Designers Risk Assessment	
Date:	20/06/19
Project Code:	02458
Document Number:	901-02458-P01
Assessment Coverage:	Glynn Weir

1. Background

The WRT are seeking to improve fish and eel passage over Glynn Weir on the river Fowey, near Bodmin. The proposed solution seeks to install a gravity eel pass and Larinier fish pass to the existing structure.

Figure 1 Glynn Weir, looking upstream (left), General Arrangement of works (right)

2. Brief description of works

To facilitate passage across the weir both a Larinier fish pass and a gravity fed eel pass are to be constructed into the existing weir.

The works will require a dry working area. It is envisaged that the weir area will be dried in sections, dividing the river in left-hand and right-hand working areas. This will allow the relatively low flows of the River Fowey to be diverted / pumped around the works area that is being worked on. It is assumed that the works will be carried out in a period of typical low-flows.

Eel Pass: The existing weir is to be broken out on the true right-hand flank (when viewed looking downstream). The existing weir glacis is to be extended to bed level and an RC channel is to be formed (from nominal A393 mesh). A lateral slope is to be formed within the channel and proprietary eel tiles will be fixed to form the eel pass.

Larinier Fish Pass: The existing weir & notch will be broken out on the true left-hand flank and a mass concrete profile will be formed on which to found the Larinier fish pass. Four aluminium units (with integrated baffles) will be attached to the slab forming the main fish pass (these aluminium units will form the internal formwork of the fish pass whilst removing the need to install baffle units into a 450mm channel). Concrete will then be poured to form the main pass that acts as a composite structure with the aluminium units.

Scour Protection: Rip-rap will be positioned to form a false weir toe, and to protect the left-hand bank.

Repair Works: Defects in the existing weir face will be repaired using concrete & reinforcement and the existing wing walls will be repaired & repointed.

Screening of Upstream Leat: A mesh screen will be installed spanning the entrance of the leat upstream of the fish pass together with associated ancillary works.

3. Key risk reduction measures

In order to ease access an 'operation and maintenance' (O&M) platform has been detailed running parallel alongside the Larinier. This avoids to requirement to access the downstream pool over rough rip-rap and may also facilitate access for construction activities.

Level mass concrete slabs have been provided at the upstream and downstream ends that ease wading access (should it be required) in low flows.

Due to the narrow width of the fish pass channel (450mm), drilling & fixing standard typical flat baffle units would have proved difficult within the constricted space. A composite aluminium / RC structure was chosen that would remove the need for fixing within the confined channel. Prefabricated aluminium units form a permanent inside-face shutter for placing concrete to form the Larinier fish pass. This simplifies formwork and rebar requirements, reducing the complexity & number of tasks on site.

Where possible, elements and details have been rationalised to allow for the contractors preferred methodology.

4. Significant residual risks

- **Lifting Operations.** The prefabricated aluminium units will need to be internally propped during lifting operations (and whilst placing concrete). Vegetation may need to be cleared to accommodate these lifting operations. The Contractor will need to produce a suitable methodology & lifting facilities and assess constraints.
- **Access to the site.** This is restricted to the true left bank side via a Forestry track. Strictly no access is available from the true right bank side. The existing leat on the true left bank side further restricts access to site.
- **Risk of high flows.** Monitor flow levels and check stability / effectiveness of cofferdams.
- **Risk of excessive seepages through weir.** Check stability of cut face in weir and assess permeability of formation material. Check adequacy of cut-off and cofferdams.
- **Risk of falls from height.** Contractor to establish sufficient protection around deep excavations and around top of adjacent walls.
- **Interface with public and other site operations.** Check adequate warning signs and fencing in place, including advisory road signage along access routes (NSWA chapter 8).
- **Service strike.** Full service utility enquiries have been conducted. Nevertheless, a check for charted & uncharted services (by CATscan) will still need to be carried out by the contractor to identify service utility locations.
- **Stability of excavations and structures**. Care taken not to undermine retaining walls when excavating in vicinity. Care should be taken not to excessively surcharge retaining wall when excavations are being conducted. Contractor to monitor surcharge loads and work in bays during excavations.

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5. Means by which significant hazards are conveyed

Where identified, expected hazards have mitigated as far as reasonably practicable. Any residual hazards that have been identified during the design have been highlighted on the construction drawings and discussed in the document below.

Assessed by : Martin Giblin **MEng (hons) GMICE**
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Item no.	Nature of risk	Level of risk	RAG list reference	Designers measures to mitigate risk	Level of risk	RAG list reference	Residual Hazard
Construction							
C1	**Managing River levels & Stage Levels**	High		The design has been minimised as far as reasonably practicable to reduce the amount of exposure, and the footprint of the works has been reduced as far as possible to reduce the complexity / scale of the cofferdam required. All works should be carried out behind temporary works cofferdams which are subject to design by the Contractor). Contractor to ensure that correct PPE (lifejackets) to be worn by contractors and operatives. The works are to be carried out within the River Fowey immediate area, which is susceptible to natural flooding. EA flood warnings can be monitored for prior notice. Contractor to define safe access routes for plant, equipment, materials and construction operatives. A flooding evacuation plan, in the event of overland floodplain flow, should identify where plant & machinery may be temporarily stored.	Low		No

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C2	**Managing flows and seepage**	Medium		The need for reinforcement & formed (shuttered) in situ concrete within the cofferdammed river areas is required. The risks of groundwater & river water seepage are to be mitigated by the contractor's temporary works cofferdam. Nevertheless, need for submersible pumping & settling siltation areas may be required. A safe sequence of construction operations will be required to manage potential seepage inflow and overtopping flow. Check stability of cut face in weir and assess permeability of formation material. Contractor to monitor the adequacy of cut-off and cofferdams during the works.	Low		No
C3	**Risk of falls from height**	Medium		The risk of falls from height have been mitigated by minimising depths of excavations for the Larinier. An access platform is designed along the length of the fish pass, which can be used for operation & construction purposes. Contractor to provide temporary works edge protection where necessary.	Low		No
C4	**Lifting**	High		Heavy elements have been reduced where possible to mitigate the risks associated with lifting. The shear connectors for the baffle units serve as possible lifting points that will provide options for the contractor's methodology. The aluminium baffles should be fixed to the founding slab after positioning to prevent movement. Outstand tabs	Low		No

				in the aluminium units provide accessible external fixing points. The aluminium units should be braced internally to maintain form during installation. The system that is used to brace the units is dependent on the contractor's methodology. By using a composite aluminium / RC system, the number of reinforcing bars in the structure has been reduced, reducing the number of lifts required. The Contractor will need to prepare a safe system of lifting. This should include a reconnaissance of the access & site and assessment of tree clearance requirements.			
C5	**Interface with the public**	Medium		The site is in a rural location and there is little foreseen interaction with the public. The entrance of the site will however be off of a public road and therefore check adequate warning signs and fencing in place, including advisory road signage along access routes (NSWA chapter 8). The provision of additional fencing (eg Herras) & signage to exclude the general public from the works may be required.	Low		No
C6	**Services damage resulting in injury to operator**	High		Service utility enquiries have been conducted. Nevertheless, a check for chartered & unchartered services (by CATscan) will still need to be carried out by the contractor to identify unknown utility locations.	Low		No

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C7	**Stability of Excavations & Structures**			Contractor to undertake inspection pits to check weir depths and footings of adjoining retaining wall. Care taken not to undermine retaining walls when excavating in vicinity. Care should be taken not to excessively surcharge retaining wall when excavations are being conducted. Contractor to monitor surcharge loads and work in bays during excavations.			
C8	**Installation - use of toxic or hazardous chemicals - resin anchor products and or grouts could be harmful to operatives & environment**	Medium		The design has been prepared to avoid the specification of epoxy resin anchor products where possible in favour of through bolts or cementitious grout. Where potentially harmful grouts have been specified, they should be installed in line with the manufacturer's recommendations. Contractors to have a suitable emergency methodology should any spillage occur into the river environment.	Low		No
C9	**Drilling - risk of operatives experiencing hand arm vibration**	Medium		Design has minimised drilling requirements as much as possible – where required, their number and embedment length has been minimised. Larinier baffle units are designed to reduce fixing no. requirements. During preparation of the weir glacis for repair, it is important that the contractor controls trigger time.	Low		No

Operation & Maintenance

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O1	**Access for debris clearance**	Medium		A level concrete slab has been detailed at the upstream end of the Larinier, allowing for wading access **during low flows.** Stop logs stops have been detailed at the upstream end that will allow flows in the Larinier to be stopped for inspection / maintenance works. A level concrete step has been provided at the downstream end again to aid in access to the bottom of the pass. Additionally, this aids as a level surface in which a cofferdam can be formed off. An Operation & Maintenance platform has been detailed with a tamped finish, along the bankside of the Larinier (running parallel), providing an adjacent surface on which the pass can be inspected (instead of continuing rip-rap). The leat screen has been sub-divided into three separate components, each with an integral lifting handle, for ease of handling & to limit weights to <25kg.	Low		No
O2	**Unauthorised access by the general public**	Medium		Due to the rural location of the pass unauthorised access by the general public is deemed a high risk. Despite this, the screen panel units have been detailed as fixed to prevent unauthorised removal.	Low		No