



**Cyfoeth Naturiol Cymru**  
**Natural Resources Wales**

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## **Water Resources LICENCE TO**

**ABSTRACT**

**WATER**

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

# IMPORTANT NOTES

## Need for safekeeping

This licence is an important document. The permission or right to abstract water may be valuable to your landholding. So -

- **Keep the licence safe, preferably with your deeds etc.**
- **Take careful note of the comments below about "transfer and apportionment" and "death and bankruptcy".**

**This is to ensure that the permission and any rights granted by the licence continue if you need to pass it on to someone else.**

If you want to:

- **revoke (cancel) the licence;**
- **vary (change/amend) the licence in any way or**
- **change your contact address (but you continue to hold the licence).**

**Please write to us at your local Natural Resources Wales office.**

Details of this licence are placed on a register, kept by Natural Resources Wales and open for inspection by the public. The public may also obtain further details about it by virtue of the Environmental Information Regulations 2004 (see also Disclosure of Information) except in special cases (for advice please contact us at the address shown on the front page of the licence).

## Transfer and apportionment

If you need to pass this licence or any part of it to someone else, you must contact Natural Resources Wales and obtain the appropriate application forms. Temporary licences cannot be transferred or apportioned. The licence holder remains responsible for compliance with the terms of the licence and any charges payable until the licence has been transferred or apportioned.

## Death or bankruptcy of the licence holder

If a licence has been 'vested' in you, as a result of the death or bankruptcy of the licence holder, please contact Natural Resources Wales in writing, telling us the licence number(s) and the date that the licence vested in you as a personal representative or trustee of the licence holder. This is necessary in order to enable you to subsequently transfer the licence.

'Vesting' is the transfer of responsibility and ownership of a licence when an existing licence holder is no longer able to hold the licence either through death or bankruptcy.

You do not have to complete a form, but you must notify us in writing within 15 months of the date of vesting, giving the full names of all personal representatives or trustees and a contact address.

## Time limits

Your licence may be subject to a time limit (stated on the front of your licence). All new abstraction licences are legally required to include a time limit. For variations to licences, time limits are added in accordance with our policy.

The duration of a time limit is determined in accordance with our time limiting policy. The time limit is linked to the next or subsequent review of water resources within a Catchment Abstraction Management Strategy (CAMS).

There will be a presumption of renewal providing three tests are met: environmental sustainability is not in question; there is continued justification of need; and water is being used efficiently. Any application for renewal will still be subject to the normal statutory considerations.

If your licence is time limited and you wish to renew it when it expires, you will need to apply for a new licence to replace the existing one. You are advised to submit this application at least three months before it expires. To allow you to give early consideration to this, we will send you a reminder approximately 18 months before the expiry date.

If your licence cannot be renewed, we will endeavour to give at least six years notice. We will also endeavour to give at least six years notice where the licence is likely to be renewed on different terms and will significantly impact upon the use of the licence.

In exceptional circumstances, for example where there are other overriding statutory duties such as the Habitats Regulations, it may not be possible to provide six years notice.

## Charges

Unless specifically exempted, we may levy an annual CHARGE for water AUTHORISED to be abstracted by this licence, in accordance with our abstraction charges scheme in force at the time.

**The licence may be revoked if charges are not paid.**

## Quantity and quality of water

You must not abstract more than the quantity specified in the licence.

Natural Resources Wales does not, by issue of this licence or otherwise, in any way guarantee that the source of supply will produce the quantity of water authorised to be abstracted by this licence, nor that the water is fit for its intended use.

The quantity of water authorised for abstraction is given in cubic metres. One cubic metre is approximately 220 gallons.

(The precise conversion is 1 cubic metres = 219.969 gallons).

## Source of supply and authorised point of abstraction

You may abstract from the point(s) specified in the licence and from no other points. If you want to add or change the authorised point(s) of abstraction, you must apply to us to vary the licence.

## Land on which water is authorised to be used

Where this condition applies, you may only use the water you abstract on the area specified in the licence. You must apply to us to vary the licence if you wish to extend or alter this area or remove it.

## Purpose for which water is authorised to be used

You may only use the water for the purpose(s) specified in the licence. You must apply to us to vary the licence if you wish to add to or change the purpose(s).

## Offences

Under the Water Resources Act 1991 it is an offence:-

- to abstract water, or cause or permit any other person to abstract water, unless the abstraction is authorised by and in accordance with an abstraction licence, or is subject to an exemption;
- to do anything to enable abstraction, or to increase abstraction, except in accordance with an abstraction licence or exemption;
- to fail to comply with the conditions of an abstraction licence.  
**Note in particular that it may be a condition of the licence to maintain the meter or other measuring device etc. and failure to do so will be an offence;**
- to interfere with a meter or other device which measures quantities of water abstracted so as to prevent it from measuring correctly;
- to fail to provide information which we have reasonably required for the purpose of carrying out any of the Natural Resources Wales water resources functions;
- to knowingly make false statements for the purpose of obtaining a licence or consent or in giving required information.

The requirement for a licence is subject to some exemptions, set out in the Water Resources Act 1991 as amended. If in any doubt as to whether you need a licence, contact us at the address shown at the bottom of the front page of the licence.

## Right of appeal

If you are dissatisfied with our decision on your licence application, you may appeal.

If you are in England, you should write to the Secretary of State for the Environment, Food and Rural Affairs, care of The Planning Inspectorate at: Room 4/19 Eagle Wing, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6PN.

If you are in Wales, you should write to Welsh Government care of The Planning Inspectorate at: Crown Buildings, Cathays Park, Cardiff, CF10 3NQ.

You must serve notice of appeal within 28 days of the date of receipt of this licence (although the Secretary of State and The Welsh Government have power to allow a longer period for serving notice of appeal). See Water Resources Act 1991, section 43.

## Disclosure of information

Information about this licence is available in the public Register held by Natural Resources Wales. Members of the public are also entitled to ask us for other "environmental information" it holds, including any activities likely to affect "the state of any water" or any "activities or other measures designed to protect it". That would include the information additional to the licence document e.g. any related agreement or abstraction returns. In certain restricted circumstances it is possible to claim that information should be kept confidential. If you require more information about keeping this information off the public register because it is confidential, please contact us by writing to the address shown on the front page of the licence within 28 days of receiving this licence.



**Cyfoeth  
Naturiol  
Cymru  
Natural  
Resources  
Wales**

Licence serial number	MD/054/0001/062
Please quote the serial number in all correspondence about this licence	

## FULL LICENCE TO ABSTRACT WATER

The Natural Resources Body for Wales (hereafter referred to as "NRW") grants this licence to:-

Thomas Ieuan Morris ("the Licence Holder")  
Trewern Farm  
Trewern Ganol  
Llanrhaeadr YM  
Powys  
SY10 0DP

This licence authorises the Licence Holder to abstract water from the source of supply described in the Schedule of Conditions to this licence and subject to the provisions of that Schedule. The licence commences from the effective date shown below and shall remain in force until the date of expiry shown below:

Signed:

Ashley Lansdown  
Permitting Team Leader  
Permitting Service  
Natural Resources Wales  
Cambria House  
29 Newport Road  
Cardiff  
CF24 0TP

Date of issue.....09 February 2022

Date effective.....01 April 2022

Date of expiry.....31 March 2034

Date of original issue....05 February 2016

This licence should be kept safe and its existence disclosed on any sale of the property to which it relates. Please read the 'important notes' on the cover to this licence

Note: References to "the map" are to the map which forms part of this licence.  
References to "NRW" are to the Natural Resources Body for Wales or any successor body.

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Environment Act 1995  
Water Resources Act 1991 as amended by the Water Act 2003  
Water Resources (Abstraction and Impounding) Regulations 2006  
Article 3 of the Natural Resources Body for Wales (Establishment) Order 2012  
The Natural Resources Body for Wales (Functions) Order 2013

## **SCHEDULE OF CONDITIONS**

### **1. SOURCE OF SUPPLY**

- 1.1 Inland water (river) known as Afon Iwrch at Trewern Ganol, Llanrhaeadr-ym-Mochnant, Oswestry, Powys.

### **2. POINT OF ABSTRACTION**

- 2.1 At National Grid Reference SJ 13443 26624 marked 'Point A' on the map.

### **3. MEANS OF ABSTRACTION**

- 3.1 Intake works and a gravity feed pipe of an external diameter not exceeding 950 millimetres controlled by level sensors, an automated control system and sluice gates.

### **4. PURPOSE OF ABSTRACTION**

- 4.1 Power production.

### **5. PERIOD OF ABSTRACTION**

- 5.1 All year.

### **6. MAXIMUM QUANTITIES OF WATER TO BE ABSTRACTED**

- 6.1 74,131.2 cubic metres per day  
27,057,888 cubic metres per year  
At an instantaneous rate not exceeding 858 litres per second.

Note: A day means any period of 24 consecutive hours and a year means the 12 month period beginning on 1 April and ending on 31 March.

### **7. MEANS OF MEASUREMENT OF WATER ABSTRACTED**

- 7.1 (i) The Licence Holder shall determine the quantity of water abstracted by reference to the kilowatt-hours generated, as measured by a kilowatt-hours meter multiplied by the conversion factor determined using the calculation checklist attached to this licence.
- (ii) The Licence Holder shall retain supporting documentation relating to details of the methodology and calculations used to convert electricity generated to the quantities abstracted and make them available to NRW on request.

### **8. RECORDS**

- 8.1 (i) The Licence Holder shall record readings of the electrical output and the corresponding quantity of water abstracted at the same time each week, as determined using the calculation checklist attached to this licence or at such other intervals as may be approved by NRW in writing.



- (ii) The Licence Holder shall send to NRW a copy of the records required by (i) above within 28 days after 31 March in each year, and also within 28 days of being so requested in writing by NRW.
- (iii) The Licence Holder shall keep all records for at least 6 years, and shall allow NRW to inspect them during all reasonable hours.

## 9. FURTHER CONDITIONS

- 9.1 (i) For the purpose of this licence, references to 'hydropower scheme' shall mean all works that include amendments to an existing weir to include a rock ramp fish easement with pool at the side immediately below the discharge points of the wash-by channels, residual flow 'HoF' notch, debris screen with vertical bar spacing at 150 millimetres, dual sluice gates, bypass stop planks, a prefabricated self-clean box with two intake chambers each with a submerged stainless steel inclined screen of 3 millimetre apertures, a fish by-wash channel, an eel and silt wash-by pipe, a gravity fed pipe of an external diameter not exceeding 50 millimetre controlled by an automated control system, a Francis turbine and associated ancillary civil works and discharge diffuser with a 3 millimetre aperture fish screen.

- 9.2 (i) The Licence Holder shall construct, operate and maintain the hydropower scheme in accordance with the specifications and drawings

'Fish Pass General Arrangement' Revision H dated 03/02/2016 and  
'Turbine Piping General Arrangement' Revision B date 03/02/2015,

copies of which are appended to this licence, or such minor amendments to those documents that are accepted in writing by NRW prior to the date of commencement of construction.

- 9.3 (i) The Licence Holder shall, as far as is reasonably practicable, ensure that no water flows through the turbine if the Licence Holder is unable to generate power.

- 9.4 (i) The Licence Holder shall return all of the water abstracted in pursuance of this licence to the Afon Iwrch at National Grid Reference SJ 13767 26190 marked 'Point Q' on the map.

- 9.5 (i) No abstraction of water shall take place unless the rate of flow in the Afon Iwrch immediately downstream of the authorised point of abstraction, marked as 'Point A' as specified in condition 2.1, is equal to or greater than 61 litres per second and the abstraction shall not cause the flow immediately downstream of said abstraction point to fall below that rate.

- (ii) The quantity of water abstracted shall not exceed 50% of the available flow in the Afon Iwrch in excess of 61 litres per second.

- (iii) At all times that abstraction is taking place, a minimum of 19 litres per second shall be released immediately downstream of the intake works by means of a pipe ('eel and silt by-wash pipe') constructed in accordance with drawing number 'Fish Pass General Arrangement' Revision H dated 03/02/2016 attached to this licence. This flow shall be known as the eel and silt by-wash flow.

- (iv) At all times that abstraction is taking place, a minimum of 35 litres per second

shall be released immediately downstream of the intake works by means of a fish by-wash channel constructed in accordance with drawing number 'Fish Pass General Arrangement' Revision H dated 03/02/2016 attached to this licence. This flow shall be known as the fish by-wash flow.

- 9.6 (i) The Licence Holder shall record readings of the electrical output and the corresponding instantaneous abstraction rate at hourly intervals, as determined using the calculation checklist attached to this licence or at such other intervals as may be approved by NRW in writing.
- (ii) The Licence Holder shall send to NRW a copy of the records required by (i) above within 28 days after 31 March in each year, and also within 28 days of being so requested in writing by NRW.
- (iii) The Licence Holder shall keep all records for at least 6 years, and shall allow NRW to inspect them during all reasonable hours.
- 9.7 (i) No abstraction shall take place unless the Licence Holder has installed a level sensor and gauge board zeroed to the weir crest level to measure the level of water in the Afon Iwrch behind the weir at National Grid Reference SJ 13449 26627 marked "Point B" on the map.
- (ii) The level sensor shall be connected to a recording device that accurately records the level of water behind the weir at hourly intervals or as otherwise approved in writing by NRW, simultaneously with measurement of electrical output in Condition 9.6 (i) above.
- (iii) No abstraction shall take place unless the Licence Holder has provided and installed a suitable level sensor and recording device in accordance with the manufacturer's instructions and any written directions given by NRW.
- (iv) The Licence Holder shall ensure that the level sensor and recording device are working at all times when abstraction takes place.
- (v) The Licence Holder shall maintain the level sensor, gauge board and recording device in such a condition and if necessary replace them so as to ensure that accurate measurements of water levels are recorded at all times.
- (vi) The Licence Holder shall send to NRW a copy of the records required by (ii) above within 28 days after 31 March in each year and also within 28 days of being so requested in writing by NRW.
- (vii) Each record shall be kept and be made available during all reasonable hours for inspection by NRW for at least 6 years.
- 9.8 (i) No abstraction shall take place unless the Licence Holder has submitted to and had approved in writing by NRW a calculated stage-discharge relationship, between the river flow and the level of water in the River Iwrch behind the weir at National Grid Reference SJ 13449 26627 upstream of the authorised point of abstraction. The corresponding data and a method statement detailing how the stage-discharge relationship was derived shall also be submitted to NRW at the same time.
- (ii) The stage-discharge relationship required by (i) above shall be determined using a minimum of ten flow gaugings taken at a range of flows between Q95

and the rate at which the maximum abstraction occurs.

- (iii) The stage-discharge relationship shall be recalculated and submitted in writing to NRW every five years from the date of issue or as otherwise agreed in writing by NRW.
  - (iv) The calculated stage discharge relationship specified in (i) above shall be amended accordingly, if requested in writing by the NRW, following the submission of the data required by (ii) above.
- 9.9
- (i) Before abstraction commences, the level sensor and the hydropower scheme's automated control system shall be programmed to secure the residual flow and flow split specified in Condition 9.5.
  - (ii) In the event that the automated control system fails, the Licence Holder shall cease operation immediately and notify NRW of this fact.
  - (iii) No abstraction shall recommence unless the automated control system is fully operational and NRW has been notified of this fact.
- 9.10
- (i) No abstraction shall take place unless the Licence Holder has installed a submerged stainless steel inclined screen of 3 millimetre apertures, an eel by-wash pipe and fish by-wash channel to prevent the entrapment, entrainment or impingement of fish and eels at the point of abstraction.
- 9.11
- (i) No abstraction shall take place unless the Licence Holder has installed a screen with spacing no greater than 3 millimetres to the discharge diffuser at the discharge outlet to prevent the entrapment, entrainment or impingement of fish and eels.
  - (ii) The Licence Holder shall maintain the screen in accordance with the manufacturer's specifications and keep records of such maintenance available for inspection.
- 9.12
- The Licence Holder shall ensure that during construction and any subsequent maintenance works to the hydropower scheme, the flow in the Afon Iwrch is allowed to pass downstream unchanged in quantity and quality at all times.
- 9.13
- The Licence Holder shall notify NRW in writing within 7 calendar days after the abstraction of water for the purpose of power production first starts.
- 9.14
- This licence shall cease to be of any effect if the abstraction it authorises has not commenced within 3 years of the licence issue date.

## **ADDITIONAL INFORMATION**

Note: the following information is provided for information only. It does not form part of the licence.

### **REASONS FOR CONDITIONS**

The licence is time-limited to a date to reflect the timing of a future review of the catchment resources availability.

Conditions 7 and 8.1: the Licence Holder is required to record readings of the electrical output and the corresponding quantity of water abstracted to demonstrate compliance with the conditions of this licence and to provide information on actual water usage for water planning purposes.

Conditions 9.1, 9.2 and 9.13: to ensure the hydropower scheme is constructed, operated and maintained in accordance with the drawings and specifications agreed by NRW during the determination of the licence.

Condition 9.3: to secure the proper and efficient use of water resources.

Condition 9.4: to ensure the abstraction can be classed as non-consumptive.

Conditions 9.5 and 9.12: to ensure a flow is maintained in the watercourse in order to maintain the riverine habitat for the conservation of the flora and fauna of the watercourse.

Conditions 9.6: to provide records of the instantaneous abstraction rate at hourly intervals to allow comparison with the records required by Condition 9.7. The comparison will demonstrate compliance with the residual flow and abstraction regime set in Condition 9.5.

Condition 9.7: to provide records of the level of water behind the weir and corresponding records of flow over the weir at hourly intervals to allow comparison with the records required by Condition 9.6. The comparison will demonstrate compliance with the residual flow and abstraction regime set in Condition 9.5.

Condition 9.8: to provide details of the calculations used to derive flow over the weir and into the leat.

Condition 9.6, 9.7, 9.8 and 9.9: to achieve and demonstrate compliance with the residual flow and abstraction regime set in Condition 9.5.

Condition 9.10: to prevent the entrapment, entrainment and impingement of fish and eels at the point of abstraction.

Condition 9.11: to prevent the entrapment, entrainment and impingement of fish and eels at the point of discharge.

Condition 9.12: to ensure that the water environment is not impacted during construction and subsequent maintenance.

Condition 9.13: to start NRW's compliance process.

Condition 9.14: to secure the proper use of water resources and to avoid commitment of water resources to an abstraction right that cannot be exercised.



## IMPORTANT NOTES

Impoundment licence serial number MD/054/0001/083 has been issued to facilitate the abstraction of water for the hydropower scheme authorised by this abstraction licence.

For the purposes of Conditions 9.2, 9.6, 9.7, 9.8, 9.9 and 9.13, the Licence Holder shall contact:

South East Area Natural Resources Planning Officer  
South East Area Natural Resources Planning Team  
Natural Resources Wales  
St. Mellons Business Park  
Fortran Road  
St. Mellons  
Cardiff CF3 0EY

Telephone: 0300 065 3000

Email address: [nrp.southeast@cyfoethnaturiolcymru.gov.uk](mailto:nrp.southeast@cyfoethnaturiolcymru.gov.uk)

### Water efficiency note

The Licence Holder should use water abstracted under the terms of this licence in an efficient manner. NRW may refer to its guidance on water efficiency (or equivalent guidance) in determining whether water is being used efficiently and may offer advice on any measures considered necessary to meet particular recommendations.

### Screening

NRW will have regard to its Screening for Intakes and Outfalls: a Best Practice Guide (or equivalent guidance) in agreeing where, how and what type of fish screens should be installed and together with the results of any monitoring in determining whether the fish screens are properly effective and maintained, and in judging whether it is necessary to require repair or replacement of the fish screens.

### Eel screening

NRW may have regard to its Eel Manual: Screening at intakes and outfalls, measures to protect eel (or equivalent guidance) in agreeing where, how and what type of eel screen should be installed and together with the results of any monitoring in determining whether the eel screen is properly effective and maintained, and in judging whether it is necessary to require repair or replacement of the eel screen.

### Eel passage

NRW may have regard to its Best Practice Guide, the Eel Manual: Elver & Eel Passes (or equivalent guidance) in agreeing where, how and what type of eel pass should be installed and together with the results of any monitoring in determining whether the eel pass is properly effective and maintained, and in judging whether it is necessary to require repair or replacement of the eel pass.

### Licence history

Licence Serial Number	Issue and Effective Date	Expiry Date	Summary of Changes
MD/054/0001/062	05/02/2016	31/03/2022	Original licence issued.
MD/054/0001/062	Issue: 09/02/2022 Effective: 01/04/2022	31/03/2034	Licence renewed on same terms. Licence Holder registered address updated.



### Calculation Checklist

This checklist shall be used to record the site data and calculate the Hydro Abstraction Factor for the site ( $HAF_{site}$ ) to allow conversion of electrical output to quantities abstracted. The  $HAF_{site}$  is the amount of water used in  $m^3$  per kWhr generated for any period.

Site Data	
Site name	
Address	
Licence serial No.	
Contact name	
Contact telephone	
Contact email	
Turbine manufacturer	
Turbine type	
Turbine serial no.	
Number of jets (where relevant)	

Performance Data		
Parameter	Value	How was the parameter determined?
Net operating head of the system at maximum power output ( $H_n (P_{max})$ ) in metres		
Turbine/water wheel efficiency at maximum power output ( $e_{turbine/water\ wheel} (P_{max})$ )		
Transmission system efficiency at maximum power output ( $e_{transmission} (P_{max})$ )		
Generator efficiency at maximum power output ( $e_{generator} (P_{max})$ )		

### Calculation of overall system efficiency of the rotating parts of the hydro system, at maximum power output ( $e_{system} (P_{max})$ )

$$e_{system} (P_{max}) = e_{turbine/water\ wheel} (P_{max}) \times e_{transmission} (P_{max}) \times e_{generator} (P_{max})$$

$$= \boxed{\phantom{000}} \times \boxed{\phantom{000}} \times \boxed{\phantom{000}}$$

$$e_{system} (P_{max}) = \boxed{\phantom{000}}$$

### Calculation of $HAF_{site}$

$HAF_{site}$  = Hydro Abstraction Factor for the site in question

$$= 366.972 / (H_n (P_{max}) \times e_{system} (P_{max}))$$

$$= 366.972 / (\boxed{\phantom{000}} \times \boxed{\phantom{000}})$$

$$= \boxed{\phantom{000}} \text{ (m3/kWh)}$$

Where:

$H_n (P_{max})$  = net head at max. power.

366.972 = a constant in order to bring the final HAF into the correct unit of  $m^3/kWhr$  (it is arrived at by dividing the number of seconds in an hour (3600) by gravity ( $9.81 \text{ m/s}^2$ ))

The volume of water abstracted for any period ( $V_{period}$ ) can then be calculated by simply multiplying the  $HAF_{site}$  by the number of kiloWatt hours generated thus:

$$V_{period} (m3) = kWh_{period} (kWh) \times HAF_{site} (m3/kWh)$$

**See example:**

(kWh is a measure of energy, whilst kW is a measure of power: at full efficiency, a 50 kW turbine will produce 50 kWh of energy in one hour, 100 kWh in two hours, 150 kWh in three hours etc.).

Performance Data		
Parameter	Value	How was the parameter determined?
Net operating head of the system at maximum power output ( $H_n (P_{max})$ ) in metres	150	Site survey
Turbine/water wheel efficiency at maximum power output ( $e_{\text{turbine/water wheel}} (P_{max})$ )	0.9	From manufacturer
Transmission system efficiency at maximum power output ( $e_{\text{transmission}} (P_{max})$ )	0.85	From manufacturer
Generator efficiency at maximum power output ( $e_{\text{generator}} (P_{max})$ )	0.85	From manufacturer

**Calculation of overall system efficiency of the rotating parts of the hydro system, at maximum power output ( $e_{\text{system}} (P_{max})$ )**

$$e_{\text{system}} (P_{max}) = e_{\text{turbine/water wheel}} (P_{max}) \times e_{\text{transmission}} (P_{max}) \times e_{\text{generator}} (P_{max})$$

$$= 0.9 \times 0.85 \times 0.85$$

$$e_{\text{system}} (P_{max}) = 0.65$$

**Calculation of HAF<sub>site</sub>**

HAF<sub>site</sub> = Hydro Abstraction Factor for the site in question

$$= 366.972 / (H_n (P_{max}) \times e_{\text{system}} (P_{max}))$$

$$= 366.972 / (150 \times 0.65)$$

$$= 3.764 \text{ (m}^3\text{/kWh)}$$

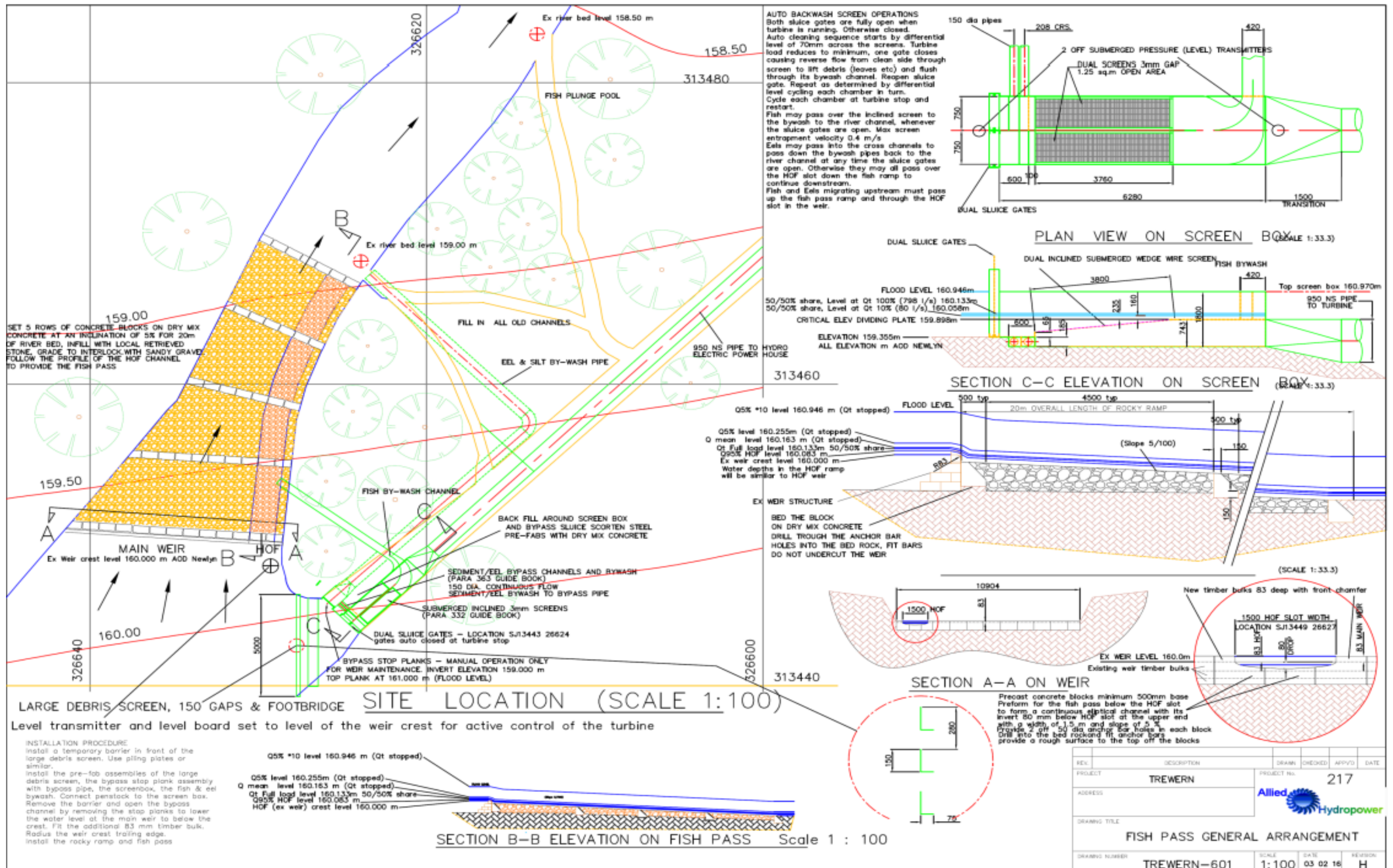
The volume of water abstracted for any period ( $V_{\text{period}}$ ) can then be calculated by simply multiplying the HAF<sub>site</sub> by the number of kiloWatt hours generated thus:

$$V_{\text{period}} \text{ (m}^3\text{)} = \text{kWh}_{\text{period}} \text{ (kWh)} \times \text{HAF}_{\text{site}} \text{ (m}^3\text{/kWh)}$$

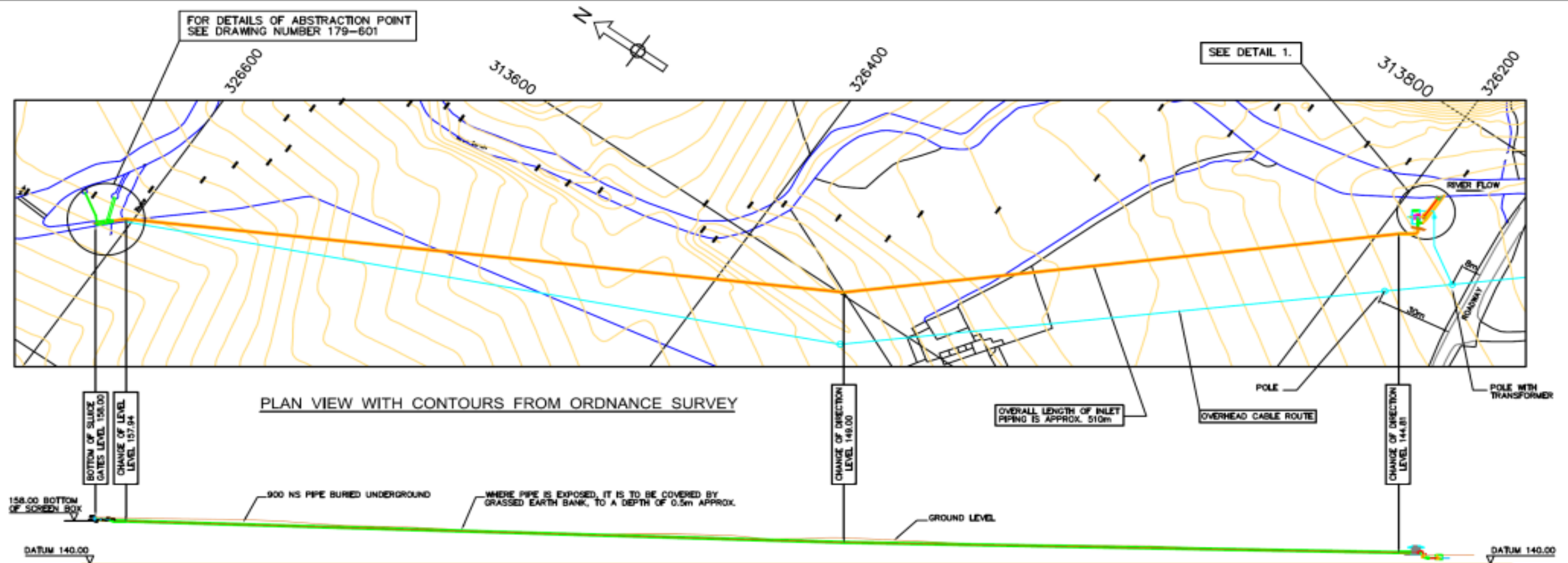
If, for example your total export of electricity for the period was 68400 kWh, then you would have abstracted a total volume of water of:

$$V_{\text{period}} \text{ (m}^3\text{)} = 68400 \text{ kWh} \times 3.764 \text{ m}^3\text{/kWh} = 257457.6 \text{ m}^3$$

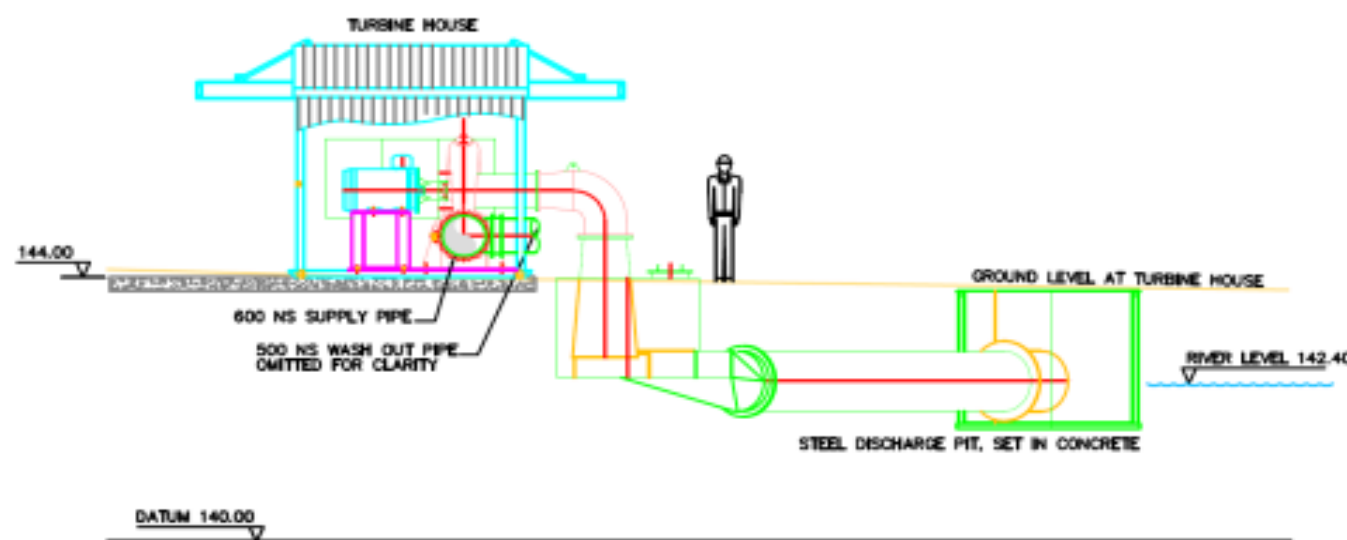




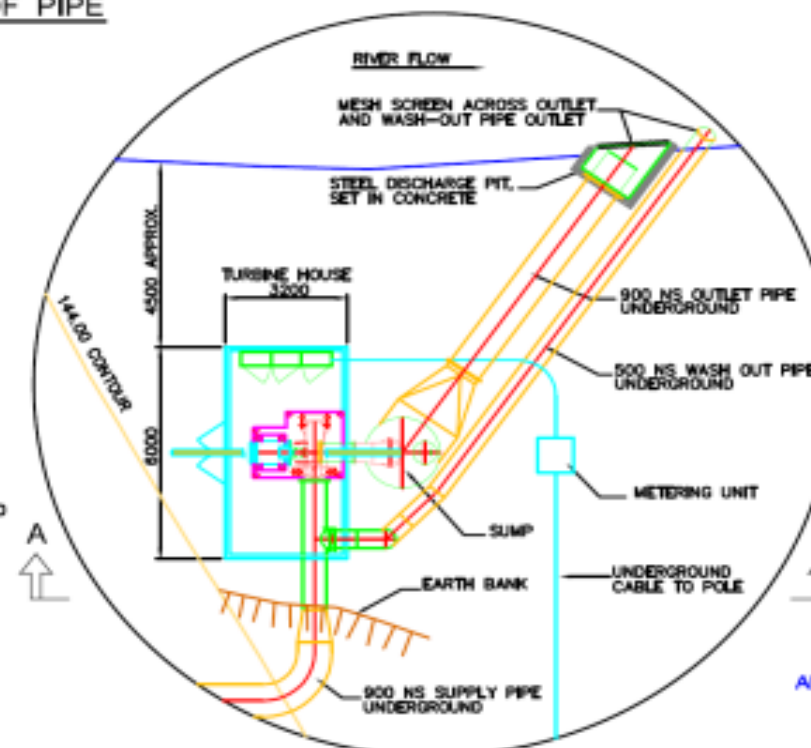




ELEVATION ALONG CENTRE LINE OF PIPE




SECTION 'A-A' (SCALE 1:50)



DETAIL 1. (SCALE 1:100)

### REFERENCE DRAWINGS

- 217-401 :- EXISTING TURBINE ASSEMBLY  
217-402 :- TURBINE AND GENERATOR ASSEMBLY  
217-403 :- TURBINE HOUSE GENERAL ARRANGEMENT  
217-601 :- FISH PASS GENERAL ARRANGEMENT

B	TURBINE HOUSE & OUTLET PIPE MODIFIED	JS					5/3/15
A	PIPE RE-ROUTED, OVERHEAD CABLE ADDED	JS					8/2/15
REV.	DESCRIPTION	DRAWN	CHECKED	APPROVED			DATE
PROJECT TREWERN		PROJECT No. 217					
ADDRESS							
 Hydropower							
<b>TURBINE PIPING GENERAL ARRANGEMENT</b>							
DRAWING NUMBER		SCALE		DATE		REVISION	
217-601		1: 750		3/2/15		B	



**Would you like to find out more about us,  
or about your environment?**

**Then call us on  
0300 065 3000 (Mon-Fri 9-5)**

**email  
enquiries@naturalresourceswales.gov.uk**

**or visit our website  
[www.naturalresourceswales.gov.uk](http://www.naturalresourceswales.gov.uk)**

**incident hotline 0300 065 3000 (24hrs)  
floodline 0345 988 1188**



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