The Cottage, Rhiw, Pwllheli, LL53 8AE
Tel 01691 648 378
www.greenearthhydro.co.uk
Company Registration Number 7417466
MCS Hydro Transition Installer 123

Geomorphology Photo Survey: Version 2 (Date: 19th September 2022)
Applicant's Name: Mark Sealy
Site Name: Brithdir Forest Hydro
Site Address: Brithdir Forest, Brithdir, Dolgellau, LL40 2SA
Watercourse Name: Nant Helygog

Basic site information:

1. The hydropower scheme proposed is 34kW and will produce an estimated 175,000 kWh (units) of electricity per year sufficient for 60 average UK homes and a 37 tonne reduction of carbon dioxide emissions annually. *(Average UK home uses 2,900 kWh/yr according to Ofgem's 'Typical Domestic Consumption Values' for 2020. Government figures for 2021 for emissions from electricity production: 0.21233kg CO2e per kWh)*

2. Intake Grid Reference:	SH 79432 18555
3. Intake weir crest elevation:	314.143mAOD
4. Power house (turbine) Grid Reference:	SH 79200 19608
5. Power house (turbine) finished floor elevation:	220.300mAOD
6. Outfall Grid Reference:	SH 79205 19597
7. Outfall invert (base) elevation:	218.890mAOD
8. Catchment Area and Watercourse Flow	
a. Catchment Area:	2.256 square kilometres
b. Annual Rainfall:	2,400mm
c. Annual Runoff:	1,759mm
d. Average Daily Flow (ADF) or Mean Flow:	126 litres per second
e. Length of depleted reach:	1,265 metres
f. Fall along length of depleted reach:	97.5 metres
g. Average depleted reach gradient	8%
9. Flow Rates & Abstraction Regime	
a. Turbine's Gross Head:	92.3 metres
b. Turbine's Net Head (@ design flow):	87.9 metres
c. Design Flow (Max Turbine Flow):	51.2 litres per second
d. Minimum Turbine Flow:	3 litres per second
e. Hands Off Flow (Q95):	14 litres per second
f. Abstraction Regime Above Q95:	70%

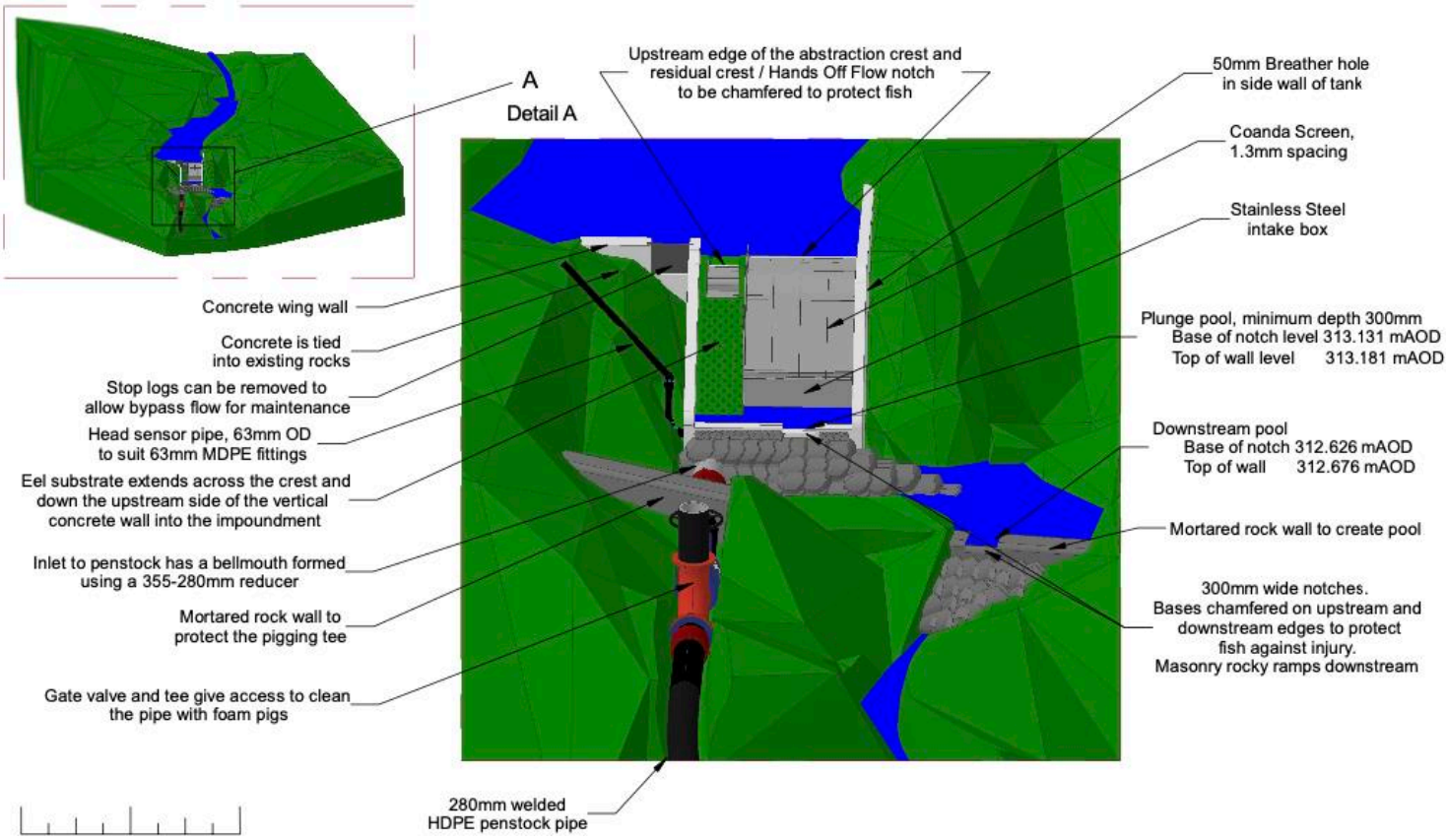
Effect of abstraction on Flow Regime:

% Exceedance Probability	Flow upstream of abstraction [l/s]	Abstraction [l/s]	Abstraction as percentage of upstream flow	Residual flow downstream of weir [l/s]	Residual flow as percentage of upstream flow
5%	439	51.2	11.7%	388	88.3%
10%	292	51.2	17.5%	241	82.5%
15%	234	51.2	21.9%	183	78.1%
20%	176	51.2	29.1%	125	70.9%
25%	149	51.2	34.4%	98	65.6%
30%	122	51.2	42.0%	71	58.0%
35%	106	51.2	48.5%	54	51.5%
40%	89	51.2	57.5%	38	42.5%
45%	78	44.8	57.4%	33	42.6%
50%	67	37.1	55.4%	30	44.6%
55%	59	31.5	53.4%	28	46.6%
60%	51	25.9	50.8%	25	49.2%
65%	45	21.7	48.2%	23	51.8%
70%	39	17.5	44.9%	22	55.1%
75%	34	13.7	40.7%	20	59.3%
80%	28	9.8	35.0%	18	65.0%
85%	23	6.3	27.4%	17	72.6%
90%	18	2.8	15.6%	15	84.4%
95%	14	0.0	0.0%	14	100.0%
100%	9	0.0	0.0%	9	100.0%

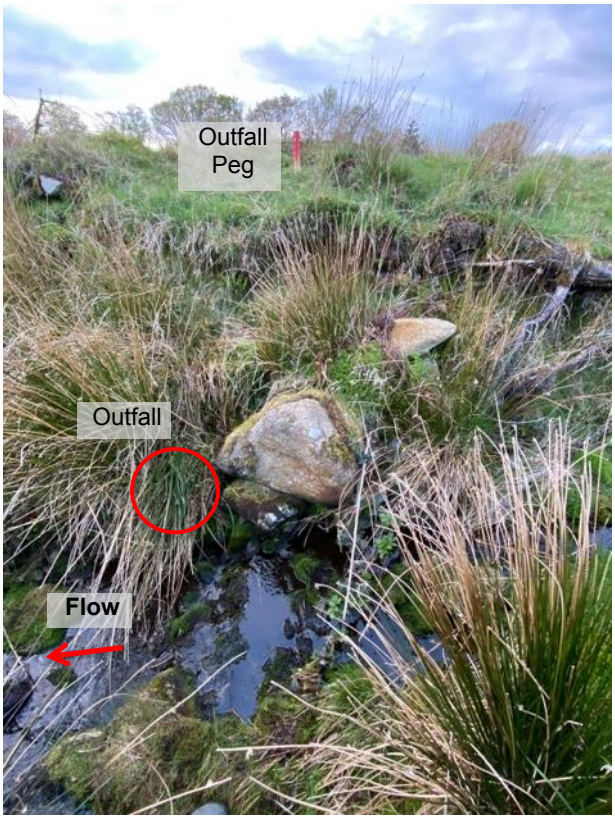
Intake site: (Location 8) NGR : SH 79432 18555

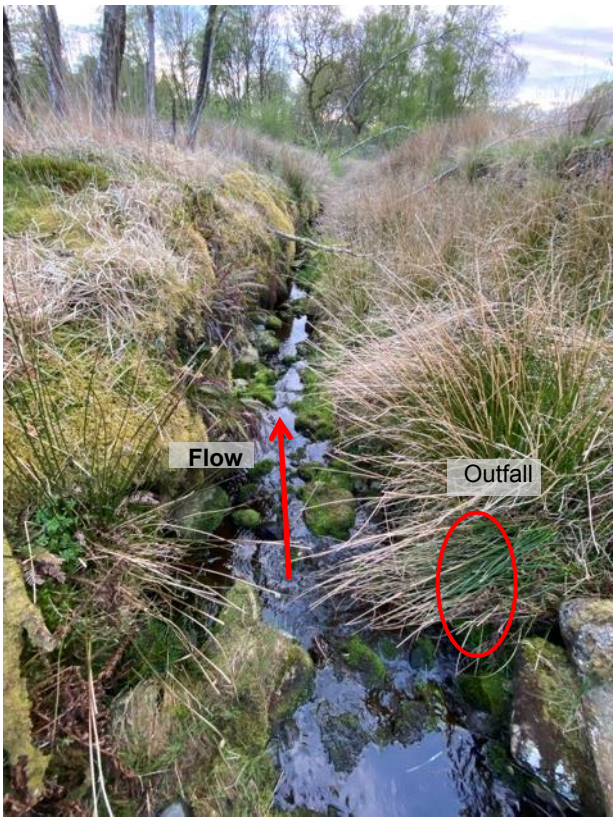
The proposal is to build a steel weir and intake box (with a coanda screen) off site and then fit it approximately where the orange wire-frame model is shown in the photo below. It will be sealed to the boulders using concrete:

3D model of proposed intake weir

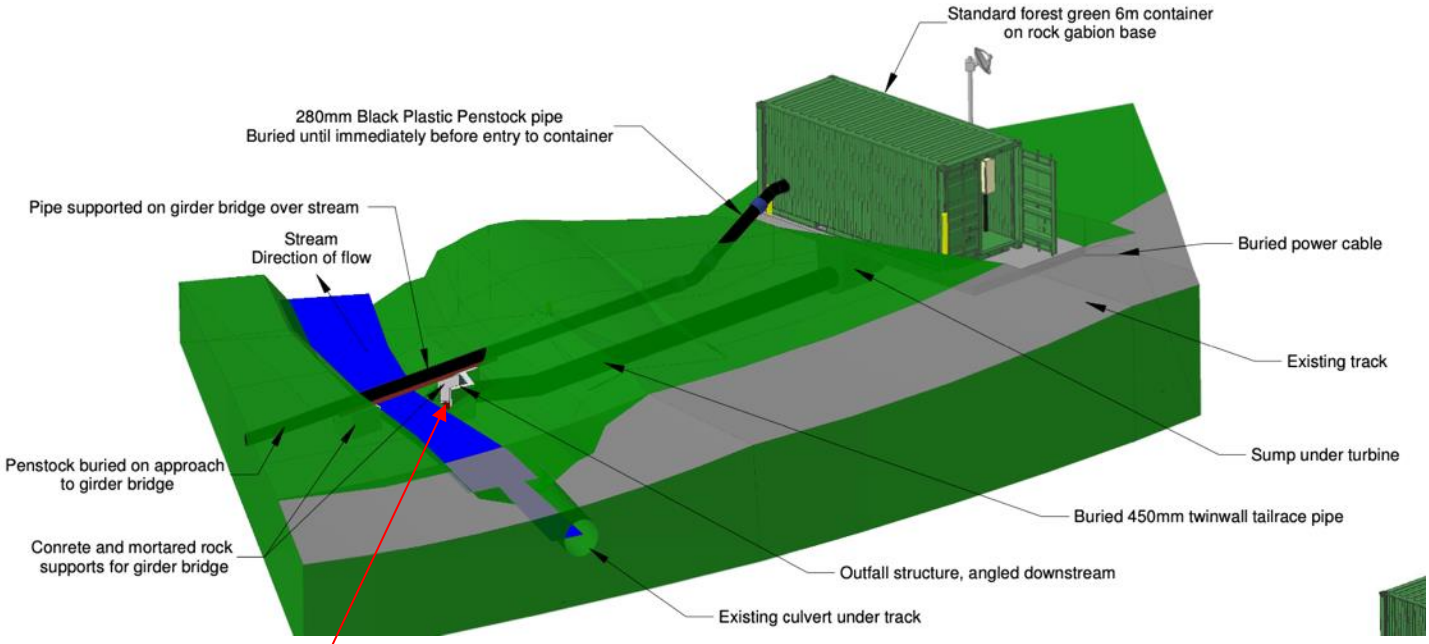


Outfall site: (Location 22) NGR : SH 79205 19597

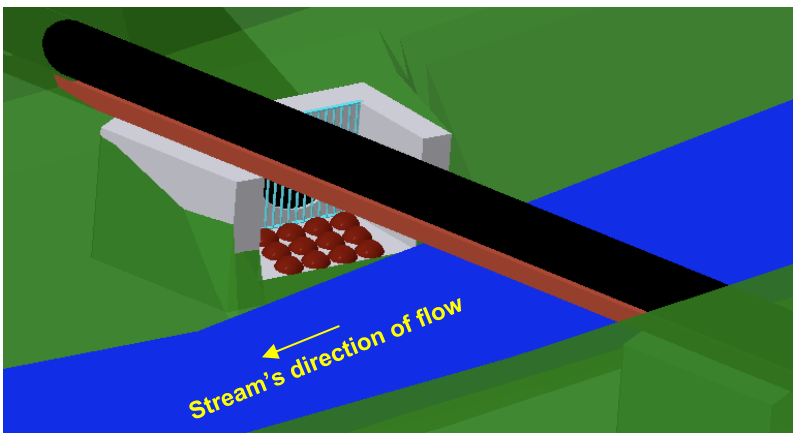




3D model of the power house and outfall



Outfall headwall arrangement



List of photo locations

All photo location numbers refer to the numbers highlighted yellow on the attached site plan. Where heights of falls are stated, these have been measured using a Leica Disto D510 laser measure.

Location 1 NGR:	SH7962218203	
Location 2 NGR:	SH7958118259	1.2m high falls
Location 3 NGR:	SH7954918306	
Location 4 NGR:	SH7952218350	1.4m high falls
Location 5 NGR:	SH7949318394	1.0m high falls
Location 6 NGR:	SH7947018478	
Location 7 NGR:	SH7945518509	
Location 8 NGR:	SH 79432 18555	Intake
Location 9 NGR:	SH7941218645	1.6m high falls
Location 10 NGR:	SH7932618777	2.0m high falls
Location 11 NGR:	SH7928718816	2.4m high falls
Location 12 NGR:	SH7925018845	5.9m high falls
Location 13 NGR:	SH7917118959	
Location 14 NGR:	SH7914419048	
Location 15 NGR:	SH7919719145	Culvert bridge
Location 16 NGR:	SH7922519261	
Location 17 NGR:	SH7920819346	
Location 18 NGR:	SH7920619428	
Location 19 NGR:	SH7911719610	
Location 20 NGR:	SH7913019614	
Location 21 NGR:	SH7918819598	
Location 22 NGR:	SH 79205 19597	Outfall
Location 23 NGR:	SH7909919625	Road bridge
Location 24 NGR:	SH7907619683	1.4m high falls
Location 25 NGR:	SH7902819729	
Location 26 NGR:	SH7898519725	
Location 27 NGR:	SH7894619760	
Location 28 NGR:	SH7888819781	Road bridge
Location 29 NGR:	SH7887219803	Disused intake weir
Location 30 NGR:	SH7887919871	~10m high falls

Location 1 NGR: SH7962218203

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 2 NGR: SH7958118259 1.2m high falls

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 3 NGR: SH7954918306

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 4 NGR: SH7952218350 1.4m high falls

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 5 NGR: SH7949318394 1.0m high falls

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 6 NGR: SH7947018478

View looking downstream (1250mm staff for scale)

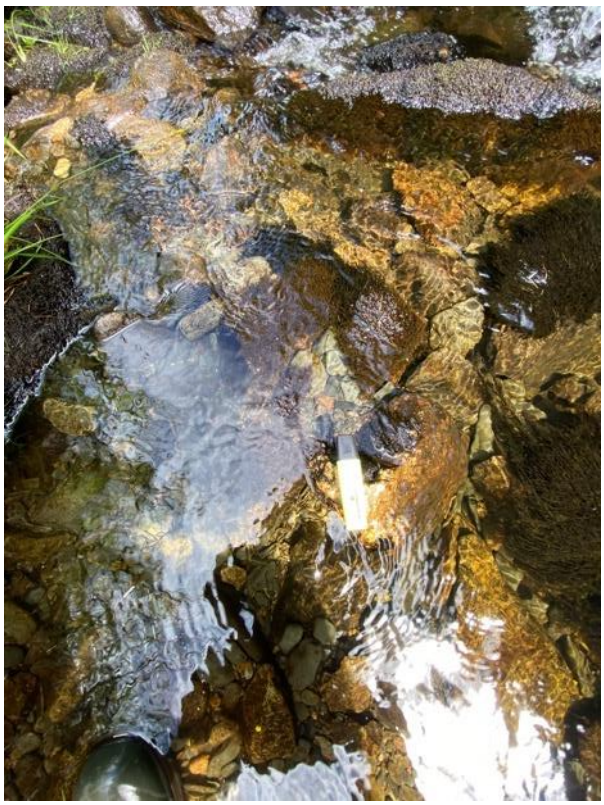
View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 7 NGR: SH7945518509

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)



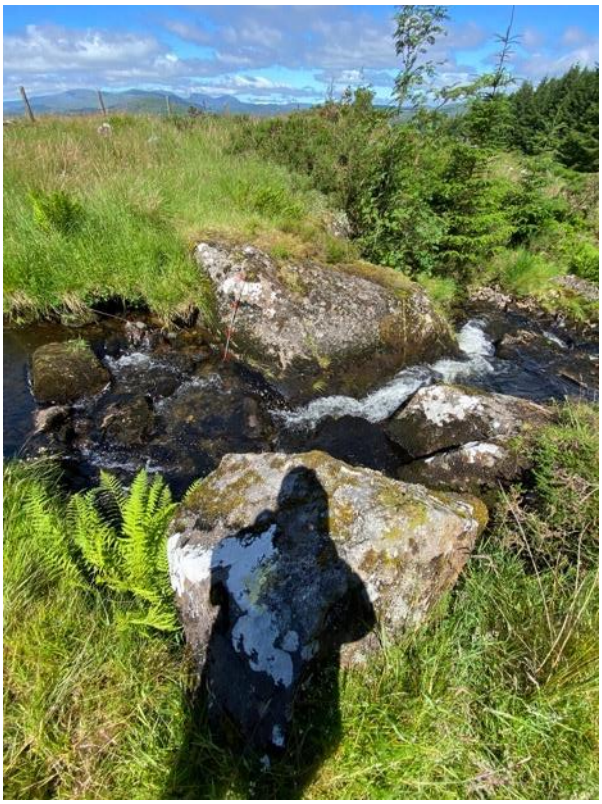
Bed Material (100mm pen for scale)

Location 8 NGR: SH 79432 18555 Intake

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)



View looking NW (1250mm staff for scale)

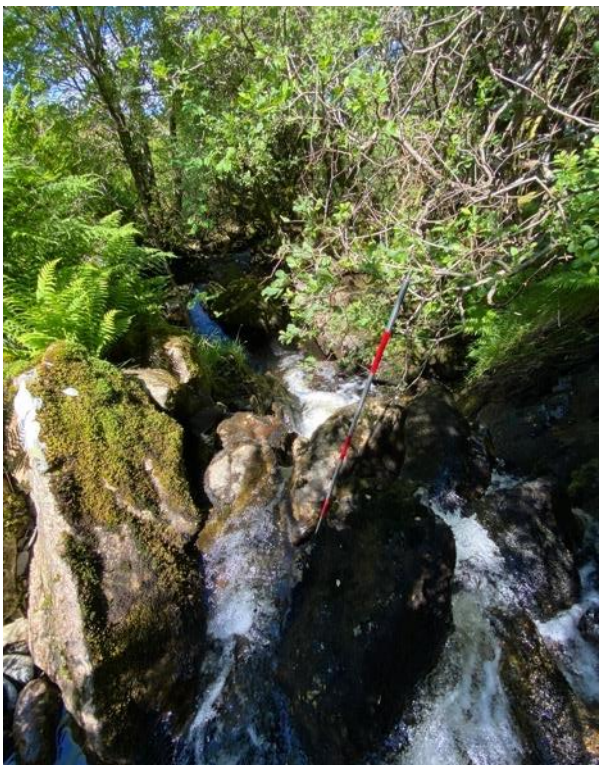
Location 9 NGR: SH7941218645 1.6m high falls

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 10 NGR: SH7932618777 2.0m high falls



View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 11 NGR: SH7928718816 2.4m high falls

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

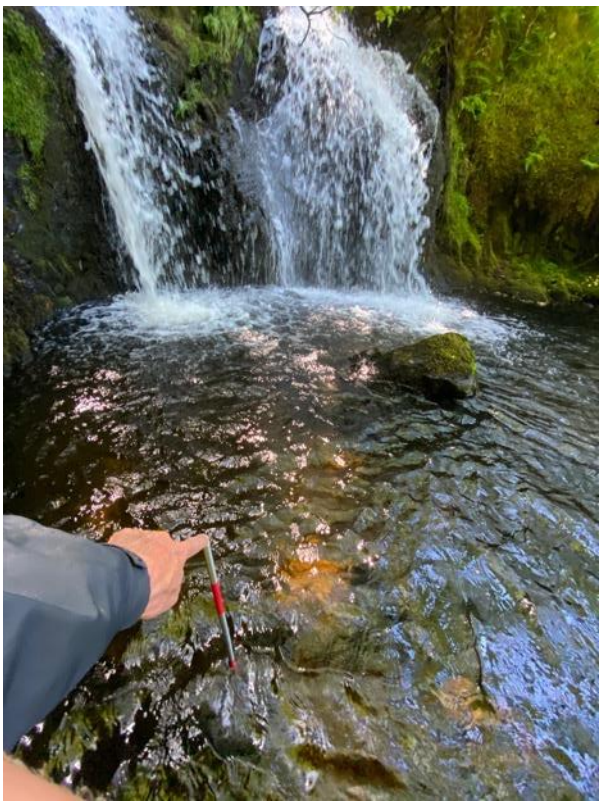
View looking upstream (1250mm staff for scale)

Location 12 NGR: SH7925018845 5.9m high falls

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)



1.0m deep pool

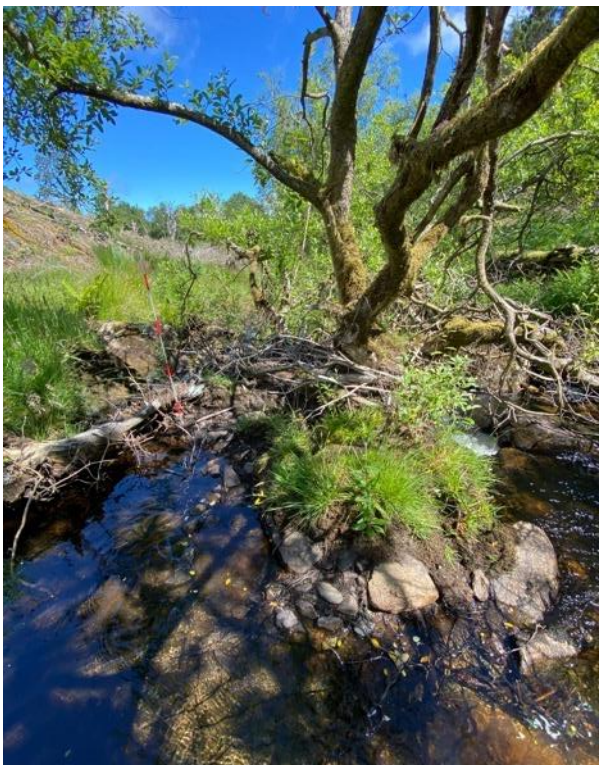
Location 13 NGR: SH7917118959

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 14 NGR: SH7914419048



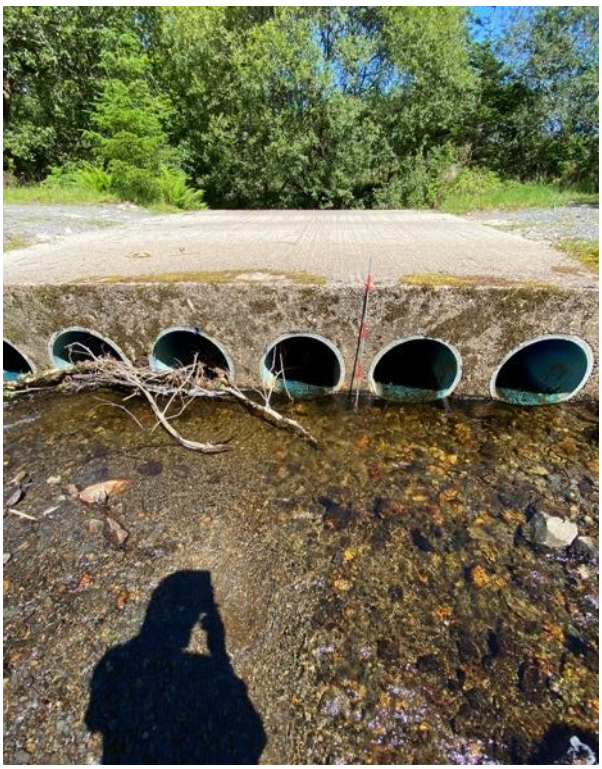
View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

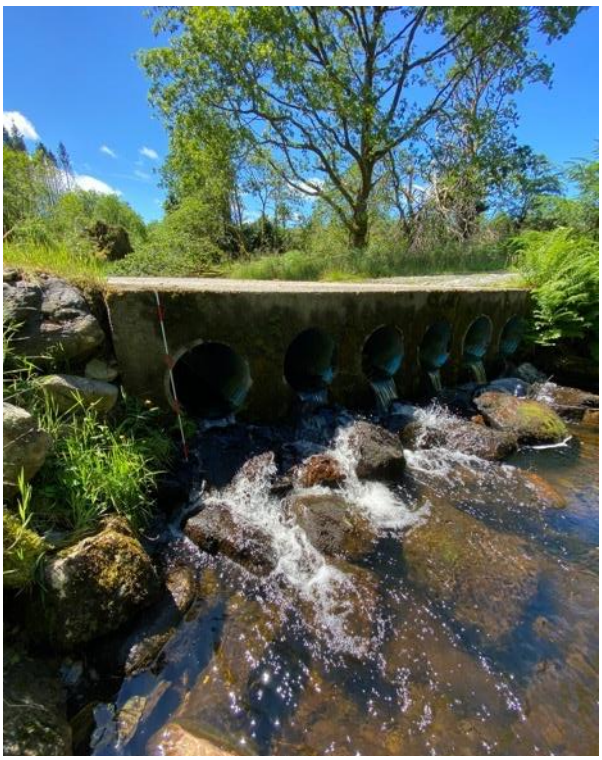
Bed Material (100mm pen for scale)

0.3m deep pool

Location 15 NGR: SH7919719145 Culvert bridge



View looking downstream (1250mm staff for scale)



View looking upstream (1250mm staff for scale)

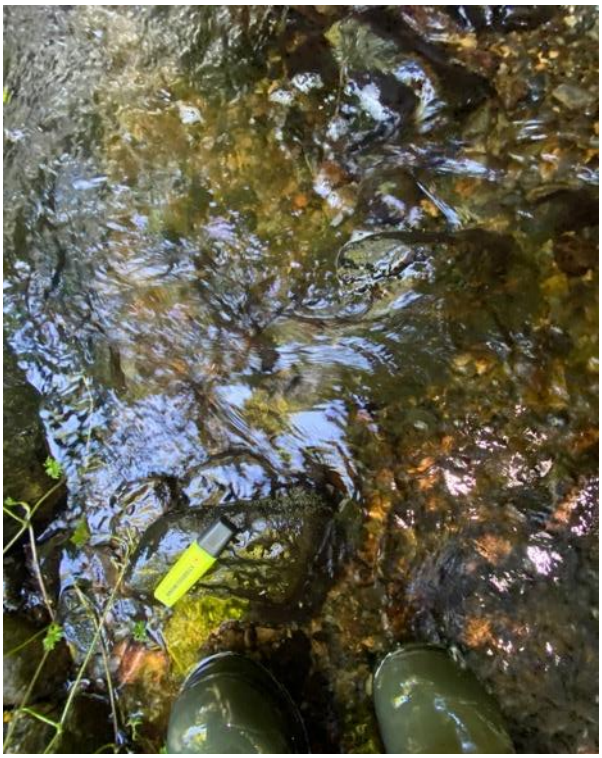
Bed Material (100mm pen for scale)

0.3m deep pool downstream of culvert

Location 16 NGR: SH7922519261

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)



Bed Material (100mm pen for scale)

View looking up tributary (1250mm staff for scale)

Location 17 NGR: SH7920819346

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 18 NGR: SH7920619428

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 19 NGR: SH7911719610

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

View looking up tributary (1250mm staff for scale)

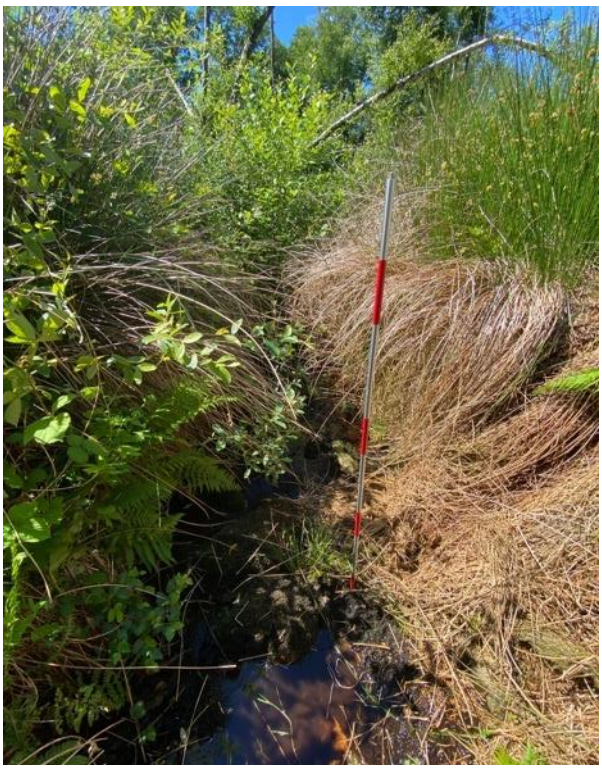
Location 20 NGR: SH7913019614

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 21 NGR: SH7918819598



View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 22 NGR: SH 79205 19597 Outfall

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

View looking North (1250mm staff for scale)

Location 23 NGR: SH7909919625 Road bridge

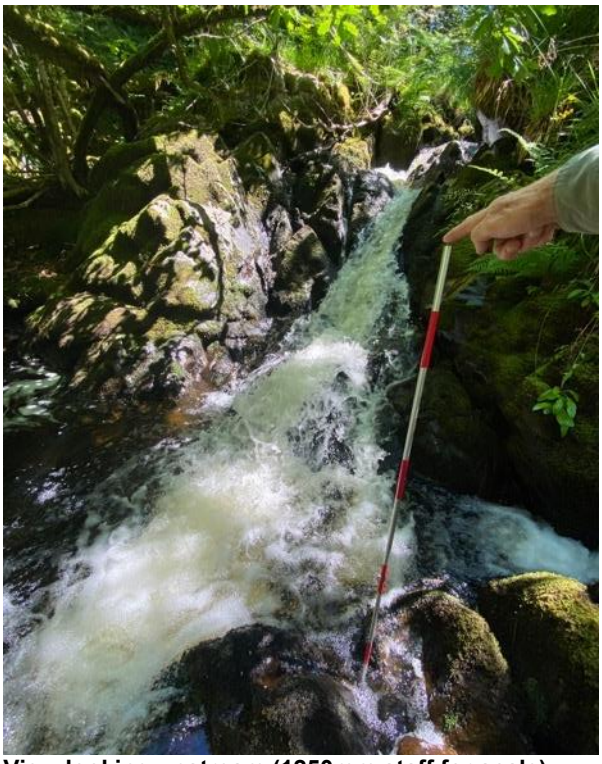
View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 24 NGR: SH7907619683 1.4m high falls

View looking downstream (1250mm staff for scale)



View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

0.4m deep pool

Location 25 NGR: SH7902819729

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 26 NGR: SH7898519725

View looking downstream (1250mm staff for scale)

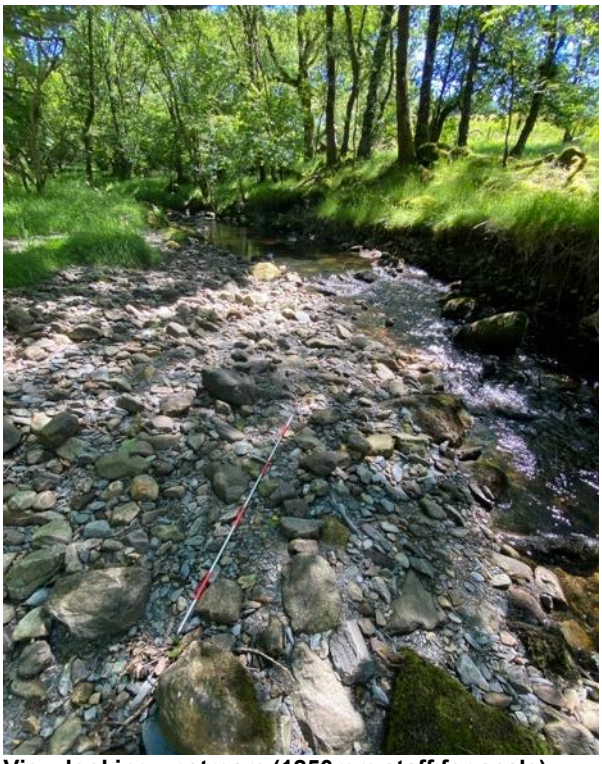
View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

View looking up tributary (1250mm staff for scale)

Location 27 NGR: SH7894619760

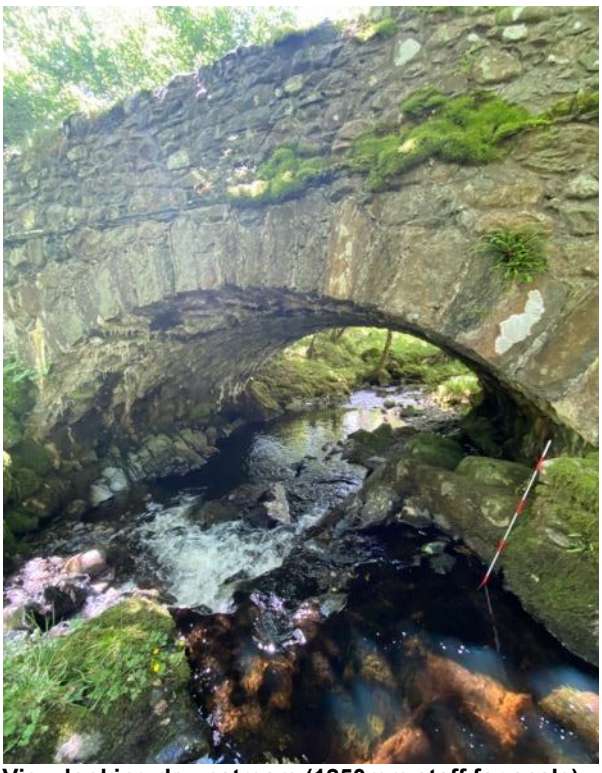
View looking downstream (1250mm staff for scale)



View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

Location 28 NGR: SH7888819781 Road bridge



View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

Bed Material (100mm pen for scale)

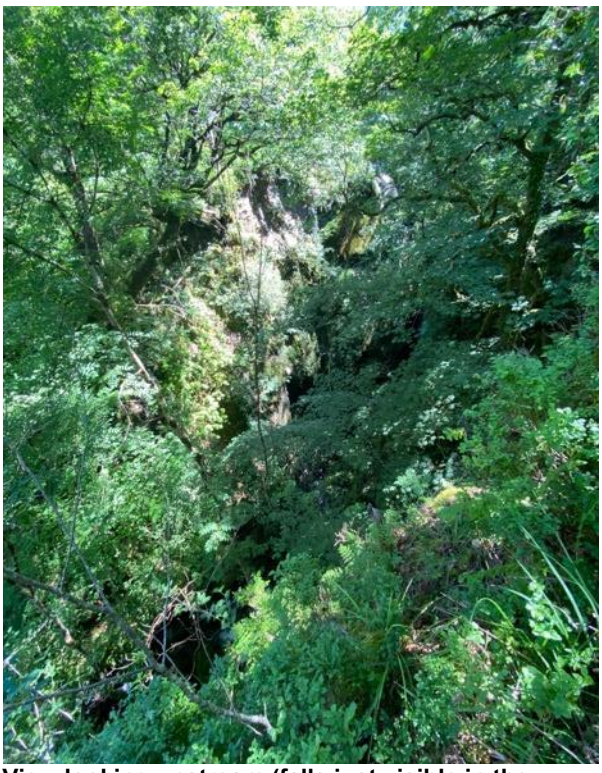
Location 29 NGR: SH7887219803 Disused intake weir

View looking downstream (1250mm staff for scale)

View looking upstream (1250mm staff for scale)

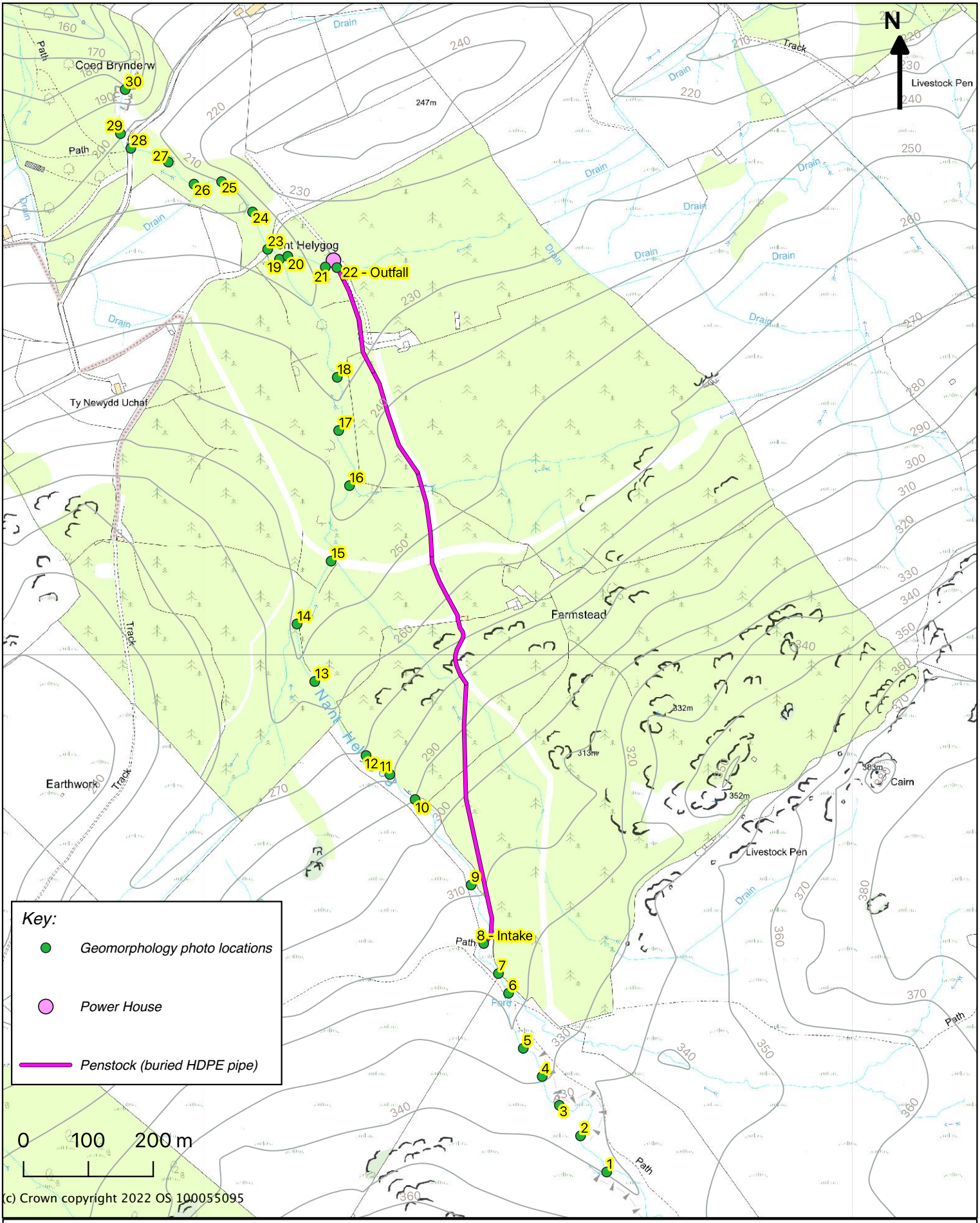
View looking down old leat (1250mm staff for scale)

Location 30 NGR: SH7887919871 ~10m high falls



View looking upstream (falls just visible in the background)

It was not safe to enter the gorge to take better photographs of the falls. They are estimated to be approximately 10m high.



Client: Mark Sealy
Installation Address: Brithdir Forest, Brithdir, Dolgellau, LL40 2SA
Drawing Title: Geomorphology photo locations
Drawn By: LMB
Date: 19th September 2022
Scale @ A4: 1:7,500
Dwg No: 220617LB01
Version: 3 (address changed)

Greenearth Hydro

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