

STEWART ROBERTSON PROJECTS LTD



PROTECTION OF MIGRATING SMOLTS IN THE RIVER ERICHT – STOPPING SMOLTS ENTERING THE LADE

Our Vision:

1. Atlantic Salmon Smolts have no access to the lade via the gates above Brig O'Blair thus protecting them from various "pinch points" and issues in the lade. This is in total accord with the TDSFB view that *Quote "preventing smolts entering the lade had to be the main objective" Unquote* (David Godfrey, Convenor, TDSFB).
2. Local businesses (who abstract water) can still abstract up to the limit of their CAR licence
3. This work will join seamlessly with other projects on the river, related to salmon passage, to ensure that the river is restored, as far as possible, to its former glory.

Lade Issues

PINCH POINT 1 - THE HAUGH



The lade “pinch point” at the Haugh where the force of water drives smolts onto the concrete wall potentially causing fatalities or life-threatening injuries

PINCH POINT 3 - WEST MILL FISH FARM



West Mill Fish Farm abstraction point, mechanical screen cleaner and dam. In certain flows, smolts get trapped and are killed by the mechanical screen or are subject to predation. The dam has been removed (January 2025) but could be reinstated in the future

PINCH POINT 2 - THE HYDRO TURBINE



The Hydro turbine – an Archimedes screw system which allows smolts to enter and journey through the screw – although classified as “fish friendly”, damage to some smolts is likely, leading to death.

PINCH POINT 4 – EAST MILL LADE ABSTRACTION POINT



Before the main lade outflow there is a split in the lade which allows water down the old East Mill Fish farm abstraction point. Smolts could easily be diverted down this East Mill exit and probably get lost because it has significant barriers over its length before its outfall into the river.

PINCH POINT 5 – LADE RETURN INTO RIVER



The Lade returns to the river to the south of Lochlands Farm. There is an adult screen to stop adult salmon migrating up the River from entering the Lade. Unfortunately, this needs cleaned regularly during the smolt run because the upstream side of the screen gets blocked due to trash which mainly stems from beaver operations in the lade. The blockage stops smolts from swimming through the screen. Trapped smolts have been seen at this location a number of times.

Every smolt is precious as we try to restore numbers of wild Atlantic Salmon and there are enough obstacles in the lade to indicate that smolts should not be allowed to enter it.

Our belief is that smolt screens should be in place at the lade entrance above Brig O' Blair and this short presentation gives an outline of our concept



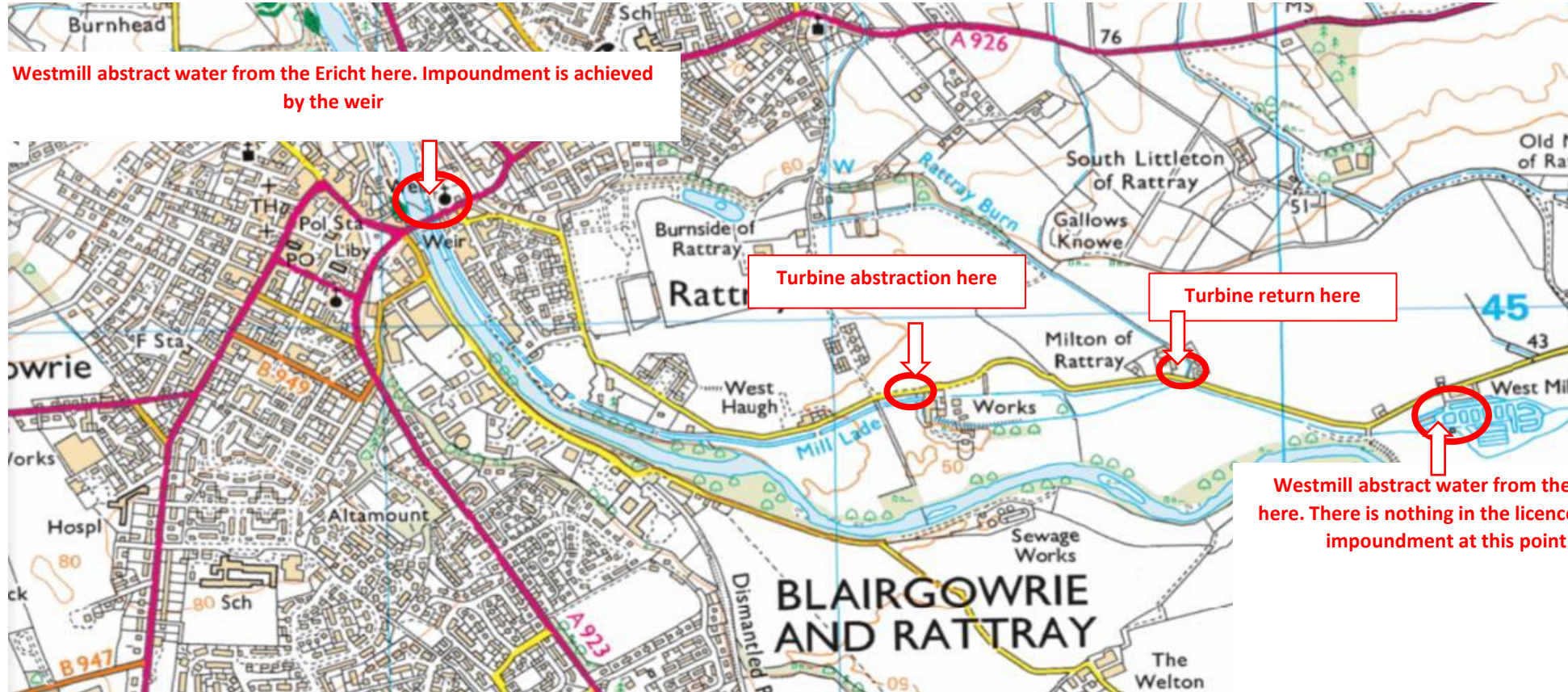
Project Aims

- 1. To understand current issues with regard to abstraction from the River Erich into the Rattray Mill Lade and from the Lade into West Mill Fish Farm and Hydro Turbine**
- 2. To understand all CAR Licences for abstraction during various flows**
- 3. To design a system which stops all adult and juvenile Atlantic Salmon entering the lade at any time (This is our preferred solution)**
- 4. To create a project plan which would allow installation of the solution before the 2026 smolt run (subject to funding)**
- 5. To calculate draft costings for the preferred solution**

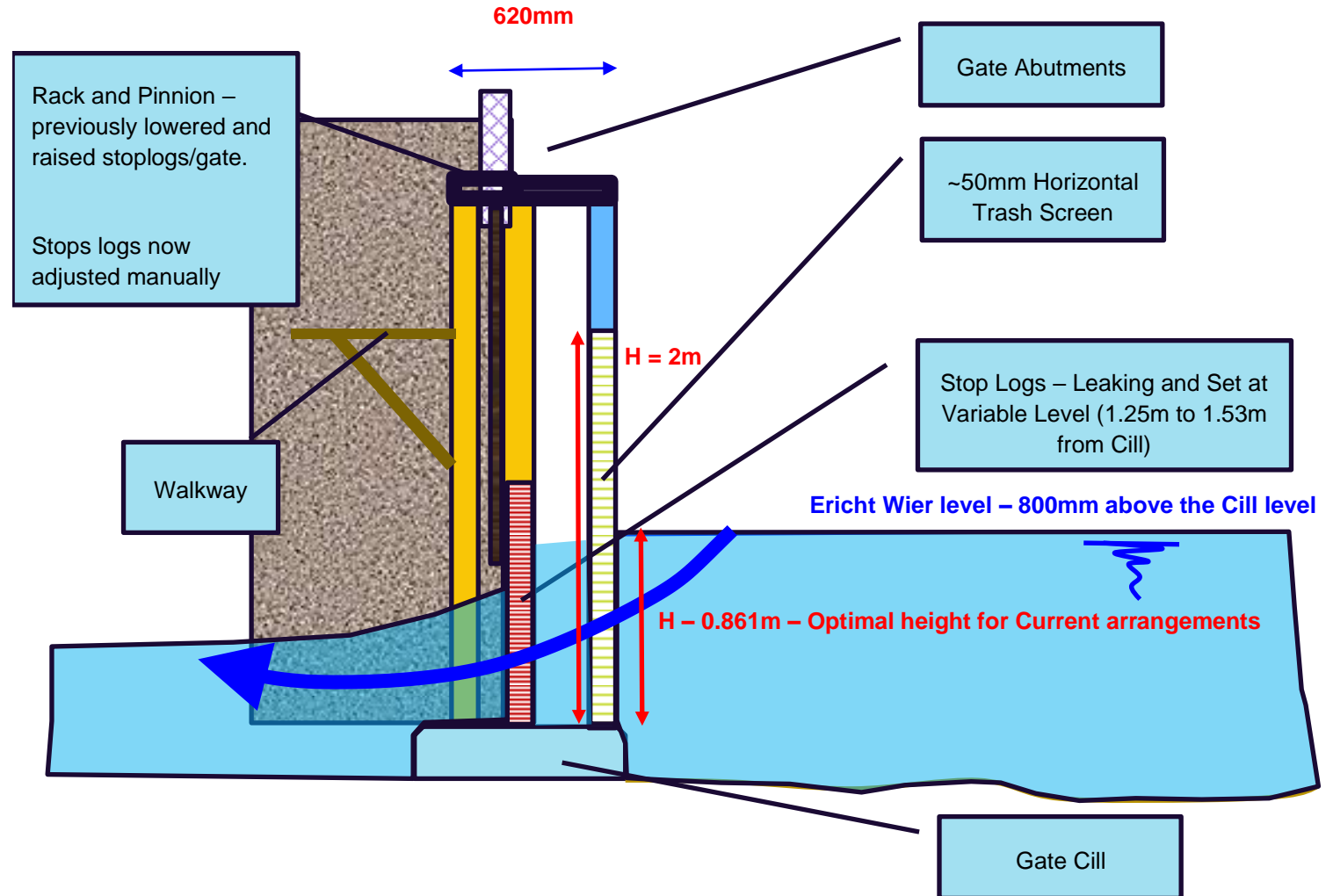
Methodology used

- **Understand and assess current condition of gates and screens at abstraction points**
 - **Main points are at Lade gates and West Mill Fish Farm – minor issues at Turbine abstraction**
- **Understand abstraction licences and related monitoring plans**
- **Refine designs to ensure project aims are satisfied**
- **Create a draft plan which covers design, development, build installation and commissioning**

Abstraction Points



Current condition of gates and screens at Lade abstraction point



West Mill Fish Farm Abstraction Point



CAR Licence Abstraction Rates

Column 1	Column 2	Column 3	Column 4
Period	Upstream location and rate	Abstraction location and rate	Abstraction location and rate
	Flow rate in River Ericht at Blairgowrie NGR NO 1740 4716	Maximum abstraction rate (m ³ /second) from the River Ericht NGR NO 1809 4529	Maximum abstraction rate (m ³ /second) from Rattray Mill lade NGR NO 2031 4470
Outwith the period of downstream fish migration	4.13	2.00	1.40
	2.87	1.77	1.40
	2.24	1.01	0.90
	1.81	0.72	0.64
	1.56	0.63	0.56
During the period of downstream fish migration	4.13	2.00	0.95
	2.87	1.77	0.95
	2.24	1.01	0.90
	1.81	0.72	0.64
	1.56	0.63	0.56

Initial Lade Gate redesign key points

1. **ADDITION -Smolt screens – to stop juvenile and adult salmon accessing the lade yet still allow licensed flows**
2. **CHANGE – assess effectiveness of current stop logs in allowing calibrated flows. Calculate flows through smolt screens at different river levels and decide on final design of gates.**
3. **CHANGE – instal vertical trash screen to replace current horizontal screens to allow easier cleaning**

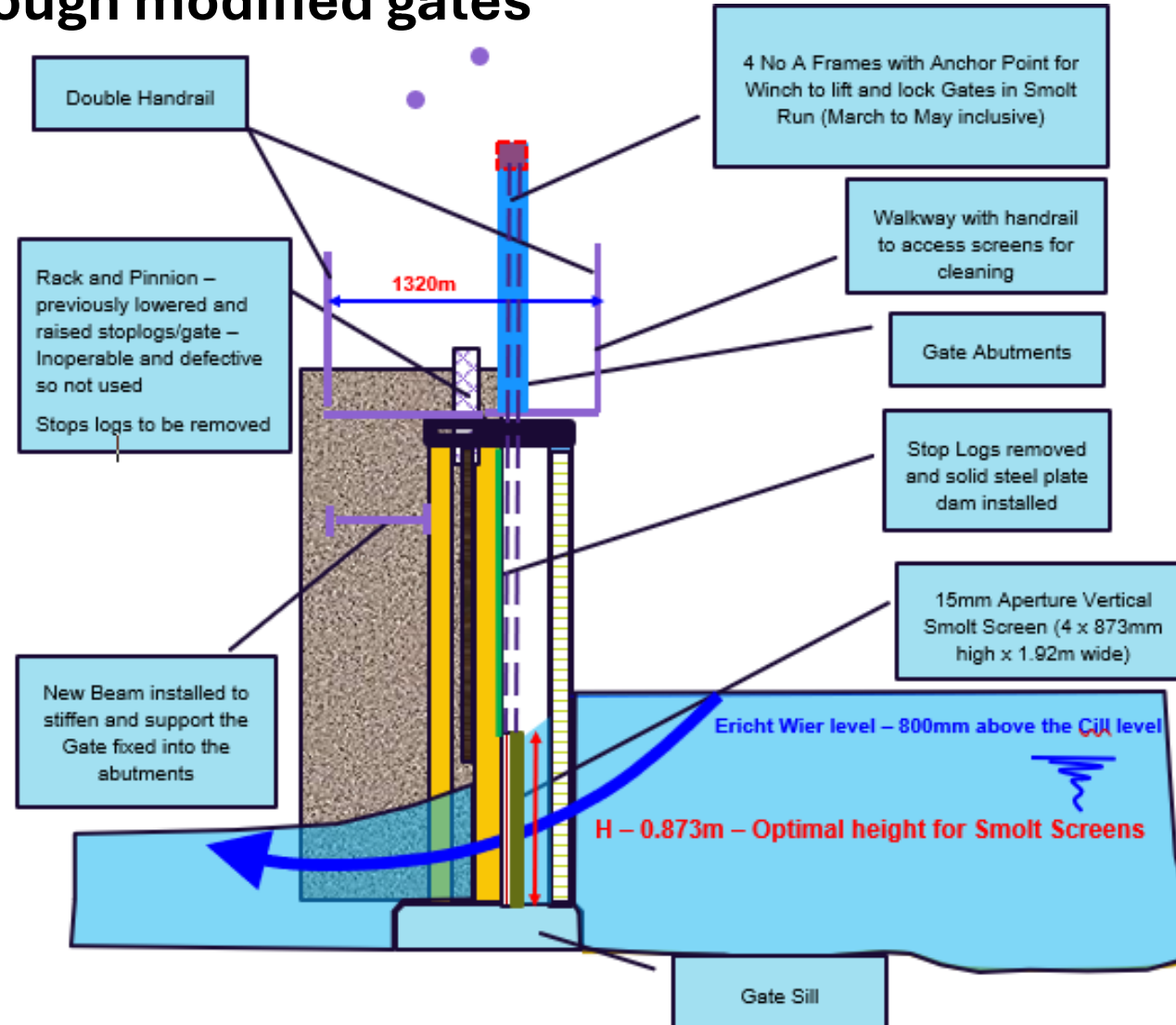
Screen Design

- Biggest challenge is design of smolt screen apertures to stop smolts and still allow licensed flows
- 7 different designs studied most of which did not meet smolt protection and licensed flows together
- Initial Preferred option:

Velocity V through the screens assumed to be 0.5m/s.

- Flow rate is Q m³/sec.
- Screen Width – $4 \times 1.92\text{m} = 7.68\text{m}$
- Screen blockage/blinding is assumed 10%.
- Assumed losses is 5%.
- So total allowance for screen efficiency is 15% in total
- Effective Width per screen = $1.92 - [((1.92/0.015) * 0.006) + 0.006] = 1.146\text{m}$
- There are 4 Screens at Effective width = 1.146m
- Allowing for 15% for blockage and losses effective = 1.146m
- Assumed velocity through screen is 0.5m/s
- $Q = AV - 2 = 4(1.146 \times H) \times 0.5 \Rightarrow 2 = 2.292 \times H \Rightarrow 2 = 2.292H$ (10% blockages and 5% hydraulic losses)
- **$H = 873\text{mm}$ with Screen aperture 15mm and vertical screen bar size: 6mm**
- **Optimal Height for a 2m³/s Maximum Extraction for a 15mm Smolt Vertical screen $\Rightarrow 873\text{mm}$**
- **This means 4 No Screens (1.92m wide x 873m with 15mm aperture and 6mm bars)**

X-section through modified gates





- **Initial preferred option:**
 - **Meets protection and licensed flows – screens in place all year**
 - **In situ 365 days – at high river flows 2 cumecs abstraction allowed, as river drops, flow through screens drops with commensurate drop in abstraction rates. This means that human intervention not required to adjust abstraction rates.**
 - **Allows safe cleaning of screens**
 - **Meets project aims**
 - **Removes any further need for Smolts screens at the fish farm**
- **Timescales:**
 - Overall Duration – **64 Weeks**
 - Developers Planning Duration – **32 weeks**
 - Contractors Planning Duration – **40 weeks**
 - Contractors Construction Period – **5 weeks**
 - Minimises screen maintenance costs

Main Conclusions – Initial preferred solution

- **The adult fish screen and existing stop log arrangement at the Ericht Gate do not protect against the migration of smolts into the Rattray Lade from the Ericht.**
- **There is no current facility within the Ericht Weir for Hands off or Compensation Flow to keep the River Ericht sustainable at all times.**
- **It is clear from the height calculation of the screen, if a smolt screen is allowed to be installed at a size of 4 No 1.92,m wide x 873mm high with 15mm apertures and 6mm bars with 15% redundancy for blockage and hydraulic inefficiencies then the maximum 2m³/s CAR Abstraction can be maintained and serviced.**
- **The above conclusion must recognise the need to maintain the smolt screens to keep them clear to ensure the flow rates required by the CAR Licence i.e maximum of 2m³/s reducing, depending on height of flow in the River Ericht. Cleaning can either be carried out manually or mechanically and both solutions attract significant costs.**

LATEST Update (Jan 2025)

Stakeholder engagement (after initial concept was published)

Initial engagement with stakeholders indicated concerns over the cleaning of screens required to clear ice and/or leaf and brash trash. There was a preference for smolt screens to be in place only for the smolt run and, perhaps, mechanical cleaning of the smolt screens.

Installation of smolt screens only at smolt run period is not a problem.

However, removal of the Smolt screens means that the stop log arrangement will need to be replaced by steel gates which can be raised and lowered to meet the licensed abstraction rates. Electrical power should also be introduced to power a flowmeter just downstream of the gates to give a constant readout of abstraction flows.

Mechanical screens can be fitted at additional cost

Our concept paper is being updated (end January 2025) to include these changes