



Glyncastle Mine Water Treatment Scheme - New licence application for a previously exempt abstraction-Additional information

1. Introduction

The Glyncastle Mine Water Treatment Scheme (MWTS) is located on the eastern side of the Neath Valley, near the town of Resolven, West Glamorgan, at National Grid Reference SN 835 029.

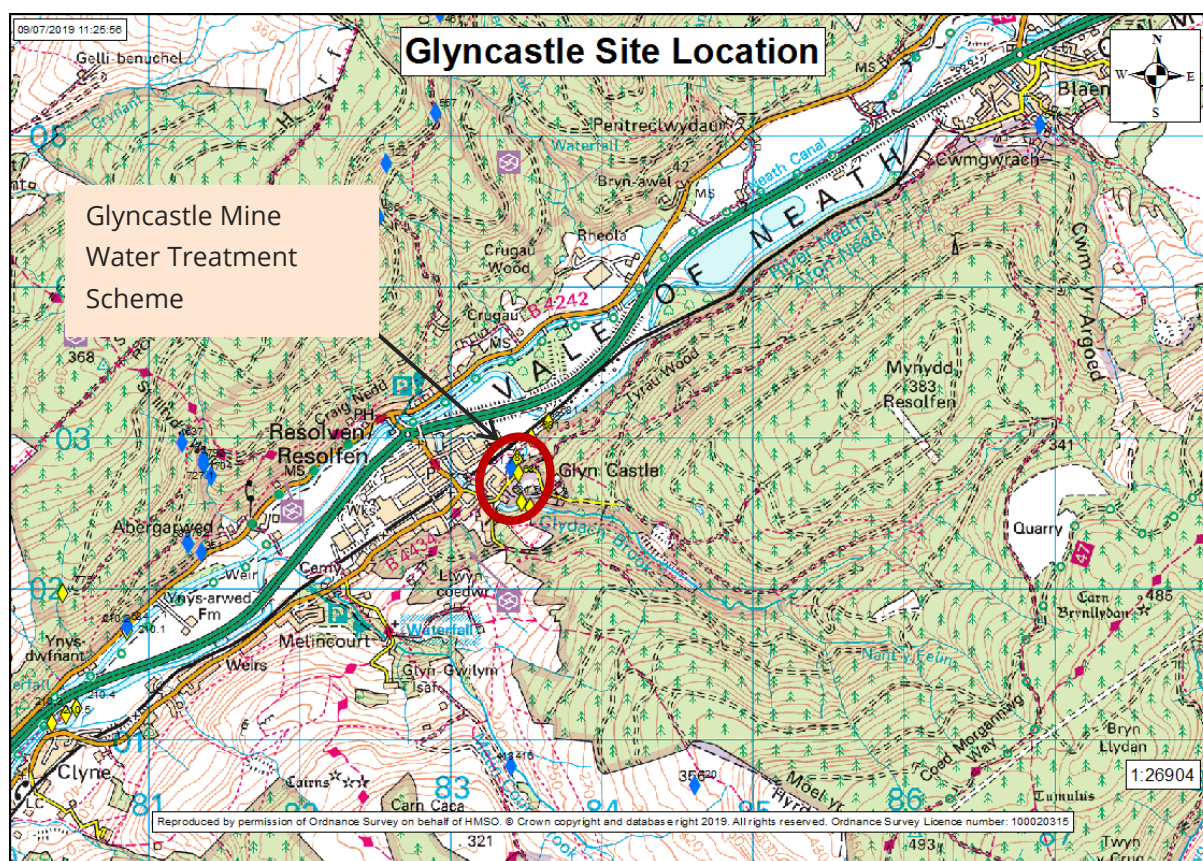


Figure 1: Location of Glyncastle Mine Water Treatment Scheme

In 1994 works were undertaken by a third party to construct an informal treatment area to treat an ochreous discharge from the disused Tyn-y-Cwm adit (Coal Authority reference 283202-003). Tyn-Cwm adit was draining the interconnected coal mines in the vicinity. The scheme involved some clearance works in the adit, during which a collapse occurred. An emergency grouting operation followed to stabilise the adit which, whilst successful in reducing the discharge, resulted in a build-up of water in the mine workings behind the collapse. This caused a new discharge from an air shaft (reference 283202-007) adjacent to the Clydach Brook, approximately 250m from the original discharge. A lesser discharge also started from a crown-hole collapse above the Tyn-y-Cwm adit, about 40m behind the adit portal.

In 2005 the Coal Authority constructed the Glyncastle MWTS. To capture the flow of mine water into the new MWTS, it was necessary to restore the original flow down the Tyn-y-Cwm adit. As it was not feasible to re-open the adit itself, directional borehole drilling was used to reinstate the function of the adit in draining the water from the workings. Two pipes were installed into the workings to collect water from behind the blockage. The pipes deliver mine water by gravity to the MWTS. The treatment scheme consists of passive treatment using two settlement ponds and three wetlands in series. The MWTS successfully remediated about 1km of impact to the Clydach Brook.

2. Pollution Remediation

The raw mine water has an average iron concentration of 20.4 mg/l.

Although not toxic in itself, iron within the mine water oxidises and precipitates out of solution within the water course and can result in the smothering of river beds.

The general principle of the MWTS is to capture trapped water from within the blocked Tyn-y-Cwm adit and transfer it, via the treatment works. The flows are generally net alkaline and hence no treatment is required to increase the alkalinity. However, dissolved oxygen levels are low and cascade structures are included to increase oxygenation. The site is effectively split between two reasonably flat plateaux, with a drop of a few meters between the top and bottom levels.

Two settlement ponds are provided to reduce the concentration of iron within the water. The three reed beds are designed to remove the iron and finally polish the mine water prior to discharge. The scheme is designed to remove iron from flows of up to 25l/s at concentrations of up to 50mg/l. In 2018-present, the mine water has discharged from the scheme with an average iron concentration of 0.68mg/l.

Figure 2 provides an overview of the mine water treatment scheme and the mine water pathways.

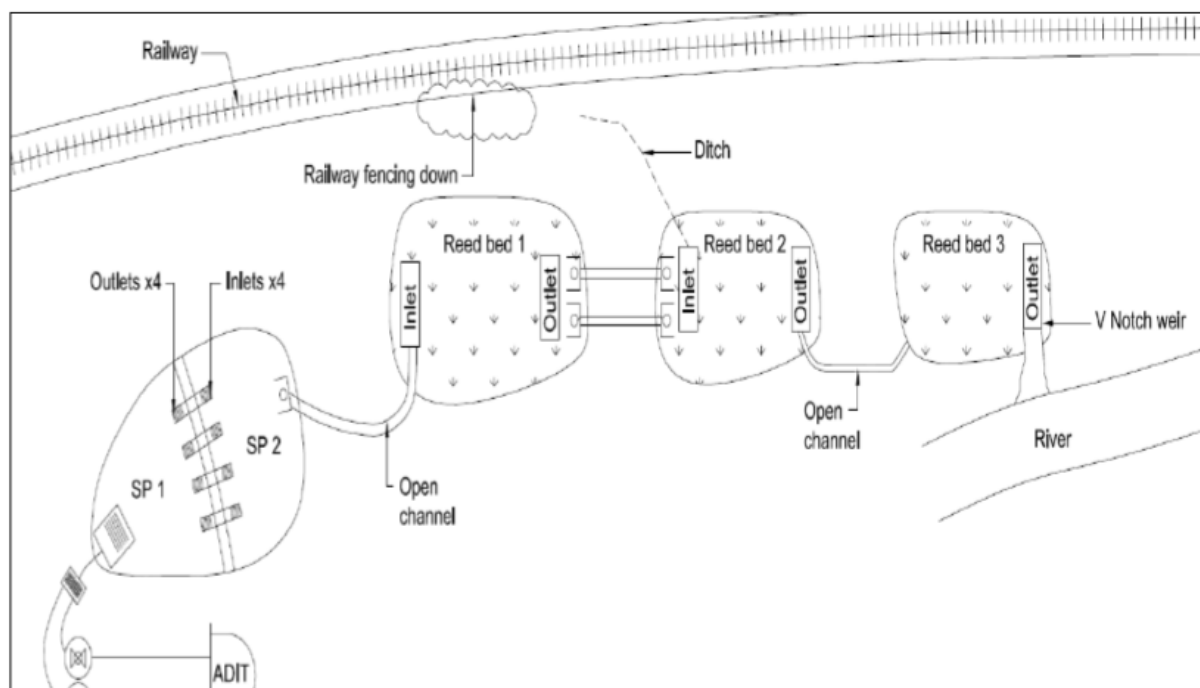


Figure 2: Overview of the MWTS layout, not to scale.

3. Answers to Specified Sections of Form WRH

The following are responses to the application form sections, in cases where the referenced document is this one, i.e. "Glyncastle Additional information".

2.4 Abstraction Invoices and Records

	Main Contact	Address	Phone Number	Email
Site Operation	Chris Crowe	Chris Crowe The Coal Authority 200 Lichfield Lane Mansfield NG18 4RG	07917174577, 01623637363	ChrisCrowe@coal.gov.uk ; EnvironmentMail@coal.gov.uk
Invoice Abstractions	Accounts Payable	Account Payable The Coal Authority 200 Lichfield Lane Mansfield NG18 4RG	01623637000	FinanceDepartment@coal.gov.uk EnvironmentMail@coal.gov.uk
Abstraction Records	Jack Cropper	Jack Cropper The Coal Authority 200 Lichfield Lane Mansfield NG18 4RG	07917093506	EnvironmentMail@coal.gov.uk JackCropper@coal.gov.uk

4.2 What is your connection to the land where the abstraction takes place?

The Coal Authority has ownership of the land where the water upwells and where the treatment scheme currently sits. Please see Appendix A, Figures A2 and A3 for maps outlining land ownership/ abstraction and discharge points.

4.3 Do you have a legal right of access to the land where the abstraction takes place?

The Coal Authority has legal rights of access to the land where the abstraction takes place. Please see Appendix A, Figures A3 for maps outlining land ownership.

7.0 Abstraction details

Mine water treatment schemes are associated with abandoned and disused mines in which mine water rebound has occurred. During the operation of the mines, water levels are artificially lowered via pumps and drainage adits. When operations in the mine ceases the pumps are turned off and the water levels rebound, flooding the mines. As a result, mine water discharges at the surface from former adits or shafts of these abandoned and disused mine workings. Transfer of the mine water for the purpose of pollution remediation, usually occurs at the surface and is a passive process, facilitated by gravity. We have therefore considered the transfer to be for surface water.

7.1 Site Map

Please see Appendix A for maps outlining the site.

8.1 Abstraction history and evidence

Abstraction has taken place continuously since September 2005.

Since the MWTS is passive, visits are infrequent to avoid excessive management cost. As there is no power supply, only simple manual readings of flow are taken during visits.

As the scheme is non-consumptive, the flow discharging from the scheme is used as a proxy for flows entering the site as inlet and outlet are assumed to be equal.

Flow is measured using a 0.29m rectangular weir plate located at the discharge point of the site. (See Appendix A and B for more images and diagrams of the scheme).

As part of ongoing site improvement works, the Coal Authority has been undertaking internal assessments of weir accuracy. This work has included a check of the approach channel, weir installation, crest condition and downstream conditions. Using this information, a weir accuracy level has been given to the monitoring points that reflects the level of error that may be associated with the monitoring structure.

An assessment of the weir at Glyncastle is considered to be of medium accuracy with $\pm 15\text{-}25\%$ on flow rate.

The records of weir measurements are provided as evidence with this application but the potential weir error of $\pm 15\text{-}25\%$ should be taken into account when looking at the provided flow rates. As the site flow is rainfall related, and infrequently monitored, the maximum quantities abstracted, given on form WRH, in Table 8.1, are estimated using the largest measured flow for the year.

For ease of visualisation of the amount of data, and the variability of flow measurements, the following trend chart is provided.

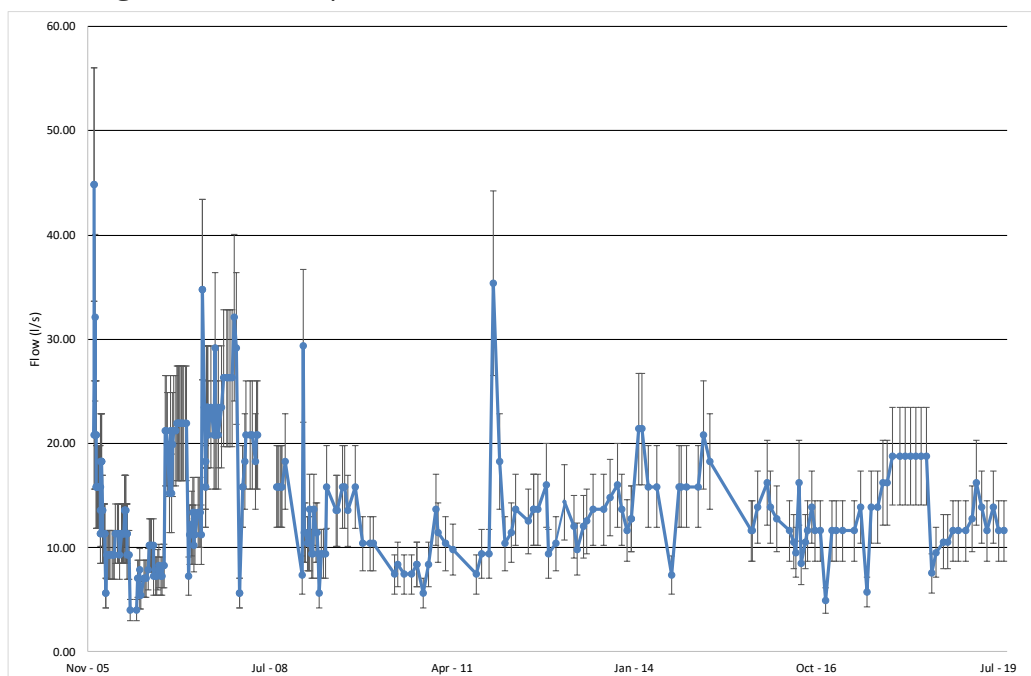


Figure 3: Graph showing the rectangular weir measurements at Glyncastle.

8.4 Detailed description of how the abstraction has taken place

None of the mine water treatment schemes in operation by the Coal Authority are associated with current, or future mine workings – they are all draining abandoned coal workings which

have historically flooded, and discharged to surface. The Coal Authority schemes do not dewater workings in the sense that water levels are not actively drawn down using pumps. The treated water emerges at the surface as a result of water levels having fully recovered within the abandoned mines so that it naturally drains from the adits/ shafts. The drainage of the old workings may be considered to be passive dewatering (by gravity), as against active dewatering (with pumps). The main purpose of transferring the mine water is for pollution treatment. On the other hand, the passive dewatering is an integral first step in order to feed water into each treatment scheme.

The mine water is captured from beyond the collapse in the Tyn-y-Cwm adit using two directionally drilled bores, which commence from within the treatment site, a few meters in front of the original adit portal.

The 150mm diameter pipes are approximately 70m long. Each pipe is fitted with a pressure gauge and valve to control the flow of water from the mine workings, such that water levels can be maintained at above 2m depth within the workings to prevent migration of mine gases or excessive oxidation of workings.

See Appendix B, Figure B1, B2 and Appendix C, Figure C1 for photos and as-built drawings of the abstraction point. Also Appendix D gives a conceptual section drawing to illustrate the set up.

Under normal operating conditions, all of the flow is transferred into the MWTS. This is to allow all of the mine water to be treated prior to its discharge into Afon Nedd (River Neath).

The abstraction volume is **entirely rainfall dependent** and flows depend on the mine-water volumes within the workings.

There is **no physical upper limit** to the volume abstracted, subject to that flow being able to pass through the two 150mm pipes. This means that extreme rainfall events across the coalfield area could result in abstracted flows being higher than the maximum value recorded to date. In a similar way, if there are fundamental changes to flow paths in the abandoned coal mines (through roof falls etc.) then higher flows could occur.

The abstraction into the MWTS has run continuously since the MWTS construction.

Flows typically range from 10l/s up to 19l/s. As these flows are dependent on rainfall, we ask that this be the basis for our abstraction licence volumes. If this isn't possible, we ask that the maximum recorded 'total' site flow reading of 19l/s be used.

The abstraction is **non-consumptive**, and following treatment, all the abstracted water is returned to Afon Nedd (River Neath).

If the mine water is no longer transferred to the treatment scheme (by shutting the valves) then flows would build up within the workings until reaching a decant level, and then would naturally discharge from the old air shaft, and the crown holes.

8.5 Please list the evidence you are providing to support your application

An excel spreadsheet entitled Glyncastle Data has been included with this application. The excel spreadsheet shows the flow volumes measured at the MWTS outlet weir.

Photos of the abstraction, treatment scheme and scheme discharge are also included in the appendices of this document.

9 Discharge Details

The site operates under discharge permit: BP0348001. This states the volume of the discharge shall not exceed 2160 cubic meters per day. This is equivalent to 25L/s instantaneous flow rate.

The scheme is non-consumptive and 100% of the water abstracted is discharged into the Afon Nedd.

16 Licence Duration

The mine water will require treatment until water quality is significantly improved. Abstraction and treatment of the water is therefore likely to continue for >25 years. Due to this we ask that the licence be granted for the maximum permitted period of 18 years. However, we are also content if NRW choose to apply the common end date for the catchment.

As indicated above (response to 8.4) the abstraction into the MWTS can physically be stopped. However, this would result in the mine-water discharges returning to their original, natural, flow path and untreated mine water would then flow into the Clydach Brook and Afon Nedd .

Appendix A: Glyncastle Mine Water Treatment Scheme

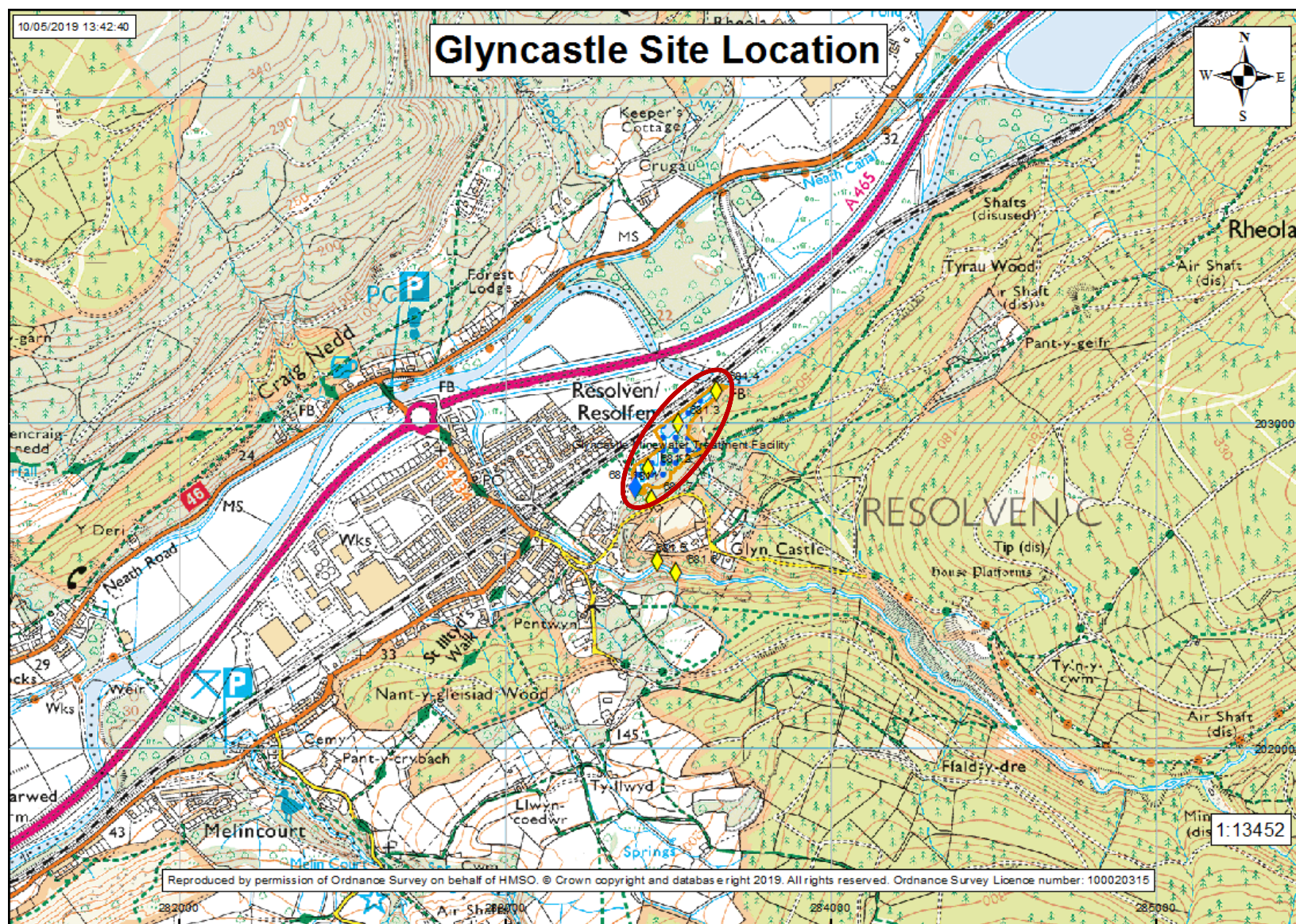


Figure A1: Glyncastle Site Location Map; site circled in red.

Figure A2: Site plan of Glyncastle; Yellow diamonds indicate scheme monitoring points.

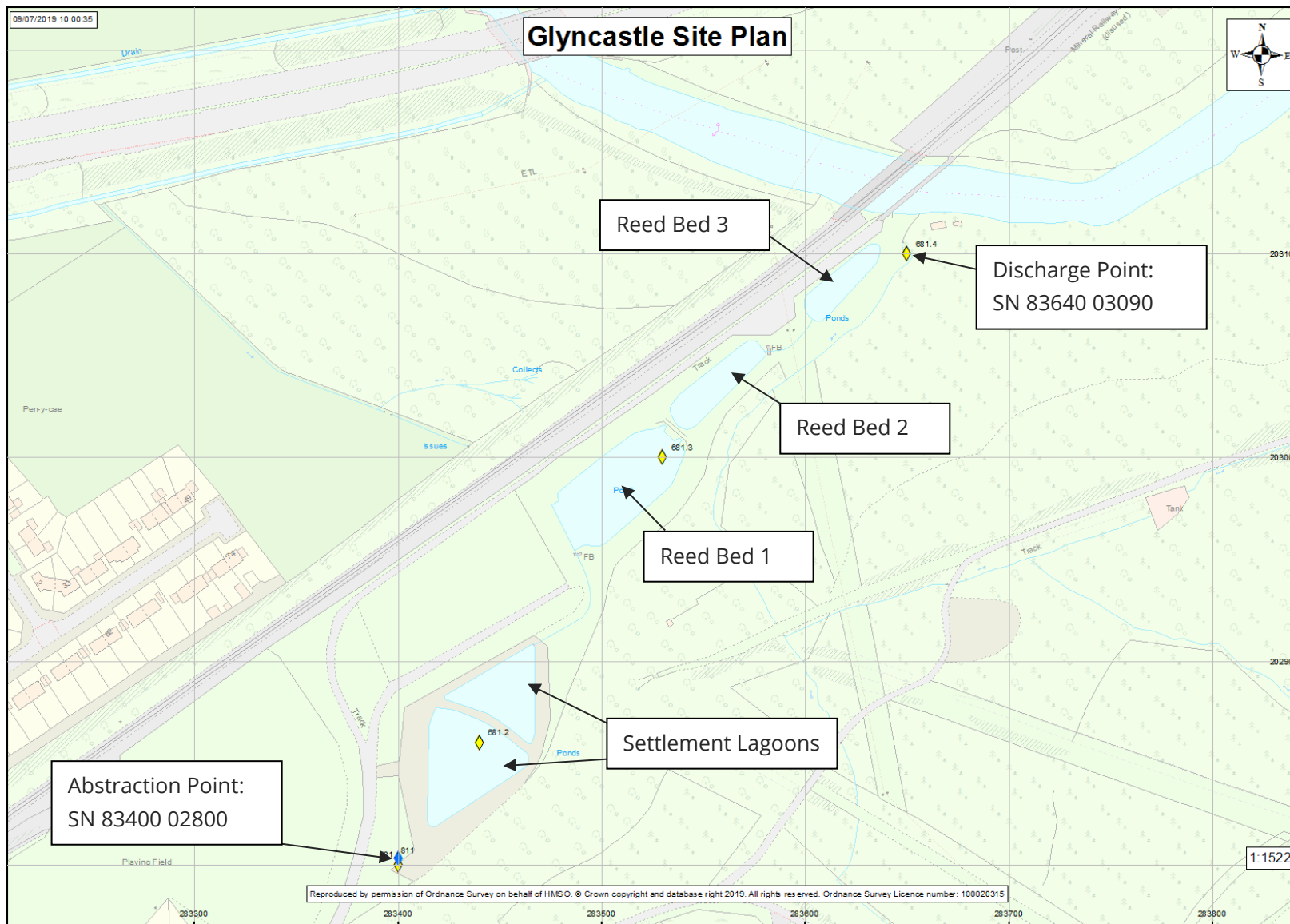
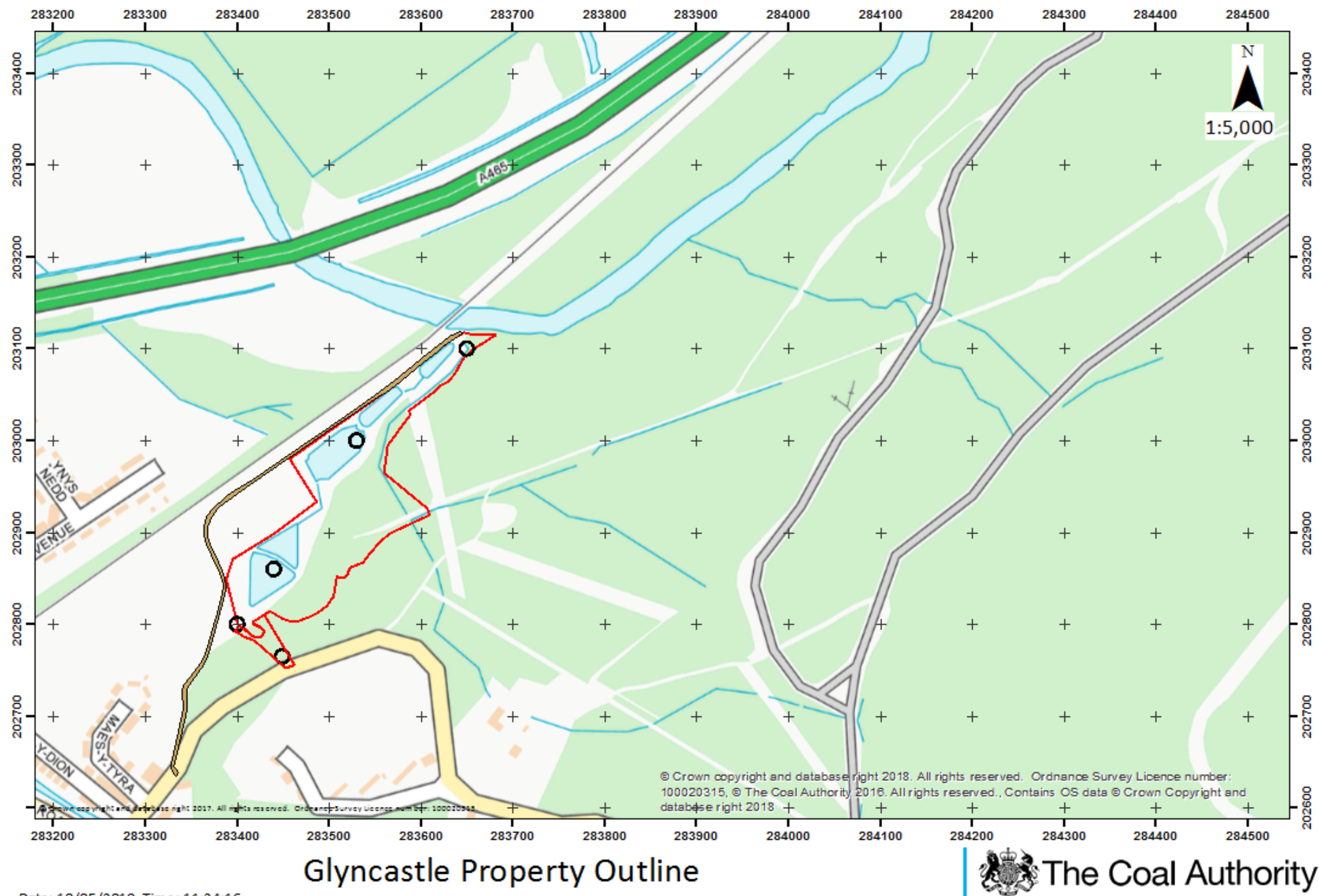


Figure A3: Property outline for Glyncastle. The area ringed in red indicates owned property.



Appendix B: Glyncastle Site Photos



Figure B1: Photos showing the abstraction set up. Left: chamber containing one of the directionally drilled borehole pipes, with valve and pressure gauge to help control and monitor water levels within the workings. Right: two pipes delivering the mine water from the workings, by gravity, to the primary aeration cascade.



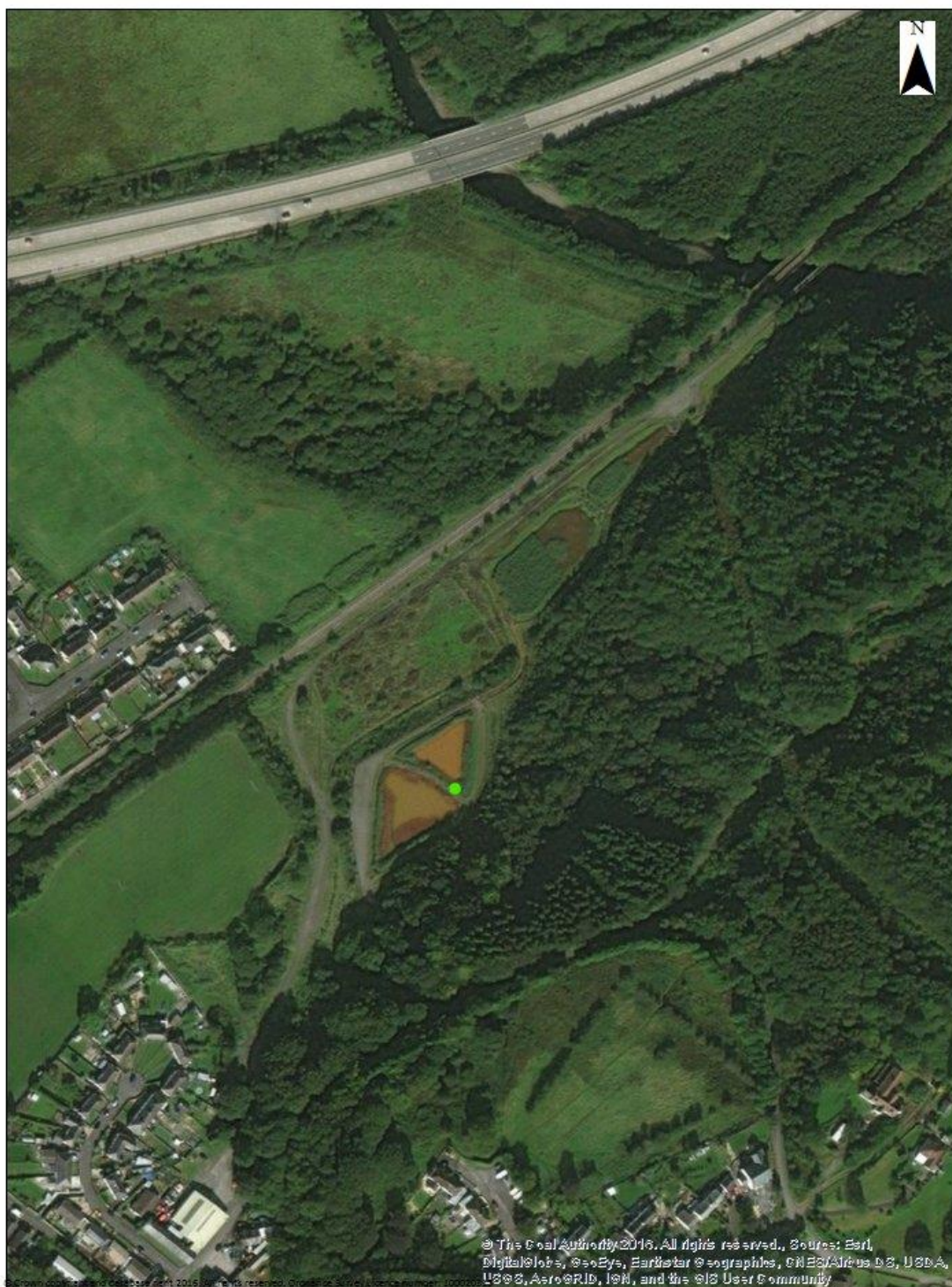
Figure B2: Photos of the two settlement lagoons where the oxidised iron settles from suspension. Left: the adit portal lies immediately to the right (out of shot) and the primary cascade is in front of the first settlement pond.



Figure B3: The left photo shows the transfer channel between the upper and lower areas of the scheme. The right photo shows the reed beds at site.



Figure B4: Photos show the now clean mine water discharging from the site. A rectangular weir allows flows to be measured at the discharge point.



Glyncastle Aerial Image

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Figure B4: Aerial image of Glyncastle Mine Water Treatment Scheme (MWTS)

Appendix C: Scheme as built drawings

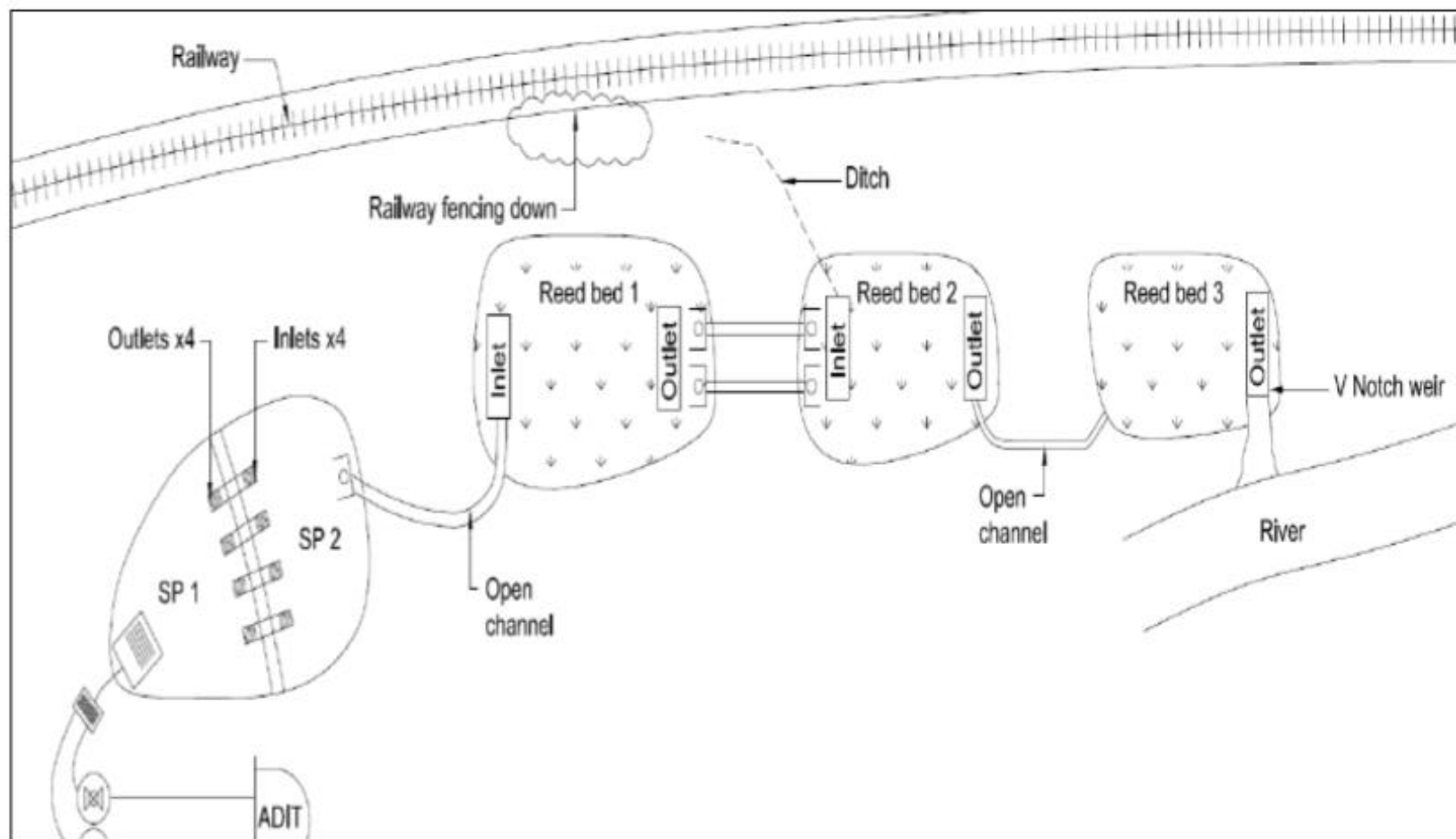


Figure C1: Diagram of the scheme layout, not to scale.

Appendix D: Section

