2022/23 Application specific information to support June 2021 Environmental Assessment Report (EAR)

The environmental assessment report submitted with this application is 'Stantec and APEM (2021) Drought Permit Environmental Statement: Dove Reservoirs'. This assessment was updated after the implementation of our drought permit in March 2019. This report uses measured reservoir level data during a previous Drought Permit (DP) implementation in 2019 to predict hydrological impacts in comparison to a modelled baseline scenario. The results of the hydrological analyses were used to assess baseline data and predict potential impacts for receptors including designated sites, protected and water-level sensitive species and recreational users.

This report has not been updated with additional data from 2020-2022 as the permit conditions we are applying for in 2022 (for an increase in abstraction from Dove Reservoirs for up to one month in March 2023) are fully covered by the scenario and assessment presented in the EAR. Both reservoirs (Foremark and Staunton Harold) are higher now in terms of water level than they were at this time of year in 2018 and we are applying for a smaller volume of water in our current application, so the assessment in the EAR is a worse case in terms of possible environmental impact when compared with our current permit application. The assessment is therefore suitable to assess any potential environmental impacts because of this permit. A comparison of the scenario described in the EAR to our current drought permit application is outlined below:

- Severn Trent Water are applying for an increase of 3,500 Ml in the aggregate abstraction limit abstraction quantity for the Dove reservoirs, increasing the annual abstraction limit from 73,200 Ml to 76,700 Ml. This increased abstraction would occur for a period of less than one month, during March 2023. In **Section 2.3.1** of the EAR (and in the drought permit granted in 2019) the proposed DP scenario is a temporary increase of 4000 Ml in the aggregate abstraction quantity for the Dove reservoirs, increasing the annual abstraction limit from 73,200 Ml to 77,200 Ml for a period of less than one month, during March 2019.

- A cumulative licence use graph for 2022 and predicted use up until 2023 indicates that the most likely date that an increase in licence volume will be required is mid-March, which is the same time of year as the scenario assessed in the EAR (see **Section 5.1**). For comparison a cumulative licence graph for Oct 2022 to end of March 2023 is included below as Figure 1. **Figure 5.1** in the EAR illustrates the scenario prepared in 2019.

- Both reservoirs currently have higher starting water levels prior to the winter refill period than the same time of year in 2018 (pre 2019 drought permit). Table 1 below provides a comparison of reservoir water level. A week in November has been chosen for this table as this is the most recent 2022 data prior to our permit application. **Section 4.8** of the EAR describes changes in water level during Drought Permit implementation in March 2019 which were largely within the range of recent historical variation. In November 2022 reservoir levels are currently higher than at a similar period in 2018 and our predictions indicate that water levels will remain within the range of recent historical variation while the permit is in place. Figures 2 and 3 have been provided for comparison with the historical data of water level ranges in **Figures 4.6 & 4.7** in the EAR.

- Reservoir water levels are not predicted to drop below historical records, so the shoreline exposure will be within the range described in **Section 5.2.2 and 5.2.3** in the EAR.

- For all receptors under the proposed Drought Permit, no impacts on receptors were predicted in comparison with the baseline in the EAR (see **Section 5**). As reservoir water levels are not predicted to drop below historical records and the period of implementation (March) is the same as described in the EAR no impacts on receptors are predicted against baseline in our current application.

- In the EAR a maximum abstraction of 220 Ml/d was cited in **Section 5.2.4**. In Figure 1 our predictions for 2023 use a maximum abstraction of 235 Ml/d (average abstraction 230Ml/d) from Foremark and Staunton Harold Reservoirs. This abstraction will occur whilst transferring 238 Ml/d into the reservoirs from the Dove River abstraction alongside the small natural catchment that flows into Staunton Harold, so as stated in the EAR reservoir levels are not predicted to drop in comparison with the baseline position during March, levels will just not be as high at the end of March as they would have been under the baseline scenario.

- The EAR states that in the event that a DP were to be implemented, STWL has committed to undertake no increased pumping from the Dove River abstraction under the 90 Ml/d HoF condition until after reservoir storage has returned above the long-term average and that the abstraction licence would be varied to reflect this. In 2022 we are not proposing to vary our Dove River abstraction licence to make this change. The Environment Agency, as the Regulator will decide how this condition will be included in the Drought Permit.

- In **Section 5.1** of the EAR, it states that 'Ba*sed upon historical combined flow data from Rolleston and Marston-on-Dove gauging stations in 2018, river flows were sufficiently high to have permitted maximum abstraction from the River Dove without reaching the 159 Ml/day HoF between January and March. Prior to any future application of the proposed DP antecedent river flow conditions would be checked to confirm that this would also be expected to be the case between January and March during the year of application'*. We have checked and confirm that this is still the case in 2022/23.

- **Section 7** of the EAR states that STWL has committed to maximise pumping into the reservoirs while flows in the River Dove allow, to bring them back to normal storage levels. This is also the case in our current application.

Table 1: Comparison of actual Reservoirs Levels (% full) and metres below the top water level between 2018 (autumn preceding previous drought permit) and immediately before application for drought permit 2022 (noting that increased abstraction above licence will not occur until March 2023)

Date	Staunton Harold Reservoir		**Foremark Reservoir**	
	% Full	Metres below top water level	% Full	Metres below top water level
19th November 2018	35.3%	-7.07	60.2%	-6.31
21st November 2022	54.7%	-4.31	64.6%	-5.52

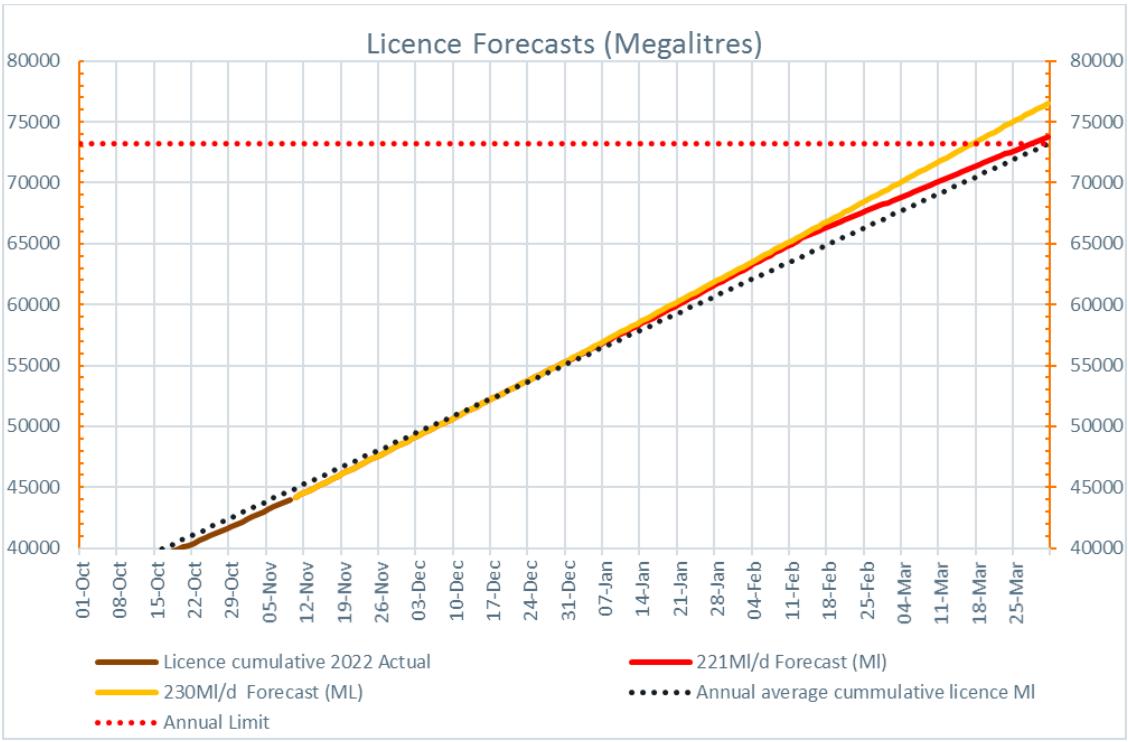


Figure 1: Actual licence usage up to 10 November 2022 and forecast abstraction between November 2022 to end of March 2023. Two scenarios have been presented with usage above licenced abstraction limit. A 230Ml/d daily abstraction rate and a 221Ml/d daily abstraction rate.

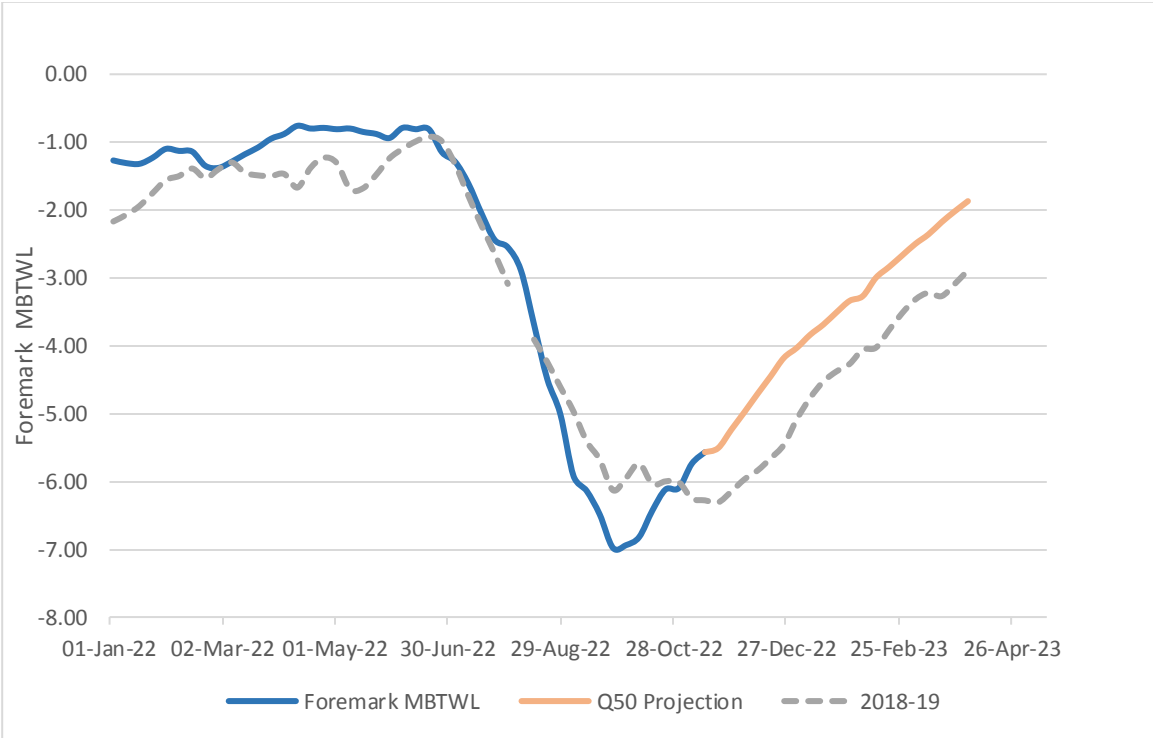


Figure 2: Foremark projected level (MBTWL). Projection assumes Q50 flows on River Dove. Projection assumes total abstraction from Staunton Harold and Foremark average of 230ML/d between December 2022 and March 2023.

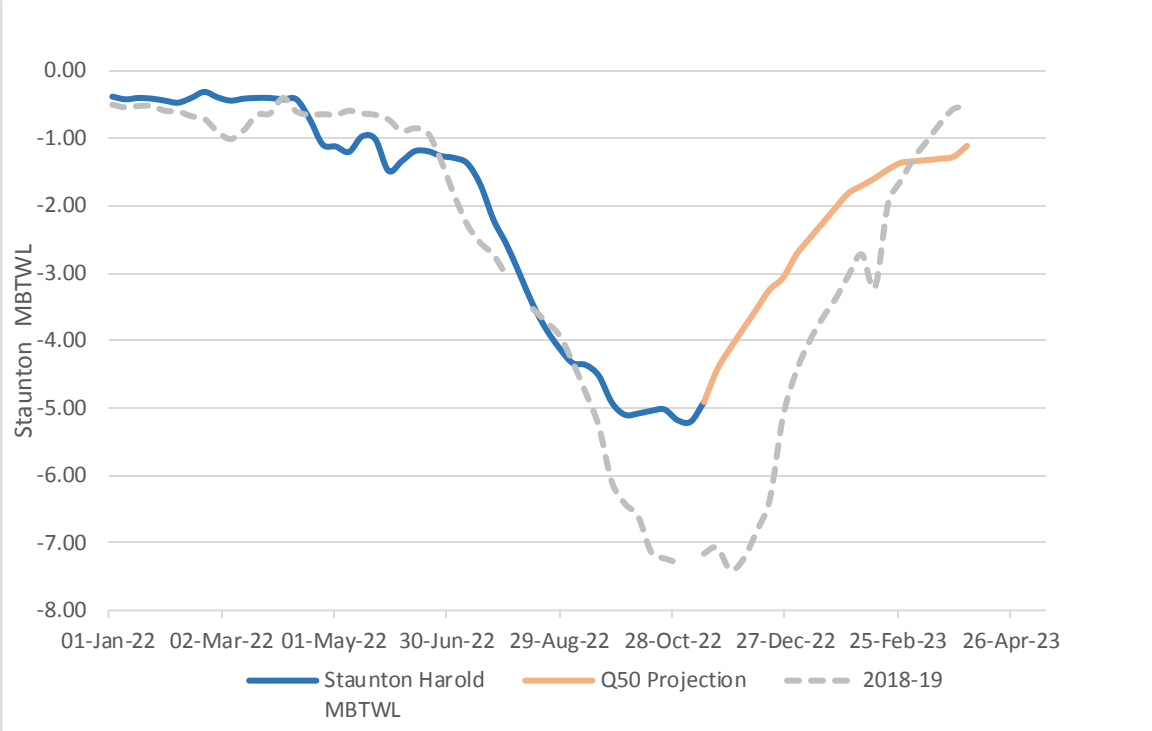


Figure 3: Staunton Harold projected level (MBTWL). Projection assumes Q50 flows on River Dove and Q50 (Average) reservoir inflows. Projection assumes total abstraction from Staunton Harold and Foremark average of 230ML/d between December 2022 and March 2023.

Drought Permit Environmental Statement: Dove Reservoirs

June 2021

T1.02

Drought Permit Environmental Statement: Dove Reservoirs

Prepared for:

Severn Trent Water Ltd

2 St John's Street

Coventry

CV1 2LZ

Report reference: 64116AN R5 FINAL, June 2021

Report status: FINAL

CONFIDENTIAL

New Zealand House, 160-162 Abbey Foregate,
Shrewsbury, Shropshire
SY2 6FD

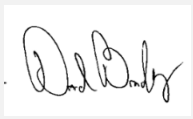
Telephone: +44 (0)1743 276 100
Facsimile: +44 (01743 248 600

Registered Office:
Stantec UK Ltd
Buckingham Court
Kingsmead Business Park
Frederick Place, London Road
High Wycombe HP11 1JU
Registered in England No. 1188070

This report has been prepared by Stantec UK Ltd (Stantec) in its professional capacity as environmental specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Stantec solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Stantec at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, Stantec may, by prior written agreement, agree to such release, provided that it is acknowledged that Stantec accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. Stantec accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against Stantec except as expressly agreed with Stantec in writing.

	Name	Signature
Author	Adam Sutcliffe (APEM) Catherine Van Russelt (APEM)	
Checked by	Hannah Austin (APEM)	
Reviewed by	David Bradley (APEM) Cecilia Young QA only	

Revision record:

Reference	Date	Status	Comment	Author	Checker	Reviewer	Issued to
64116AN R5D1	06/11/2019	First draft		AS, CVR	HA	HA	STWL
64116AN R5D2	09/12/2019	Second draft		AS	HA	HA	STWL and EA
64116AN R5D3	10/03/2021	Third draft		AS	JW	HA	STWL and EA
64116AN R5D4	05/05/2021	Final draft	Track changes accepted, one final revision to text (section 2.1.2)	JW	HA	DB ACY	STWL and EA
64116AN R5 FINAL	02/06/2021	Final	Marked as Final, all track changes accepted	JW			STWL and EA

Executive Summary

Severn Trent Water Limited abstracts water from Foremark and Staunton Harold reservoirs in southern Derbyshire. The reservoirs are filled using water abstracted from the River Dove. They supply water to the Strategic Grid Water Resource Zone via the local Water Treatment Works.

During times of water resource shortages as a result of exceptional shortage of rain, Severn Trent Water Limited would seek to temporarily increase its combined annual abstraction licence for these reservoirs (i.e. the combined abstraction from Staunton Harold and Foremark Reservoirs and the River Dove (although in practice the latter is not used)) for less than a one month period during March. Severn Trent Water Limited would do this through a proposed Drought Permit. A Drought Permit at Staunton Harold and Foremark reservoirs would be required only for a very short period (less than one month during previous implementation in March 2019).

This report used measured reservoir level data during a previous DP implementation to predict hydrological impacts in comparison to a modelled baseline scenario. The results of the hydrological analyses were used to assess baseline data and predict potential impacts for receptors including designated sites, protected and water-level sensitive species and recreational users.

Predicted changes in water level and shoreline exposure during Drought Permit implementation in March 2019 were largely within the range of recent historical variation. For all receptors under the proposed Drought Permit, no impacts were predicted in comparison with the baseline.

There will be no impacts on the water bodies downstream of the reservoirs, nor on the River Dove.

As part of its normal operations, Severn Trent Water Limited has committed to maximise pumping into the reservoirs while conditions in the river allow.

Routine operational monitoring will continue to be undertaken and will allow the effects of the proposed Drought Permit to be captured.

Contents

FIGURES

TABLES

1 Introduction

1.1 Background

Severn Trent Water Limited (STWL) abstracts water from Foremark and Staunton Harold reservoirs in southern Derbyshire. The reservoirs are filled using water abstracted from the River Dove. They supply water to the Strategic Grid Water Resource Zone via the local Water Treatment Works (WTW).

During times of water resource shortages as a result of exceptional shortage of rain, STWL would seek to temporarily increase its combined annual abstraction licence for these reservoirs (i.e. the combined abstraction from Staunton Harold and Foremark Reservoirs) for less than a one-month period during March. STWL would seek to do this through a proposed Drought Permit (DP).

1.2 Drought Permits and Drought Orders

In periods of unusually low rainfall, where water resources become scarce, powers are available to grant DPs, ordinary drought orders (DOs) and emergency drought orders under the Water Resources Act 1991 (as amended by the Environment Act 1995 and the Water Act 2003). DPs and DOs are drought management actions that, if granted, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment (EA & Defra, 2019).

In the case of DPs, the EA must be satisfied that a serious deficiency of supplies of water in any area exists or is threatened and that the reason for the deficiency is an exceptional shortage of rain.

DPs can be applied for under the Water Resources Act 1991 (Section 79A) where the main change is variation of an abstraction licence condition, such as the maximum yearly allocation or a compensation flow. They are authorised by the EA which can hold a public hearing to discuss the application if it deems one is necessary. The environmental assessment of DOs and DPs is undertaken in recognition of the guidance from the Environment Agency for DP applications, as contained in:

- Environment Agency (2019) Drought permits and drought orders. Supplementary guidance from the Environment Agency and Department of Environment, Food and Rural Affairs. May 2019
- Environment Agency (2020a). Water Company Drought Plan Guideline. April 2020
- Environment Agency (2020b). Environmental assessment for water company drought planning supplementary guidance. July 2020.

The environmental assessment to be carried out to support the DP is not a statutory Environmental Impact Assessment (EIA), as recognised, for example, within the Town & Country Planning regime and its enabling regulations. However, this environmental assessment has been undertaken in accordance with best practice guidance wherever applicable.

An Environmental Assessment Report (EAR), which includes a monitoring plan and mitigation measures, is required for each supply-side management action (e.g. DPs and/or DOs) included within the Drought Plan. Each EAR should provide details of baseline flow conditions, assess impacts of potential changes to the flow regime due to implementation of the DP and/or DO, and provide an Environmental Monitoring Plan (EMP) to support the requirement for baseline, during and post DP / DO monitoring.

1.3 Objectives and scope

This report constitutes an environmental statement for a DP at the Dove Reservoirs (Foremark and Staunton Harold). The report has been tailored to reflect a potential future DP implementation period during March for less than one month (see Section 2.3).

It provides an environmental assessment of the potential effects of STWL's proposed drought actions. Where potential impacts are identified, appropriate mitigation measures are presented to reduce impacts where possible. The report also includes an EMP detailing monitoring recommendations for the periods prior to, during and post DP implementation.

Following this background section, this report is structured as follows:

- Section 2 presents background information about the study site, abstraction licences and baseline operation, before describing the proposed DP operation;
- Section 3 presents the assessment method;
- Section 4 presents the baseline environment of the study area;
- Section 5 sets out an assessment of changes to physical pathways and the assessment of impacts on ecological and other receptors;
- Section 6 provides a summary of the assessment findings;
- Section 7 discusses possible mitigation measures;
- Section 8 outlines the EMP; and
- Section 9 provides the conclusions and recommendations.

2 The Dove Reservoirs Drought Permit

2.1 Operation of the Dove Reservoirs

2.1.1 Water sources

The Strategic Grid Water Resource Zone within which Staunton Harold and Foremark reservoirs are situated, is the largest of STWL's resource zones. Water abstracted from the reservoirs by STWL forms part of STWL's public water supply within the region and abstraction can be used to support water resources elsewhere in the Strategic Grid Zone. Both Staunton Harold and Foremark reservoirs are 'pumped storage' i.e. they are filled predominantly using water abstracted from the River Dove.

Water abstracted from Foremark Reservoir can be pumped to Staunton Harold Reservoir four miles away and re-abstracted to supply the local WTW (although it is unusual for the sources to be operated in this way). Water can also be pumped directly to the local WTW. Foremark Reservoir is entirely pumped storage and therefore does not normally spill or overtop; Staunton Harold Reservoir receives some inflow from the catchment and occasionally spills and overtops (although it is managed to minimise this). A compensation flow is released from both reservoirs to the downstream waterbodies.

The Strategic Grid Zone is managed in accordance with operating policies and control rules to provide a secure water supply to customers. These policies and control rules show the actions to be taken at any time of the year to protect water supplies against the worst drought conditions on record (such as pumping from rivers when flows are high enough to enable the conservation of water stored in reservoirs). STWL carries out continuous hydrological and hydrogeological monitoring, in conjunction with the Environment Agency, to enable day-to-day monitoring of the water resources situation. This information is a key input to the regular assessments of supply security that are carried out using water resource simulation models to identify the sustainable yields of sources and the actions required to maintain water supplies. These assessments provide the basis for identifying the need for, and timing of, any drought management measures.

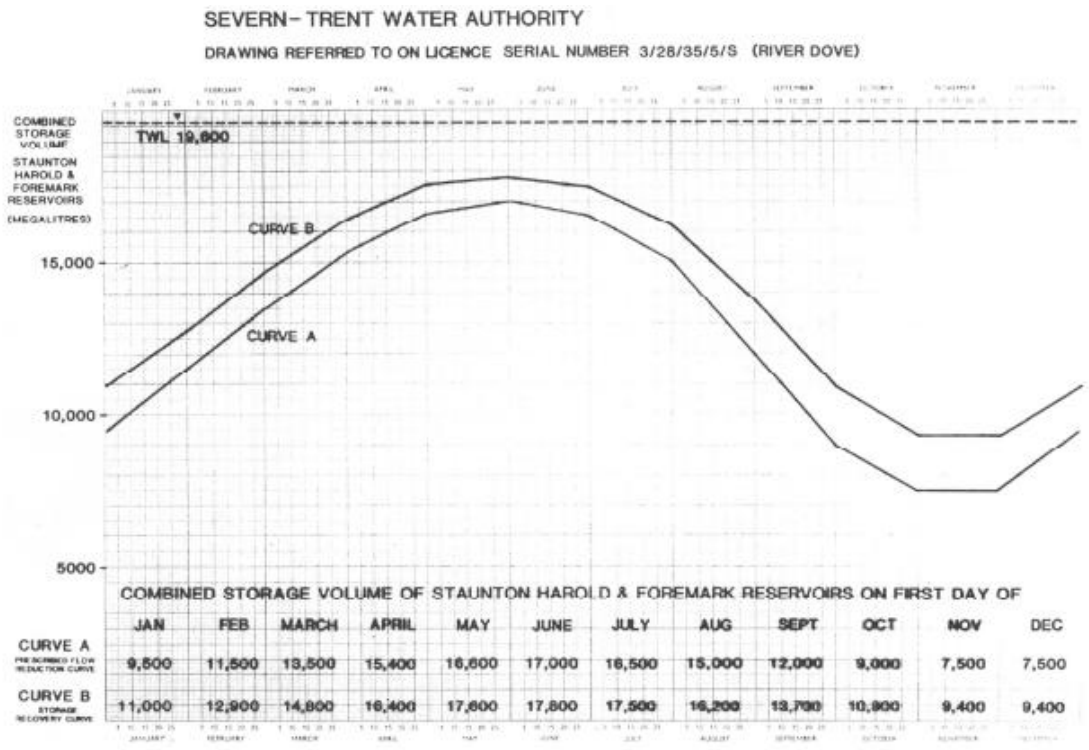
2.1.2 Dove River Abstraction Licence

The Dove River abstraction licence permits the abstraction of 86000 Ml/year from the River Dove (equivalent to an average rate of 235.6 Ml/day). This abstraction is authorised for the purpose of transfer of raw water to Staunton Harold and/or Foremark Reservoirs. In theory the licence also allows the abstraction to be used to supply water directly to the local WTW (although in practice this purpose is not currently used).

The abstraction rate should be such that a residual flow of at least 159 Ml/day is left in the River Dove downstream of the intake at all times, unless storage in the reservoirs is such that the lower residual flow of 90 Ml/day applies (Figure 2-1). It is noted that the abstraction licence was varied in April 2020. The 90Ml/d flow condition was removed from the licence through upfront permitting, with the change to come into effect by 2030.

The residual flow is calculated as the difference between the sum of the flows from the Environment Agency gauges at Marston and Rolleston and the abstracted quantities. The control curves are shown in Figure 2-1, and this forms part of the licence. The figure has two curves: A and B, which define amendments to the residual flow. The minimum residual flow in the Dove can be reduced to 90 Ml/day if the combined storage of Staunton Harold and Foremark Reservoirs falls below Curve A. When storage drops below Curve B there is a requirement to pump at such a rate that overall storage increases at an average rate of 70 Ml/day subject to the availability of water in the river (in excess of the prescribed flow of 159 Ml/day). During this period there is no obligation to abstract more than

250 Ml/d from the River Dove or when abstraction is not possible due to exceptional circumstances, or if the abstracted water would not be of satisfactory quality.



	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
CURVE A	9,500	11,500	13,500	15,400	16,600	17,000	16,500	15,000	12,000	9,000	7,500	7,500
CURVE B	11,000	12,900	14,800	16,400	17,600	17,800	17,500	16,200	13,700	10,900	9,400	9,400

Figure 2-1 Dove River Abstraction Licence Control Curves

2.1.3 Staunton Harold Abstraction Licence

The licence permits the abstraction of 46600 Ml/year from Staunton Harold Reservoir (equivalent to an average rate of 127.67 Ml/day). There is a compensation flow requirement to the downstream water course of 1.7 Ml/day.

2.1.4 Foremark Abstraction Licence

The licence permits the abstraction of 73200 Ml/year from Foremark Reservoir (equivalent to an average rate of 200.55 Ml/day). There is a compensation flow requirement to the downstream water course of 0.41 Ml/day.

The combined abstraction from Staunton Harold and Foremark reservoirs must not exceed 73200 Ml/year (equivalent to an average rate of 200.55 Ml/day).

2.2 Previous Drought Order/Permit Applications and Licence Variations

The actions STWL does and would take to protect water storage levels at its major reservoirs form part of its statutory Drought Plan, a copy of which can be found on its website here:

https://www.severntrent.com/about-us/future-plans/water-resource-management/drought-plan/

Due to exceptionally hot and dry weather in summer 2018, followed by the unusually dry autumn/winter in 2018/19, STWL applied for (and was granted) a DP to temporarily increase its combined annual abstraction licence for the Dove reservoirs (i.e. the combined abstraction from Staunton Harold and Foremark Reservoirs) for the 2018/19 licence year. The DP was effective from 8th March 2019 to 31st March 2019 and increased the aggregate quantity of water that STWL was

permitted to abstract by 4000 Ml (20% of the combined storage of the Dove Reservoirs) from 73200 Ml/year to 77200 Ml/year.

2.3 Proposed Drought Permit Operation

2.3.1 Drought Permit scenarios

Under the proposed DP scenario, a temporary increase of 4000 Ml in the aggregate abstraction quantity for the Dove reservoirs[1] would be sought, increasing the annual abstraction limit from 73200 Ml to 77200 Ml. This would be sought for a period of less than one month, during March.

The compensation flow downstream of the reservoirs would remain unchanged and because the reservoirs are pumped storage, and designed not to spill, there would be no change to the flow regime downstream of the reservoirs.

The justification for the proposed DP at Staunton Harold and Foremark reservoirs and consideration of alternatives would be set out in a Statement of Support to accompany the DP application.

An increased combined annual abstraction licence limit for the reservoirs would allow STWL to maintain public water supply via the local WTW, part of the Strategic Grid Zone.

The DP may result in a change in reservoir drawdown which might affect the aquatic environment associated with the reservoirs. Such potential impacts are analysed as part of the environmental assessment, based upon measured historical data, including from the time period during which a DP was granted in March 2019. Since there would be no change in the flow regime downstream of the reservoirs, the downstream waterbodies are not considered further.

In the unlikely event that the proposed DP caused reservoir storage to drop below Curve A (Figure 2-1), STWL would not utilise the Dove river abstraction under the lower residual flow of 90 Ml/day while the DP was in place, nor until the combined storage in the reservoirs had returned above the long term average[2]. The abstraction licence would be varied to reflect this. Therefore, no change in abstraction from the River Dove would occur compared to normal operation, and therefore the River Dove downstream of the abstraction intakes is not considered further in this report.

The geographical extent of the study is therefore restricted to Staunton Harold and Foremark (Figure 2-2).

[1] Defined in the Foremark abstraction licence as the combined abstraction from Staunton Harold and Foremark Reservoirs and the River Dove (though in practice the latter is not used), equivalent to 20% of the combined storage of both reservoirs.

[2] It is noted that the long-term average storage licence condition is not based on a single number but an annual curve which varies across the year (based on 10 years of historical data).

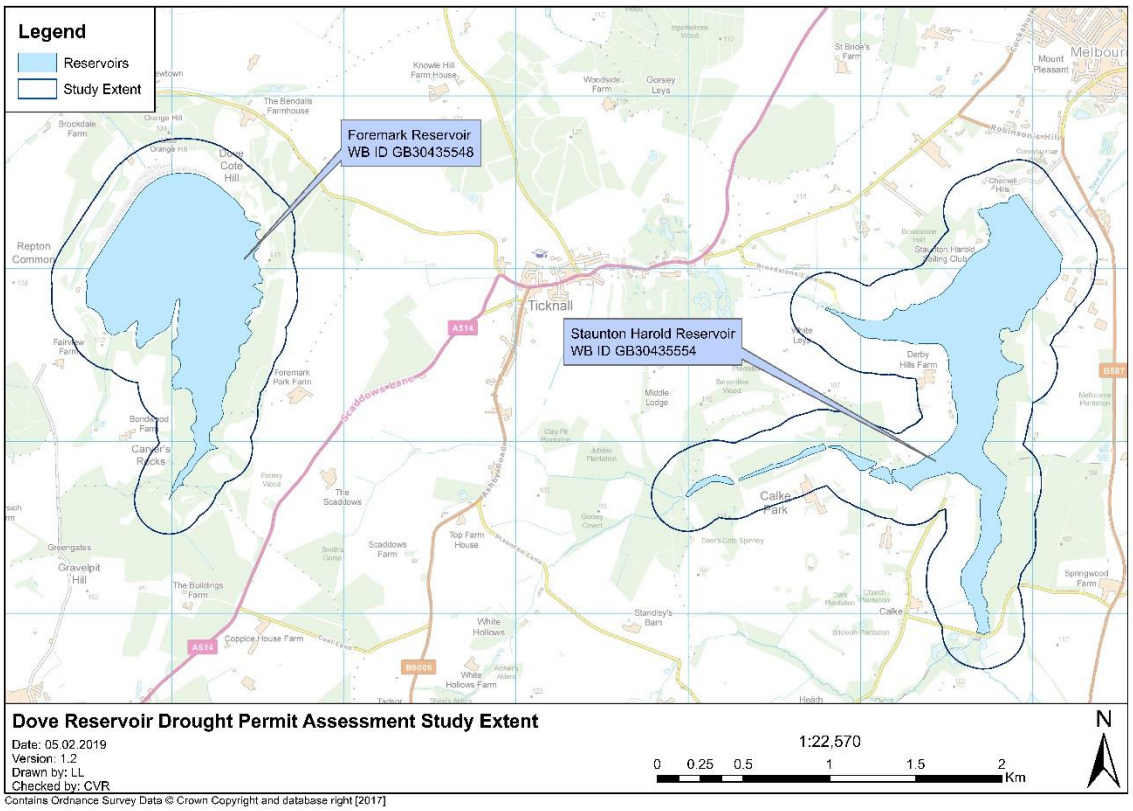


Figure 2-2 Study area, showing WFD water bodies

3 Assessment method

3.1 EAR production guidance

The environmental assessment of a potential DP is undertaken in recognition of the following principal guidance from the EA and Defra:

- Environment Agency (2019) Drought permits and drought orders. Supplementary guidance from the Environment Agency and Department of Environment, Food and Rural Affairs. May 2019
- Environment Agency (2020a). Water Company Drought Plan Guideline. April 2020
- Environment Agency (2020b). Environmental assessment for water company drought planning supplementary guidance. July 2020.

The environmental assessment process involved definition of the baseline, followed by three stages:

- EAR Stage 1: Hydrological, hydrogeological and geomorphological impact assessment;
- EAR Stage 2: Environmental sensitivity assessment; and
- EAR Stage 3: Identifying any additional evidence/data requirements.

The baseline conditions are those that exist in the absence of the proposed drought actions.

The staged EAR approach is consistent with the EIA 'source'-'pathway'-'receptor' concept. The EAR Stage 1 constitutes a 'pathways' assessment. Pathways are the means by which an effect reaches or is propagated upon the receiving 'receptor'; pathways with respect to DP EARs are typically changes to water level, water quality or physical habitat. Effects on these pathways have been assessed with respect to their likely scale, timing, duration and spatial extent, but not their value.

EAR Stage 2 defines how the predicted pathway changes (from EAR Stage 1) may cause an 'effect' on receptors, ultimately characterising the significance of each identified effect. With respect to DP EARs, these are typically water level-sensitive biota and water users. Compliance with regulatory requirements can also be considered a receptor. As for pathways, impacts on receptors have been assessed with respect to their likely scale, timing, duration and spatial extent. However, as receptors, their importance (or value) is also considered to establish to overall significance of the impact.

There are many independent and linked characterisations undertaken in the overall assessment of significance and the process has been defined for this project having cognisance of the latest CIEEM guidelines (CIEEM, 2018). Figure 3-1 illustrates (in schematic form) the overall process of defining significance of individual effects. All individual, component assessments are recorded; Table 3-1 provides the assessment component categories and definition guidance.

The geographical extent of the study area is restricted to Staunton Harold and Foremark reservoirs and therefore these two locations have been identified as assessment points (APs).

At each AP, the proposed DP has been linked to impacts on receptors (including water users) via physical habitat pathways. The assessment is risk-based i.e. it is focussed by the severity of the predicted impacts of the DP compared to the baseline, and on those receptors which could potentially be affected by the predicted effects of the DP on physical habitat pathways.

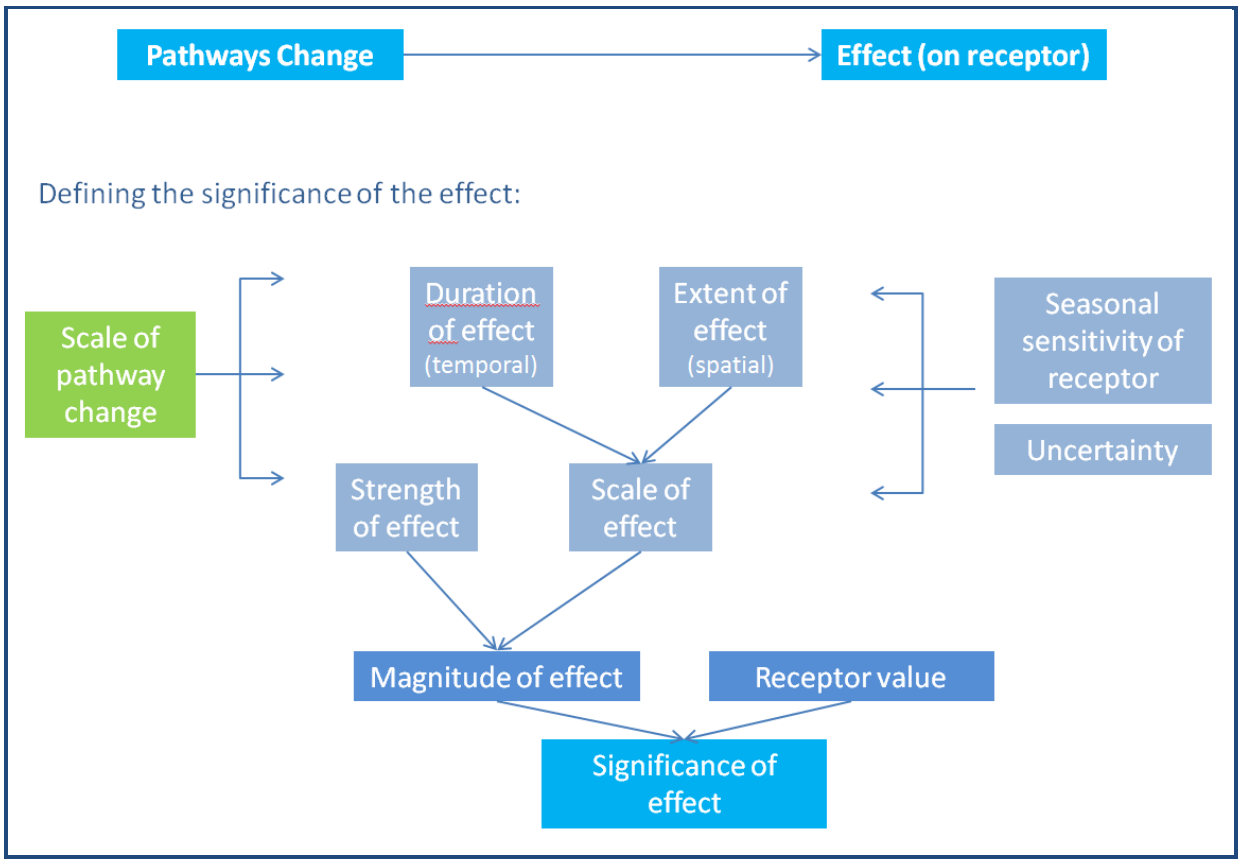


Figure 3-1 Schematic of the EAR stage 2 process, in which significance of each effect is defined

Table 3-1 Assessment component categories and definition guidance

Component	Categories	Commentary
Seasonal sensitivity	High / Medium / Low / None	Assessed on an individual species / life-stage / receptor basis for individual months e.g. salmon juveniles may have High sensitivity in some calendar months and Low sensitivity in other calendar months.
Uncertainty	Confirmed / Probable / Suspected / Unknown	Receptor and site specific; may depend on data availability; knowledge of receptor etc. Defined for information/ consideration within all other component assessments.
Duration	Permanent / Long Term / Medium Term / Short Term	Receptor and site specific; defined for example in relation to ecological characteristics such as species' life cycle.
Extent	Extensive / Moderately extensive / Localised / Negligible	Spatial or geographical area over which the impact/effect may occur.
Scale	High / Medium / Low / Negligible	Matrix combination of duration and extent.
Strength	Large -ve / Moderate -ve / Small -ve / Negligible / Small +ve / Moderate +ve / Large +ve	Receptor and site specific; incorporates positive and negative change
Magnitude	High Negative / Medium Negative / Low Negative / Negligible / Low Positive / Medium Positive / High positive	Matrix combination of scale and strength.
Receptor value	**International** / **National** / **Regional / County** / **District / Parish** / **Negligible**	As adapted from CIEEM 2018.
Significance	**Critical** / Major / Moderate / Minor / Negligible / Minor Benefit / Moderately beneficial / Highly beneficial / **Very highly beneficial**	Matrix combination of receptor value and magnitude.

3.2 Pathways

The pathways considered as part of this study are:

- **Hydrological** – reservoir storage; and
- **Hydromorphological** – reservoir level and shoreline.

Pathways effects have been assessed in sequence.

Reservoir storage has been presented based on predicted baseline and measured DP abstraction rates (from March 2019) and abstraction and storage data provided by STWL.

Reservoir storage has been translated to reservoir levels using reservoir bathymetry data.

3.3 Receptors

The receptors considered as part of this study are:

- **WFD Classification**;
- **Designated sites;**
- **Protected species;**
- **Water-level sensitive species;**
- **Invasive Non-Native Species; and**
- **Recreational users**.

Assessment of potential impacts on these receptors in large part relies upon expert assessment of the estimated effects of the DP on pathway variables in comparison with baseline (normal) operation.

4 Baseline

4.1 Water Framework Directive Classification

Drought plan environmental assessment guidance (Environment Agency, 2020b) recommends that the assessment explicitly address potential impacts on WFD status.

The status of the two relevant WFD surface waterbodies, for the two most recent classification years are summarised in Table 4-1.

Table 4-1 Summary of recent WFD classification status and objectives

Water Body ID	Water Body Name	Hydro-morphological Designation	Class-ification	Ecological Status / Potential	Failing Elements		Reasons For Not Achieving Good Status
					Phyto-plankton	Total Phosphorus	
GB30435554	Staunton Harold Reservoir	Artificial	2015 (Cycle 2)	MEP	M	P	Diffuse and point sources (agriculture, water industry and contaminated land)
			2016 (Cycle 2)	PEP	P	P	
GB30435548	Foremark Reservoir	Artificial	2015 (Cycle 2)	MEP	N/A	B	Diffuse and point sources (agriculture and water industry)
			2016 (Cycle 2)	MEP	N/A	B	

M=Moderate, P=Poor, B=Bad, MEP=Moderate Ecological Potential, PEP=Poor Ecological Potential
The WFD surface water bodies downstream of the reservoirs and downstream of the River Dove abstraction are not included in this table because they would not be affected by the proposed DP, as described in Section 2.3.

4.2 Designated Sites

A search for statutory features on Staunton Harold Reservoir and Foremark Reservoir was conducted using MAGIC (http://www.magic.gov.uk/). The search was restricted to features located on the banks of the reservoirs only. Returned features are summarised in Figure 4-1.

The following layers were interrogated:

- Areas of Outstanding Natural Beauty (AONB)
- Local nature reserves (LNR)
- National nature reserves (NNR)
- National parks
- Ramsar sites
- Sites of Special Scientific Interest (SSSI)
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)

These statutory designations are considered to be of National (domestic UK legislation) or International (European and international legislation) Importance. Sites designated under UK, European and international legislation are considered, where sites may be designated for their wildlife or geological interest. Designated sites may be impacted via a change in reservoir level leading to exposure of sediments. This has the potential to impact the integrity of the substrate itself and the utilisation of the shoreline by flora and fauna that may be protected under the designation.

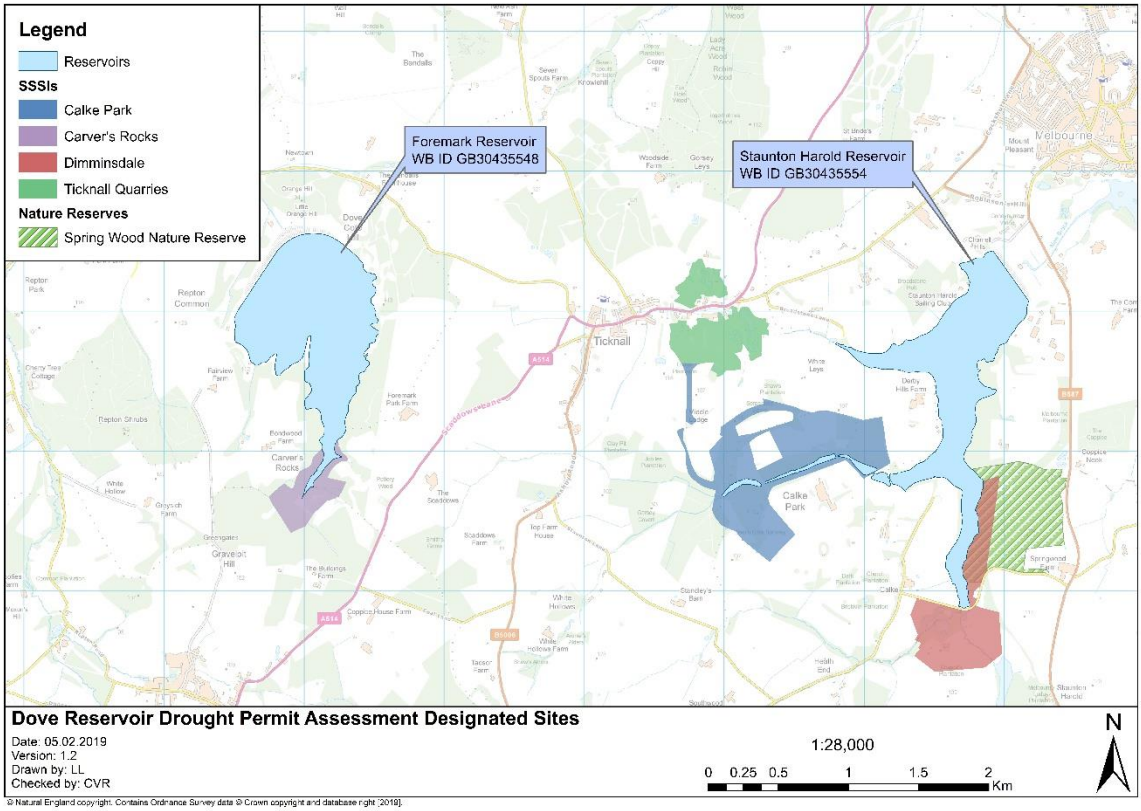


Figure 4-1 Designated sites in the vicinity of Foremark and Staunton Harold reservoirs

Staunton Harold Reservoir

Two SSSIs were identified in the immediate vicinity of Staunton Harold Reservoir; Dimminsdale SSSI (SK 377 218) and Calke Park SSSI (SK 365 230) (also designated as a NNR; Calke Abbey and its associated grounds are managed by the National Trust). Dimminsdale SSSI is designated due to the presence of various uncommon habitats including ancient semi-natural woodland, one of the largest areas of unimproved acidic grassland remaining in Leicestershire and disused lead workings of national geological importance. Calke Park SSSI contains concentrations of very large, old, stag-headed oak trees, ancient limes and beeches. These trees sustain exceptional assemblages of deadwood invertebrate fauna which breed in living, dying and dead wood of trees that are several hundred years old.

A further SSSI was identified in the vicinity of Staunton Harold Reservoir; Ticknall Quarries (SK 358 238) which has been designated due to the presence of a number of habitats, species of vegetation and geological features.

Located to the east of the reservoir is Spring Wood Nature Reserve, a woodland and stream habitat containing a mixture of trees, species of bird and fungi. Although not designated as a LNR, Spring Wood is an important wildlife habitat managed by the Derbyshire Wildlife Trust.

Foremark Reservoir

A single SSSI was identified on the banks of Foremark Reservoir: Carver's Rocks SSSI (SK 330 227). This site consists of a number of habitats including open water, eutrophic marsh, woodland and heath which support many plant and animal species of restricted distribution. The site is also managed by the Derbyshire Wildlife Trust as a Nature Reserve.

4.3 Protected Species

A spatial search of biodiversity records was conducted using the NBN Atlas (https://nbnatlas.org/), using data providers with open licenses. The area of each reservoir plus a 100m buffer zone was searched, and all recorded species records within that search zone were reviewed.

Staunton Harold Reservoir

White-clawed crayfish (*Austropotamobius pallipes*) have been historically recorded in the reservoir between 1979 and 1997, and in the inlet to the reservoir between 2002 and 2014 (Environment Agency, pers. comm.).

There are records of two species of bird which are Near Threatened on the International Union for Conservation of Nature (ICUN) list recorded at Staunton Harold Reservoir; the Northern Lapwing/Green Plover (*Vanellus vanellus*) recorded between 2001 and 2005 and the Curlew (*Numenius arquata*) recorded between 2001 and 2004. Both are wading birds and feed along the water's edge, although will only be occasional visitors to Staunton Harold Reservoir with more suitable habitat present in the nearby upland Peak District reservoirs.

Foremark Reservoir

One species of butterfly has been recorded; the White-Letter Hairstreak (*Satyrium w-album*) which is Endangered on the Red List, but was only recorded in 1979. This species is found near or on elm trees.

4.4 Water Level Sensitive Species

Aside from the protected species described in Section 4.3, other species known to be present which could be affected by changes in water levels include stocks of brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) in Foremark Reservoir. Staunton Harold contains several species of coarse fish.

4.5 Invasive Non-Native Species

The impact of DP scenarios on spreading INNS is considered with particular reference to High Impact species that are present or may establish, using the UKTAG guidance on the assessment of alien species pressures (UKTAG, 2013). UKTAG (2015) classifies INNS according to their perceived level of impact, and this is applied here.

A spatial search of biodiversity records was conducted using the NBN Atlas (https://nbnatlas.org/), using data providers with open licenses. The area of each reservoir plus a 100m buffer zone was searched, and all recorded species records within that search zone were reviewed.

Staunton Harold Reservoir

There have been two High Impact INNS recorded at Staunton Harold Reservoir: the zebra mussel (*Dreissena polymorpha)* in 2011; and Nuttall's Water-Weed (*Elodea nuttallii*) in 2012.

Foremark Reservoir

There were no INNS recorded at Foremark Reservoir.

4.6 Site Character & Recreational Users

Staunton Harold Reservoir

Staunton Harold Reservoir offers a range of leisure activities such as walking, bird watching, sailing and coarse angling. The site is easily accessible with a car park and surfaced footpaths for wheelchair users and

pushchairs, with a variety of footpaths which run around the eastern side of the reservoir, and link to Foremark Reservoir. Nearby Calke Abbey and its associated grounds are managed by the National Trust; the country house estate offers a variety of leisure activities including walking. Staunton Harold Sailing Club and the Burton Mutual Angling Association coarse fishery operate from the reservoir. Bird watching is popular in the wildflower meadows of Dimminsdale SSSI/NNR and Spring Wood Nature Reserve, although the latter is only accessible to permit holders.

Foremark Reservoir

Foremark Reservoir is also accessible by car and there are some paths suitable for wheelchairs and pushchairs. There are walking routes to the west and south of the reservoir with links to Staunton Harold Reservoir. Burton Sailing Club operates from the reservoir. Foremark Reservoir has a trout fishery that Severn Trent Water lease.

4.7 Dove Reservoirs – Abstraction

Water levels in the Dove reservoirs must be considered in the context of each of the Dove River, Foremark, Staunton Harold and the Staunton Harold/Foremark combined abstraction licences. The operation of the Dove River abstraction for the 2018-2019 financial year, which necessitated application for a DP, is shown in (Figure 4-2). Average daily abstraction as of 07/03/2019 (the day prior to DP implementation) was calculated as 174.9 Ml/day (below the licenced daily average of 235.6 Ml/day) with an average annual (2007-2019) distribution to Foremark and Staunton Harold reservoirs of 64% and 36% respectively. Based upon maximum pumping capacity for the remainder of the 2018/19 financial year (238 Ml/day, assuming all pumps at the Dove River abstraction were operational), the Dove River abstraction licence was not forecast to breach the maximum licensed annual abstraction. Although the licence authorises abstraction direct to the WTW for public water supply, this purpose is not used, and the raw water is always transferred to the reservoirs.

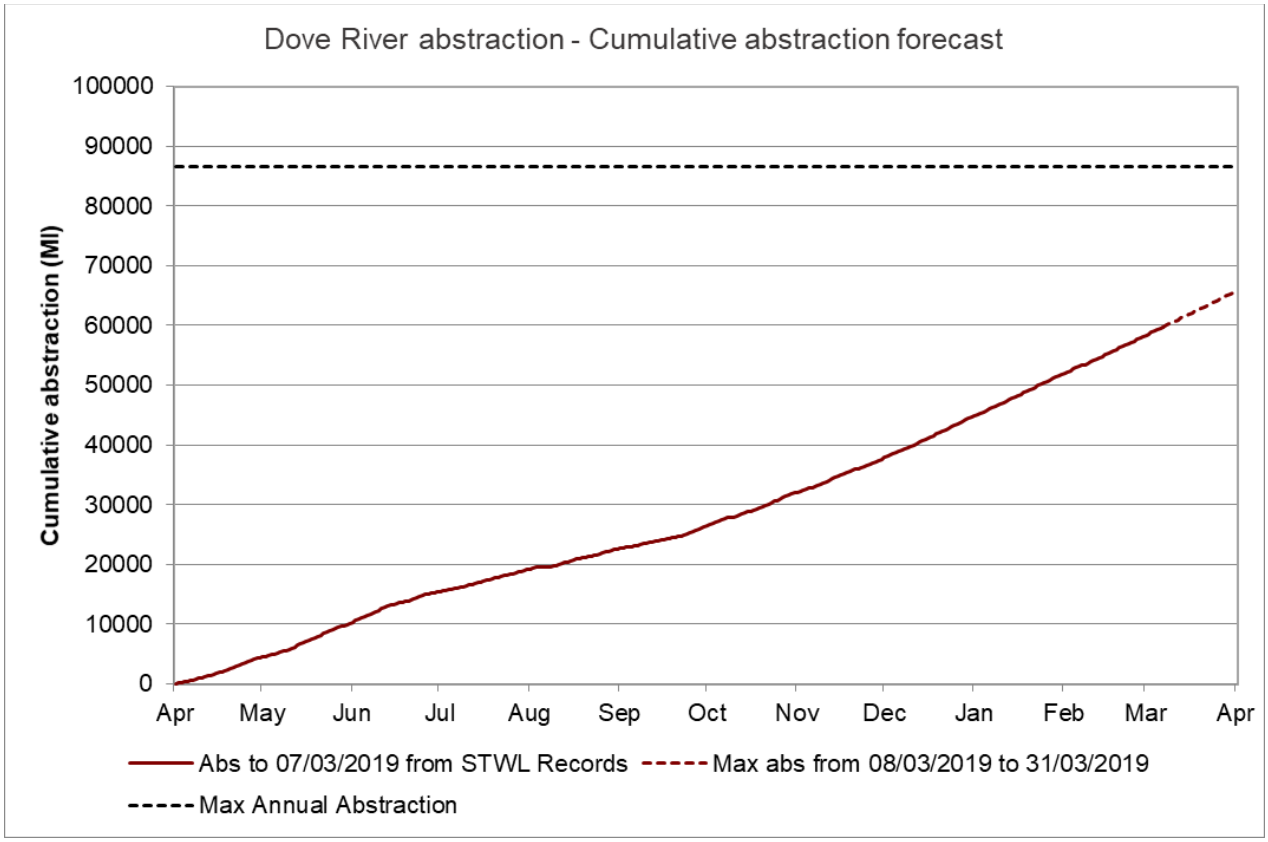


Figure 4-2 Dove River abstraction (2018-2019 financial year)

Both Foremark (Figure 4-3) and Staunton Harold (Figure 4-4) reservoirs were within their annual abstraction licence limits as of 7th March 2019. Cumulative annual abstraction from Foremark in the 2018/19 financial year was marginally higher compared to previous years from April to June, with an increase in abstraction rate from June 2018 onwards. Abstraction from Staunton Harold during the same period was comparable to that undertaken in 2014-2015 and 2016-2017, though the rate of abstraction decreased markedly in December 2018 when reservoir storage was low.

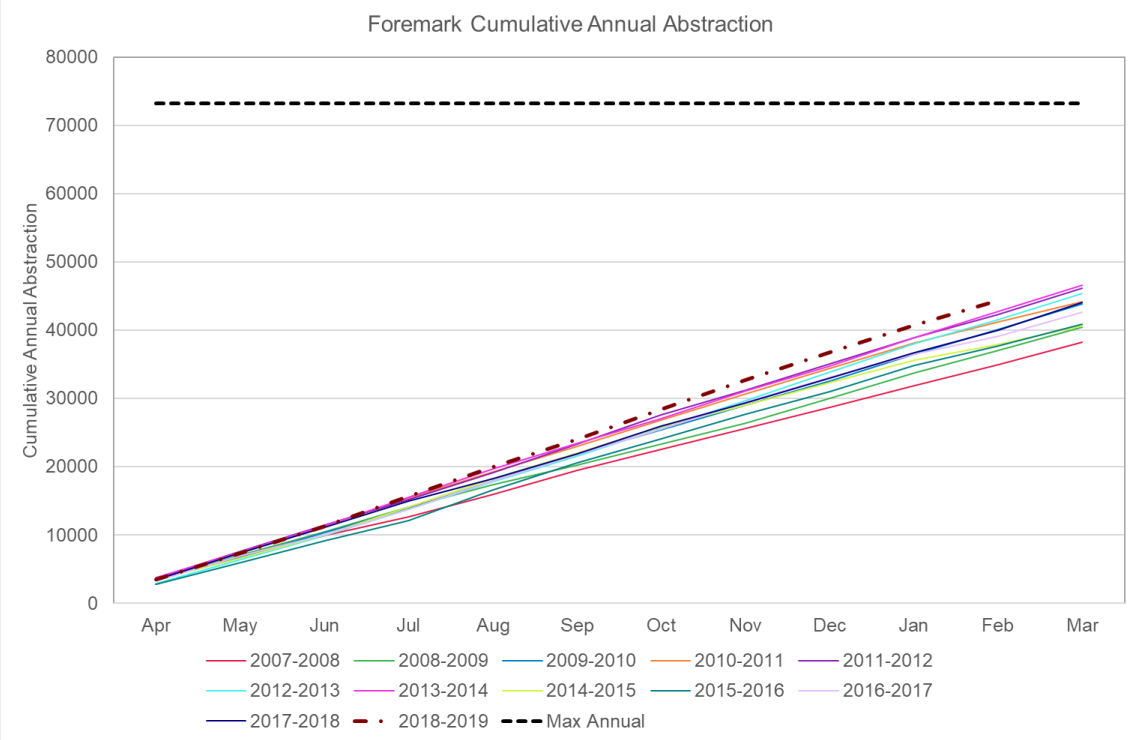


Figure 4-3 Foremark reservoir abstraction (2007 - 2019). Data for March 2019 excluded due to increased rate of abstraction under DP implementation

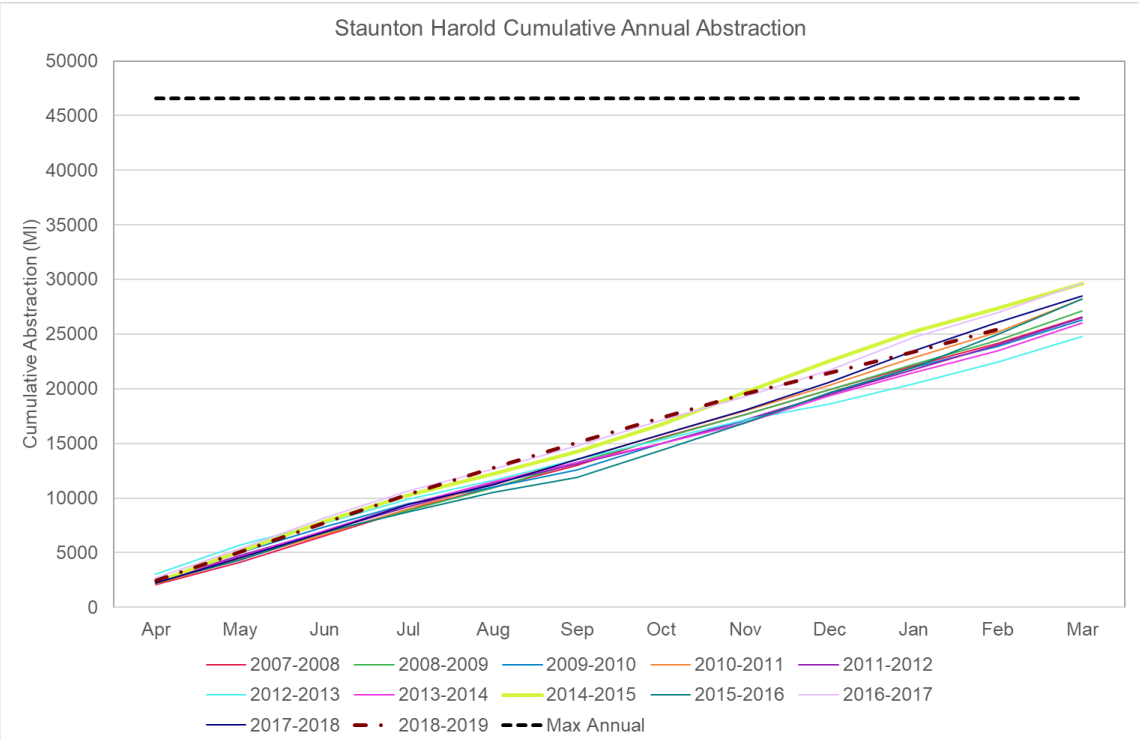


Figure 4-4 Staunton Harold reservoir abstraction (2007-2019). Data for March 2019 excluded due to increased rate of abstraction under DP implementation

Although the Dove River abstraction and the reservoir abstractions were well within their respective abstraction licence limits prior to DP implementation, the cumulative abstraction limit to the local WTW as specified within the Foremark Licence of 73200 Ml/year was at risk of being reached prior to the end of March 2019 (Figure 4-5). Cumulative annual abstraction rates in 2018-2019 between April to December were comparably higher than those recorded historically.

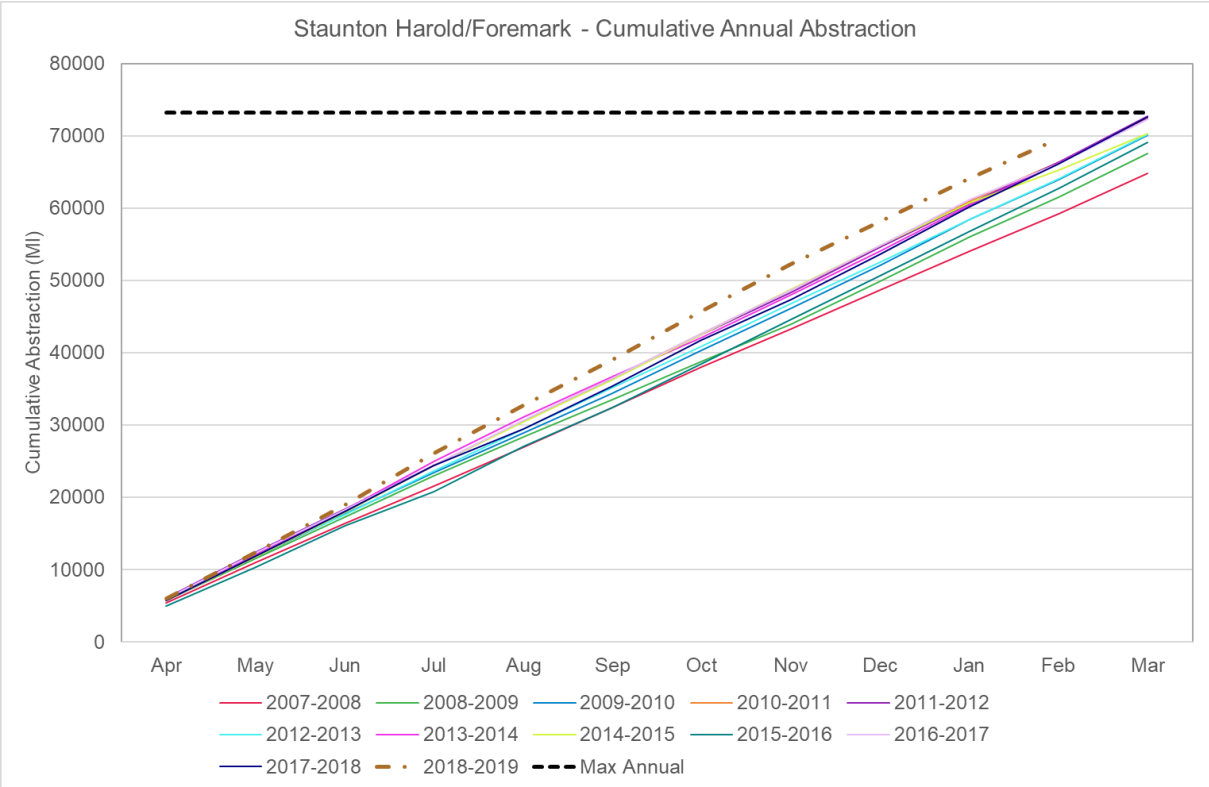


Figure 4-5 Cumulative abstraction to the local WTW (2007-2019). Data for March 2019 excluded due to increased rate of abstraction under DP implementation.

4.8 Dove Reservoirs - Water Levels

Historical annual variation of water levels in Foremark and Staunton Harold reservoirs is shown in Figure 4-6 and Figure 4-7. Baseline refill to 7th March 2019 in Foremark Reservoir was within the range of historical variation for the time of year (2007-2018) and is typical of refill following high drawdown in the preceding autumn (e.g. 2014-2015 and 2016-2017). Water levels in Staunton Harold reservoir in January to February 2019 were significantly lower than in January to February in previous recent years as a result of extended drawdown following prolonged dry weather in summer 2018 followed by the unusually dry autumn/winter in 2018/19. During December 2018 the reservoir was drawn down to a level approximately two metres lower than previously recorded in 2011. Levels in early March 2019 had recovered to a level similar to other lowest recorded years.

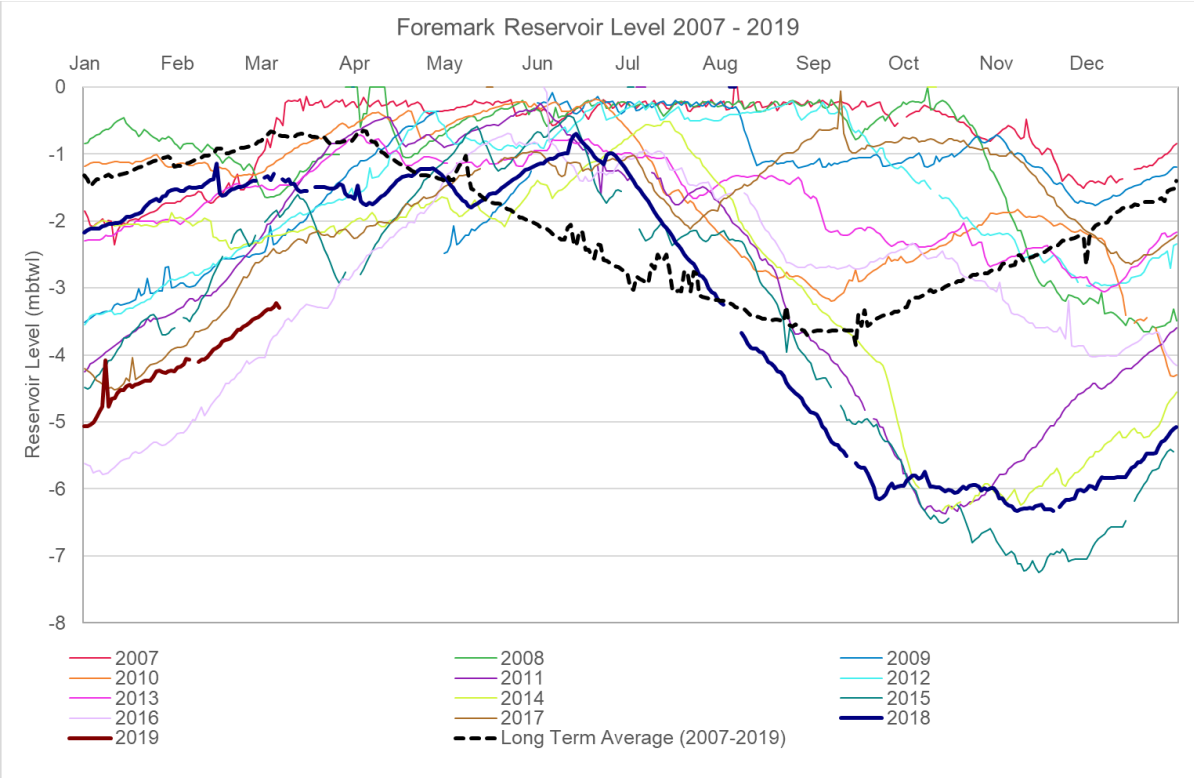


Figure 4-6 Foremark Reservoir water levels (2007 to March 2019)

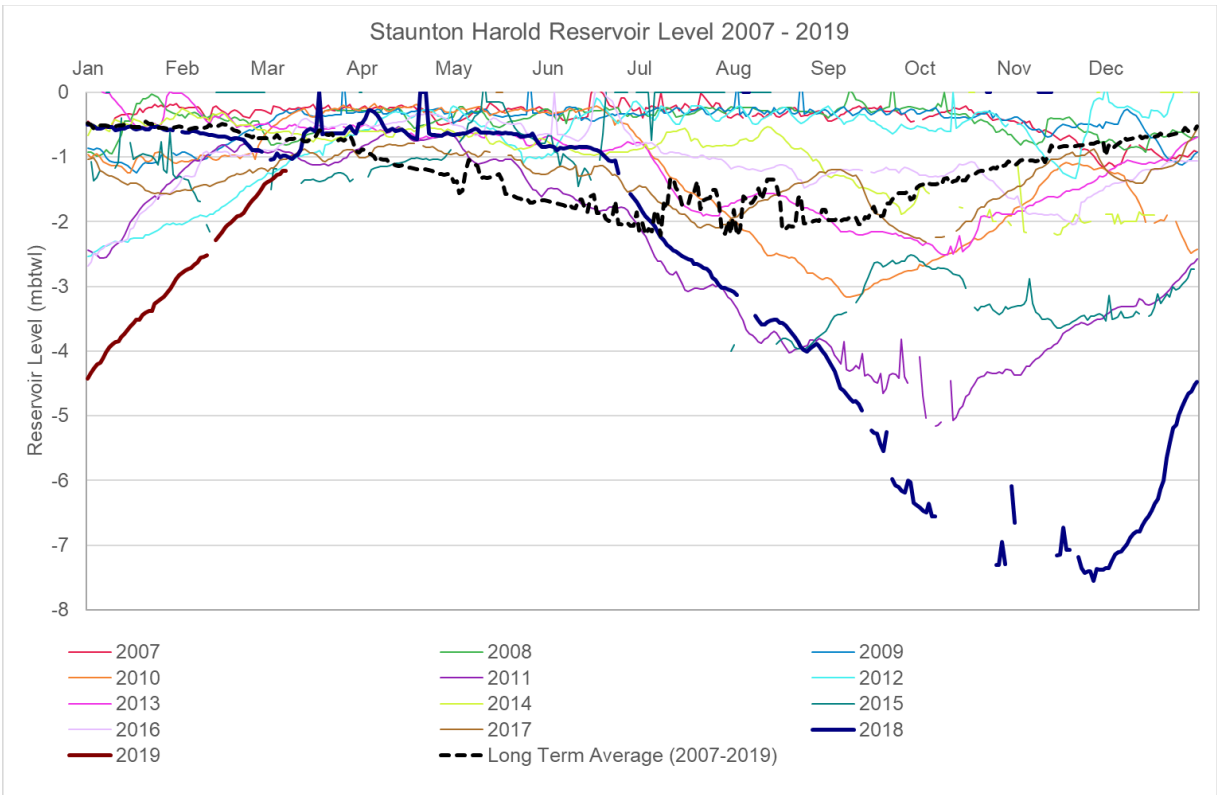


Figure 4-7 Staunton Harold Reservoir water levels (2007 to March 2019)

4.9 Dove Reservoirs - Shoreline exposure

Survey drawings showing the bathymetric profile of both reservoirs (derived from surveys undertaken by a third party in 2016) were provided by STWL and used to assess shoreline exposure under baseline conditions. The bathymetry of each reservoir was presented as elevation contours in (non-georeferenced) PDF format. To enable analysis of these datasets, the drawings were converted into TIF raster format, then loaded into ArcGIS and georeferenced against Ordnance Survey (OS) background mapping. Once the drawings were georeferenced, the contour lines were digitised as vector-based polylines, with the elevation data from the drawing attributed to each polyline feature. Upon completion of the digitisation, the polylines were imported into Surfer gridding software and analysed to generate a bathymetric grid of each reservoir. The resultant grids are presented in Figure 4-8.

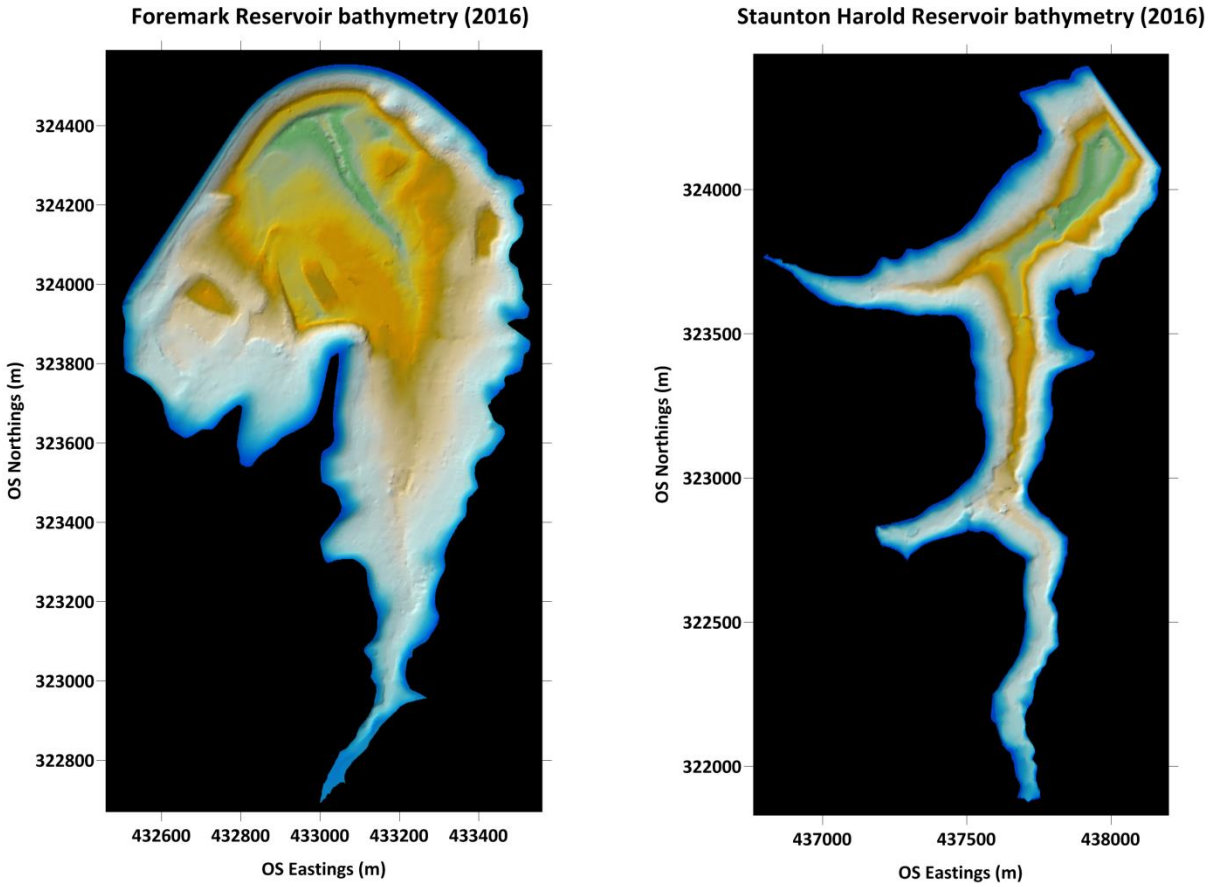


Figure 4-8 Bathymetric grids generated from survey drawings

The modelled data were generated at a resolution of 1 m^2 in grid format. The gridded data were used to generate a 2D contour model representative of the original bathymetric survey. From the grid data, it was possible to derive volumetric calculations for each reservoir based on the highest elevation contour digitised. From this the relationship between water level and volume in each reservoir was calculated.

4.9.1 Baseline – Foremark

Variation in shoreline exposure for the period 8th March to 31st March in the historical (2007-2018) series is shown in Figure 4-9.

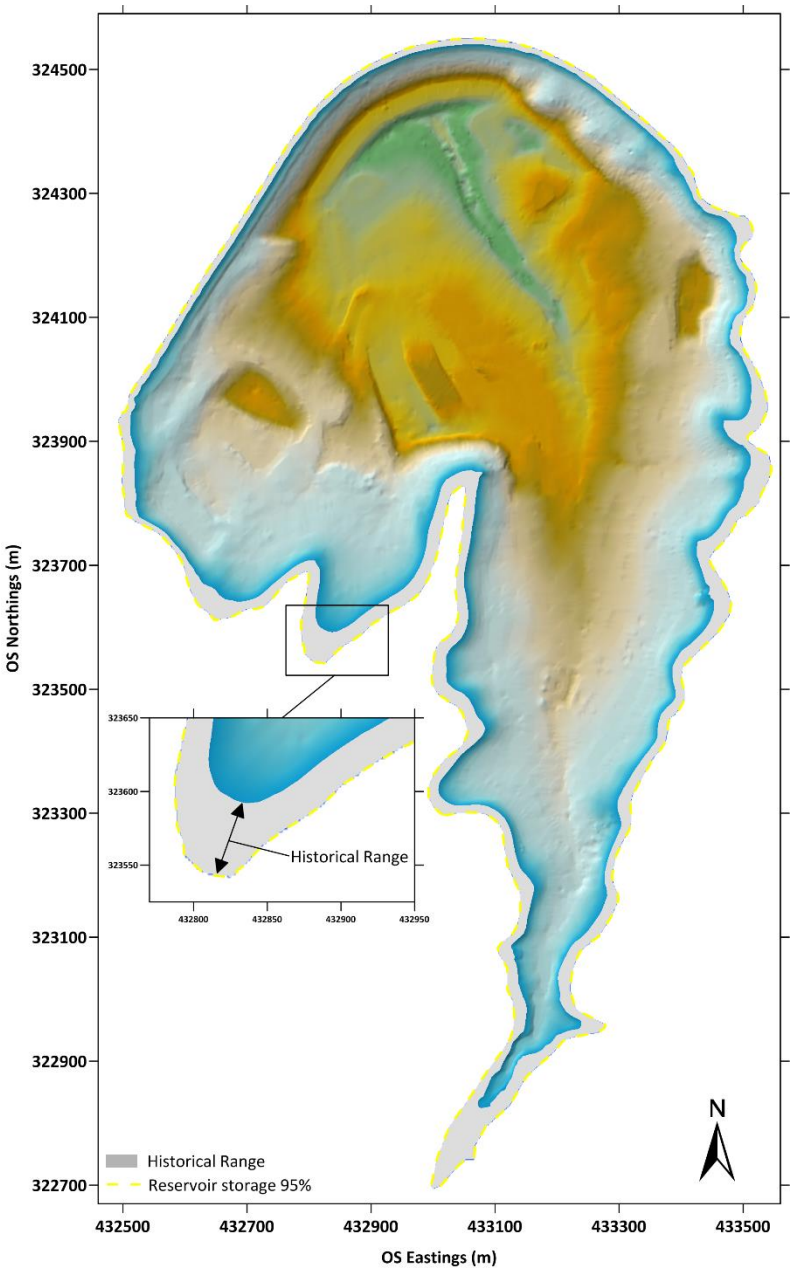


Figure 4-9 Foremark Reservoir shoreline exposure – historical range (08/03– 31/03 2007-2018)

4.9.2 Baseline – Staunton Harold

Variation in shoreline exposure for the period 8th March to 31st March in the historical (2007-2018) series is shown in Figure 4-10.

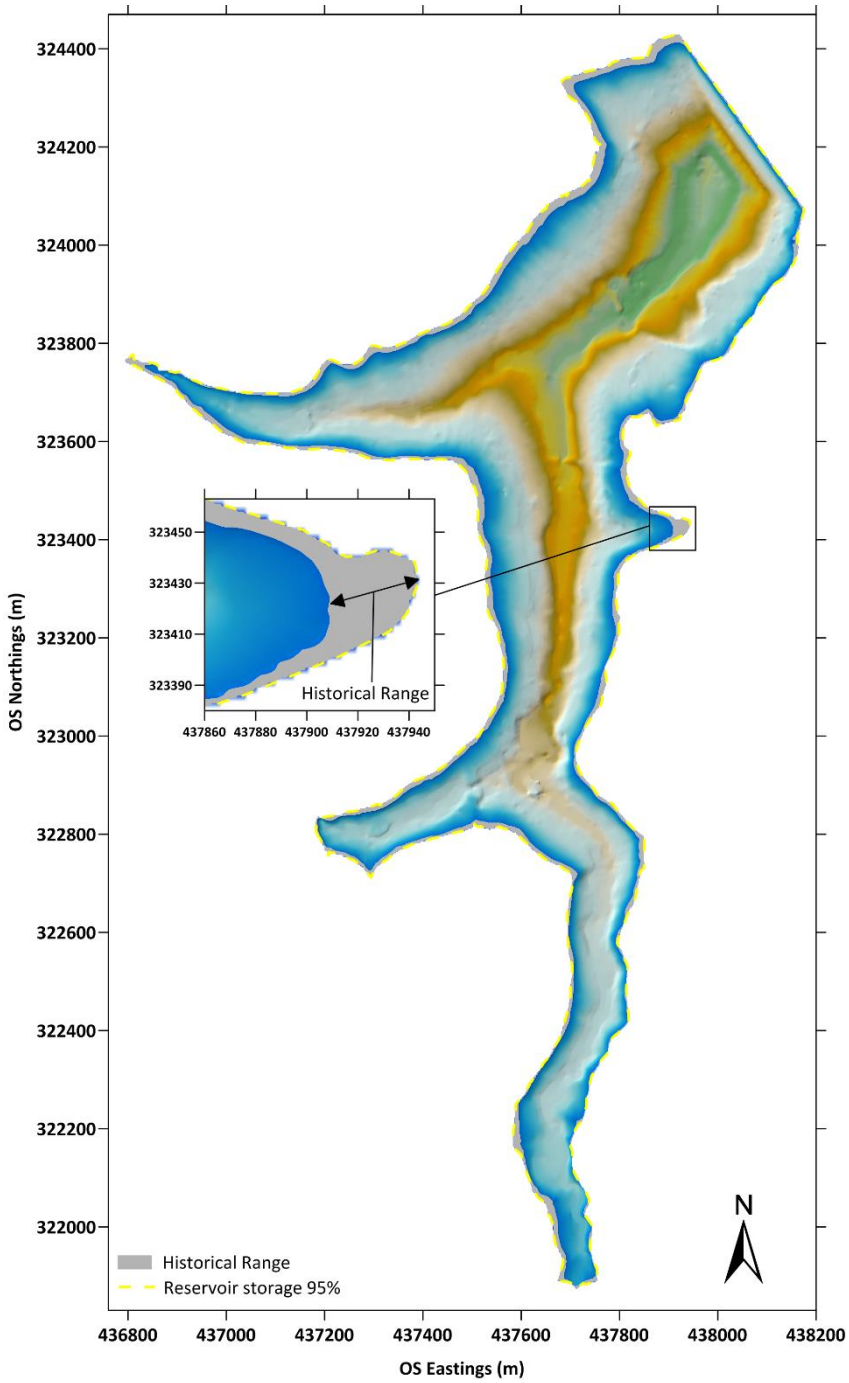


Figure 4-10 Staunton Harold Reservoir shoreline exposure – historical range (08/03 – 31/03 2007-2018)

5 Impact Assessment

5.1 Projected abstraction under DP scenario

Under the DP scenario, it is not proposed to vary the individual annual abstraction limits of either of the Dove River, Foremark or Staunton Harold licences. Based upon historical combined flow data from Rolleston and Marston-on-Dove gauging stations in 2018, river flows were sufficiently high to have permitted maximum abstraction from the River Dove without reaching the 159 Ml/day HoF between January and March. Prior to any future application of the proposed DP antecedent river flow conditions would be checked to confirm that this would also be expected to be the case between January and March during the year of application. Furthermore, in the event that a DP were to be implemented, STWL has committed to undertake no increased pumping from the Dove River abstraction under the 90 Ml/day HoF condition until after reservoir storage has returned above the long-term average. The Dove river abstraction licence would be varied to reflect this. As such, the proposed DP will have no impact on the River Dove compared to baseline conditions.

Conditions in late 2018 and early 2019 are considered representative of a situation under which a DP application might be needed in future. Prior to implementation of the DP in 2019, abstraction rates were around 220 Ml/day (above the average remaining abstraction rate of 88 Ml/day that would have been needed in order to remain within the 73200 Ml annual abstraction limit by financial year end - 31st March 2019). Had abstraction continued at this elevated rate, with maximum abstraction from the River Dove being maintained, the combined annual abstraction limit would have been reached on or around 16th March 2019 (Figure 5-1).

Actual abstraction rates during the March 2019 DP implementation period from both Foremark and Staunton Harold Reservoirs (along with a combined value to the local WTW) are shown in Table 5-1. Although the DP was in place from 8th March 2019, additional abstraction above the annual licence limit under the DP took place from 18th March to 31st March and resulted in a total additional abstraction volume of 3002 Ml above the normal annual licence limit (the normal annual licence limit of 73200 Ml was reached on 18th March 2019) [3].

Table 5-1 Abstraction rates prior to and during Drought Permit implementation in March 2019

Scenario	Average Daily Abstraction (Ml/day)		
	Foremark	Staunton Harold	To Local WTW
Prior to Drought Permit Implementation (01/04/2018 - 07/03/2019)	121	90	209
During Drought Permit Implementation (08/03/2019[4] - 31/03/2019)	127	87	214

If this DP were to be implemented in future, depending on antecedent conditions, the date of implementation could differ slightly from that in 2019, and the total DP abstraction volume could also differ. In its drought

[3] Note data for 09/03 – 10/03/2019 for Foremark reservoir missing. Included as average of 127 Ml/d for these two days.
[4] The DP was implemented as of 08/03/2019, with abstraction rates to the local WTW increasing accordingly. As such the annual licence limit was reached on 18/03/2019.

plan STWL has allowed for implementation during the month of March (but not outside this month) and a total DP abstraction volume of 4000 Ml.

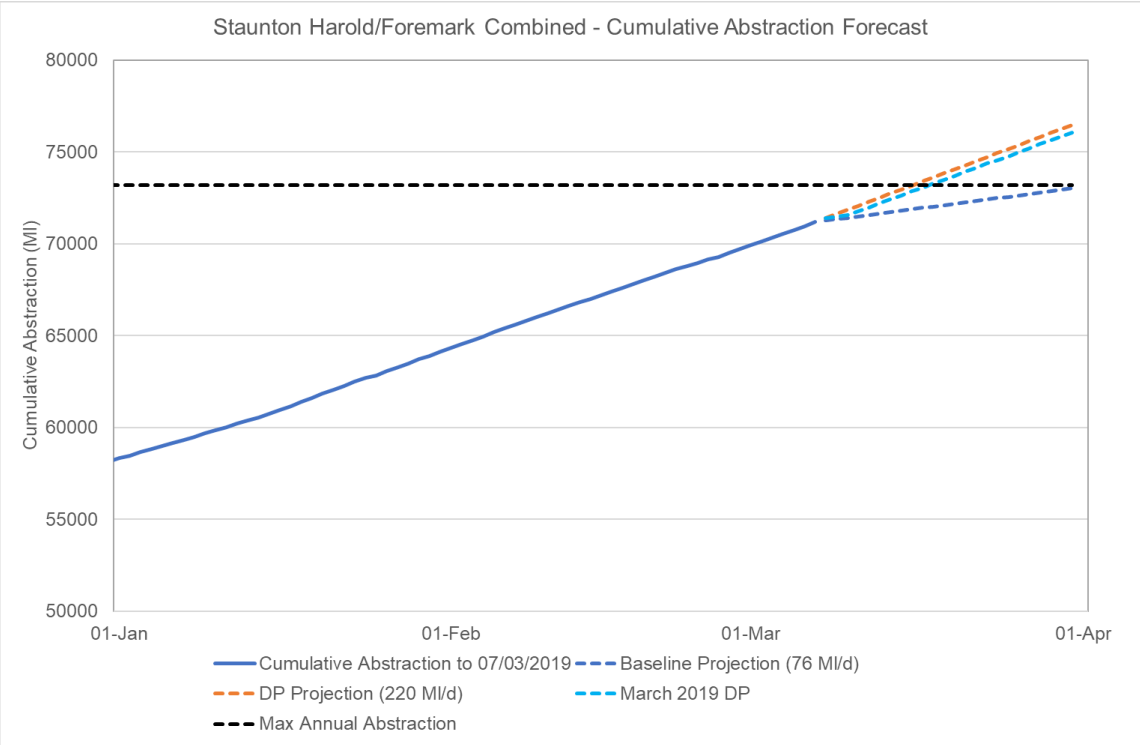


Figure 5-1 Cumulative abstraction to the local WTW forecast under baseline and DP conditions

5.2 Pathways Assessment

5.2.1 Reservoir levels

Projected reservoir storage under baseline abstraction rates were determined using the following equation:

$$S_x = S_{x-1} + Q_{Dmax} + Q_{in} - Q_{comp} - Q_{WTW}$$

Where:

S_x is reservoir storage on a given day (Ml);

S_{x-1} is reservoir storage on the preceding day (Ml);

Q_{Dmax} is inflows from the Dove River abstraction at maximum abstraction rate (Ml/day);

Q_{in} is average inflows from natural catchment (Stanton Harold only, Ml/day)

Q_{comp} is outflows due to statutory compensation flow requirements (Ml/day); and

Q_{WTW} is abstracted flows to the local WTW (Ml/day).

Proportional inflows from the Dove River abstraction to each reservoir were based on average pumping rates during 2018-2019. Proportional abstractions to the local WTW from each of Foremark and Staunton Harold reservoirs under baseline conditions were averaged based upon measured abstraction rates between 1st April 2018 and 7th March 2019. The DP scenario was based upon measured data from the 2019 DP implementation (8th March to 31st March 2019). Values assumed for each flow term of the above equation are presented in Table 5-2.

Table 5-2 Inflow and outflow parameters used in calculation of reservoir storage

Scenario	Foremark			Staunton Harold			
	Q_{Dmax}	Q_{comp}	Q_{WTW}	Q_{Dmax}	Q_{in}[5]	Q_{comp}	Q_{WTW}
Baseline	145	0.41	48	93	25-34	1.7	28
Drought Permit	145	0.41	125	93	25-34	1.7	95

Equivalent reservoir level (in metres below top water level) was then calculated based upon stage/storage relationships provided by STWL. Results for Foremark and Staunton Harold reservoirs are shown in Figure 5-2 and Figure 5-3, with data presented up to and including 17th September 2019.

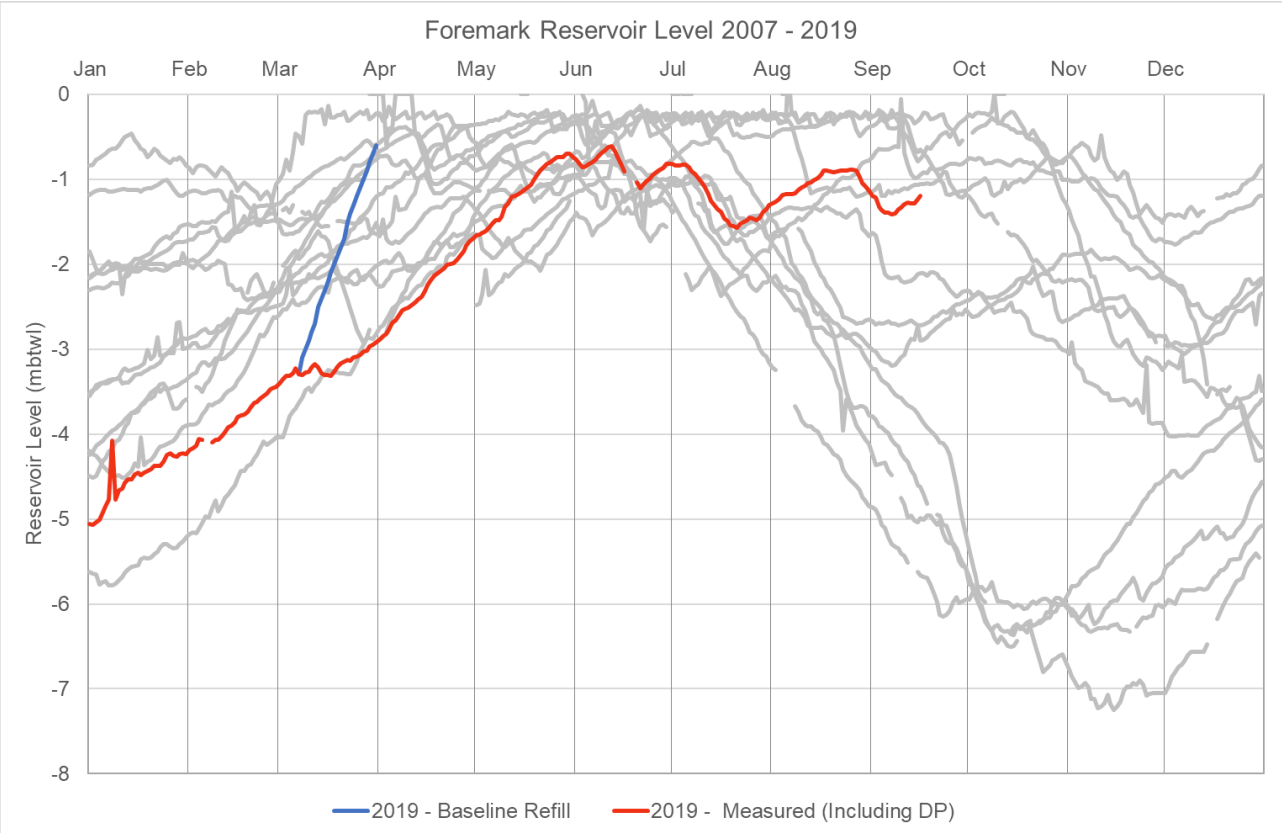


Figure 5-2 Foremark Reservoir 2019 projected baseline refill and measured refill (including March 2019 DP). Historical reservoir levels shown in grey for context.

Under operational conditions, refill to zero metres below top water level would not occur due to the reservoir's operation as a pumped storage reservoir; refill has been predicted to 95% full, in line with normal operation. Under the baseline scenario, maximum abstraction rates from the Dove River abstraction to Foremark reservoir of 145 Ml/day, and a daily average abstraction of 48 Ml/day to the local WTW, refill of the reservoir to 95% full was predicted to occur by 31st March 2019. Under the DP scenario, water levels during

[5] Monthly average inflows from Hysim. January 34 Ml/day, February 30 Ml/day, March 25 Ml/day.

refill were predominantly within or close to the range of historical variation (and well above minimum recorded water levels throughout the historical record). Although the reservoir did not refill to 95%, recorded water levels were within three metres (2.92m) of top water level on 31st March 2019 (equating to approximately 80% full and approximately 10,700Ml). Beyond the DP implementation period, reservoir levels continued to be within the range of historical variation and reached 95% full on 10th June 2019.

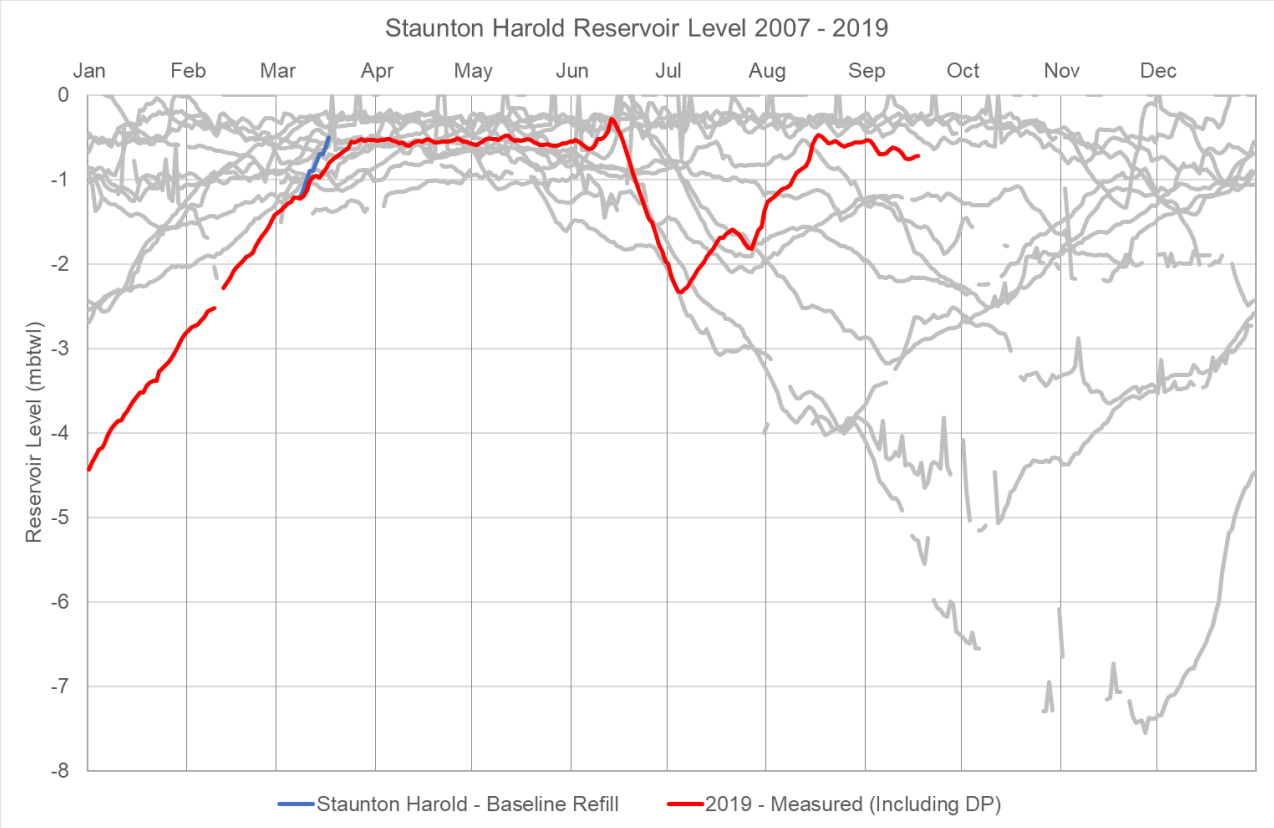


Figure 5-3 Staunton Harold Reservoir 2019 projected baseline refill and measured refill (including March 2019 DP). Historical reservoir levels shown in grey for context.

Under the baseline scenario, maximum abstraction rates from the Dove river abstraction to Staunton Harold reservoir of 93 Ml/day, and a daily average abstraction of 28 Ml/day to the local WTW, refill of the reservoir to 95% full was predicted to on or around 17th March 2019. Again, refill to zero metres below top water level would not occur due to the reservoir's operation as a pumped storage reservoir, and to minimise downstream flood risk. The rate of refill under baseline conditions was predicted to be slightly faster than the recent range of historical variation. Under DP operation (from 8th to 31st March 2019), water levels were just below the range of recent historical variation until 12th March 2019, and within the range of historical variation beyond this date. Beyond the period of DP implementation, reservoir levels continued to be within the range of historical variation.

5.2.2 Shoreline exposure – Foremark

Shoreline exposure for Foremark Reservoir under baseline and DP abstraction conditions for the period 8h March 2019 to 31st March 2019 is shown in Figure 5-4. Variation in shoreline exposure for the same period in the historical (2007-2018) dataset is also shown. Under baseline abstraction conditions, shoreline exposure was forecast to vary from -3.1 mbtwl to -0.5 mbtwl i.e. within the range of historical variation. Shoreline exposure under the DP was within or close to the range of historical variation and varied between -3.1 mbtwl and -2.9 mbtwl on 8th March 2019 and 31st March 2019 respectively.

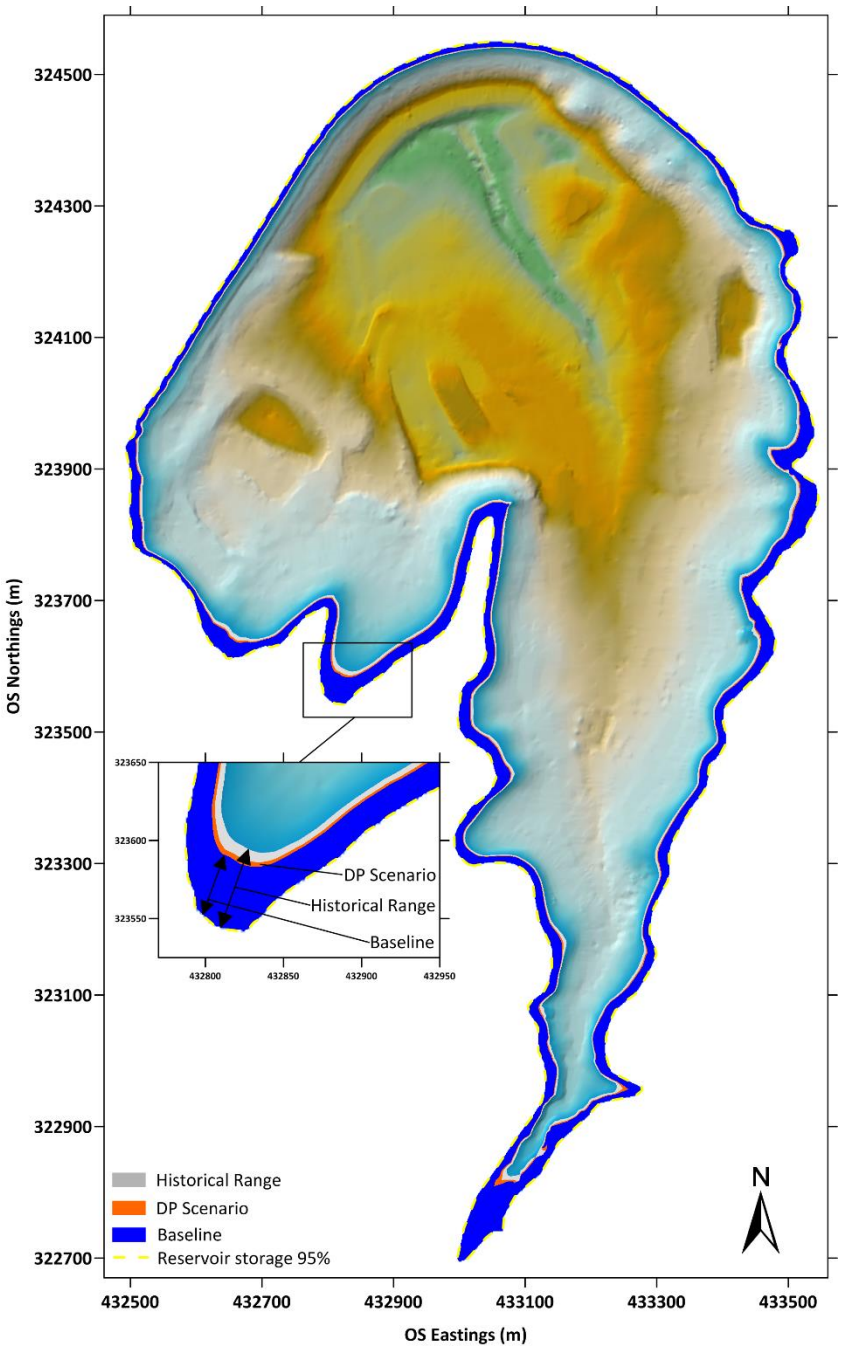


Figure 5-4 Foremark Reservoir shoreline exposure – baseline and DP (08/03/2019 – 31/03/2019)

5.2.3 Shoreline exposure – Staunton Harold

Shoreline exposure for Staunton Harold Reservoir under baseline abstraction conditions for the period 8th March 2019 to 31st March 2019 is shown in Figure 5-5. Variation in shoreline exposure for the same period in the historical (2007-2018) dataset is also shown. Under baseline abstraction conditions, shoreline exposure was forecast to be within the range of historical variation, with the reservoir predicted to refill prior to 17th March 2019. Shoreline exposure under the DP was predominantly within the range of historical variation (as of 12th March 2019) and varied between -1.2 mbtwl and -0.5 mbtwl on 8th March 2019 and 31st March 2019 respectively.

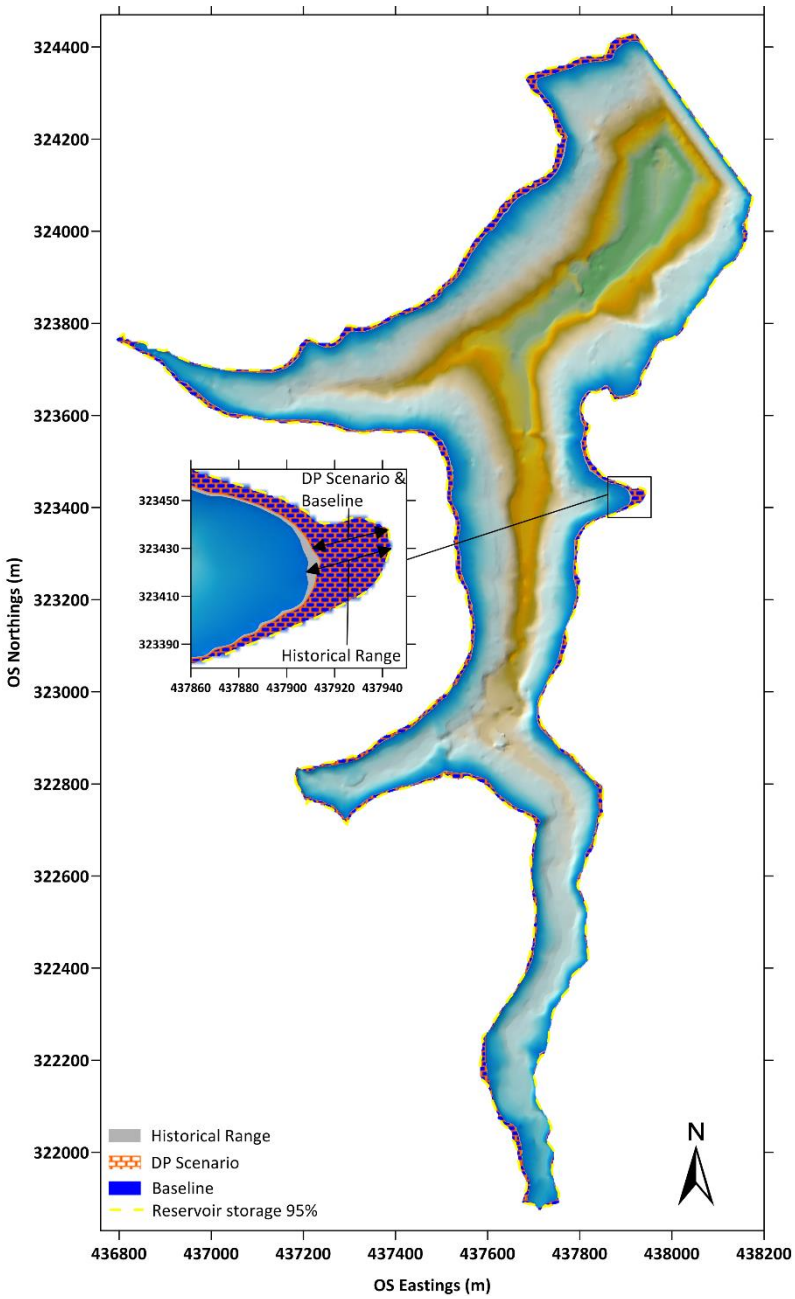


Figure 5-5 Staunton Harold Reservoir shoreline exposure – baseline and DP (08/03/2019 – 31/03/2019). Shoreline exposure under the DP closely mirrors that in the baseline scenario range and is shown hatched for clarity.

5.2.4 Summary

Because the proposed DP is to abstract a maximum of 220 Ml/day from Foremark and Staunton Harold whilst transferring 238 Ml/day into the reservoirs from the Dove River abstraction, reservoir levels are not predicted to drop in comparison with the baseline position during March, levels will just not be as high at the end of March as they would have been under the baseline scenario.

Predicted changes in water level and shoreline exposure during DP implementation in mid- to late- March are predicted to be within (or close to) the range of recent historical variation. Based on this assessment, the duration of effect is short and there is no change in the spatial extent of the effect in comparison with the

baseline, therefore there is no change in the scale, strength or magnitude of effect in comparison with the baseline.

5.3 Receptors Assessment

5.3.1 Water Framework Directive status

There is no particular seasonal sensitivity of WFD status to the predicted water level changes in March. The proposed DP is short in duration and measured water levels during the March 2019 DP implementation were largely within the range of historical operational variation, to which the biological quality elements associated with the reservoirs are well adapted. Effects of any future DP implementation would be expected to be of a similar nature. Hence no impact of the DP on WFD status is predicted in comparison with normal operation.

5.3.2 Designated Sites

The identified sites and their associated heritage and culture value are not considered sensitive to water level changes and the maximum receptor value identified is National.

As the predicted changes in water levels associated with the DP are within or close to the range of normal operational variation in mid to late March it is not expected that the designated sites identified within the study area will be negatively impacted by the DP.

5.3.3 Protected Species

The identified species are considered to have low sensitivity to water level changes and the maximum receptor value identified is International.

Staunton Harold Reservoir

There are records of two species of bird which are Near Threatened on the International Union for Conservation of Nature (ICUN) list recorded at Staunton Harold Reservoir; the Northern Lapwing/Green Plover (*Vanellus vanellus*) recorded between 2001 and 2005 and the Curlew (*Numenius arquata*) recorded between 2001 and 2004. Both are wading birds and are unlikely to be affected by the predicted changes in water levels associated with the DP as they will continue feed along the water's edge, the DP implementation period is outside the main breeding season, and predicted water level variations are within the range of normal operation. Lapwing and Curlew should continue to be occasional visitors to Staunton Harold Reservoir with more suitable habitat present in the nearby upland Peak District reservoirs.

White-clawed crayfish (*Austropotamobius pallipes*) have been historically recorded in the reservoir between 1979 and 1997, and in the inlet to the reservoir between 2002 and 2014 (Environment Agency, pers. comm.). White-clawed crayfish refuges are usually submerged so may become exposed as a result of a reduction in water level, however the predicted change in water level associated with the DP is within or close to the range of normal variation in mid to late March, so the impact on any remaining populations of white-clawed crayfish as a result of DP operation is expected to be negligible.

Foremark Reservoir

One species of butterfly has been recorded; the White-Letter Hairstreak (*Satyrium w-album*) which is Endangered on the Red List, but was only recorded in 1979. This species is found near or on elm trees, so it is very unlikely to be affected by changes in reservoir water levels. As the predicted water level changes under the DP are within or close to the range of normal operational variation, no impacts of the DP on this species are predicted.

5.3.4 Water Level Sensitive Species

The identified species in Foremark Reservoir are considered potentially sensitive to water level changes and the maximum receptor value identified is National. The identified species in Staunton Harold Reservoir are considered unlikely to be affected by water level changes and the maximum receptor value identified is Regional/County. As the measured water level changes under the DP in 2019 were largely within the range of normal operational variation, and effects of any future DP implementation would be expected to be of a similar nature, no impacts of the DP on these species are predicted.

5.3.5 Invasive Non-Native Species

Establishment and transfer of INNS is potentially sensitive to water level changes and the maximum receptor value identified is National.

Staunton Harold Reservoir

There have been two High Impact INNS recorded at Staunton Harold Reservoir; the zebra mussel (*Dreissena polymorpha)* in 2011 and Nuttall's Water-Weed (*Elodea nuttallii*) in 2012. As the measured change in water level associated with the 2019 DP was largely within the range of normal operational variation, and effects of any future DP implementation would be expected to be of a similar nature, no impacts of the DP on risk of transfer of these INNS are predicted.

Foremark Reservoir

There were no INNS recorded at Foremark Reservoir and measured changes in water level under the 2019 DP were largely within the range of normal variation. As the effects of any future DP implementation would be expected to be of a similar nature, no impacts of the DP on risk of transfer are predicted.

5.3.6 Site Character and Recreational Users

Recreational users of both reservoirs (and their associated heritage and culture value) are potentially sensitive to water level changes and the maximum receptor value identified is Regional/County.

Predicted reservoir water levels during the 2019 DP were largely within the historical operational variation, and effects of any future DP implementation would be expected to be of a similar nature. Therefore, no impact on site character or recreational users is predicted as a consequence of the proposed DP, in comparison with baseline operation.

6 Summary

This report used measured reservoir level data to predict hydrological impacts under the baseline and proposed DP. The results of the hydrological analyses have been used to assess baseline data and predict potential impacts for the following pathways and receptors:

- Reservoir levels and shoreline exposure;
- Water Framework Directive status;
- Designated sites;
- Protected species;
- Water level sensitive species;
- Invasive non-native species;
- Site character; and
- Recreational users.

The pre-mitigation predicted impacts are summarised in Table 6-1.

For all receptors under the proposed DP, negligible impacts were predicted in comparison with the baseline. A DP at Staunton Harold and Foremark reservoirs is required only for a very short period (less than one month during March) and is likely to be implemented very infrequently.

Table 6-1 Summary of pre-mitigation predicted impacts for the proposed Drought Permit. Grey shaded cells indicate months that are outside the proposed Drought Permit

Month	J	F	M	A	M	J	J	A	S	O	N	D
Staunton Harold and Foremark Reservoirs												
Reservoir water level			N									
Reservoir shoreline exposure			N									
Water Framework Directive			N									
Designated sites			N									
Protected species			N									
Water level sensitive species			N									
Invasive non-native species			N									
Site character			N									
Recreational users			N									

Key to Environmental Effects:

NC	No change compared to baseline
N	Negligible impacts
	Minor negative impacts
	Moderate negative impacts
	Major negative impacts
	Potential beneficial impacts
	Not applicable

7 Mitigation measures

Where significant negative impacts (defined for this report as those of moderate significance or greater) are identified during the environmental assessment process, there is a need to identify appropriate mitigation measures in order to avoid, reduce or remedy any impacts. Such measures may be identified either to be implemented in advance or implemented during implementation of the proposed DP.

In this case, no significant negative impacts have been identified as a consequence of the proposed DP; its effects are predicted to result in almost no change for all pathways and receptors in comparison with the baseline.

As part of its normal operation, STWL has committed to maximise pumping into the reservoirs while flows in the River Dove allow, to bring them back to normal storage levels.

In the unlikely event that the DP caused reservoir storage to drop below Curve A (Figure 2-1), STWL would not utilise the Dove river abstraction under the lower residual flow of 90 Ml/day while the DP was in place, nor until the combined storage in the reservoirs had returned above the long term average based on a 10 year dataset. The Dove river abstraction licence would be varied to reflect this.

8 Environmental monitoring plan

The environmental assessment indicates that the proposed DP presents a low risk to the environment (reservoir levels largely within the range of historical variation, minimal change in shoreline exposure and hence impact on associated receptors is predicted in comparison with baseline operation). Therefore, in line with the requirements of the Environment Agency's Environmental assessment for water company drought planning supplementary guidance (EA, 2020b), only routine monitoring (monitoring that would normally be undertaken as part of STWL's normal operations) will be carried out, to confirm that any effects are as predicted. Details are presented in Table 8-1.

Table 8-1 Staunton Harold and Foremark Reservoirs Drought Permit Environmental Monitoring Plan

Parameter	Site/Location	By Whom	Brief Scope	Baseline Timing/ Frequency	During DP Timing/ Frequency	Post Drought Permit Timing/ Frequency
Abstraction	Staunton Harold	STWL	Abstraction volume	Daily	Daily	Daily
Abstraction	Foremark	STWL	Abstraction volume	Daily	Daily	Daily
Abstraction	River Dove	STWL	Abstraction volume	Daily	Daily	Daily
Water Level	Staunton Harold	STWL	Reservoir water level	Daily	Daily	Daily
Water Level	Foremark	STWL	Reservoir water level	Daily	Daily	Daily

9 Conclusions and recommendations

The proposed DP is predicted to have negligible impacts on all receptors in comparison with the baseline scenario.

The pre-mitigation potential impacts are summarised as follows:

Table 9-1 Summary of potential impacts pre-mitigation

Scenario	Impact Significance	Receptors
Proposed DP	Negligible impacts	All receptors associated with Staunton Harold and Foremark Reservoirs

In this case, no significant negative impacts have been identified as a consequence of the proposed DP.

Nevertheless, as part of its normal operations, STWL has committed to maximise pumping into the reservoirs while conditions in the river allow. In the unlikely event that the DP caused reservoir storage to drop below Curve A, STWL has also committed not to utilise the Dove river abstraction under the lower residual flow of 90 Ml/day while the DP was in place, nor until the combined storage in the reservoirs had returned above the long term average based on a 10 year dataset. The abstraction licence would be varied to reflect this (Section 7).

Routine operational monitoring will continue to be undertaken and will allow the effects of the proposed DP to be captured (see Section 8).

REFERENCES

CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.

Environment Agency (2019) Drought permits and drought orders. Supplementary guidance from the Environment Agency and Department of Environment, Food and Rural Affairs. May 2019.

Environment Agency (2020a). Water Company Drought Plan Guideline. April 2020

Environment Agency (2020b). Environmental assessment for water company drought planning supplementary guidance. July 2020.

UKTAG (2013) Guidance on the assessment of alien species pressures. Revised March 2013. https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Alien%20species%20guidance%20modified%20from%20Feb%2004%20-%20March%202013.pdf

UK Technical Advisory Group on the Water Framework Directive (2015). Revised classification of aquatic alien species according to their level of impact. Working paper version 7.6 (22/07/2015). https://www.wfduk.org/sites/default/files/Media/Assessing%20the%20status%20of%20the%20water%20environment/UKTAG%20classification%20of%20alien%20species%20working%20paper%20v7.6.pdf