

22 November 2018

Permit Receipt Centre
Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP

Dear Sir / Madam,

HIGHLAND SPRING LIMITED
SITE LOCATION: 'BLAEN TWYNI'

Application to Vary an Existing Groundwater Abstraction Licence WA/059/0001/014

Please find enclosed WRA and WRD application forms and associated supporting documentation covering the existing licence (WA/059/0001/014) held by Highland Spring Limited.

Also enclosed is a letter of authorisation from Highland Spring Limited allowing Envireau Water to represent and sign forms relating to the abstraction licence application, a supporting report and a location figure. We will pay the application fee of £135 by credit card if you would please call on 01332 871882.

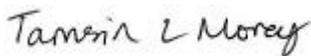
If in determining the application there are any queries or questions please contact us as soon as possible (tamsin@envireauwater.co.uk) so that we may address them.

Pre-application discussions have been carried out with Charlotte Lillywhite and Hannah Pearce (Permitting Officers, Water Resources) and Kay Roberts (Geoscience) from NRW so please ensure that they are consulted on the application.

Please ensure that all correspondence regarding the application is directed to Envireau Water so that we are able to respond promptly. Please also ensure that the draft licence is sent to Envireau Water so that we are able to check it prior to finalisation.

We look forward to receiving the varied licence in due course but in the meantime if you would like to discuss any aspect of the application then please do not hesitate to contact us.

Yours faithfully,



Tamsin Morey MSc CEnv
Principal Water Resources Specialist



Permit Receipt Centre (Cardiff)
Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP

Dear Sir/Madam

HIGHLAND SPRING LIMITED
SITE LOCATION: 'BLAEN TWYNI'

Application to vary an existing groundwater abstraction licence

We hereby authorise Envireau Water to represent and sign on our behalf, forms relating to an application to vary the abstraction conditions on existing abstraction licence WA/059/0001/014, held by Highland Spring Limited.

Yours sincerely

A handwritten signature in black ink that reads "Bryan McCluskey". Below the signature, the date "21/11/18" is written in the same ink.

Bryan McCluskey

Group Operations Director

On behalf of Highland Spring Limited

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



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) | <input type="checkbox"/> | Only complete this form |
| * Pre-application enquiry (hydropower) | <input type="checkbox"/> | Also complete form WRB |
| * Application for a Groundwater Investigation Consent | <input type="checkbox"/> | Only complete form WRC |
| New full abstraction licence | <input type="checkbox"/> | Also complete form WRD |
| New temporary abstraction licence | <input type="checkbox"/> | Also complete form WRD |
| New licence to transfer water | <input type="checkbox"/> | Also complete form WRD |
| New impoundment licence | <input type="checkbox"/> | Also complete form WRE |
| Renewal of a time-limited licence | <input type="checkbox"/> | Also complete form WRD |
| Removal of an existing impoundment | <input type="checkbox"/> | Also complete form WRE |
| Technical variation of an abstraction licence | <input checked="" type="checkbox"/> | Also complete form WRD |
| Technical variation of an impoundment licence | <input type="checkbox"/> | Also complete form WRE |
| * Administrative variations to existing licences | <input type="checkbox"/> | 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

P18-017

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

-

Full Name

-

Company, Charity or
Trading Name

HIGHLAND SPRING LIMITED

Company or Charity
Registration Number

SC067339

Registered Address

STIRLING STREET
BLACKFORD
PERTSHIRE
SCOTLAND

Postcode: PH4 1QA

Office: 01360 312121
Mobile: 07787 413678

Telephone Number

Email Address

williamb@highlandspringgroup.com

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

MS

Full Name

TAMSIN MOREY

Company, Charity or Trading Name

ENVIREAU WATER

Position in Company

PRINCIPAL WATER RESOURCES SPECIALIST

Registered Address

CEDARS FARM BARN
MARKET STREET
DRAYCOTT
DERBYSHIRE

Postcode: DE72 3NB

Telephone Number

Office: 01332 871882
Mobile: 07979 168997

Email Address

tamsin@envireauwater.co.uk

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

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

Kay Roberts / Charlotte Lillywhite
WA/059/0001/014

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

WA/059/0001/014

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

SN
SN

85389
58280

17540
17262

7.3 Source of supply or location of proposed impoundment

Sandstone aquifer

7.4 Site name / reference

Blaen Twyni Site

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.

THIS APPLICATION IS TO REMOVE THE 'HANDS OFF FLOW' CONTROLLED RESTRICTION ON ABSTRACTION RATE (FURTHER CONDITIONS SECTION 9.1) FOR ABSTRACTION RATES UP TO 245m³/hr.

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	<input type="text" value="Tamsin L Morey"/>
Print name	<input type="text" value="TAMSIN MOREY"/>
Position	<input type="text" value="AGENT TO HIGHLAND SPRING LIMITED"/>
Date	<input type="text" value="21/11/2018"/>

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

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
- 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)
BH A (PRODUCTION BOREHOLE 5)	SINGLE POINT	SN 85389 17540	
BH B (PRODUCTION BOREHOLE 6)	SINGLE POINT	SN 85280 17262	

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.

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)
BH A (PRODUCTION BOREHOLE 5)	COMMERCIAL WATER BOTTLING	ALL YEAR	123,822.0	340.0	14.2	24	3.97
BH B (PRODUCTION BOREHOLE 6)	COMMERCIAL WATER BOTTLING	ALL YEAR	123,822.0	340.0	14.2	24	3.97
		Total	123,822.0	340.0	14.2		

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 CHANGE FROM EXISTING LICENSED QUANTITIES.

THE LICENCE VOLUME OF 123,822 m³ ALLOWS THE BOTTLING OF 99,057.6 m³ WITH THE REMAINING 20% BEING USED FOR CIP / WASHDOWN OF BOTTLES / LINES THAT ARE IN CONTACT WITH THE PRODUCT AND THEREFORE MUST BE WASHED WITH PRODUCT WATER. WASH WATER IS DISCHARGED THROUGH A REED BED TREATMENT SYSTEM TO THE NANT TWYNNI UNDER TRADE EFFLUENT PERMIT (No. BP0294701).

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)
<i>e.g. Carrots</i>	<i>Silty clay</i>	<i>10</i>	<i>90</i>

Livestock type	Number of animals	Maximum daily quantity of water used (cubic metres)	Comments
<i>e.g. Sheep</i>	<i>200</i>	<i>0.005 per animal</i>	<i>Drinking water</i>
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)
<i>e.g. Greens</i>	<i>0.9</i>	<i>220</i>
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
<i>e.g. Ice cream</i>	<i>1.9 cubic metres per tonne of ice cream</i>	<i>10,000 tonnes</i>
WATER BOTTLING	1m ³ per 800 litres bottled	99,057,600 litres

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 m³/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.

SEE THE GROUP ENVIRONMENTAL STATEMENT AND THE ENVIRONMENTAL OBJECTIVES APPENDED TO THIS APPLICATION.

ALL WASTE/NON-BOTTLED WATER FROM THE SITE IS DISCHARGED THROUGH A REED BED TREATMENT SYSTEM TO THE NANT TWYNNI VIA TRADE EFFLUENT PERMIT (No. BP0294701).

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.

N/A

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		
Screen aperture size (mm)		

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)
Q, FIGURE 1	SN 85268 17407	ANY VOLUME ABSTRACTED IN EXCESS OF 118.4m ³ /d WHEN HoF ACTIVE	N/A

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

IF THE HOF IS ACTIVE THEN THE PUMPING RATES FROM THE BOREHOLES ARE REDUCED VIA INVERTER DRIVES TO THE LOWER PERMITTED TOAL ABSTRACTION RATE OF 4.93M³/HR (118.4M³/D). IF ANY EXCESS WATER IS ABSTRACTED THEN THIS IS DISCHARGED FROM THE SITE VIA THE REED BED SYSTEM DESCRIBED ABOVE.

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.

SEE ACCOMPANYING MONITORING SUMMARY REPORT.

THE HOF WAS ORIGINALLY APPLIED WITH THE AIM OF PROTECTING AGAINST PUMPING INDUCED LOW FLOWS IN THE NANT TWYNNI WHICH MIGHT AFFECT FISH PASSAGE. THE LONG TERM TESTING ALONGSIDE MONITORING OF GROUNDWATER LEVELS AND STREAM FLOWS HAS DEMONSTRATED THAT THE GROUNDWATER AND SURFACE WATER SYSTEMS ARE NOT CONNECTED AT THE SITE.

13. Planning application

Have you sought advice on your planning application?

No N/A 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

Tamsin L Morey

Print name

TAMSIN MOREY

Position

AGENT TO HIGHLAND SPRING LIMITED

Date

22/11/2018

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

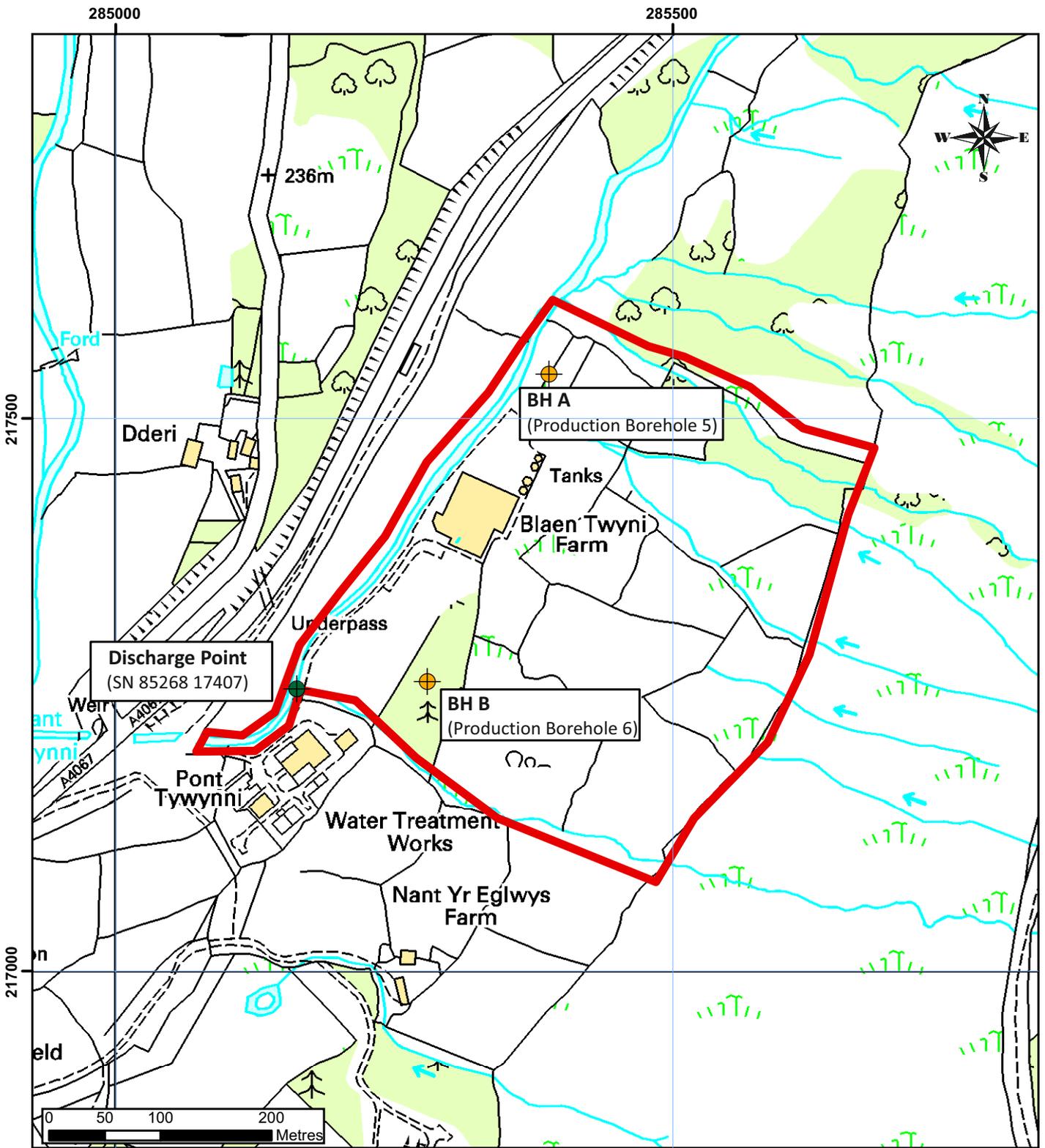
Evidence of negotiations of expected access rights, if applicable

State number of continuation sheets (enter 0 if none included)

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:

- Report summarising long term monitoring exercise undertaken at the site



Reproduction of base map with the permission of The Controller of Her Majesty's Stationary Office © Crown copyright. Licence No. AL 100050002. Scale 1 : 5,000 at A4

KEY

 Applicant's Land Boundary	 Abstraction Points	 Discharge Point
---	--	---



Ref: P18-017 HS Blaen Twyni HIA\ Figure 1 - Land Boundary and Abstraction Points
Date: 15/10/2018

Highland Spring Limited

Figure 1

Blaen Twyni Site Boundary, Abstraction & Discharge Points

Environmental Management System

Document Title: Group Environmental Policy

Approval: Head of Technical



ENVIRONMENTAL POLICY

Highland Spring Ltd was formed in Blackford at the Ochils in 1979 and has evolved into the Highland Spring Group. There are 5 sites across the United Kingdom, of varying footprint. Employing over 440 staff, we have the biggest UK produced brand of Bottled Water with 95% of our output sold in the UK. The production facilities are dedicated to the bottling of natural sourced water in a range of packaging formats to suit all consumer needs.

1. Highland Spring Group is committed, without prejudice to the development and sustainability of its business, to minimise the impact of its operations on the environment.
2. Highland Spring Group will promote practices to ensure that the organisation meets compliance, as a minimum standard, with all applicable regulatory and legislative requirements and will seek to achieve continual improvement in environmental performance.
3. Areas of specialist responsibility are allocated to key personnel to monitor and report on environmental achievement. The Environment Team, led by a senior member of management, will carry out reviews of procedures and trends, setting objectives and targets to effectively control transport and distribution, waste, emissions, discharges, land contamination and the consumption of natural resources, materials, fuel and energy. Priority will be given to ensuring the protection of the catchment area for our water.
4. In accordance with our continuing policy to protect the integrity of our Mineral, Spring and Bottled Water sources and catchment areas, Highland Spring Group will endeavour to minimise adverse environmental effects, protecting biodiversity and the ecosystem by preventing pollution in daily operations and any new developments of the business.
5. Without compromise or restriction to trade, where economically viable, and meeting our customer needs Highland Spring Group will strive to minimise our packaging through light weighting, use of recycled and innovative materials, provided their use does not prejudice the integrity of the product water.
6. Highland Spring Group will promote, in its staff training programmes, the implementation of good environmental practices.
7. This policy is available to all company employees, suppliers and customers and to any other interested party. The company's environmental policy is documented and reviewed annually.

CHIEF EXECUTIVE:

A handwritten signature in black ink, appearing to read "res", followed by a long horizontal flourish.

DATE: 14th October 2017

1/ Environmental Objectives

- The Fells produce high quality bottled water and is committed to continuous improvement in all its activities to minimise its impact on the environment. Our vision is to conduct business activities in an environmentally responsible and sustainable manner. Particular consideration will be given to:
 - **Legal compliance**
The Fells is committed to compliance with relevant environmental legislation as an absolute minimum standard for all operations, in addition to meeting the requirements of relevant industry codes of practice and standards.
 - **Carbon management**
We will aim to incorporate energy efficiency measures at all levels of the business and evaluate opportunities for the use of renewable energy sources.
 - **Sustainable waste management**
Priority will be given to the elimination and minimisation of waste at source. We will actively encourage source segregation of waste to facilitate the reuse and recycling of materials. The Fells is committed to ultimately eliminating the use of landfill as a disposal route, and actively seeking more sustainable solutions for unavoidable waste.
 - **Product packaging**
We are committed to identifying the best packaging choices for our products, balancing the needs of the environment, product protection and food safety.
 - **Water & Effluent Management**
We will promote the efficient use of water and encourage water conservation measures, without compromising hygiene standards. We will aim to minimise material losses to drain, to reduce the environmental impact of authorised discharges from our facilities, and utilise effluent treatment plants to ensure compliance where required.
 - **Pollution prevention**
Storage & handling of hazardous materials and essential site infrastructure will be managed and maintained in order to meet our commitment to prevent pollution.
 - **Communication & training**
The Fells recognise the vital role that colleagues play in reducing the environmental impact of our operations, and will provide adequate resource, training and information to ensure that the appropriate skills and competences are available within the business to implement this policy. The Environmental team will meet on a regular basis to facilitate communication on environmental matters and to facilitate the sharing of best practice.
 - **Continual improvement**
Colleagues are encouraged to challenge the way we do things, to seek a better way and to drive continual improvement in our environmental performance. This will be supported through the internal reporting and review of appropriate environmental key performance indicators (KPI's).



NANT TYWYNNI MONITORING 2018

HIGHLAND SPRING GROUP, BEACONS SITE (BLAEN TWYNI)



For

Highland Spring Group
Stirling Street
Blackford
Perthshire
PH4 1QA



By

Envireau Water (Wales)
PO Box 215
Mold
CH7 9EH

Tel: 01824 780922
E-mail: wales@envireauwater.co.uk
Web: www.envireauwater.co.uk



TABLE OF CONTENTS

1	BACKGROUND	1
2	INTRODUCTION	2
3	CONCEPTUAL MODEL.....	2
4	MONITORING AND DATA COLLECTION	2
5	2018 MONITORING DATA	2
5.1	Rainfall and Stream Stage / Flow Data.....	3
5.2	Groundwater.....	4
5.3	Abstraction.....	5
6	CONCLUSION	5
	REFERENCES	7

FIGURES

Figure 1	Site Location and Monitoring Points
Figure 2	Nant Tywynni Stream Stage and Rainfall
Figure 3	Stage-Discharge Relationship Nant Tywynni (2015-2018)
Figure 4	Nant Tywynni Stream Discharge and Rainfall
Figure 5	Flow Duration Curve (October 2015 – July 2018)
Figure 6	Nant Tywynni Stream Discharge Accretion (2015-2018)
Figure 7	BH2 Groundwater Level, Stream Stage and Rainfall
Figure 8	Groundwater Levels and Abstraction
Figure 9	BH5 Abstraction, Rainfall, Groundwater Levels and Stream Stage

TABLES

Table 1	Low Flow Duration Statistics
---------	------------------------------

© Envireau Ltd. 2018

Envireau Ltd. Registered in England & Wales No. 6647619. Registered office: Cedars Farm Barn, Market Street, Draycott, Derbyshire, DE72 3NB, UK.

Any report provided by Envireau Ltd. is for the client's use and may be reproduced by the client for internal use. The report must not be issued to third parties without the express written consent of Envireau Ltd. If the report is released to any third party, Envireau Ltd will not accept responsibility or liability of any nature to that third party to whom the report (or part thereof) is released. Moreover, Envireau Ltd will accept no liability for damage or loss as a result of any report being made known to, or relied upon by, a third party, unless expressly agreed with Envireau Ltd in writing.

Revision	Details	Completed by	Date	Checked by	Date
REV01	Final	MU	07/11/2018	TM	08/11/2018

NANT TYWYNNI MONITORING 2018

HIGHLAND SPRING GROUP – BLAEN TWYNI

1 BACKGROUND

Flow monitoring on the Nant Tywynni at Highland Spring's water bottling plant at Blaen Twyni, Pen-Y-Cae ("the Site") began in 2005. The purpose of the monitoring exercise has been to assess the connectivity between the groundwater and surface water systems at the Site and to evaluate the impact of groundwater abstraction carried out under licence (WA/059/0001/014) from production boreholes BH5 and BH6, upon flows in the Nant Tywynni. The primary concern of Environment Agency Wales (EAW) at the time was that abstraction induced low flows could potentially impact upon fish passage along the Nant Tywynni.

A Hands-Off-Flow Condition (HOF), currently in place on the licence, was designed to protect against such low flows. At the time the absence of a rated section at the Site meant that the HOF was based at Craig-Y-Nos gauging station downstream on the River Tawe. This HOF historically often resulted in abstraction being curtailed at the plant during the summer months. The HOF was temporarily removed via a Groundwater Investigation Consent (GIC) by EAW for a period of five years (2005-2009) to allow monitoring on the Nant Tywynni to continue without interruption. The monitoring consistently concluded that the groundwater and surface water systems at the Site are separate and that groundwater abstraction at the plant does not impact on streamflow in the Nant Tywynni.

Despite the monitoring conclusions of the initial five monitoring seasons (2005 – 2009), the then owner of the site did not progress discussions with EAW to a licence variation application with some six years passing before Highland Spring purchased the Site. Discussions commenced between Envireau Water and Natural Resources Wales (NRW) in 2015 to re-activate the project. Due to the intervening period, NRW requested that additional monitoring be carried out in order to review the conclusions of the historic monitoring and whether the conceptual groundwater and surface water systems model at the Site remained valid. A new GIC (WA/059/0001/014) was issued on 27/07/2015 to temporarily remove the HOF to allow continued abstraction / monitoring and was extended in October 2016 to cover the period up until 31/10/2018.

Following issue of the new GIC, monitoring recommenced at the historic monitoring points in October 2015 and has now been in place for the preceding three years to present. A Monitoring Summary and Hydrological Impact Assessment report covering the 2015 - 2017 monitoring period [Ref. 1] was submitted to NRW in February 2018. This included the 2005-2009 monitoring reports as appendices. No fundamental issues or concerns were raised by NRW. However, it was recommended by NRW, that given the time left on the GIC, monitoring should continue during 2018 to try to capture a further low flow period.

2 INTRODUCTION

The purpose of this document is to present and review the results of the 2018 monitoring season within the context of the 2015-2017 monitoring period and to re-test the conceptual model of the groundwater and surface water systems at the Site. The report should be read in conjunction with Ref.1 and the historic reports contained within.

3 CONCEPTUAL MODEL

The conceptual model of the groundwater and surface water systems at the Site developed between 2005 and 2009 and validated over the 2015-2017 season of the monitoring project is as follows:

- Stream discharge in the Nant Tywynni and groundwater levels are very strongly linked with rainfall;
- Groundwater levels are consistently higher than water levels in the Nant Tywynni;
- Periods of high groundwater level generally correspond to periods of high water level in the Nant Tywynni and vice versa;
- Changes in groundwater level are often very much more pronounced than changes in water level in the Nant Tywynni; and
- Variations in the abstraction rate from the production boreholes has no noticeable effect on either stream stage/discharge in the Nant Tywynni or groundwater level in the observation borehole BH2.

4 MONITORING AND DATA COLLECTION

The Site location and monitoring points are shown on Figure 1. The following datasets were collected at all monitoring points between 2005 and 2009 with data collection recommencing in October 2015 up to present. A near complete record is available for BH5 from 2005 to 2018.

- Logged abstraction from / water level in the production boreholes (Boreholes BH5 and BH6);
- Logged water level in the observation borehole (Borehole BH2);
- Logged stage in the Nant Tywynni adjacent to the plant;
- Logged rainfall at the Site; and
- Manual streamflow gauging in the Nant Tywynni using the dilution gauging method.

Background and details of all the data collection methods and monitoring points at the Site are provided in full within the 2015-2017 monitoring summary report [Ref.1].

5 2018 MONITORING DATA

The 2018 season monitoring data is presented in the following sections and is compared to data from the 2015 – 2017 monitoring period and historic records, where appropriate. Due to the interest in the lower end of the flow range and the flashy nature of the flows in the Nant Tywynni, monitoring visits were planned through keeping a close eye on the local weather forecast and the site staff carrying out a daily check of the stage at the rated section gauge board. Rainfall data from the Site rain gauge was also provided on a regular basis as a further point of reference.

The heatwave during the summer period of 2018 in South Wales and over much of the UK caused flows to drop significantly into the range of interest. Two manual flow gauging were carried out during June/July 2018 and the gauging results were used to update the stage-discharge relationship developed for the rated section over the 2015 - 2017 monitoring seasons. Details of the gaugings and results are provided in the following section.

Data from all the logged monitoring points was downloaded on the 10th July and therefore the record assessed as part of this summary covers the period up to this date. Rainfall and borehole abstraction data was however provided by the Site for the period up to present.

5.1 Rainfall and Stream Stage / Flow Data

Rainfall data for the 2015-2017 and 2018 monitoring periods and stream stage recorded at the rated section on the Nant Tywynni is presented on Figure 2. A general stage recession between the winter and summer seasons starts as early as March and some lower flow periods occur quite early in the spring. As a result of the heatwave in 2018, stage in the Nant Tywynni exhibited a marked recession from late spring into the summer period following a very wet March and April.

Manual flow gaugings were carried out on 6th June and 10th July 2018. The initial visit was primarily focused on data download and maintenance although a gauging was carried out to add to the stage-discharge relationship despite flows not being within the flow range of interest. The gauging on the 6th June recorded a flow of 169 l/s. In contrast, the gauging on the 10th July recorded a flow of 53.5 l/s which is the lowest flow gauged over the 2015-2018 monitoring period.

The rainfall record for the Site rain gauge indicates that only 2mm of rainfall fell for the nineteen days prior to 10th July gauging. Rainfall totals for May and June were also very low with only 94mm and 81mm recorded, respectively. Small rainfall events occurred following the gauging with the end of July being relatively wet in comparison with significant events of 61mm and 66mm. The rainfall total for July was 176mm. Furthermore, the month of August was markedly wet in comparison with rainfall totalling 392mm. The gauging on the 10th July therefore captured a point towards the end of the low flow period at the Site during 2018 before flows increased in response to rainfall.

The stage-discharge relationship developed for the rated section between 2015 and 2017 was updated to include the 2018 flow gaugings as presented on Figure 3. The rating curve now comprises a total of 10 gauging points captured across the low end of the flow range in the Nant Tywynni and a strong relationship between stage and discharge for this flow range has been developed as indicated by the R-squared value of 0.98. Given the strength of the rating curve and wetter weather conditions following the gauging on 10th July, further gaugings were not carried as it was considered that additional gaugings would not add anything significant to the understanding of low flows at the Site.

The low flow duration statistics for the historic monitoring period are presented in Table 1 and the flow hydrograph for the 2015-2018 monitoring period is presented along with the Site rainfall record as Figure 4.

Table 1 Low Flow Duration Statistics

Probability of Exceedance (%)	Estimated Stream Discharge (l/s)				
	2005	2006	2007	2008	2009
99	28	33	29	30	31
95	39	41	41	45	50
90	58	51	58	63	84

The lowest flow gauged during the recent monitoring period was 53 l/s (10th July 2018) which represents a flow between Q90 and Q95 based on this historic data in Table 1. Based on the updated stage-discharge relationship, the lowest calculated flow of 34 l/s occurred on the 8th July 2018 which is between Q95 and Q99 based on Table 1. The majority of flows over the 2015-2017 monitoring period were well above this low flow range and as such the low flow duration curve developed over the historic 2005-2009 monitoring period has not been updated. Figure 5 presents the flow duration curve for the 2015-2018 monitoring period.

There was a lack of correlation in terms of losses and gains in streamflow past the Site during the 2005 - 2007 monitoring seasons, which supported the initial conclusion that streamflow in the Nant Tywynni is not affected by groundwater level. No accretion gauging was carried out during the 2008 / 2009 seasons due to a predominance of high flows. Gauging during the 2016, 2017 and again in 2018 seasons showed no consistent correlation in losses or gains in streamflow in the Nant Tywynni past the Site (Figure 6).

5.2 Groundwater

Groundwater level data from the observation borehole (BH2) is compared to rainfall and stream stage in the Nant Tywynni at the rated section for the 2015-2018 monitoring period on Figure 7. The groundwater level varies by up to 0.8m in the short term and the level trend follows the general trend in rainfall, mirroring the observations during the historic and recent monitoring periods. The 2018 monitoring shows no deviation from these trends and highlights the strong influence of rainfall on both the groundwater and surface water systems.

The water level in BH2 is consistently more than 3.5m above baseflow water levels in the Nant Tywynni at the rated section (Figure 7). Due to the difference in ground elevation between BH2 and the rated section, comparison of the groundwater level in BH2 was historically made with the stage in the closest section of the Nant Tywynni (20m downstream of gauging location G1 [Figure 1]). Stage measurements are not taken at this location so a stage trace was synthesised from the rated section stage data by adding on the difference in stream bed elevation (3.52m) between the two locations. Elevation survey data is contained within the historic reporting [see Ref.1].

The difference between the groundwater level in BH2 and the nearby stream stage ranges between 0.2 and 0.65m; the groundwater level being higher than the baseflow water level across the record (Figure 7). The very dry period between May and July 2018 caused a marked recession in both stream stage and groundwater level in BH2. Groundwater level in BH2 came within 10cm of the baseflow water level in the Nant Tywynni nearest to BH2. With the exception of the 2018 heatwave period, the variation in range is comparable to that seen in the 2008 (0.1m to 0.9m) and 2009 (0.3 to 1.0m) [see Ref.1] seasons and continues to reflect the flashy nature of the system being strongly influenced by rainfall.

5.3 Abstraction

Abstraction for water bottling at the Site is permitted to take place from production boreholes BH5 and BH6 although no abstraction has occurred from BH6 for a number of years due to problems with the borehole.

Figure 8 shows daily total abstraction from BH5 over the 2015-2018 monitoring period along with groundwater level data from BH5, BH6 and BH2. The water level variations seen in the three boreholes reflect that all abstraction occurred from BH5, with the water level in BH6 responding to the pumping pattern of BH5. There is a marked background recession in groundwater level between May and mid-July 2018 due to very dry heatwave period.

The baseline abstraction rate from BH5 over the monitoring period was approximately 70m³/d with shorter bursts of abstraction up to 119m³. A six week period between mid-May and early July 2016 saw a peak demand of 229 to 245m³/d. As presented and concluded in Ref.1, this period of abstraction did not result in excessive drawdown in BH6 and variations in the rate that water is pumped from BH5 had no noticeable effect on either stream stage in the Nant Tywynni or water level in BH2.

Figure 9 shows abstraction, water level in BH2, BH5 and BH6 with stream stage in the Nant Tywynni between January and July 2018. The baseline abstraction rate during this period was 118m³/d with short bursts of reduced abstraction rates between 72 and 106m³/d. There were no peak demands similar to the 2016 rates. However, despite the higher baseline abstraction rate the data shows that sudden changes in pumping do not result in falls in water level in the stream or BH2. Neither do sudden decreases in pumping result in rises in water level. Rainfall is the only visible influence on stream stage/flow in the Nant Tywynni as concluded from the historic monitoring.

6 CONCLUSION

Monitoring has now been undertaken over eight 'summer' seasons between 2005 – 2009 and 2016 – 2018 and six monitoring summary reports have been produced and submitted to EAW/NRW between 2006 and 2018.

Clear and consistent conclusions over the eight monitoring seasons have been drawn from analysis of onsite rainfall data, stream stage monitoring and discharge gauging, flow accretion passed the plant, groundwater levels in the onsite production and observation boreholes and groundwater abstraction data. The key conclusions are as follows:

- Streamflow in the Nant Tywynni and groundwater levels are very strongly linked with rainfall;
- Groundwater levels are consistently higher than water levels in the Nant Tywynni;
- Periods of high groundwater level generally correspond to periods of high water level in the Nant Tywynni and vice versa;
- Changes in groundwater level are often very much more pronounced than changes in water level in the Nant Tywynni; and
- Variations in the abstraction rate from the production boreholes has no noticeable effect on either stream stage/discharge in the Nant Tywynni or water level in the observation borehole BH2.

Envireau Water

The HOF was originally applied to the licence to protect the Nant Tywynni against pumping induced low flows, which could impact upon fish passage through structures such as the culvert underneath the A4067 downstream of the Site.

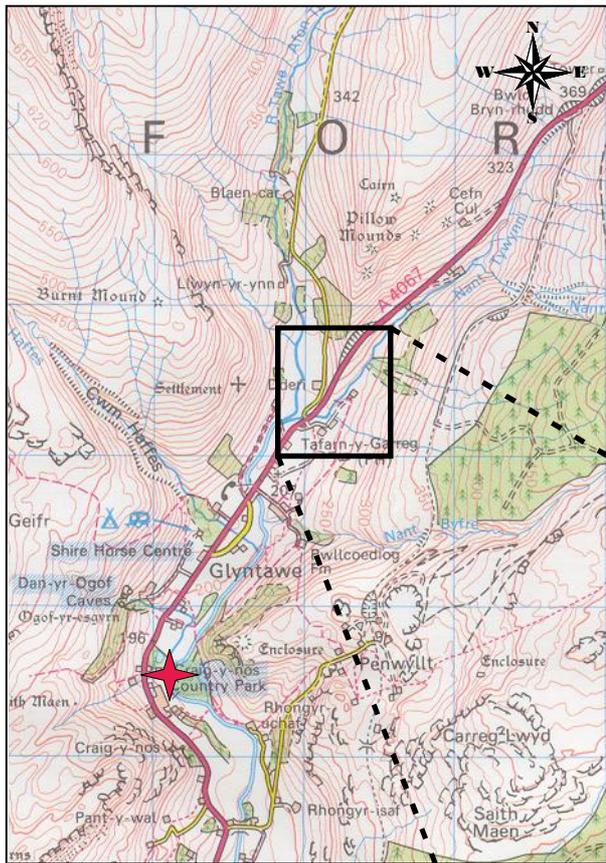
The absence of a connection between the groundwater and surface water systems at the site negates the need for a HOF on the groundwater abstraction licence at the Site. Envireau Water concludes that removal of the HOF for abstraction rates up to 245m³/d (the maximum rate during the long term monitoring exercise) would not result in any detriment to low flows in the Nant Tywynni or the ecosystem as a whole.

Envireau Water
08/11/2018

REFERENCES

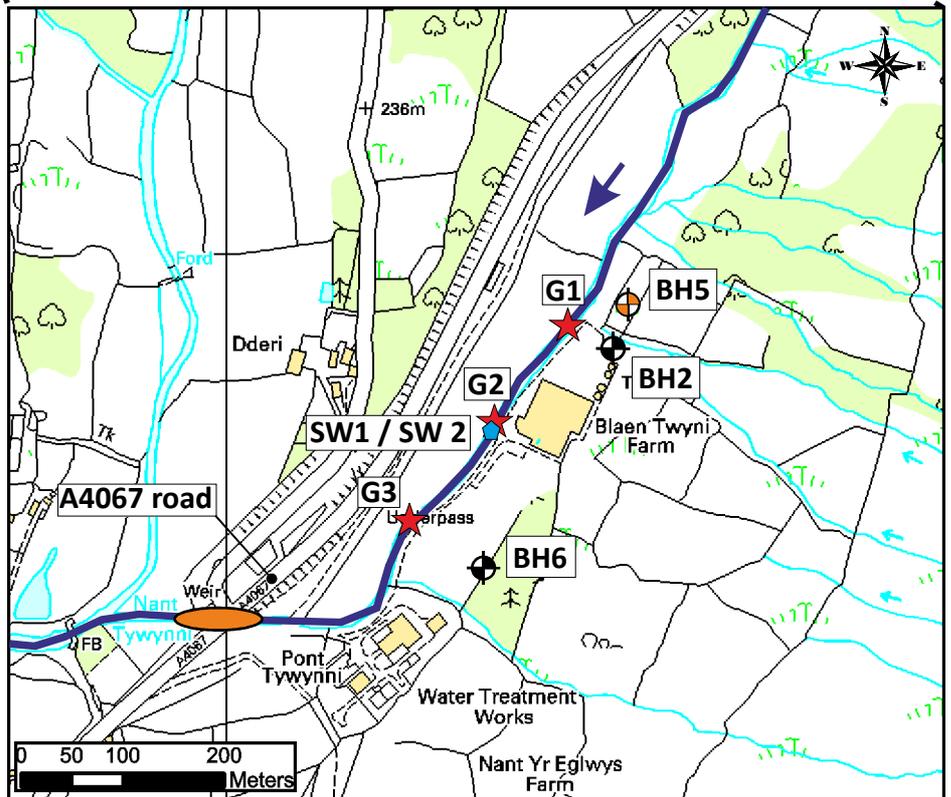
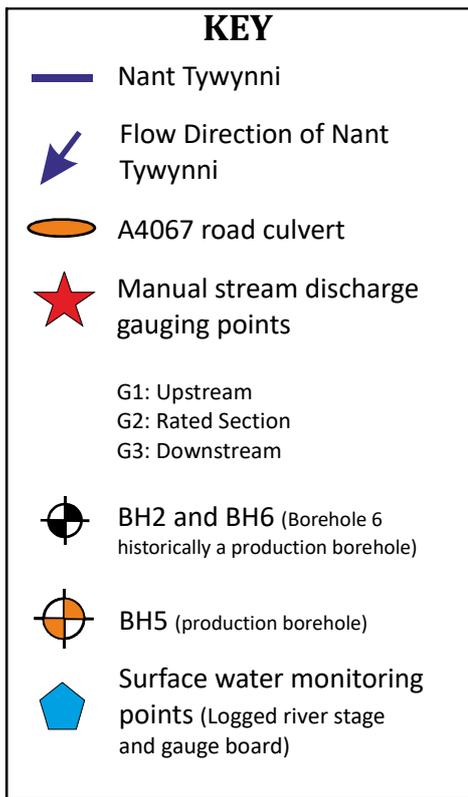
- Ref.1 Envireau Water. (February 2018). Highland Spring Group Beacons Site (Blaen Twyni) – Monitoring Summary and Hydrological Impact Assessment.

FIGURES



★ Natural Resources Wales gauging station (Craig-Y-Nos) where Hands-off-Flow condition is based.

Scale 1 : 50,000 at A4



Scale 1 : 7,500 at A4

Reproduction of base map with the permission of The Controller of Her Majesty's Stationary Office © Crown copyright. Licence No. AL 100050002.

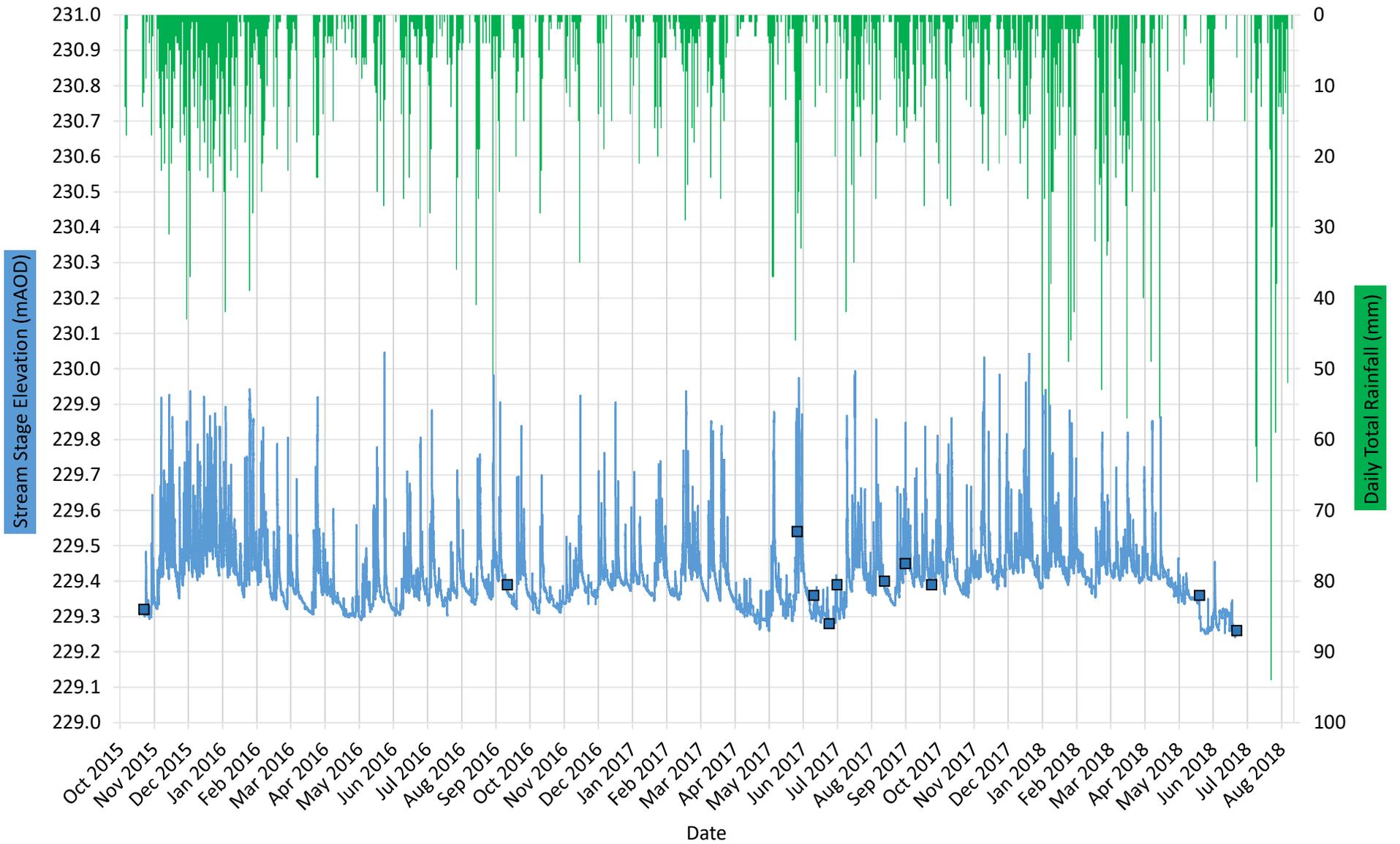


Ref: P18-17 HS Blaen Twyni Lic \ Fig 1 Site
 Loc.cdr
 Date: 08/11/2018

Highland Spring Group - Blaen Twyni

Figure 1

Site Location and Monitoring Points



■ Daily Total Rainfall
 — Logged Stream Stage
 ■ Observed Stream Stage

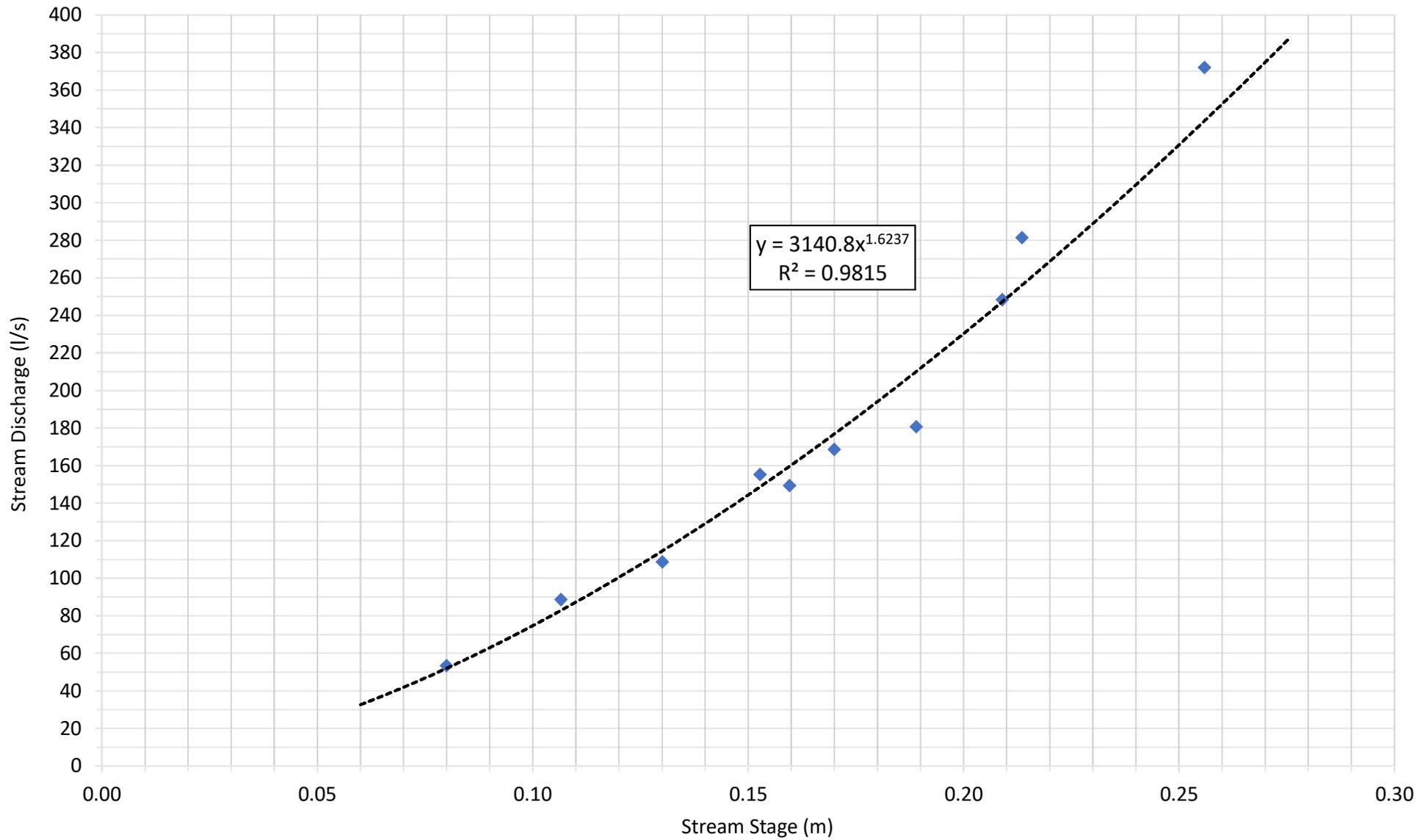


Ref: P18-17 HS Blaen Twyni Lic \ Fig 2 Rain
 Stage.cdr
 Date: 08/11/2018

Highland Spring Group - Blaen Twyni

Figure 2

Nant Tywynni Stream Stage and Rainfall



◆ Discharge Gauging - - - - Power (Discharge Gauging)

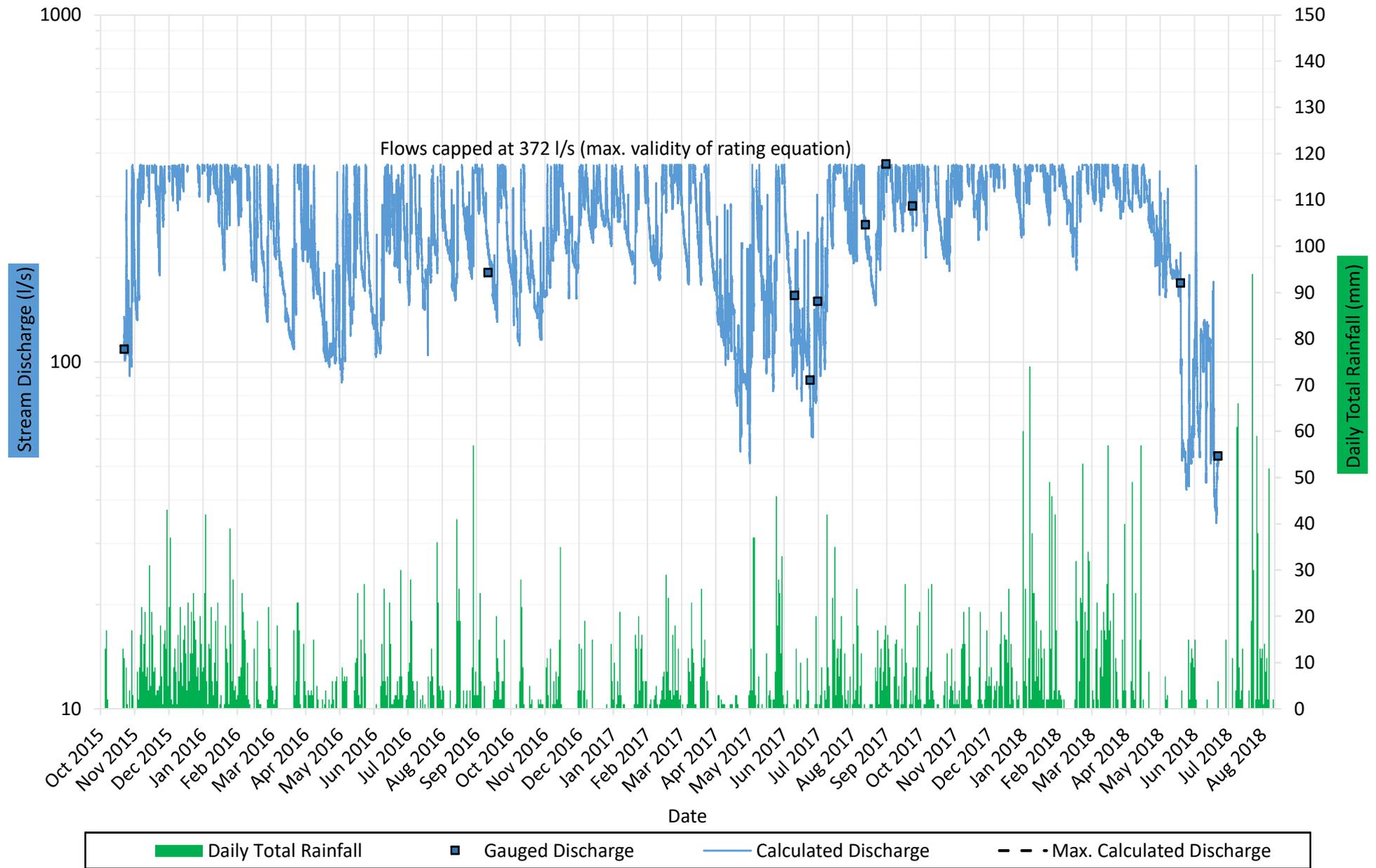


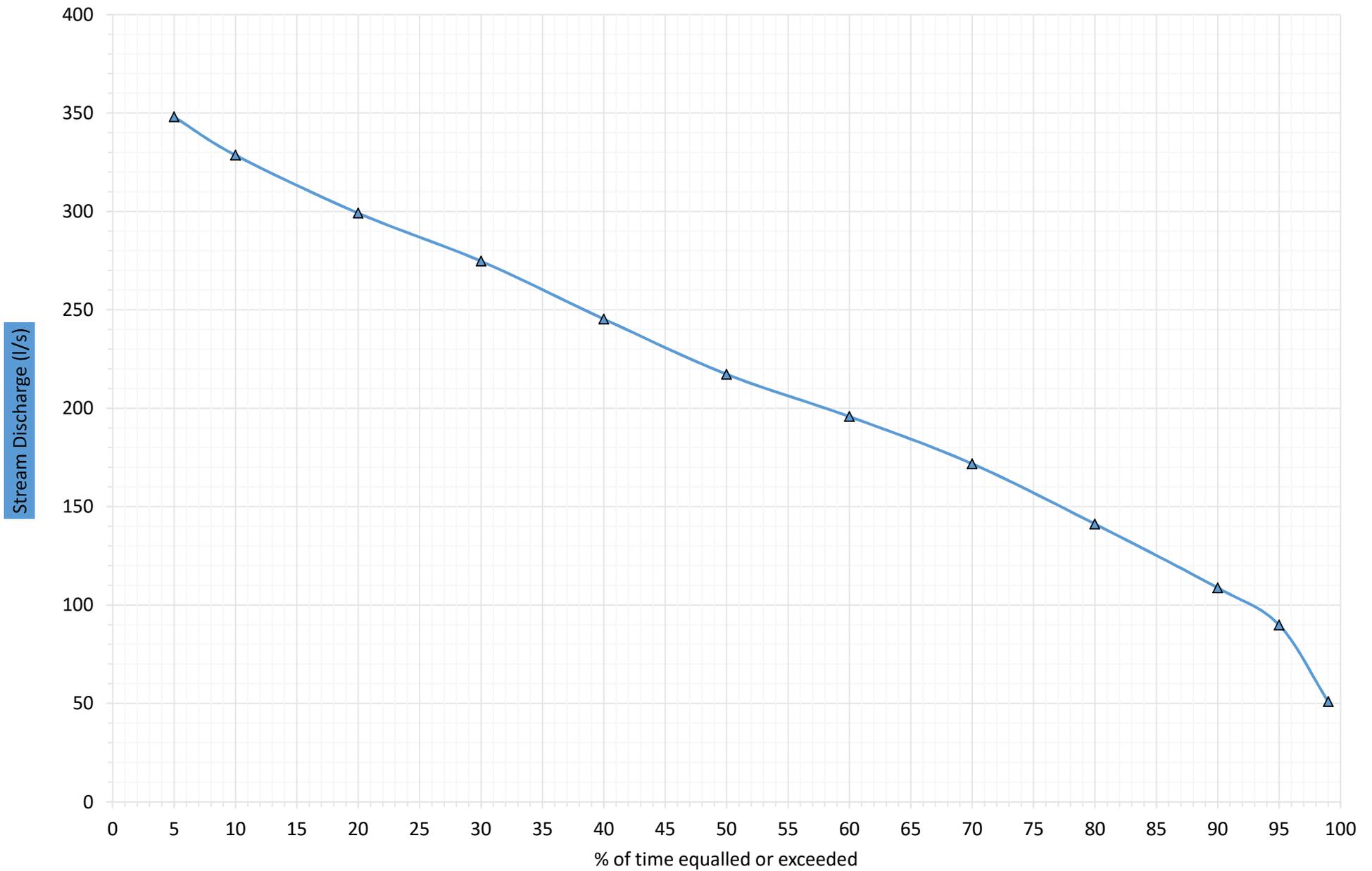
Ref: P18-17 HS Blaen Twyni Lic \ Fig 3 SD relationship.cdr
Date: 08/11/2018

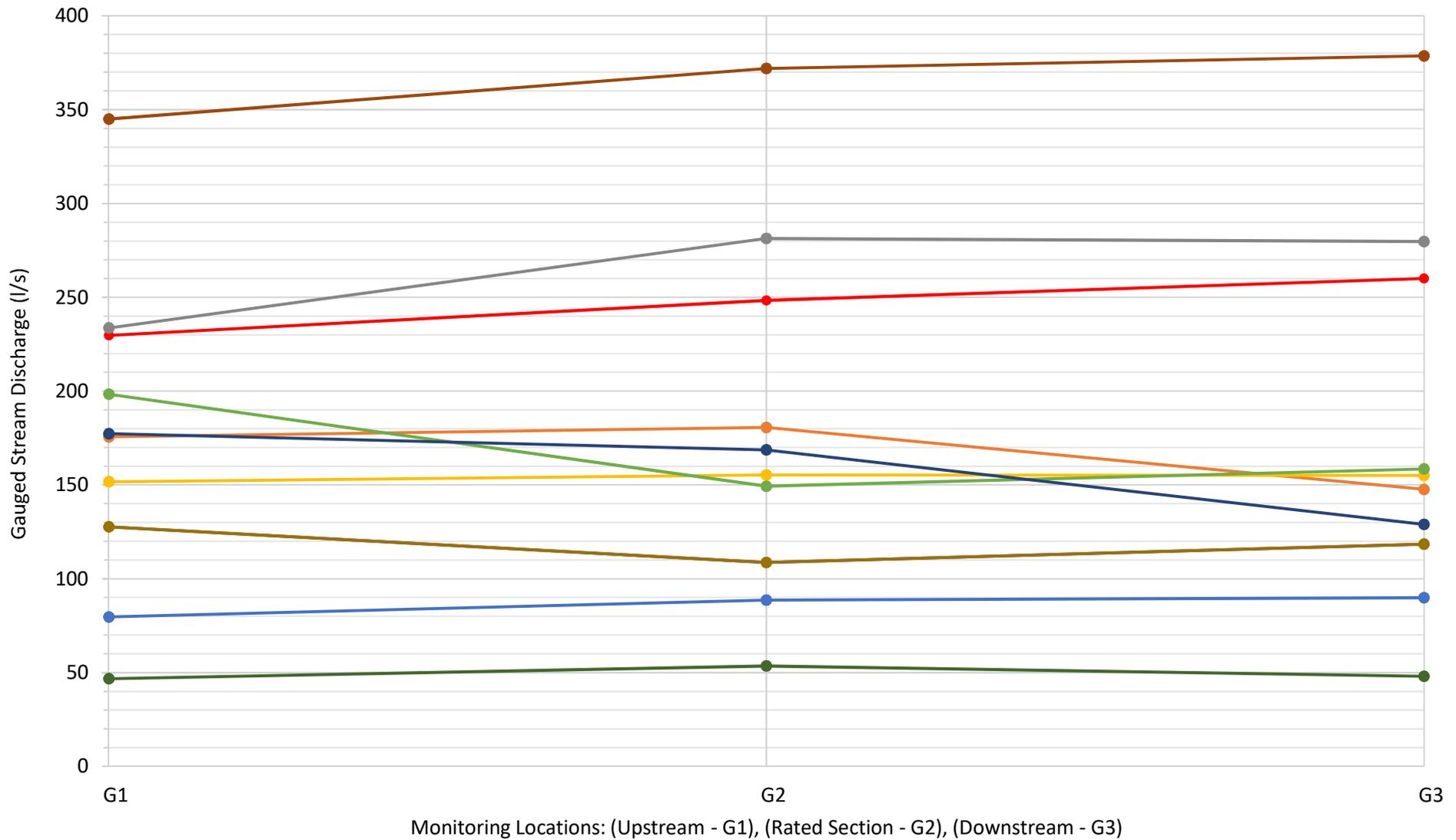
Highland Spring Group - Blaen Twyni

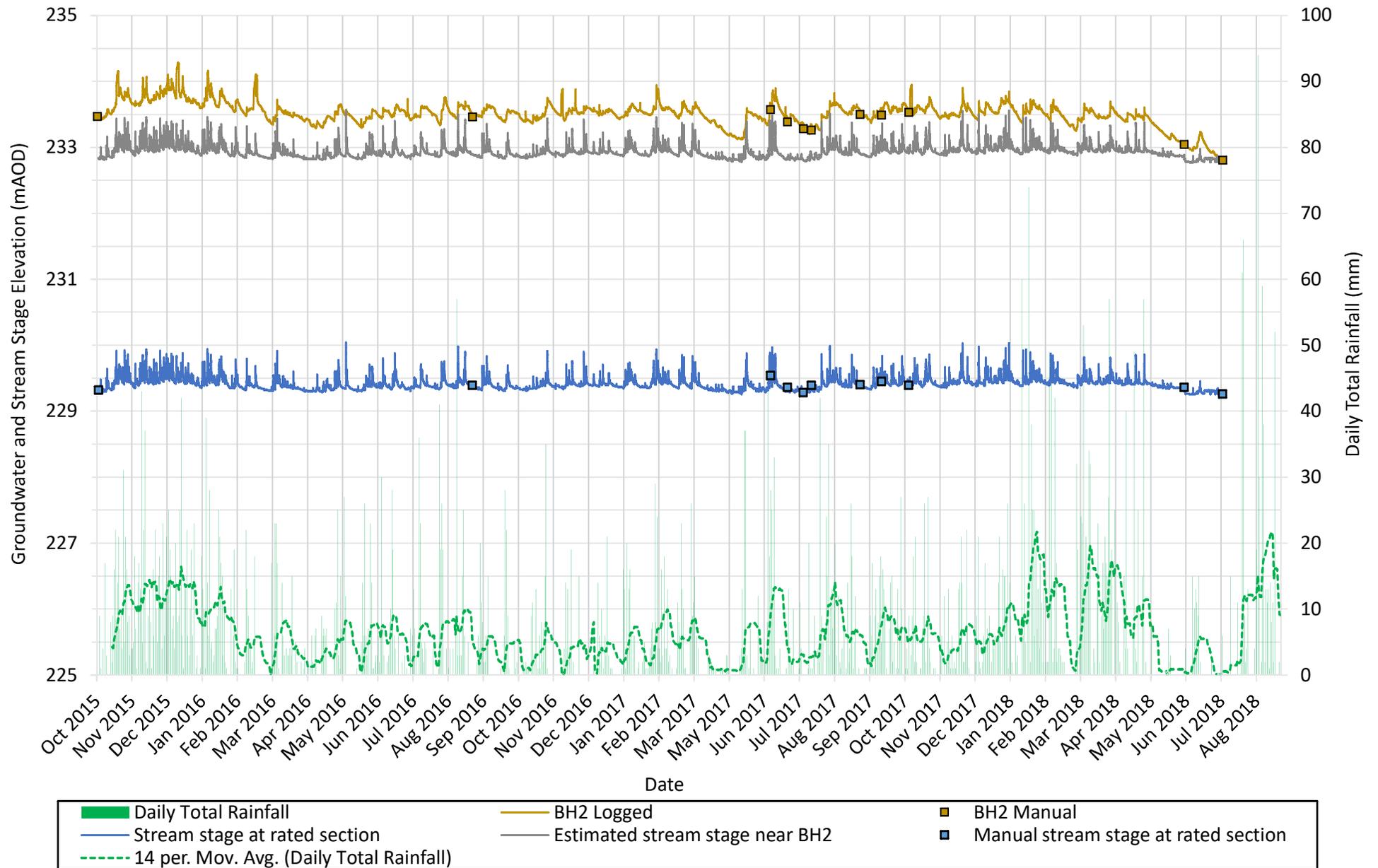
Figure 3

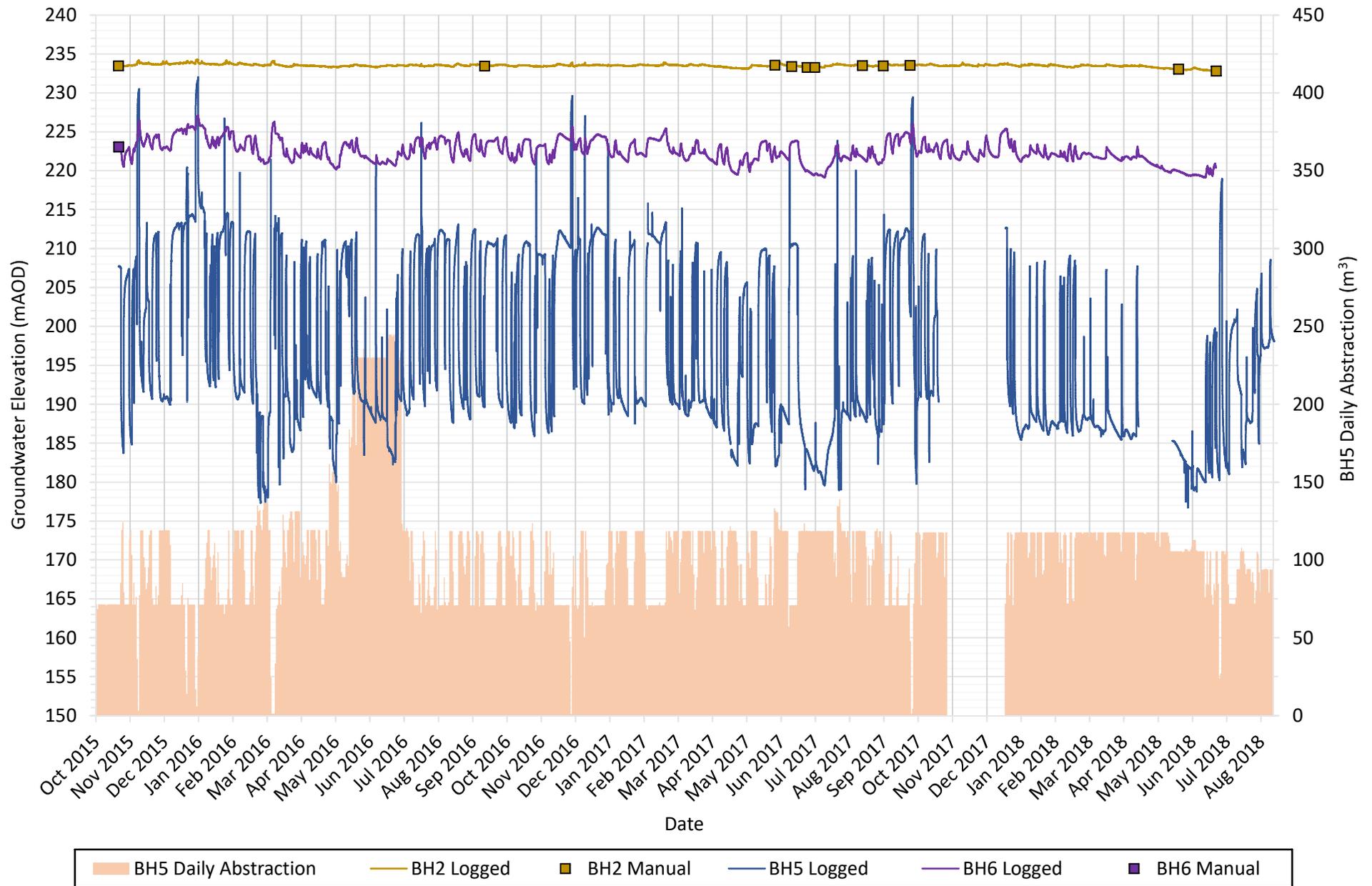
Stage-Discharge Relationship Nant Tywynni (2015-2018)











Ref: P18-17 HS Blaen Twyni Lic \ Fig 8 GWL Abs 15-18.cdr
Date: 08/11/2018

Highland Spring Group - Blaen Twyni

Figure 8

Groundwater Levels and Abstraction

