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# Anglian Water Habitat Regulations Assessment: Stage II Appropriate Assessment

River Nene: Rutland Water (Wansford Intake)

27 March 2020

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# Issue and Revision Record

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The preparation of Rev C and Rev D of this report includes the contribution of Atkins, who worked alongside Mott MacDonald to respond to feedback received on Rev B.

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Anglian Water abstract from the River Nene at Wansford. Under drought conditions they may seek a drought permit allowing a temporary 50% reduction in Minimum Residual Flow (MRF) immediately downstream of the Wansford intake on the River Nene. This would allow continued abstraction to recharge Rutland Water. Anglian Water are obliged to conduct a Habitat Regulations Assessment (HRA) to determine the impact of the proposed drought permit on the interest features of European designated sites, i.e. Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites.

The first stage of the HRA process (Stage I Screening Assessment) was included in the Drought Permit Environmental Assessment (Mott MacDonald, 2018a). It was concluded that the proposed drought permit could have a Likely Significant Effect (LSE) on one or more European designated sites. Consequently, a Stage II Appropriate Assessment is required, which is the subject of this report. The objective of an Appropriate Assessment is to determine if implementation of the proposed drought permit would have an adverse effect on the integrity of European designated sites and, if adverse impacts are anticipated, to propose and assess potential mitigation measures to alleviate those impacts.

The potential impacts of the proposed drought permit on hydrology, water chemistry, sediment transport, salinity regime and habitats were considered in this Stage II Appropriate Assessment. Nutrient enrichment was identified as the only significant potential impact of the proposed Wansford intake drought permit on the Nene Washes SAC/SPA/Ramsar site. Interest features of the European designations for the Nene Washes include spined loach and internationally important bird assemblages, both of which are susceptible to the impacts of nutrient enrichment. Eutrophication of the Nene Washes could affect the spined loach population via reduced food availability, habitat loss and low dissolved oxygen concentrations at the sediment-water interface. Bird assemblages may also be impacted by the effects of eutrophication on food availability.

Adverse effects of drought permit implementation on the water quality of the Nene Washes can be mitigated by implementing the following measures:

- Reduce phosphorus input to the River Nene from WRCs and small point sources in the catchment;
- Variable abstraction; and
- Cessation of abstraction during periods of stress.

Consideration should also be given to the management of water levels in the Nene Washes. For example, inflow of water from the River Nene to Morton’s Leam via Stanground Sluice should cease when nutrient levels are high in the river. A monitoring programme has also been devised to ensure that critical thresholds for water quality parameters, especially phosphate, are not exceeded in the designated site.

# 1 Introduction

## 1.1 Background

Anglian Water abstracts from the River Nene at Wansford to fill Rutland Water. Under drought conditions they may seek a drought permit allowing a temporary 50% reduction in Minimum Residual Flow (MRF) immediately downstream of the Wansford intake on the River Nene. This would allow continued abstraction to recharge Rutland Water. The Environment Agency's Water Company Drought Plan Guidance (Environment Agency, 2017) states that a water company must ensure that its plan meets the requirements of the Conservation of Habitats and Species Regulations (UK Government, 2017). Therefore, they must undertake a Habitats Regulations Assessment (HRA) on the effects of the drought permit on European sites, alone or in combination with other plans.

The first stage of the HRA process (Stage I Screening Assessment) was included in the Drought Permit Environmental Assessment (Mott MacDonald, 2018a). It was concluded that the proposed drought permit could have a Likely Significant Effect (LSE) on one or more European designated sites. Consequently, Anglian Water are obliged to conduct a Stage II Appropriate Assessment, which is the subject of this report. The main objective of the Stage II Appropriate Assessment is to determine if implementation of the proposed drought permit would have an adverse effect on the integrity of European designated sites and, if adverse impacts are anticipated, to propose and assess potential mitigation measures to alleviate those impacts.

## 1.2 Habitats Regulations Assessment framework

The requirement for a HRA is established through European Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, hereby referred to as the 'Habitats Directive', in Articles 63 and 64. The Habitats Directive has been transposed into United Kingdom legislation by the Conservation of Habitats and Species Regulations 2017 ('Habitats Regulations') (S.I. 2017/1012) (as amended). Under Regulations 61 and 102, any plan or project, not directly connected with or necessary to the management of a Natura 2000 site, which may give rise to significant effects upon a Natura 2000 site (either alone or in-combination with other plans or projects), must be subject to a HRA to determine the implications for the site in view of its conservation objectives.

Natura 2000 sites include Special Protection Areas (SPAs), Special Areas for Conservation (SACs), candidate SACs and proposed SPAs, as well as Sites of Community Importance (SCIs) which have been adopted by the EC, but not yet formally designated by the government of the Member State. Natura 2000 sites are hereafter referred to as European sites (or European marine site where relevant) in accordance with the Habitat Regulations. In the UK, Ramsar wetlands of international importance are also required to undergo an assessment when a plan or project is considered likely to have a significant effect upon a site (Department for Environment, Food and Rural Affairs (Defra, 2006). It should be noted that herein Ramsar sites are also referred to as European sites.

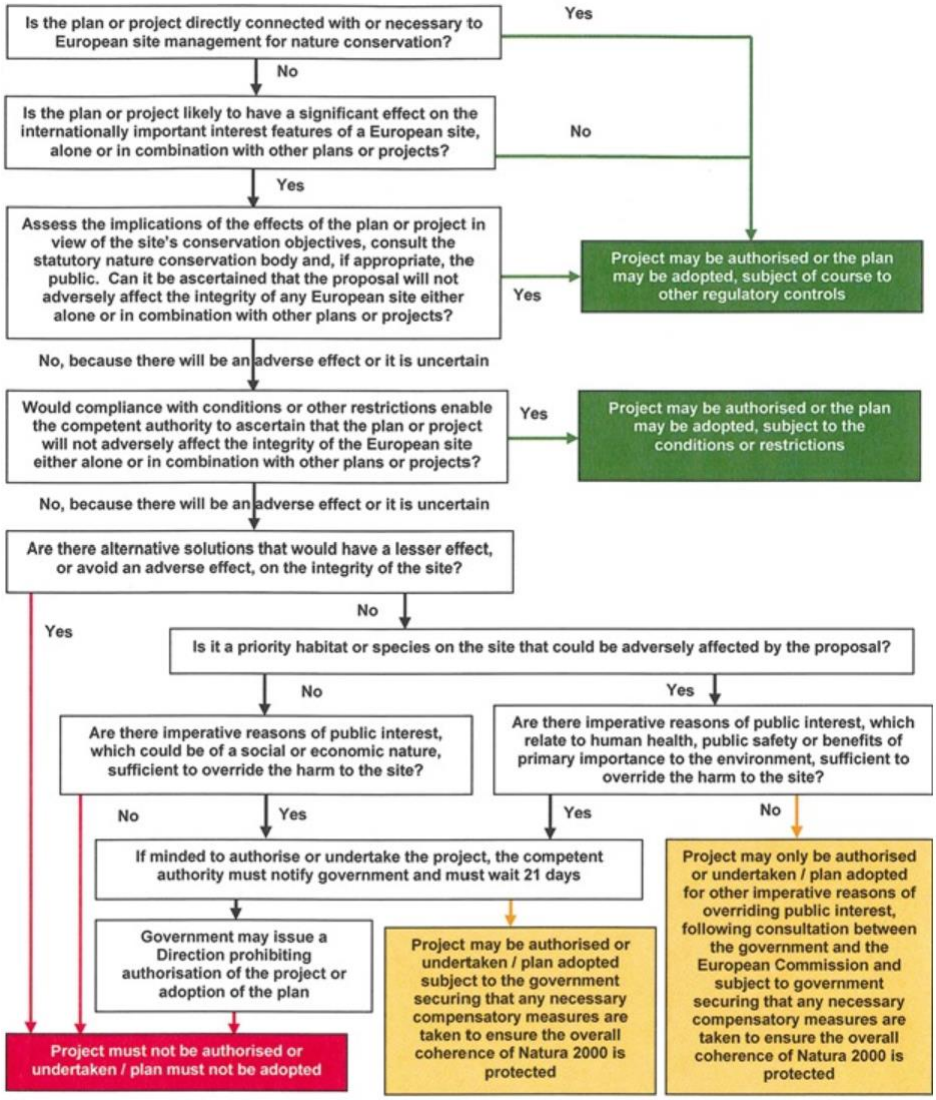
Water companies in England are required to produce a Drought Plan every five years. Specific HRA guidance is provided in the UK Water Industry Research (UKWIR) report *Strategic Environmental Assessment and Habitat Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans* (UKWIR, 2012). The plan-making authority are responsible for conducting the HRA in consultation with the appropriate nature conservation body, otherwise referred to as the competent authority. In this case the plan-making authority

and competent authority are Anglian Water and Natural England, respectively. According to the Habitats Regulations, the plan-making authority shall only be permitted to give effect to the Plan/Project after having ascertained that it will not adversely affect the integrity of a European site subject to Regulation 62 or 102.

The HRA is undertaken in a series of steps, which are usually referred to as ‘stages’ in the case of the assessment of projects and ‘tasks’ in the case of the assessment of plans (DCLG, 2006). However, for continuity with previous HRA reports to Anglian Water, the term ‘stage’ will be used in this document rather than ‘task’, despite it being in support of the 2019 Drought Plan. The series of stages correspond with the steps prescribed by the Habitats Regulations Assessment Handbook.

Each stage determines whether further stages in the process are required. For example, in the first stage by identifying the presence or absence of significant indicators of LSE. If the conclusion of the Stage I assessment is that there will be no significant impacts on the European site(s), there is no requirement to undertake further stages, and so forth. Figure 1 illustrates the full HRA process.

**Figure 1: Assessment process**




## 1.3 Scope of the Stage II Appropriate Assessment

Under Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended) ("Habitat Regulations"), a competent authority must make an appropriate assessment of the implications of the plan or project.

As part of this plan, a Stage I Screening for the Assessment of LSE was undertaken to assess the environmental impacts of the proposed drought permit at the River Nene Wansford intake (Mott MacDonald, 2018a). LSE in this context are any effects that may reasonably be predicted as a consequence of a plan or project, which may affect the conservation objectives of the features for which a site was designated (English Nature, 1994). The Stage I Screening concluded that there is LSE of the plan on a European site, with all the qualifying habitats and features therefore requiring Stage II Appropriate Assessment.

This report details Stage II of the HRA which is required to:

- Consider the impact of the project on the integrity of the Natura 2000 site, either alone or in combination with other projects and plans, with respect to the conservation objectives of the site and its structure and function; and
- Assess potential mitigation strategies where adverse impacts are identified, including setting out a timescale and identifying mechanisms through which the mitigation measures will be secured, implemented and monitored.

Potential impacts may be direct or indirect and are dependent on the relationship between the action (drought permit) and the receptor (the qualifying features of the European site). The significance of an impact is relative to:

- Sensitivity, existing condition and conservation status of the qualifying features of the site; and
- Scale of the impact in space and time.

Potential impacts on the qualifying features of the European site are evaluated with respect to the scale, extent and nature of the impact. For example, the area of habitat affected, changes in hydrodynamics, potential changes in species distribution, and the duration of the impact. The sensitivities of each of the qualifying features are also assessed.

This report will be sent for consultation with the relevant nature conservation authorities and the public. If the competent authority considers that residual adverse effects remain, the next stage of HRA (Stage III Assessment of Alternative Solutions) would be required.

## 1.4 Methodology

This Stage II Appropriate Assessment has been formulated using the following approach:

- Detailed assessment of impacts of the proposed drought permit;
- Assessment of the European site's characteristics and identification of its conservation objectives;
- Identification of the aspects of the proposed drought permit that will significantly impact the conservation objectives of the European site(s);
- Review of relevant environmental data available from the Environment Agency to assess the significance of the threat; and
- Review of all formal and informal consultation responses.

This assessment has been undertaken in accordance with the following guidance:

- EC (2000), *Managing Natura 2000 Sites*. The provisions of Article 6 of the Habitats Directive 92/43/EEC;
- EC (2001), *Assessment of plans and projects significantly affecting Natura 2000 sites.* Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC;
- Environment Agency (2017). *Drought plan guideline extra information. Environmental Assessments for Water Company Drought Plans*;
- Tyldesley & Chapman (2013). *The Habitats Regulations Assessment Handbook;* and
- UK Water Industry Research (2012), *Strategic Environmental Assessment and Habitat Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans*. Provision of specific guidance for conducting drought plan HRAs, aligned with the Water Company Drought Plan Guideline (Environment Agency, 2017).

## 1.5 Structure of the report

The structure of this report follows the recommended guidance for undertaking Appropriate Assessments as follows:

- **Section 2** presents a description of the proposed development and a summary of the HRA Stage I Screening Assessment;
- **Section 3** presents a description of the Nene Washes European designated sites, the qualifying features, conservation objectives and the sensitivity of these features;
- **Section 4** presents the predicted impacts of the proposed development on features of the European designated sites;
- **Section 5** presents mitigation measures and monitoring requirements; and
- **Section 6** includes recommendations and presents conclusions of the assessment.

# 2 River Nene: Wansford Intake

## 2.1 Overview of existing abstraction licence

Anglian Water abstracts from the River Nene at Wansford to supply Rutland Water. This has a daily maximum licensed rate of 763Ml/d, with an annual maximum of 180,000Ml (which is equivalent to a daily average of 493Ml/d; Anglian Water, 2015). The intake at Wansford can actually pump a maximum of 518Ml/d from the river (Anglian Water; personal communication, November 2018). The MRF immediately downstream of the Wansford intake is set at 125Ml/d for December to April (winter) and 150Ml/d for May to November (summer).

## 2.2 Overview of proposed drought permit

The proposed drought permit comprises a 50% reduction in the MRF for surface water abstraction at Wansford on the River Nene to refill Rutland Water during drought conditions. This 50% reduction in MRF could constitute a winter or summer drought permit. As described above, the normal licence conditions impose a MRF of 125Ml/d for December to April inclusive (winter), and 150Ml/d for May to November inclusive (summer). Therefore, a 50% reduction in MRF would equate to 62.5Ml/d in winter and 75Ml/d in summer. It has been assumed that maximum daily and annual abstraction rates would remain unchanged from those currently licensed under normal conditions.

Anglian Water would only consider implementing the proposed drought actions when the recharge of Rutland Water is compromised during a severe, possible multi-season, drought. A winter drought permit would most likely be sought following both a dry summer and a dry winter, enabling Anglian Water to refill Rutland Water during a period of relatively high flows. However, should drought conditions continue to present a significant risk to supply, a permit for the following summer may also be considered.

A winter drought permit was granted to Anglian Water in 2011, for the period mid-December 2011 until the end of April 2012, to reduce the MRF at Wansford on a variable basis, to an absolute minimum of 70Ml/d (not actually 62.5Ml/d which would represent a true 50% reduction in MRF). A monitoring programme was conducted throughout this period, the results of which were used to determine the effectiveness of the permit (Atkins, 2015). Anglian Water collected water quality data throughout, which was reported by the Environment Agency (2012).

## 2.3 Summary of HRA Stage I Screening Assessment

The objective of the Stage I Screening was to determine whether implementation of the proposed plan will have LSE on the qualifying objectives of European designated sites. This was achieved through a desk-based review of the following information:

- European site(s), their primary reasons for selection and qualifying features, conservation objectives and site vulnerabilities;
- The sensitivity of the primary reasons for selection and qualifying features to environmental change; and
- The assessment of potential impacts of the proposed drought permit on the hydrological regime, ecology and water quality of the River Nene presented in the Drought Permit Environmental Assessment (Mott MacDonald, 2018a).

The study area was defined as the stretch of the River Nene from the site of abstraction at Wansford to the mouth of The Wash Estuary. Given the nature of the Project, the ZoI was not considered likely to extend beyond sites that are in hydrological continuity with the location of the potential drought permit. As such, European sites within terrestrial areas surrounding the river and estuary were not included in the study area.

A search for European sites within the study area was carried out using Defra's 'Multi Agency Geographic Information for the Countryside' (MAGIC) website (Defra, 2016). It was established that the proposed drought action is not within the boundary of a European site. The European site(s) listed in Table 1 were identified within the ZoI of the drought action.

**Table 1: European sites within the ZoI of the drought permit actions**

| Site Name | Designation | Approximate Distance Downstream from Site |
|---|---|---|
| Nene Washes | SAC | 16km |
| Nene Washes | SPA | 16km |
| Nene Washes | Ramsar site | 16km |
| The Wash and North Norfolk Coast | SAC | 64km |
| The Wash | SPA | 64km |
| Rutland Water | Ramsar site | Water abstracted at Wansford is piped to the reservoir |
| Rutland Water | SPA | Water abstracted at Wansford is piped to the reservoir |

It was concluded that there are no mechanisms by which potential impacts arising from the proposed drought permit at Wansford (e.g. flow, water level, flooding, water chemistry or habitat loss) could result in LSE on either The Wash and North Norfolk Coast SAC/Ramsar/SPA or Rutland Water Ramsar/SPA. Consequently, impacts on The Wash and Rutland Water European designated sites will not be considered further in this Stage II Appropriate Assessment.

Water quality deterioration in the River Nene, specifically a potential increase in phosphate concentration arising from implementation of the drought permit during summer, may have a significant effect on some interest features of the Nene Washes European sites. It was therefore considered necessary that this Stage II Appropriate Assessment be conducted to provide a detailed prediction of potential drought permit impacts on the Nene Washes and to propose potential mitigation measures to alleviate predicted impacts.

# 3 Nene Washes European Designated Site

## 3.1 Site overview

The Nene Washes are located approximately 16km from the abstraction site at Wansford and have an area of 15km$^2$. They are one of the country's few remaining areas of washland habitat and are essential to the survival of populations of wildfowl and waders that are nationally and internationally important.

The areas of rough grassland and wet pasture provide a variety of sward structure and important herbs for bird nesting habitat and feeding, respectively. Additional winter feeding is provided by remains of arable cropping on small areas. These washlands also play a role in relation to the nearby Ouse Washes in that they accommodate wildfowl populations displaced from the Ouse Washes when deep floodwaters prevent their feeding.

In addition, the site is notable for the diversity of plant life within its network of dykes. Many of the ditches hold a rich flora which includes such uncommon species as frogbit (*Hydrocharis morsus-ranae*), water violet (*Hottonia palustris*) and flowering rush (*Butomus umbellatus*). Moreton's Leam, a large 14$^{th}$ century drainage channel running along the eastern flank of the Nene Washes, contains the highest recorded density of spined loach (*Cobitis taenia*) in the country. There may also be thriving populations in the smaller ditches of the washes. It is one of only four remaining locations for this species in the UK.

The site is maintained by inundation and this is controlled through a Water Level Management Plan (WLMP). The washlands are used for the seasonal uptake of floodwaters. Under low winter flows (typically December to March), the Stanground Sluice, which connects Morton's Leam to the River Nene, is closed. Consequently, during winter the River Nene is normally only connected to Morton's Leam and hence the Nene Washes during periods of flood flow, where connection will be either through automatic opening of Stanground Sluice (once the river reaches 3.8mODN), or via the Cradge Bank spillway (Atkins, 2015). However, there are three licences (held by the RSPB and the Whittlesey Wildfowlers & Conservationists) that allow abstraction of water from Morton's Leam to enable artificial flooding of the Nene Washes to maintain the wetlands and there may be occasions during the winter months when a comparatively small amount of water is allowed to enter the Morton's Leam to meet this need.

In the summer months, flow through Stanground Sluice maintains levels in Morton's Leam and the Nene Washes. This is important for wet fencing, irrigation and nature conservation. The optimal summer flow is 15Ml/d. If the flow at Stanground Sluice is insufficient the RSPB can operate the Gravel Dyke Feed to provide extra River Nene flow into the Washes (Environment Agency, 2011). During the summer months the area has traditionally been used for cattle grazing.

## 3.2 Nene Washes European designated sites

The Nene Washes are designated as a SAC, SPA and as a Ramsar wetland of international importance. This section describes the features of conservation importance that are listed in each designation.

### 3.2.1 Nene Washes SAC qualifying features

The Nene Washes are primarily designated as a SAC under article 4(4) of the Directive (92/43/EEC) as they host spined loach, which is an Annex II listed species (JNCC, 2015a).

### 3.2.2 Nene Washes SPA qualifying features

This site qualifies as an SPA under Article 4.1 of the Directive on the Conservation of Wild Birds (79/409/EEC) by supporting over-wintering populations of the Annex I species Bewick's swan (*Cygnus bewickii*). It also qualifies under Article 4.2 (79/409/EEC) as it supports species of international importance not listed in Annex I (JNCC, 2015b). These are summarised in Table 2.

**Table 2: Nene Washes SPA species of importance**

| Species | Breeding | Overwinter |
|---|---|---|
| **Annex I** | | |
| Bewick's swan (*Cygnus bewickii*) | | X |
| **Not listed in Annex I** | | |
| Black-tailed godwit (*Limosa limosa limosa*) | X | |
| Eurasian wigeon (*Anas penelope*) | | X |
| Eurasian teal (*Anas crecca*) | | X |
| Gadwall (*Anas strepera*) | X | X |
| Garganey (*Anas querquedula*) | X | |
| Northern pintail (*Anas acuta*) | | X |
| Northern shoveler (*Anas clypeata*) | X | X |

### 3.2.3 Nene Washes Ramsar site qualifying features

The list of Ramsar criteria applied to the designation of the Nene Washes as a wetland of international importance include Criterion 2 and 6, the details of which are provided in Table 3.

**Table 3: Nene Washes Ramsar site qualifying features**

| Criterion | Notes |
|---|---|
| 2 | • Supports vulnerable, endangered, or critically endangered species or threatened ecological communities<br>• Supports an important assemblage of nationally rare breeding birds.<br>• Supports a wide range of raptors occur through the year.<br>• Supports several nationally scarce plants, and two vulnerable and two rare British Red Data Book invertebrate species have been recorded. |
| 6 | • Supports 1% of the individuals in a population of one species or subspecies of water bird.<br>• Species/populations occurring at levels of international importance.<br>• Species with peak counts in winter: Bewick's swan (*Cygnus bewickii*).<br>• Species/populations identified subsequent to designation for possible future consideration:<br>• Spring/autumn - black-tailed godwit (*Limosa limosa islandica*)<br>• Winter - Northern pintail (*Anas acuta*) |

Source: (JNCC, 1993)

## 3.3 Site condition, conservation objectives and improvement plan

### 3.3.1 Site Condition

The Nene Washes SAC, SPA and Ramsar site are legally underpinned by the Nene Washes Site of Special Scientific Interest (SSSI). The SSSI is composed of eight units, of which only two were assessed as being in 'Favorable' condition by Natural England at the time of the most recent assessment (2009/2010) (Natural England, 2010). The remaining six units, which account for 80% of the areal extent of the site, were all classified as 'Unfavorable-Recovering'.

### 3.3.2 Nene Washes European sites conservation objectives

The conservation objectives of the Nene Washes SAC and SPA are outlined in the European Site Conservation Objectives for the Nene Washes SAC UK0030222 (Natural England, 2014a) / SPA UK9008031 (Natural England, 2014b). The conservation objectives of the site are broad and given as follows:

*'to ensure that the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features and the aims of the Wild Birds Directive, by maintaining or restoring:*

- *The extent and distribution of the habitats of qualifying species;*
- *The structure and function of the habitats of qualifying species;*
- *The supporting processes on which the habitats of qualifying species rely;*
- *The populations of qualifying species; and*
- *The distribution of qualifying species within the site'.*

### 3.3.3 Site Improvement Plan

Site Improvement Plans (SIPs) provide a high-level overview of the issues (both current and predicted) affecting the condition of the Natura 2000 features of a designated site. SIPs outline the priority measures required to improve the condition of the features. They does not cover issues where remedial actions are already in place or ongoing management activities which are required for maintenance.

The SIP developed for the Nene Washes identifies the following features as existing pressures or threats affecting the condition of the site and requiring improvement (Natural England, 2014c):

- Water pollution; and
- Hydrological changes.

According to the SIP, spined loach require low nutrient conditions. The phosphorus concentration conservation target for the Nene Washes is an annual mean of 0.1mg/l. Higher phosphorus levels will lead to detrimental impacts on this species as the macrophyte community structure and habitat structure will change. The SIP proposed that water quality in Moreton's Leam and the ditches within the site were reviewed by 2016, using pre-existing data from EA monitoring and specially commissioned data where appropriate. The extent of diffuse phosphate pollution also needs investigation prior to consideration of further actions to reduce nutrient inputs to the site.

Flooding on the Nene Washes can lead to difficulties in managing the wet grassland habitats, which may prevent some bird species from successfully breeding, and impact the numbers of over-wintering birds at the site. Ongoing monitoring and adaptive management are required in solving year to year water issues. Actions required to address water issues are a review of past works to improve water level management and assess if they are successful, or if further work is needed. It is recommended that the partnership of organisations and individuals involved at the site should keep in regular liaison, monitor bird numbers and water levels, and seek to adjust management accordingly within the framework of pre-existing plans. The timescale for this investigation and monitoring work was given as 2015 to 2020 in the SIP.

## 3.4 Sensitivities and conservation status of the qualifying features

### 3.4.1 Spined loach

Spined loach belong to the true loach family (Caobitidae), a family of Old World freshwater fish. They are found in shallow, slow-flowing or stagnant water in all manner of waterbodies, e.g. rivers, streams, canals, ditches, drains and lakes. Optimal habitat is thought to be clear oxygen-rich water, with dense patchy submerged macrophyte cover and fine-particle substrate, such as mud and sand.

Spined loach are nocturnal, they stay hidden under rocks or buried in sand or mud during the day. They are most active at night, when they filter small benthic invertebrates and organic matter from the sediment for food. They possess the ability of intestinal breathing, meaning that when water is oxygen-poor they swallow air at the water's surface bringing oxygen into the intestine where it is absorbed into the bloodstream. The spawning season is from April to June. Females typically produce 300 to 1,500 eggs close to the ground (e.g. on stones, roots or plants), which are then fertilized by the males. The larvae hatch in four to six days and their expected lifespan is between three and five years (FishBase.org and references therein, 2018).

Although widely distributed throughout Europe and Asia, in the UK their distribution appears to be restricted to just five east-flowing river systems in eastern England: River Trent, River Welland, River Witham, River Nene and River Great Ouse. The fish has limited means of dispersal, so UK populations are largely genetically isolated from each other (Environment Agency, 2005). Although they are listed on Annex II of the EC Habitats and Species Directive, they are categorized on the International Union for Conservation of Nature (IUCN) Red List as a 'least concern' species.

Spined loach are sensitive to changes in a number of environmental variables, including water quality, temperature, salinity, flow and water levels. Nutrient enrichment is of particular concern as it promotes benthic algal growth and increased siltation, which could degrade the condition of substrate relied upon by spined loach for spawning and feeding. An increase in nutrients (e.g. phosphate and nitrate) can also result in algal blooms in lentic systems, leading to a decrease in light attenuation and consequently reduced submerged macrophyte cover. An increase in microbial remineralization at the sediment surface due to the influx of organic matter could also result in low dissolved oxygen (DO) concentrations. Although spined loach have the stop-gap measure of intestinal breathing when DO levels are low, their preference is for oxygen-rich environments. Persistent anoxia at the sediment-water interface could lead to population decline due to enhanced egg and juvenile mortalities (Vostradovsky, 1973; English Nature, 1998; FishBase, 2018).

## 3.5 Internationally important bird assemblage

The Nene Washes hosts an internationally important assemblage of waterfowl and waders during the breeding and over-wintering seasons. The wildfowl and waders listed in the Nene Washes European sites designations include Bewick's swan, black-tailed godwit, northern pintail, Eurasian wigeon, Eurasian teal, gadwall, garganey and northern shoveler. Table 4 summarises the conservation status of these species.

**Table 4: Conservation status of the Nene Washes Ramsar site and SPA qualifying bird species**

| Species | Designation | European Conservation Status | IUCN Status |
|---|---|---|---|
| Bewick's Swan | SPA | Annex I | Least concern |
| | Ramsar site | Criterion 6 | |
| Black-tailed godwit | SPA | Not listed in Annex I | Near threatened |
| | Ramsar site | Criterion 6 | |
| Eurasian teal | SPA | Not listed in Annex I | Least concern |
| Eurasian wigeon | SPA | Not listed in Annex I | Least concern |
| Gadwall | SPA | Not listed in Annex I | Least concern |
| Garganey | SPA | Not listed in Annex I | Least concern |
| Northern pintail | SPA | Not listed in Annex I | Least concern |
| | Ramsar site | Criterion 6 | |
| Northern shoveler | SPA | Not listed in Annex I | Least concern |

The key threats to birds within this assemblage are inappropriate water levels, water quality degradation and changes to sediment transport and deposition processes. Flooding during spring and early summer can severely damage the breeding bird interest by flooding nests, drowning young and degrading habitat. Deep flooding during winter impacts on the overwinter bird population, again due to habitat loss. Disruption of the normal sediment transport and deposition processes resulting from flow velocity changes could also result in habitat loss. Nutrient enrichment can lead to invertebrate, fish and macrophyte species decline, which could compromise food availability for waterfowl.

# 4 Impact Assessment

## 4.1 Potential impacts on the River Nene

Mott MacDonald (2018a) conducted an environmental assessment to identify the potential impacts of the proposed Wansford intake drought permit on the River Nene. The impact of the proposed drought permit on the hydrological regime was assessed using modelled flows for the river immediately downstream of Wansford intake. Flow series from a historical severe drought event (1933 to 1935) with a return period in the region of 1 in 200 years were selected as the baseline, onto which the 50% reduction in MRF was applied. Analysis of monitoring data from the Environment Agency was also carried out to determine baseline ecological, water quality and physico-chemical conditions, and to identify potential sensitivities. The findings of this assessment were used to inform the HRA Stage I Screening Assessment. Table 5 summarises the potential impacts of the proposed drought permit that were considered relevant to the European sites in hydrological continuity with the Wansford intake.

**Table 5: Potential impacts of the proposed Wansford intake drought permit**

| Impact | Details |
|---|---|
| **Flow regime** | The impacts of the proposed drought permit were assessed by imposing the 50% reduction in MRF on historical flow data from an 18-month period of extreme drought (October 1933 – March 1935). Under this drought permit scenario, the flow downstream of the Wansford intake remained at the MRF for extended periods. A reduction in flows of up to 50% were simulated compared to the non-drought permit scenario, as well as mean reductions of 49%, 23% and 38% for summer 1934, winter 1934/35 and summer 1935, respectively. However, there were significant high flows under this drought scenario, which peaked at approximately 8000Ml/d during summer and 6000Ml/d during winter. These substantial spate flows would help to maintain the hydrological function of the River Nene during drought permit implementation. |
| **Water levels** | A review of the 2011/12 winter drought permit by Atkins (2015) determined that river levels could be maintained through the correct management of control structures along the River Nene corridor and by adjusting the MRF when required. It should be possible to maintain water levels in the summer by similar means, providing that the water used in lock operation and leakage downstream does not exceed the volume of water entering the reach above the locks. |
| **Flooding** | As the drought permit will only be implemented during periods of low flows, there are not expected to be any impacts on downstream flooding in terms of frequency or extent. |
| **Water chemistry** | Nutrient enrichment (especially phosphate) and the subsequent development of algal blooms and low DO concentrations are currently the only water quality concerns along the fluvial River Nene. During periods of low flow, such as during implementation of the proposed drought permit, the river will have a lower dilution capacity. Consequently, nutrients (and other pollutants) discharged into the River Nene from point sources downstream of the abstraction point may have an increased impact on water quality. However, the impact will be mitigated downstream by the input of flows from tributaries and discharges, which serve to increase the dilution capacity of the river. Sporadic high flows may help to flush nutrients through the system, further alleviating the impacts of a reduction in the MRF. |
| **Salinity regime** | The potential reduction in River Nene freshwater flow to The Wash estuary during drought permit implementation may result in a small change in the salinity profile within the tidal stretch of the river. The extent of the salinity increase will be dependent on the magnitude of flow reductions. However, the increase in salinity in the lower reaches of the river is likely to be minimised by occasional flushing events, flow inputs from WwTWs and tributaries, and by control of structural features along the river corridor. Additionally, the dominance of marine/estuarine processes within the tidal reach and in The Wash mean that salinity |

| Impact | Details |
|---|---|
| | changes resulting from reduced MRF are not likely to be significant in the event of a drought permit being implemented. |
| **Suspended sediment / siltation** | As flows are reduced, the risk of sediment build-up increases, and when applying the 1933-35 drought scenario, reductions in flows of up to 50% for extended periods may have a significant impact on sedimentation along the River Nene. During low flows, tidally generated sediments may be allowed to penetrate further up tidal reach of the River Nene. Sporadic high flows may help to 'flush' sediment through the system, and hence reduce build-up. |
| **Habitat loss** | The main mechanism for habitat loss at European sites is indirectly through the occurrence of other potential impacts such as alterations to water levels and flow or chemical changes, as mentioned above. Hydro-dependent habitats in the downstream site may be sensitive to direct impacts, such as the erosion of saltmarsh through changes in sediment transport processes. |

## 4.2 Potential impacts on the qualifying features of the Nene Washes designated sites

### 4.2.1 Screening of potential impacts

Most of the environmental impacts described in Table 5 above were screened out of further assessment at Stage I as they were not considered to have a LSE on the interest features of the Nene Washes European designated sites (Mott MacDonald, 2018a).

Water levels in the Nene Washes are maintained by inundation, which is controlled by a Water Level Management Plan (WLMP), and flows from the River Nene enter the Nene Washes and Moreton's Leam via Stanground Sluice. Although flow and water levels in the River Nene downstream of Wansford intake are expected to decrease under drought permit conditions, structural controls on the Nene Washes mean that this impact will not be replicated within the designated site. Consequently, changes to sedimentation and suspended sediment concentrations within the Nene Washes could also be discounted. As could physical habitat loss due to water level changes and/or erosion.

Of the impacts considered in the Stage I Screening Assessment, in the event of a drought permit being implemented, only water quality degradation was thought likely to have a significant impact on features of the Nene Washes European sites. A reduction in flows due to increased abstraction would reduce the dilution capacity of the river downstream from the Wansford intake. Nutrients and other pollutants discharged to the River Nene from point sources downstream of the abstraction point will therefore have a greater impact on water quality than they would do under normal, non-drought permit conditions. As flows from the River Nene enter the Nene Washes and Moreton's Leam via Stanground Sluice, water quality changes in the river will be conveyed to the Washes.

The potential drought permit impact on water quality of the Nene Washes is likely to be more pronounced in summer than in winter. During the summer the sluice gates are usually open, allowing inflow from the River Nene to maintain water levels in the Washes. Conversely, Stanground Sluice is usually closed during the winter and the Nene Washes are only connected to the River Nene during periods of flood flows, when the dilution capacity is enhanced and poor water quality is likely to be of less concern. Occasionally during a dry winter, a comparatively small amount of water is allowed to enter Morton's Leam from the river for artificial flooding of the Washes to maintain wetlands.

### 4.2.2 Significance of water quality degradation

In the most recent EU Water Framework Directive (WFD) assessment, Moreton's Leam waterbody was classified as being of Good physico-chemical status. Concentrations of phosphate, ammonia, DO and Biological Oxygen Demand (BOD), and pH were all compliant with their respective ecological quality standard (EQS); individually achieving either Good or High status. On the other hand, the upstream River Nene waterbody, Islip to Tidal, only achieved Moderate physico-chemical status on account of phosphate concentration, which was classified as Moderate. Table 6 presents the five-year averages (2013 – 2017) of various water quality parameters for Morton's Leam compared to an upstream sample site on the River Nene within the Islip to Tidal waterbody (Peterborough Town Bridge) and a sample site on the section of the River Nene parallel to Morton's Leam (Dog in a Doublet Sluice).

**Table 6: Water quality WFD EQS assessment of 2013-2017 Environment Agency monitoring data.**

| | Determinant: | DO Saturation (10%ile) | BOD (90%ile) | Ammonia (90%ile) | pH (5-95%ile) | Orthophosphate (AA*) |
|---|---|---|---|---|---|---|
| | Units: | % | mg/l | mg/l | pH | mg/l |
| | WFD Good EQS: | 60 | 5 | 0.6 | 6-9 | 0.120 |
| EA Monitoring Locations | Peterborough Town Bridge | 90.10 | 4.19 | 0.10 | 7.99-8.48 | 0.151 |
| | Dog in a Doublet Sluice | 83.31 | 4.97 | 0.09 | 7.99-8.60 | 0.149 |
| | Moreton's Leam | 71.74 | 4.37 | 0.24 | 7.73-8.25 | 0.084 |

Source: The Environment Agency open source data. * AA: Annual average.

| | |
|---|---|
| | Compliant with EQS |
| | Non-compliant with EQS |

It is clear from this data analysis that the key water quality issue in the River Nene is high nutrient concentrations, specifically phosphate. The key risk from high orthophosphate concentration is that it can promote algal growth and subsequently deplete oxygen levels as the rate of microbial remineralisation increases to account for the increase in organic matter. Depleted oxygen levels can have serious impacts on the ecosystem and its inhabitants, particularly fish. However, DO and BOD levels are both compliant with their respective EQS, hence the impacts of eutrophication do not appear to have been widely manifested in the River Nene.

While Moreton's Leam appears not to experience the same high phosphate concentrations of the River Nene, an influx of phosphate-rich water from the river during drought permit conditions could compromise the current Good physico-chemical status. It is also possible that the phosphate conservation target of 0.1mg/l specified in the SAC/SPA SIP (Section 3.3) would be exceeded. As water is typically slower moving in the Washes compared to river flows, the effects of eutrophication described above can proliferate more easily.

### 4.2.3 Potential impacts on the qualifying features of the Nene Washes SAC/SPA/Ramsar site

Potential impacts of water quality degradation on the featured species of the Nene Washes European designations are detailed in Table 7.

**Table 7: Potential impacts on Nene Washes European site qualifying features**

| Feature | Impact | Impact Pathway |
|---|---|---|
| Spined loach | Water quality degradation – nutrient enrichment | • Stimulation of algal biomass and the consequent decrease in light attenuation could result in reduced macrophyte cover, leading to spined loach habitat loss.<br>• Promotion of algal growth, and the consequent increase in organic matter remineralization, could create DO concentration sags at the sediment-water interface, potentially leading to enhanced egg and juvenile mortalities and overall population decline.<br>• Promotion of benthic and filamentous algal growth could degrade the condition of substrate relied upon by spined loach for spawning and feeding.<br>**Without mitigation, an adverse effect on the qualifying feature is anticipated.** |
| Waterfowl and wader assemblage | Water quality degradation – nutrient enrichment | • Promotion of algal growth, and the consequent increase in organic matter remineralization, could lead to DO concentration sags, which in turn could result in a decrease in macroinvertebrate and fish abundance.<br>• A decrease in light attention due to high algal biomass could reduce macrophyte cover.<br>• Two effects of eutrophication could compromise food availability to the bird population of the Nene Washes.<br>**Without mitigation, an adverse effect on the qualifying feature is anticipated.** |

## 4.3 In-combination effects

Article 6(3) of the Habitats Directive requires that "*any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in-combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives*". Therefore, the potential impacts on the interest features of the Nene Washes European sites due to the proposed drought permit in-combination with other plans/projects relevant to the area must be assessed.

### 4.3.1 Other proposed Anglian Water drought permits

Duston Mill intake is an Anglian Water abstraction point located on the River Nene upstream of Wansford intake. The Anglian Water 2019 Drought Plan proposes a drought permit for Duston Mill to secure the recharge of Pitsford Reservoir during drought conditions. The proposed drought permit comprises a 50% reduction in the MRF immediately downstream of Duston Mill. Previous assessment of this plan determined that implementation of the proposed drought permit at Duston Mill would reduce flows in the River Nene between Duston Mill and Wansford intake, although flows would remain above the normal summer MRF of 150Ml/d for flows immediately below Wansford. Therefore, while implementation of the proposed drought permit for Duston Mill would result in less water being available for abstraction at Wansford, it is not expected that there would be a significant impact on flows downstream of Wansford intake (Mott MacDonald, 2018b). The Duston Mill drought permit will not change the frequency with which the Wansford MRF is reached. In summary, implementation of the proposed drought permit at Duston Mill is not expected to compound the impacts of the Wansford intake drought permit on the Nene Washes designated sites.

### 4.3.2 Planning applications

A number of planning applications have been permitted by Peterborough Council since October 2017. It is possible that some of these planned developments could be under construction

during the period that the proposed drought permit is applicable (2019 to 2024). As Peterborough is on the River Nene and upstream of the Nene Washes, construction sites in hydrological continuity with the river could have an impact on water quality within the Nene Washes designated sites. At this stage it is not possible to identify if any of these schemes could result in water quality deterioration in the area of influence of the drought plan and result in in-combination effects. It is likely that any scheme of significant scale with potential to affect the Nene Washes designated sites will also undergo an HRA and in-combination effects will also be considered at that stage.

### 4.3.3 Environment Agency Drought Plans

#### 4.3.3.1 East Anglia Area

There is no overlap in European Sites considered for the Wansford intake and East Anglia Area Environment Agency drought plan.

#### 4.3.3.2 Lincolnshire and Northampton

There is no overlap in European Sites considered for the Wansford intake and Lincolnshire and Northampton Environment Agency drought plan.

#### 4.3.3.3 East Anglia (East)

There is no overlap in European Sites considered for the Wansford intake and East Anglia (East) Environment Agency drought plan.

### 4.3.4 Other water company drought plans

#### 4.3.4.1 Cambridge Water

There is no overlap in European Sites considered for the Wansford intake and Cambridge Water's drought plan.

#### 4.3.4.2 Affinity Water

There is no overlap in European Sites considered for the Wansford intake and Affinity Water's drought plan.

#### 4.3.4.3 Yorkshire Water

There is no overlap in European Sites considered for the Wansford intake and Yorkshire Water's drought plan.

#### 4.3.4.4 Severn Trent Water

The updated Severn Trent Water Drought Plan is not currently available. There is no expectation of any overlap in European sites considered for the Wansford intake and Severn Trent drought plans.

#### 4.3.4.5 Essex and Suffolk Water

A screening exercise to determine if a SEA was required was undertaken and concluded that the supply-side actions would not have a significant effect on the environment. As a result, no in combination likely significant effects are anticipated between Wansford intake and Essex and Suffolk Water drought plan.

### 4.3.5 Water company Water Resources Management Plans (WRMP)

#### 4.3.5.1 Anglian Water WRMP 2019

Anglian Water's final WRMP 2019 includes HRA screening assessment for three plans; the Best Value Plan (BVP), the Least Cost Plan (LCP) and the adaptive strategy. Six options across the three plans were identified as having a Likely Significant Effects on European sites and taken forward to Stage 2 appropriate assessment. These were: ESU1 Felixstowe Desalination, ESU2 Ipswich Water Reuse, NFN1 Kings Lynn Desalination, SHB2 Pyewipe Water Reuse for non-potable use, NFN2 Kings Lynn Water Reuse and NFN3 Fenland Reservoir.

There is no overlap in European Sites considered for the Wansford Intake and the Felixstowe Desalination, Ipswich Water Reuse, Pyewipe Water Reuse and Fenland Reservoir options.

Kings Lynn Desalination option (WRMP) considers the LSE on The Wash SPA, The Wash Ramsar and The Wash and North Norfolk Coast SAC as does the drought plan Wansford Intake on the River Nene. The level of detail in the WRMP does not allow detailed consideration of the effects on the European sites, however there is a likelihood for LSE during both construction and operation of the option. These are again related to pollution events affecting water quality during construction and changes in salinity as a result of brine discharge during operation. It is assumed that appropriate mitigation can be developed to ensure there are no adverse effects on the European Sites. Wansford Intake may lead to eutrophication which could affect the spined loach population, but appropriate mitigation has been identified, therefore if mitigation is implemented for both Kings Lynn Desalination and Wansford Intake, no in combination LSEs are anticipated.

The Kings Lynn Water Reuse option in the WRMP and Wansford Intake on the River Nene consider the impacts on The Wash SPA, The Wash Ramsar and The Wash and North Norfolk Coast SAC. The impacts of Kings Lynn Water Reuse on the European sites relates to pollution events during construction which may impact water quality. However, it is assumed appropriate mitigation will be put in place and therefore no likely significant effects are likely to occur. Wansford Intake may lead to eutrophication which could affect the spined loach population, but appropriate mitigation has been identified, therefore if mitigation is implemented for both Kings Lynn Water Reuse and Wansford Intake, no in combination LSEs are anticipated.

#### 4.3.5.2 Affinity Water WRMP19

There is no overlap in European Sites considered for the Wansford intake and Affinity Water's WRMP.

#### 4.3.5.3 Severn Trent Water WRMP19

There is no overlap in European Sites considered for the Wansford intake and Severn Trent Water's WRMP.

#### 4.3.5.4 Yorkshire Water WRMP19

There is no overlap in European Sites considered for the Wansford intake and Yorkshire Water's WRMP.

#### 4.3.5.5 Cambridge Water WRMP19

There is no overlap in European Sites considered for the Wansford intake and Cambridge Water's WRMP.

#### 4.3.5.6 Essex and Suffolk Water WRMP19

There were no supply schemes in Essex and Suffolk Water's WRMP19 so no in combination LSE's are anticipated.

### 4.3.6 Other plans and projects

#### 4.3.6.1 Water Resources East (WRE)

The WRE programme is not due to start until 2045 as it is part on longer term planning and is an entirely non-statutory plan, whereas Anglian Water's Drought Plan is only active for another year. There is currently no Habitat Regulations Assessment for the WRE plan therefore any in-combination effects cannot be assessed as this time.

#### 4.3.6.2 Anglian River Basin Management Plan (RBMP)

The level of detail in the plan does not allow consideration of the effect on individual European Sites, but the HRA determines that the RBMP is not likely to have any significant effects on any European sites, alone or in-combination with other plans and projects. Therefore, no in-combinations LSEs with Wansford Intake are anticipated.

#### 4.3.6.3 National Policy Statement – Sizewell C

There is no overlap in European Sites considered for the Wansford intake and Sizewell C construction or operation.

#### 4.3.6.4 A14 upgrade

There is no overlap in European Sites considered for the Wansford intake and the A14 upgrade.

#### 4.3.6.5 Cam-MK-Ox corridor

No further details are available on this scheme at present.

#### 4.3.6.6 East West Rail

There is no HRA for East West Rail as the are no European Sites that could be impacted by the scheme.

# 5 Mitigation and Enhancement Measures

Anglian Water are committed to minimising any potential downstream impacts that could occur as a result of implementation of the drought permit. Detailed information of the monitoring requirements and proposed mitigation measures are provided in the Environmental Assessment Report.

# 6 Conclusions

Nutrient enrichment was identified in the Stage I Screening Assessment as a potential impact of the proposed Wansford intake drought permit on the Nene Washes SAC/SPA/Ramsar site. Interest features of the European designations for the Nene Washes include spined loach and internationally important bird assemblages, both of which are susceptible to the impacts of nutrient enrichment. This Stage II Appropriate Assessment investigated the effect of nutrient enrichment on these features. Eutrophication of the Nene Washes could affect the spined loach population via reduced food availability, habitat loss and low dissolved oxygen concentrations at the sediment-water interface. Bird assemblages may also be impacted by the effects of eutrophication on food availability. No in-combination effects were identified.

Adverse effects of drought permit implementation on the water quality of the River Nene and, by extension, the Nene Washes can be mitigated against by implementing the following measures:

- Reduction of phosphorus inputs to the river from WRCs and small point sources in the catchment;
- Variable abstraction; and
- Cessation of abstraction during periods of stress.

Consideration should also be given to the management of water levels in the Nene Washes. For example, inflow of water from the River Nene to Morton's Leam via Stanground Sluice should cease when nutrient levels are high in the river.

A monitoring programme has also been devised to assess if any potential effects on critical thresholds for water quality parameters, especially phosphate, occur.

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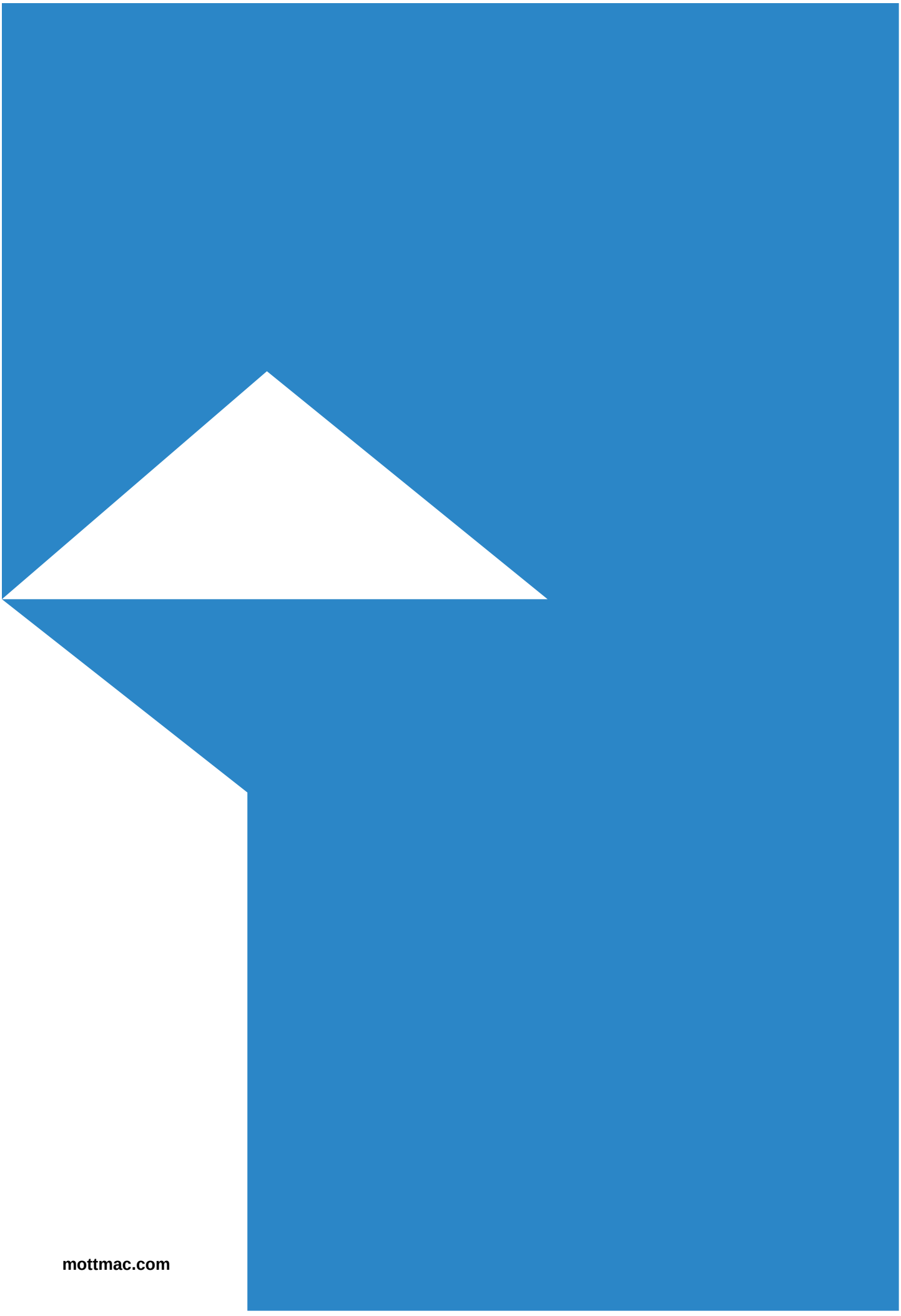

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