Outline Drainage Strategy: The Mole, Barry Docks

P01

April 2021

www.jbaconsulting.com

Associated British Ports
25 Bedford Street
LONDON
WC2E 9ES

JBA Project Manager

Annabelle Sellick
JBA Consulting
Kings Chambers
8 High Street
Newport
South Wales
NP20 1QU

Revision History

Revision Ref/Date	Amendments	Issued to
April 2021	-	Nick Card

Contract

This report describes work commissioned by Nick Card, on behalf of Associated British Ports (ABP). Clare Burnell of JBA Consulting carried out this work.

Prepared by ..... Clare Burnell BSc (Hons) MSc

Assistant Analyst

Reviewed by ..... Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM

Chartered Senior Analyst

..... George Baker BEng AIEMA CEnv IEng MCIWEM C.WEM

Associate Director

Purpose

This document has been prepared as a Draft Report for Associated British Ports. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

JBA Consulting has no liability regarding the use of this report except to Associated British Ports.

Copyright

Contents

List of Figures

List of Tables

Abbreviations

ABP	Associated British Ports
FRAW	Flood Risk Assessment Wales
JBA	JBA Consulting
NRW	Natural Resources Wales
SuDS	Sustainable Drainage Systems

1 Introduction

1.1 Terms of reference

JBA Consulting were commissioned by Associated British Ports (ABP) to prepare an Outline Drainage Strategy for the land at The Mole, Barry. The assessment is to support a planning application and to seek SAB pre-application advice for proposed engineering works at the development site.

2 The Site

2.1 Site description

The 3.1ha Brownfield site is located in Barry in the Vale of Glamorgan (NGR ST115673), as shown in Figure 2-1. The site is located in an industrial area of Barry, within the docks, and currently houses the Barry Community Water Activity Centre. A residential development, and Neptune Road forms the western boundary of the site, with all other boundaries surrounded by Barry Dock.

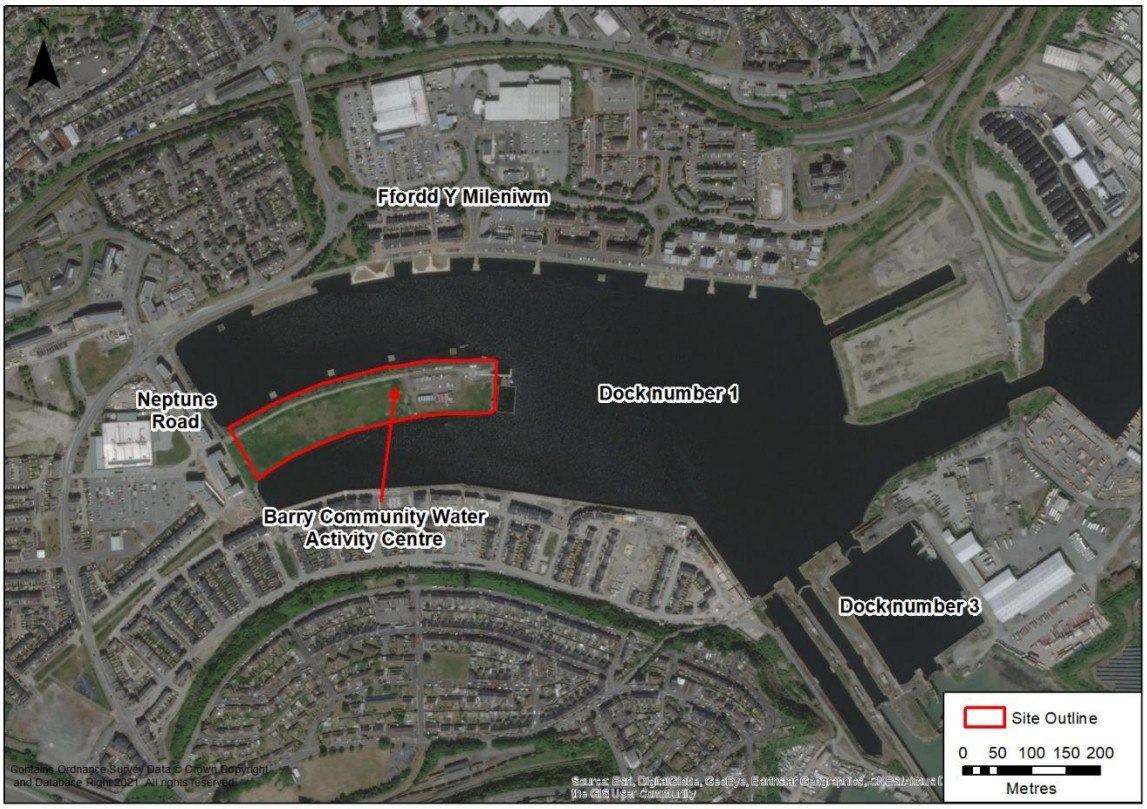


Figure 2-1 Site location

2.2 Site topography

The site has a generally flat topography as shown in Figure 2-2. There is a slight slope from 8.9mAOD in the west of the site to 8.6mAOD in the east. From north to south the site is generally level, except for an existing access road along the northern boundary of the site which is approximately 0.9m lower than the surrounding ground level. An area of raised ground adjacent to the access road has an approximate level of 9.2mAOD. A slipway in the eastern part of the site is represented by a lower ground level of 7.5mAOD. Peak Surveying Services have produced a detailed topographic survey of the site which can be found in Appendix A. Figure 2-2 gives a broad overview of levels on site using NRW 1m LiDAR.

The post development ground levels were not finalised at the time of writing. However, it is known that the ground level on site will be raised to a minimum of 9.0mAOD as part of flood mitigation works. The ground raising will use a combination of soils and rubble from neighbouring client sites and the material will be permeable in nature.

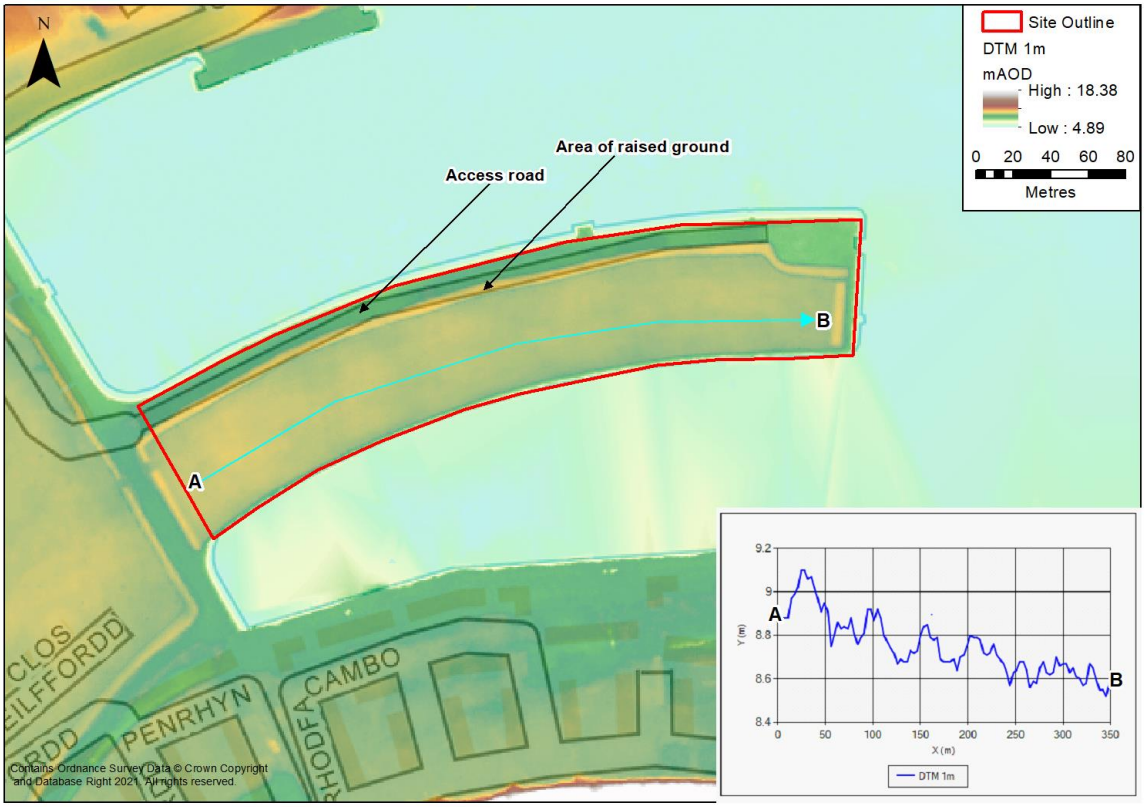


Figure 2-2 Site topography using Natural Resources Wales 1m LiDAR

2.3 Proposed development

Future proposals for the site include development for residential purposes. To support these future aspirations, ground raising at the site is required to mitigate flood risk. Consequently, this Outline Drainage Strategy, along with this pre-application submission to the SAB, has been prepared solely to support a planning application for engineering works to raise the ground levels in the full extent of the development site (shown by the red line boundary in Figure 2-1). The proposed ground raising will level the entire site to a minimum level of **9.00mAOD**. Whilst the exact material to be brought onto site is still to be confirmed, it shall be permeable in nature, and will likely be comprised of soil and rubble from local client-owned sites.

Due to the size and location of the site it is assumed that any future development will house several apartment blocks with associated roads and parking spaces. The Water Activity Centre in the eastern part of the site is likely to be re-located to Easy Quay, adjacent to Ffordd Y Milleniwm Road.

2.4 Summary of surface water and small watercourse flood risk

The NRW Flood Risk Assessment Wales (FRAW) map for surface water and small watercourses is shown in Figure 2-3. The site is largely at 'very low' risk from surface water and small watercourse flooding where there is a less than a 0.1% AEP chance of flooding in any given year. The northern and eastern boundaries of the site are shown to be at a low risk of surface water flooding. However, this is an artifact of the broadscale modelling approach, as surface water in these areas will rapidly drain to the dock.

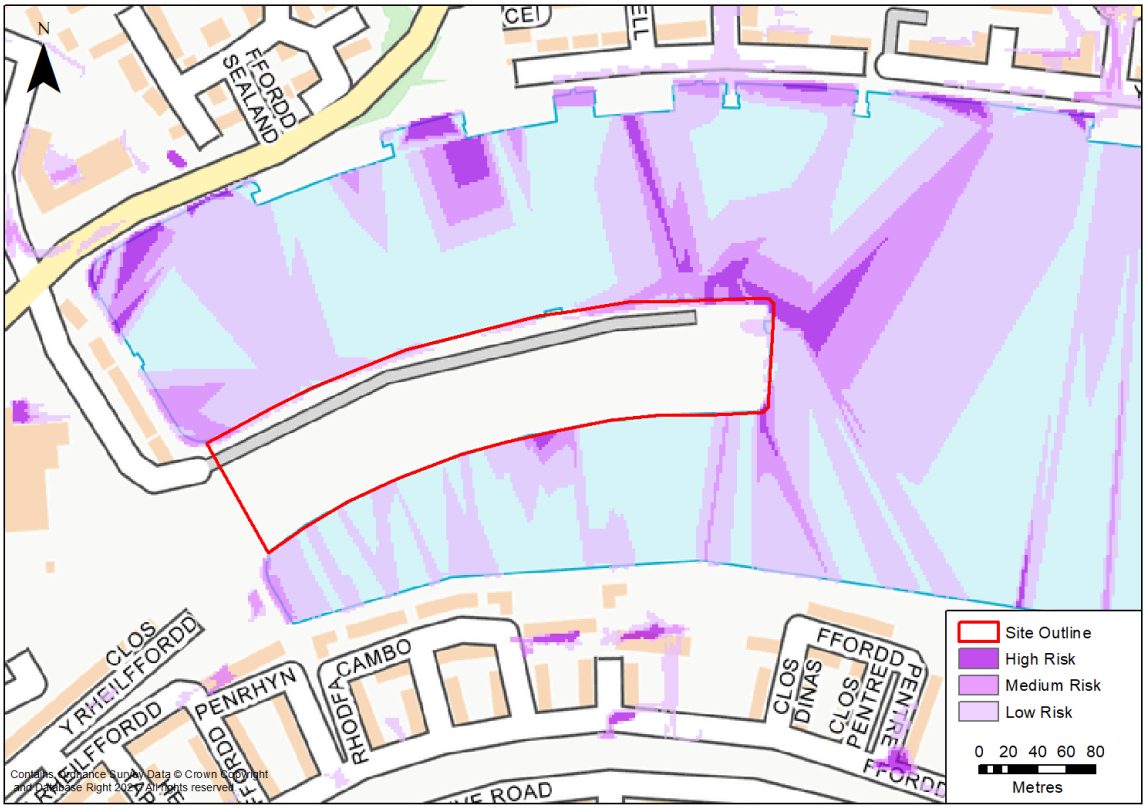


Figure 2-3 NRW FRAW map for surface water and small watercourse flooding

2.5 Summary of groundwater flood risk

Groundwater flooding is caused by unusually high groundwater levels. It occurs as excess water emerging at the ground surface or within manmade structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, in some cases lasting for weeks or months, and can result in significant damage to property. The risk of groundwater flooding depends on the nature of the geological strata underlying the sites, as well as on local topography.

The Vale of Glamorgan Local Flood Risk Management Strategy[1] states that the risk of groundwater flooding in the study area is considered to be between 50% to 75% chance of flooding. Barry has historically been affected by groundwater flooding; however, the risk of groundwater flooding in Barry is typically linked to areas of overlying limestone. This does not apply to the Mole site, which is built on significant made ground and will have a groundwater table directly linked with the water level of the Dock. Consequently, we conclude that the risk of groundwater flooding is very low for the Mole.

1 The Vale of Glamorgan. Local Flood Risk Management Strategy (2013) https://www.valeofglamorgan.gov.uk/Documents/Living/Environment/Flood-and-coastal-erosion-risk/VoGC-LFRMS.pdf

3 Existing surface water drainage regime

3.1 Existing site geology and drainage

The soils on site were assessed on the Cranfield Soilscapes Viewer[2] and were shown to be freely draining slightly acid but base-rich soils. Due to the industrial nature and setting of the site this description should be used with caution as the soils are likely to be highly compacted and constitute of made ground to significant depths, making infiltration unlikely.

The geology of the site was assessed using the BGS Geology of Britain Viewer[3]. The bedrock geology was shown to be Blue Anchor Formation comprised of mudstone and other sedimentary bedrock. Superficial deposits at the site are comprised of clay, silt and sand.

It is unknown whether there is an existing surface water drainage system at the proposed development site. However, it can be confidently assumed that surface water from the site flows into the surrounding dock.

3.2 Greenfield runoff rates

Table 24.1 of the SuDS Manual indicates that the FEH methods (FEH Statistical and ReFH) should be the preferred methods for calculating peak runoff rates. This is supported by Natural Resources Wales GN008 Flood Estimation: Technical Guidance and Environment Agency research by Faulkner et al which concluded that FEH methods are applicable across a range of catchment sizes and that they should be used in place of outdated methods such as IH124 and ADAS 345 where possible.

The UK SUDS tool has been used to calculate Greenfield runoff rates for the sites developable area (3.1ha) using the FEH Statistical Method, as seen in Appendix B. The calculated Greenfield runoff rates are shown in Table 3-1.

Table 3-1 Greenfield runoff rates

Return Period	Specific Runoff (l/s/ha)	Peak Runoff Rate (l/s)
1	4.1	12.7
QBAR	4.7	14.5
30	8.3	25.8
100	10.2	31.6

3.3 Greenfield runoff volumes

Greenfield runoff volumes were calculated for a six-hour storm event at the site using the FSSR16 method as shown in Equation 1 below.

$$\text{Runoff volume} = \text{Site Area} \times \text{Rainfall Depth} \times \text{Percentage Runoff}$$

Equation 1: FSSR16 method for calculating Greenfield runoff volumes

Percentage runoff was calculated using the FSSR16 methodology which accounts for soil type, catchment wetness and storm intensity. The rainfall depths for a six-hour 100-year storm

2 http://www.landis.org.uk/soilscapes/

3 http://mapapps.bgs.ac.uk/geologyofbritain/home.html

event were extracted from the FEH Web Service and are summarised in Table 3-2 with the calculated Greenfield runoff volumes.

Table 3-2 Greenfield rainfall depths and runoff volumes

Return Period	6-hour rainfall runoff depth (mm)	Site runoff volume (m3)
100	71.6	702.4
100 plus climate change (20%)	85.9	883.1

4 Surface Water Management Approach

4.1 Sustainable Drainage Systems

Sustainable Drainage Systems (SuDS) aim to mimic the natural processes of Greenfield surface water drainage by allowing water to flow along natural flow routes and also aims to reduce the runoff rates and volumes during storm events, whilst providing water treatment benefits. SuDS also have the advantage of providing Blue and Green Infrastructure and ecology and recreational benefits when designed and maintained properly.

Schedule 3 of the Flood and Water Management Act 2010 was enacted in Wales in January 2019, leading to the requirement for all new developments to incorporate SuDS in the development. This needs to encompass the four pillars of SuDS design, shown in Figure 4-1.

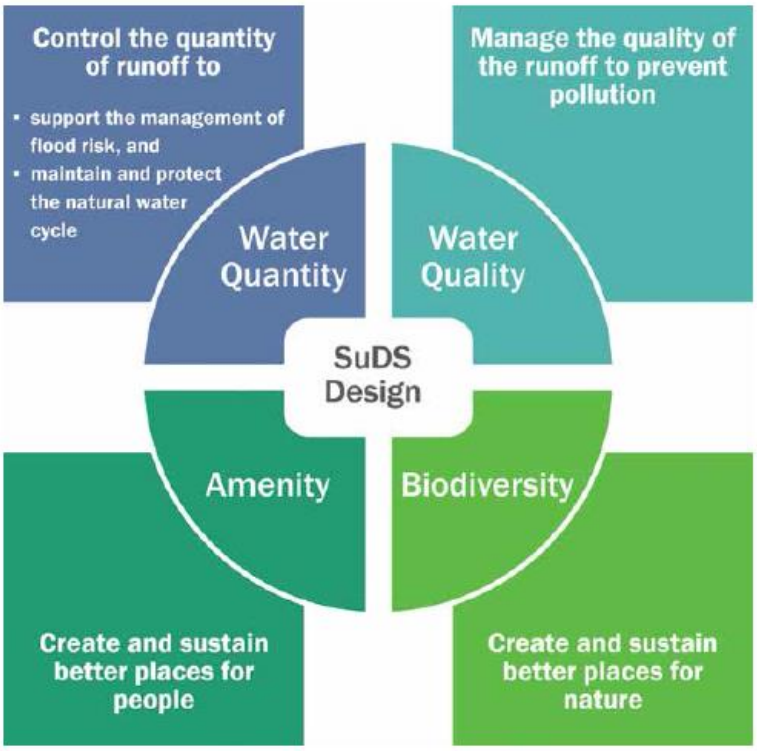


Figure 4-1 Four pillars of SuDS design (CIRIA, 2015)

4.2 Design Criteria

The following national guidance documents and design standards are considered when developing a SuDS strategy for a new development site:

- C753 The SuDS Manual (Ciria, 2015)
- Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems (Welsh Government, 2018)
- Planning Policy Wales – Edition 10, December 2018
- The Building Regulations 2010 Part H: Drainage and Waste Disposal
- Sewers for Adoption 7th Edition
- County/City wide guidance from the local SuDS Approval Body (SAB), if available

4.3 Application of guidance

Although in principle SuDS and SAB approval are required on all new developments there are some exceptions. The Sustainable Drainage (SuDS) Statutory Guidance states that SAB approval is not required for:

- Permitted development covering an area of land under 100 square metres,
- Developments with drainage implications of a single dwelling and the area of land covered by the construction work is less than 100 square metres, or
- In the case of any other type of construction work, the area of land covered is less than 100 square metres.

The Sustainable Drainage (Enforcement) (Wales) Order 2018 defines Construction Work as anything which has drainage implications:

"Construction Work has drainage implications if the building or structure will affect the ability of the land to absorb water."

We believe that the proposed development will not have drainage implications for the site for two main reasons:

- **The proposals to raise ground levels shall not fundamentally alter the existing drainage arrangement of the site, or the ability of the site to drain surface water.**
- **There is the potential for the proposed ground raising to improve infiltration potential of the site, thus having positive drainage implications.**

Currently, surface water on site flows into the surrounding dock primarily by overland flow. As the proposed engineering work at the site will raise ground levels to a minimum 9.0mAOD, and the material used shall be of a permeable nature, the proposed works shall not directly affect the surface water drainage pathways on the site or affect the ability of the site to drain surface water.

It is likely that the soils on site are currently heavily compacted due to the industrial nature and setting of Barry Docks, meaning that the site is effectively impermeable. Although ground investigations have not been undertaken for this site, this assumption is based on a site (East Quay) to the north east of Barry Docks, which is also under the client's ownership. JBA Consulting produced the Outline Drainage Strategy for this development in August 2020. Investigations at East Quay indicate that the soil was heavily compacted into layers, making infiltration unlikely. The material used to raise ground level to a minimum of 9.0mAOD at The Mole site will be comprised of a combination of soil and rubble from other client-owned sites in the area. Ground raising will give the site a greater capacity to absorb water as these materials will not be highly compacted and allow greater infiltration than other materials such as clay. The depth of approximately 0.5m of new material across the whole site, as a result of ground raising, provides a large volume of additional storage for surface water compared to the current site. We believe that ground raising at the site therefore has the potential to improve its infiltration potential and reduce the rate at which surface water enters the dock.

Further, due to the site's location next to Barry Docks, surface water discharge from the site does not need to be limited. This is in line with standard G2.1 of the Statutory Standards for SuDS[4]:

"Where the surface water body is unaffected by either the discharge rate or volume of runoff (e.g. an estuary, the sea or a water body identified in the Local Flood Risk Management Strategy [LFRMS] as not needing hydraulic control of runoff to it), the hydraulic management

[4] Statutory Standards of SuDS (2018) https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf

control requirements are limited to the drainage service provisions for the site and adjacent areas that could be affected by the performance of the drainage system."

As there is no limit to surface water discharge, there is no requirement to store surface water on site. It is advised that ground levels on site slope towards the docks to allow for effective surface water drainage via gravity.

As the proposed development is likely to improve drainage at the site and there is no limit to surface water discharge, we believe that SAB approval is not required.

4.4 Vale of Glamorgan SAB

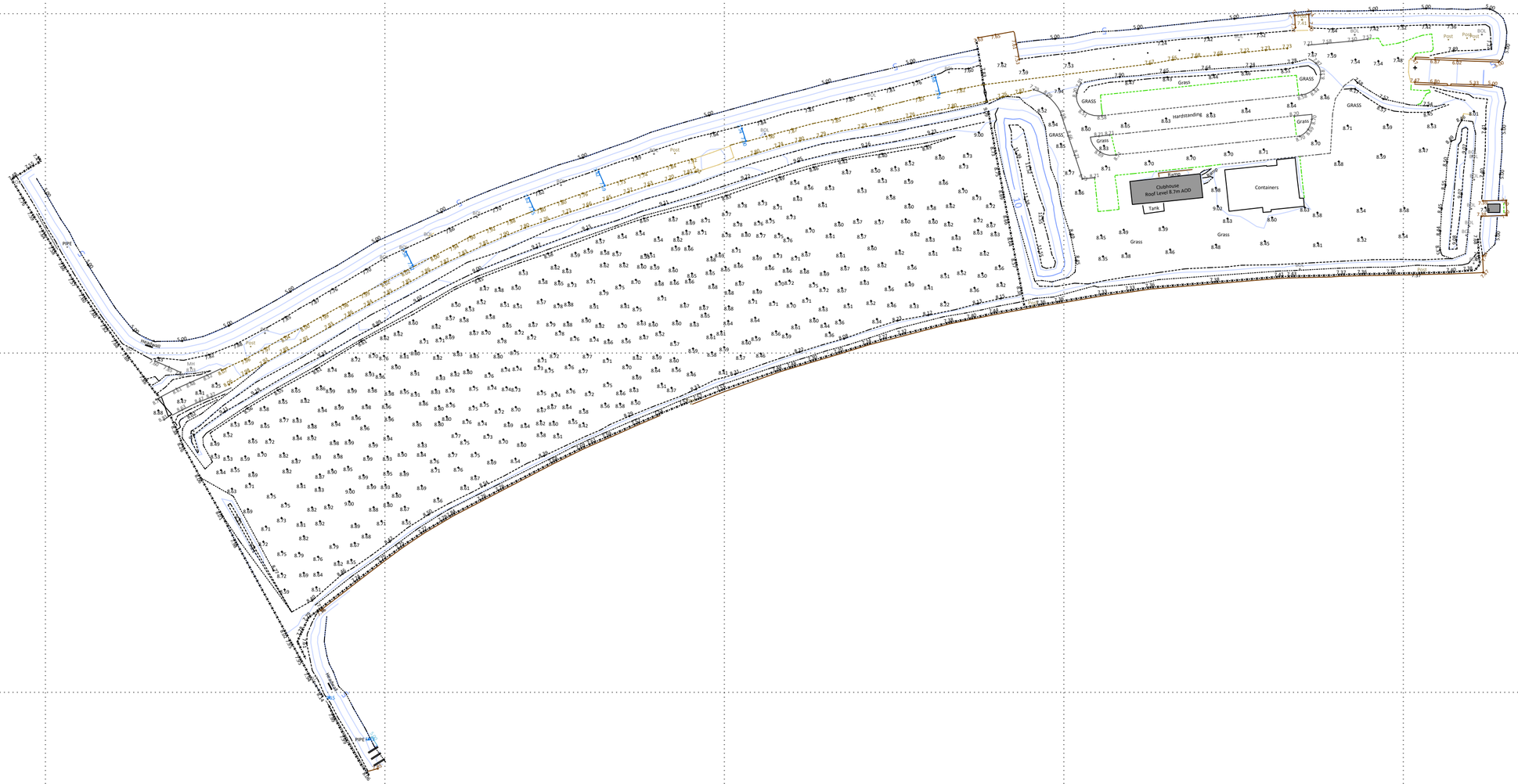
Informal discussions with Vale of Glamorgan SAB have taken place regarding surface water drainage and the need for SAB approval for the site. The Vale of Glamorgan SAB have informally agreed that SAB approval will not be needed at the site due to its location next to Barry Docks and the proposed ground raising which will have the additional benefit of improving surface water drainage. This application seeks to formalise this opinion and the principle of progressing the application without the need for a full, detailed SAB application.

5 Conclusion

- JBA Consulting were commissioned by Associated British Ports (ABP) to prepare an Outline Drainage Strategy for the land at The Mole, Barry. The assessment is to support a planning application and to seek SAB pre-application advice for proposed engineering works at the development site.
- The proposed engineering works are part of a phased approach to use the site for future residential development. To support these future aspirations, ground raising at the site is required to mitigate flood risk.
- The topography on site is generally level with a slight slope from 8.9mAOD in the west of the site to 8.6mAOD in the east. An access road on the northern boundary of the site is approximately 0.9m lower than the surrounding ground level. A slipway with a ground level of 7.5mAOD is found in the north eastern part of the site.
- As a flood mitigation measure, it is proposed to raise the ground levels to a minimum of 9.0mAOD. This will use permeable materials including soil and rubble from local client-owned sites.
- The site is at a little to no risk of flooding from groundwater, surface water or small watercourses.
- Soils on site were described as freely draining slightly acid but base-rich soils. Due to the industrial nature of the site this description should be used with caution as the soils are likely to be highly compacted and constitute of made ground to significant depths making infiltration is unlikely.
- It is unknown whether there is an existing surface water drainage system at the proposed development site. However, it can be confidently assumed that surface water from the site flows into the surrounding dock.
- Greenfield runoff rates for the site for QBAR were calculated at 14.5l/s using the UKSUDS Tool.
- It is considered that the site does not require SAB approval as a result of the positive drainage implications of the proposals to raise ground levels. The addition of material to the site has the potential to improve infiltration and ground storage capacity, whilst not fundamentally altering the current drainage regime.
- Due to the site's location next to Barry Docks, surface water discharge from the site does not need to be limited. This is in line with standard G2.1 of the Statutory Standards for SuDS.
- The Vale of Glamorgan SAB have informally agreed that SAB approval will not be needed at the site. The purpose of this pre-application submission is to formalise this position in line with the contents set out within this report.

Appendices

A Topographic survey



LEGEND

- BOL — Bollard
- Bottom of Bank
- Concrete
- Fence
- Gate
- Invert Level
- Kerb Channel
- Kerb Dropped
- MH — Manhole Cover
- Post — Post
- 0.00 — Spot Level
- Top Of Bank
- Topographic Contour (1m Interval)
- Topographic Contour (5m Interval)
- Track
- Verge
- Wall Bottom
- Building

NOTES:

Site surveyed to Ordnance Survey OSNet™ GB OSGB36(15) through Leica SmartNet.

CLIENT:

PICK EVERARD

SITE:

ASSOCIATED BRITISH PORTS
BARRY
THE MOLE

PLAN:

TOPOGRAPHIC SURVEY
6 FEBRUARY 2020

Scale: 1:1000 @ A2 — 4 March 2020

PSS – 085 – 008 – 001
(Client No. – Project No. – Drawing No.)

PEAK SURVEYING SERVICES
Sheepbridge Business Centre, 655 Sheffield Road,
Chesterfield, Derbyshire, S41 9ED
Telephone: 01246 938799
Email: mail@peaksurveyingservices.com
Website: www.peaksurveyingservices.com

B Greenfield runoff rates

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Clare Burnell
Site name:	The Mole
Site location:	Barry

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.39816° N
Longitude:	3.27293° W
Reference:	3921347256
Date:	Mar 31 2021 16:34

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha): 3.1

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.568
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.08

Hydrological characteristics

	Default	Edited
SAAR (mm):	909	909
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):		14.47
1 in 1 year (l/s):		12.74
1 in 30 years (l/s):		25.76
1 in 100 year (l/s):		31.55
1 in 200 years (l/s):		35.6

Offices at

Coleshill
Doncaster
Dublin
Edinburgh
Exeter
Haywards Heath
Isle of Man
Limerick
Newcastle upon Tyne
Newport
Peterborough
Saltaire
Skipton
Tadcaster
Thirsk
Wallingford
Warrington

Registered Office
1 Broughton Park
Old Lane North
Broughton
SKIPTON
North Yorkshire
BD23 3FD
United Kingdom

+44(0)1756 799919
info@jbaconsulting.com
www.jbaconsulting.com
Follow us:

Jeremy Benn Associates Limited

Registered in England 3246693

JBA Group Ltd is certified to:
ISO 9001:2015
ISO 14001:2015
ISO 27001:2013
ISO 45001:2018