



The Sizewell C Project

9.87 Water Monitoring Plan

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CONTENTS

1	DRAFT WATER MONITORING PLAN.....	1
1.1	Introduction	1
1.2	Monitoring Strategy	3
1.3	Monitoring	3
2	PROPOSED MONITORING NETWORK	5
3	ESTABLISHMENT OF TRIGGER LEVELS.....	9
4	USE OF TRIGGERS	17

TABLES

Table 2.1:	Summary of the proposed water monitoring locations.....	6
Table 2.2:	Summary of the proposed groundwater monitoring locations to be included in the core network.....	9
Table 3.1:	Proposed water level triggers and supporting thresholds.....	14

PLATES

Plate 1.1: Locations of SSSIs in relation to Sizewell C main development site.	2
Plate 2.1: Locations of proposed monitoring installations.....	5
Plate 3.1: observed groundwater levels in peat for piezometers on Sizewell Marshes	11
Plate 3.2: Groundwater level centiles for piezometer P8 on Sizewell Marshes	16
Plate 4.1: Process for monitoring and action.....	17

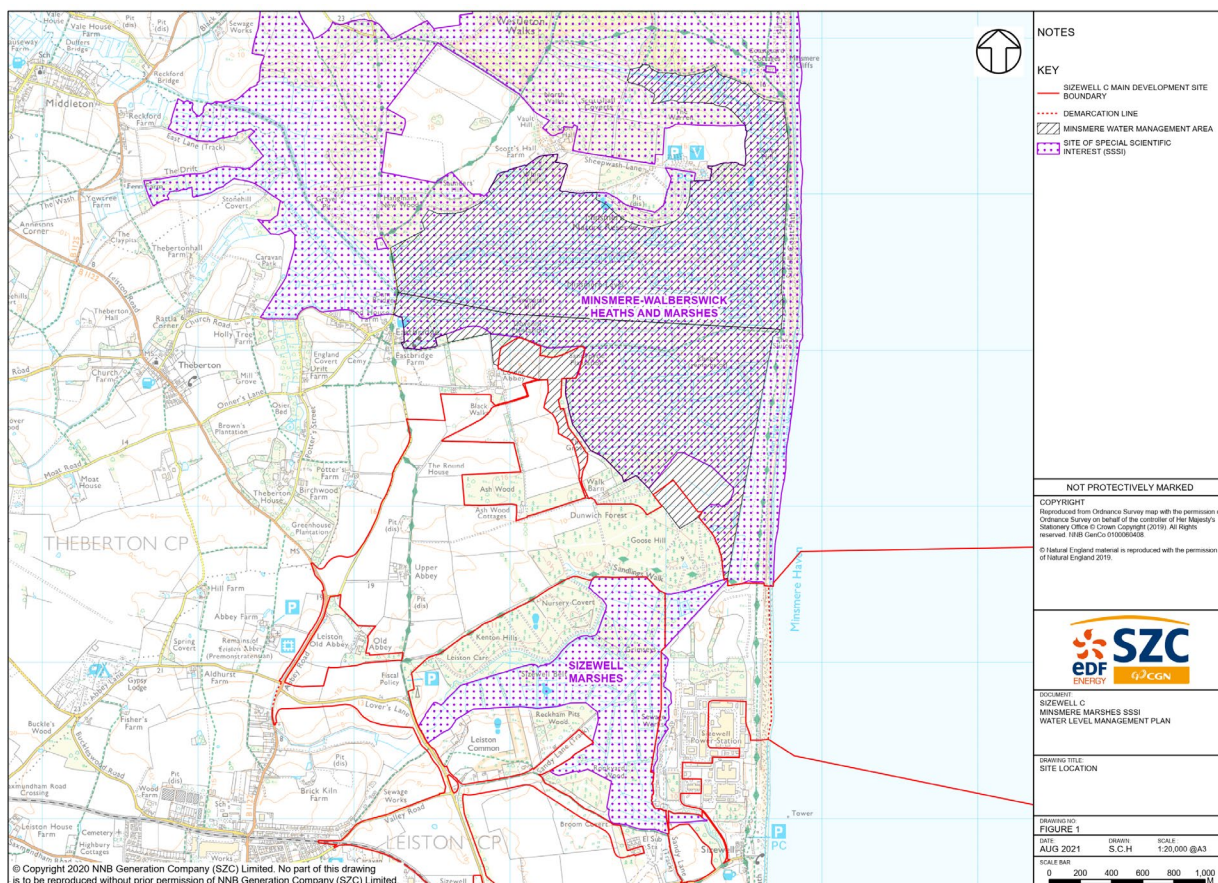
1 DRAFT WATER MONITORING PLAN

1.1 Introduction

- 1.1.1 Requirement 7 of the draft DCO (Doc Ref. 3.1(G)) requires the approval of a Water Monitoring Plan. This will address both groundwater and surface water monitoring and must be in general accordance with the Main Development Site Water Monitoring and Response Strategy (**Volume 3, Appendix 2.14.A** of the **ES Addendum** [\[AS-236\]](#)).
- 1.1.2 This is a draft Water Monitoring Plan, which has sought to set out the proposed water monitoring arrangements. Further consultation with East Suffolk Council, Suffolk County Council, the RSPB, the Internal Drainage Board, the Environment Agency and the MMO will be undertaken before a final Water Monitoring Plan is proposed and submitted to ESC for approval subsequent to the grant of DCO consent.
- 1.1.3 Section 1.2 of the Water Monitoring and Response Strategy [\[AS-236\]](#) explains the current monitoring arrangements, including data collection and frequency. The Water Monitoring and Response Strategy [\[AS-236\]](#) confirms that this monitoring will be continued for the duration of the construction works, unless alternative arrangements are approved as part of this Plan. The Water Monitoring Plan will secure both the monitoring and response arrangements.
- 1.1.4 The groundwater and surface water environment surrounding the main development site supports water-dependent habitats that are of national and international importance. The area to the south and west of the site is located within the Sizewell Marshes Site of Special Scientific Interest (SSSI), while the area to the north is located within the Minsmere to Walberswick Heaths and Marshes SSSI, of which parts are Special Protection Area (SPA), Special Area of Conservation (SAC), and Ramsar sites. Both SSSI sites are shown in relation to the main development site boundary in Plate 1.1.
- 1.1.5 The Water Level Management Plan (WLMP) for Sizewell Belts [now Sizewell Marshes] SSSI (Environment Agency, 1998) indicates that water levels should be held within 0.15m of ground level at all times. However, monitoring undertaken since 2011 has confirmed the variation in water levels is greater than this.
- 1.1.6 The WLMP for Minsmere (Environment Agency, 1996) prescribes actions for the Minsmere reserves, but the water management for Minsmere South levels has changed significantly since this time. There is therefore no current management plan for the current mosaic of habitats. The RSPB,

who maintains this site, have confirmed that it aims to maintain surface inundation across large areas of the site through the winter and early spring.

Plate 1.1: Locations of SSSIs in relation to Sizewell C main development site.



- 1.1.7 There is an extensive network of monitoring locations within the main development site and in its vicinity, which focuses on Sizewell Marshes SSSI. This network was established in 2011 to determine baseline hydrogeological and hydrological conditions for the purpose of impact assessment, especially in relation to the hydroecology within the SSSIs.
- 1.1.8 This Water Monitoring Plan focuses on Sizewell Marshes. It will use existing monitoring locations, both within the Order limits and outside it. Water level control is targeted at the area of Sizewell Marshes where maximum drawdown in the Crag is predicted. Section 3 describes the water level monitoring triggers and the actions that can be taken on the site.
- 1.1.9 The RSPB undertakes water level monitoring on Minsmere South Levels and the wider Minsmere Reserves, with manual readings taken on a

monthly basis. No change to the monitoring regime or water level control are proposed for the Minsmere reserves.

1.2 Monitoring Strategy

1.2.1 The approach to monitoring, as set out in the Water Monitoring and Response Strategy [AS-236], is adaptive - allowing it to evolve through the construction programme and into the operation of Sizewell C. This is explained further below and will ensure that monitoring of the water environment remains appropriate as activities change over time.

1.2.2 The monitoring network on Sizewell Marshes that was used to inform the DCO application includes 86 No. groundwater piezometers. Automated sensors are installed and monthly manual water level measurements are taken. Locations are shown on [Figure 19.3 \(APP-310\)](#) and further description of the monitoring undertaken at each location is given in [Appendix F \(APP-309\)](#).

1.2.3 To understand surface water flows and levels within the Sizewell Marshes SSSI, a programme of velocity and stage monitoring is currently implemented at 7 No. locations. The locations of these gauges are shown on [Figure 19.3 \(APP-310\)](#) and rationale for their locations is described in [Appendix F \(APP-309\)](#).¹

1.2.4 A weather station is also currently in place at the site which monitors multiple parameters.

1.3 Monitoring

1.3.1 The assessment of potential changes to the water environment as a result of the construction and operation of Sizewell C shows that the predicted changes are limited in extent, magnitude and duration such that no significant environmental impacts should occur ([APP-297](#)). However, it is recognised that monitoring is required to demonstrate that the predicted change is realised, and not exceeded as the project progresses and that remedial measures can be triggered and implemented if required.

1.3.2 The scope of this existing monitoring programme covers an area that is significantly larger than the area where changes in the water environment are predicted. Changes in water level are forecast to be limited to the fields closest to the western boundary of the main development site.

¹ Note: in the final version of this document these plans will be appended so that the Water Monitoring Plan is freestanding.

- 1.3.3 Monitoring focused on Sizewell Marshes is proposed, which will allow the effect of the proposed development to be compared against the established baseline, to validate the effectiveness of the mitigation measures implemented and to trigger further intervention if necessary. Monitoring of Minsmere South Levels or the wider Minsmere Reserve as SZC Co. is not proposed, as significant effects within these areas are not predicted.
- 1.3.4 The proposed monitoring locations for Sizewell Marshes have been informed by the assessment works undertaken to support the DCO application. This monitoring will allow direct comparison of future conditions with the baseline record at the same locations. This will provide real world validation of the predicted changes. It will also allow any unanticipated change to be identified and addressed.
- 1.3.5 When developing this Water Monitoring Plan, it is recognised that monitoring will be required to support other permits and licences (e.g. an abstraction licence is required for the groundwater dewatering). Therefore, as permits and licences are granted, the Water Monitoring Plan will be kept under review and updated to include the further monitoring as may be required. Any such changes to the Water Monitoring Plan would be submitted to ESC for their approval.
- 1.3.6 Monitoring results will be issued to the Environment Review Group and any necessary actions would be based on the following considerations:
- Event based triggers associated with natural hydrological variability (e.g. drought or flood) or non-development related changes (e.g. actions by others)
 - Event based triggers associated with construction activities
 - Other relevant changes (e.g. revisions to permits and licences, ecological survey results)
 - Six monthly reviews in April and October to align with the hydrological year, enabling lessons learnt and good practice to be reviewed and be drawn into an updated plan
- 1.3.7 The Water Monitoring Plan will be reviewed in light of monitoring results and any updates must be made in line with the principles listed in the **Monitoring and Response Strategy** provided as **Volume 3, Appendix 2.14.A** of the **ES Addendum** [\[AS-236\]](#). Revisions to the Water Monitoring Plan would be submitted pursuant to Requirement 7 to East Suffolk Council for approval, following consultation with the Environment Agency, Royal

Society for the Protection of Birds (RSPB), Natural England, the East Suffolk Internal Drainage Board and the Local Lead Flood Authority.

2 PROPOSED MONITORING NETWORK

2.1.1 A summary of the proposed monitoring locations to be included in the network and monitored by SZC Co. is provided in Plate 2.1 and Table 2.1.

Plate 2.1: Locations of proposed monitoring installations

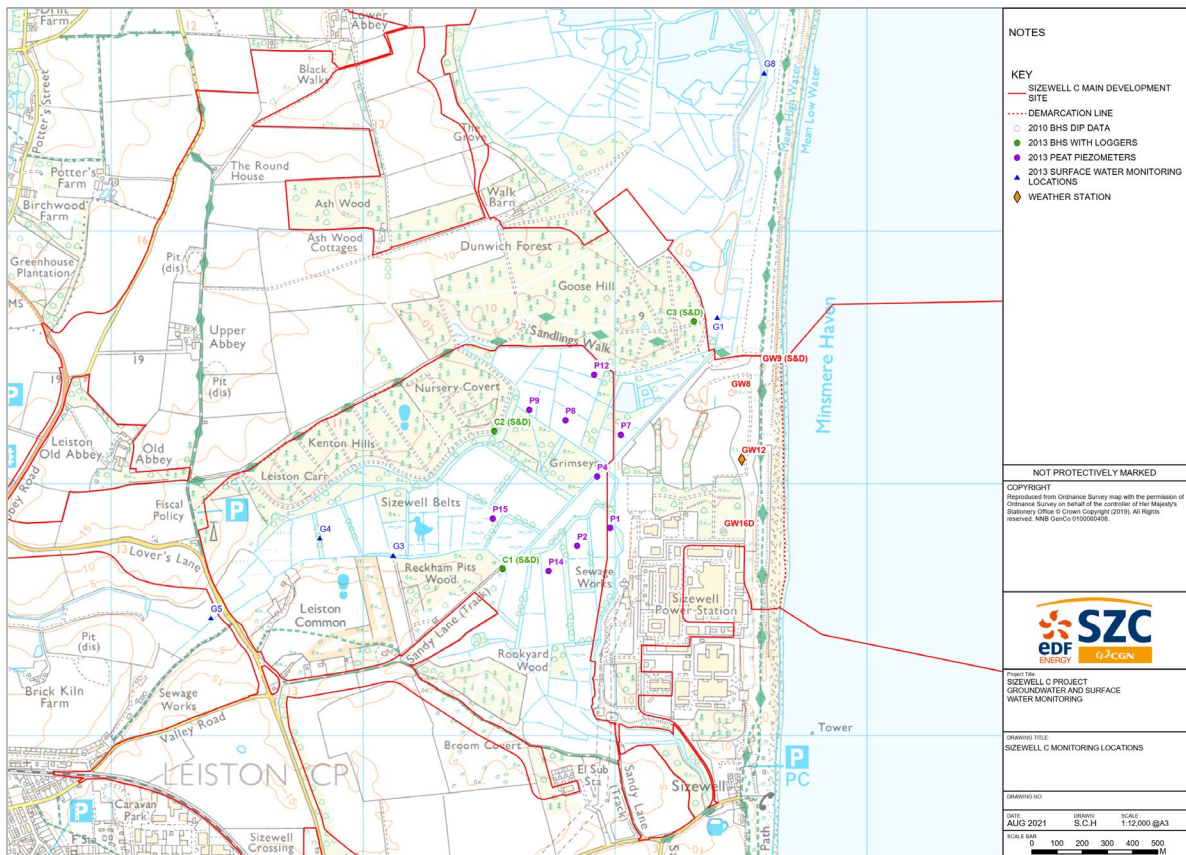


Table 2.1: Summary of the proposed water monitoring locations

Installation type and identifiers	Location	Frequency	Rationale
Piezometer P1, P4, P7	Eastern boundary of Sizewell Marshes	Automatic loggers recording water level every 15 minutes, with monthly downloads and manual measurements. Water quality twice yearly in winter and summer.	The proximity of these monitoring locations to the main construction area (MCA), the realigned Sizewell Drain (DRN163G0202 and DRN163G0201), and areas of maximum drawdown in the peat. They measure groundwater in the shallow peat, and will allow the early identification of effects that may extend further into the designated wetland. Trigger levels will be established for these locations.
Piezometer P2, P8, P9, P12, P14, P15	Within fen meadow	Automatic loggers recording water level every 15 minutes, with monthly downloads and manual measurements. Water quality twice yearly in winter and summer.	The monitoring locations sit in the nationally designated fen meadow habitats. They measure groundwater in the shallow peat and lie within the zone where drawdown of more than 0.1m is predicted in Crag. Whilst smaller effects are predicted in the peat, the monitoring locations are proposed to verify these findings. Trigger levels will be established for these locations.

Installation type and identifiers	Location	Frequency	Rationale
Borehole C1 (S&D), C2 (S&D), & C3 (S&D)	To the north and west of the MCA	Automatic loggers recording water level every 15 minutes, with monthly downloads and manual measurements. Water quality twice yearly in winter and summer.	Shallow and deep paired boreholes, monitoring groundwater levels and quality at different elevations in the strata. Provides a proximal comparison between water levels in the Crag and peat, and verifies predicted changes in the Crag.
Borehole GW8, GW9 (S&D), GW12, GW16(D)	Within the MCA	Automatic loggers recording water level every 15 minutes, with monthly downloads and manual measurements. Water quality twice yearly in winter and summer.	Boreholes in different strata within the MCA. These will ultimately be lost during construction.
Gauging station G3, G4	Western parts of Sizewell Marshes	Automatic loggers recording water level every 15 minutes, with monthly downloads and manual measurements. Water quality twice yearly in winter and summer.	Surface water monitoring to understand the distribution of the key surface water inputs to Sizewell Marshes to be measured.

Installation type and identifiers	Location	Frequency	Rationale
Gauging station G5	Aldhurst Farm	Automatic loggers recording water level every 15 minutes, with monthly downloads and manual measurements. Water quality twice yearly in winter and summer.	Surface water monitoring linked to the operation of the compensatory habitat. A condition of the permits and licences for the operation of Aldhurst Farm.
Gauging station G1, G8	Downstream of SSSI crossing	Automatic loggers recording water level every 15 minutes, with monthly downloads and manual measurements. Water quality twice yearly in winter and summer.	Surface water monitoring providing the means of demonstrating the lack of effect downstream of the MCA. The reach is influenced by tide locking at Minsmere Sluice, which can only fully be separated from the fluvial influence by using both gauges.
Surface water sampling	Topographic low points within the fen meadow habitat	Water quality twice yearly in winter and summer.	This is a new element, included to monitor water quality within the SSSI. Sampling will take place in local depressions or small topographic features within fen meadow habitats favoured by low lying and/or rarer species. See TEMMP [REP5-088] for details on the targeting of monitoring locations.

2.1.2 Water level and water quality data are collected at the same monitoring locations. Water levels are monitored at all sites using a combination of automated sensors verified by manual readings. The frequency of water quality monitoring is lower than the water level monitoring. It is conducted twice per year through a combination of in-situ field sampling and laboratory analysis. Baseline monitoring results are summarised in the Conceptual Site Model of the Hydrogeological Regime ([APP-304](#)).²

2.1.3 The proposed list of water quality determinands in Table 2.2 is focused on a simple suite of parameters and major nutrients.

Table 2.2: Summary of the proposed groundwater monitoring locations to be included in the core network

Determinand	Units	Limit of detection
pH	n/a	n/a
Electrical Conductivity	µS/cm	1
Alkalinity (Total)	mg/l	10
Chloride	mg/l	1
Ammonium	mg/l	0.05
Ammoniacal Nitrogen as NH ₃ and NH ₄	mg/l	0.05
Nitrite	mg/l	0.02
Nitrate	mg/l	0.5
Total Phosphorus	mg/l	0.02
Phosphate	mg/l	0.2
Sulphate	mg/l	1.0
Total Oxidised Nitrogen	mg/l	0.2
Calcium	mg/l	5.0
Potassium	mg/l	0.5
Magnesium	mg/l	0.5
Sodium	mg/l	0.5

3 ESTABLISHMENT OF TRIGGER LEVELS

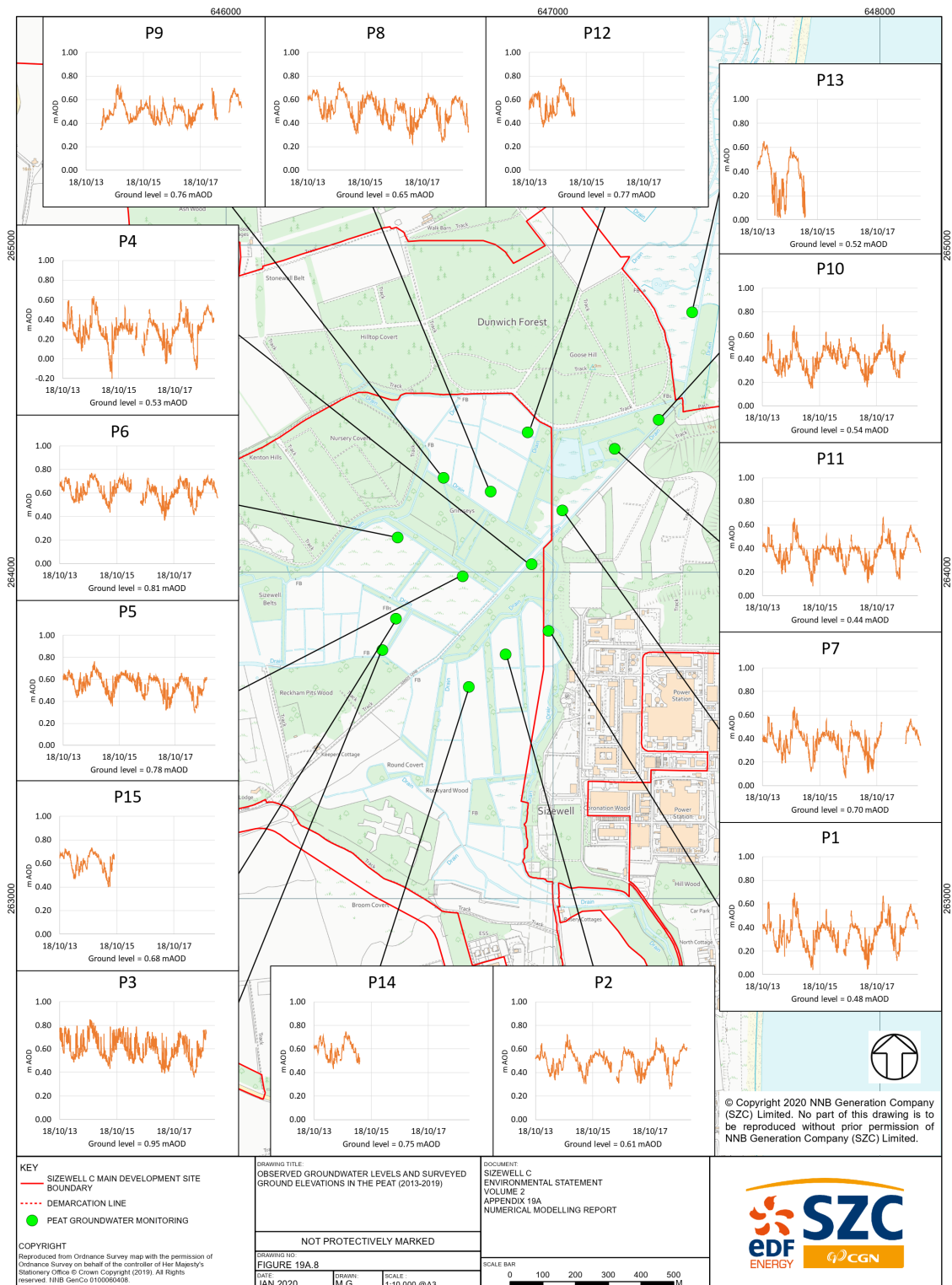
3.1.1 Should data collection and analysis identify an environmental effect from the construction and operation of Sizewell C that is beyond those predicted within the Environmental Statement, it will trigger an action to reduce that effect.

3.1.2 Any response to changes in groundwater or surface water systems needs to be made with reference to the requirements of affected waterbodies, and their sensitivity to change. The following sub-sections present information on Sizewell Marshes and proposed triggers for action by SZC Co.

² Note: in the final version of this Plan, the baseline levels will be contained in a table or appendix.

- 3.1.3 The management of water levels across Sizewell Marshes SSSI is currently covered by the Sizewell Belts WLMP (Environment Agency, 1998), which describes the responsibilities of all relevant parties in maintaining an appropriate hydrological regime to support the designated wetland features. It was published in 1998 and has not subsequently been updated. The following key information sources have been produced since the publication of the WLMP in 1998, which provide independent evidence on the ecohydrological requirements of the designated features that are present on Sizewell Marshes SSSI:
- Ecohydrological guidelines for wet woodland (Barsoum *et al.*, 2005)
 - Ecohydrological guidelines for lowland wetland plant communities (Wheeler *et al.*, 2004)
 - A wetland framework for impact assessment at statutory sites in England and Wales (Wheeler *et al.*, 2009a)
 - Wetland functional mechanisms: a synopsis of WETMECS (Wheeler *et al.*, 2009a)
- 3.1.4 Natural England's latest condition assessment, conducted in 2021, indicates that Sizewell Marshes SSSI is in favourable condition. Elevated water levels across parts of the site, however, impeded Natural England's ability to complete the condition assessment for the whole site.
- 3.1.5 SZC Co. has coordinated a wealth of site-specific surveys, investigations and analyses to inform the development of the Sizewell C project. This includes transient groundwater modelling [APP-298], surface water and groundwater monitoring [APP-304], and ecological surveys that cover the whole of Sizewell Marshes SSSI [APP-226].
- 3.1.6 From the monitoring data collected since 2011, the following observations can be made regarding the water management regime:
- water levels are not currently held within 0.15m of ground levels at all times (see [Figure 19A.8 \[APP-298\]](#), which is presented as Plate 3.1), as was the stated target for the original WLMP (Environment Agency, 1998); and
 - peak water levels are at or close to ground levels, however, minimum levels are often at greater depth than the target, even in the areas supporting the highest quality M22 communities.

Plate 3.1: observed groundwater levels in peat for piezometers on Sizewell Marshes



Source: Figure 19A.8 [APP-298]

3.1.7 The micro-topographic variability across the site adds complexity when describing hydrological conditions for the designated communities. The difference between tussock tops and the surrounding ground surface is a key interest within the fen meadow areas. Tussocks in the SSSI range in height from 0.05m to 0.15m.

3.1.8 Validated LiDAR data are available for Sizewell Marshes, meaning that it has been feasible to describe the water management regime for each unit of the SSSI. These data are used as the basis for defining water levels triggers. High resolution water level monitoring will then be used to assess whether conditions within Sizewell Marshes are consistent with the baseline (pre-construction) period.

a) Triggers for action

3.1.9 The objective throughout the construction period is to maintain the existing water management regime. From the available baseline information, it is clear that the use of published literature alone to define triggers for action is not appropriate. Baseline water level monitoring data have been analysed to define triggers, which have the following characteristics:

- Triggers are defined based on the requirements of the fen meadow (M22) community as this has the most exacting water management requirements on the site.
- Monthly triggers are defined for the peat piezometers within Sizewell Marshes, reflecting the seasonal changes in water level requirements throughout the year.
- November to February inclusive, maximum water levels can be less than 0.15m below ground level. Minimum levels are defined by the 70th percentile water level from the baseline monitoring.
- March to October inclusive, upper and lower triggers are defined for each month, with an upper threshold defined by 30th centile values recorded from baseline monitoring and a lower threshold defined by the 70th centile values.

3.1.10 Defining triggers using these characteristics recognises the range of conditions that are observed on the site. Patterns of water level across the marshes will be reviewed as a whole, not simply for an individual location. Table 3.1 lists the proposed values triggers, based on baseline monitoring at the sites.

3.1.11 This approach is illustrated in Plate 3.2, which has been derived from groundwater level data collected at location P8, within the fen meadow

(M22) habitat. For location P8, ground level is at 0.654mAOD. In the winter months, water levels are typically above the ground surface. The need for action would be triggered if water levels dropped below the 70th centile value (within the red shaded area). The process for taking action is described in Section 4.

- 3.1.12 Summer water levels show similar levels of variability to winter levels, including some periods where water levels exceed ground level. In the summer, triggers prescribed when water levels drop below the 70th centile and are higher than the 30th centile (both areas are shaded red).
- 3.1.13 Routine water quality monitoring will continue but will not be used as a trigger for action. It will feed into the twice-yearly reviews of the Water Monitoring Plan. Should a potential impact on water levels be identified then further targeted water quality monitoring will be a potential action. Targeting may be for specific locations and determinands to investigate specific issues.

Table 3.1: Proposed water level triggers and supporting thresholds

Location	P1	P2	P4	P8	P9	P12	P14	P15
Ground level at piezometer	0.484	0.609	0.526	0.654	0.762	0.766	0.746	0.684
Mean ground level in compartment	-	0.550	-	0.650	0.740	0.650	0.710	0.710
Indicative summer trigger based on mean ground level in compartment	-	0.400	-	0.500	0.590	0.500	0.560	0.560
January triggers	Lower: 0.410	Lower: 0.495	Lower: 0.354	Lower: 0.699	Lower: 0.602	Lower: 0.572	Lower: 0.570	Lower: 0.653
February triggers	Lower: 0.378	Lower: 0.499	Lower: 0.308	Lower: 0.737	Lower: 0.572	Lower: 0.551	Lower: 0.550	Lower: 0.657
March triggers	Lower: 0.301	Lower: 0.504	Lower: 0.199	Lower: 0.689	Lower: 0.548	Lower: 0.518	Lower: 0.537	Lower: 0.609
April triggers	Upper: 0.327 Lower: 0.221	Upper: 0.518 Lower: 0.454	Upper: 0.410 Lower: 0.137	Upper: 0.760 Lower: 0.606	Upper: 0.592 Lower: 0.473	Upper: 0.524 Lower: 0.447	Upper: 0.548 Lower: 0.491	Upper: 0.626 Lower: 0.518
May triggers	Upper: 0.273 Lower: 0.212	Upper: 0.471 Lower: 0.400	Upper: 0.303 Lower: 0.109	Upper: 0.682 Lower: 0.605	Upper: 0.596 Lower: 0.505	Upper: 0.477 Lower: 0.386	Upper: 0.514 Lower: 0.447	Upper: 0.578 Lower: 0.489
June triggers	Upper: 0.279	Upper: 0.416	Upper: 0.244	Upper: 0.673	Upper: 0.626	Upper: 0.508	Upper: 0.451	Upper: 0.548

SIZEWELL C PROJECT
– DRAFT WATER MONITORING PLAN

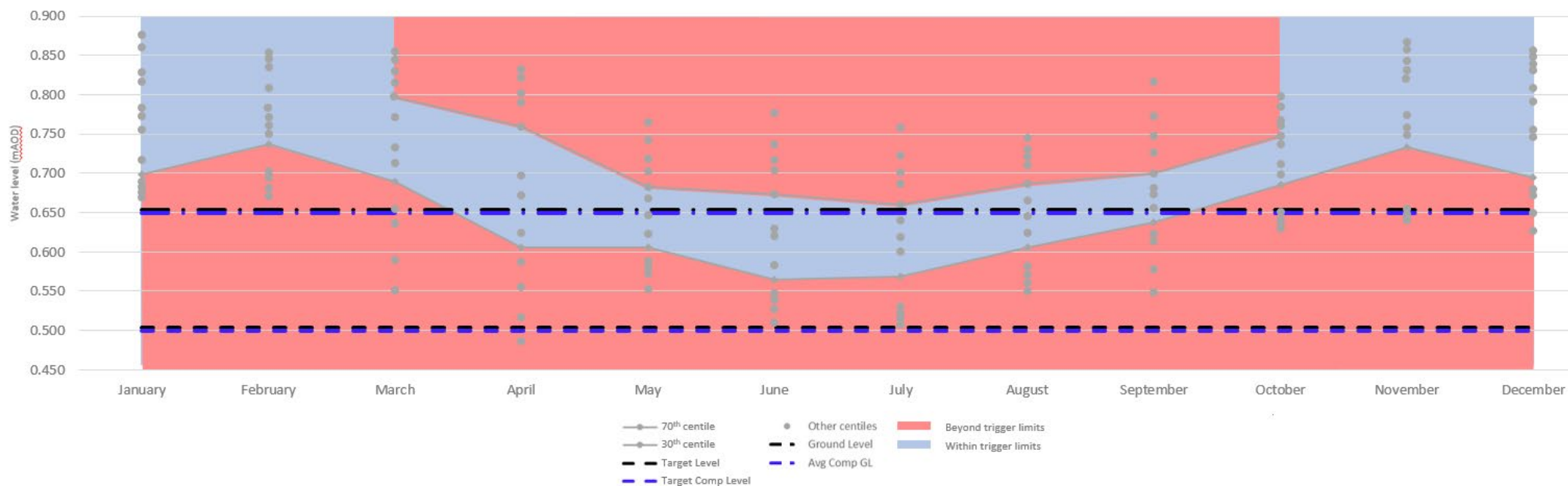
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Location	P1	P2	P4	P8	P9	P12	P14	P15
	Lower: 0.152	Lower: 0.354	Lower: 0.017	Lower: 0.565	Lower: 0.586	Lower: 0.393	Lower: 0.334	Lower: 0.447
July triggers	Upper: 0.282 Lower: 0.153	Upper: 0.422 Lower: 0.318	Upper: 0.171 Lower: 0.042	Upper: 0.660 Lower: 0.569	Upper: 0.637 Lower: 0.595	Upper: 0.508 Lower: 0.301	Upper: 0.499 Lower: 0.377	Upper: 0.578 Lower: 0.419
August triggers	Upper: 0.324 Lower: 0.212	Upper: 0.473 Lower: 0.354	Upper: 0.308 Lower: 0.206	Upper: 0.686 Lower: 0.606	Upper: 0.673 Lower: 0.606	Upper: 0.474 Lower: 0.319	Upper: 0.531 Lower: 0.432	Upper: 0.591 Lower: 0.459
September triggers	Upper: 0.355 Lower: 0.287	Upper: 0.468 Lower: 0.418	Upper: 0.426 Lower: 0.217	Upper: 0.700 Lower: 0.637	Upper: 0.735 Lower: 0.618	Upper: 0.441 Lower: 0.316	Upper: 0.526 Lower: 0.489	Upper: 0.617 Lower: 0.505
October triggers	Upper: 0.397 Lower: 0.355	Upper: 0.534 Lower: 0.452	Upper: 0.436 Lower: 0.315	Upper: 0.748 Lower: 0.685	Upper: 0.715 Lower: 0.644	Upper: 0.587 Lower: 0.444	Upper: 0.577 Lower: 0.479	Upper: 0.665 Lower: 0.560
November triggers	Lower: 0.406	Lower: 0.496	Lower: 0.422	Lower: 0.733	Lower: 0.609	Lower: 0.572	Lower: 0.553	Lower: 0.624
December triggers	Lower: 0.412	Lower: 0.496	Lower: 0.399	Lower: 0.695	Lower: 0.604	Lower: 0.556	Lower: 0.544	Lower: 0.640

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Plate 3.2: Groundwater level centiles for piezometer P8 on Sizewell Marshes

Monitoring Point P8 - M22 NVC

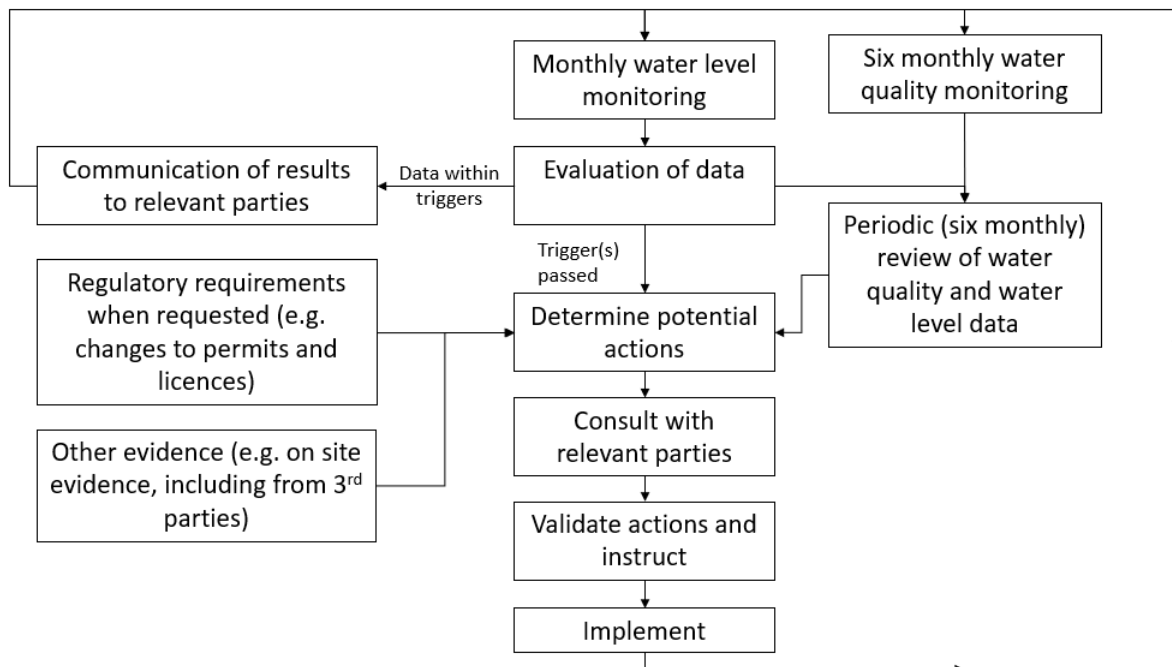


4 USE OF TRIGGERS

4.1.1 Monitoring would be reported to the ERG, who would provide advice on whether the trigger levels had been reached, the intervention and the action that may be required. SZC Co. would then implement the advice of the ERG.

4.1.2 **Plate 4.1** outlines the process for obtaining data, reviewing it, determining action, its acceptance and implementation.

Plate 4.1: Process for monitoring and action



4.1.3 SZC Co. will download water level data and review it on a monthly basis. The passing of a trigger at a specific location would lead to a rapid review of data from the wider monitoring network, led by SZC Co. This would determine the scale of issue and the required adjustment of the water control structure. This proposed adjustment would be discussed with relevant parties, validated by the ESG and East Suffolk Council, and would then be implemented by SZC Co.

4.1.4 Once constructed, the proposed control structure on the realigned Sizewell Drain will be the principal means of adjusting water levels across Sizewell Marshes. When water levels are above bankfull levels or below the bed level at the location of the structure there will be no direct mechanism for controlling levels on Sizewell Marshes.

- 4.1.5 Water levels above bankfull levels at the location of the water control structure would ultimately be governed by the Minsmere Sluice and flow conditions along the Leiston Drain. Similarly, when water levels are below the bed level at the location of the control structure, they would ultimately be governed by the prevailing natural hydraulic gradient in the wider groundwater system.
- 4.1.6 SZC Co. would be committed to controlling the inputs of surface water drainage into the marshes from the construction and operation activities, as secured by Requirement 5 of the dDCO (Doc Ref. 3.1(G)) and subsequent drainage consents (once applied for and approved). For the purposes of the Water Monitoring Plan, as secured by Requirement 7 of the dDCO (Doc Ref. 3.1(G)), the trigger range for action is taken as between the 70th centile (lower level threshold) at the corresponding monitoring locations and the ground level at the location of the water control structure.
- 4.1.7 On a six monthly (twice yearly) basis, water quality monitoring will be undertaken which will feed into a periodic review of monitoring procedures and trigger levels.
- 4.1.8 Two broader factors may also lead to a review of monitoring procedures and potential actions. Firstly, the granting of environmental permits and licences may include conditions for water level monitoring and control. Secondly, where other evidence is presented (e.g. from the Terrestrial Ecology Monitoring and Mitigation Plan (TEMMP)) it may be relevant to amend water management on Sizewell Marshes. Where relevant these external factors will lead to an update to the Water Monitoring Plan to ensure a coordinated approach.
- 4.1.9 These protocols may require other permissions to be in place (e.g. impoundment licence, environmental permits) and would be updated to ensure that they include additional triggers underpinning the permits and permissions.
- 4.1.10 Where appropriate, passing of a trigger would also instigate wider stakeholder engagement and investigation. For example, where an external pressure is the potential cause of a trigger being passed, including water levels above ground level at the location of the water control structure.
- 4.1.11 SZC Co. is drafting a side agreement between SZC, NGL and the RSPB as the riparian landowners along Leiston Drain. This will potentially include other relevant bodies including the Environment Agency, East Suffolk IDB and Natural England. This will set out the shared objectives for managing water levels within Sizewell Marshes. Its objective will be to ensure that all parties continue to manage water levels within their land ownership in a

manner that is consistent with maximising the ecological value of the SSSI. The agreement would seek to ensure that no party places additional burden on adjoining landowners without their prior approval. The agreement will provide that all parties will use reasonable endeavours to work together in managing water levels in the area and will work together constructively and proactively. The agreement is intended to recognise SZC Co.'s new role and re-formalise the existing agreements in place or implicit in the management of the SSSI. Whilst not required to facilitate the implementation of the Water Monitoring Plan, the sharing of data and the findings of its periodic review will be aided by the formation of this side agreement.

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