FORM WRA: Applicant details and proposal outline

Water Resources Act 1991 (as amended by the Water Act 2003), Environment Act 1995, The Water Resources (Abstraction and Impounding) Regulations 2006, The Natural Resources Body for Wales (Functions) Order 2012

Cyfoeth Naturiol Cymru Natural Resources Wales

1. Application type and fee

For the application types listed, complete this form and/or the relevant additional forms named below. Please tick which forms have been included with your application. Forms should be completed with reference to Guidance Note WRX.

* Pre-application enquiry (non-hydropower)	☐ Only complete this form
* Pre-application enquiry (hydropower)	☐ Also complete form WRB
* Application for a Groundwater Investigation Consent	☐ Only complete form WRC
New full abstraction licence	☐ Also complete form WRD
New temporary abstraction licence	☐ Also complete form WRD
New licence to transfer water	☒ Also complete form WRD
New impoundment licence	☐ Also complete form WRE
Renewal of a time-limited licence	☐ Also complete form WRD
Removal of an existing impoundment	☐ Also complete form WRE
Technical variation of an abstraction licence	☐ Also complete form WRD
Technical variation of an impoundment licence	☐ Also complete form WRE
* Administrative variations to existing licences	☐ Only complete form WRF
* No fee required	

Please indicate how you wish to pay your application fee and provide a reference number where relevant.

Cheque ☐ BACS ☐ Credit or debit card ☒ Your reference number PRCJNBENTLE001

2. Applicant details

This is who the licence would be issued to and must be a legal entity such as an individual, registered company, charity or public body. If you are an agent acting on behalf of an applicant, provide their details here and yours in Section 3. See Guidance Note WRX for clarification of the details required and signatories permissible for organisations.

Applicant type:

Individual	☐	Limited company	☒	Charity	☐	Corporate body	☐
Partnership	☐	Sole trader	☐	Club	☐	Other	☐

If other, please specify

Title: MR

Full Name: Angus Ridge

Company, Charity or Trading Name: JN Bentley Ltd

Company or Charity Registration Number: 01085646

Registered Address:
Snaygill Industrial Estate
Keighley Road
Skipton
North Yorkshire
Postcode: BD23 2QR

Office: 01756 799425
Mobile:

Telephone Number

Email Address | info@jnbentley.co.uk

We will contact you by email unless you tick here ☐

Please specify who we should contact with regard to your site operation.

Site operations contact | Applicant ☐ | Agent ☒

For applications for abstraction licences, please also specify who we should contact for invoices and abstraction records (returns).

Invoice address* | Applicant ☒ | Agent ☐

Abstraction records contact* | Applicant ☐ | Agent ☒

* Not required for temporary or transfer licences.

Enter the agent's details in Section 3, or provide details of alternative or additional contacts on a separate sheet and tick here to show that you have done so. ☐

3. Details of agent or individual authorised to act as application contact

This is who we will correspond with unless otherwise informed. If an agent has signed on behalf of an applicant, please include a letter of authorisation from the applicant allowing the agent to act as signatory.

Title | MR | Full Name | GAVIN PASCOE

Company, Charity or Trading Name | JN BENTLEY LTD

Position in Company | SITE AGENT

Registered Address | Snaygill Industrial Estate
Keighley Road
Skipton
North Yorkshire
Postcode: BD23 2QR

Telephone Number | Office: 01633287729
Mobile: 07970354261

Email Address | Gavin.Pascoe@mottmac.com

4. Entitlement to apply (only required for abstraction licence applications)

Does the applicant have a legal right of access to the point of abstraction?

Has a right of access ☒ | Has an expected right of access ☐

Owner/occupier of land ☐ | Date these access rights are expected | 24th June 2019

For formal abstraction licence applications where you are the landowner/occupier, provide a map with the land boundary and all abstraction and discharge point(s) marked. Please tick here to show that you have done this. ☒

For expected rights of access, please also provide the additional evidence as outlined in Guidance Note WRX. Please tick here to show that you have done this. ☐

5. Application reference number

Have you undertaken a pre-application enquiry or had any previous discussions with us?

No ☒ Yes ☐ Provide reference number or staff member's name

6. Remediation work

Is this proposal as a result of a Restoring Sustainable Abstraction programme or other work requested by us?

No ☒ Yes ☐ If yes, provide your licence number

7. Source of supply

7.1 State where you intend to abstract from

Surface Water ☐ Groundwater ☒

Give Groundwater Investigation Consent number if applicable: n/a

7.2 Provide a 12 digit National Grid Reference for the proposed or existing abstraction or impoundment point (e.g. ST 19057 76826)

ST | 09111 | 69524

7.3 Source of supply or location of proposed impoundment: SPS Wet Well

7.4 Site name / reference: Waycock Cross Waste Water Treatment Works

8. Proposal summary

Please provide an outline of your proposal as described in Guidance Note WRX, including any sketches. If you are submitting a pre-application enquiry, this must include the quantities of water you propose to abstract. If necessary continue on a separate sheet and tick here to show that you have done this. ☐

Proposed de-watering of the excavation to construct and install a new Pre-Cast Concrete segmental structure, via underpinning or caisson technique.

With an objective to allow excavation work to be carried out in dry and stable conditions we propose a perimeter deepwell dewatering system. We have assumed that deepwells would be installed from the existing ground level around the perimeter of the site at approximately 5 m centres. We propose to drill and install each deepwell with a rotary drilling rig via water-flush technique.
The discharge location and its proximity to the dewatering system is indicted on drawing 3493_S_204-ARP-04-XX-LP-CX-09014.

The SI provides limited information on the permeability of the target aquifer. Within rock the flow of groundwater is predominately controlled via fissure flow and can vary greatly within short distances. As a result, it is often prudent to undertake a pumping test at the site prior to commencing dewatering activities. Such testing is anticipated to be undertaken in due course to finalise the dewatering scheme.

In the absence of pumping test data, the number of wells that we have suggested is the minimum scheme that we feel has a reasonable chance of reducing groundwater pressures within the excavation.

Indicative Dewatering - Deepwells
- Installation Level: Existing ground level.
- Dewatering Length: Perimeter ~ 20 m.
- Installation Method: Rotary drilling rig.
- Number of wells 4-6 no. pumped wells, 1 no. monitoring/contingency well.
- Well Spacing: nominal 3-5 m centres.
- Well Depth: Installed up to 12 m (12.5 mOD).
- Well Details: Bore size 250 mm nominal. Liner size 150 mm nominal.
- Pump size: Up to 0.75 kW.

After well installation and development individual submersible borehole pumps would be installed within each. These will be connected with individual wire armoured hoses to a common 150mm collection main positioned around the perimeter for final discharge via a v-notch settlement tank and flowmeter.

9. Declaration

Please see Guidance Note WRX for details of who can sign this section and note the information in that document relating to the Data Protection Act 1998.

By signing below, you are declaring that as far as you know and believe the information given in this form, on any map and in any supporting or additional information, is true.

Signed	Angus Ridge
Print name	Angus Ridge
Position	DIRECTOR
Date	25/2/19

Application Checklist

Please tick the following checklist items to indicate that you have included the required information. If any sections of the form are left blank and no supporting information submitted, where we have insufficient information to make a decision on your application, we will return your application to you.

Essential:

Letter of authorisation from the applicant, allowing the agent to act as signatory ☐
Map showing the land ownership boundary with all abstraction and discharge point(s) clearly marked ☒

Where relevant:

Evidence of negotiations of expected access rights, if applicable ☐
For groundwater abstractions, results of pump test (if not previously submitted) ☐

For Natural Resources Wales' use only:

Date received _____

Reference Number _____

Payment received Yes ☐ Amount received _____
No ☐ Not required ☐

FORM WRD: Application for a new abstraction licence or a technical variation to an abstraction licence

Water Resources Act 1991, Environment Act 1995, The Water Resources (Abstraction and Impoundment) Regulations 2006, The Natural Resources Body for Wales (Functions) Order 2012

Cyfoeth Naturiol Cymru Natural Resources Wales

1. Application type

New full abstraction licence	☐	Give existing licence serial number and/ pre-application reference number
New temporary abstraction licence	☐	
New licence to transfer water	☒	PRCJNBENTLE001
Renewal of a time-limited abstraction licence	☐	
Technical variation to an abstraction licence	☐	

For hydropower abstractions, specify the capacity (in kilowatts) of your scheme.

25kW or less ☐ >25 to 50kW ☐ >50 to 100kW ☐ >100kW ☐

2. Linked licences

2.1 Does your proposal involve water rights trading?

No ☒ Yes ☐ If yes, provide licence serial number(s)

2.2 Is the licence (to be) aggregated with any other licences?

No ☒ Yes ☐ If yes, provide licence serial number(s)

3. Abstraction details

Provide details of all points of abstraction**.** Details of abstraction location(s) should correspond with any maps submitted.

If necessary, continue on a separate sheet and tick here to show that you have done this ☐

Abstraction location name / reference	Type (single point / reach)	National Grid Reference (12 digit)	If a reach, downstream National Grid Reference (12 digit)
Waycock Cross Waste Water Treatment Works – SPS Wet Well	Single	ST 09111 69524	n/a

4. Means of abstraction

Detail the structure and equipment involved in the abstraction process. If this information is detailed in a supporting document, provide the document reference. For groundwater abstractions, include borehole depth and diameter and provide details of screening and lining. If necessary, continue on a separate sheet and tick here to show that you have done this. ☐

Proposed de-watering of the excavation to construct and install a new Pre-Cast Concrete segmental structure, via underpinning or caisson technique.

With an objective to allow excavation work to be carried out in dry and stable conditions we propose a perimeter deepwell dewatering system. We have assumed that deepwells would be installed from the existing ground level around the perimeter of the site at approximately 5 m centres. We propose to drill and install each deepwell with a rotary drilling rig via water-flush technique.
The discharge location and its proximity to the dewatering system is indicted on drawing 3493_S_204-ARP-04-XX-LP-CX-09014.

The SI provides limited information on the permeability of the target aquifer. Within rock the flow of groundwater is predominately controlled via fissure flow and can vary greatly within short distances. As a result, it is often prudent to undertake a pumping test at the site prior to commencing dewatering activities. Such testing is anticipated to be undertaken in due course to finalise the dewatering scheme.

In the absence of pumping test data, the number of wells that we have suggested is the minimum scheme that we feel has a reasonable chance of reducing groundwater pressures within the excavation.

Indicative Dewatering - Deepwells
- Installation Level: Existing ground level.
- Dewatering Length: Perimeter ~ 20 m.
- Installation Method: Rotary drilling rig.
- Number of wells 4-6 no. pumped wells, 1 no. monitoring/contingency well.
- Well Spacing: nominal 3-5 m centres.
- Well Depth: Installed up to 12 m (12.5 mOD).
- Well Details: Bore size 250 mm nominal. Liner size 150 mm nominal.
- Pump size: Up to 0.75 kW.

After well installation and development individual submersible borehole pumps would be installed within each. These will be connected with individual wire armoured hoses to a common 150mm collection main positioned around the perimeter for final discharge via a v-notch settlement tank and flowmeter.

5. Abstraction quantities

Provide details of the abstraction quantities and periods proposed, including any deregulated abstractions (< 20 cubic metres per day) you currently have. Details of abstraction locations should correspond with any maps submitted.

Abstraction location name / reference	Purpose which water will be used for	Abstraction period (state 'all year' or give months)	Maximum annual abstraction volume (cubic metres)	Maximum daily abstraction volume (cubic metres)	Maximum hourly abstraction volume (cubic metres)	Number of hours of abstraction per day	Peak abstraction rate (litres per second)
Waycock Cross Waste Water Treatment Works - SPS	De-watering of ground water table.	6 months	90,202	502	21	24	5.8
		Total	90,202	502	21		

6. Calculations and supporting information

Please provide further details of your intended use of water, including calculations in support of the quantities you have requested, your operational regime and any management agreements. See Guidance Note WRX for details of what is required. If your proposal involves the provision of a residual flow via a notch or orifice, provide information on how this has been calculated.

If necessary, continue on a separate sheet and tick here to show that you have done this. ☒

No intended use, ground water abstraction is to manage groundwater during the construction of new subsurface structure. Proposed water to be discharged to a local drainage ditch, with appropriate mitigation and pollution control measures.

Abstraction rate has been calculated from in-situ rising head permeability testing.
Please refer to Hydrogeological Impact Assessment, Appendix A [3493_S_204-ARP-08-XX-RP-GE-10039] for details.

7. Industry-specific requirements

Complete the relevant table in line with the purpose of your proposal to demonstrate a justification of need for the quantities proposed. For uses not covered here or to provide further details, please use a separate sheet and tick here to show that you have done this ☐

7.1 For agricultural use:

Crop type	Soil type (for multiple soil types, indicate approximate split)	Maximum area of crop to be irrigated annually (hectares)	Maximum annual depth of irrigation to be applied (millimetres)
e.g. Carrots	*Silty clay*	*10*	*90*

Livestock type	Number of animals	Maximum daily quantity of water used (cubic metres)	Comments
e.g. Sheep	*200*	*0.005 per animal*	*Drinking water*
Provide details of any additional requirements (washing / cleaning)			

7.2 For golf course irrigation:

Feature	Maximum area to be irrigated daily (hectares)	Maximum depth of water to be applied daily (millimetres)
e.g. Greens	*0.9*	*220*
Tees		
Greens		
Fairways		
Others		

7.3 For industrial use:

Industry sector or process type	Water use per unit produced (state units)	Maximum units produced per year
e.g. Ice cream	*1.9 cubic metres per tonne of ice cream*	*10,000 tonnes*

7.4 For hydropower:

If you have submitted this information as part of your pre-application enquiry and no changes have been made to your proposal in the meantime, you are not required to provide these details again.

% abstraction and zone applied for (see HGN2)	Average gradient of depleted reach (%)	Catchment size above abstraction point (kilometres square d)	Net head between abstraction and discharge points (metres)
Turbine efficiency (%)	**System efficiency (%)**	**Maximum power output (kilowatts)**	**Annual capacity (kilowatt hours)**

State the length of depleted reach (in metres)

Provide the flow data (in cubic metres per second) & ratios specified below:	
Q95	
Q10	
Qmean	
What is the ratio of Q95:Qmean?	
What is the ratio of Q10:Qmean?	

Please send us a copy of the full flow duration curve for the site and confirm the method used to derive this. If you have used modelling software such as LowFlows, please provide us with a copy of the output (graph, data and catchment map) including the Long Term Average rainfall.

What low flow protection* do you propose to maintain in the depleted reach when the hydropower scheme is operating (in m^3/s)?

* Low flow protection is the flow rate above which abstraction can begin and is separate to the abstraction % take, see HGN2 for details.

8. Means of measurement

State how you intend to measure abstracted quantities at each abstraction point.

Meter ☒ Power Generated ☐ Other ☐

If other, please specify

9. Water efficiency

Describe all steps you have taken or intend to introduce to ensure efficient use of water, such as water storage, re-use or conservation provision. If necessary, continue on a separate sheet and tick here to show that you have done this. ☐

n/a

10. Fish and eel considerations (surface water abstractions only)

10.1 Confirm the fish species present at your site. If you are submitting a survey or report with your application, please tick here to show that you have done this. ☐

None.

10.2 Does your proposal include measures to safeguard fish and eels? Only provide details of outfall screening if abstracted water is to be discharged back into a watercourse.

	Intake	Outfall
Type of fish screen	n/a	n/a
Screen aperture size (mm)	n/a	n/a

11. Discharge details

11.1 If you intend to return any of the abstracted water to the environment, provide details below. Details of discharge location(s) should correspond with any maps submitted.

Discharge location name / reference	National Grid Reference of discharge point (12 digit)	Total volume to be discharged (cubic metres)	Environmental Permit for Water Discharge Activity number (if applicable)
Discharge Point	ST 09082 69534	90,202	Application in Progress

11.2 Provide a description of the structure and equipment involved in discharge.

After well installation and development individual submersible borehole pumps would be installed within each. These will be connected with individual wire armoured hoses to a common 150mm collection main positioned around the perimeter for final discharge via a v-notch settlement tank and flowmeter.

12. Other abstractors / water users

Provide details of nearby abstractors or users of water who could be affected by your proposal. This should include deregulated users (exempt activities or abstractions < 20 cubic metres per day), anglers and canoeists.

Vale of Glamorgan Council have confirmed of no water abstraction points within 1km from our work site.

13. Planning application

Have you sought advice on your planning application?

No ☒ Yes ☐

If yes, submit a copy of the Planning Authority's response.

14. Declaration

Please see Guidance Note WRX for details of who can sign this section and note the information in that document relating to the Data Protection Act 1998.

By signing below, you are declaring that as far as you know and believe the information given in this form, on any map and in any supporting or additional information, is true.

Signed	Angus Ridge
Print name	Angus Ridge
Position	DIRECTOR
Date	25/2/19

Application Checklist

Please tick the following checklist items to indicate that you have included the required information. If any sections of the form are left blank and no supporting information submitted, where we have insufficient information to make a decision on your application, we will return your application to you.

Essential:

Form WRA completed	☒
Map showing applicant's land boundary with all abstraction and discharge point(s) clearly marked	☒
Evidence of negotiations of expected access rights, if applicable	☒
State number of continuation sheets (enter 0 if none included)	0

Where relevant:

Letter of authorisation from the applicant, allowing the agent to act as signatory	☐
Form WRE completed, if your proposal also requires an impoundment licence	☐
Further information requested in our pre-application response letter to you	☐

For hydropower applications, full flow duration curve for the site, confirmation of the method used to derive this and a copy of the output (graph, data and catchment map) including the Long Term Average rainfall, where available ☐

Planning Authority response, where available ☐

Additional supporting information - please list below:

1. 3493_S_204-ARP-04-XX-LP-CX-09014 - WRA ABSTRACTION LICENSE LOCATION PLAN
2. 3493_S_204-ARP-08-XX-RP-GE-10039 - Hydrogeological Impact Assessment
3. Right of Access Evidence

A3

LANDOWNER

DWR CYMRU
PENTWYN ROAD
NELSON
TREHARRIS
CF46 6LY

LEGEND:

ABSTRACTION POINT
ST 09111 69524

DISCHARGE POINT
ST 09082 69534

DCWW LAND BOUNDARY

0 5 10 20 50 Metres

Scale 1:1250

Rev.	Date.	Drawn.	Description.	Chkd.	Appd.	Date.
P1	14.02.19	LO	FOR INFORMATION	BMB	ASK	14.02.19

Capital Delivery Alliance
Cynghrair Cyflawni Cyfalaf
Ty Awen, Spooner Close, Coed Kernew, Newport, NP10 8FZ

Project Name.
WEYCOCK CROSS WWTW WFD
QUALITY P REMOVAL

Drawing Title.
WRA ABSTRACTION LICENSE
LOCATION PLAN

Suitability.	Suitability Code.
FOR INFORMATION	S2

Originator.	Designer.	Date.
LO	BMB	FEB 19

Internal Project Number.	Scale.	Rev.
241360	1:1250	P1

Drawing Number.
3493_S_204-ARP-04-XX-LP-CX-09014

Dwr Cymru Welsh Water

Weycock Wastewater Treatment Works

Hydrogeological Impact Assessment

3493_S_204-ARP-08-XX-RP-GE-10039

P1 | 14/02/2019

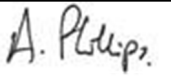
Job number 241360-05

Ove Arup & Partners Ltd
13 Fitzroy Street
London
W1T 4BQ
United Kingdom
www.arup.com

ARUP

Document Verification

ARUP

Job title		Weycock Wastewater Treatment Works			**Job number** 241360-05
Document title		Hydrogeological Impact Assessment			**File reference**
Document ref		3493_S_204-ARP-08-XX-RP-GE-10039			
Revision	**Date**	**Filename**	HIA_WeycockWwTW_Draft1		
Draft 1	12/02/2019	**Description**			
			Prepared by	Checked by	Approved by
		Name	Emma Watts	Les Brown	Aled Phillips
		Signature			
P1	14/02/2019	**Filename**	HIA_WeycockWwTW_Issue		
		Description	Hydrogeological Impact Assessment for refurbishment of the Weycock WwTW		
			Prepared by	Checked by	Approved by
		Name	Emma Watts	Les Brown	Aled Phillips
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			

3493_S_204-ARP-08-XX-RP-GE-10039P114/02/2019

		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
			Issue Document Verification with Document		✓

3493_S_204-ARP-08-XX-RP-GE-10039P114/02/2019

Contents

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Appendices

1 Introduction

1.1 Purpose of this Report

This report presents a Hydrogeological Impact Assessment (HIA) of temporary construction dewatering activities required for the refurbishment and upgrade of Weycock Wastewater Treatment Works (WwTW) located in Weycock Cross in the Vale of Glamorgan county borough, South Wales. This is furthermore known in this report as "The Site".

'Water Abstraction and Impounding (Exemptions) Regulations 2017' requires that certain temporary construction dewatering activities in England and Wales require an abstraction licence. This report presents hydrogeological context of the Site to assess whether an abstraction license is required.

This report outlines a conceptual hydrogeological model of the construction site, summarises the findings of additional ground investigation, and considers the potential connection and risk of impact on nearby sensitive environmental receptors. The conceptual model has then been used to inform a Tier-1 HIA following NRW guidelines[1].

1.2 Legislative Background

The introduction of the 'Water Abstraction and Impounding (Exemptions) Regulations 2017' in England and Wales has introduced the need to licence temporary construction dewatering activities in certain situations.

All large-scale groundwater abstractions required for construction dewatering, as of January 2018, require a licence to carry out these operations. These regulations have been brought into motion to help create a fairer system for all abstractors as well as enable the Regulator to manage water resources more effectively.

The new regulations are cited as the 'Water Abstraction and Impounding (Exemptions) Regulations 2017'[2]. Under Part 2, Section 5 (entitled 'Small scale dewatering in the course of building or engineering works') of these Regulations, the following exemptions to groundwater abstraction licencing are identified:

"Small scale dewatering in the course of building or engineering works"

5.(1) The restriction on abstraction does not apply to an abstraction or series of abstractions of water carried out in the course of building or engineering works for the purpose of dewatering from a sump or excavation if:

> *(a) the abstraction or series of abstractions are temporary and, in any event, carried out over a period of less than six consecutive months beginning with commencement of the first abstraction;*
>
> *(b) each abstraction does not cause or is not likely to cause damage to a conservation site or specific features in such a site;*
>
> *(c) each abstraction does not cause or is not likely to cause damage to protected species; and,*

(d) either:

(i) the water abstracted is immediately discharged to a soakaway; or,

(ii) the volume of water abstracted is less than 100 cubic metres of water per day and there is no intervening use of that water before discharge.

5.(2) Where the abstraction is undertaken within 500 metres of a conservation site or within 250 metres of a spring, well or borehole used to supply water for any lawful use, paragraph (1)(d)(ii) applies in respect of that abstraction as if the reference to 100 cubic metres of water per day were a reference to 50 cubic metres of water per day."

All of these provisions listed above must be satisfied to qualify for an abstraction licence exemption. All abstractions less than 20 m^3/d, for whatever use, will still (as of April 2005) not need to undergo an application for an abstraction licence.

1.3 Description of Proposed Construction Activities

Dewatering is required to facilitate the construction of a 6m square and 8m deep wet well excavation as part of upgrade works for the WwTW at Weycock. This excavation will penetrate through superficial geology and into the underlying limestone bedrock aquifer. Based on the expected groundwater conditions, dewatering will be required to maintain dry working in the excavation. It is anticipated that wellpoint system will be used to dewater the superficial deposits and bedrock to a depth 0.5m below the excavation base (details of the dewatering system are yet to be designed).

The proposed dewatering activities, including construction phases of excavation and installation will be temporary and are currently programmed to be a maximum of 22 consecutive weeks duration.

The excavation will be backfilled with existing material excavated from the area to restore the local natural conditions.

1.4 Need for an Abstraction Licence

It is anticipated that an abstraction licence will be required to permit dewatering at the Site because the estimated maximum daily abstraction rate is 500 m^3/d (5.8 l/s). Additionally, both the most likely and maximum scenarios exceed the 50 m^3/d thresholds as cited in the regulations and so an abstraction licence is required. The full HIA assessment and calculations are shown in **Appendix A**.

The 50 m^3/d in this instance (rather than 100 m^3/d) is due to the proximity of the scheme to the Barry Woodlands Site of Special Scientific Interest (SSSI) conservation site.

NRW have stated that an application for an abstraction licence must be accompanied by a HIA. The HIA methodology is described in 'Hydrogeological

Impact Appraisal for dewatering abstractions'[1]. The HIA methodology is composed of a series of 14 steps as follows:

1. Establish the regional water resource – see Section 2;
2. Develop a conceptual model for the dewatering operation and the surrounding area – see Section 3;
3. Identify all potential water features which are susceptible to flow impacts – see Section 4.1;
4. Apportion the likely flow impacts to the water features – see section 4.2;
5. Mitigate the flow impacts – see Section 4.3;
6. Assess the significance of the net flow impacts – see Section 4.4;
7. Define the search area for drawdown impacts – see Section 5.1;
8. Identify all potential water features which could be impacted by drawdown – see Section 5.2;
9. Predict the likely drawdown impacts – see Section 5.3;
10. Mitigate the drawdown impacts – see Section 5.4;
11. Assess the significance of net drawdown impacts – see Section 5.5;
12. Assess the water quality impacts – see Section 6;
13. Redesign the mitigation measures to minimise flow and drawdown impacts – see Section 7;
14. Develop a monitoring strategy – see Section 8.

2 Regional Water Resource Status

The Site is located within the River Waycock surface water catchment. Surface water and groundwater resources are classed as "Water available for licensing" at Q95 according to the 'Thaw and Cadoxton Abstraction Licensing Strategy 2015'[3].

3 Development of the Conceptual Model

3.1 Site Location and Topography

The Site is located close to the town of Barry in South Wales within the village of Weycock Cross in the Vale of Glamorgan (approximate grid reference of the site is ST 0911 6954). The proposed dewatering activities will take place at this location, as shown in the site plan in **Figure 1**.

The topography of the site is relatively flat with elevations ranging between 23 mAOD and 27 mAOD.

3.2 Published Geology

3.2.1 Geology

Geological Formation	Period Deposited	Estimated Thickness of Deposit (m)	Aquifer Designation	Comments
Superficial Geology				
Made Ground	Recent	0.5	Not classified	Although not shown on geological maps, Made Ground is expected to be common in the area due to the presence of hardstanding and development of the area at the Site.
Alluvium	Recent	N/A	Secondary A	Deposits composed of interbedded clay, silt, sand and gravel[5].
Alluvial Fan Deposits	Recent	N/A	Secondary A	Deposits composed of interbedded clay, silt, sand and gravel[5].
Bedrock Geology				
St Mary's Well Bay Member	Carboniferous	N/A	Secondary A	Part of the Blue Lias Formation. Majority of scheme area is underlain by this bedrock. These rocks are typically composed of alternating sequences of limestone beds interbedded with mudstones[6].
Porthkerry Member	Carboniferous	N/A	Secondary A	Part of the Blue Lias Formation. Outcrops within the scheme area as thin bands. These rocks are typically composed of alternating sequences of limestone beds interbedded with mudstones[6].
Lavernock Shales Member	Carboniferous	N/A	Secondary B	Part of the Blue Lias Formation. Outcrops within the scheme area as thin bands. Typically composed of mudstones[6].

3.2.2 Structural geology

One fault lies within the scheme area. The influence of this on groundwater flow is unknown, and therefore it is not known if this feature acts as a barrier or conduit to flow.

Due to the presence of limestone across the scheme area there is the risk of encountering karstic features, vugs and other dissolution features. There is no evidence of collapse features at the surface.

3.3 Ground Investigation

3.3.1 Previous ground investigation

One phase of ground investigation has been undertaken between 19th to 23rd November 2018 to inform the design of the Weycock WwTW. A total of 1No. dynamic sampled and rotary borehole, 10No. trial pits and 4No. hand dug pits to expose buried services were excavated.

Table 1 below summarises the borehole depths and the methods used, and **Figure 2** below shows the location of these ground investigation boreholes.

Table 1: Phase, excavation method, and depth of ground investigation in vicinity of the Site

Borehole	GI Phase	Grid Reference	Overall depth (m)	Cable percussive (mBGL) (terminated)	Rotary open hole (mBGL)	Rotary core (mBGL) (terminated)
BH01	1	309110.63 169520.31	9.0	-	GL – 3.0	3.0 – 9.0 (confined groundwater)
TP01	1	309083.38 169524.94	2.0	-	-	-
TP02	1	309086.82 169530.90	2.3	-	-	-
TP03	1	309085.39 169517.86	2.2	-	-	-
TP04A	1	309100.37 169517.91	2.0	-	-	-

TP04B	1	309111.71 169523.50	2.0	-	-	-
TP04C	1	309115.92 169525.93	1.75	-	-	-
TP05	1	309105.94 169519.16	2.0	-	-	-
TP06A	1	309112.67 169519.29	1.9	-	-	-
TP06B	1	309108.79 169528.37	1.9	-	-	-
TP07	1	309128.17 169540.58	0.5	-	-	-

The encountered ground conditions in the vicinity of the Site are provided below in **Table 2**.

Table 2: Summary of encountered ground conditions in vicinity of the Site

Borehole/trial pit	Made ground base (m)	Alluvial Fan Deposits base (m)	Bedrock base (m)	Bedrock	Final depth (m)
BH01	-	3.0	9.0 (unproven)	Carbonaceous mudstone with occasional bands of micritic mudstone. Interpreted to be interbedded limestone and mudstone.	9.0

All trial pits encountered approximately 0.3 to 1.0m of made ground within them, overlying alluvial fan deposits.

3.4 Hydrogeology

3.4.1 Ground investigation

Groundwater in borehole BH01 was encountered at a depth of 5 mBGL and was encountered within limestone of the St Mary's Well Bay Member. This groundwater in the limestone showed a rise to 1.3 mBGL[7], suggesting the clay superficial deposits act as a confining layer to the limestone bedrock.

An in-situ rising head permeability testing from the ground investigation suggests a permeability of approximately 3.4 x 10^{-6} m/s for the St Mary's Well Bay Member in the vicinity of the Site[7], see **Appendix A1**.

3.4.2 Conceptual Model

The St Mary's Well Bay Member is anticipated to be the main water-bearing aquifer, with permeable layers within the alluvium and alluvial fan deposits also expected to yield moderate amounts of groundwater. At the Site, the superficial deposits encountered during ground investigation[7] are clay dominated, which confine the bedrock aquifer.

This ground investigation suggests the bedrock aquifer is confined with pressure heads to approximately 1 mBGL.

The nearest high value receptor is Barry Woodlands SSSI, which comprises of several isolated woodland units that are located adjacent to the Site. The nearest unit is located 50m north of the Site and has been assessed by Dr. Rob Lowe of Rigare Ltd. Dr Rob Lowe's assessment[8] concludes that no groundwater-dependent wetland features are present adjacent to the site. On this basis the proposed dewatering can have no effect on the ecohydrological functioning of the SSSI. Other blocks of the SSSI have not been assessed due to them being a significant distance (>300m) from the dewatering works at the Site. This email correspondence is shown in **Appendix B1**.

A figurative conceptual model is shown in **Figure 3**.

3.5 Short-term Construction Activities Associated with Removal of Groundwater

The proposed construction programme at the Site includes phases of deep underground works for construction of the wet well. Dewatering will be required ahead and during the remedial works, planned for the new refurbishment of the Weycock WwTW. The dewatering programme will be temporary, with a scheduled duration of less than 22 consecutive weeks. The location and description of the proposed works are provided in more detail on **Figure 1**.

4 Flow Impacts

4.1 Water Features Susceptible to Flow Impacts

The following features have been considered as part of a desk study to determine all water-dependent receptors that have potential to be affected by flow impacts:

- **Conservation sites:**

  The nearest unit of the Barry Woodlands SSSI is located approximately 50m north (at its nearest extent) and upgradient of the excavation[9]. As detailed in Section 3.4.2, this woodland unit has been assessed and is not in hydraulic connection with groundwater. On this basis this conservation site is not considered further in this section.

- **Local springs:** A desk-based assessment of water features indicates that there are 2 potential springs within 500m of the excavation[9][8]. These are labelled as issues on the 1:50,000 OS Map and are located at grid references ST 0942 6961 and ST 0947 6941 (265m and 325m from the Site respectively). They issue from the Lavernock Shales Member[4]. These are upgradient of the dewatering works and issue from a different formation to those being abstracted from. Therefore, they will not be impacted by changes in flow.

- **Surface watercourses:** Two unnamed tributaries of the River Waycock (classified as field drains on **Figure 1**) are located running adjacent to the north and south of the Site boundary, and downgradient of the excavation[9]. Near the Site these tributaries are located on the alluvial fan deposits, which have been proven during ground investigation to be clay dominated deposits and likely to provide limited baseflow to these tributaries. The River Waycock is located downgradient of the Site, situated on alluvium.

- **Local licensed and unlicensed abstractions:** No water wells are shown on BGS Geoindex[4]. The 2018 Envirocheck report[11] for the project also has not identified any groundwater abstraction licences within 2km of the Site boundary. Correspondence with Glamorgan Council by email confirms there is no known unlicensed abstractions within 1km of the scheme[12], see **Appendix B2**.

4.2 Apportioning of the Flow Impacts

No impacts to flow are anticipated to the two unnamed tributaries of the River Waycock that run adjacent to the Site. This is due to both tributaries being located on alluvial fan deposits downgradient of the planned dewatering works. These alluvial fan deposits are proven to be of a clay nature and are conceptually thought to provide minimal baseflow contributions. These deposits will also act as a confining unit preventing hydraulic connection with the groundwater in the bedrock aquifer.

The alluvium in the area is of an unknown composition and could be in hydraulic connection with the St Mary's Well Bay Member. If they are in connection, then dewatering in the bedrock could impact on the baseflow contributions to the downgradient River Waycock. Any changes to flow in the River Waycock could change erosion and deposition patterns and could impact on the habitats in the downstream river by changes in the geomorphological conditions.

4.3 Mitigation of Flow Impacts

The main discharge point will be to one of the tributaries running adjacent to the Site. These discharge into the River Waycock 200m south of the Site boundary. Discharge to one of the tributaries will fully compensate for any potential reduction in baseflow to the downstream river habitat.

4.4 Significance of Net Flow Impacts

No significant flow impacts are anticipated following mitigation.

5 Drawdown Impacts

5.1 Search Area for Drawdown Impacts

Table 3: Range of radius of influences calculated

Hydraulic Conductivity (m/s)	**Radius of Influence (Ro)- Sichardts, Partially Penetrating (m)**
Minimum 3.4×10^{-7}	13
Mean 3.4×10^{-6}	41
Maximum 3.4×10^{-5}	129

Due to the limitations of the Sichardt's equation, and for a conservative approach, the radius of influence for assessment of drawdown impacts has been taken as 195m. This is one and a half times the maximum radius of influence calculated, as detailed in **Table 3**.

5.2 Water Features Susceptible to Drawdown Impacts

The following features have been considered as part of a desk study to determine all water-dependent receptors that have potential to be affected by drawdown impacts:

> **Conservation sites:** The nearest unit of Barry Woodlands SSSI is located approximately 50m north (at its nearest extent) of the excavation, and upgradient, of the Site[8]. However, this unit of woodland is not groundwater dependent, see Section 3.4.2. The next closest unit of the

SSSI is not within the anticipated radius of influence (>300m) that will be impacted by drawdown.

- **Surface watercourses:** Two unnamed tributaries of the River Waycock, where they lie on the limestone bedrock, located adjacent to the site[8].
- **Local springs:** A desk-based assessment of water features indicates that there are no springs within the radius of influence[8].
- **Local licensed and unlicensed abstractions:** There are no known groundwater abstractions within the radius of influence of the dewatering works[4][11].

5.3 Prediction of Maximum Drawdown Impacts

The maximum radius of influence from each borehole is anticipated to be 195m, as estimated from the Sichardts formula using permeabilities acquired from an on-site falling head test. Two unnamed tributaries of the River Waycock are within 195m of the dewatering works and have the potential to be impacted by the drawdown associated with the dewatering works where they are in potential connection with the bedrock (i.e. no alluvial fan deposits).

5.4 Mitigation of Drawdown Impacts

In terms of surface water, the unnamed tributaries of the River Waycock are the closest watercourse within the maximum radius of influence, and as this is the anticipated discharge point for the abstraction it is not perceived to be negatively affected. As most of the abstracted water is proposed to be discharged to compensate for any reduction in baseflow that may be experienced in the tributaries.

5.5 Significance of Drawdown Impacts

Mitigation should be carried out to ensure that levels within the unnamed tributaries of the River Waycock are maintained so there are no significant adverse effects to the receptor.

6 Water Quality Impacts

The contractor will adhere to the conditions of the Environmental Permit (temporary discharge consent) to ensure that the rate and quality of any discharge to the watercourse does not cause adverse effects to the wider environment. The method of treatment will be explained in detail in the Construction Environmental Management plan (CEMP) which will be produced prior to any activities on site. Contamination of water bodies should be prevented by best practice (following Guidance for Pollution Prevention[13]).

A settlement tank will be used to allow settling in the abstracted water to limit levels of silt that might be released to the environment. In addition, the use of a

2mm-5mm silica filter pack within each wellpoint is being considered, which will act as an additional treatment barrier by allowing the filtration of the groundwater prior to it reaching the surface.

7 Redesign Mitigation Methods

Currently it is proposed to discharge all the abstracted water directly to one of the unnamed tributaries of the River Waycock. Discharge will be via a settlement tank to prevent excess siltation, and no negative impacts on water quality in the tributary are anticipated.

8 Monitoring and Reporting Plan

Regular monitoring of abstraction volumes will be undertaken throughout the duration of the dewatering works. The discharge quality will also be monitored visually to check that quality and turbidity is suitable for discharge to the surface watercourse.

9 Conclusions

This report presents an HIA that follows the methodology outlined in NRW guidelines. The assessment concludes that a temporary abstraction licence will be required for the proposed construction dewatering activities at Weycock WwTW. This is because the estimated abstraction volume will exceed 50 m^3/d, the maximum permitted abstraction volume when a conservation site is within 500m of the dewatering works.

The assessment has reviewed all possible impacts to any local water features and concluded there are no residual impacts following the mitigation to discharge to a surface watercourse adjacent to the Site.

In addition, no changes to the existing hydrological regime are anticipated post-construction to any water-dependent habitats as a result of the construction works.

As a result, no further tiers of investigation are considered necessary, given the temporary nature of the abstraction.

10 References

[1] Environment Agency, 2007. Hydrogeological impact appraisal for dewatering abstractions. Science Report - SC040020/SR1

[2] The Water Abstraction and Impounding (Exemptions) Regulations 2017. 2017 No. 1044, PART 2, Regulation 5. https://www.legislation.gov.uk/uksi/2017/1044/regulation/5/ made Accessed 29/20/2018

[3] Thaw and Cadoxton Abstraction Licensing Strategy. May 2015. https://cdn.naturalresources.wales/media/682043/thaw-cadoxton-licensing-strategy-final-may-15.pdf?mode=pad&rnd=131596369480000000

[4] BGS Geoindex webmap http://mapapps2.bgs.ac.uk/geoindex/home.html. Accessed 14/05/2018

[5] BGS Sheet 263: Cardiff - Drift http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001758 Accessed 29/01/2019

[6] BGS Sheet 263: Cardiff – Solid http://www.largeimages.bgs.ac.uk/iip/mapsportal.html?id=1001757 Accessed 29/01/2019

[7] Quantum Geotechnical, 2018. Weycock Cross: Geotechnical Interpretative Report Phase 1 Ground Investigation. Report No: xx

[8] Dr Rob Lowe, personal communication. Email dated 20th December 2018.

[9] Magicmap. http://magic.defra.gov.uk/MagicMap.aspx. Accessed 12/11/2018

[10] Google Maps. https://www.google.co.uk/maps. Accessed 12/11/2018

[11] Groundsure. Enviro Insight report, 2018. BGS Weycocks Cross WwTW and RM.

[12] Glamorgan Council, personal communication. Email dated 19th October 2018.

[13] Guidance for Pollution Prevention http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/. Accessed 30/05/2018

Figures

Figure 1: Site layout and proposed works with geological map

A3

SSSI - Barry Woodlands

Sewage Works

Unnamed field drain

Solar Farm

Water level and invert level of field drain survey point

TP1

TP2

TP7

Water level and invert level of field drain survey point

TP6

CS

TP3

TP4

TP5

BH1 - position to be agreed on site with MMB and GI Contractor. Refer to Schedule 2.

Solar Farm

Water level and invert level of field drain survey point

Solar Farm

Unnamed field drain

Legend

Existing WwTW

- Decommission, make safe, fill in
- Decommission, make safe, remove

Superficial deposits

- Alluvium
- Alluvial Fan Deposits

Bedrock

- St Mary's Well Bay Member

Features & constraints

- Historical Tanks (likely sludge) now shown as heavily vegetated area.
- Solar Farm
- Hardstanding
- SSSI - Barry Woodlands

Ground Investigation

- Proposed borehole
- Proposed trial pit
- Proposed water level and invert level of field drain survey

Issue	Date	By	Chkd	Appd
P0	2018-10-05	DZ	KI	DR

Metres

0 5 10 20

Client

DCWW

Dŵr Cymru Welsh Water

Job Title

Weycock WwTW

Figure 1

Features and Constraints Plan

Scale at A3

1:500

Job No	Drawing Status
241360-00	**Preliminary**

Drawing No	Issue
Figure 1	**P0**

10/08/2017 09:14:35

\\global\europe\Cardiff\Jobs\241000\241360-0004 Internal Project Data\4-80 GIS\4-84 Map Documents\GEO_Geotechnics\GIS weycock.mxd

Template A3: Version 2

Figure 2: Geological Cross-section from Ground Investigation

ARUP

Calculation sheet

Job No.	Sheet No.	Rev.
241360	1 of 1	

Member Location: Cont.

Drg. Ref.:

Job title: Weycock WWTW

Made by: DZ | Date: 26 Nov 2018 | Chd.:

Geo sketch section NOT TO SCALE

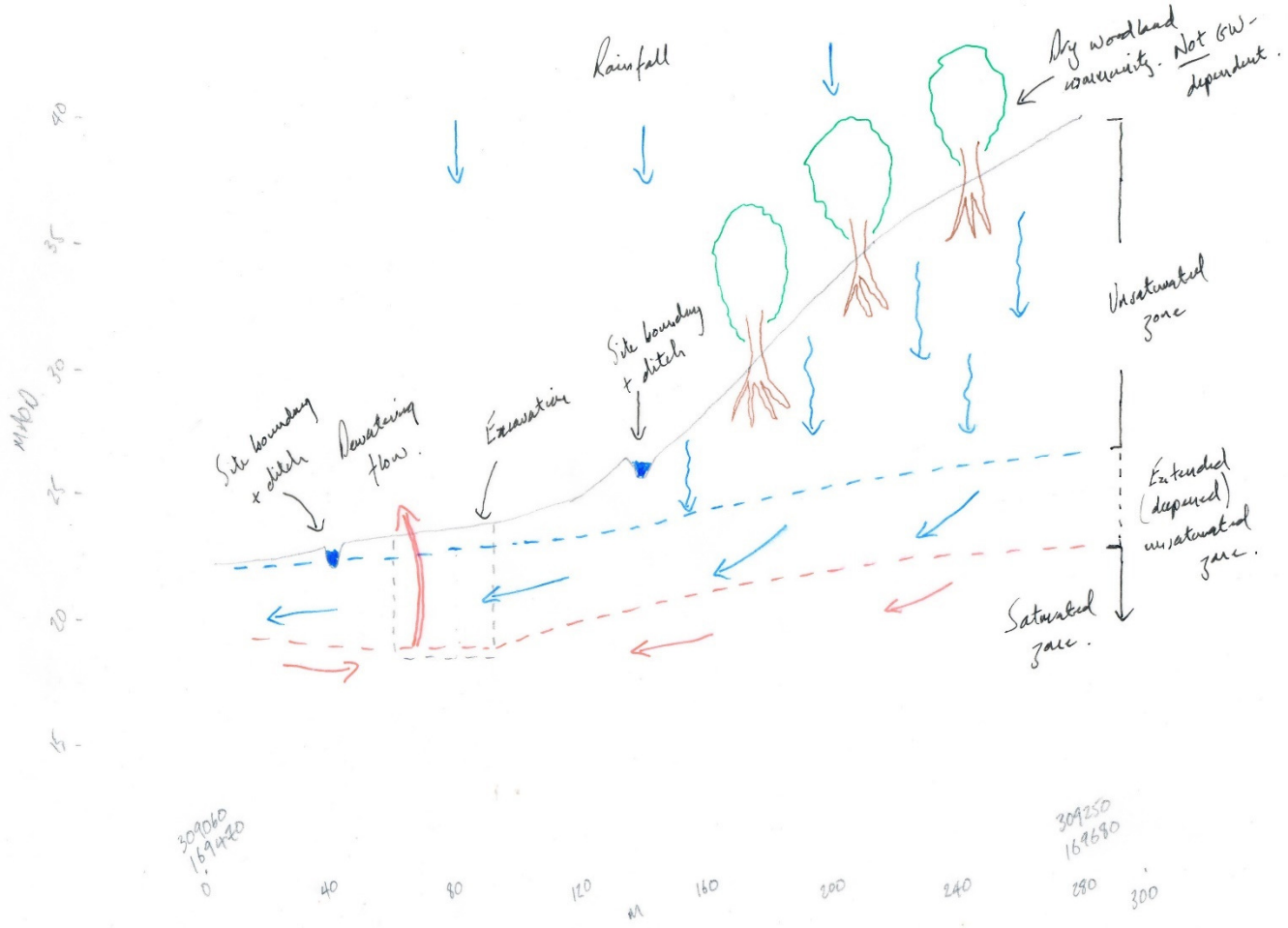
Unnamed Stream

Weycock WwTW

TP03 TP01 TP02 TP4A TP05 TP06B TP06A TP04B TP04C TP07

OAP20

Figure 3: Conceptual site model of the proposed dewatering works (constructed by Dr Rob Lowe)[8]



Appendices

Appendix A

Hydrogeological Impact Assessment

A1 Rising Head Test Analysis

N.B. The rising head test was carried out by Quantum Geotechnical on 24th January 2019, and an analysis was carried out by them on the data. After this was reviewed by Arup it was determined that the analysis was incorrect, and a subsequent analysis was carried out by Arup and has been used to inform this assessment. This appendix shows the edited assessment completed by Arup.

CONTRACT:		**Weycock Cross WWTW**	**CONTRACT No.**	**G40192**
TYPE OF TEST:		**RISING HEAD TEST IN STANDPIPE**	**DATE OF TEST:**	**24.02.19**
			BOREHOLE No.	**BH01**
Depth Below Ground level to:			**Ground Level**	
Base of Test Zone (m)		**5.75**	**(m A.L.D.)**	**24.570**
Top of Test Zone (m)		**3.00**	**Elevation of**	
Initial Ground Water Level prior to Test Commencing (mbgl)		**1.17**	**Casing (m A.L.D.)**	**-**
Height of Casing Above Ground Level (m)		**0.00**	**Diameter of Borehole (mm)**	**50**

TIME ELAPSED (t-t0, mins)		**DEPTH AT TIME (t) (from Ground Level, m)**	**HEAD AT TIME (t) (H, m)**	**HEAD RATIO H/Ho**
0	0.68	1.85	0.68	1.00000
1	0.45	1.62	0.45	0.66176
2	0.27	1.44	0.27	0.39706
3	0.18	1.35	0.18	0.26471
4	0.11	1.28	0.11	0.16176
5	0.05	1.22	0.05	0.07353
6	0.03	1.20	0.03	0.04412
7	0.01	1.18	0.01	0.01471
8	0.00	1.17	0.00	0.00000

Remarks: Unable to Lower Water Level any further, pump flow rate 6.5 Litres/min

BS EN ISO 22282-2 (Hvorslev method)

$$k = \frac{r^2 \cdot \ln\left(L/R\right)}{2 \cdot L \cdot t_o}$$

r (radius of measuring tube, m) =	0.025
R (radius of the test section, m) =	0.0536
L (length of test section, m) =	2.75
t0 (time it takes for water level to rise/fall 37 percent of initial change in head, s) =	132
k (coefficient of permeability, m/s) =	**3.39E-06**

IN-SITU PERMEABILITY TEST

(B.S. 5930:1999)

9.673691937

DRAWN	T M Burke	CHECKED	
APPROVED		DATE	
REV A DATE		REV B DATE	

A2 HIA Radial Flow Assessment

ARUP

JOB TITLE	Weycock WwTW Hydrogeological Impact Assessment
JOB NUMBER	241360-05
MADE BY	EW
CHECKED BY	LB
DATE	14/02/2019
Description of spreadsheet	Appendix A- Hydrogeological Impact Assessment Calculations to support HIA report.
Sheet Number prefix	
Member/Location	
Drawing Reference	
Filename	

CONTENTS OF SPREADSHEET

Sheet	Description
Cover	
References	
Confined- Partially Penetrating	

AUTHORISATION OF LATEST VERSION

Type and method of check		Full calculation and methodology check
Signatures & dates:	Made by	Emma Watts
	Checked	Les Brown

REVISIONS Current Revision 1

Rev.	Date	Made by	Checked	Description
1	12/02/19	EW	LB	Calc check undertaken by LB on sheet 'Confined- Partially Penetrating'.

KEY

Input value	These will need to be changed for each assessment
Calculated value	Do not edit
HIA output value	Do not edit
AquiferTest Raw data	

Heath (1983) reports the following values (in percent by volume) for porosity, specific yield and specific retention:

Material	Porosity (%)	Specific Yield (%)	Specific Retention (%)
Soil	55	40	15
Clay	50	2	48
Sand	25	22	3
Gravel	20	19	1
Limestone	20	18	2
Sandstone (unconsolidated)	11	6	5
Granite	0.1	0.09	0.01
Basalt (young)	11	8	3

The following table shows representative values of specific yield for various geologic materials (from Morris and Johnson 1967):

Material	Specific Yield (%)
Gravel, coarse	21
Gravel, medium	24
Gravel, fine	28
Sand, coarse	30
Sand, medium	32
Sand, fine	33
Silt	20
Clay	6
Sandstone, fine grained	21
Sandstone, medium grained	27
Limestone	14
Dune sand	38
Loess	18
Peat	44
Schist	26
Siltstone	12
Till, predominantly silt	6
Till, predominantly sand	16
Till, predominantly gravel	16
Tuff	21

http://www.aqtesolv.com/aquifer-tests/aquifer_properties.htm

Radius of Influence and Flow Rates from a Fully Penetrating Analysis

Analysis - Confined Aquifer. Partial penetration of equivalent well. Feed by radial flow (groundwater only)

Assumptions: Radial flow to well, partially penetrating well, confined aquifer, circular source at distance Ro (Theim equation)
from Cashman and Preene, 2013

Qpp = B*Qfp where:
Qfp = (2πkD (H-hw)) / (ln[R0/re])

Project: Weycock Cross

EGL (Equivalent ground level) =	0	BEGL	Datum should be taken as ground level (Note BEGL= below equivalent ground level)
GWL (Groundwater level) =	1.13	BEGL	Ground level monitoring shows maximum groundwater levels at approximately 1.13 mBGL
BoE (Base of Excavation) =	8	BEGL	Anticipated maximum depth of excavation
EXL (Drawdown level) =	8.5	BEGL	Drawdown should take place to 0.5m below the bottom of the excavation so groundwater does not intercept excavation
DD req (Total Drawdown required) =	7.37	m	
Top of aquifer =	5	BEGL	Top of confined aquifer as shown on ground investigation borehole no. BH01
Bottom of aquifer =	25	BEGL	Base of confined aquifer is not known, no deep borehole logs exist in the area to prove the thickness. However a 20m thick aquifer has been assumed as the effective aquifer, as per usual in limestone aquifers where top part is most fractured/fissured
H =	23.87	m	Height of original water table above base of aquifer
hw =	16.5	m	Height of maximum depression of groundwater above base of aquifer
D =	20	m	Aquifer Thickness
c (empirical factor) =	3000		As per Sichardt's equation for radial flow
a (length of excavation) =	6	m	Anticipated length of excavation
b (width of excavation) =	6	m	Anticipated width of excavation
r (radius of wellpoints) =	0.075	m	Radius of wellpoints needed for partial penetration analysis
K (minimum) =	3.39E-07	m/s	
K (maximum) =	3.39E-05	m/s	
K (mean) =	3.39E-06	m/s	Mean has been taken from a variable head test completed in BH01 at the site, the minimum and maximum have been taken as one order of magnitude from this value for a conservative approach.

Radius of Influence calculator: Sichardts

Ro = 3000(h - hw) √k

Scenario	c	H m	hw m	K m/s	Ro (Sichardts) m
Minimum K	3000	23.87	16.5	3.39E-07	**12.87**
Maximum K	3000	23.87	16.5	3.39E-05	**128.73**
Mean K	3000	23.87	16.5	3.39E-06	**40.71**

Used to convert a rectangular pit to a circular one.

re = √(ab/π)

re, Effective Radius for excavation m	a m	b m	π
3.39	6	6	3.14

Flow rate calaculator

Scenario	π	K m/s	T m2/s	H m	hw m	Ro m	re m	Q l/s	Q m3/d
Minimum K	3.14	3.39E-07	6.78E-06	23.9	16.5	12.87	3.39	0.24	20.31
Maximum K	3.14	3.39E-05	6.78E-04	23.9	16.5	128.73	3.39	8.63	745.59
Mean K	3.14	3.39E-06	6.78E-05	23.9	16.5	40.71	3.39	1.26	109.07

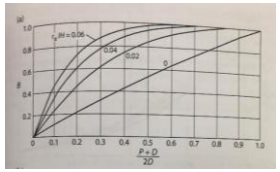
Partially Penetrating Assessment

Partial Penetrating Assessment- Confined	
rw	0.08
H	23.87
rw/H	**0.003142019**
P (Top of Aquifer - Toe of wellpoint)	6
D	20
P + D/2D	**0.65**
B (FROM GRAPH)	**0.67**

Assumed toe of wellpoint 2.5m below drawdown required; 2.5m suction head for wellpoints

From Preene and Cashman p203

Qfp (l/s)	B	Qpp (BQfp) (l/s)	Qpp (m3/d)
0.24	0.67	**0.16**	**13.61**
8.63	0.67	**5.78**	**499.54**
1.26	0.67	**0.85**	**73.08**



Distance of receptor from excavation 300 m

Drawdown at receptor boundary

	Minimum K	Maximum K	Mean K	
pik	1.06E-06	1.06E-04	1.06E-05	m/s
2.3Qlog(Ro/ri)	-0.000495323	-0.004886131	-0.001688	m2/s
si (Drawdown at SSSI boundary)	**0.00**	**0.00**	**0.00**	m

Distance of 2nd receptor from excavation 300 m

Drawdown at receptor boundary

	Minimum K	Maximum K	Mean K	
pik	1.06E-06	1.06E-04	1.06E-05	m/s
2.3Qlog(Ro/ri)	-4.95E-04	-0.004886131	-0.001687514	m2/s
si (Drawdown at SSSI boundary)	**0.00**	**0.00**	**0.00**	m

Appendix B

Email Correspondence

B1 Correspondence with Dr Rob Lowe R.E. Barry Woodlands SSSI

Emma Watts

From: rob@rigare.co.uk
Sent: 20 December 2018 15:28
To: Debbie Brown; Katherine Iles
Cc: Barbara Modrzejewska-Baudin; Emma Watts; Gerd Cachandt; Mike Jones (G); Claire Pooley
Subject: RE: [External] RE: Weycock Barry - SSSi support to potential abstraction licence

Thanks Debbie, that's useful. I can't see any surface water features within the block of woodland adjacent to the site, but there are such features mapped in some of the other blocks.

Katherine et al. Given the above and previous email, my conclusion is that there are almost certainly no groundwater-dependent wetland features within the woodland block adjacent to the site, and therefore that the proposed dewatering will have no effect on the ecohydrological functioning of this block of SSSI woodland.

The site for proposed dewatering is c. 300 m away and significantly the downslope of the next closest area of SSSI woodland, to the south-west. This separation, and also the scale of the excavation and the estimated dewatering rate, almost certainly preclude ecohydrological impacts on this block of woodland as well, even if it contains a groundwater-dependent wetland feature(s).

A site visit would reduce the (already small) uncertainty relating to this conclusion.

Do you need anything from me in terms of formal outputs, for example for inclusion in the report?

(I have spent 1.5 hours on this so far)

Rob

From: Debbie Brown <debbie.brown@arup.com>
Sent: 20 December 2018 14:25
To: rob@rigare.co.uk; Katherine Iles <katherine.iles@arup.com>
Cc: Barbara Modrzejewska-Baudin <Barbara.Modrzejewska@arup.com>; Emma Watts <Emma.Watts@arup.com>; Gerd Cachandt <Gerd.Cachandt@arup.com>; Mike Jones (G) <Mike-G.Jones@arup.com>; Claire Pooley <Claire.Pooley@arup.com>
Subject: RE: [External] RE: Weycock Barry - SSSi support to potential abstraction licence

Hi Rob,

No surveys of the SSSI have been undertaken by ourselves, however I have reviewed the NRW habitat mapping information which indicates that the SSSI sectors to the north-east of the road are all semi-natural broadleaved woodland, with dominant species ash, oak and hazel (see attached).

There is no indication of the locations of hydrological features within these woodlands unfortunately.

Please let me know if there is anything else you need.

Kind regards,
Debbie

Debbie Brown
Ecologist | Consulting West
MCIEEM

I will be out of the office on Mondays and Fridays

Arup
4 Pierhead Street Capital Waterside Cardiff CF10 4QP United Kingdom
d: +44 29 2026 6444 m: +44 78 2443 4441
www.arup.com

Connect with me on LinkedIn

From: rob@rigare.co.uk [mailto:rob@rigare.co.uk]
Sent: 18 December 2018 15:46
To: Katherine Iles <katherine.iles@arup.com>; Debbie Brown <debbie.brown@arup.com>
Cc: Barbara Modrzejewska-Baudin <Barbara.Modrzejewska@arup.com>; Emma Watts <Emma.Watts@arup.com>; Gerd Cachandt <Gerd.Cachandt@arup.com>; Mike Jones (G) <Mike-G.Jones@arup.com>; Claire Pooley <Claire.Pooley@arup.com>
Subject: RE: [External] RE: Weycock Barry - SSSi support to potential abstraction licence

Ah, apologies, that's my Outlook playing up – I was hoping that would be fixed with moving to a new machine – anyway…. . Completed email as follows. Worth reading the whole thing as I'd edited the text I'd already written as well.
……..

Hi Katherine,

Thanks for the information.

The first thing I need to do is identify any SSSI interest features which have hydrology-related supporting conditions (this more-or-less equates to them being wetland features), and I wonder whether Debbie or Claire could help with this. Looking at the SSSI citation for Barry Woodlands (attached):

- My guess is that the majority ash woodland doesn't have any hydrology-related supporting conditions (i.e. isn't wetland).
- Later in the citation there is mention of flushes, streams, humid ravines and wooded swamp (with upwelling calcareous water). These features are obviously associated with hydrology-related supporting conditions, and I wonder whether we know where these are within the SSSI?

Looking at the OS 2-25K coverage, the closest bit of the SSSI to your site (it borders it) is Coed Bach. It is upslope of your site, located on a relatively steep slope, and there are no surface water or wetland features marked within the SSSI or obvious on Google Earth. Given these circumstances I would be surprised if there was any groundwater-mediated ecohydrological effects from dewatering within this part of the SSSI.

The nearest other parts of the SSSI are c. 300 m away, and just from a proximity v. dewatering rate (estimated > 50 m3/d, which is only 0.6 l/s – need confirmation on this), I'd be very surprised if there were any effects from the dewatering.

It would be good to have any information on anticipated dewatering rates and drawdown radii, and also on the locations of any wetland features within the SSSI, to test the above.

Rob

From: Katherine Iles <katherine.iles@arup.com>
Sent: 18 December 2018 15:17
To: rob@rigare.co.uk; Debbie Brown <debbie.brown@arup.com>
Cc: Barbara Modrzejewska-Baudin <Barbara.Modrzejewska@arup.com>; Emma Watts <Emma.Watts@arup.com>; Gerd Cachandt <Gerd.Cachandt@arup.com>; Mike Jones (G) <Mike-G.Jones@arup.com>; Claire Pooley <Claire.Pooley@arup.com>
Subject: RE: [External] RE: Weycock Barry - SSSi support to potential abstraction licence

Hi Debbie,

As discussed, can you provide support to Rob – see email below.

Rob,
I note you'd not finished your email – was there further comment / query?

Many Thanks,

Katherine

From: rob@rigare.co.uk <rob@rigare.co.uk>
Sent: 18 December 2018 3:00 PM
To: Katherine Iles <katherine.iles@arup.com>
Cc: Barbara Modrzejewska-Baudin <Barbara.Modrzejewska@arup.com>; Emma Watts <Emma.Watts@arup.com>; Gerd Cachandt <Gerd.Cachandt@arup.com>; Mike Jones (G) <Mike-G.Jones@arup.com>
Subject: [External] RE: Weycock Barry - SSSi support to potential abstraction licence

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- Later in the citation there is mention of flushes, streams, humid ravines and wooded swamp (with upwelling calcareous water). These features are obviously associated with hydrology-related supporting conditions, and I wonder whether we

---

From: Katherine Iles <katherine.iles@arup.com>
Sent: 18 December 2018 10:59
To: Rob Low <rob@rigare.co.uk>
Cc: Barbara Modrzejewska-Baudin <Barbara.Modrzejewska@arup.com>; Emma Watts <Emma.Watts@arup.com>; Gerd Cachandt <Gerd.Cachandt@arup.com>; Mike Jones (G) <Mike-G.Jones@arup.com>
Subject: Re: Weycock Barry - SSSi support to potential abstraction licence

Hi Rob,

Thanks for helping us out here and providing support at relatively short notice.

Outline brief:
To confirm, investigation of proposed construction excavation depths has identified high groundwater flows and a rate of >50m3 per day is anticipated for dewatering likely to take less than 4 months. On this basis, an abstraction licence is anticipated to be required. In relation to gathering of information and developing our understanding of water resources and any sensitive site, the support we require is a review and assessment of any sensitive sites within the Weycock site area that may be impacted by any dewatering activities. From our brief discussion, I understand you may need up to half a day (3 to 4 hours), to provide information to inform the Hydrogeological Impact Assessment (HIA) that our hydrogeologist (Emma) is progressing with.

In relation to the sensitivity of any protected sites, we are particularly interested to understand if any SSSI in close proximity to the site would be sensitive to very short term dewatering and if there may or may not be impact on habitats… flora / fauna etc. This will help us determine to need to go down the pump test route or whether available information is adequate to develop the hydrogeological conceptual model and be satisfied with the assessment of potential impact on any receptors.

Available information:
I'm providing some key bits of information below, and if you need more detail and information please just ask.

Proposed works at the Weycock Waste Water Treatment works (in relation to dewatering activities):
Part of the works that is likely to require dewatering is the excavation for the construction of the new pumping station. Excavations may be in the order of around 4 to 5mbgl, however the design of the proposed pumping station is currently ongoing.

Geo & Enviro work done to date:
Part 1 high level desk study
Part 2 detailed desk study (refer to Figure 1A high level constraints mapping)
BH specification (refer to Drawing 3 showing proposed GI locations, including the BH for log attached)

Intrusive ground investigation:
A GI was undertaken in November 2018. Refer to the proposed GI positions provided on Drawing 3 attached.

The log of BH1 is attached.

Should you require any further information please let me know.

Many Thanks,

Katherine

Katherine Iles
Senior Engineer | Geotechnics | Infrastructure West
BSc(Hons) MIES CSci CGeol FGS

Arup
4 Pierhead Street Capital Waterside Cardiff CF10 4QP United Kingdom
d: +44 29 2026 6548 m: +44 7841 249 655
www.arup.com

Connect with me on LinkedIn

B2 Correspondence with Glamorgan Council R.E. Private Abstractions

Emma Watts

From: Lewis, Keri <kelewis@valeofglamorgan.gov.uk>
Sent: 19 October 2018 13:31
To: David Zhao
Cc: Morgan, Rhodri
Subject: [External] RE: Private water supplies information - Weycock

Follow Up Flag: Follow up
Flag Status: Completed

Hi David

In Rhodri's absence, and following payment confirmation, I have followed up this EIR. I have searched the 1km radius area for the scheme near Weycock Cross roundabout as requested. There are no known private water supplies within the search area.

I trust this assists.

From June 2017 my working pattern has changed to Weds AM, Thursday and Friday.

Cofion cynnes / Warm regards,

Keri Lewis

Shared Regulatory Services

www.srs.wales

MR. KERI LEWIS BSc (Hons) MSc CEnv MIEnvSc FGS
SPECIALIST SERVICES OFFICER | ENVIRONMENT
Shared Regulatory Services | Gwasanaethau Rheoliadol a Rennir
Bridgend, Cardiff and Vale of Glamorgan
Email: kelewis@valeofglamorgan.gov.uk
Mobile Phone: 07971287302

CEnv
Chartered Environmentalist

From: David Zhao [mailto:david.zhao@arup.com]
Sent: 14 September 2018 17:08
To: Morgan, Rhodri

Cc: Katherine Iles; Barbara Modrzejewska-Baudin
Subject: Private water supplies information - Weycock

Hi Rhodri,

We are undertaking a hydrogeological study for a scheme near Weycock cross roundabout near Barry and was wondering if you had any information on private water supplies within a 1km radius of the scheme area. Please see the site location plan attached. Any queries just get in touch.

Kind regards,

David Zhao
Engineer | Geotechnics
BA (Mod) (Hons), FGS

Arup
4 Pierhead Street Cardiff CF10 4QP United Kingdom
d: +44 20 7755 5677
www.arup.com

Connect with me on LinkedIn

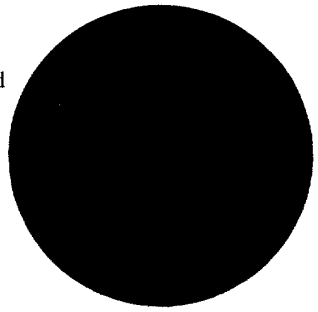
HM LAND REGISTRY

LAND REGISTRATION ACTS 1925 to 1971

LAND CERTIFICATE

THIS IS TO CERTIFY THAT THE land described in the property register and shown on the official plan of the title numbered as stated on the back page of this certificate is registered at HM Land Registry with the class of title stated in the proprietorship register. There are annexed to this certificate office copies of the entries in the register and of the official plan and, where so indicated in the register, of documents filed in the Land Registry.

Under section 68 of the Land Registration Act 1925 and rule 264 of the Land Registration Rules 1925, this certificate shall be admissible as evidence of the matters contained herein and, under section 64 of the said Act, must be produced to the Chief Land Registrar on every entry in the register of a disposition by the registered proprietor of the land and on every transmission thereof.



WARNING

1. No endorsement, note, notice or entry made in this certificate other than those officially made at HM Land Registry shall have any operation.

2. All persons are cautioned against altering, adding to or otherwise tampering with this certificate or any document annexed thereto.

The most recent date entered below is the latest one on which this land certificate was made to agree with the register.

A land certificate may be sent at any time to the appropriate district land registry to be brought up to date in any respect that may be necessary. This service is provided free of charge and is usually completed within a day or two of the receipt of the certificate. By this means, a registered proprietor is provided with conclusive evidence of the current state of the register.

Although the copy of the title plan in the certificate will correspond with the title plan filed at the Land Registry on the latest date specified below, a later revision of the Ordnance Survey Map may have taken place and in this connection your attention is drawn to the General Information Notes below concerning 'Inspection of the Land', 'Revision of the Ordnance Survey Map' and 'Boundaries of Registered Land'.

Dates when this land certificate was made to correspond with the register.

COMPARED WITH 10 SEP 1986 REGISTER			

GENERAL INFORMATION

OFFICE COPIES OF THE REGISTER

A registered proprietor may obtain from the appropriate district land registry an office copy of his registered title by applying on printed form A44 and paying the prescribed fees according to the scale for the various items set out on that form. Form A44 (like all other printed Land Registry forms) may be purchased from any branch of H.M. Stationery Office or through a law bookseller or stationer. Any other person may, with the written authority of the registered proprietor, likewise obtain an office copy of the register. Office copies are usually prepared and despatched within two days of the receipt of the application.

SEARCHES OF THE REGISTER

An intending purchaser, lessee or mortgagee who holds the written authority of the registered proprietor to inspect the register may apply to the appropriate district land registry for an official search to ascertain whether any entries have been made in the register since the date of issue of the office copy, or, alternatively, the date on which the land certificate was last made to correspond with the register. The issue of the official certificate of the result of search will automatically confer upon the purchaser, lessee or mortgagee priority for a full period of thirty working days for the lodging of the application to register the disposition. If the disposition is of the whole of the land in the registered title, application should be made in printed form 94A but, if it affects only a part of the land in the registered title, printed form 94B should be used. The official certificate of the result of search will be issued in most cases by return of post.

The above is a general outline of the procedure for obtaining an official certificate of search as laid down by the current land registration rules relating to official searches. The effect of these rules is explained in Practice Leaflet No. 2 which is obtainable free of charge from any district land registry. This deals with the procedures of searching in much greater detail than can be given here. It also explains how an application for official search without priority can be made and how solicitors can make official searches by telephone or teleprinter. Before applying for official searches, applicants are strongly recommended to refer to the current land registration rules relating to official searches or to Practice Leaflet No. 2.

INSPECTION OF THE LAND

Intending purchasers should inspect the land for the purpose of ascertaining its precise boundaries and discovering whether there are any rights of way, light, drainage or other overriding interests to which it is subject (see the inside back page of this cover sheet). Enquiries should also be addressed to any person in occupation of the land or buildings thereon as to their rights of occupation and to whom rent (if any) is paid.

REVISION OF THE ORDNANCE SURVEY MAP

The title plans prepared by H.M. Land Registry are based on the large scale maps of the Ordnance Survey. The Ordnance Survey Map is revised from time to time and a new title plan based on a later revision may be substituted for the plan filed at the Land Registry. If this occurs, an entry to that effect will be made in the register and the copy of the title plan in this certificate will be replaced when the certificate is next lodged at the Land Registry.

ADDRESS FOR SERVICE

The address of any person as entered in the register shall, unless he otherwise directs, be his address for service (Land Registration Rules, 1925, rule 315). Registered proprietors should notify the appropriate district land registry of any change of address and forward the land certificate for amendment. No fee is charged for making the alteration.

H.M. LAND REGISTRY

TITLE NUMBER

WA 334431

H.M. LAND REGISTRY

Map Reference ST0969

Edition 1 opened 20.5.1986 TITLE NUMBER WA334431 *This register consists of* 2 *pages*

A. PROPERTY REGISTER

containing the description of the registered land and the estate comprised in the Title

COUNTY	DISTRICT
SOUTH GLAMORGAN	VALE OF GLAMORGAN

The Freehold land shown and edged with red on the plan of the above Title filed at the Registry being land on the East side of Waycock Road, Barry.

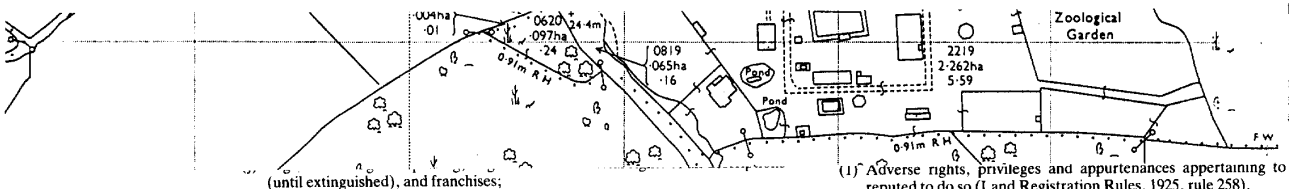
B. PROPRIETORSHIP REGISTER

stating nature of the Title, name, address and description of the proprietor of the land and any entries affecting the right of disposing thereof

TITLE ABSOLUTE

Entry number	Proprietor, etc.
1.	WELSH WATER AUTHORITY of Cambrian Way, Brecon, Powys, registered on 20 May 1986.
2.	RESTRICTION registered on 20 May 1986:-Except under an Order of the registrar no charge by the proprietor of the land is to be registered.

Any entries struck through are no longer subsisting



(until extinguished), and franchises;

(1) Adverse rights, privileges and appurtenances appertaining to other land or reputed to do so (Land Registration Rules, 1925, rule 258).

(2) All rights and title conferred on the National Coal Board (Coal Act 1938, section 41; Coal Industry Nationalisation Act, 1946, section 5).

Demand No. 8954115 1/86 W & W Ltd. 1314

er Model III

The most recent date entered below is the latest one on which this land certificate was made to agree with the register.

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COMPARED WITH REGISTER 10 SEP 1986

TITLE NUMBER WA334431

H.M. LAND REGISTRY AB 10

C. CHARGES REGISTER

containing charges, incumbrances etc., adversely affecting the land and registered dealings therewith

Entry number	The date at the beginning of each entry is the date on which the entry was made on this edition of the register	Remarks
1.	20 May 1986-The land in this title is subject to the following rights reserved by a conveyance thereof dated 16 December 1975 made between (1) Annie Lakin (Vendor) and (2) George Wimpey & Co. Limited (Company):- "EXCEPTED and RESERVED unto the Entitled Persons out of this Conveyance for the benefit of the Reatined Land and every part thereof full right and liberty for agricultural purposes only in conjunction with the agricultural use of the Retained Land to pass and repass with or without motor vehicles agricultural machinery and animals over and along the Brown Land being the site of the said access road to be constructed thereon by the Company as hereinafter mentioned. IT IS HEREBY AGREED AND DECLARED that Mrs Lakin and her successors in title or other the owners for the time beinf of any part of the Retained Land shall have the right to connect to at such point or points as shall be agreed by the Company and draw water from any main water pipes which may be laid by the Company over the Development Site and the Retained Land provided that any of such persons who effect such connection shall arrange for suitable payment to the relevant water Authority for any water so consumed and shall duly comply with any statutory or local regulations in connection therewith."	H.M. LAND REGISTRY AB 10

Any entries struck through are no longer subsisting

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REVISION OF THE ORDNANCE SURVEY MAP

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APPURTENANT RIGHTS AND PRIVILEGES

Under rule 251 of the Land Registration Rules, 1925, the registration of a person as proprietor of land vests in him together with the land, all buildings, erections, fixtures, commons, hedges, ditches, fences, ways, waters, watercourses, liberties, privileges, easements, rights and advantages whatsoever, appertaining or reputed to appertain to the land, or any part thereof, or at the time of registration demised, occupied, or enjoyed therewith or reputed or known as part or parcel of or appurtenant to the land or any part thereof.

POSITIVE COVENANTS

The obligation to perform positive covenants (e.g., covenants to erect and maintain fences, to repair roads or to indemnify a predecessor in title in respect of the observance and performance of existing covenants) is not a burden on the land. Consequently such covenants are not entered as incumbrances in the charges register. On a sale of registered land, as on a sale of unregistered land, the vendor will want to satisfy himself as to whether or not he has entered into any positive covenants so that he may, when requisite, take an indemnity covenant from the purchaser.

Examination of the land certificate will reveal positive covenants when they are intermixed with restrictive covenants set out therein or contained in any deed or documents a copy of which is included in the certificate. In addition, since 1952, positive covenants contained in transfers of registered land have been noted in the proprietorship register. This procedure was adopted to overcome the difficulty that, since transfers are filed in H.M. Land Registry after registration, the existence of positive covenants contained therein might otherwise be overlooked. No such note is made in respect of positive covenants entered into prior to the date of first registration of the land because the deeds or copies of them are in the hands of the registered proprietor (or his mortgagee) and are thus available to him for inspection.

BOUNDARIES OF REGISTERED LAND

Rule 278 of the Land Registration Rules, 1925, provides as follows:

1. Except in cases in which it is noted in the property register that the boundaries have been fixed, the filed plan or general map shall be deemed to indicate the general boundaries only.

2. In such cases the exact line of the boundary will be left undetermined—as, for instance, whether it includes a hedge or wall and ditch, or runs along the centre of a wall or fence, or its inner or outer face, or how far it runs within or beyond it; or whether or not the land registered includes the whole or any portion of an adjoining road or stream.

To ascertian the exact boundaries of land registered with general boundaries, the land should, therefore, be inspected, and such inquiries as to, and perambulation of, boundaries made as may be necessary.

OVERRIDING INTERESTS

The Register kept by H.M. Land Registry under the Land Registration Acts, 1925 to 1971, is guaranteed by the State and takes the place of the title deeds necessary in the case of unregistered land. It does not normally, therefore, show matters which are not usually disclosed in an abstract of title.

In addition to the charges and other matters set out in the Charges Register, registered land may (like unregistered land) be subject to:

1. Such rights as may be ascertained by
   (a) inspection of the land; e.g., rights of way, light, drainage and other easements;
   (b) enquiry of the occupier; e.g., leases not exceeding 21 years granted at a rent without taking a fine.

2. Liabilities arising under Acts of Parliament
   (a) affecting land generally; e.g., redemption annuities and other rates and taxes of a general character;
   (b) affecting land in a particular district; e.g., in London the Metropolis Management Act, the Building Acts, the Public Health Acts, etc;
   (c) the possibility of compulsory acquisition or requisition whether permanently or for a limited period, by a Government Department or a local authority; e.g., under the Town and Country Planning Acts, the Agriculture Act, 1947, etc.

3. Local land charges, i.e., charges in favour of a local authority under an Act of Parliament and registered as provided for by the Local Land Charges Act, 1975, in the local registers kept by such local authority.

The list of overriding interests to which registered land may be subject contained in section 70 of the Land Registration Act, 1925, is as follows:

(1) All registered land shall, unless under the provisions of this Act the contrary is expressed on the register, be deemed to be subject to such of the following overriding interests as may be for the time being subsisting in reference thereto, and such interests shall not be treated as incumbrances within the meaning of this Act, (that is to say):

(a) Rights of common, drainage rights, customery rights (until extinguished), public rights profits à prendre, rights of sheepwalk, rights of way, watercourses, rights of water, and other easements not being equitable easements required to be protected by notice on the register;

(b) Liability to repair highways by reason of tenure, quit-rents, crown rents, heriots, and other rents and charges (until extinguished) having their origin in tenure;

(c) Liability to repair the chancel of any church;

(d) Liability in respect of embankments, and seas and river walls;

(e) Payments in lieu of tithe, and charges or annuities payable for the redemption of tithe rentcharges;

(f) Subject to the provisions of this Act, rights acquired or in course of being acquired under the Limitation Acts;

(g) The rights of every person in actual occupation of the land or in receipt of the rents and profits thereof, save where enquiry is made of such person and the rights are not disclosed;

(h) In the case of a possessory, qualified, or good leasehold title, all estates, rights, interests, and powers excepted from the effect of registration;

(i) Rights under local land charges unless and until registered or protected on the register in the prescribed manner;

(j) Rights of fishing and sporting, seignorial and manorial rights of all descriptions (until extinguished), and franchises;

(k) Leases for any term or interest not exceeding twenty-one years, granted at a rent without taking a fine;

(l) In respect of land registered before the commencement of this Act, rights to mines and minerals, and rights of entry, search and user, and other rights and reservations incidental to or required for the purpose of giving full effect to the enjoyment of rights to mines and minerals or of property in mines or minerals being rights which, where the title was first registered before the first day of January, eighteen hundred and ninety-eight, were created before that date, and where the title was first registered after the thirty-first day of December, eighteen hundred and ninety-seven, were created before the date of first registration;

Provided that, where it is proved to the satisfaction of the registrar that any land registered or about to be registered is exempt from land tax, or tithe rentcharge or payments in lieu of tithe, or from charges or annuities payable for the redemption of tithe rentcharge, the registrar may notify the fact on the register in the prescribed manner.

(2) Where, at the time of the first registration any easement, right, privilege, or benefit created by an instrument and appearing on the title adversely affects the land, the registrar shall enter a note thereof on the register.

(3) Where the existence of any overriding interest mentioned in this section is proved to the satisfaction of the registrar or admitted, he may (subject to any prescribed exceptions) enter notice of the same or of a claim thereto on the register, but no claim to an easement, right, or privilege not created by an instrument shall be noted against the title to the servient land if the proprietor of such land (after the prescribed notice is given to him) shows sufficient cause to the contrary.

The following overriding interests have been added to the list:

(1) Adverse rights, privileges and appurtenances appertaining to other land or reputed to do so (Land Registration Rules, 1925, rule 258).

(2) All rights and title conferred on the National Coal Board (Coal Act 1938, section 41; Coal Industry Nationalisation Act, 1946, section 5).

LAND REGISTRATION ACTS

1925 to 1971

LAND CERTIFICATE

Title Number: WA334431.

NOTES

1. *Solicitors are requested to inform their clients of the above title number so that they may record it and thus render it readily available for future use.*
2. *So that this Certificate may readily open bookwise, it should not be further folded.*

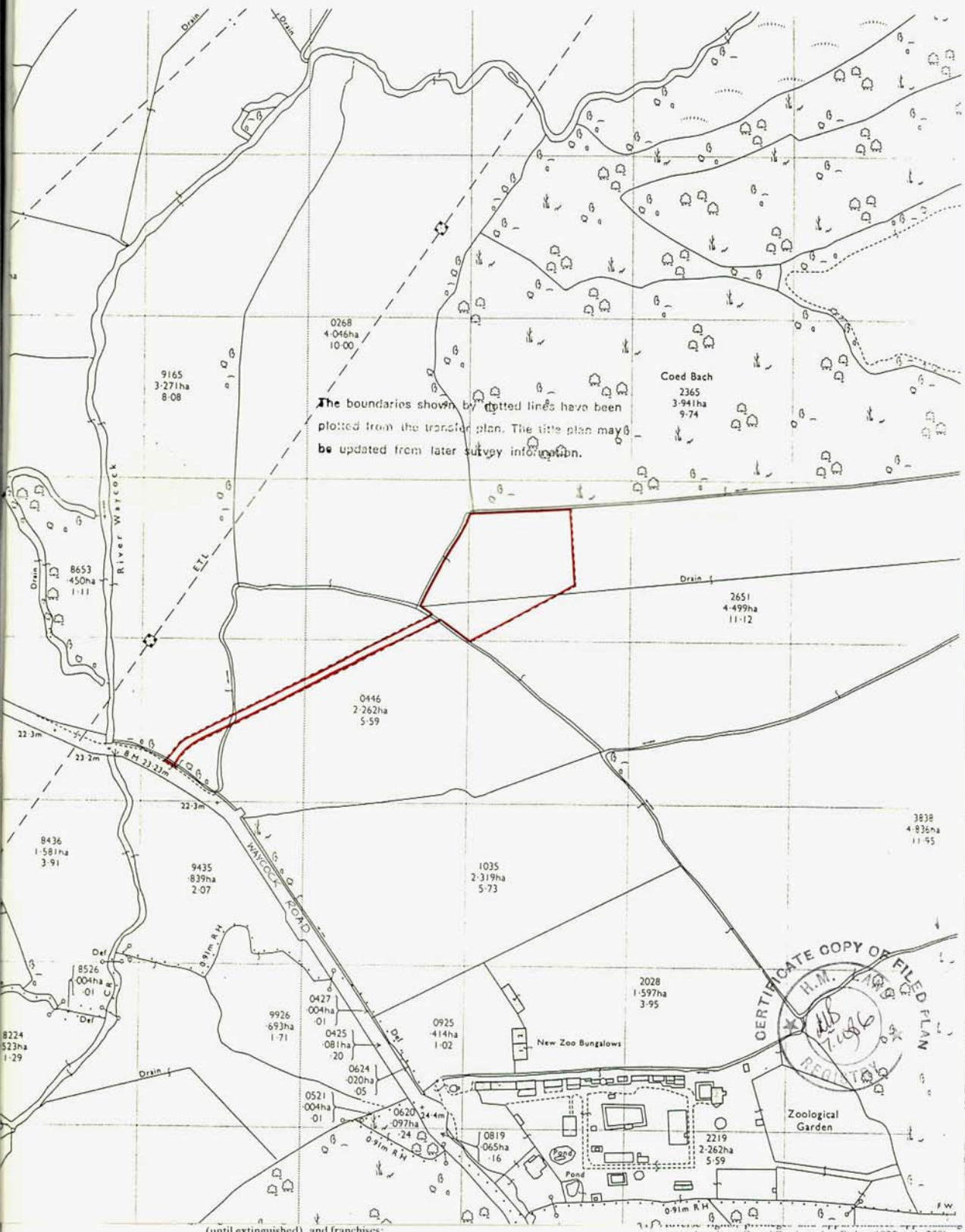
78 I

Dd 8882437 310M 3/85 Ed(223801)

H.M. LAND REGISTRY

TITLE NUMBER	
WA 334431	

ORDNANCE SURVEY PLAN REFERENCE	ST0869/0969.		Scale 1/ 2500
COUNTY SOUTH GLAMORGAN	DISTRICT VALE OF GLAMORGAN		© Crown copyright 1972



(until extinguished), and franchises;

reputed to do so (Land Registration Rules, 1925, rule 258).

(2) All rights and title conferred on the National Coal Board (Coal Act 1938, section 41; Coal Industry Nationalisation Act, 1946, section 5).

DP/G/16A

Form 20
(Freehold or Leasehold)

Land Registration Acts 1925 to 1971

H.M. Land Registry

Stamp pursuant to section 28 of the Finance Act, 1931, to be impressed here	*When the transfer attracts Inland Revenue duty, the stamps should be impressed here before lodging the transfer for registration*

* *Use form 43 when fresh restrictive covenants are imposed.*

TRANSFER OF PART
NOT IMPOSING FRESH RESTRICTIVE COVENANTS*

(Rule 98 or 115, Land Registration Rules, 1925)

The Title number allotted to the land transferred will on registration be officially entered opposite	WA334431

Oyez Publishing Limited
Norwich House
11/13 Norwich Street
London EC4A 1AB
a subsidiary of
The Solicitors' Law Stationery Society, Limited

F23525. 1/77
★★★★

County and district (or London borough) SOUTH GLAMORGAN VALE OF GLAMORGAN

Title number(s) WA 23983

Property HIGHLIGHT PARK SEWAGE TREATMENT WORKS BARRY

Date 12th May 1986

In consideration of ONE POUND

(1) *Strike out if not required.*

pounds (£1.00) (1)*the receipt whereof is hereby acknowledged*

(2) *Insert in BLOCK LETTERS, full name(s), postal address(es) and occupation(s) of the proprietor(s) of the land.*

(2) WIMPEY HOMES HOLDINGS LIMITED OF 27 HAMMERSMITH GROVE LONDON

(3) *If desired or otherwise as the case may be (see rules 76 and 77).*

(3)*as beneficial owner(s)* hereby transfer(s) to:

(4) *Insert in BLOCK LETTERS, full name(s), postal address(es) and occupation(s) of transferee(s) for entry on the register.*

(4)
WELSH WATER AUTHORITY
CAMBRIAN WAY
BRECON
POWYS

(5) *See notes as to plan on page 4.*

the land shown and edged with red on the (5)plan bound up within and known as HIGHLIGHT PARK SEWAGE TREATMENT WORKS BARRY

being part of the land comprised in the title above mentioned

[OVER

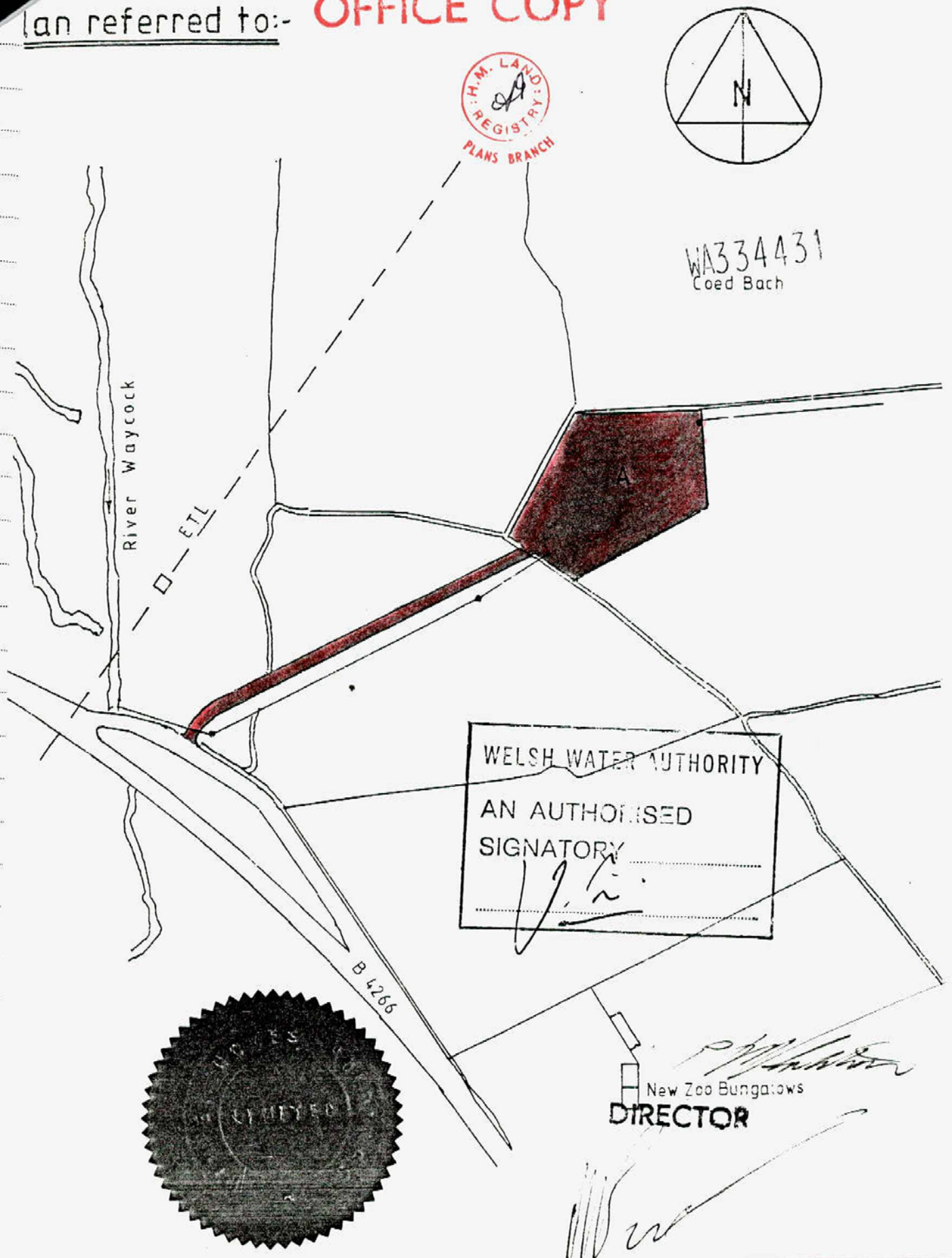
lan referred to:-

OFFICE COPY

H.M. LAND REGISTRY PLANS BRANCH

WA334431

Coed Bach



WELSH WATER AUTHORITY

AN AUTHORISED SIGNATORY

DIRECTOR

Wimpey Homes Holdings Limited,
382 Newport Road,
CARDIFF.

FOR AND ON BEHALF OF

WIMPEY HOMES HOLDINGS LIMITED

Scale - 1:2500

ıace is not sufficient, additional sheets may be used provided they are securely sewn hereto; the execution and attestation should in that case be added at the end.

a certificate of the purposes of p Act, 1891, and Acts is not re- this paragraph deleted.

(1)*It is hereby certified that the transaction hereby effected does not form part of a larger transaction or series of transactions in respect of which the amount or value or aggregate amount or value of the consideration exceeds* £30,000

r use when the r is a company ration.

(2)*The common seal of* WIMPEY HOMES HOLDINGS LIMITED

was hereunto affixed in the presence of

r other officers ed by the articles iation, charter, etc. tnote).

(3)*Director*

(3)~~Secretary~~ AUTHORISED SIGNATORY

THE COMMON SEAL OF

or use by trans- other than a y or corporation.

(4)~~Signed, sealed and delivered by the said~~ WELSH WATER AUTHORITY

in the presence of

~~Name~~

~~Address~~ AN AUTHORISED SIGNATORY

~~Occupation~~

1365

(4)Signed, sealed and delivered by the said

Seal

in the presence of

Name

Address

Occupation

‡ In the case of a company or corporation unless the transfer has been executed in accordance with section 74(1) of the Law of Property Act, 1925, it should be accompanied by a certificate signed by the secretary or solicitor of the company or corporation that the transfer has been duly executed in accordance with the company's articles of association or the corporation's statute, charter, etc.

[OVER