

Fish pass design proposal, Whalley Weir Hydro Scheme

Client:
Whalley Community Hydro Limited

Our reference: SG/3238/Design
Wednesday, November 23, 2011

Fish pass design proposal

<i>Revision</i>	<i>Date</i>	<i>Reason</i>
0	31/10/11	Original
A	23/11/11	Included are the responses from the EA, 10 November 2011 11:07

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1 Introduction

This report contains a design proposal for a fish pass and eel/elver pass for the proposed hydro scheme at Whalley Weir.

2 Fish pass

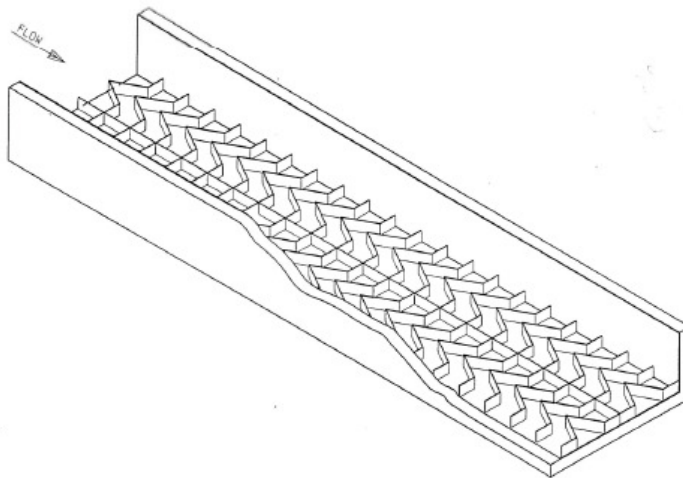
We are proposing for this type of river a Larinier super active baffle fish pass of double width. The pass is designed for a water level $H_a = 270\text{mm}$. This will result in a flow speed of $1.18\text{m}^2/\text{s}$ and water passage of 700l/s . The 700l/s is about 10% of the turbine flow.

A H_a of 270mm will be maintained till $Q_{28.9}$ with flows above the head will increase and the flow and flow speed will increase.

The level is maintained at constant by an automatic sluice and the speed reduction of the turbine till flows up to nominal ($6.25\text{m}^3/\text{s}$) + HoF of the system which is set $1.98\text{m}^3/\text{s}$. The $1.98\text{m}^3/\text{s}$ includes the nominal flow of the fish pass which is $0.7\text{m}^3/\text{s}$. total flow on which this head is maintained will be $8.23\text{m}^3/\text{s}$. this equals to as described above to $Q_{28.9}$.

Please find a table with water levels in Appendix A and Appendix B. These tables are showing the levels over the full range of flows. Graphs can be found in Appendix C

According to the good practice guidance of the EA these values are well within the guidelines and suitable for most fish.



3 Eel or Elver pass

We have proposed an up and over eel/elver pass. We can supply brushes with 20mm (for elvers) or 30mm suitable for larger size eels. For the design this doesn't make a difference. We have included a double 150mm brush. The trunk is 300mm square with lid for easy maintenance.

Total brush width is 300mm.

We are using a bilge pump able to pump 25-50 l/s at the highest point. This pump will run from dusk till dawn.

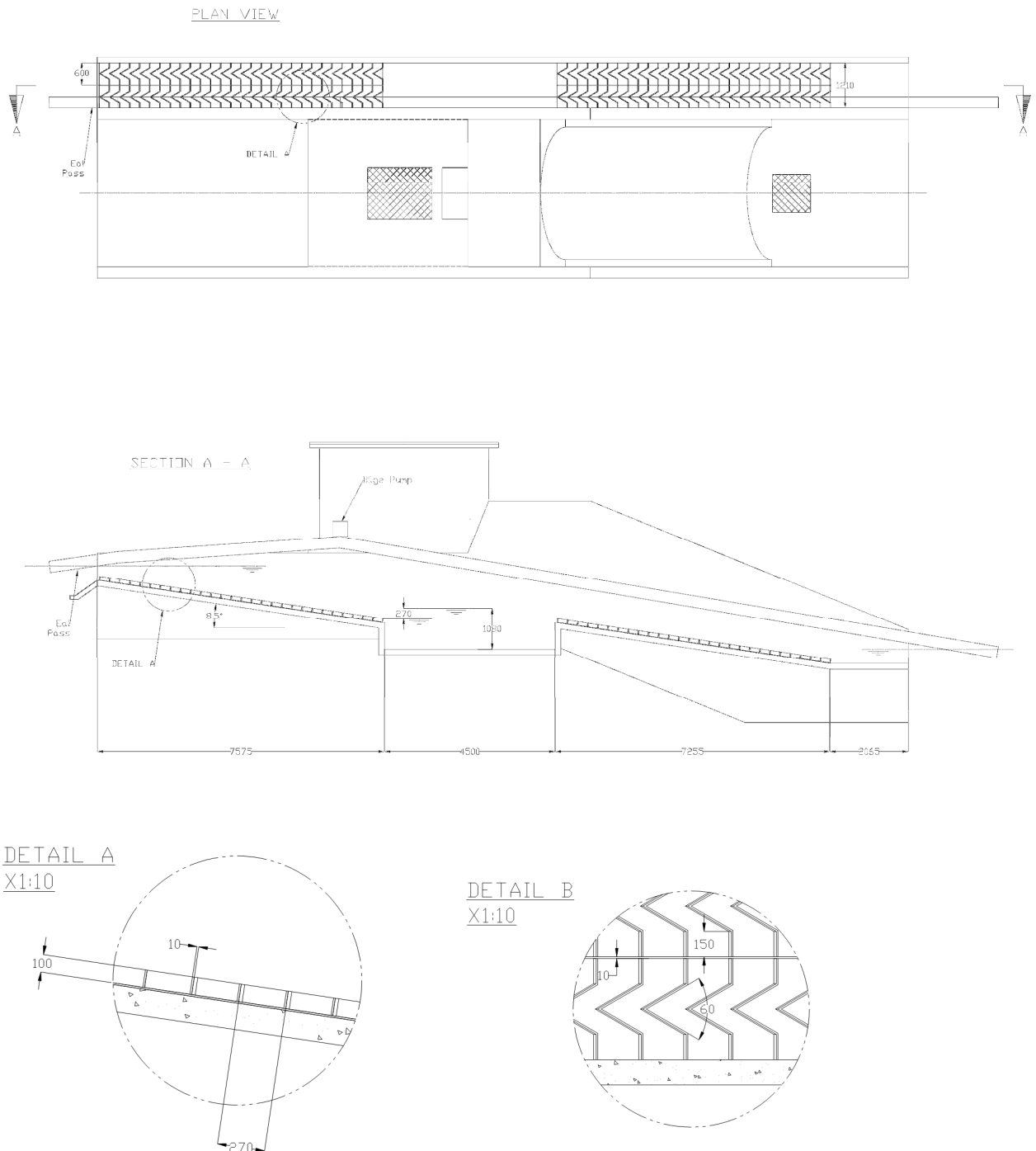
Please find below a picture:

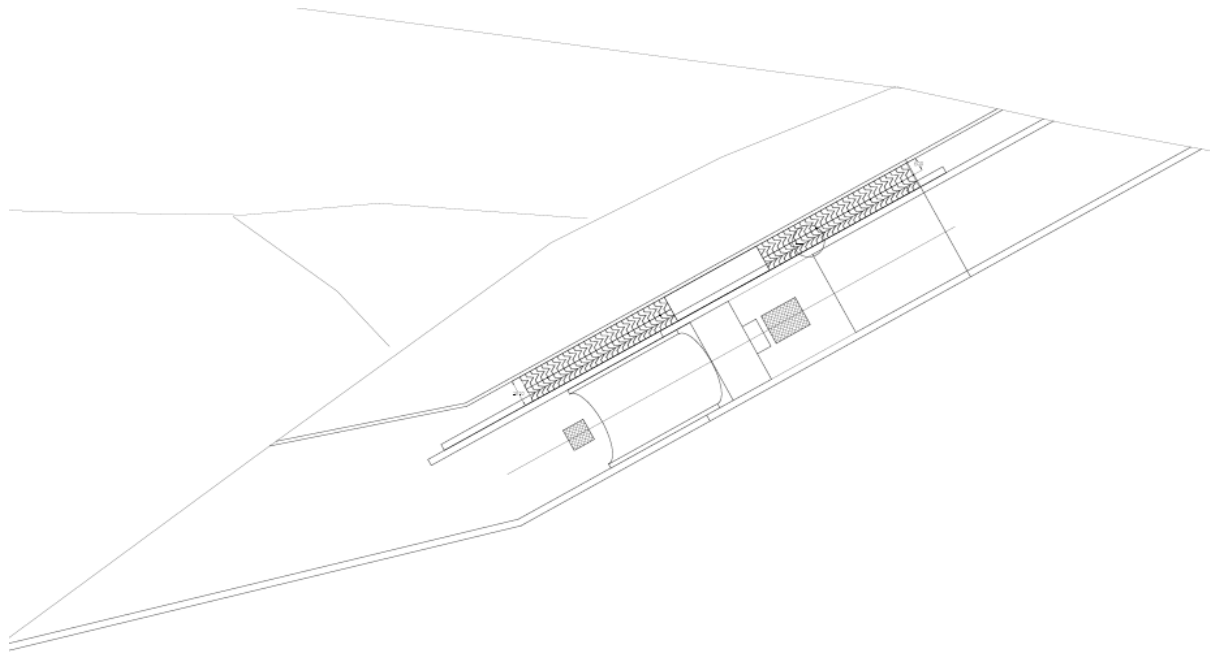


We intent to use:

1000x150x12, 0.8mm diameter black or green polyester 4mm tufts at 20 or 30mm spacing.

4 Design proposal at Whalley Weir





We trust our proposal meets with your requirements however if you should have need for any explanation of our proposal or additional information please do not hesitate to contact us.

Yours Faithfully
SPAANS BABCOCK LTD



Bert Boersma
Technical Sales Manager

Appendix A Table with levels

Occurrence (%)	Flow (m³/s)	Residual flow (m³/s)	Nominal flow (m³/s)	Usable flow (m³/s)	Flow through fishpass (m³/s)	% total flow	% turbine flow	Flow over weir (m³/s)	Head over fishpass (Ha)	Level drop (%)	Level drop (m)	Upstream level used (m)	Upstream level (m)	Down stream level (m)	Nett head (m)
5.0	27.93	2.64	6.25	6.25	1.36	5%	22%	20.32	0.43	100%	0.00	4.93	5.09	3.07	1.86
7.5	22.67	2.50	6.25	6.25	1.22	5%	20%	15.20	0.39	100%	0.00	4.93	5.05	2.98	1.95
10.0	19.53	2.41	6.25	6.25	1.13	6%	18%	12.16	0.36	100%	0.00	4.93	5.03	2.92	2.01
12.5	17.34	2.34	6.25	6.25	1.06	6%	17%	10.03	0.35	100%	0.00	4.93	5.01	2.88	2.05
15.0	15.49	2.28	6.25	6.25	1.00	6%	16%	8.24	0.33	100%	0.00	4.93	5.00	2.85	2.08
17.5	13.76	2.22	6.25	6.25	0.94	7%	15%	6.57	0.32	100%	0.00	4.93	4.98	2.82	2.11
20.0	12.15	2.17	6.25	6.25	0.89	7%	14%	5.01	0.31	100%	0.00	4.93	4.97	2.79	2.14
22.5	10.72	2.11	6.25	6.25	0.83	8%	13%	3.64	0.30	100%	0.00	4.93	4.96	2.76	2.16
25.0	9.55	2.07	6.25	6.25	0.79	8%	13%	2.51	0.29	100%	0.00	4.93	4.95	2.74	2.19
27.5	8.65	2.04	6.25	6.25	0.76	9%	12%	1.65	0.28	100%	0.00	4.93	4.94	2.73	2.20
30.0	7.96	1.98	6.25	5.98	0.70	9%	12%	1.28	0.27	100%	0.00	4.93	4.94	2.71	2.21
32.5	7.37	1.99	6.25	5.38	0.71	10%	13%	1.28	0.27	100%	0.00	4.93	4.94	2.70	2.23
35.0	6.78	1.98	6.25	4.80	0.70	10%	13%	1.28	0.27	100%	0.00	4.93	4.94	2.69	2.24
37.5	6.22	1.98	6.25	4.24	0.70	11%	16%	1.28	0.27	100%	0.00	4.93	4.94	2.68	2.25
40.0	5.94	1.98	6.25	3.96	0.70	12%	18%	1.28	0.27	100%	0.00	4.93	4.94	2.68	2.25
42.5	5.51	1.98	6.25	3.53	0.70	13%	20%	1.28	0.27	100%	0.00	4.93	4.94	2.67	2.26
45.0	5.18	1.98	6.25	3.20	0.70	13%	22%	1.28	0.27	100%	0.00	4.93	4.94	2.66	2.26
47.5	4.90	1.98	6.25	2.92	0.70	14%	24%	1.28	0.27	91%	0.15	4.78	4.94	2.66	2.12
50.0	4.65	1.98	6.25	2.67	0.70	15%	26%	1.28	0.27	82%	0.30	4.63	4.94	2.65	1.98
52.5	4.42	1.98	6.25	2.44	0.70	16%	29%	1.28	0.27	75%	0.41	4.52	4.94	2.65	1.88
55.0	4.20	1.98	6.25	2.22	0.70	17%	31%	1.28	0.27	69%	0.50	4.43	4.94	2.65	1.79
57.5	3.99	1.98	6.25	2.02	0.70	17%	35%	1.28	0.27	64%	0.58	4.35	4.94	2.64	1.71
60.0	3.80	1.98	6.25	1.82	0.70	18%	38%	1.28	0.27	60%	0.65	4.28	4.94	2.64	1.64
62.5	3.61	1.98	6.25	1.63	0.70	19%	43%	1.28	0.27	56%	0.71	4.22	4.94	2.63	1.58
65.0	3.43	1.98	6.25	1.46	0.70	20%	48%	1.28	0.27	53%	0.76	4.17	4.94	2.63	1.53
67.5	3.27	1.98	6.25	1.29	0.70	21%	54%	1.28	0.27	50%	0.81	4.12	4.94	2.63	1.49
70.0	3.12	1.98	6.25	1.14	0.70	22%	61%	1.28	0.27	47%	0.86	4.07	4.94	2.63	1.45
72.5	2.98	1.98	6.25	1.00	0.70	23%	70%	1.28	0.27	45%	0.90	4.03	4.94	2.62	1.41
75.0	2.85	1.98	6.25	0.87	0.70	24%	80%	1.28	0.27	43%	0.93	4.00	4.94	2.62	1.38
77.5	2.74	1.98	6.25	0.00	0.70	25%	100%	2.04	0.27				4.95	2.62	na
80.0	2.63	1.98	6.25	0.00	0.70	26%	100%	1.94	0.27				4.95	2.62	na
82.5	2.53	1.98	6.25	0.00	0.70	28%	100%	1.83	0.27				4.94	2.62	na
85.0	2.43	1.98	6.25	0.00	0.70	29%	100%	1.73	0.27				4.94	2.61	na
87.5	2.32	1.98	6.25	0.00	0.70	30%	100%	1.63	0.27				4.94	2.61	na
90.0	2.20	1.98	6.25	0.00	0.70	32%	100%	1.50	0.27				4.94	2.61	na
92.5	2.05	1.98	6.25	0.00	0.70	34%	100%	1.35	0.27				4.94	2.61	na
95.0	1.86	1.97	6.25	0.00	0.69	37%	100%	1.17	0.27				4.94	2.60	

Appendix B Simplified Table

Occurrence (%)	Flow (m ³ /s)	Residual flow (m ³ /s)	Usable flow (m ³ /s)	Flow through fishpass (m ³ /s)	% total flow	% turbine flow	Flow over weir (m ³ /s)	Head over fishpass (Ha)	Upstream level used (m)	Upstream level (m)	Down stream level (m)	Nett head (m)
5.0	27.93	2.64	6.25	1.36	5%	22%	20.32	0.43	4.93	5.09	3.07	1.86
10.0	19.53	2.41	6.25	1.13	6%	18%	12.16	0.36	4.93	5.03	2.92	2.01
15.0	15.49	2.28	6.25	1.00	6%	16%	8.24	0.33	4.93	5.00	2.85	2.08
20.0	12.15	2.17	6.25	0.89	7%	14%	5.01	0.31	4.93	4.97	2.79	2.14
25.0	9.55	2.07	6.25	0.79	8%	13%	2.51	0.29	4.93	4.95	2.74	2.19
30.0	7.96	1.98	5.98	0.70	9%	12%	1.28	0.27	4.93	4.94	2.71	2.21
35.0	6.78	1.98	4.80	0.70	10%	15%	1.28	0.27	4.93	4.94	2.69	2.24
40.0	5.94	1.98	3.96	0.70	12%	18%	1.28	0.27	4.93	4.94	2.68	2.25
45.0	5.18	1.98	3.20	0.70	13%	22%	1.28	0.27	4.93	4.94	2.66	2.26
50.0	4.65	1.98	2.67	0.70	15%	26%	1.28	0.27	4.63	4.94	2.65	1.98
55.0	4.20	1.98	2.22	0.70	17%	31%	1.28	0.27	4.43	4.94	2.65	1.79
60.0	3.80	1.98	1.82	0.70	18%	38%	1.28	0.27	4.28	4.94	2.64	1.64
65.0	3.43	1.98	1.46	0.70	20%	48%	1.28	0.27	4.17	4.94	2.63	1.53
70.0	3.12	1.98	1.14	0.70	22%	61%	1.28	0.27	4.07	4.94	2.63	1.45
75.0	2.85	1.98	0.87	0.70	24%	80%	1.28	0.27	4.00	4.94	2.62	1.38
80.0	2.63	1.98	0.00	0.70	26%	100%	1.94	0.27		4.95	2.62	na
85.0	2.43	1.98	0.00	0.70	29%	100%	1.73	0.27		4.94	2.61	na
90.0	2.20	1.98	0.00	0.70	32%	100%	1.50	0.27		4.94	2.61	na
95.0	1.86	1.97	0.00	0.69	37%	100%	1.17	0.27		4.94	2.60	

Appendix C Graphs

