

## Structure C 302/127A

### Site Information

Location: Between Tain and Ardgay Stations

ELR: WCK 54.1035

OS Grid Ref: NH 64135 87259

### Remit:

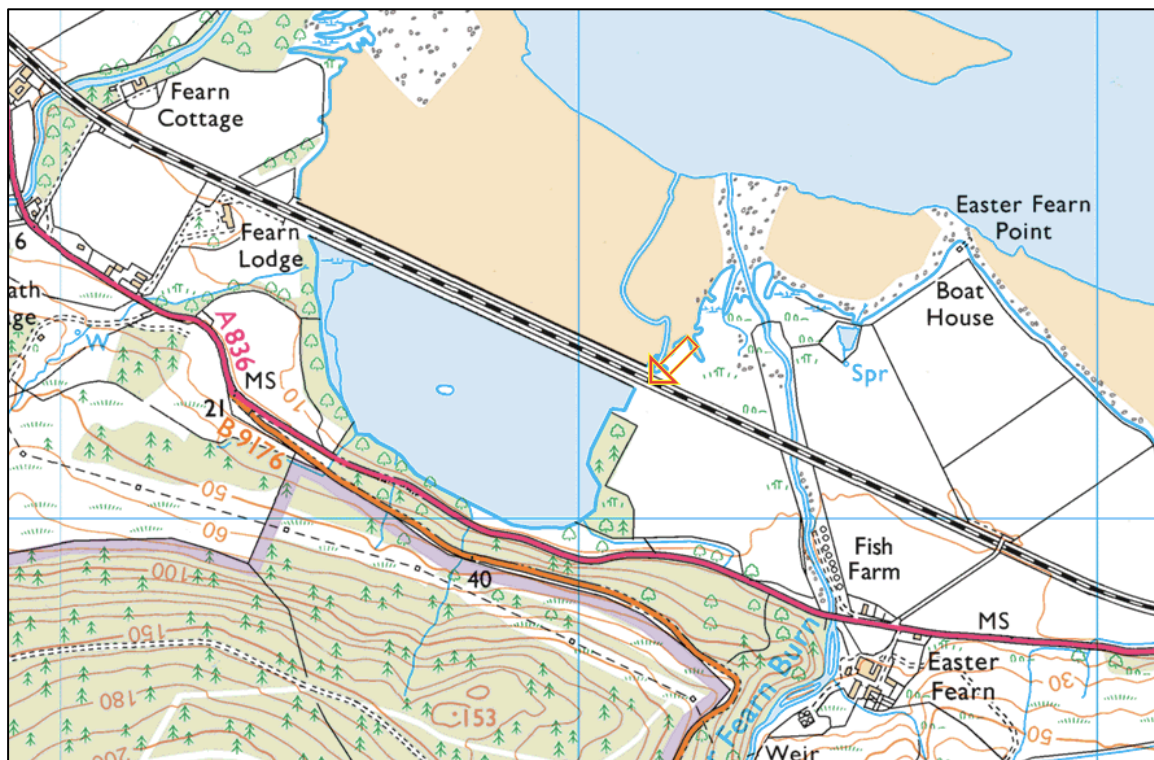
*Carry out inspection of defective Upside Outlet Tidal Flap which has been wedged open and produce report detailing schedule of repairs. Copy of report to be sent to RAM Team. The sluice gate is designed to let water into a certain height on the rising tide and then retain a water level on the outward tide. This gate is not operating correctly, and it is letting the full tide enter the enclosed area, causing the island to be almost completely submerged twice a day. This has led to the loss of important nesting habitat for breeding fowl and birds this season with nests continually being flooded due to the high water level in the enclosed water area.*

### Track

Lines speed: 70mph

Track is situated on straight embankment approx. 5m high.

Track comprises bullhead rail on timber sleepers with chairs.



Map 1 – Site Location

## Inspection

MHB completed an inspection of the structure on 12/10/20 at low tide.

## Outlet

The river bed at the outlet comprised very soft silty mud.

The rectangular tidal flap is constructed from timber and measures approximately 1800mm wide by 1300mm high as shown in Figure 1. It is fixed to a hinge joint that is bolted onto a concrete headwall. The face of the timber flap has been covered with a soft foam material presumably to create a seal around the inlet when operating properly.

It was not possible to open the flap during the site visit as it requires more than 2 people or the use of machinery which was not available and therefore the internal dimensions at the outlet are not known. It was however possible to insert a camera for a photograph which shows the culvert to comprise timber sleepers and side walls similar to the inlet which was more easily accessible.

The timber box culvert is situated in a concrete surround. Overlaying the concrete is 400mm of stonework which the brackets are fixed into.

The steel bracket connecting the flap to the concrete is approximately 300 long x 200 high by 20mm thick.

Flanking either side of the outlet flap are small timber sidewalls that extend 1200mm downstream of the outlet and measure 900mm high from the bed level.

Timber bank protection is situated along both of the outlet banks. The wood is deteriorated although in fair condition for its suspected age and the material behind the retention is stable.





Figure 1 - Outlet





Figure 2 – Flap Bracket





Figure 3 – View Downstream to Dornoch Firth



## Inlet

Water was observed to be flowing through the culvert.

The bed at the inlet comprises soft silty mud. A concrete invert is present 900mm from the inlet portal. There is a 100mm step from the natural bed up to the concrete invert. The concrete is of an older construction comprising large stone aggregates which has been eroded and broken up over time leaving a rough stony finish to the invert.

The culvert comprises a timber box of sleepers and sidewalls 800mm high by 1130mm span. Above the timber portal is 170mm thick concrete and 300mm thick stonework. Internally, the masonry is in good condition with some rot apparent on the left corner of the culvert portal.

The clear width from one wingwall to the other is approximately 2250mm. Masonry repairs have been undertaken to the wingwalls which are in good condition.

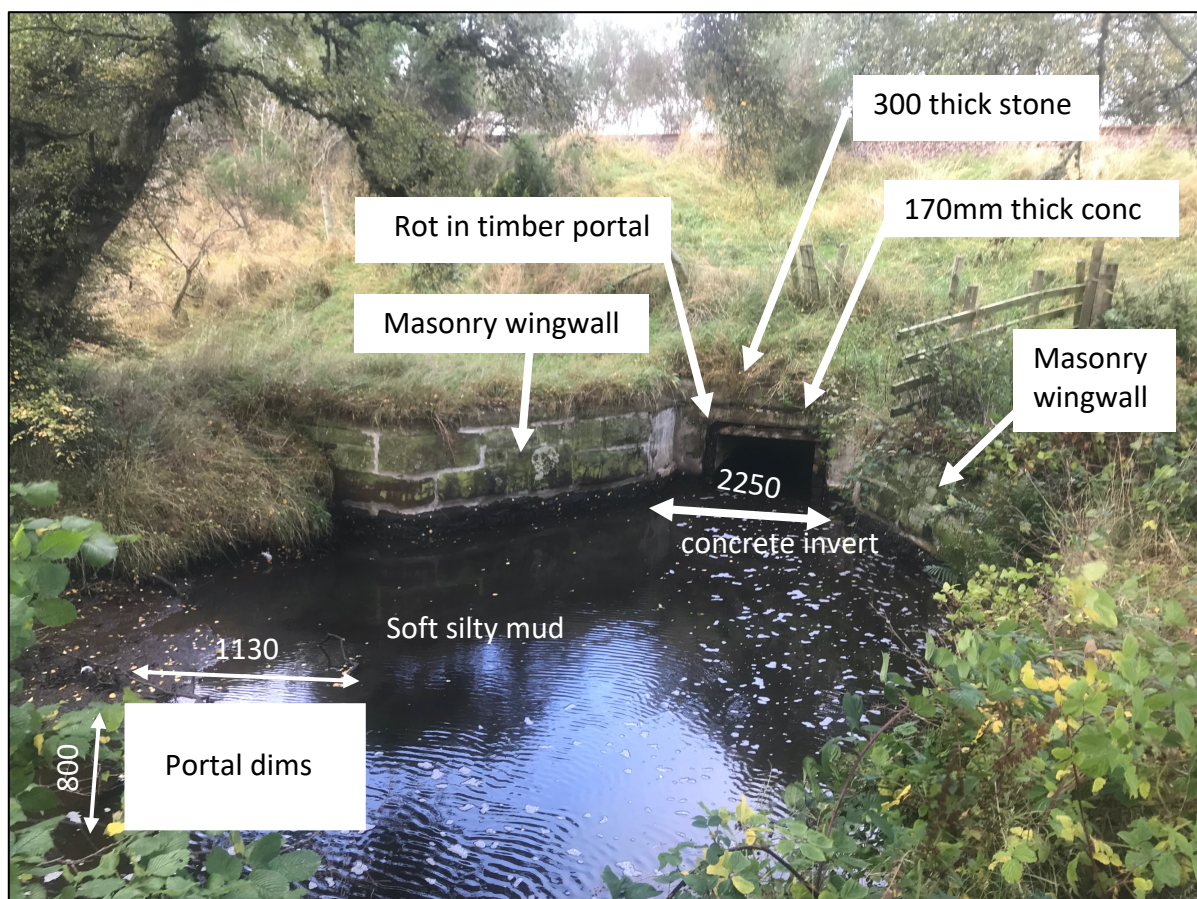


Figure 4 – Inlet



## Upstream

An unnamed body of water is situated 50m up stream of the inlet.

Water at the point of this picture was shallow at the time of the inspection (low tide). It is understood that a structure used to exist here. Timber or metal plates used to fit into the slits of the concrete blocks to maintain high water at low tide. It is unknown when this was deconstructed however a review of Routeview shows the structure to be in place in April 2019.



Figure 5 - Upstream



Figure 6 – Upstream Routeview 2019



### **Options for remediation works**

1. Remove the existing flap and associated brackets and replace with a modern GRP flap valve which would fix onto the existing headwall. Other minor repairs to be carried out as required.
2. Replace the existing headwall with a new concrete (or similar) headwall with flap valve. This provides assurance that the connection between the flap valve and the headwall is good and will achieve a 50-year design life.
3. As option 2 but extend the scope to also improve the outlet training walls as well as the headwall
4. As option 3 but extend the scope to also include remediations at the inlet – albeit it looks to have had attention recently
5. Complete replacement of the culvert with a NR compliant structure.
6. Any of the previous options with the addition of reinstating the upstream water retention structure as an alternative/additional way of controlling water levels in the loch.