

3.0 Environmental Impact Review

November 2022



Hawk's Tor Drought Permit Application 2022

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1.0 Executive Summary

This document sets out our assessment of the potential environmental impacts of abstraction from Hawk's Tor Pit as part of the proposed drought permit.

This water body is not currently used for public water supply yet has been in the past. The abstraction licence (1977-1986) and drought orders of 1995/96 determine a set of operating parameters including a maximum drawdown and level monitoring designed to manage the environmental impacts of abstraction.

The changes set out in the proposed permit will once again allow water to be abstracted for the lake for public water supply, whilst maintaining the maximum drawdown limit established in previous permits.

The proposed permit includes introduction of a compensation flow from the lake into Warleggan River, this will mitigate negative impacts on the downstream environment. Similarly, the inclusion of a hands-off flow within the proposal will help protect aquatic life within the lake by maintaining adequate depth of water and reduce the risk of bank failure.

The monitoring plan includes the completion of a more detailed Environmental Assessment Report drawing on field work which is currently underway. This document will be published by 31 December 2022 and will, if required, generate a refreshed assessment of ongoing mitigations

2.0 Introduction

2.1 Aim and Objective

The purpose of this report is to provide a desktop assessment of the potential environmental impacts that may occur because of implementing a drought permit for abstraction at Hawk's Tor Pit to support the storage recovery of Colliford Reservoir, until a full EAR is concluded by 31st December 2022.

2.2 Scope and basis of the report

South West Water have commissioned an Environmental Assessment Report to be published 31st December that will follow a 'source-pathway-receptor' approach. As an interim measure this report

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draws upon numerous sources to understand the likely impact of abstracting from Hawk's Tor Pit on a temporary basis and provide justification for proposed interim monitoring and mitigation steps.

The following sources were used:

- Hawk's Tor Environmental Monitoring Plan (SWW, 2007)
- Hawk's Tor Valuation Report (Fenn Wright, 2019)
- Internal survey data on hydrology and fisheries (SWW, 2022)
- Geological Site Documentation Management Brief (Natural England, 1994)

Cross-referencing to:

- Park Lake Monitoring Report (SWW, 2017)
- *Licence Renewal Supporting Information (SWW November 2015) embedded*

2.3 Background

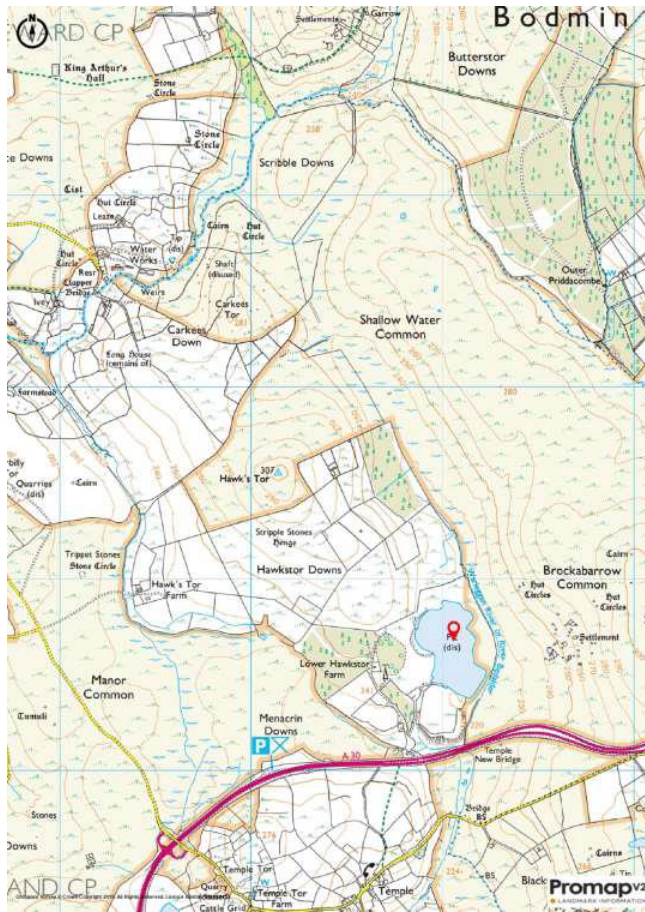
Hawk's Tor Pit was a disused China clay pit located at National Grid Reference [NGR] SX 151 745 on Bodmin Moor in Cornwall, just northeast of Colliford Reservoir (SX 15032 74637) within the headwaters of the Warleggan River.

Figure 1. Photograph of Hawk's Tor Pit



Map 1 – OS Map of Hawk's Tor

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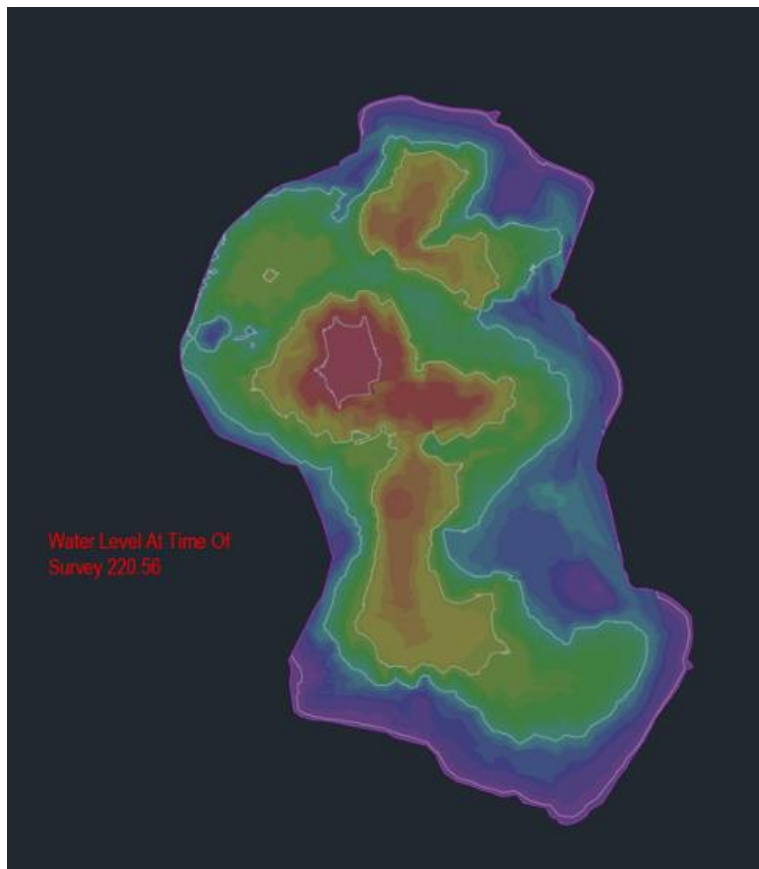


Fenn Wright (2019: Pg. 7)

Hawk's Tor Pit is a large open area of water with a surface area of 12.3 hectares and a top water level of 220 metres Above Ordnance Datum (AOD). Estimated volume is c.1,526,600 cubic metres (commissioned preliminary report, 2022) and maximum recorded depth at c. 32 metres (Fenn Wright, 2019: Appendix 3), being relatively shallow at the southern end with the deepest area at the northern end. See Figure 2.

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Figure 2: Hawk's Tor Pit Bathymetric Survey 26 October 2022



Hawk's Tor Pit is ideally geographically placed, either to enable pumped storage to Colliford Reservoir (most likely during the winter months) or to provide raw water directly to St Cleer, De Lank and/or Lowermoor Water Treatment Works (WTWs) (most likely during the summer months). It thus offers great flexibility as a raw water resource.

The former South West Water Authority held a temporary Licence to Abstract Water relating to Hawk's Tor Pit from 16 June 1977 to 28 February 1986 (pre Colliford Reservoir construction). The license authorised an abstraction from the Pit of up to 10,000 cubic metres per day (2.2 Mg/d) or one million cubic metres per year (220 Mg/year). The water taken was used to support De Lank and/or Lowermoor Water Treatment Works (WTW) at times of low river flows and/or major depletion of storage in Crowdy Reservoir.

This former operation was brought back into use on 20 September 1995, using existing mains, when a Drought Order (DO) was made (Statutory Instrument 1995 Number 2477) authorising a temporary abstraction of up to 10,000 cubic metres per day (2.2 Mg/d) from the Pit. Thereby providing additional raw water to support De Lank and/or Lowermoor WTWs and helping to conserve raw water storage in Colliford Lake. In 1996, a second DO granted a new temporary abstraction link to Colliford Reservoir.

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Table B: Overall performance of the pit in response to the abstraction regime under DO I&II.

| | DO I | DO II (phase 1) | DO II (phase 2) |
|--|---------------------|-------------------------|-------------------------|
| Abstraction Period | 03/10/95 - 19/12/95 | 23/02/96 - 10/06/96 | 23/07/96 - 16/08/96 |
| No of Pumping Days | 78 | 109 | 25 |
| Licensed Abstraction Rate (MI/d) | 10 | 20 | 20 |
| Average Abstraction Rate (MI/d) | 4.31 | 11.92 | 6.59 |
| Maximum Abstraction Rate (MI/d) | 7.98 | 16.83 | 14.96 |
| Maximum Draw-down (m) | 1.91m | 11.55m (12m cut-off) | 11.78m (12m cut-off) |
| Total Transferred Volume (MI) | 335 | 1400 | |
| Cessation & Recovery date | 06/02/96 | 23/07/96 | 24/07/97 |
| Cessation & Recovery depth (m) * to Top Water Level (TWL) | + 1.91m* | + 1.31m | + 11.78m* |

EMP, 2007: pg.16

The operational phases of both historical DOs extended for 319 days in total (212 of which were pumped), resulting in a total abstraction of c.1,800 MI and a maximum drawdown of 11.78m, i.e., to the 12 m cut-off depth. Following the final cessation of operation, the pit took 465 days to recharge naturally to TWL (EMP, 2007: pg.16).

An important condition on both DOs for 1995 and 1996 was the need for SWW to collect and collate the agreed data and provide this in reports at the end of each drought order. A final report in 1998 summarised events between 1995-1997 and notably concluded that operational procedures had no significant impact on:

- (i) water quality in the Warleggan River
- (ii) groundwater levels in the wetlands to the north of the pit
- (iii) river flows in the Warleggan River

The report concluded the DOs were managed effectively to reduce risks and ensure no significant impact to the environment (EMP, 2007: pg.9).

A key consideration is that Hawk's Tor Pit used to be isolated and far more reliant on rainfall to facilitate recharge to maintain water levels because it was hydraulically isolated from the diversion of the Warleggan River around the eastern edge of the site. Therefore, at the time of the 1995/6 drought orders there was a slow response of the pit to refill to original water level). Since this time the river has

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been diverted back into the pit, rather than around it, this occurred around 2009. As such the flow into and out of the lake is much increased compared to 1995/6 – this will shorten recharge times but also creates the need for maintaining a flow downstream of the lake.

It is likely that Hawk's Tor Pit will recover at a faster rate than historically experiences because the Warleggan River flows are now entering the pit at the northern end of the site at SX 15106 74864 and SX 15086 74889, along with a smaller flow also entering on the south-east side at SX 15222 74485.

3.0 Hydrology

Hawk's Tor is a pit excavation into underground strata comprising low permeability, weathered and kaolinised granite. It originally had a small, residual, surface water catchment that mainly comprises spoil and made ground - the result of historic land modification and drainage activities when the site was Hawk's Tor Pit China Clay Works.

When the pit was abandoned and allowed to fill, outfall arrangements were engineered at its southern end so that when the lake became full in high flow conditions, overflow could occur into the Warleggan River through an outfall structure that would maintain lake level slightly above that of the adjacent stream. **However, now Hawk's Tor is surface water fed since the naturalisation of the Warleggan River in c.2009 which enters the pit in the North and flows out at the south.**

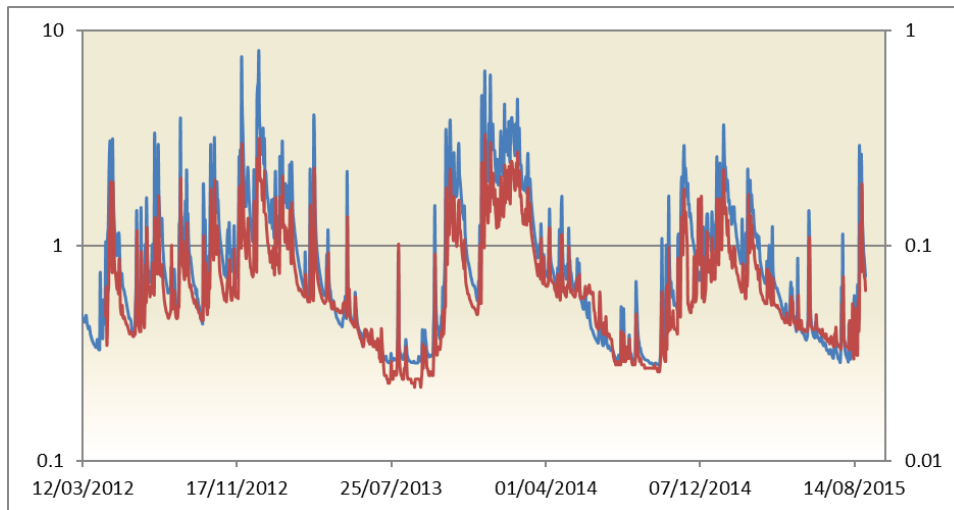
Therefore, once the lake level starts to fall there will be cessation of flow to the River Warleggan and an artificial estimated compensation flow will need to be maintained. Based on recent environmental monitoring site visits by SWW (October 2022), flow rate will be 0.032m³/s, or 2.76ML per day (note 12-hour period). This is based on downstream Qube modelling and equates to roughly 0.4 * average daily flow for April and May.

Similarly, the stream entering the lake will no longer join the water body at the top water level but will rather form a new channel running down to the drawn down level of the lake.

Additional verification of Hawk's Tor being predominantly rainfall fed is provided by both the Trenant Stream and nearby Warleggan River both showing similar patterns of flow response to rainfall 2012-2015, see Figure 3 (SWW, 2017: pg.39).

Figure 3 – Close correlation (2012-2015) of Trenant Stream flow from Park Lake (red) and Warleggan Stream flow from Hawks Tor Pit (blue), suggesting that both are rainwater reliant catchments. Note: Hawks Tor is also fed by Warleggan Stream now entering the northern end of Hawks Tor pit at approximately 80ML/day and exiting the southern end of the pit at approximately 80ML/day (established in October 2022).

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Y axes in cumecs (semi log); Warleggan stream left axis, Trenant Stream right axis

3.1 Flow and Water Quality

The defined reach downstream for monitoring programmes under the previous DOs of 1995/6 was at 8.6km, identified as either three-times the catchment area or four-times the natural Q95 flow (EMP, 2007: pg11) which includes the downstream stretch where the Black Tor Dam tributary also enters the Warleggan River.

Environment Agency data 1969-1997 from the Trengoffe flow metering station, approximately 6km south of Hawk's Tor Pit outlet, indicated Q95 flow averages at 0.195 m³/s (see Table 1 below).

Table 1: Flow statistics (m³) for the Warleggan River (based on EA data from 1969 to 1997)

| Station Name | NGR | Catchment Area (km ²) | Q95 | Q90 | Gauged ADF | Q10 | Q5 |
|--------------|--------------|-----------------------------------|-------|-------|------------|-------|-------|
| Trengoffe | SX 1593 6737 | 25.3 | 0.195 | 0.235 | 0.855 | 1.803 | 2.271 |

EMP, 2007: pg18

Recent SWW site visits (October 2022) have determined more up-to-date flow statistics, which align to those above. Water quality will be monitored by spot sampling as outlined in the monitoring plan submitted with the permit application.

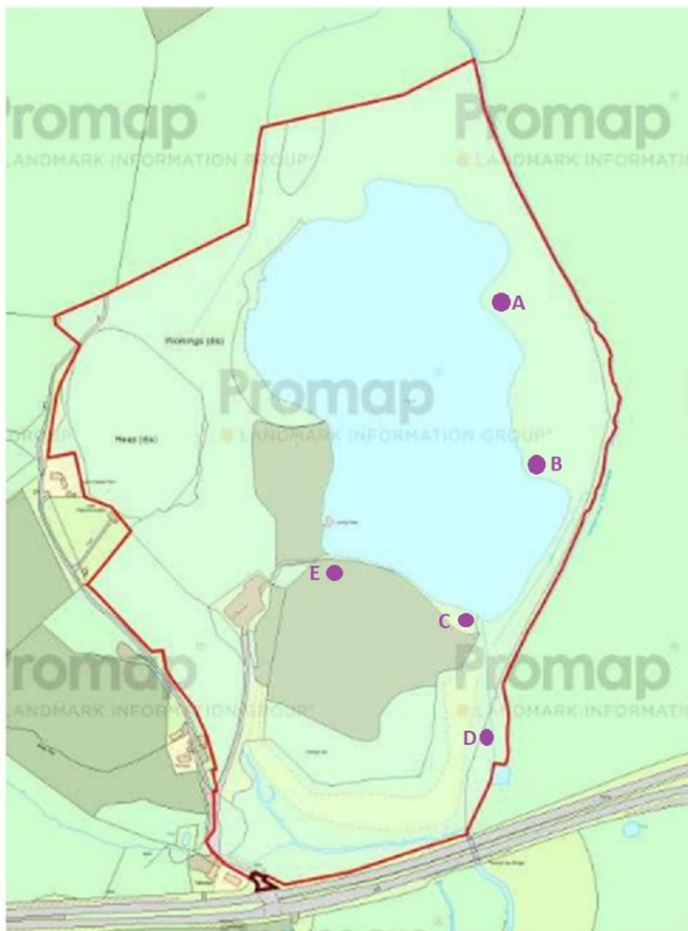
3.2 Groundwater

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Piezometers can be installed to assess the potential risk of hydraulic connection between groundwater and surface water in the vicinity of Hawk's Tor Pit. Based on the 1998 analysis SWW are confident that there is not a hydrologic connection, but a series of shallow piezometers can be installed, locations based on *current* hydrogeological needs, practical access and topography (not assumed from data prior to c.2009 Warleggan Stream diversion into the pit).

The piezometers will be monitored for the purpose of measuring groundwater level to identify and allow mitigation of risks of abstraction affecting wider landscape designated sites (Hawk's Tor geological SSSI designation and Bodmin Moor North biological SSSI designation). However, drawdown from the lake is unlikely to have an impact on the groundwater levels of the Bodmin Moor North SSSI Site as it has been assessed as having low vulnerability. It would be difficult to damage the deposits either quickly or extensively other than the excavation of the interest or the infilling of the pit (Natural England, 1994).

Figure 4 - proposed piezometer monitoring locations at Hawk's Tor



4.0 Hawk's Tor Water Quality

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Overall, the Warleggan River is c.12.92 km long (catchment area 29.014 km²) of which only c.1.3 km is upstream of the pit forming a small area of wetlands and downstream eventually becomes a tributary of the River Fowey.

The similarity of the in-situ water quality in the pit with that within headwaters of the Warleggan River means that when overflow occurs and when compensation flow is released, the effect of both these occurrences on the wider River Fowey system downstream can be considered benign.

Furthermore, the water quality being of a very similar nature in both waterbodies, the impact of the proposed abstraction from Hawk's Tor for the purpose of improving Colliford Reservoir recovery is considered to have a negligible impact on the blended raw water quality. The existing raw water quality risks are fully mitigated by the blending and the current multi-barrier treatment process at Restormel, St Cleer and De Lank Water Treatment works.

Therefore, abstraction from Hawk's Tor does not significantly increase the raw water quality risks and is not considered likely to cause any adverse impact on the treated water quality.

4.1 Water Framework Directive status

The Warleggan River is a tributary into the catchment of the River Fowey, flowing into the River Bedalder before joining the Upper Fowey. Stream flow will include any outflow from the overflow of Hawk's Tor and any surface run-off draining into the leat system which circumvents Hawk's Tor Pit.

Historically, the River Warleggan also included discharges from Hawk's Tor Pit when it was previously a China Clay Works site before the river was circumvented around Hawk's Tor Pit. Internal surveys in 2022 have revealed the circumvented stream has now been re-diverted into the pit itself which means the river now flows from its source *through* Hawk's Tor, which needs to be considered in future monitoring.

The most recent Water Framework Directive (WFD) classification data for the Warleggan River waterbody is the 2019 cycle 3 data. The waterbody is classed at Moderate ecological status with all ecological elements achieving 'Good' status or better (EA Catchment Data Explorer, 2022).

Three stretches of the wider Fowey catchment were surveyed as part of the abstraction licence renewal for the nearby Park Lake in 2015 (SWW, 2017), which indicate recent water quality status for the River Fowey under WFD classifications:

- Fowey (Warleggan to St Neot) WFD Ref: GB108048001420
- Lower River Fowey WFD Ref: GB108048007650

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- Fowey (Upper) WFD Ref: GB108048001410

Each survey considered the following parameters: Ecological, Chemical, Fish, Invertebrates, Macrophytes etc., Ammonia, BOD, Dissolved Oxygen, pH, Phosphate, Temperature, Priority Hazardous Substances, Other Pollutants and Specific Pollutants.

All three of the above sites were assessed as 'Good' or 'High' status (SWW, 2017, pg. 50).

In conclusion, the drought permit is not expected to have any impact on water quality in either Hawk's Tor or Colliford Reservoir, with the previous hands-off level of 12m (applied for the 1995/6 Drought Permits) remaining in place.

5.0 Environmental Surveys & Designations

Hawk's Tor Pit is located within a designated Area of Outstanding Natural Beauty (AONB). Part of the pit, the northern end including some of the area currently flooded, is designated a geological (palynological) Site of Special Scientific Interest (SSSI) (SW 150749, 5.94 ha) and is reported as being in a favourable condition with no condition threats (Natural England, 2022). Furthermore, during valuation of the site no adverse ground or soil conditions were reported (Fenn Wright Valuation Report, 2019; pg.16).

Away from the northern and eastern boundary of Hawk's Tor Pit is the western boundary of Bodmin Moor North SSSI (SX 157 755, 487.55 ha), a biological designation for upland heath dominated by acid grasslands, shrub and bog wetlands to the north of the site. It was reported as being in an unfavourable recovering condition in 2015, due to historic overgrazing, which is now controlled, so the existing condition threat risk is considered low.

The SSSIs are not considered to be hydraulically linked to Hawk's Tor Pit or sensitive to any draw down of the water level in the pit (EMP, 2007: pg.6). The fluvial interface between the pit discharge (within the Warleggan River) and Hawk's Tor Pit SSSI extends for only c. 240m downstream, before being hydrologically isolated by the elevated A30 trunk road. Consequently, no adverse effects on groundwaters are anticipated.

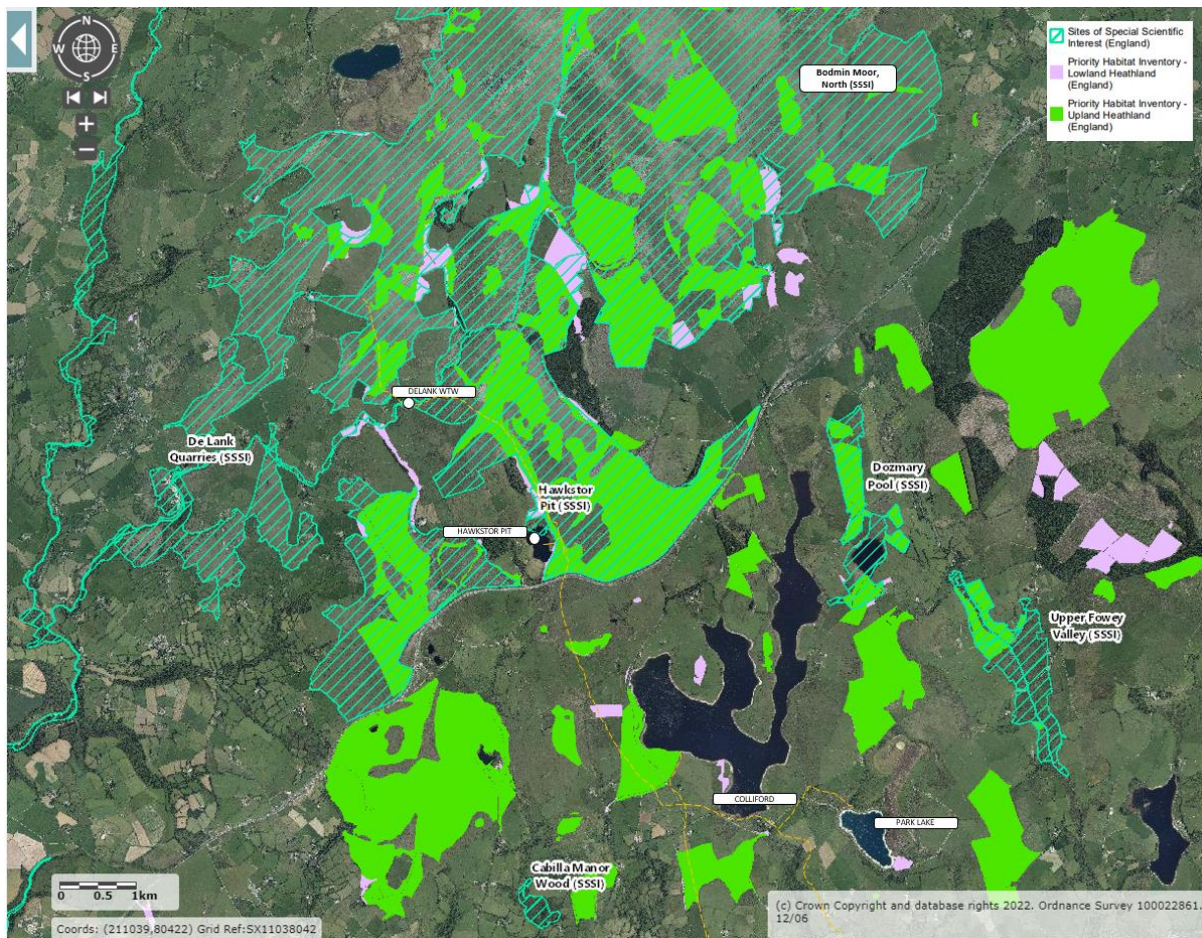
Within the wider catchment Cabilla Manor Wood SSSI is bisected by the Warleggan River. This SSSI is located c. 5.2km downstream and is designated for its coppiced, ancient Sessile Oak (*Quercus petraea*) woodland habitat and fern assemblage. The river within the woodland is described as structurally diverse with boulders, riffles, pools and overhanging banks, and is a breeding site for Large Red Damselfly (*Pyrrhosoma nymphula*) and Broad-bodied Chaser (*Libellula depressa*). Neither odonata species are considered as threatened. Otter (*Lutra lutra*) spraint has also been reported on the

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river banks. Both units of these SSSI are reported to be in favourable condition (NE, 2015) and given the conservation features covered by the designation and distance downstream, this SSSI would not be adversely affected by the implementation of the proposed drought permit.

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Figure 5: Map of SSSI designations and priority habitats surrounding Hawk's Tor Pit



Source: Magic Map 28th October 2022

5.1 Species

Fish species present in the River Fowey covered under the EC Habitats Directive (95/43/EEC) include:

- Atlantic salmon (*Salmo salar*);
- Bullhead (*Cottus gobio*);
- Brook lamprey (*Lampetra planeri*);
- Sea lamprey (*Petromyzon marinus*).

Of these fish species, only salmon and bullhead have been recorded in the Warleggan River. Salmon are recorded throughout the river, while the bullhead is only found in the lowermost reaches (EMP, 2007: pg.7) and past records indicate the most consistently performing reaches for salmon are located downstream of Carne Wood (pg.28).

The river habitat is conducive to support eels (*Anguilla anguilla*) which in the past have been recorded throughout the Warleggan, yet abundance levels were low (EMP, 2007: pg.28).

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There is a likelihood that some coarse fish species may have become established in the lake, however no evidence of fish stocks of commercial value and no INNS were observed during inspection for valuation. (Fenn Wright Valuation Report, 2019; pg.14; pg.17).

Within the wider catchment, wetland species are recorded including the otter (*Lutra lutra*), dipper (*Cinclus cinclus*), kingfisher (*Alcedo atthis*), peregrine (*Falco peregrinus*), merlin (*Falco columbarius*), hen harrier (*Circus cyaneus*), golden plover (*Pluvialis apricaria*) and grey heron (*Ardea cinerea*) (EMP, 2007: pg.5; pg.7). All are listed in the Habitats Directive, therefore would require protection and conservation assistance through EC legislation if found present in any further assessment of Hawk's Tor Pit.

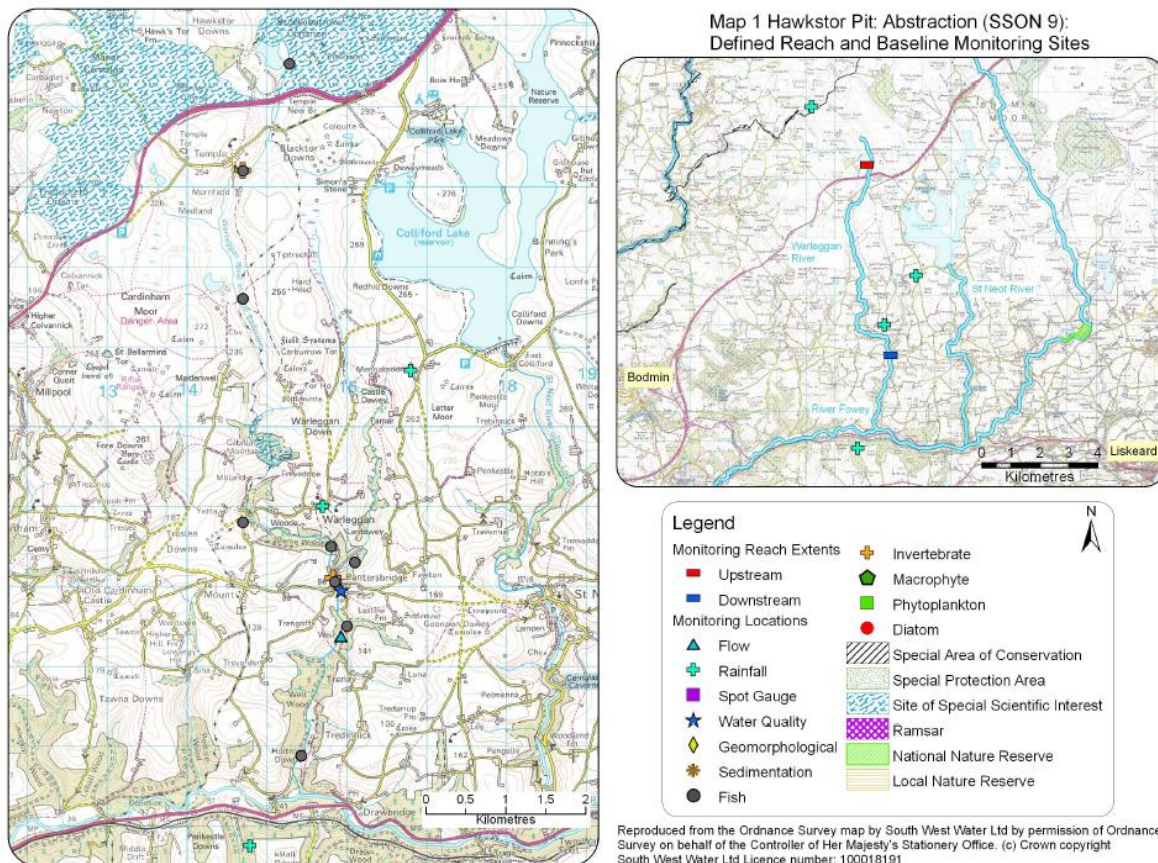
Consultation with Natural England (NE) on 01/11/2022 outlined the proposal and NE was appropriately reassured that neither Hawk's Tor Pit SSSI or Bodmin Moor North SSSI are likely to adversely affected by the proposed drought permit abstraction (Document 6 consultation document)

Previous internal surveying (SWW, 2007) provided details of environmental surveys undertaken at the site in preparation for a previous Drought Management Plan. The document details of flow, water quality and ecological monitoring undertaken including data on species present, including higher plants and bryophytes, fish, birds, invertebrates and mammals.

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5.2 Timings of Environmental Surveys

Figure 6 – Previous environmental monitoring points at Hawk's Tor (SWW, 2007)



More recent environmental survey information for the Hawk's Tor site taken in October 2022 informing South West Water's environmental assessment of the site in its current condition, in addition to the documents listed in section 2.2.

6.0 Macrophytes and Phytobenthos

The WFD combined macrophyte and phytobenthos element is intended to reflect the ecological significance of nutrient status of a given water body. The macrophyte and phytobenthos combined biological element of the upper Fowey (GB108048007650) is classified as 'Good' status. The classification for the downstream waterbody, the Fowey (Warleggan to St Neot) (GB108048001410), is 'High' status.

Potential effects on macrophytes and phytobenthos can arise from changes in flow, wetted width and water quality of the Warleggan River that increased siltation may potentially smother benthic species and effect nutrient availability.

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These effects are not expected to occur as the compensation flow will prevent these conditions from arising and the outflow monitored to remain as agreed.

7.0 Macroinvertebrates

There is no recorded macroinvertebrate data for Hawk's Tor. In the absence of survey data, the macroinvertebrate community has been determined as a **Medium** sensitivity receptor. The magnitude of impact on Hawk's Tor Pit and the Warleggan River is predicted to be **negligible**, due to the compensatory flow, therefore potential impacts of the drought permit were determined to be of **Negligible** significance.

8.0 Fish

Survey work in October 2022 by SWW, using the seine netting method, confirmed the presence of Brown Trout in the pit, however they were only captured at low densities. Based on the fish population in the surrounding water bodies it is *assumed* that European eel may also be present in the pit. This baseline data for the lake suggests that migratory movements of Atlantic salmon is restricted to the lower reaches of the catchment, beyond the influence of the proposed permit changes.

For any fish populations present in the lake there is a risk of entrainment into the abstraction pumps, which can be mitigated with the use of appropriate screens, meaning that sensitivity of the receptor is determined as **high** due to the inability of fish species to tolerate low or ceased water levels and the slow anticipated recharge of the pit may be medium-term. However, the magnitude of the impact of abstraction, both in the Pit and in the River Warleggan, is thought to be **negligible** as the Pit remains at a depth suitable to support fish species present (Brown Trout; Atlantic Salmon) with the hands off 12m level in place and the compensatory flow (excluded from the 12m hands off water level) being maintained into the river until pit water levels are restored. Therefore, the overall significance of the impact of abstraction on fish is **minor**.

As a precaution, an outlet screen will be placed on the pit abstraction pumps, with a 20mm coarse mesh screen to prevent removal of or harm to Brown Trout and other species that may be present. Therefore, the movement of fish populations between Hawk's Tor and the wider catchment is likely to be limited, unless as a mitigation intervention deemed necessary from the environmental monitoring activity undertaken as per the permit conditions.

9.0 Birds

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Otter (*Lutra lutra*), kingfisher (*Alcedo atthis*), peregrine (*Falco peregrinus*), merlin (*Falco columbarius*), hen harrier (*Circus cyaneus*) and golden plover (*Pluvialis apricaria*) are all listed in the Habitats Directive, as requiring protection and conservation assistance through EC legislation. All these species have been recorded on Bodmin Moor and are likely to be recorded at Hawk's Tor Pit.

10.0 Protected Species

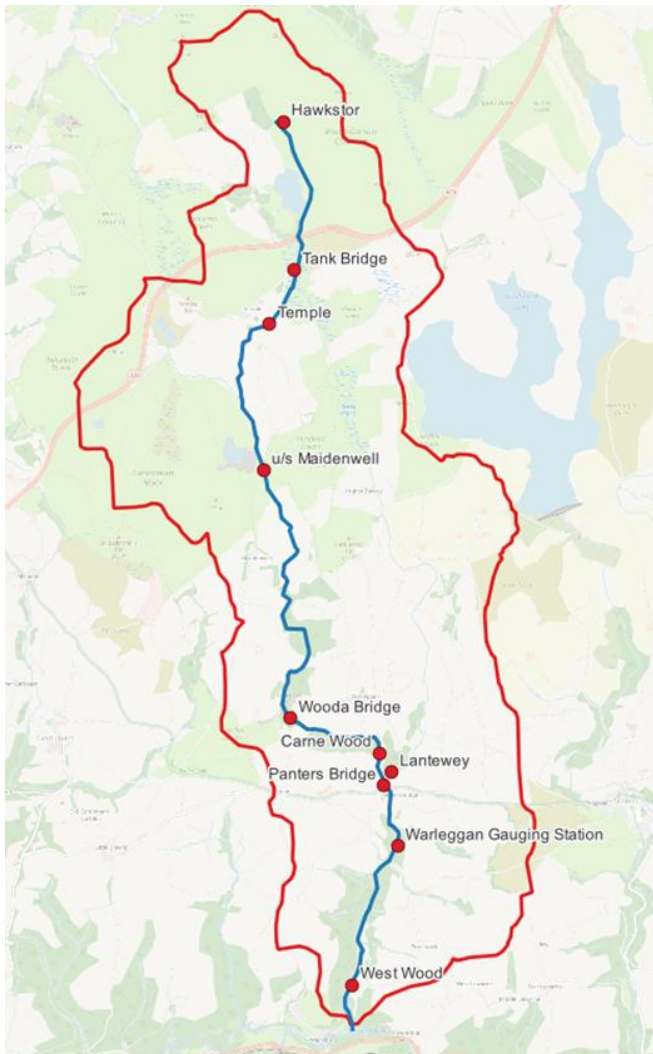
The Environment Agency has carried out electric fishing surveys at 10 survey sites within the Warleggan catchment (see Figure 6 below). Data from 1994 to 2021 taken from the Fish and Ecology Data Explorer (source: <https://environment.data.gov.uk/ecology/explorer/>, accessed 29th October 2022) shows that 4 species have been recorded in these surveys; Atlantic salmon (*Salmo salar*), Brown trout (*Salmo trutta*), bullhead and European eel.

Table 2 - Summary of species recorded in Environment Agency electric fishing surveys

| Site Name | NGR | Atlantic salmon | Brown trout | Bullhead | European eel |
|---------------------------|--------------|-----------------|-------------|----------|--------------|
| Temple | SX1477273180 | y | y | n | y |
| u/s Maidenwell | SX1464871576 | y | y | n | y |
| Wooda Bridge | SX1485068842 | y | y | n | y |
| Carne Wood | SX1581868422 | y | y | y | y |
| Panters Bridge | SX1585068060 | y | y | y | y |
| Warleggan Gauging Station | SX1598167396 | y | y | n | y |
| West Wood | SX1543065880 | y | y | y | y |
| Tank Bridge | SX1506473770 | y | y | n | n |
| Hawkstor | SX1500075400 | n | y | n | n |
| Lantewey | SX1594968205 | y | y | n | y |

Figure 7 – Map of EA electric fish surveys within the Warleggan catchment

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11.0 Invasive Species

The most recent visits to site undertaken by SWW in October 2022 determined that no INNS appear present at Hawk's Tor Pit. This is further verified from RSK in October 2022 and by observations in the Valuation Report of Hawk's Tor Pit undertaken by Fenn Wright in 2019 (Pg. 17).

12.0 Landscape and Visual Amenity

Hawk's Tor Pit is located within the Bodmin Moor section of the Cornwall AONB and a remnant of mining activity in the landscape. The most significant visual impact expected is lowered water levels due to further abstraction, yet the Pit has mostly restricted views from the surrounding landscape. Visual amenity would affect a relatively small number of people who might use the common land to the east of the site and possibly recreational visitors to Colliford Lake nearby.

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The importance of maintaining special qualities of the AONB landscape may determine the impact receptor as **high** sensitivity, however the magnitude of impact is expected to be **low** because the permit would not exceed the maximum drawdown limit of 12m as permitted in the 1995/6 drought orders. Therefore, the overall significance of impact of a Drought Order on landscape is **minor**, to be considered in the context that Hawk's Tor Pit is already experiencing drought conditions which may be negatively affecting visual amenity.

13.0 Recreation

There are no formal access tracks either down to the Hawk's Tor Pit or around it and it is not possible to walk around the edge of the lake at the northern end due to the very steep banks (Fenn Wright, 2019). Therefore, along with nearby access to recreation facilities at Colliford Reservoir likely attracting any potential recreational activity, sensitivity of the tourism and recreation at Hawk's Tor is determined to be **low** and overall significance of impact on recreation value is expected to be **negligible**.

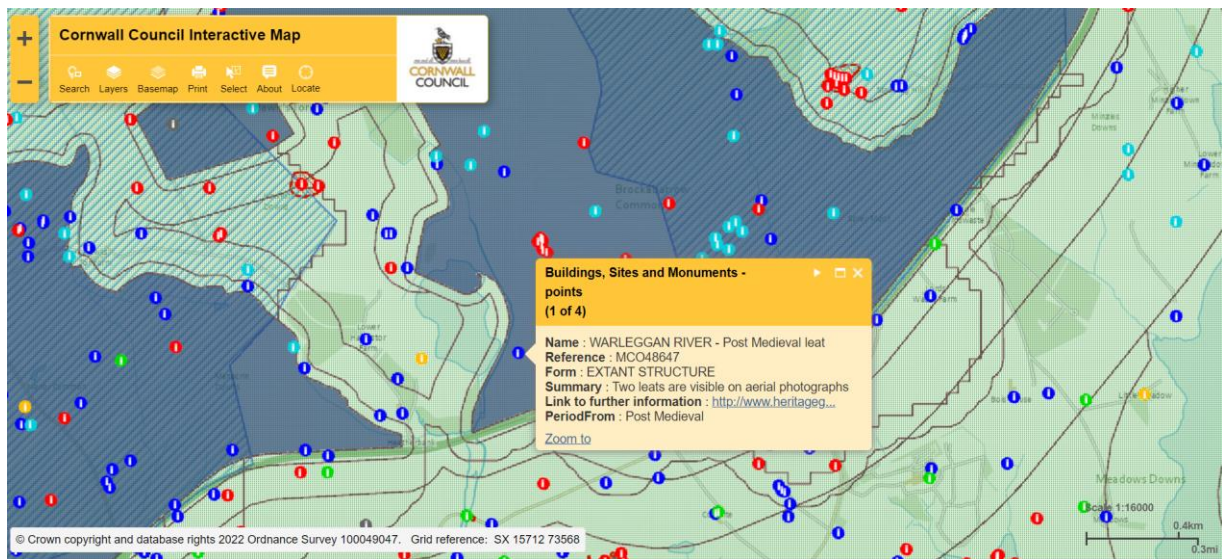
14.0 Archaeology and Cultural Heritage

Hawk's Tor is situated within the setting of Stripple Stones, Hawkstor Downs Scheduled Ancient Monument (SAM) to the north-west of the site. The leat dug along the eastern side of the pit is recorded as a post-medieval structure, assessed to have low magnitude of impact and negligible sensitivity, of which all monitoring activity would be careful to steer clear of including piezometer installation.

Abstraction from the Pit is not expected to affect geological integrity of the ground on which it sits, to be monitored with the installation of piezometers, as there is no intrusive groundwork. Therefore, overall significance of impact on archaeology and cultural heritage value is expected to be **negligible**.

Figure 8 – Map of historical buildings, sites and monuments in the Hawk's Tor vicinity

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15.0 Environmental Monitoring Plan (EMP)

We shall undertake the following **monitoring** steps:

- i. Lake in-flow and out-flow volumes measured fortnightly via manual gauging.
- ii. Flow upstream of the Warleggan River north of the A30 (new temple bridge) by fortnightly manual gauging
- iii. Piezometers to be installed to the south and east perimeters of the Pit with a weekly review of data.
- iv. Continuous levels of Hawk's Tor Pit measured from pump pontoon and recorded via telemetry.
- v. Continuous compensation flow readings to Warleggan River; reported weekly for the daily average.
- vi. Daily abstraction volume via installed meter on the pump pontoon collated as daily a total and reported weekly.

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- vii. In-situ spot water quality monitoring at two locations of Warleggan River; downstream of Hawk's Tor outflow (SX1514374312) and at Cabilla Wood/Warleggan River road bridge (SX1478968927)
- viii. Walkover survey of lake for fish in distress weekly, specifically to target times of downstream migration and should pooling occur in the lake.
- ix. Walkover survey of Warleggan River downstream for fish in distress weekly; downstream of Hawk's Tor outflow (SX1514374312), to the confluence with the Black Tor tributary (SX1502673571) and to the accessible limit approaching Cabilla Woods from Cabilla Wood/Warleggan River road bridge (SX1478968927)
- x. Implement weekly assessment of bankside stability of Hawks Tor SSSI exposed faces during draw-down.

To **mitigate** the impacts of the drought permit we shall:

- i. Provide a compensation flow of 32 l/s (based on Nov-Mar Q95 Qube modelling) through temporary pumps from Hawk's Tor Pit into Warleggan River.
- ii. Provide three artificial spates for twelve hours duration during November to December 2022 at 64 l/s to aid migration of salmonid fish.
- iii. Provide a post drought permit compensation of 11 l/s (based on Apr-Sept Q95 Qube modelling) until 30 September 2023 or until recovery of Hawks Tor Pit to TWL, whichever is sooner.
- iv. Provide three artificial spates for twelve hours during April and May 2023 at 32 l/s to aid migration of salmonid smolts.
- v. Provision for fish rescue team to support migration of fish around the site as TWL is drawn down.
- vi. Provision of further compensation and artificial spates will be undertaken in autumn 2023 in the event until Hawk's Tor not returning to TWL.

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- vii. Deliver targeted habitat enhancement of Warleggan River to the A30 (current land boundary).
- viii. Include a hands-off flow condition of 12m from TWL, based on 1995 experience, to preserve bank stability. NB although abstraction for public water supply would stop at 12m, abstraction to maintain compensation flows would not be reduced.
- ix. In the unlikely event that we identify bankside instability we shall seek immediate review from an internal South West Water accredited Supervising Civil Engineer.
- x. In the event of water quality downstream pollution or water quality issues which are proven to be linked to the abstraction at Hawk's Tor Pit, we shall look to increase compensation volumes.
- xi. Publish an Environmental Assessment Report and revised Environmental Monitoring Plan by 31st December 2022
- xii. Implement 2mm screening on the pumps to protect against unknown invasive species transference risk.

An environmental statement setting out a summary of the environmental assessments which have been undertaken for this drought permit is included as ***Document 3 Hawk's Tor Pit Drought Permit Environmental Impact Review***.

The key documents with the environmental assessments and monitoring plans are:

1. Drinking Water Services Report 2022 – Operations Supporting Evidence (**Document Ref: 1.3**)
2. Water Quality Information Hawk's Tor (**Document Ref: 1.4**)
3. Hawks Tor Drought Permit Environmental Impact Review (**Document Ref: 3.0**)