The Coal Authority

Resolving the impacts of mining

October 2019

Whitworth A&B and Gwenffrwd Mine Water Treatment Scheme - New licence application for a previously exempt abstraction-Additional information

1. Introduction

Whitworth A&B and Gwenffrwd Mine Water Treatment Scheme (MWTS) is one of a group of three MWTS located near Tonmawr village. These three are collectively known as the Pelenna sites, the other two being Garth Tonmawr MWTS, and Whitworth No.1 MWTS.

The Pelenna valley situated near the towns of Neath and Port Talbot in South Wales is a classic example of the legacy of coal mining. Coal mining began in the area around Tonmawr, a village in the Pelenna valley. The earliest records show mining dated back to 1823 followed by the development of a number of pits over the next 100 years. Mining ceased in the early 1960's. Following the closures of these mines, workings flooded and mine drainage discharged into the Gwenffrwd and Blaenpelenna, tributaries of the Afon Pelenna. The discharges stained the two tributaries and the River Pelenna orange. They caused elevated iron concentrations for approximately 7km, as far downstream as the confluence with the River Afan. Ecological assessments showed the mine water discharges were causing juvenile trout populations and macroinvertebrate assemblages to be impoverished.

A project was set up to look into ways to deal with the mine water pollution. The chosen method of treatment was to construct wetlands as a means of passively treating the mine water discharges.

The Pelenna Mine Water Treatment Group was constructed in three phases between 1995 and 1999.

The construction of Whitworth A&B and Gwenffrwd MWTS was completed in April 1998 and the project was carried out in partnership, by Neath Port Talbot Borough Council and the Environment Agency.

Whitworth A&B and Gwenffrwd MWTS was passed to the Coal Authority in 2014.

The system treats three mine water discharges:

- Whitworth A Adit
- Whitworth B Adit
- Gwenffrwd Adit

The current scheme consists of: capture of the mine water emerging by gravity from the three adits; treatment in four constructed wetland cells; and discharge of treated mine water to Nant Gwenffrwd by two separate outlets. The site also has a drying bed, which was formerly another wetland treatment cell.

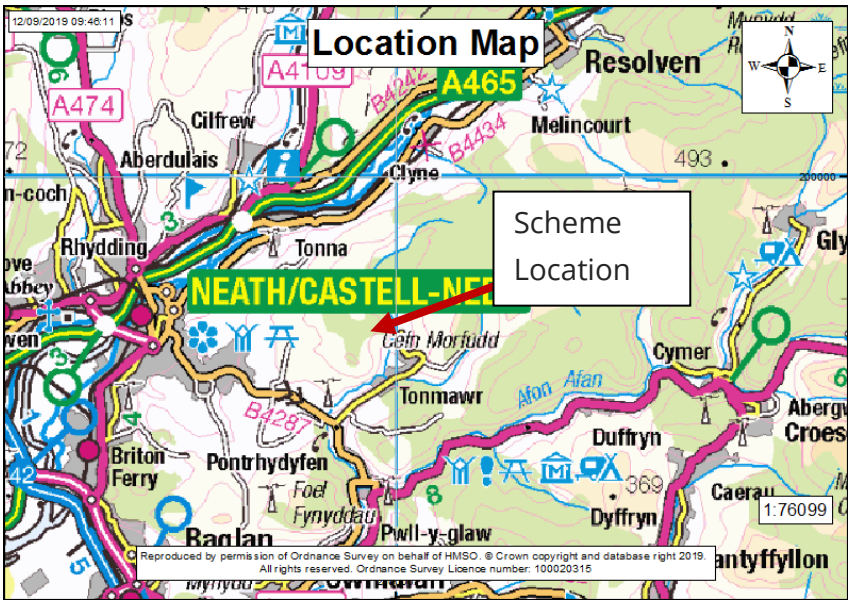

Figure 1: Mine Water Treatment Scheme location (A more detailed location map can be found in Appendix A).

2. Pollution Remediation

The current (2019) layout for the MWTS is:

- Whitworth A: Mine water is piped to a settling pond and then reed bed for treatment.
- Whitworth B and Gwenffrwd: Mine water is transferred to a cascade, or Ochre Accretion Terrace (OAT) to aerate the mine water. Then, the combined flow enters a settlement lagoon and lastly a reed bed.

The raw mine water has an average total iron concentration of:

- Whitworth A: 30mg/l
- Whitworth B: 4.7mg/l.
- Gwenffrwd: 5.6mg/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 acidity of the mine water also causes problems within the watercourse for macroinvertebrates and fish.

Average discharge concentrations (2018-present) from the scheme are:

- Reedbed 1 (Whitworth A): 0.56mg/l.
- Reedbed 2 (Gwenffrwd and Whitworth B): 0.8mg/l

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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. "Gwenffrwd/Whitworth A&B- 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 owns the land where the water is upwells and is piped to the treatment scheme. 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 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 of the site.

8.1 Abstraction history and evidence

Transfer of the mine water has taken place continuously throughout the full duration of the seven year qualifying period.

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.

Flow is measured at the Gwenffrwd Adit overflow chamber and the Whitworth A Adit overflow chamber.

No flow measurements are taken from the Whitworth B Adit as no method is in place to measure the flows within the transfer pipe, or channel.

Flows are also measured at the two consented discharge outlet points for the MWTS. From 2019 the northern outlet measures the Whitworth A flow (treated), and the southern outlet measures the combined Gwenffrwd and Whitworth B flow (treated). Prior to 2019 some of the Whitworth A water could spill over into the Gwenffrwd lagoon – this meant that the flows measured at the outlets did not always reflect the actual adit flows.

The Coal Authority understands that before it took over the MWTS in 2014, some periodic changes had occurred to underground flows within the abandoned coal mine. The mechanism of the change within the abandoned, sealed, flooded (i.e. inaccessible for inspections) coal mines is unknown. It could for example be related to the steady build up of blockages, and subsequent erosion of blockages, with the position of a blockage being such that flow out of the mine can be diverted in alternative directions. In 1998, the original design of the scheme was intended to treat Gwenffrwd adit, and to leave the minor Whitworth B adit flow untreated. But then, during construction, the mine water flow switched from Gwenffrwd to Whitworth B. This meant it was desirable to treat Whitworth B. Hence, an extra pipe, and channel was installed to also connect Whitworth B into the MWTS. It is not known at what time the flow switched back to Gwenffrwd, or if there have been multiple switching events during the MWTS lifetime. Since taking on the site in 2014, the Coal Authority has understood that the dominant flow has been from Gwenffrwd adit.

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.

The records of weir measurements are provided as evidence with this application but the potential weir error of ± 25-50% should be taken into account when looking at the provided flow rates.

As the flow rate of mine water at the site is rainfall related, and infrequently monitored, an estimation of the quantities abstracted are given on form WRH, in Table 8.1, using the largest measured flow rate recorded for the year (peak instantaneous flow rate in l/s). Consequently, these values are anticipated to be the maximum volumes of water that may have been abstracted during the year, but, in practice, volumes abstracted would have been less than the volumes stated. For ease of visualisation of the amount of data, and the variability of flow rate results, trend chart is provided in Figure 2.

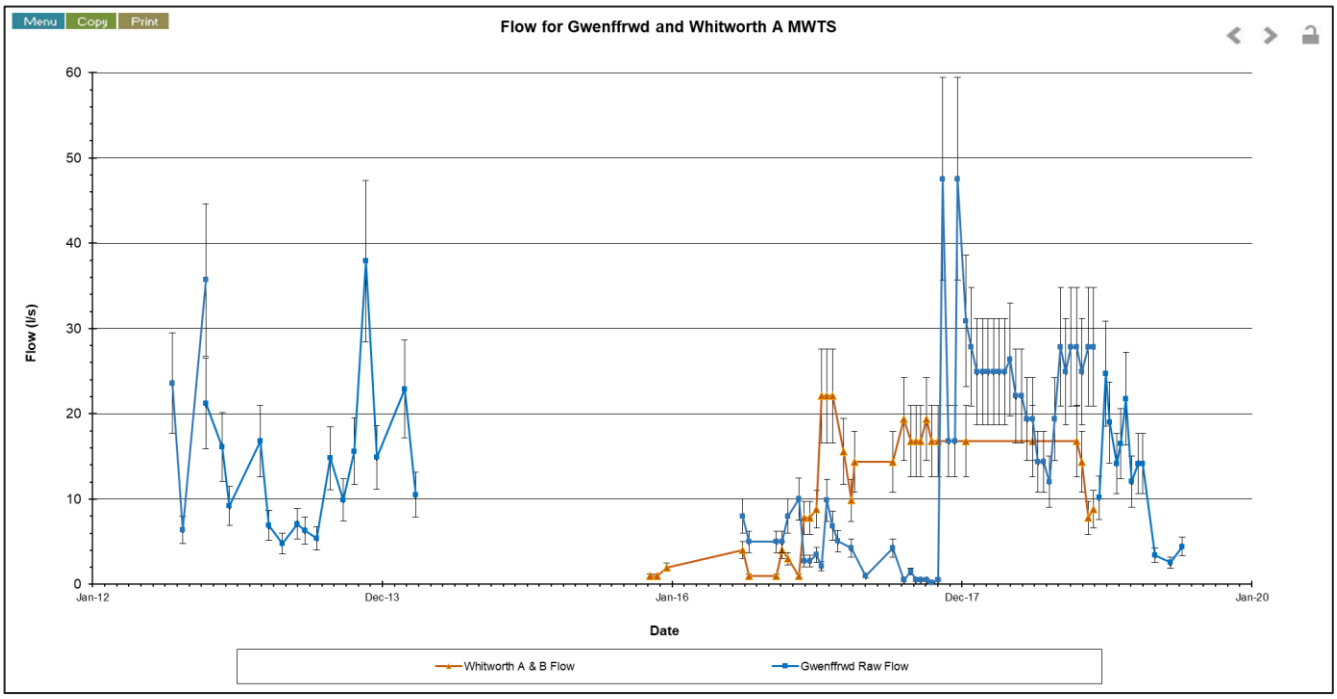


Figure 2: Graph showing weir flow readings with error bars of ± 25%.

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 don't dewater workings in the sense that water levels aren't actively drawn down using pumps. The water treated emerges at 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 source for the mine water is from the mines surrounding Tonmawr Village. The adits have the Coal Authority mine entry references: 279197-037 (Whitworth A), 280197-004(Whitworth B), and 280196-016 (Gwenffrwd).

The water upwells at site **entirely passively** and capture occurs once the water emerges at surface.

See Appendix B, Figure B1 and Appendix C, Figure C1 for photos and drawings of the abstraction point.

The abstraction volume is **entirely rainfall dependent** and flows depend on the mine-water volumes within the workings. 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 transfer of water into the MWTS has run continuously since its construction in 1998.

Flows are only measured intermittently but range from 2l/s up to >47l/s for the Gwenffrwd and Whitworth A abstractions (Figure 2). Due to the flows being 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 flow reading of 47l/s for Gwenffrwd be used and 22l/s for Whitworth A.

No flow data is available for Whitworth B and therefore no flow information can be provided beyond the observations by the Coal Authority that in recent years the Whitworth B flow has been minimal compared to Gwenffrwd flow. However, noting the above comments about the flow having switched (underground) between Whitworth B and Gwenffrwd, it is requested that any volumetric flow limits applied to Gwenffrwd Adit should equally be applied to Whitworth B Adit. That is because, at any future time, the full flow of Gwenffrwd adit could switch underground again to emerge at Whitworth B adit.

The abstraction is **non-consumptive** and all the abstracted water is returned to Nant Gwenffrwd.

Overflows operate as follows.

Whitworth A and Whitworth B can overflow during high flow periods into a pond which existed before the MWTS was constructed in 1998. The pond discharges directly into Nant Gwenffrwd. This pre-existing pond does not form part of the engineered treatment system. Hence the overflows do not receive any formal treatment.

Gwenffrwd can overflow during high flow periods into a (unnamed) tributary of Nant Gwenffrwd. This overflowing mine water does not receive any formal treatment.

Note on location of abstraction:

It is possible to argue that since only part of the flow of mine water passes through the overflow chambers into the treatment cells, then the location of the abstraction is actually at the overflow chambers. It is this overflow structure which effectively controls, or limits, the flow abstracted into the MWTS with any remaining surplus flow being directed to the overflow. We would welcome a discussion on the appropriate location of the abstraction points for the licence.

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

An excel spreadsheet, entitled Gwenfrrwd and Whitworth A&B Data, has been included with this application. The excel spreadsheet shows the flow volumes measured at the 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 has two discharge permits. One for the more northerly 'Whitworth A' scheme (BP0272601) and a second for the southerly 'Whitworth B and Gwenffrwd' scheme (BP0272501). There are no limits given on the scheme permits, only that they are rainfall related.

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.

Appendix A: Whitworth A&B and Gwenffrwd Mine Water Treatment Scheme

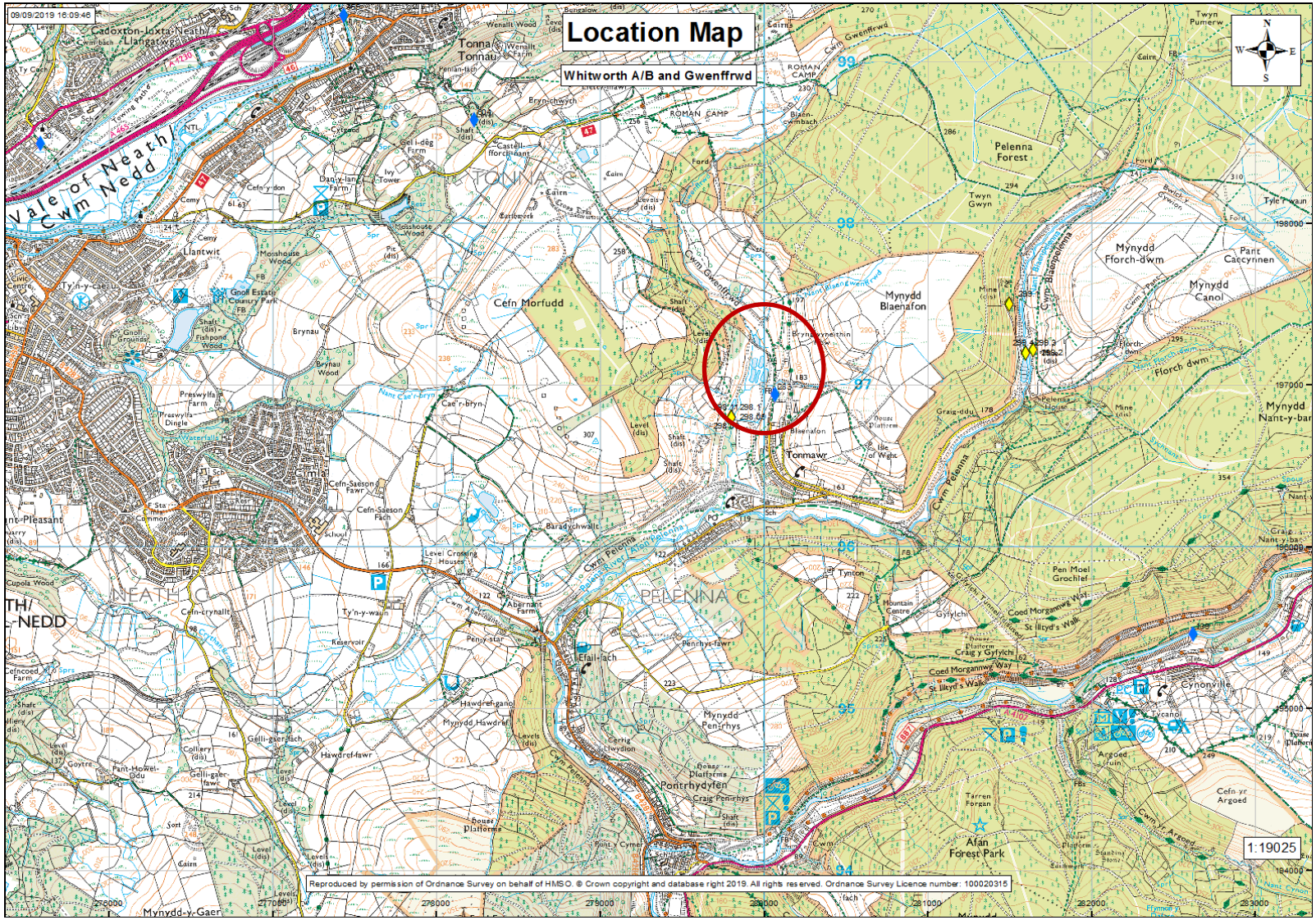


Figure A1: Gwenffrwd/Whitworth A&B Site Location Map; site circled in red

Figure A2: Site plan of Gwenffrwd/Whitworth A&B with monitoring points marked on.

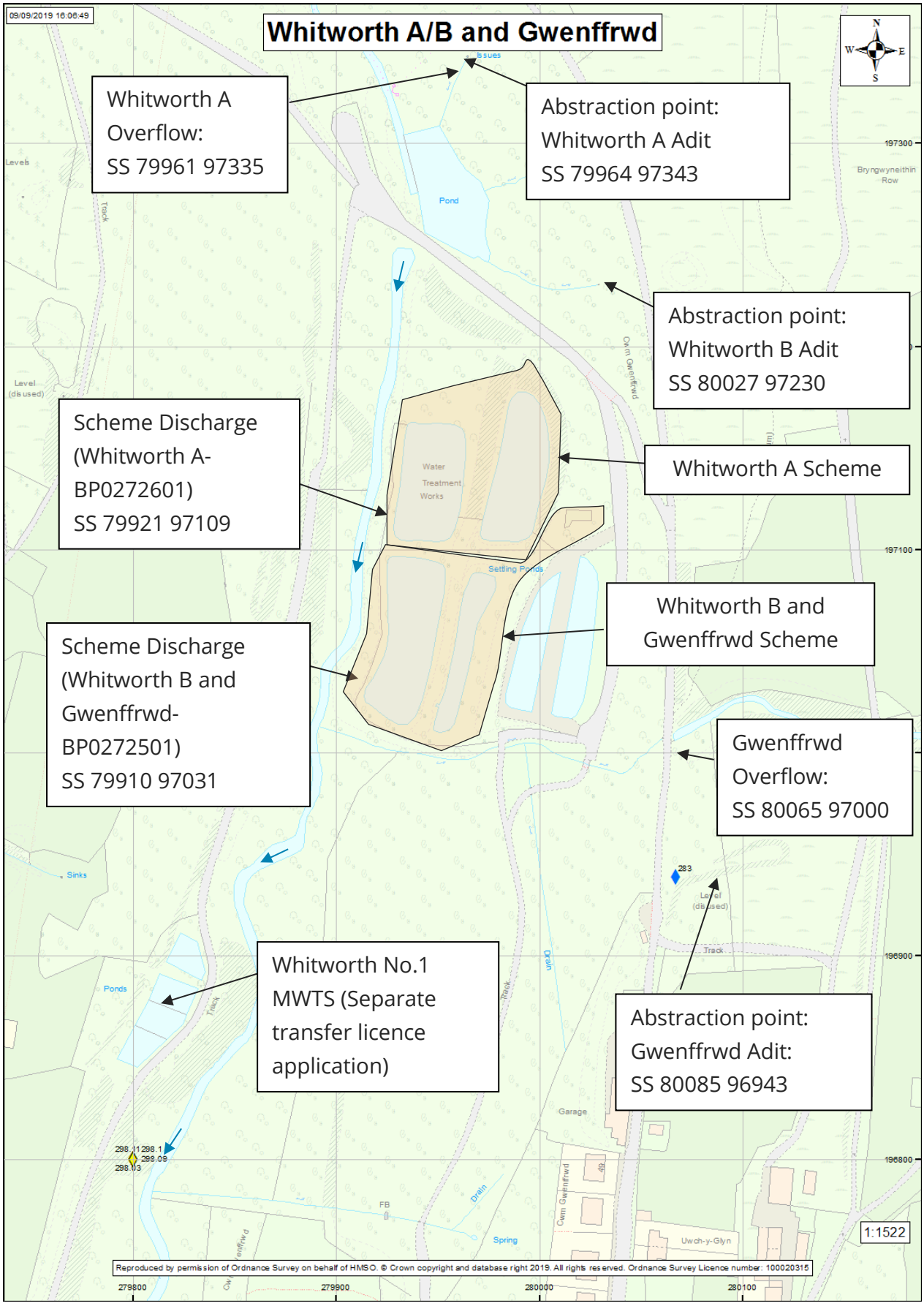
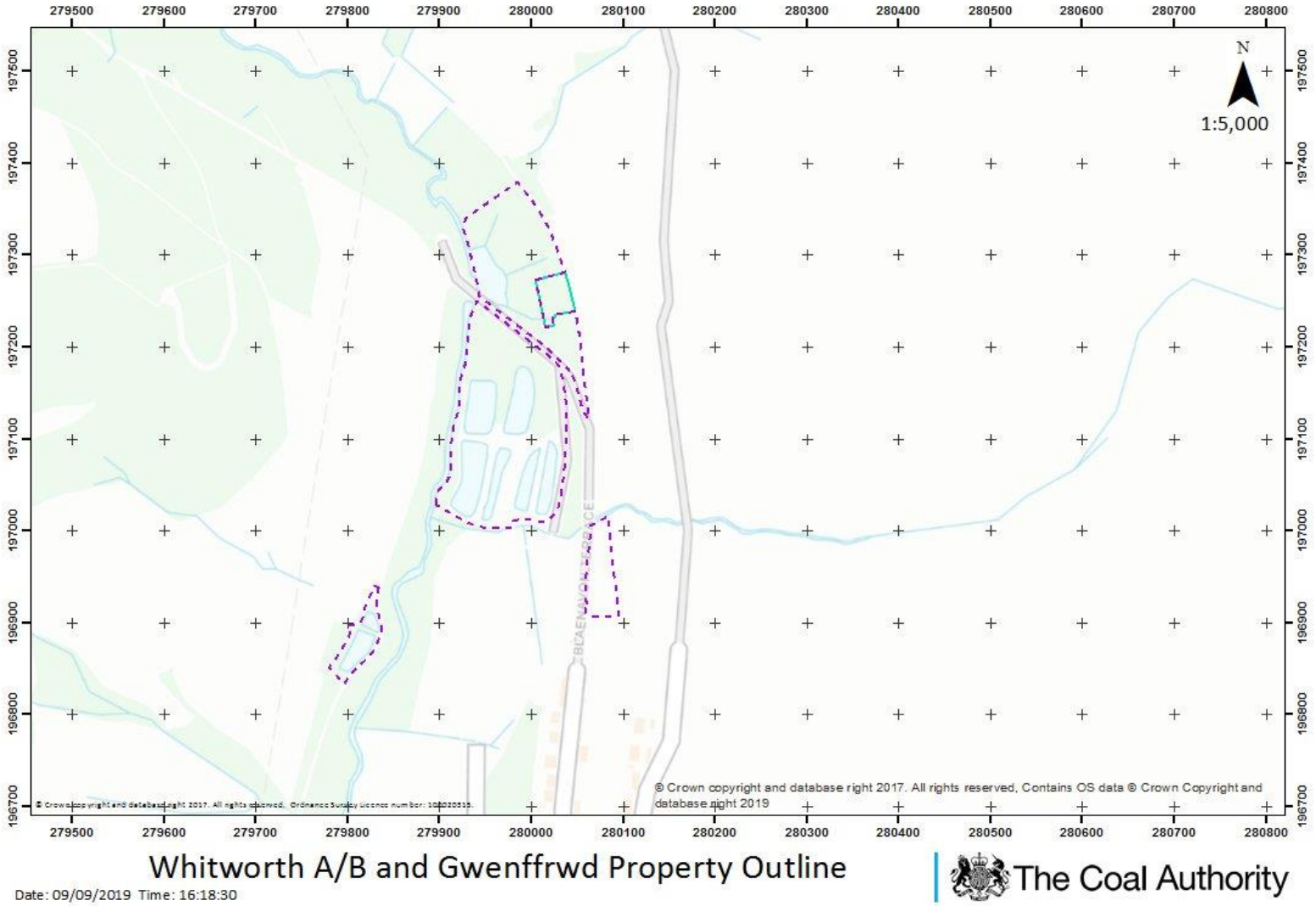


Figure A3: Property outline for Gwenffrwd/Whitworth A&B; areas outlined in purple indicate property owned by the Coal Authority



Appendix B: Gwenffrwd/Whitworth A&B Site Photos

Figure B1: Photos showing the mine water emergence and capture at Gwenffrwd.
B1a: Gwenffrwd mine water emerging into transfer ditch.
B1b: Ditch transporting mine water towards scheme
B1c: Overflow chamber collecting mine water at end of ditch
B1d: Inside overflow chamber, v-notch weir for flow measurements.

Figure B2: Photos showing the mine water emergence and capture at Whitworth B
B2a: Boggy ochreous area where Whitworth-B mine water upwells, and is collected, photo taken in low flow conditions.
B2b: Lined channel transporting Whitworth B mine water to the treatment scheme

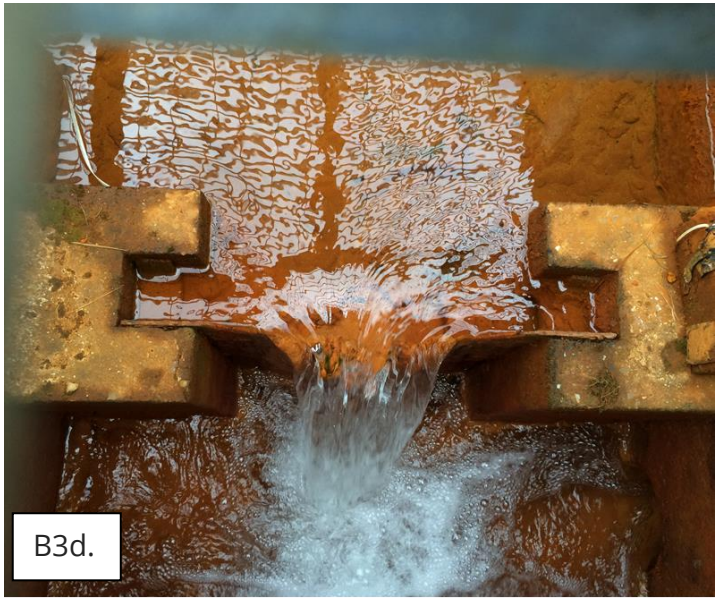


Figure B3: Photos showing the mine water emergence and capture at Whitworth A
B3a: Upwelling of Whitworth A Adit mine water
B3b: Overflow chamber collecting emerging mine water.
B3c: Inside the Whitworth A overflow chamber – overflows occur on the right when high flows overtop the removable weir boards
B3d: Whitworth A v-notch weir for flow measurements.

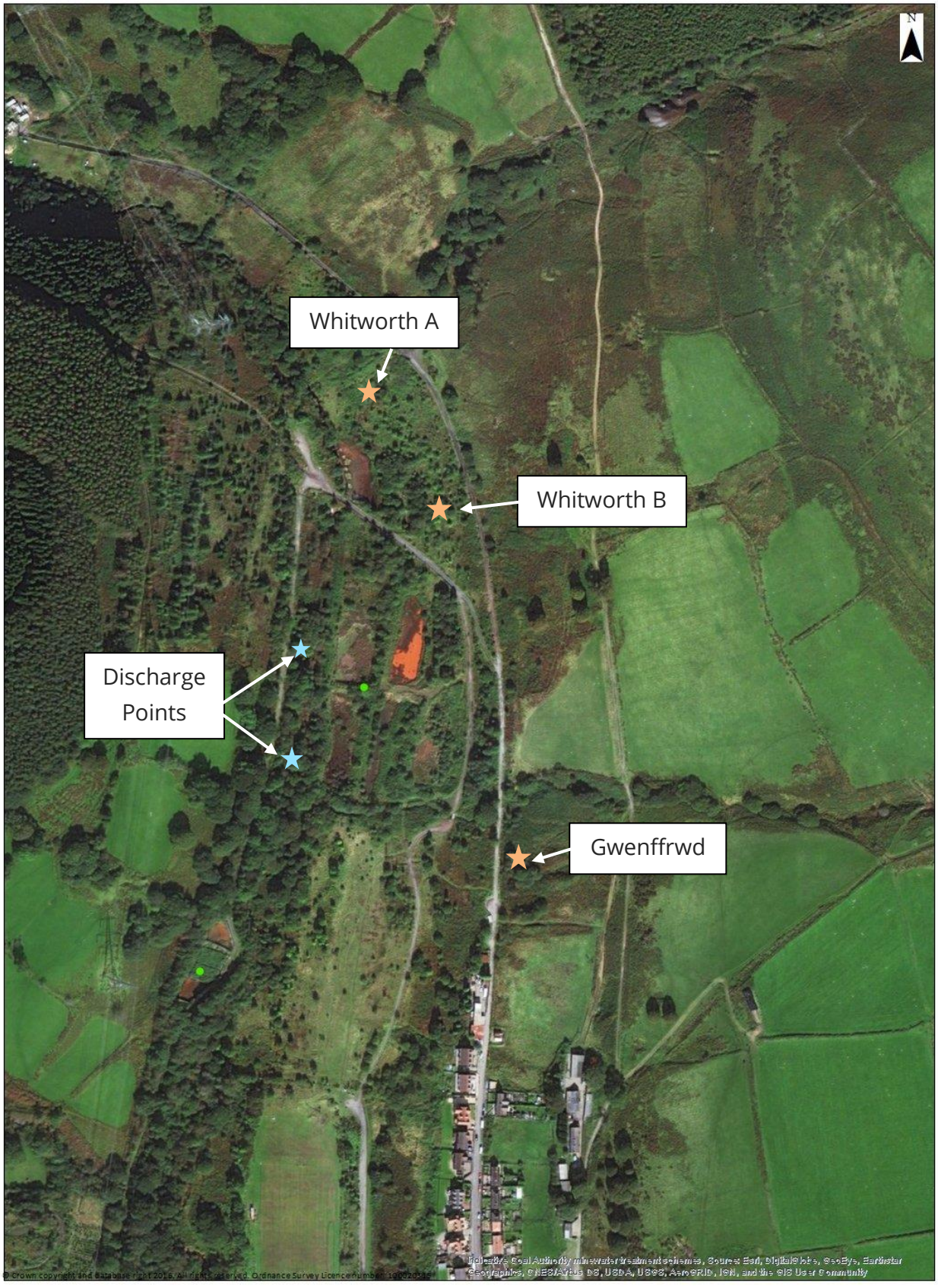
Figure B4: Photos showing Gwenffrwd/ Whitworth B scheme:
B4a: Cascade (or Ochre Accretion Terrace, OAT) into the scheme
B4b: Photo of settlement lagoon, cascade into scheme partially visible (located upper centre of photo).
B4c: Gwenffrwd reed bed


B5a.


B5b.

Figure B5: Photos showing the Whitworth A Scheme:
B4a: Settlement Lagoon of the Whitworth A scheme
B4b: Photo of the Whitworth A treated mine water discharge point and monitoring weir.

Figure B6: Aerial image showing the Whitworth/ Gwenffrwd Scheme.



Appendix C: Site Schematic

Figure C1: Drawings showing the water diversion from the adit to the reed beds and the location of the flow monitoring weir. (an updated version of: Wiseman, I. 2002. Constructed Wetlands for mine water treatment. R&D Technical Report P2-181/TR