JBA Project Code	2019s0083
Contract	St. Teresa's Lands, Temple Hill, Monkstown, Blackrock, Co. Dublin
Client	JJ Campbell & Associates
Date	14 November 2021 – Rev 6.0
Author	Chris Wason
Subject	Stormwater Audit - Stage 1 Report



1 St. Teresa's Lands, Temple Hill, Monkstown, Blackrock, Co. Dublin.

1.1 Introduction

JBA have been engaged for the purposes of undertaking a Stage 1 SW Audit relating to the above development on proposals developed by JJ Campbell and Associates (JJC) for a planning application on behalf of Oval Target Limited.

The application concerns the demolition of some existing buildings and to convert St. Teresa's House into 2 & 3 bedroom apartments. In addition, 11 apartment blocks and basement car parking will be constructed to provide a total of 487 apartments. The site location is shown in Figure 1-1 below.

Figure 1-1 - Site Location - Aerial Photo taken before buildings were demolished



The audit has been completed in accordance with Dún Laoghaire Rathdown County Council's (DLRCC) Stormwater Audit Procedure (Rev 0, Jan 2012). The results of the audit are set out in the table below.



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1.2 Stage 1 Audit

Design Parameter	Audit Result
Proposed Development	The subject site is located within Dun Laoghaire County Development Plan 2016-2022 and is a mature site with existing buildings and associated infrastructure.
	The site is approximately 3.9 ha. in total, comprising a drained area of 2.1189 ha.
	The subject of this Stage 1 stormwater audit is to review the proposed surface water drainage design and sustainable urban drainage system proposals for the proposed development.
	The review is based on JJ Campbell Planning Report Rev 1, dated September 2021, and associated drawings as provided on 17 September 2021.
	It is proposed that site is split into two zones for SW drainage purposes as shown below
	RCKFIELD PARK
Delevent	
Relevant Studies/Documents	 Greater Dublin Strategic Drainage Strategy (GDSDS) Greater Dublin Regional Code of Practice for Drainage Works The SUDs Manual (CIRIA C753) - 2015 DLR County Development Plan 2016-2022
Key Considerations & Benefits of SUDs	 The key benefits and objectives of SUDs considered as part of this audit and listed below include: Reduction of run-off rates; Provision of volume storage; Volume treatment provided; Reduction in volume run-off; Water quality improvement; Biodiversity.

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Author		Chris Wason	
Subject Stormwater Audit - Stage 1 Report		Stormwater Audit - Stage 1 Report	
	Site Characteri	istics Soil: 13 nr. soil infiltration tests were undertaken by Ground invest Approximately 50% passed with infiltration rates ranging fro 2.506x10-6 m/s, and 50% failed. Generally, the eastern side o to fair better in the infiltration tests. The UKSuds web site too SOIL type 4.	tigations Ireland. m 1.824x10-5 to f the site seemed gives a value of

On the basis of the soil tests undertaken JJC have taken a SOIL value of 3 (SPR of 0.37) as being more representative of the site which seems reasonable. This would imply that the site has some ability to infiltrate runoff to ground in some areas.

Rainfall (basis for surface water pipeline network design):

Rainfall parameters can be estimated using Met Éireann data, using the Flood Studies Report (FSR) values or the values in the GDSDS. The Met Éireann method can be more representative of a site if selected correctly and this has been done by JJC. A comparison of values used by JJC and those estimated by JBA is shown below:

	JJ Campbell	JBA Value
Rainfall model:	Windes	Met Éireann
M5-60 (mm):	17	16.6
Ratio R:	0.3	0.275

Taken from Met Eireann data (E 321811;N 229008) The values adopted in the Windes model are rounded up into the appropriate 'zone' and as recommended by the UKSuds site and are acceptable

JJC have increased the increased rainfall rates and storage requirement by 20% to allow for climate change in the hydraulic calculations. 10% is recommended in the GDSDS for rainfall so this is acceptable.

Qbar

From the UKSuds website the SAAR value is 900mm and for an edited value of SOIL of 3, the Qbar is 8.17 l/s

Values taken from the WWW.uksuds.com website – SAAR 900; SOIL 3 (SPR 0.37) for the site location.

Adopting the above values gives for the site south of the stream, based on 2.119 ha, the nett area of the site as required by DLRCC (see drg. 2011-07/C3):

	JJC edited value	uksuds Default Value
Qbar (l/s)	8.17	13.73
Q30		29.24
Q100		35.83

JJC have therefore taken a more conservative value which is acceptable.

Contributing Areas (as extracted from App D of the Planning Report)









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Roofs / She	ds/ etc 1.228	Hectares	100	% Impervie	ous	1.23	Hectar
Permeable	Parking 0.141	Hectares	80	% Impervi	ous	0.11	Hectar
Road / Dath	0.750	Hostaroo	00	/ Impond		0.69	Heater
Total	s 0.750 2 12	Hectares	90	Total Im	pus	0.08 2 02	Hectar
	2.12	10010103		. otar nii		2.02	ricetal
50% of Volu	me to be attenuated in Z	one 1 using Sto	ormtech Cel	ls Notion Tor			
DU% OF VOIU	me to be attenuated in Z	one 2 using Co	ncrete Atter	nuation Tar	ТК		
Green roo required b Drainage	of area = 0.3935 h by DLRCC. • Calculations	a. Providir	ng a % o	f 64% w	vhich is grea	ter than	that
calculations separate	is development a ons for the storm r ly on a spreadshe	network on etwork on et. Cause	ly and the way FLC	ning rep ne stora DW calc	ge has been culations hav	assess e been	ed
submitte	a for the revised s	cneme.					
Although	a one-hundred v	ear storm h	nas beer	n used f	or pipe desid	gn purpo	oses.
the maxi	num rainfall was	set at 50 m	nm/hr. W	e would	d normally re	comme	nda
two (or 5) year return perio	od for desig	n and th	ne netwo	ork checked	for up to	o 100
year stor	m for flooding. Pip	be sizing is	not nor	mally cr	itical when a	a restrict	ed ol
) is applied.						
Full calcu	lations, including	the storag	e facilitie	es in the	e model, hav	ve been	run fo
the 1 in 3	0 and a1 in 100 y	ear storms	s + 20%	climate	change to e	ensure th	nat
adequate	e levels of service	are achiev	/ed.				
•							
Storage	Tank Assessme	nt booksee				ا مارید ما	4
he site a	age tank analysis	nas been	for Zone	a sprea	Zone 2 A to	ne whoi ital allow	e oi iable
outflow of	8.17 l/s has beer	used and	a total s	torage	required of 1	1600m3	abio
including	20% climate cha	nge) based	d on loca	al rainfal	ll data.		
-		· · · -					
The tanks	have been check	ked using F	-LOW	nn 1 /70)E m () = = = -	oolar k	م ما م
A Stormte	cn SC/40 system	i is proposi	ea in Zoi and adia	ne 1 (/3	building B2 i	esign ne	ad 0' 2
772m3 a	nd design head or	f 2.166m) l	both with	bass fr	orward flow	of 4.1 l/s	∠ s. An
allowance	of 20% climate c	hange has	also be	en inclu	ided in the la	atest	
assessme	ent (v1.7).						
We have	the following com	ments on t	he prop	osals;	a constant d	liooborg	- - f
۱.	The spreadsheet, 3 17 l/s which doe	s not take	izing, as into acc	sumes: ount a v	a constant d	/dischar	ae ue
r	elationship. The (GDSDS red	commen	ds that	volume sho	uld be	90
i	ncreased by 20-3	0% to allow	w for this	and a	check done	using a	digita
r	nodel at detailed	design sta	ge. How	ever, th	e tanks have	e also be	en
C	checked and desig	gned in FL	OW hyd	raulic m	odel.		
2.	The head adopted	l is 1.4m fo	or Zone '	and 2.	11m in zone	e 2 in the	e repo
١	vith pass forward	each of 4.	1 I/s (8.2	I/S IN to	otal). The hy	drobrake	9
(aetalis provided in R2mm respectively	Appendix	G provid	bed and	Driffice Size 0	i yumm	and
3 1	t is noted that Zor	y which are	ardes to	the Car	equale. vsfort stream	n/culver	t The
J. I	8 AEP is indicat	ed in the F	RA as 1	2.75m	This would	mean th	e tha
t	he outfall could be	e surchara	ed which	n would	affect the di	scharge	rate
á	and tank performa	ince. Thes	se paran	neters s	hould be che	ecked by	/ JJC
4. I	t is noted that Zor	ne 1 discha	arges to	an exist	ting DN225 p	oublic S	N
	/	~ -		,			

sewer (at Mh 9002) on Temple Hill Road, IL 12.77mm. This line could







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	also be s should b 5. Are ther within 1r	subject to surcharge in times of flood and the tank design be checked by JJC. e any groundwater concerns for the stormtech unit? If GW is n of the base then the unit may need to be lined to protect GW
SuDS Measures Considered	SuDS Technology	Comments
	Green Roofs	Proposed on all apartment blocks, even those <300m2. Overall green roof coverage exceeds the 60% requirement of DLRCC. Total roof area on drg C11 = 6090m2 of which 3935m2 is green (65%)
	Swale/ Filter Drain / Infiltration trench	Swales were considered but discounted due to the number of mature trees and possible damage to roots. Road runoff is directed into the landscaped areas except for 2 key low points. It is assumed that filter drains will be used where required for main drain runs. Detail to be provided
	Permeable Paving	Proposed to intercept all impermeable areas of the site but not clear how this is achieved. Relative impermeability has been assumed. It is likely that that some infiltration will take place in some areas.
		350mm is stated of stone subbase with 30% porosity. Due to the poor infiltration of the ground a high-level overflow is proposed. Is it assumed that the area below this pipe is available for interception of flow?
	Soakaways	No soakaways are proposed. They could be considered in more suitable areas
	Petrol Interceptor	None proposed. These should be considered where road/car park runoff is collected before discharge to the stream, or to the foul network in the case of underground car park drainage.
	Other Sediment Management	Generally, road runoff to landscaped areas. No details shown of how runoff will be intercepted
	Surface Water Attenuation	 Attenuation will be provided by way of; A. Green roofs – 5mm interception B. Permeable paving – 5mm interception C. Underground storage tanks a. Tank 2 is an RC tank due to site constraints. RC tanks are generally not preferred. LA approval will be required. b. Tank 1 is a Stormtech or similar unit.
	Rain water harvesting	None proposed
	Detention Basins, Retention Ponds, Stormwater Wetlands	No detention basins are proposed due to site geometry.
	Tree Root Structural Cell Systems, Bio-retention.	None proposed. Could structural cell systems be considered for new trees?

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Interception of flow	It is a requirement of the GDSDS that a minimum of 5mm of runoff is intercepted i.e. is retained on site. This will apply to non-green roof areas and all other impermeable areas. The GDSDS allows for 80% paved and 0% permeable. CIRIA 753 Table 24.6 provided deemed to satisfy rules. The full extent of permeable paving and the contributing areas should be clarified as table 24.6 considers that only an equivalent area can be considered for interception storage for unlined pavement if infiltration capacity >1x10-6 m/s. If less, then up to 5 times the pavement area can be considered as extra contributing area.
	Green roofs are deemed to satisfy.
	JJC have provided an overall calculation for volume stored in permeable paving and green roofs but these calculations do not necessarily apply to interception of flow from all impermeable area. Also, it needs to be clear if all impermeable areas are intercepted not just a gross figure. It is not clear how the non-green roof areas are intercepted. The impermeable roof area, not counting the green roof area = (6090 - 3935) = 2155m2. Paved area excluding permeable paving = 7500m2 of which 2300m2 are paths and generally assumed to discharge to landscaped areas Impermeable area to be intercepted = (2155+5200) x0.8 = 5884m2. Permeable paving = 1200m2 therefore an additional 1200m2 can be deemed or 6000m2 if in areas with good permeability. How are all areas to be intercepted? JJC should clarify that the interception of flow satisfies the CIRIA report requirements.
Surface Water Drainage Design	 The design is at planning stage and detailed design has been provided; The site is split into two zones for drainage purposes The discharge from tank 2 will be connected to the existing stream/culvert in the northeast corner of the site The discharge from tank 1 will be to an existing Mh9002 located on a DN225 public sewer. Underground car park drainage is shown connected to the foul system via a Petrol interceptor Green roofs are proposed SI indicated relatively poor drainage but may be acceptable in some local area. High level overflows are proposed in the permeable paving
SuDS Management Train for water quality and flood protection	The SuDs philosophy, as set out in the GDSDS, has been given consideration and, in particular, the criteria set out in Figure 6.1 of the manual. Criterion 1.1 – interception of first 5mm of rainfall – see comments above Criterion 1.2 – treatment volume of events larger than 5mm i.e. 10mm rainfall Criterion 3 – no flooding predicted for 30-year storm and no property flooding for 100 year storm. Hydraulic analysis has been undertaken. Criterion 4.3 is used for all attenuation storage Qbar pass forward flow is used for control split equally between the two tanks
Climate Change	An allowance of 20% increase in flows has been included for climate change in the latest model for the rainfall intensities for the purposes of sizing the attenuation storage in FLOW. 20% was used for initial sizing in the spreadsheet. This adequately addresses the recommendation of 10% increase for rainfall as set out in table 6.2 of the GDSDS.
Discharge Rate / Flow Control	Flow control from each tank is 4.1 l/s at a head of 1.4m & 2.11m. Outlet diameter is approximately 90mm and 83mm which is ok.



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Exceedance flows	Consideration has been given to exceedance flow.
Health & Safety and Maintenance Issues	The proposed drainage system comprises SuDS devices, green roofs, traditional road gullies, manholes, attenuation systems and underground pipes. These elements, with the level of detail provided, are considered acceptable from a Health & Safety perspective once supplier/manufacturers guides are followed and complied with during the detailed design, construction and operation.
	Optimum performance of the SuDS treatment train is subject to the frequency of maintenance provided. At detailed design stage, it is recommended that a maintenance regime be adopted.
	Particular consideration is required at detailed design stage to the design, maintenance requirements and whole life plan (and replacement) of the SuDS system as a whole.
	Regular maintenance of the hydrobrake will be required to remove any blockages, particularly in the wake of heavy rainfall events or local floods. A bypass mechanism should be provided in case of blockage and some form of alarm for notification of same to the maintenance organisation responsible.
	Petrol interceptors have been provided in u/g car park areas. These should be fitted with an audible high-level silt and oil alarm for maintenance and safety purposes. Regular inspection and maintenance is recommended for the petrol interceptor.
	Please note that silt and debris removed from the petrol interceptor during maintenance will be classified as contaminated material and should only be handled and transported by a suitably licensed contractor and haulier and disposed of at a suitably licensed landfill only.
Audit Result	Please refer to the Feedback Form attached for comments and designers responses

Audit Report prepared by:	Chris Wason BEng, CEng MICE Principal Engineer
Approved by:	Michael O'Donoghue BEng CEng MIEI Senior Engineer

Note: JBA Consulting Engineers & Scientists Ltd. role on this project is as an independent reviewer/auditor. JBA Consulting Engineers & Scientists hold no design responsibility on this project. All issues raised and comments made by JBA are for the consideration of the Design Engineer. Final design, construction supervision, with signoff and/or commissioning of the surface water system so that the final product is fit for purpose with a suitable design, capacity and life-span, remains the responsibility of the Design Engineers.

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Appendix A – Audit Feedback Form

