Dŵr Cymru
Welsh Water

North Wales Reservoir Discontinuance Project

Scheme Overview - Llyn Bran Reservoir

[Overview version 2]

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Stillwater Associates Limited Alma House - Suite 3 | Alma Road | Reigate | Surrey | RH2 0AX
T: 01737 768237 | E: office@stillwater-associates.co.uk | www.stillwater-associates.co.uk

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Summary

Dŵr Cymru Welsh Water (DCWW) has identified the following four reservoirs in North Wales for discontinuance in accordance with the requirements of the Reservoirs Act 1975.

- Llyn Bran Reservoir
- Brithdir Mawr Reservoir
- Cilcain Reservoirs No.1 and No.2
- Penmaenmawr – Mountain Reservoir

These reservoirs were identified following a RARS2017 report prepared by ARUP as part of a wider portfolio risk assessment on behalf of DCWW. It is understood that additional sites may follow in due course.

This document summarises the discontinuance scheme proposal for **Llyn Bran Reservoir**.

The 'discontinuance' of a reservoir, under Section 13 of the Reservoirs Act 1975 requires an owner to reduce a reservoir's water storage capacity to a volume that is less than 10,000 m^3 (in Wales). This reduction can be achieved either by creating a large notch in the dam, or by complete removal of the dam.

Stillwater Associates completed a discontinuance feasibility assessment for Llyn Bran Reservoir in November 2018. This assessment involved a visual inspection of the site to determine the current condition of the dam and appurtenant structures and to become familiar with the general surrounding landscape. A number of studies and analyses were then undertaken to determine appropriate options for either retaining the reservoir in its current form or for discontinuing the reservoir in accordance with the requirements of the Reservoirs Act 1975.

An archaeological assessment of the site and a Preliminary Ecological Appraisal were also carried out to inform the need for mitigation measures, and to identify potential enhancement opportunities. These options were presented to DCWW in a feasibility study report in 2018. DCWW has since indicated that they intend to proceed with the discontinuance of Llyn Bran Reservoir.

Informed by the feasibility stage report and associated assessments further investigations and studies have been carried out during 2020 and 2021, along with detailed consultations with relevant authorities in relation to potential environmental and ecological impacts and downstream flood risk related to the discontinuance of the reservoir.

This report serves to provide a short summary of the proposed Llyn Bran Reservoir discontinuance option.

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1. Site Location

Llyn Bran Reservoir is situated in the County of Denbighshire approximately 12km southwest of Denbigh and 10km north of Cerrigydrudion as shown in Figure 1.1 below.

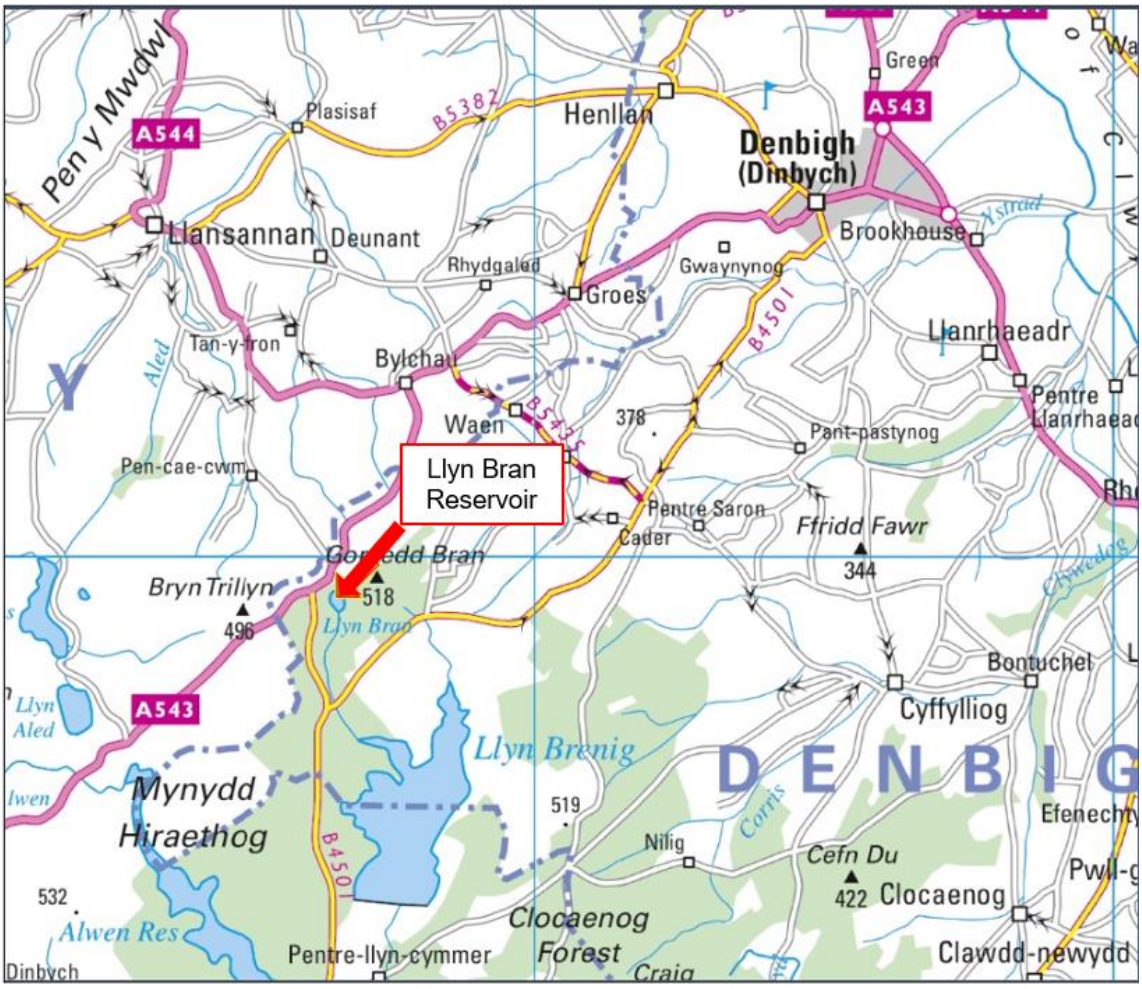

Figure 1: Location of Llyn Bran Reservoir (courtesy of Streetmap)

2. Recommended Option 2B: Discontinuance

Under this option the entire dam wall and overflow structure will be removed down to original ground level across the valley allowing the outflow from the remaining lake to flow unimpeded down the valley through the site of the dam. It is anticipated that the dam wall will be removed using an excavator mounted hydraulic breaker. The concrete arisings would be broken up on site and removed by dumper truck for disposal off site. The concrete foundation of the dam will be left in place at or just below original ground level.

The scour valve will be removed, and the scour pipe sealed by grouting.

Environment and ecology assessments have been carried out, including detailed consultations with Natural Resources Wales (NRW). Key impacts that have been identified, as a result of drawing down the reservoir, are:

- Loss of water vole habitat (Habitats Regs).
- Loss of macrophyte species from lake margins.

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Silt management during the physical works for discontinuance will be a critical issue to ensure silt is retained within the reservoir basin, and prevented from passing downstream.

To help minimise the potential impacts it is proposed to draw down the reservoir for discontinuance in a single stage, over approximately two weeks, to allow the dam to be removed. The proposed mitigations for the potential impacts are addressed in the report 'Llyn Bran Environmental Report' [Ricardo June 2021]. In summary, the key measures are:

- Capture and temporary ex situ management of resident water vole population, with new lake margin habitat established before re-introducing the water voles.
- Translocation and new planting of relevant macrophyte species, followed by post-drawdown monitoring.
- Vegetation clearance, supervised by an ecologist, to exclude reptiles from proposed working areas, with ongoing ECoW supervision during construction activities and relocation of reptiles, as necessary.
- A carefully planned and managed strategy for retaining silt within the reservoir basin using a range of proven techniques and measures, avoiding disturbance of silt as far as possible, and desilting of areas, mainly in the southern part of the reservoir, where ongoing and future movement of water would be expected to disturb silt.

An updated hydrological study and flood modelling have been carried out as part of the planning stage design in 2021. Whilst this study confirms that there will be an increased flood risk downstream, as a result of the reduction in reservoir attenuation, the study also showed that the only notable downstream impact will be a likely increase in the frequency of flood water surcharging the culvert beneath a forestry track, and another culvert further downstream beneath the B4501 road. A detailed assessment of these impacts, presented in the report 'Llyn Bran Reservoir Discontinuance Project: B4501 & A543 Roads: Flood Risk and Embankment Stability' [Stillwater Associates, July 2021], indicates that this surcharging of the culverts might increase the frequency of water impounding against the two embankments in question, and there may be an increased chance of blockage occurring. In the case of the forestry track this is within the ownership of DCWW, and damage to this track, should it occur, can be accepted. In the case of the B4501 culvert, the assessment of the embankment, which included stability analyses under a range of possible flood scenarios, indicates that the embankment and road would themselves be unaffected, although there may, under extreme flood conditions, be minor overtopping of the road embankment for a short period of time. This overtopping is likely to be shallow, spread out across the road, and would not be considered as presenting a risk to life, and would not be expected to result in damage to the road infrastructure. The outputs of the assessment have been presented to Denbighshire County Council, the highways authority. A consultation process is underway with DCC to determine the need, if any, for appropriate and proportionate mitigation works in respect of the likely increased frequency of culvert surcharging or blockage.

It is noted that the much larger Llyn Brenig Reservoir is located approximately 2.5km downstream of Llyn Bran Reservoir. Llyn Brenig will attenuate flood flows and the increased downstream flood risk associated with the discontinuance of Llyn Bran is not expected to have any further significant impact beyond the two watercourse crossings of the B4501.

Table 1 below provides a summary of the preferred discontinuance option, with key considerations and the estimated scheme implementation costs.

Sketches of the preferred option are presented in Figures 1.2 and 1.3.

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Table 1: Llyn Bran Reservoir - important considerations relating to the discontinuance option

Consideration	**Option 2B: Discontinuance - complete removal of dam**
Summary of option	**Return Llyn Bran to original natural footprint with entire concrete dam removed.**
Technical constraints **(dam structure and stability, overflow capacity and emergency drawdown requirements)**	*None – removal of dam is technically straightforward.*
Silt Management	*Mitigation be required to prevent silt transportation downstream during and after works (e.g. dredging, silt removal, re-vegetation and silt traps)*
Downstream Flood Risk	*Limited attenuation of inflows. Detailed assessment confirms increased flood risk with likely increased frequency of culvert surcharging beneath B4501 road. Assessment indicates no adverse impact on the highways embankment. Possible need for appropriate and proportionate mitigation works to be determined in consultation with DCC Highways Team.*
Access	*Temporary access will need to be formed to allow access for plant and to remove spoil from site.* *Permanent vehicle access not required.*
Amenity, Landscape and Biodiversity	*Change in landscape with lake returned to its original natural form – considered to be not detrimental to landscape.* *PEA indicates likely adverse impacts unless appropriate mitigation measures implemented. Detailed consultations carried out with NRW with mitigation proposed, most critically for water vole habitat, and also for macrophytes.* ***Potential to use residual lake for translocation of aquatic plants from Llyn Anafon discontinuance, plus river corridor and other habitat enhancement opportunities.***
Archaeology and Heritage	*No known archaeological interest. Partial watching brief to be maintained during discontinuance works.*
Safety	*Existing safety issues removed, and no new safety issues introduced – no long-term liability.*
Planning and Consents	*Certificate of Lawful Development issued.* *Impoundment Licence and Ordinary Watercourse Consent required.*
Ongoing Monitoring and Maintenance	*Reservoir removed from Reservoirs Act 1975.* *Infrequent visits to monitor estate interests.*
Option Cost: Capital cost ***50-year total cost***	**£600,000*** ***£612,000****
includes cost of downstream flood mitigation works (additional road culverts) estimated at £120,000, and ecological mitigation. Excludes environmental enhancements.	

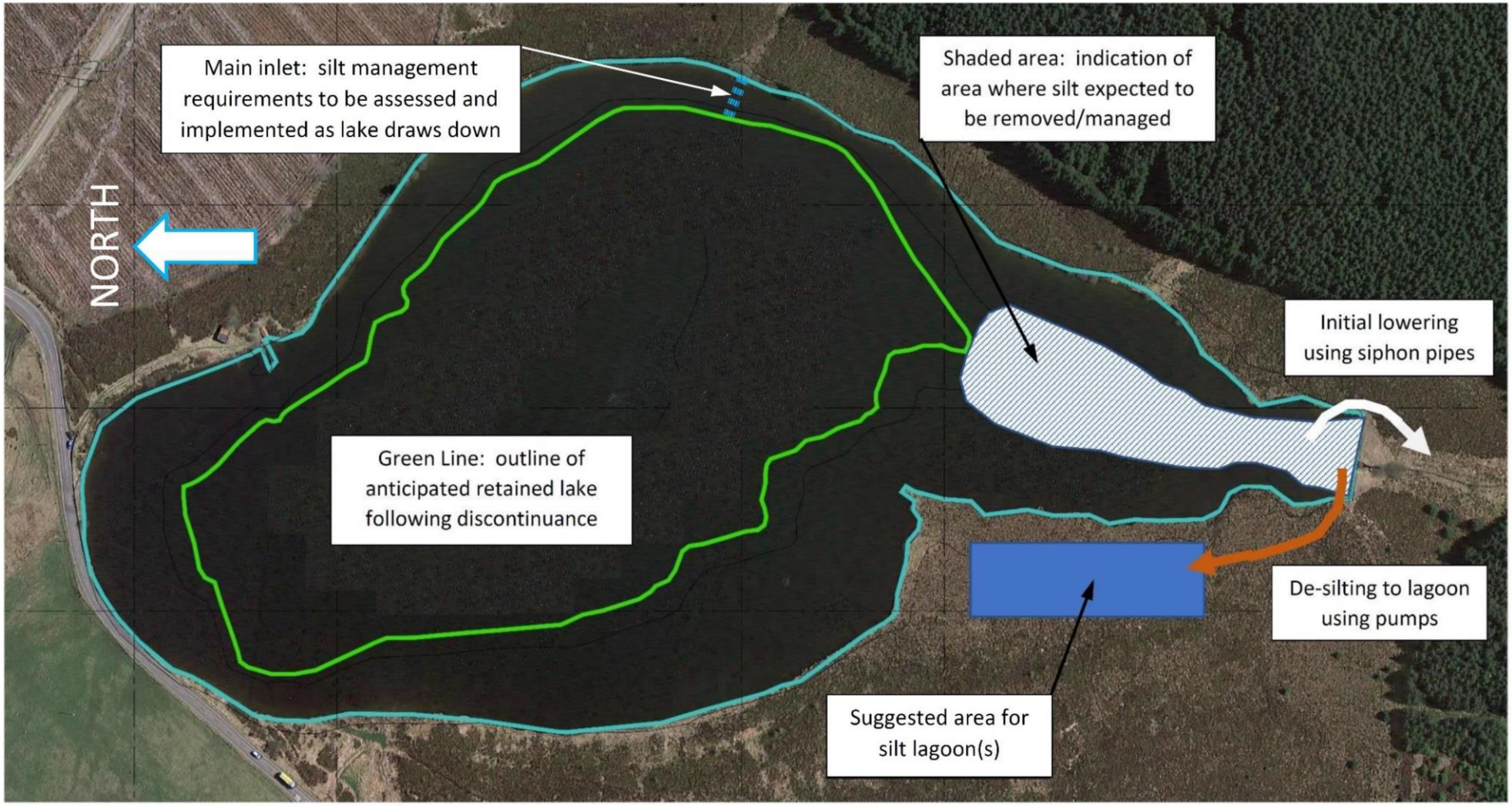

Figure 2: Llyn Bran Reservoir discontinuance Option 2B: Proposed Single-Stage Drawdown Approach

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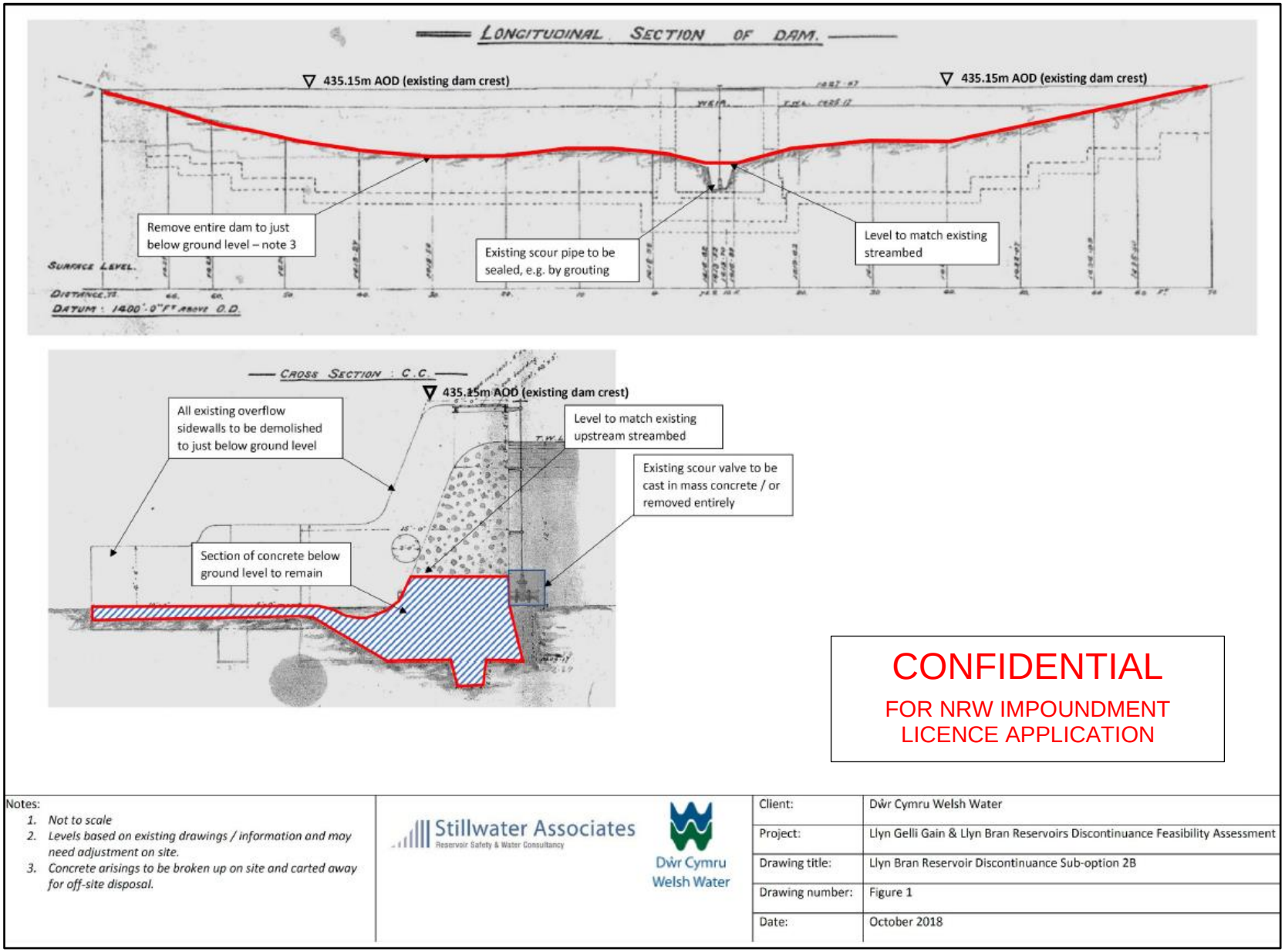

Figure 3: Llyn Bran Reservoir discontinuance Option 2B: Proposed Removal of Dam