



Groundwater Flood Risk Assessment

Electric vehicle charging facility

Chippenham

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Summary

- ⇒ The proposed development comprises the construction of a new electric vehicle charging facility.
- ⇒ This Assessment has been prepared because the site is identified as being within an area at potential risk of groundwater emergence in the Wiltshire Council Strategic Flood Risk Assessment.
- ⇒ It is concluded that the site is at low risk of groundwater flooding (and all other sources of flooding).
- ⇒ In the unlikely event that the site were to flood, local drainage systems, and the ground surface levels, would direct flow southwards as the existing situation. Any flows would remain shallow.

Attachments

- T20-P1528-DR-0001, Topographic and utility survey, July 2025
- 10829 - 0001_01-PL Planning Site Layout Review of Commercially Available Groundwater Flood Risk Mapping
- HDL-INST-20-120 Rev A Proposed Levels Strategy & Contour Plan
- HDL-INST-20-121-Proposed Cross Sections

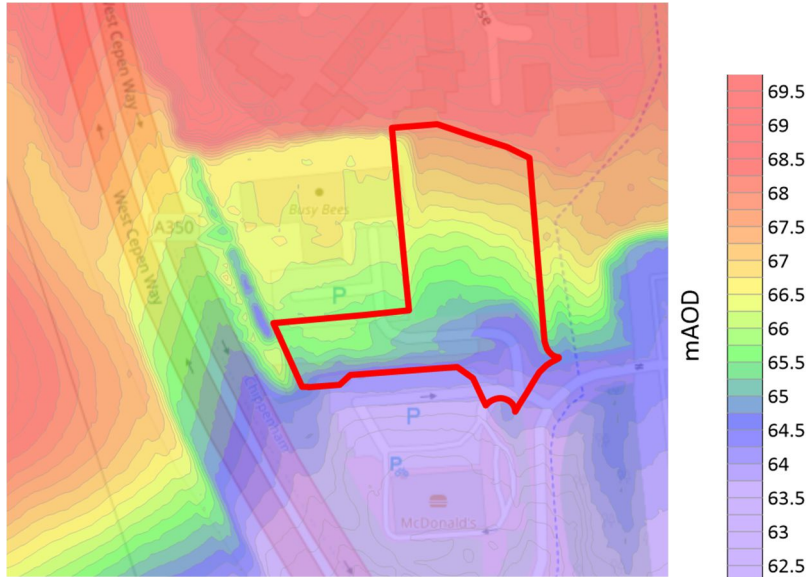
1 Introduction

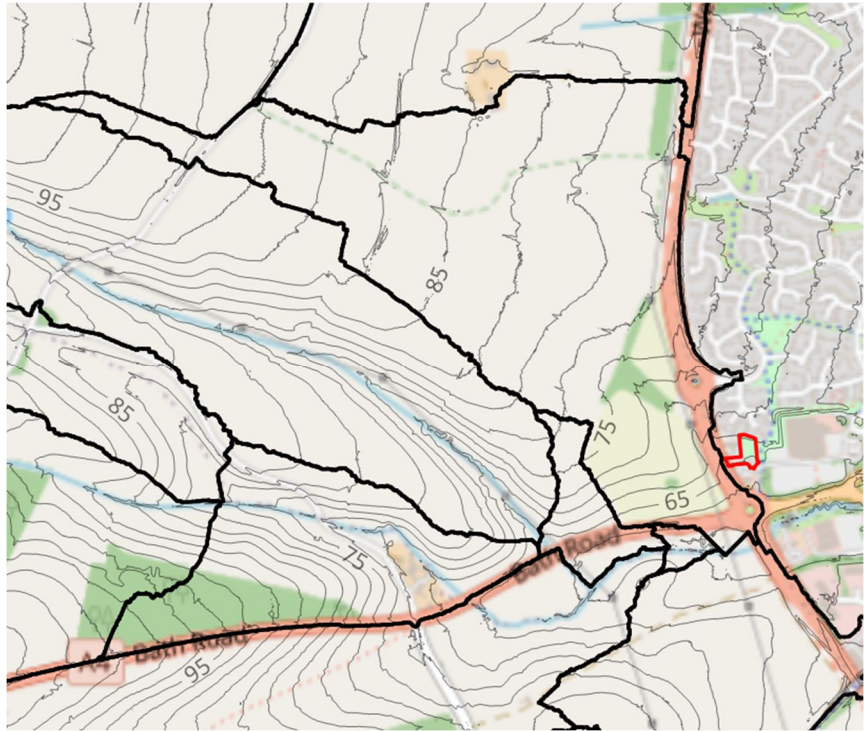
- 1.1 Amazi Consulting Ltd has been instructed to prepare this Groundwater Flood Risk Assessment (FRA) associated with the proposed electric vehicle charging facility at Land North of Bath Road, Chippenham, SN14 0BJ.
- 1.2 This report has been prepared for the sole use of Instavolt Ltd. Its contents cannot be copied or relied upon by others, except the planning and drainage authorities, without the written authority of Amazi Consulting Ltd.
- 1.3 This FRA has been prepared in response to the planning authority's pre-commencement request for a 'Site-Specific Groundwater Flood Risk Assessment' (Wiltshire Council planning ref: PL/2025/07726).
- 1.4 This Assessment has been undertaken as a desk study and relies upon data produced by others. The flood data used is currently the best available for assessing flood risks at the site. This report does not attempt to comment upon insurance, or for flood events other than as stipulated by planning policy. There is always the risk, however small, that flooding could be different to that assessed.

2 The Development

2.1 The site location information and setting are summarised in Table 2.1.

Table 2.1 – Existing site overview

Address	Land North of Bath Road, Chippenham
Post code	SN14 0BJ
NGR	389700 mE, 172200 mN
Location plan	 Figure 2.1 – Site location
Local topography	See attached survey for site topographical survey. This relates to Ordnance datum (mAOD). Site levels vary from 67.85 mAOD at the north boundary, to 65.5 mAOD at the south west corner and 64 mAOD at the south east of the site.  Figure 2.2 – Contours near site 0.25 m c-c (Source: lidar composite: Contours-ST87se_DTM_1m.tif, downloaded 25 March 2026)

	 Figure 2.3 – Contours near site 0.5 m c-c (Source: lidar composite: Contours-ST87se_DTM_1m.tif, downloaded 25 March 2026) The approximate topographical watersheds are outlined in black. These are theoretical only and do not include the effects of drainage systems or localised topographical features (kerbs, buildings, pipes, ponds, walls, small watercourses etc.), and localised depressions have been filled.
Local planning authority	Wiltshire Council
Lead Local Flood Authority (LLFA)	Wiltshire Council

- 2.2 The site is currently classified as *less vulnerable* in accordance with Annex 3 of the NPPF.
- 2.3 The proposed development comprises the construction of an electric vehicle charging facility.
- 2.4 The proposed use is classified as *less vulnerable*, in accordance with Annex 3 of the NPPF.

3 Groundwater Flooding

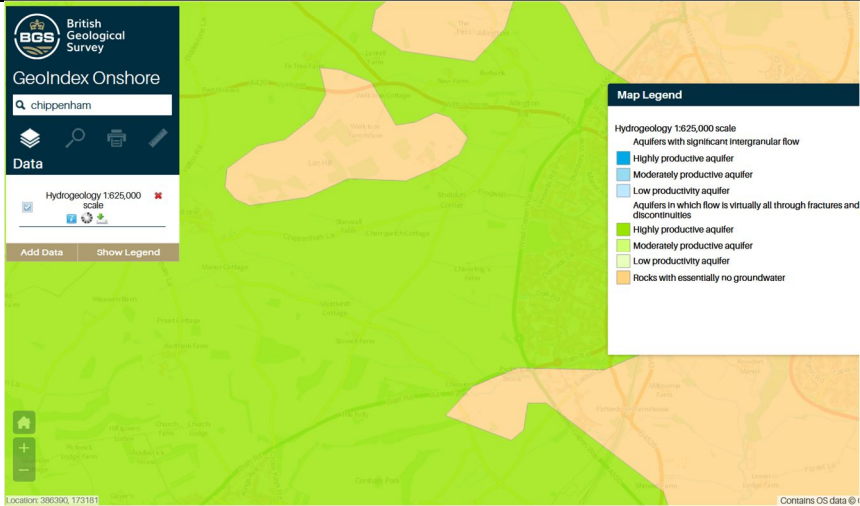
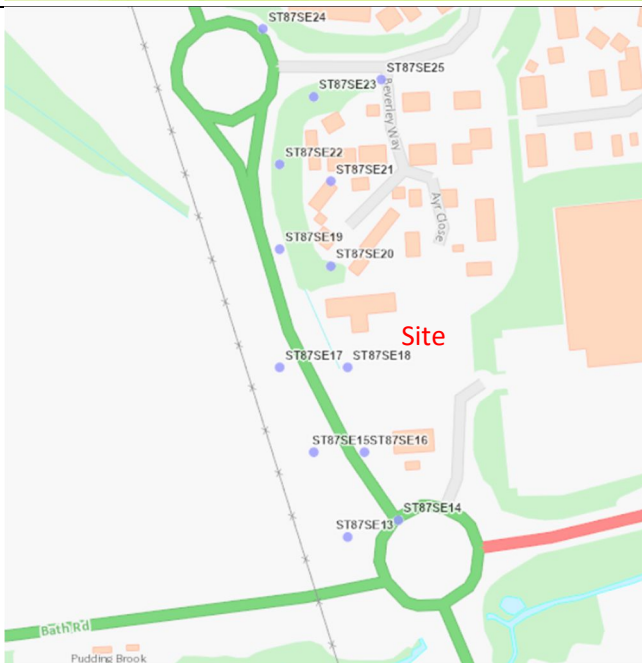
3.1 Data

3.1.1 The planning authority has stated that ‘the site is identified as being susceptible to groundwater flooding. A groundwater FRA is required in line with the Council’s Groundwater Management Strategy.’

3.1.2 In order to undertake this assessment we first present the data relating to groundwater flooding. This is then proceeded by commentary from §3.2.

- Table 3.1: Soil data
- Table 3.2: Groundwater flood mapping
- Table 3.3: Groundwater monitoring data

Table 3.1 - Soils

Ref	Source	Extracts
A	British Geological Survey Hydrogeology 1:625,000	
b	British Geological Survey (BGS) Boreholes	 These records are to a maximum depth of 4m. They mainly indicate clay at these shallow depths.

		e.g.: SdT87SE16 (1990):																																								
		Ground Level <table><tr><th>Description</th><th>Depth (m)</th><th>Level (m OD)</th><th>Sample or Test</th><th>Depth (m) to Sample or Test</th><th>Water Level (m)</th></tr><tr><td>Firm, dark brown, silty CLAY with many roots.</td><td rowspan="3">0.25 0.5 1.1</td><td rowspan="3"></td><td rowspan="3">CBR B</td><td>0.5</td><td rowspan="3"></td></tr><tr><td>Very stiff, grey-green and yellow-brown silty CLAY.</td><td>0.8</td></tr><tr><td>Strong to very strong, grey-green weathered brown on discontinuity surfaces, medium grained LIMESTONE, very thinly bedded dipping at 180/10, with joints dipping steeply to 110 and 340.</td><td></td></tr><tr><td>TRIAL PIT COMPLETE AT 1.1m</td><td></td><td></td><td></td><td></td><td></td></tr></table>	Description	Depth (m)	Level (m OD)	Sample or Test	Depth (m) to Sample or Test	Water Level (m)	Firm, dark brown, silty CLAY with many roots.	0.25 0.5 1.1		CBR B	0.5		Very stiff, grey-green and yellow-brown silty CLAY.	0.8	Strong to very strong, grey-green weathered brown on discontinuity surfaces, medium grained LIMESTONE, very thinly bedded dipping at 180/10, with joints dipping steeply to 110 and 340.		TRIAL PIT COMPLETE AT 1.1m																							
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c	Highways Development Ltd Drainage Strategy report, HDL-INST-20-RP-001, September 2025	This report submitted in support of the planning application mentions how a 'ground investigation undertaken in relation to previous development proposals for the site identified the geology to align with the geological mapping, with topsoil over made ground, overlying the Cornbrash Formation approximately 0.5 to 1 m below ground level.'																																								

d	Castledine Environmental Phase 1 Land Contamination Risk Assessment, September 2025	4084D P1 Hand – Chippenham Castledine Environmental 6.8.1 SUPERFICIAL DEPOSITS Both BGS geological mapping and the Groundsure report record no superficial geological deposits located on site with the nearest record being an area of Alluvium, comprising sands with clays and gravels and possible organic inclusions, located 101m south of site. 6.8.2 BEDROCK DEPOSITS Both BGS geological mapping and the Groundsure report records bedrock geology of the Cornbrash Formation underlying site, comprising a medium- to fine-grained limestone with bioclastic wackestones and packstones (generally bluish grey when fresh, weathering to olive or yellowish brown). Records of the Forest Marble Formation, comprising a silicate mudstone are then located 14m south west of site; with records of the Kellaways Formation, comprising a silicate sandstone and siltstone, then located 26m south of site.
e	Insitu excavations 2026	Parco Civil Engineering & Groundworks Ltd have made the following comments relating to excavations on site in the past few weeks: • Two excavations to levels of 63.85 and 64.25 mAOD. • This is down to 1 to 2 m below proposed site ground levels. Proposed site levels are shown on the attached Proposed Levels drawing. • Neither excavation encountered groundwater. • The soil profile has been reported as <i>'50-100mm of topsoil, 200mm of soil and stone, then into a clay/stone material across the whole of site'</i>. See photographs below:

																						
f	Wiltshire Council Level 1 Strategic Flood Risk Assessment (SFRA), 2024	There are limited superficial deposit in the study area. <i>‘To the east and west of the Chippenham study area there are small deposits of Head. These comprise a mixture of clay, silt, sand & gravel’.</i> §2.3.1 <i>‘The Cornbrash Formation is classified as a secondary A aquifer (water bearing) and rests above the Forest Marble Formation. The thin aquifer is typically hydraulically separated from the Combe Down Oolite aquifer (Table 2) by the clays in the Forest Marble Formation. This scenario is expected to lead to the development of a perched water table in the Cornbrash Formation. Therefore, the Cornbrash Formation is of interest to this study because it outcrops at surface over much of the study area.’</i> 2.3.3 Bedrock Groundwater Levels Cornbrash Formation There is no monitoring of groundwater levels undertaken by the Environment Agency in the Cornbrash Formation. However, Table 3 presents water level data from three BGS borehole logs. Whilst it is important to note that the data is not recent and does not show seasonal fluctuations, it does indicate that a perched water table exists within the thin Formation and is close to ground level in places. The locations of the boreholes identified within Table 3 are shown on Figure 1. Table 3: Water levels in the Cornbrash Formation obtained from BGS logs <table><tr><th>Borehole Reference</th><th>Approximate Location</th><th>Water Level (mbgl)</th><th>Date of record</th><th>Base of Cornbrash below GL (m)</th></tr><tr><td>ST97SW37</td><td>Central Chippenham</td><td>1.85</td><td>5/02/1988</td><td>4</td></tr><tr><td>ST97SW204</td><td>NW of Chippenham</td><td>1.6</td><td>1/09/1993</td><td>2.7</td></tr><tr><td>ST97SW13</td><td>SW of Chippenham</td><td>0.84</td><td>1937</td><td>4.5</td></tr></table> ‘mbgl’ – meters below ground level. ‘GL’ – Ground Level; ‘NW’ – north west; ‘SW’ - southwest The Ladyfield Brook and Pudding Brook probably receive groundwater inflow (baseflow) from the Cornbrash Formation. However, there are no available data to confirm groundwater / surface water interactions.	Borehole Reference	Approximate Location	Water Level (mbgl)	Date of record	Base of Cornbrash below GL (m)	ST97SW37	Central Chippenham	1.85	5/02/1988	4	ST97SW204	NW of Chippenham	1.6	1/09/1993	2.7	ST97SW13	SW of Chippenham	0.84	1937	4.5
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ST97SW13	SW of Chippenham	0.84	1937	4.5																		

Table 3.2 - Groundwater flood mapping

Source	Extract
Wiltshire Strategic Flood Risk Assessment Appendix G Groundwater Emergence	<i>There is a risk of groundwater flooding to surface and sub-surface assets. Groundwater levels are between 0.025 and 0.5 m below the ground surface.</i>

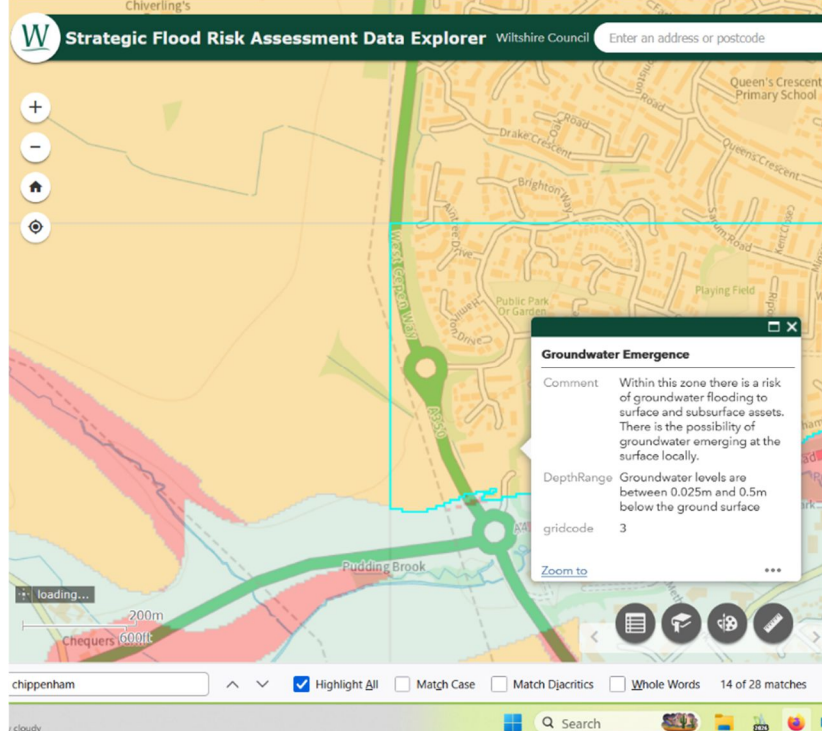
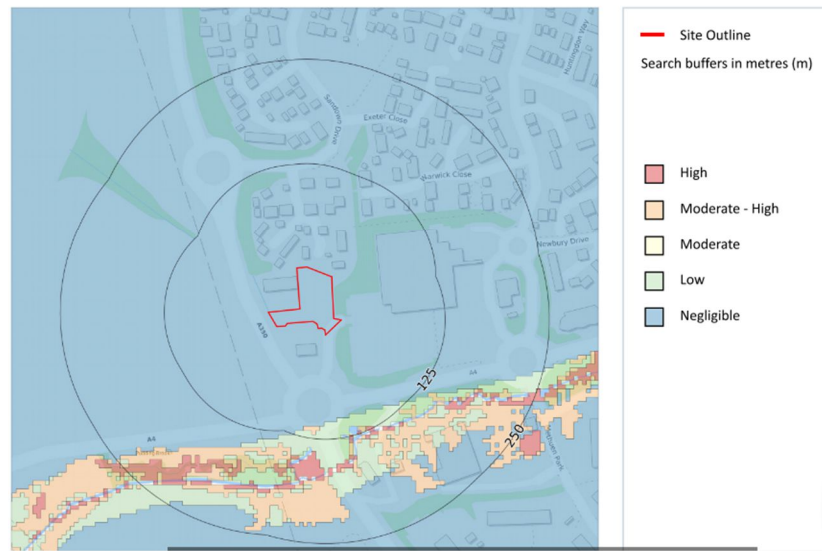
	
Groundsure report ref: GS-54M-BYW-JV9-L6Y (August 2025) appended to Castledine Environmental Phase 1 Land Contamination Risk Assessment, September 2025	9 Groundwater flooding  This data is stated as being sourced from Ambiantal Risk Analytics. Although we understand that the data is actually GeoSmart's Groundwater Flood Risk Mapping (GW5)
Highways Development Ltd Drainage Strategy report, HDL-INST-20-RP-001, September 2025	This report submitted in support of the planning application mentions how a <i>'ground investigation undertaken in relation to previous development proposals for the site identified.....groundwater levels within the testing locations were found to be at 1.65 and 2.3 m below ground level'</i>.



Table 3.3 - Groundwater monitoring data

Station identifiers	Location map	Data extracts
Allington 2 Station Type Groundwater Grid Reference ST8969074870 Station ID (WISKI) 91487435 Aquifer Great Oolite Borehole Depth 53.5 m Datum 83.9 mAOD		2006-2026: From: 22/09/2006 To: 02/03/2026 Complete record 5 years 1 year 6 months 8 weeks 4 weeks 1 week Advisory Dates provided for sub-daily data exceed the limit for display. Graph shows daily reading at 9am for this date range. To see sub-daily data choose dates no more than eight weeks apart. 2025-2026: From: 02/03/2025 To: 02/03/2026 Complete record 5 years 1 year 6 months 8 weeks 4 weeks 1 week Advisory Dates provided for sub-daily data exceed the limit for display. Graph shows daily reading at 9am for this date range. To see sub-daily data choose dates no more than eight weeks apart. Min = 66 mAOD (November 2017) Max = 81.255 mAOD (April 2024) ∴ Shallowest depth on record = 2.645 m bgl

Biddeston 2

Station Type
Groundwater (Dipped Only)

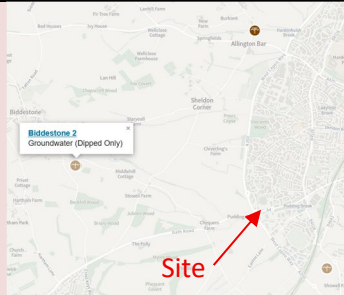
Grid Reference
ST8704872874

Station ID (WISKI)
91487434

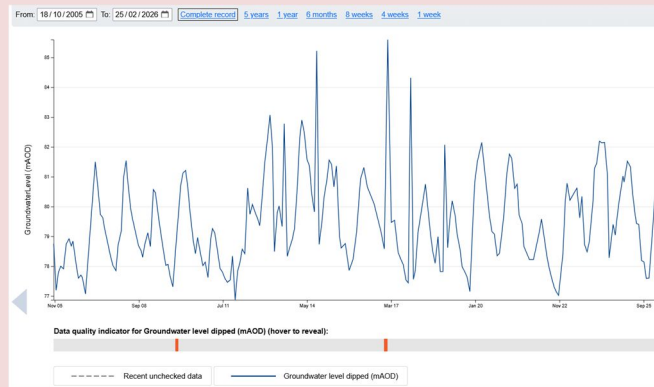
Aquifer
Great Oolite

Borehole Depth
45 m

Datum
106.72 mAOD



2005-2026:



Min = 76.87 mAOD (November 2011)
Max = 85.6 mAOD (January 2017)
∴ Shallowest depth on record = 21.12 m bgl

Biddeston 3

Station Type
Groundwater (Dipped Only)

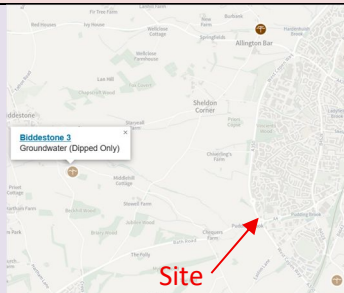
Grid Reference
ST8701972876

Station ID (WISKI)
90887433

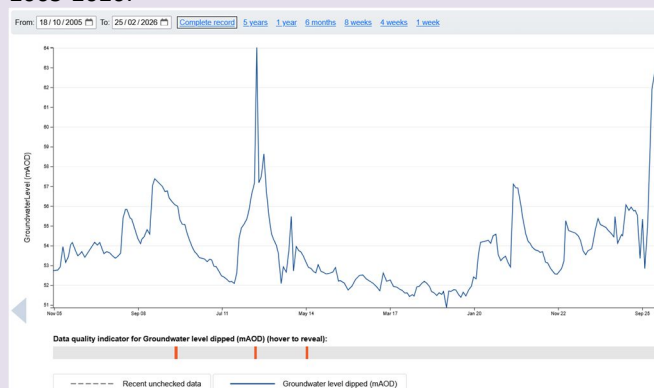
Aquifer
Inferior Oolite

Borehole Depth
110 m

Datum
106.82 mAOD



2005-2026:



Min = 50.87 mAOD (January 2019)
Max = 64.02 mAOD (August 2012)
∴ Shallowest depth on record = 42.8 m bgl
Not regular annual variations

Patterdown

Station Type
Groundwater (Dipped Only)

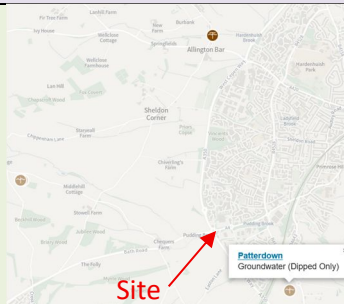
Grid Reference
ST9075171344

Station ID (WISKI)
91497131

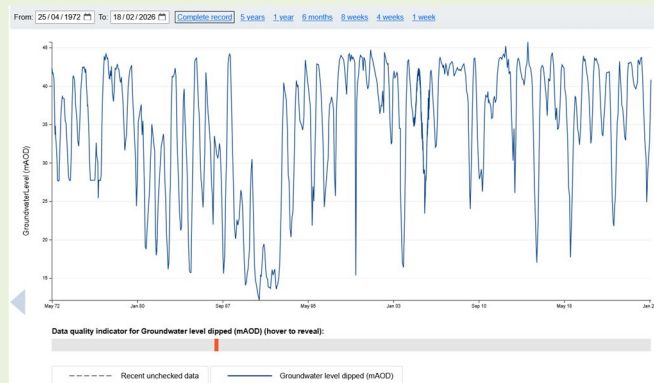
Aquifer
Great Oolite & Fuller's Earth

Borehole Depth
89.6 m

Datum
53.8 mAOD



1972-2026:



Min = 12.12 mAOD (December 1990)
Max = 45.73 mAOD (January 2015)
∴ Shallowest depth on record = 8.07 m bgl
Generally above 40 mAOD in winter

3.2 Discussion

- 3.2.1 Soil data shows that there is likely to be thin layer of superficial deposits of clayey soil with the Cornbrash limestone at shallow depth beneath. The Cornbrash is expected to host groundwater as a perched, secondary aquifer, with the primary aquifer at greater depth. The BGS soil data confirms that the clay beneath the site may be as thin as c1 m at the south of the site, but thicker at the higher, north end of the site. This would be compatible with the comment from a previous site soil investigation that encountered groundwater at '1.65 and 2.3 m' below the site. I.e., within the Cornbrash strata below the clay. None of this data in itself confirms that groundwater could emerge at the surface though.
- 3.2.2 The monitoring data in Table 3.3 is for groundwater within the primary aquifer. Although the stations are, in the scheme of national hydrogeology, quite close to the site, the ground levels, and depth of superficial deposits at the stations, are significantly different compared to the site. So they do not provide much background data on the risks at the site itself.
- 3.2.3 There is no national Government produced groundwater flood risk mapping. The two main commercially available groundwater flood mapping in Table 3.2 show what initially appear to be opposing risk of groundwater flooding at the site:
- GeoSmart GW5 shows 'Negligible' risk of groundwater flooding
 - Jba mapping in the Wiltshire Council Level 1 Strategic Flood risk assessment (SFRA) shows groundwater between 0.025 and 0.5 m below the surface with the possibility of groundwater emerging at the surface.

Neither confirm that that groundwater flooding is likely though. As stated at a webinar on groundwater flooding hosted by the Chartered Institution of Water and Environmental Management (27 March 2026), these maps indicate "*where groundwater flooding should be considered, not where it could occur*".

- 3.2.4 As explained in the attached *Review of Commercially Available Groundwater Flood Risk Mapping*, the two aforementioned data sets have been produced using differing methods. And as stated in the SFRA, '*mapping within the SFRA should not be used in place of local groundwater monitoring*', and we suggest, site specific ground investigation. The SFRA makes use of the risk of the Jba groundwater emergence mapping alongside the Environment Agency groundwater Flood Alert Areas and the groundwater and surface water Recorded Flood Outlines to identify those areas which could be most at risk of groundwater flooding (described in more detail in section 4.5 of the SFRA). We know from Table 3.2 that the site is not within a flood alert area, and Appendix J of the SFRA confirms that there has been no recorded flooding at the site. As stated in the (SFRA), Jba mapping, '*groundwater Flood risk mapping is not available for the county*' and '*in general, less is known about groundwater flooding than other sources and availability of data is limited*'. It '*is suitable for general broad-scale assessment of the groundwater emergence in an area but is not explicitly designed for assessment at the scale of a single property*'.
- 3.2.5 As stated in the SFRA, the (groundwater emergence) risk bands it presents are based on the risk of emergence, and not surface flooding due to groundwater. As stated in the SFRA, '*the*

dataset also shows the risk of emergence of groundwater rather than the actual flood risk from groundwater flooding’ and that it ‘only identifies the predicted groundwater levels and does not show the flow paths or impact of groundwater once it has emerged.’ Furthermore, the Wiltshire Council Groundwater Management Strategy (2016) further clarifies:

‘Typically groundwater flooding may be defined as the emergence of groundwater at the ground surface away from perennial river channels, under conditions where the “normal” ranges of groundwater level and groundwater flow are exceeded.’

‘Our understanding of the mechanisms of groundwater flood risk is in its infancy and to date prediction of future events is unsophisticated when compared to the modelling of fluvial or surface water flood events. This is primarily because of the lack of data and complexity of groundwater flow behaviour and emergence.....Currently there is no standard method to predict the future risk of groundwater flooding’.

3.2.6 We note that:

The SFRA seems to confuse the terminology used in relation to groundwater mapping....SFRA §4.5 states: ‘JBA has developed a Groundwater Flood Map product at the national scale. This dataset shows variations in the risk of groundwater emergence at the surface..... It should be noted that these risk bands are based on the risk of emergence, and not surface flooding due to groundwater. The 5m resolution JBA Groundwater flood map has been used within the SFRA’.

The groundwater emergence maps are produced at a national scale and understood to be the same as SFRA Appendix G, which is not entitled Groundwater Flood Map, but Groundwater Emergence.

Contrastingly, §3.2.3 of the SFRA introduces the term ‘groundwater zone’ that ‘has also been defined using the JBA risk of groundwater emergence mapping (three highest risk categories) alongside the EA groundwater Flood Alert Areas’. Groundwater zone is not mentioned again in the SFRA text, but Groundwater Flood Zone is used as a heading for the mapping within SFRA Appendix R. The only direct reference to the purpose of Appendix R in the SFRA is in §12.3 (Sequential testing) which states ‘Appendix R provides a methodology for using flood risk data within the application of the Sequential Test’. Appendix R itself does not, however, ‘provide a methodology’, but instead it is entitled ‘Groundwater Flood Zone for Application of Sequential Test’ and the mapping shown is called ‘Groundwater Sequential Test area’!

Appendix R also states:

The analyses performed to prepare the mapping are all for a 1 in 100-year (1% AEP) event and so provide a risk of groundwater flooding to the surface as they are based on predicted difference between groundwater level and the ground surface.

So, our main conclusions from all this are that SFRA Appendix G is the nationally produced Groundwater Emergence mapping, and Appendix R is the Wiltshire specific Groundwater Flood Zones. And we assume that if a site is within a Groundwater Flood Zone (Appendix R), then it is expected to be considered for a Sequential Test. However, this mapping is not legible, so we cannot use it, E.g.:



- 3.2.7 The proposed site levels are shown on the attached drawing. This indicate that in order to level the site, there will be up to c1.6 m of cut into existing ground. The recent excavations described in Table 3.1, confirm no groundwater encountered to a level of 63.85 mAOD, over 1m below proposed ground levels. There is no evidence from insitu records that groundwater would be present at the surface.

3.3 Mitigation

- 3.3.1 The discussion in §3.2 concludes that although unlikely, there is a risk that (perched) groundwater could be present near the surface. There is no evidence to suggest it would, or could, emerge on site, but this section considers a precautionary approach in the unlikely event of groundwater emerging at the surface on site.
- 3.3.2 Figure 2.2 shows that the site is not at a low area in local topography. Ground falls north to south across the site and continues falling to the south. The site ground level on site is higher than the ground around the adjacent Sainsburys store which is mainly set at a ground level of 64.3 mAOD and below. So if there are similar soil characteristics on the adjacent site, any groundwater emerge is likely to occur there, rather than at the site.
- 3.3.3 Primarily, any water at the surface on site would follow the same route as rainwater on site. It would enter the site drainage systems or follow the site surface water exceedance route. Refer to designs by Highways Development Ltd for proposed site drainage. There would be nowhere on site for water to pond and any surface flow would be shallow since the ground levels fall relatively steeply.
- 3.3.4 As per the SFRA methodology, if groundwater did emerge, a reliable way of assessing the resulting flooding is to use *the 0.1% AEP (1 in 1,000 year) Risk of Flooding from Surface Water dataset has then been used to identify the key topographic flow paths within these areas, providing a proxy dataset of the potential flow route of any groundwater flooding*. Figure 3.1 shows that the site is not at risk of surface water flooding, i.e. it is not within any notable flow paths of surface water from off site. There is an existing watercourse to the west of the site that assists to convey flows past the site to the south. And, as shown in Figure 2.3, there is very limited land uphill of the site that falls towards the site. So, if groundwater flooding occurred uphill of the site, it should not be directed onto the site.

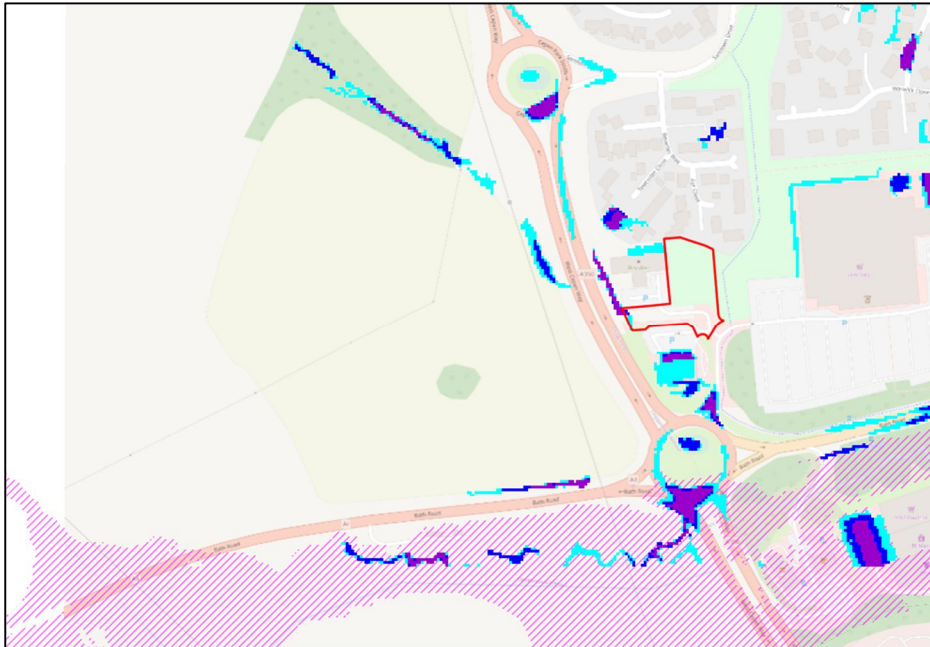


Figure 3.1 – Risk of flooding – including climate change

Surface Water

High ⇒ greater than or equal to 3.3% chance in any given year (1:30)

Medium ⇒ less than 3.3% (1:30) but greater than or equal to 1% (1:100) chance in any given year

Low ⇒ less than 1% (1:1,000) chance in any given year

(Source: rofsw_cc01Polygon.shp)

Fluvial

Pink hatching ⇒ flood zones plus climate change

(Source: Flood_Zone_River_and_Sea_plus_CCP1Polygon.shp)

Contours at 0.5 m c-c

(Source: lidar composite: Contours-ST87se_DTM_1m.tif, downloaded 25March 2026)

- 3.3.5 The sensitive areas of the proposed site listed below are all located at the north of the site on the highest ground and, where possible, will be raised up by at least 250 mm from surrounding ground:
- RMC 1250 (Data Cabinet)
 - 16-Way Schneider Feeder Pillar for BESS
 - TR7 (500kVA - 800kVA)
- 3.3.6 As a precaution, underground site infrastructure is be designed to withstand groundwater near to the ground surface.
- 3.3.7 It is never safe to enter floodwater (walk, swim, cycle or drive etc.). It may be fast flowing, contain debris, be contaminated, cold or hide unseen dangers. Other advice and information on local flooding is available from the following websites:
- Environment Agency Floodline: 0345 988 1188 and <https://www.gov.uk/prepare-for-a-flood>
- National Flood Forum: <https://nationalfloodforum.org.uk/about-flooding/preparing/checklist-action-plan/>
- Wiltshire Council: <https://www.wiltshire.gov.uk/article/10596/Flooding-advice-for-homeowners>

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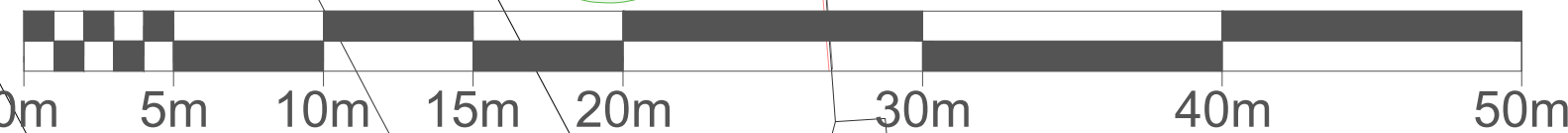
1. InstaVolt to provide 12x wider EV charging bays and 4x fully accessible EV charging bays.
2. Chargers to be installed flush to ground on proposed tarmac, level with bays.
3. Feeder pillars, substation and BESS unit to be installed on proposed hardstanding verge as shown.
4. Existing line painting within site boundary to be configured as shown.
5. Existing vegetation to be removed within site boundary where required to accommodate equipment. For proposed landscaping information, see Appendix 6 of ecology report (**Ref. no.: '250405'**) Further detail is expected to be provided in the form of an HMMP that will be conditioned
 - Vegetation removed for hardstanding: 1087m²
 - New planting / habitat enhancement: 515m²
6. Existing kerb line and verge (hatched blue) to be dropped for a new vehicle crossover. Proposed kerb line to be installed as shown (hatched pink). Footpath to be extended as shown (hatched green). Tarmac to be installed up to the proposed kerb line in level with the charging bays. Dropped kerb to be installed as shown (hatched orange) to provide vehicle access, with pedestrians retaining the right of way.
7. Existing Trees (shown light blue) to be removed. New trees (area shown dark blue) to be planted. All new cabling must avoid retained tree's RPA's (shown circled pink around tree trunk).
8. CCTV Masking Requirements:
 - Masking to be applied for all private property.
 - Masking to be applied for views of commercial buildings outside Instavolt's leasehold.
 - Masking not required for roads and other publicly accessible areas.
9. All measurements to be taken from the centre point of a line, unless stated otherwise.
10. Site Area = 2899m²
11. Please also refer to the following:
 - Transport Note - **Ref. no.: '2508-020 TS01'**
 - Tree Constraints Plan - **Drawing no.: 'TCP-1'**
 - Ecology Report - **Ref. no.: '250405'**

Nursery

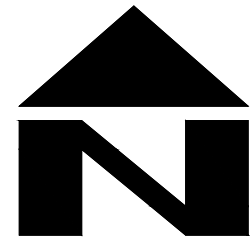
1.2m pedestrian access to
be installed as shown for
additional accessibility.

See note '6'.
InstaVolt totem to be installed as shown.

Bins to be attached to lampposts as shown.



COMMENTS			REV.	DESCRIPTION		REV. BY	APP.	DATE	ADDRESS Land lying North of Bath Road, Chippenham, SN14 0AF United Kingdom	PROJECT NAME		
			A	Issued for comment		DB	NB	23/07/25		COOPER ESTATES - CHIPPENHAM HUB		
			B	Updated layout as per latest design		NB	RK	05/09/25		DRAWING TITLE		
			C	Removed amended kerb line		NB	JM	12/09/25		PLANNING SITE LAYOUT		
			D	Schneider feeder pillar specification updated		CB	JM	24/09/25		DRAWING NO.		
			SCALE (@A2) 1:250		DRAWN BY DB							
											REV. D	

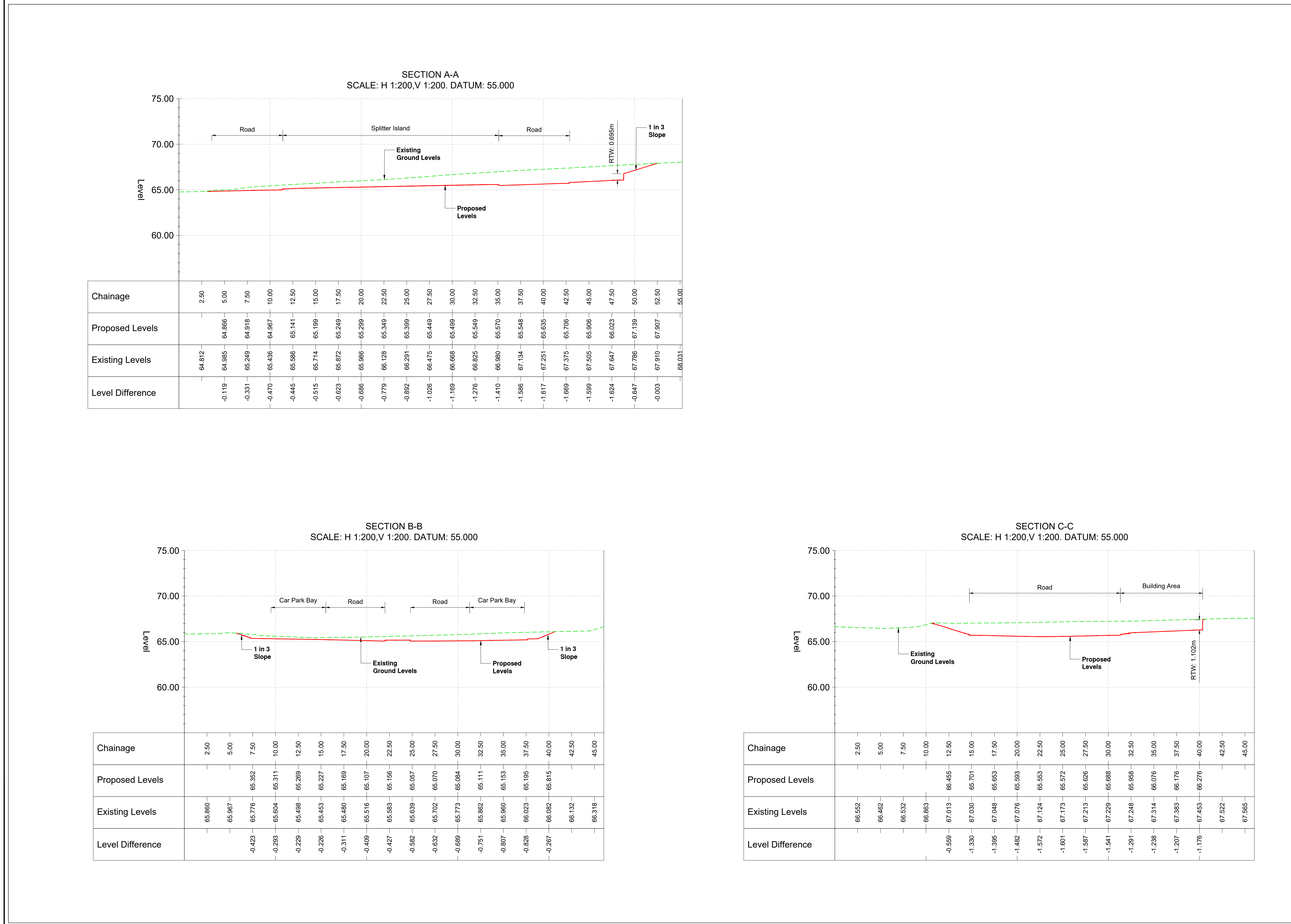


- NOTES
1. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.
 2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM.
 3. DO NOT SCALE FROM THIS DRAWING. WORK ONLY FROM STATED DIMENSIONS OR SETTING OUT DETAILS.
 4. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
 4. ALL SETTING OUT INFORMATION TO BE PROVIDED BY THE END CLIENT. BEFORE COMMENCING CONSTRUCTION OF ANY PART OF THE WORKS, THE CONTRACTOR SHALL VERIFY THE SETTING OUT DATA IN RELATION TO THE SITE AND INFORM THE END CLIENT AND/OR ENGINEER IMMEDIATELY SHOULD ANY ISSUES BE IDENTIFIED.
 5. CUT AND FILL CONTOURS ARE INTENDED TO BE INDICATIVE ONLY AND DO NOT REPRESENT EXACT LOCATIONS ON SITE.
 6. FOR PAVEMENT CONSTRUCTION, REFER TO HDL DRAWING HDL-INST-20-100.
 7. UTILITIES INFORMATION PROVIDED BY END CLIENT. INFORMATION IS NOT TO BE RELIED UPON. CONTRACTOR IS TO TAKE ALL NECESSARY PRECAUTIONS TO IDENTIFY AND PROTECT EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS.

- KEY
- Site Boundary
 - Major Contour (100mm)
 - Minor Contour (25mm)
 - Proposed Spot Levels
 - Proposed Top of RTW Level
 - Existing Level
 - Proposed Retaining Wall

FOR APPROVAL

					CLIENT		CONSULTANT		DESIGNER		SCHEME		DRAWING TITLE	
									A.O		CHIPPENHAM HUB, BATH ROAD, CHIPPENHAM		PROPOSED LEVELS STRATEGY & CONTOUR PLAN	
									A.O					
									D.O		JOB No. HDL-INST-20			
									D.O		SCALE @ A1			
									D.O		DATE			
											17/12/2025			
											SHEET NUMBER			
											1 of 1			
											DRAWING NUMBER			
											HDL-INST-20-120			
											REV			
											A			



- NOTES
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KEY

Existing Ground Levels

Proposed Ground Levels

FOR APPROVAL



Review of Commercially Available

Groundwater Flood Risk Mapping

1.0 Introduction

- 1.1 This Review summarises available information regarding commercially available groundwater flood risk maps.
- 1.2 This report has been undertaken as a brief study to accompany our flood risk assessments. If this information is used by any other party, or for any other purpose, then the user accepts full liability in doing so.
- 1.3 This Review relies mainly upon Environment Agency publications.

2.0 Groundwater Flood Data

2.1 The British Geological Survey defines groundwater flooding as:

"The emergence of groundwater at the ground surface away from perennial river channels or the rising of groundwater into man-made ground, under conditions where the 'normal' ranges of groundwater level and groundwater flow are exceeded".

And 'natural seasonal waterlogging or poor drainage are not defined as groundwater flooding.'¹

2.2 There is national scale flood risk mapping produced by:

a) Jacobs GEMS (2004),

- First attempt at mapping groundwater flooding¹
- Tends to over estimate flooding¹

and

b) the Environment 'areas Susceptible to groundwater flooding (AStGwf, 2010).

- 1 km² strategic scale grid¹
- It does not show the likelihood of groundwater flooding, only isolated locations within susceptible areas are actually likely to flood¹
- It should not be used as sole evidence for any specific flood risk¹
- This mapping has specific technical weakness¹
- This was produced solely for the purposes of the preliminary flood risk assessment in 2011 to meet the European Floods Directive (Directive 2007/60/EC) and the Flood Risk Regulations (2009).¹

2.3 Both these mapping are older, less detailed and less accurate than commercial products.¹

2.4 Commercially available data is more detailed and includes:

- i. GEoSmart GW5 groundwater flood risk mapping: 5 m grid
- ii. Jba GB Groundwater Flood mapping: 5 m grid
- iii. British Geological Survey susceptibility to groundwater flooding: 50 m grid

2.5 This Review focuses on the former two more detailed 5 m grid mapping.

2.6 The table given below is a useful summary of the comparison between the GeoSmart and Jba commercial data. Regarding both these datasets, the following quotes have been taken from reference 1:

- i. Based upon BGS 50 K geology, Lidar DTM
- ii. Their methods are not published in full
- iii. Less transparency around methods used
- iv. The method used to produce the final products is not freely available and so it is difficult to make a detailed accurate assessment of the suitability and accuracy of each

- v. They aim to establish groundwater flooding in terms of risk, with a 1 in 100-year flood event criteria (JBA's groundwater flood map in the Chalk aquifer in south-east England at 75, 100 and 200-year return periods)
- vi. Uncertainty regarding the methodology of the commercial products can be barriers to their usage.
- vii. There are considerable technical difficulties and uncertainties in mapping groundwater flood risk, so it is important that the methodology used in developing mapping products is clearly documented including any limitations. At present, as the national products are all commercially developed (without a published detailed methodology), there is no forum for discussing accuracy, limitations, weaknesses and potential errors in the risk mapping (6.6.3).
- viii. Even the most developed groundwater flooding risk maps produced are not as specific, or accurate, in terms of predicting flood risk in the way the current maps for fluvial flood risk do
- ix. Climate change is not considered.
- x. They are generally not fit for purpose* to assess the likelihood at property level.

*This is a bold statement to make and the author may not fully understand the implications of saying this. Given the intended usage stated by the producers, we would not necessarily consider the data not fit for purpose and the mapping does have a useful role in highlighting areas that may require assessment.

Table 6.6 National scale groundwater flood risk mapping approaches¹

	GeoSmart (previously part of ESI)	BGS	JBA Consulting
Method	Combines a likelihood of flooding during a 1 in 100-year return period scenario with the underlying uncertainty in groundwater flooding. The severity of the flooding is then based on the underlying aquifer (transmissivity), range and extent of properties to come to overall risk.	Developed groundwater surface map based on geological permeability and distance from watercourses. Used conceptual models of PSD and clear water flooding to determine groundwater flooding susceptibility.	Groundwater table generated under 1 in 100-year flood event conditions. This is then compared against ground levels to establish potential depth to groundwater for a given area.
Software	Python coding for processing and modelling, ArcGIS for visuals.	ArcGIS for processing and visuals.	ArcGIS for processing and visuals, R statistical package for rainfall modelling.
Data inputs	Groundwater levels from monitoring boreholes, LiDAR DTM (5m), BGS 50k geology, river levels.	Groundwater levels from monitoring boreholes, BGS 50k geology, BGS permeability index data set, DTM, river base levels.	Rainfall, LiDAR DTM (5m), BGS 50k geology, river levels, OS vector mapping.
Data outputs	5m GIS raster grid and polygon of groundwater flood risk score bands.	50m GIS raster grid of groundwater flood susceptibility bands.	5m GIS raster grid and polygon of depth to groundwater/flood risk score bands.
Validation	Database of groundwater flood events is maintained (for example, sourced from projects, or the internet). This feeds into a 6-month update cycle, where discrepancies are highlighted, and calibrations are made where necessary.	The BGS has data on the locations of previous groundwater flooding events gathered through research projects and discussions with environment regulators and local authorities. This information has provided a means to validate the susceptibility data set.	Calibrated against monitoring borehole data and observed flood events.
Limitations	Uncertainty in underlying permeability in the geology. Local variations in topography, uncertainty in where groundwater seepage occurs and accumulates. It is advised that the model is calibrated with local primary data,	One of the main limitations is scale. It is difficult to combine the detail of small scale modelling with national scale modelling. Often small scale features can determine areas of groundwater emergence, but are difficult to include within large aquifer	Broad national scale, local models and mapping may be more accurate (for example, chalk catchments with varied responses). Where superficial deposits are thin, only the underlying bedrock characteristics are considered.

	where available, to improve results.	scale models. Need constant refinement and improved parameterisation of large aquifers.	
Climate change considered?	Not considered in the product. Although guidance can be provided on impacts of climate change, which will vary spatially.	Not considered in the product.	Not considered in the product. The rainfall grid model could be updated to produce recharge under climate change scenarios.

- 2.7 We have contacted the producers of both these datasets and not gained any further insight into the differences in the data. Both provide probability of occurrence information, with the GW5 data categorising the results into score bands, and the Jba mapping also gives the estimated maximum depth of groundwater below ground level. GeoSmart has stated that:

The GeoSmart model takes into account not only bedrock groundwater flooding but also the risk of groundwater flooding from permeable superficial deposits (PSD) from rivers and tides. The GW5 map uses depth to groundwater, bedrock geology, superficial geology, plus other geological characteristics to determine risk at a 5m resolution and the map is calibrated against a database of groundwater flooding events. We are confident that the GeoSmart GW5 map represents a market-leading indicative screening tool, with areas with a >1% annual probability of groundwater flooding. Like other current groundwater flood maps used in the UK, the GeoSmart map also shows areas of potential groundwater emergence.

- 2.8 We conclude that neither data set appears preferable over the other. We suggest that since there is no other data available both data is beneficial to establishing if groundwater flooding is a possible risk and they are best used alongside site specific geological and topographical data.

3 References

- 1 - Environment Agency/DEFRA/NRW Rapid evidence assessment and overview of groundwater flood risk management in England FRS19217, June 2021
- 2 – Jba GB Groundwater Flood risk Mapping, technical overview, 2016
- 3 - <https://geosmartinfo.co.uk/data/groundwater-flood-risk-map/geosmart-gw5/>
- 4-<https://www.jbaconsulting.com/knowledge-hub/jba-launches-5m-resolution-groundwater-flood-map/>

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