existing site and any future development.



At the request of UA, PPL have invited tenders for the above works which are due to be returned mid May 2019. Upon receipt and review the above works will be instructed shortly thereafter.



Appendix A – Figures









	01 DRAWING NUMBER PP-01 SHEET REFERENCE +0.00 LEVEL FFL +0.00 FINISHED FLOOR LEVEL APPLICATION BOUNDARY
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Appendix B – Historical Maps









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Drawing No. N17397-702F

P2

Rev.

Project

Dublin Whitewater Course, Dublin

T. +44 (0)191 261 9000 E. info@patrickparsons.co.uk W. www.patrickparsons.co.uk





Appendix C – Flood Report

OPW National Flood Hazard Mapping

Summary Local Area Report

This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Dublin

NGR: 0 166 345

This Flood Report has been downloaded from the Web site www.floodmaps.ie. The users should take account of the restrictions and limitations relating to the content and use of this Web site that are explained in the Disclaimer box when entering the site. It is a condition of use of the Web site that you accept the User Declaration and the Disclaimer.



Δ.	6. Tolka Richmond Road August 1986	Start Date: 25/Aug/1986
	County: Dublin	Flood Quality Code:1
	Additional Information: Reports (4) More Mapped Information	
Δ.	7. Tolka Botanic Ave area August 1986	Start Date: 25/Aug/1986
<u>/</u>	County: Dublin	Flood Quality Code:1
	Additional Information: Photos (6) Reports (5) Press Archive (1) More Mapped In	formation
Δ	8. Tolka Nov 1965	Start Date: 25/Nov/1965
	County: Dublin	Flood Quality Code:3
	Additional Information: Photos (2) Reports (6) Press Archive (2) More Mapped In	formation
Δ	9. Tolka September 1946	Start Date: 20/Sep/1946
	County: Dublin	Flood Quality Code:3
	Additional Information: Reports (10) More Mapped Information	
Δ	10. Tolka September 1931	Start Date: 03/Sep/1931
	County: Dublin	Flood Quality Code:3
	Additional Information: Reports (10) Press Archive (1) More Mapped Information	
Δ	11. Tolka November 1915	Start Date: 12/Nov/1915
	County: Dublin	Flood Quality Code:3
	Additional Information: Reports (10) More Mapped Information	
Δ	12. Tolka November 1901	Start Date: 12/Nov/1901
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	Additional Information: Reports (9) More Mapped Information	
Δ	13. Tolka November 1898	Start Date: 23/Nov/1898
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Δ	14. Tolka October 1880	Start Date: 28/Oct/1880
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Δ	15. Fenian Street June 1963	Start Date: 11/Jun/1963
	County: Dublin	Flood Quality Code:3
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Δ	16. Ringsend June 1963	Start Date: 11/Jun/1963
	County: Dublin	Flood Quality Code:3
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	17. Grafton Street June 1963	Start Date: 11/Jun/1963
	County: Dublin	Flood Quality Code:3
	Additional Information: Reports (3) Press Archive (2) More Mapped Information	
Δ	18. Clanbrassil Street June 1963	Start Date: 11/Jun/1963
	County: Dublin	Flood Quality Code:3
	Additional Information: Reports (3) Press Archive (2) More Mapped Information	

A	19. North Strand Road June 1963	Start Date: 11/Jun/1963	
Д	County: Dublin	Flood Quality Code:3	
	Additional Information: Reports (3) Press Archive (2) More Mapped Information	on	
Δ	20. Flooding at Herbert Cottages, Ballsbridge, Dublin 4 on 24th	Start Date: 24/Oct/2011	
	County: Dublin	Flood Quality Code:2	
	Additional Information: Reports (1) More Mapped Information		
Δ	21. Flooding at Havelock Square, Sandymount, Dublin 4 on 24th	Start Date: 24/Oct/2011	
	Oct 2011 County:Dublin	Flood Quality Code:2	
	Additional Information: Reports (1) More Mapped Information		
Δ	22. Flooding at Bath Avenue, Sandymount, Dublin 4 on 24th Oct	Start Date: 24/Oct/2011	
	County: Dublin	Flood Quality Code:2	
	Additional Information: Reports (1) More Mapped Information		
Δ	23. Flooding at Railway Cottages, Ballsbridge, Dublin 4 on 24th	Start Date: 24/Oct/2011	
	County: Dublin	Flood Quality Code:2	
	Additional Information: Reports (1) More Mapped Information		
Δ	24. Flooding at ESB Sportsco, Ringsend, Dublin 4 on 24th Oct	Start Date: 24/Oct/2011	
	County: Dublin	Flood Quality Code:2	
	Additional Information: Reports (1) More Mapped Information		
Δ	25. Dodder Oct 1987	Start Date: 21/Oct/1987	
	County: Dublin	Flood Quality Code:4	
	Additional Information: Photos (3) More Mapped Information		
Δ	26. Bath Avenue June 1963	Start Date: 11/Jun/1963	
	County: Dublin	Flood Quality Code:2	
	Additional Information: Photos (1) Reports (2) More Mapped Information		
	27. Tolka April 1909	Start Date: 03/Apr/1909	
Д	County: Dublin	Flood Quality Code:4	
	Additional Information: Reports (4) More Mapped Information		



UK locations:
