MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 3, Annex 3.4: River morphology survey technical report

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Glossary

Term	Meaning
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Baseline	The status of the environment without the Transmission Assets in place.
Biodiversity benefit	An approach to development that leaves biodiversity in a better state than before. Where a development has an impact on biodiversity, developers are encouraged to provide an increase in appropriate natural habitat and ecological features over and above that being affected.
Cartographer workspace	This is a web-based app used to record the Modular River Physical (MoRPh) Field Survey data and carry out the River Type Survey.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to, and information to support, the Environmental Impact Assessment and Habitats Regulations Assessment processes for certain topics.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Expert Working Group	A forum for targeted engagement with regulators and interested stakeholders through the Evidence Plan Process.
Important Ecological Feature	Those features that are important and should be subject to detailed assessment, as explained in the Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018).
MoRPh	The Modular River Physical survey. The MoRPh survey is one part of the Modular River Survey suite of scaled assessment techniques.
MoRPh5	A series of five consecutive Modular River Physical surveys. Multiple MoRPh5 surveys allow a balance between detailed recording of local features and broader coverage of the river by significant numbers of MoRPh surveys. MoRPh5 surveys underpin the River Condition Assessment component of DEFRA's Biodiversity Metric
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.

Term	Meaning
Onshore Order Limits	See Transmission Assets Order Limits: Onshore (below).
River Condition	River Condition is the result of the River Condition Assessment. The final River Condition is determined from the results of Morph5 surveys and a desk-based assessment of river-type.
River Condition Assessment	River Condition Assessment (RCA) combines MoRPh field survey with a geomorphological River Type desk study to generate and help interpret a detailed set of 37 MoRPh Pro indicators and raw data, securely saved in the Cartographer workspace. The River Condition Assessment method provides environmental professionals with the in-depth knowledge and software tools to enable the baseline assessment of River Condition together with scenario modelling for target condition, as needed for biodiversity benefit reporting. The RCA method can also be used for other types of post-intervention investigations e.g. river restoration.
Study area	This is an area which is defined for each environmental topic which includes the Transmission Assets Order Limits as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each topic is intended to cover the area within which an impact can be reasonably expected.
Survey area	The area within which each survey has been undertaken. This may differ from the Study Area as a Survey Area will be based on species or survey-specific guidance on the extent of survey required, which may be limited by, for example, habitat conditions, or be defined in terms of buffer areas around an area of potential impact.
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above).
Transmission Assets Order Limits: Onshore	The area within which all components of the Transmission Assets landward of Mean High Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds). Also referred to in this report as the Onshore Order Limits, for ease of reading.

Acronyms

Acronym	Meaning
EIA	Environmental Impact Assessment
ES	Environmental Statement
IEF	Important Ecological Feature
MoRPh	Modular River Physical Survey
RCA	River Condition Assessment

Units

Unit	Description
%	Percentage
m	Metres

1 River morphology survey technical report

1.1 Introduction

1.1.1.1 This document forms Volume 3, Annex 3.4: River morphology survey technical report of the Environmental Statement (ES) prepared for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (hereafter referred to as 'the Transmission Assets'). The ES presents the findings of the Environmental Impact Assessment (EIA) process for the Transmission Assets.

1.1.1.2 River Condition Assessment (RCA) combines Modular River Physical (MoRPh) field survey with a geomorphological River Type desk study. The desk study element is a reach-based study identifying the hydrogeomorphological river type. The MoRPh survey comprises a field survey technique, used to identify features of a watercourse and its adjacent habitat. In combination, the field and desk study gives each individual stretch of the river an RCA score of either: 1= Good, 2= Fairly Good, 3= Moderate, 4= Fairly Poor, 5= Poor.

1.1.1.3 Watercourses, in isolation, are not considered an Important Ecological Feature (IEF) within the ES. However, RCA and the information within this document is used to inform the baseline and any necessary mitigation or enhancement works associated with the watercourse and/or adjacent habitat, including for biodiversity benefit and the metric calculation.

1.1.1.4 This document presents the results of the RCA carried out on watercourses in the survey area, in 2023 and 2024. The purpose of the surveys was to obtain information on river type and condition in case impacts on watercourses requiring mitigation and/or monitoring were identified in the ES, and to provide condition assessment information for biodiversity benefit , as reported in the Onshore Biodiversity Benefit Statement (document reference J11).

1.1.1.5 RCA were carried out on rivers and streams that cross the Onshore Order Limits.

1.1.2 Study area

1.1.2.1 The study area is intended to cover the area within which an impact can be reasonably expected and describes the geographical extent subject to desk-based research.

1.1.2.2 No study area is defined for the RCA, as this document does not identify Important Ecological Features. Instead, as detailed in **paragraph 1.1.1.2**, the purpose of this annex is to provide baseline data and to inform the metric calculation associated with biodiversity benefit.

1.1.3 Survey area

1.1.3.1 The survey area is defined as the area within which each MoRPh field survey has been undertaken and is based on RCA-specific guidance on the extent of the survey required. The survey area for RCA (hereafter referred to as 'the survey area') is defined as a 10 metre (m) buffer around the Onshore Order Limits, as shown in **Figure 1.2** to **Figure 1.4**. A 10 m buffer was adopted as habitats within 10 m of a watercourse are considered to be riparian habitats, and impacts within the 10 m around a watercourse are required to be included within biodiversity benefit assessments.

1.1.3.2 Adopting a survey area that is greater in extent than the Onshore Order Limits ensures that the ES is accurately informed with data from within the Onshore Order Limits (i.e. that may be subject to direct impacts) and data from outside the Onshore Order Limits (i.e. that may be subject to indirect impacts).

1.1.4 Contextual data

1.1.4.1 Owing to the iterative design process of the Transmission Assets, some surveys were undertaken further than 10 m from the Onshore Order Limits. These surveys may have been located within, or within the buffer of, previous iterations of the Onshore Order Limits. Nevertheless, information from these surveys have been included in this technical report because they provide context regarding the ecological sensitivity of the wider area and to inform Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES (where relevant).

1.1.5 Relevant legislation

1.1.5.1 There is no specific regulation in relation to protected species or river morphology relevant to this document, as this document does not identify IEFs. Instead, as detailed in **paragraph 1.1.1.2**, the purpose of this annex is to provide baseline data and, where relevant, to inform the metric calculation associated with biodiversity benefit. Legislation relevant to Biodiversity benefit is detailed in Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES.

1.1.6 Consultation

1.1.6.1 In October 2022, the Applicants submitted an EIA Scoping Report to the Planning Inspectorate, which described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects for the construction, operation and maintenance and decommissioning phases of the Transmission Assets.

1.1.6.2 The scope and methodology of the RCA surveys, including those undertaken beyond the current Onshore Order Limits, were discussed, and agreed with stakeholders via regular onshore ecology Expert Working Group (EWG) meetings. Further detail regarding consultation undertaken with respect to onshore ecology, including terrestrial

invertebrate surveys can be found in Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES.

1.2 Methodology

1.2.1 RCA survey

1.2.1.1 RCA scoping surveys, which identified any suitable watercourses, were undertaken in conjunction with Phase 1 habitat surveys completed within the survey area. Watercourses, including rivers and streams, within 10 m of the Onshore Order Limits were scoped in for RCA surveys.

1.2.1.2 The assessments were carried out by an experienced surveyor with the RCA accreditation and followed the MoRPh survey guidelines outlined in The MoRPh Survey Technical Reference Manual (Gurnell and Shuker, 2022). The river type was also determined using the Guide to Assessing River Condition (Gurnell *et al.*, 2022) (see **Figure 1.1**).

1.2.1.3 The MoRPh survey is a river habitat survey that combines information gathered from three river units of different size (module, sub-reach, reach), based upon both primary site-specific survey and secondary sources (such as map data and remotely sensed data) (referred to hereafter as 'post survey data processing'). A module is a short length of river that are usually approximately twice the width of the river. A sub-reach, or Multi-MoRPh sub-reach is the length of river that is within the area of a proposed development, of which 20% must be surveyed. The reach may be a longer section of river, but is the area extending upstream from the survey area until there is a major tributary providing more than 10% of the flow in the river/stream, a major artificial barrier (e.g. >5m tall – likely to significantly change flow or sediment movement), or there is a distinct and persistent change in planform (e.g. meandering to straight/slightly sinuous).

1.2.1.4 Module and sub-reach (Multi-MoRPh) surveys are conducted in the field using the MoRPh survey method, which focusses on a single river channel and its immediate margins (the banks and land within 10 m of the river bank).

1.2.1.5 The reach (river type) survey encompasses the entire length of a river reach (normally less than 500 m to 10 kilometres (km)) and includes the module and sub-reach surveys. The reach survey attempts to assess the geomorphological type of river that is being surveyed.

1.2.1.6 MoRPh surveys provide a sample of the physical character of the river reach within which they are located. Whilst a single MoRPh characterises the local physical structure of a river, MultiMoRPh surveys aim to record as much of the full range of physical habitats that are supported by the river.

1.2.1.7 RCA site specific surveys, along with post survey data processing is required to generate the river condition outputs for Natural England's Biodiversity Metric Calculation Tool (Natural England, 2024). The outputs would come under the on-site watercourse baseline in the

metric. The methodology for the site-specific survey and post survey data processing is set out below.

Site-specific survey

1.2.1.8 During the site-specific survey element of the RCA, surveyors carried out at least five consecutive MoRPh surveys (collectively termed a MoRPh5) along each watercourse scoped in for survey (**section 1.3.1**), assessing multiple aspects, including the habitats within 10 m of the channel, the bank face, channel margin, and channel bed. Within these aspects, the surveyor considered factors such as:

- ground cover;
- water surface flow types;
- materials and vegetation present;
- natural and artificial features; and
- bank face profile and reinforcement.

1.2.1.9 The RCA guidance (Gurnell and Shuker, 2022) requires at least 20% of the watercourse within the survey area to be surveyed, which may result in multiple MoRPh5 surveys. The number of MoRPh5 surveys required was determined prior to completing the site-specific surveys.

Post-survey data processing

1.2.1.10 The assessed characteristics of the watercourse were input into the Cartographer workspace during or after the field survey, and were used to calculate a value and preliminary condition score for the river based on positive and negative indicators.

1.2.1.11 This is known as MoRPh River Type Pro Surveys of the RCA. This element also determines the properties of the reach of the river that the MoRPh5 surveys lie within and overall. This determined the watercourse type and a condition class/score, from poor to good, for each surveyed section of watercourse. There are 13 river types that can be assigned, which each have a letter code, as shown in **Figure 1.1**.

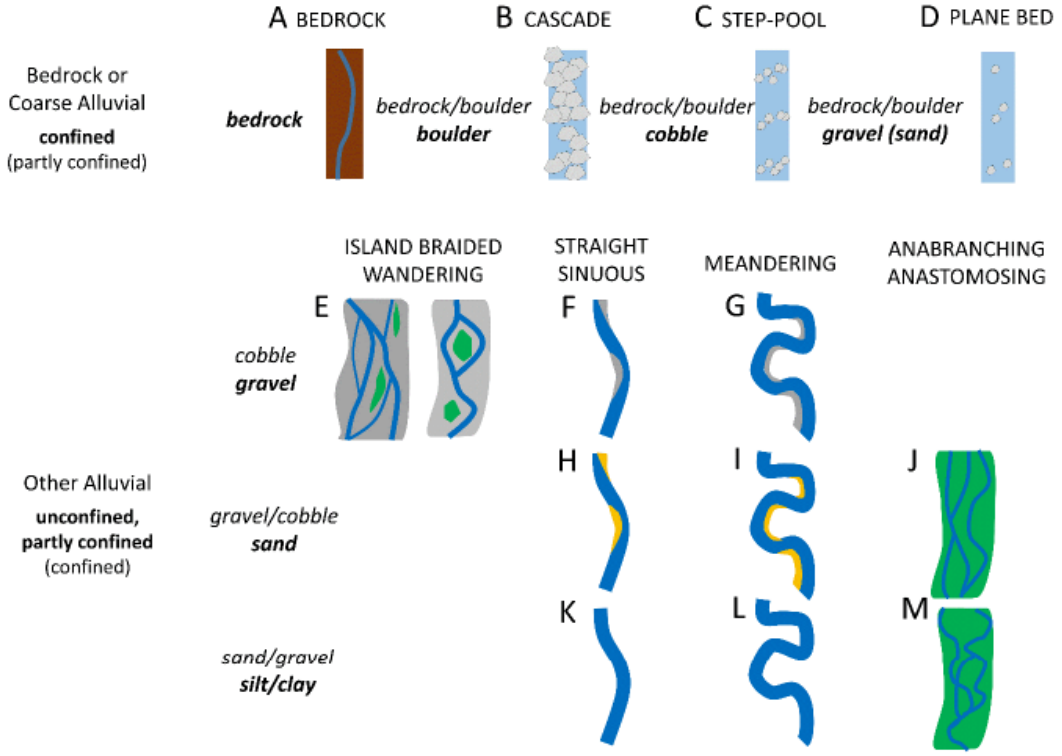


Figure 1.1: River types as classified by Gurnell *et al.* (2022)

Dates of survey

1.2.1.12 The MoRPh field surveys were carried out between December 2023 and July 2024 by an RCA accredited surveyor and assistant. The results of the field surveys produced preliminary condition scores for each site. The MoRPh River Type Pro Surveys were then carried out to determine the river condition for use in the Biodiversity Metric Calculations within the Onshore Biodiversity Benefit Statement (document reference J11).

1.2.2 Limitations

1.2.2.1 No significant limitations were noted for the survey. In some cases full access to bankside for full length of watercourses was not available but this is not considered to significantly affect the validity of the survey results given their limited application.

1.3 Results

1.3.1 Overview

1.3.1.1 Sections of the seven water courses identified as requiring river MoRPh surveys that cross the Onshore Order Limits were surveyed; these were:

- Wrea Brook (watercourse reference C);
- Dow Brook (watercourse reference D);

- Freckleton Pool (watercourse reference R);
- Middle Pool (watercourse reference S);
- Savick Brook (watercourse reference I);
- River Ribble (watercourse reference T); and
- Mill Brook (watercourse references N and P).

1.3.1.2 As per Gurnell and Shuker (2022), prior to carrying out the MoRPh field surveys the extent of the watercourses potentially impacted by the Transmission Assets was calculated, as well as where the MoRPh surveys should be carried out in order to cover 20% of each watercourse.

1.3.1.3 The required sections of watercourses which were surveyed are shown in **Figure 1.2** to **Figure 1.4**.

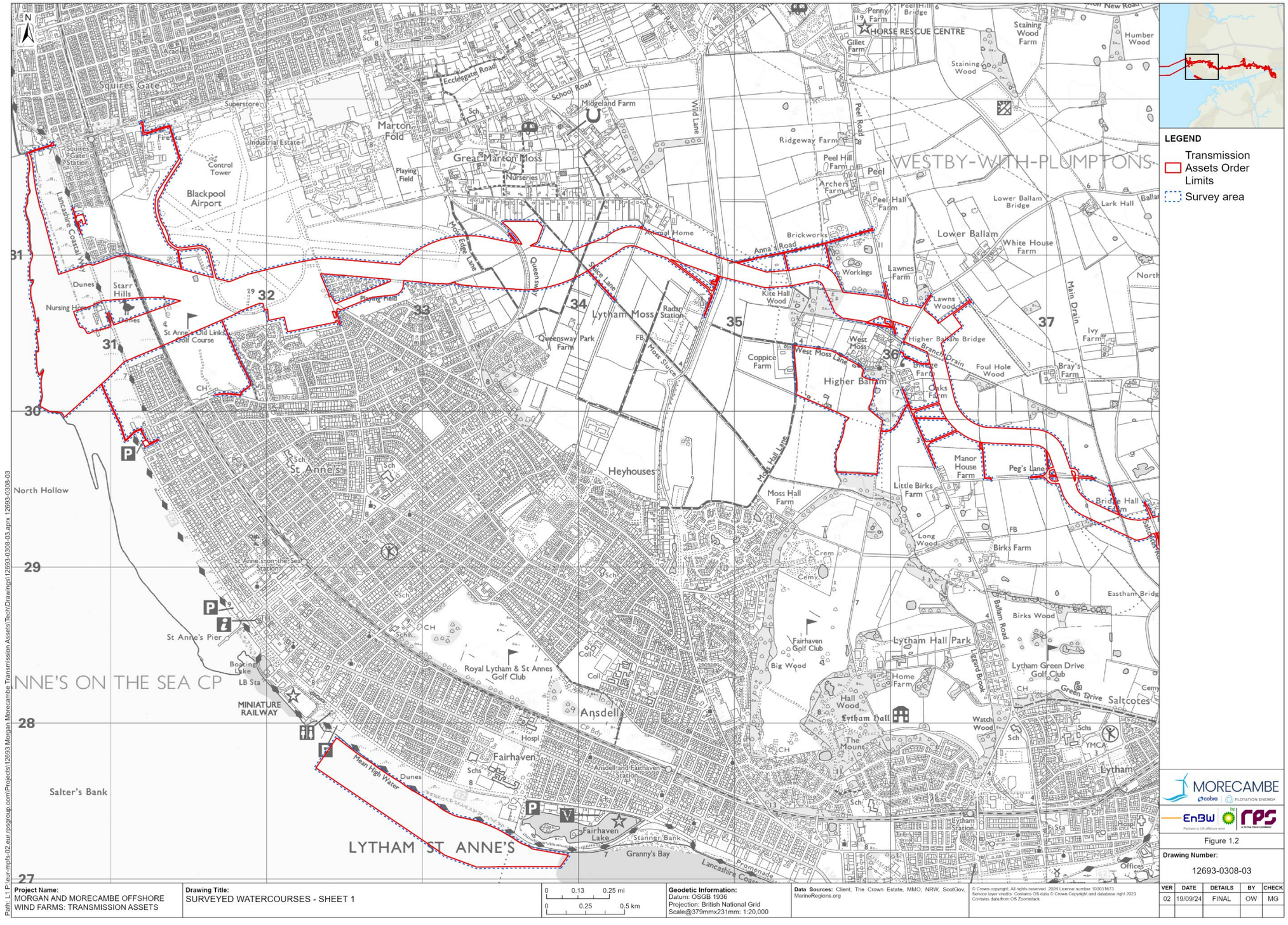
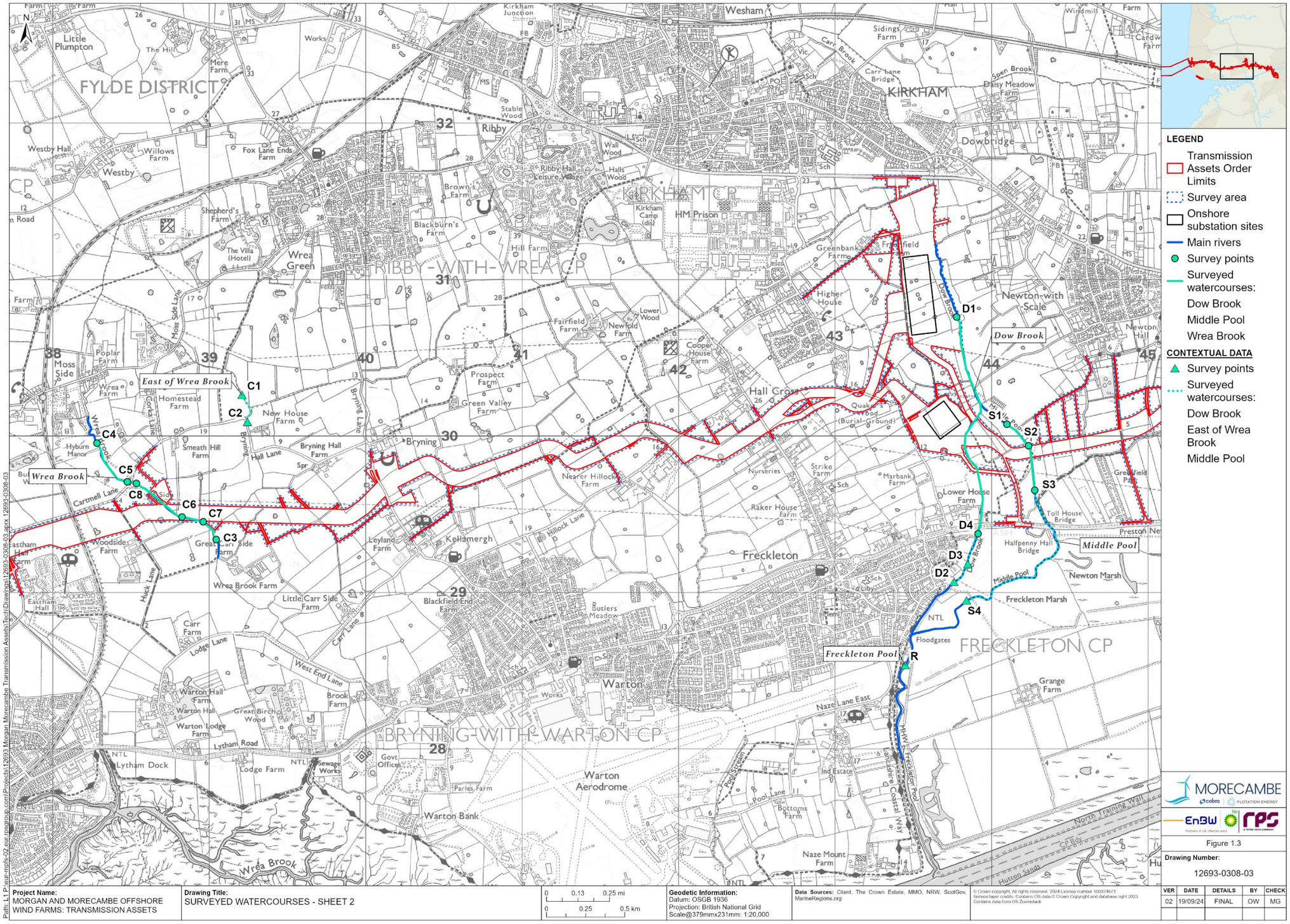


Figure 1.2: Surveyed watercourses – sheet 1



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MORECAMBE cobra FLOTATION ENERGY
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Partners in UK offshore wind

Figure 1.3
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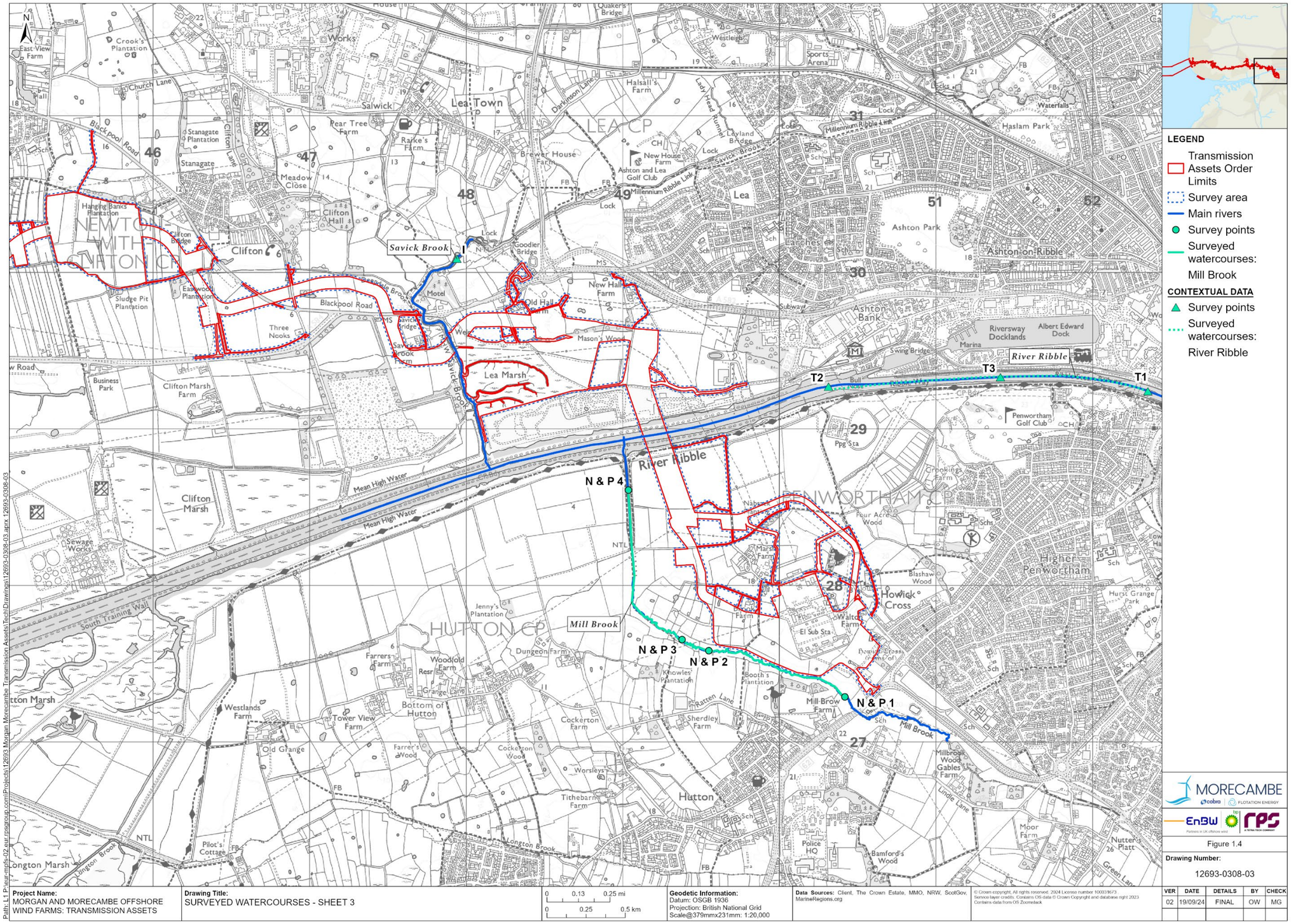
Figure 1.3: Surveyed watercourses – sheet 2



LEGEND

- Transmission Assets Order Limits
- Survey area
- Main rivers
- Survey points
- Surveyed watercourses: Mill Brook

CONTEXTUAL DATA

- Survey points
- Surveyed watercourses: River Ribble

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Drawing Title:	SURVEYED WATERCOURSES - SHEET 3
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Figure 1.4

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Figure 1.4: Surveyed watercourses – sheet 3

1.3.2 MoRPh field survey and river type survey

1.3.2.1 Following completion of the RCA for each watercourse, the final results were calculated in the Cartographer workspace.

1.3.2.2 The location of each MoRPh5, watercourse details, river type, and final condition score are detailed in **Table 1.1** below and **Figure 1.5** to **Figure 1.7**.

1.3.2.3 There are 15 potential river types (A to M). The river types are approximately divided into confined river types (A to D), or unconfined or partly confined (E to M). Within the two divisions rivers are further divided by the dominant type of substrate (bedrock, boulder, cobble, sand) for confined river types, and by its form in unconfined (island braided-wandering, straight-sinuous, meandering, or anabranching / anastomosing.

1.3.2.4 The preliminary condition score for a MoRPh5 sub-reach is translated into a final condition score (5-Good, 4-Fairly Good, 3-Moderate, 2-Fairly Poor, 1-Poor) according to the river type under consideration.

1.3.2.5 The method uses condition indicators which are assigned a positive or negative score with regards to diversity and abundance of physical and hydrological habitats. Negative indicators represent the extent of anthropogenic impacts.

1.3.2.6 Example photographs of each watercourse are shown in **Appendix A**.

Table 1.1: River Condition Assessment summary

Watercourse reference	Watercourse survey location (OS Grid Reference)	Watercourse ID	Watercourse description	Final river type	Final condition score
C	SD 39209 30264	Wrea Brook (1)	Re-aligned stream with two channels, low flow running through arable fields.	K(straight sinuous)	Poor
	SD 39244 30091	Wrea Brook (2)		K	Fairly Poor
	SD 39044 29339	Wrea Brook (3)		K	Poor
	SD 38282 29956	Wrea Brook (4)		K	Fairly Poor
	SD 38477 29708	Wrea Brook (5)		K	Fairly Poor
	SD 38825 29483	Wrea Brook (6)		K	Poor
	SD 38961 29453	Wrea Brook (7)		K	Fairly Poor
	SD 38534 29698	Wrea Brook (8)		K	Fairly Poor
D	SD 43776 30761	Dow Brook (1)	Small watercourse in a rural setting (upstream section)	K	Poor
	SD 43759 29069	Dow Brook (2)		K	Fairly Poor

Watercourse reference	Watercourse survey location (OS Grid Reference)	Watercourse ID	Watercourse description	Final river type	Final condition score
	SD 43847 29182	Dow Brook (3)	Small watercourse running through Freckleton Marsh (downstream section)	K	Fairly Poor
	SD 43912 29376	Dow Brook (4)		K	Poor
S	SD 44097 30076	Middle Pool (1)	Sinuous watercourse running through Freckleton marsh in the South.	K	Fairly Poor
	SD 44236 29939	Middle Pool (2)		K	Fairly Poor
	SD 44275 29655	Middle Pool (3)		K	Poor
	SD 43839 28950	Middle Pool (4)		K	Poor
R	SD 43447 28537	Freckleton Pool	Straight small watercourse following on from Middle Pool and meeting the River further south.	K	Fairly Poor
I	SD 47940 30088	Savick Brook	Straight-sinuous tributary running through farmland and connecting to the River Ribble in the south.	K	Fairly Poor
N and P	SD 50418 27289	Mill Brook (1)	Modified straight channel set within a wooded levee. Tidal flap valve at confluence with the river Ribble to the north. To the south it becomes more meandering and then runs east.	I (meandering)	Fairly Poor
	SD 49548 27584	Mill Brook (2)		I	Moderate
	SD 49378 27655	Mill Brook (3)		I	Fairly Poor
	SD 49035 28611	Mill Brook (4)		K	Poor
T	SD 52352 29241	River Ribble (1)	Large main channel leading to the Ribble Estuary.	Navigable	Fairly Poor
	SD 50313 29271	River Ribble (2)		Navigable	Fairly Poor
	SD 51411 29331	River Ribble (3)		Navigable	Fairly Poor

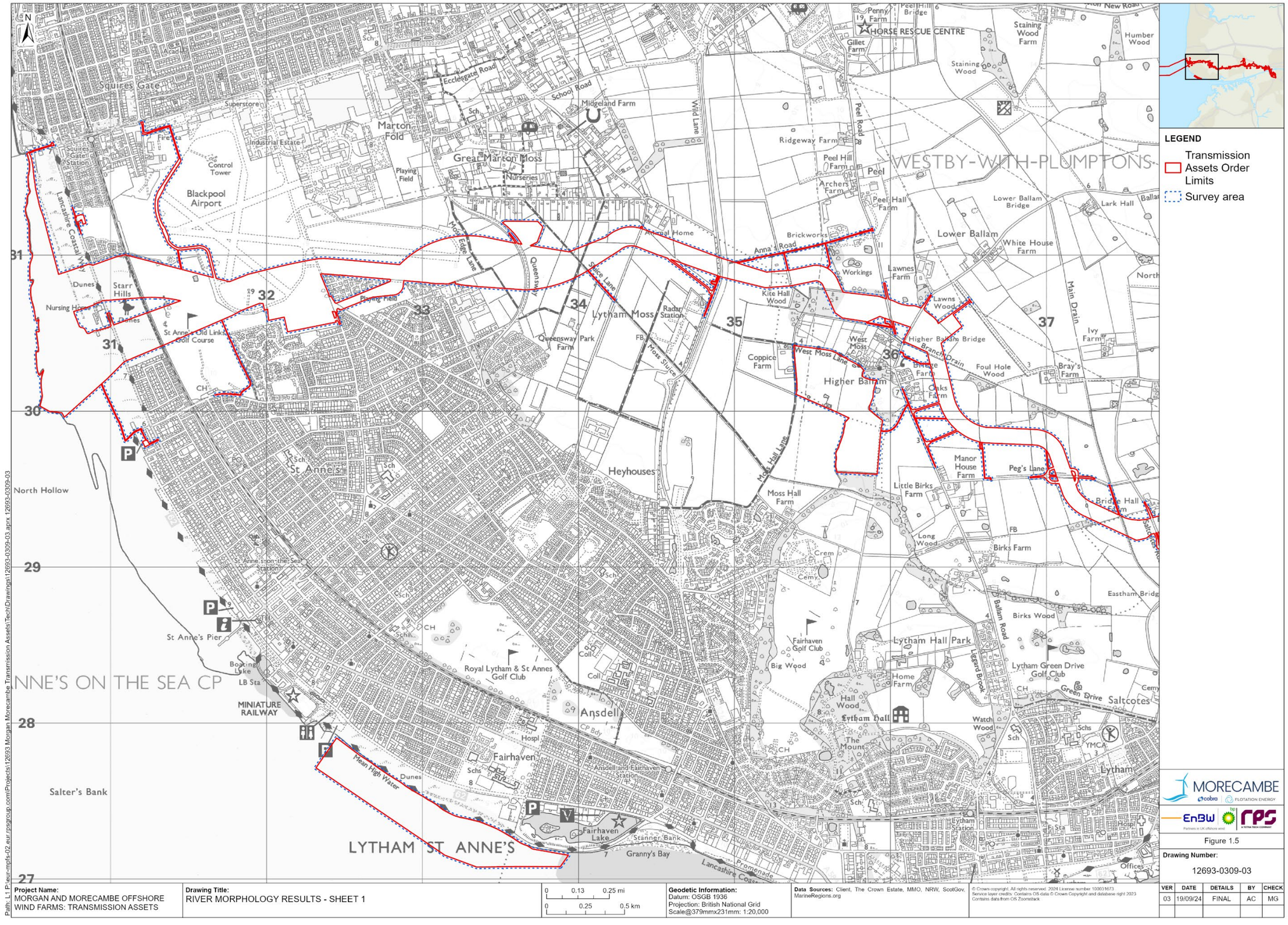


Figure 1.5: River morphology results – sheet 1

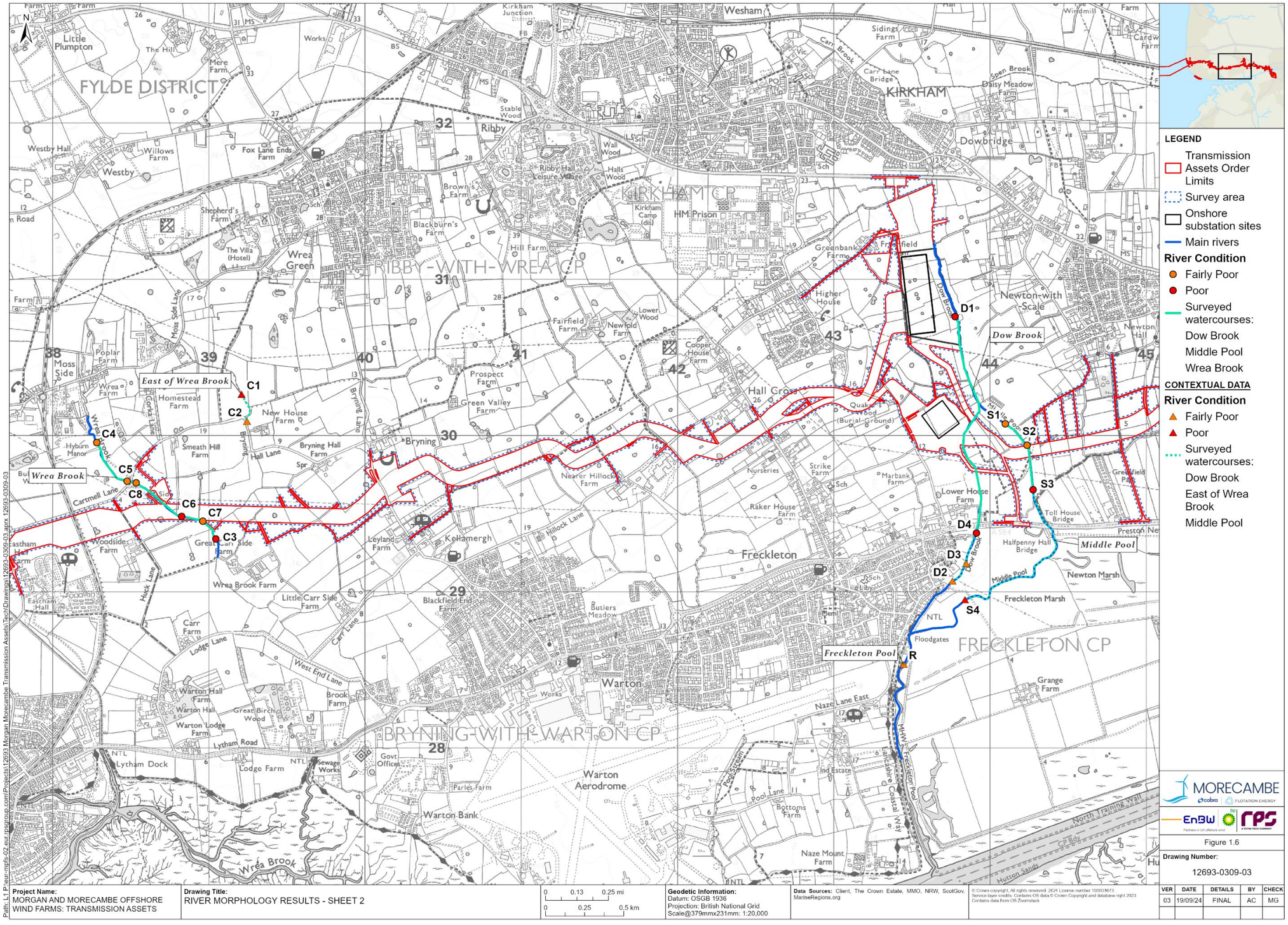
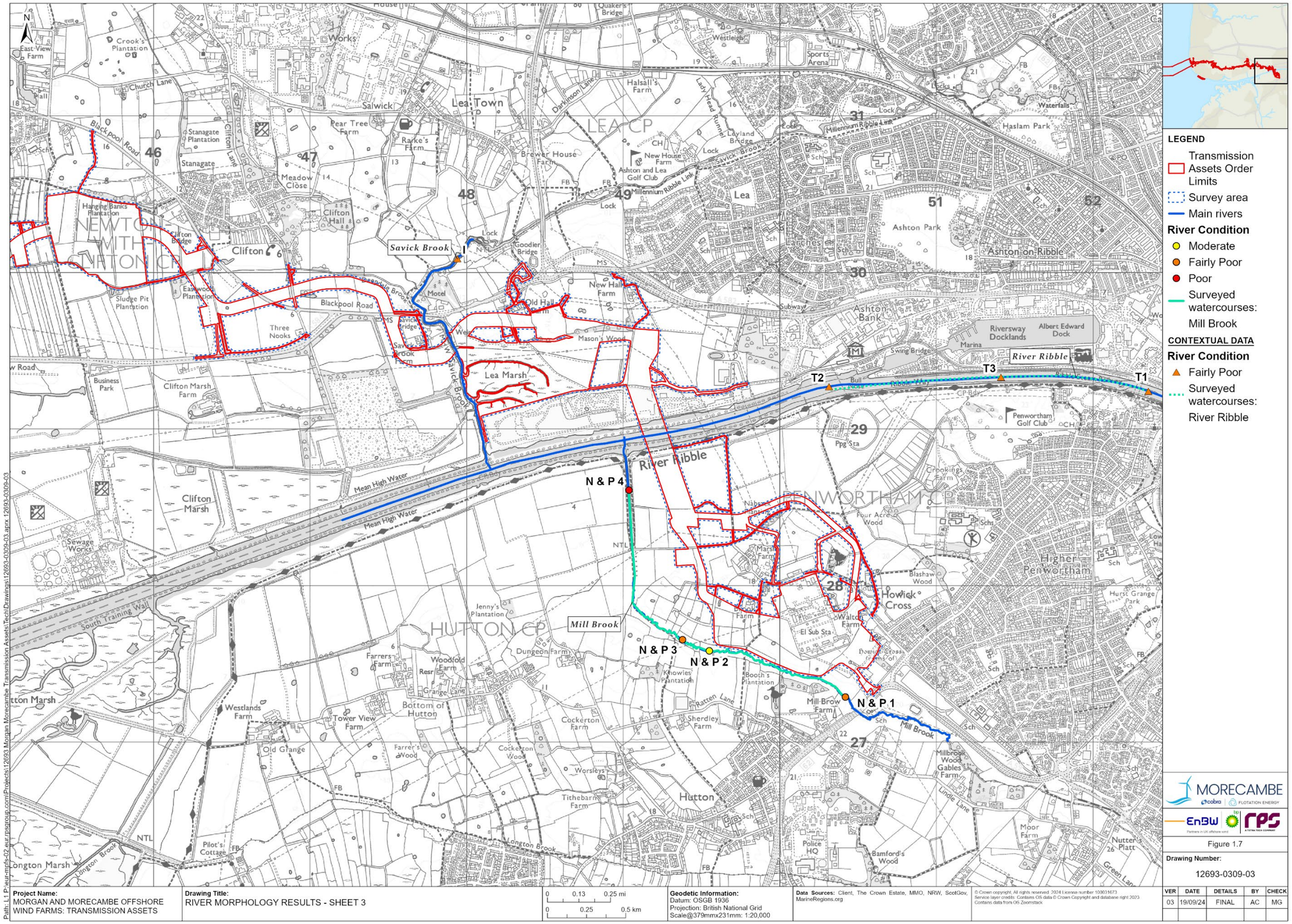


Figure 1.6: River morphology results – sheet 2



LEGEND

- Transmission Assets Order Limits
- Survey area
- Main rivers

River Condition

- Moderate
- Fairly Poor
- Poor
- Surveyed watercourses: Mill Brook

CONTEXTUAL DATA

River Condition

- Fairly Poor
- Surveyed watercourses: River Ribble

Figure 1.7

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Figure 1.7: River morphology results – sheet 3

1.4 Summary

1.4.1.1 This technical report presents the results of the RCA undertaken between December 2023 and July 2024 to inform the baseline of Volume 3, Chapter 3: Onshore ecology and nature conservation of the ES and the Onshore Biodiversity Benefit Statement (document reference J11).

1.4.1.2 Seven watercourses were identified as requiring MoRPh field surveys based on the survey area. All have been surveyed.

1.4.1.3 These watercourses were classed as either straight sinuous, meandering, or navigable rivers and the majority are in poor/fairly poor condition apart from a section of Mill Brook which is classed as moderate condition. This information has been used within the Statutory Biodiversity Metric and the calculation of biodiversity benefit, where relevant. This excludes Freckleton Pool and Middle Pool, which lie outside the survey area.

1.5 References

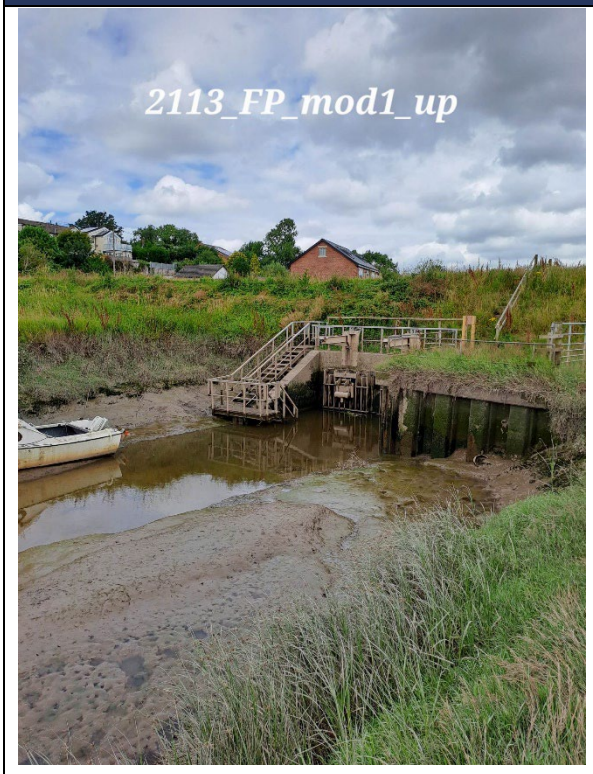
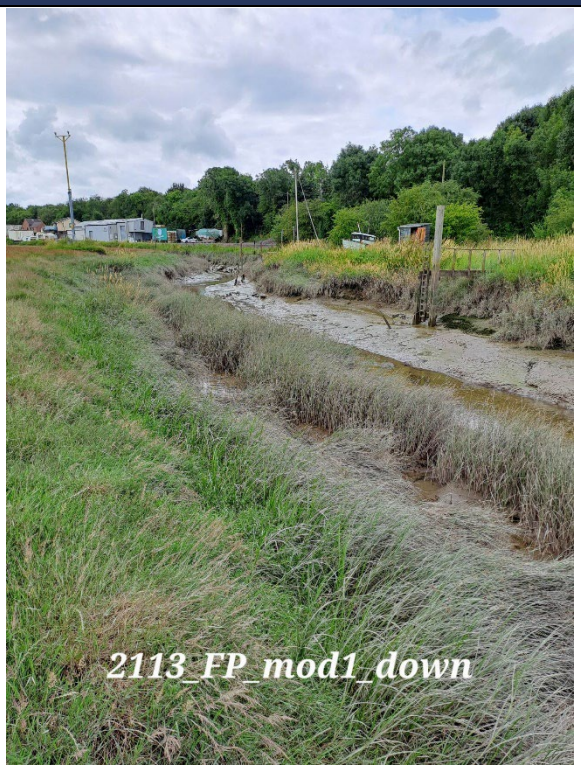
Gurnell, A. and Shuker, L. (eds) (2022) The MoRPh Survey: Technical Reference Manual, 2022 Version. Available at: https://modularriversurvey.org/. Accessed June 2024.

Gurnell, A.M, England, J., Scott, S.J., and Shuker, L.J. (eds) (2022) A GUIDE TO ASSESSING RIVER CONDITION Part of the Rivers and Streams Component of the BioDiversity Net Gain Metric. Available at: https://modularriversurvey.org/. Accessed June 2024.

Natural England (2024) Statutory biodiversity metric tools and guides. Available at: https://www.gov.uk/government/publications/statutory-biodiversity-metric-tools-and-guides Accessed June 2024.

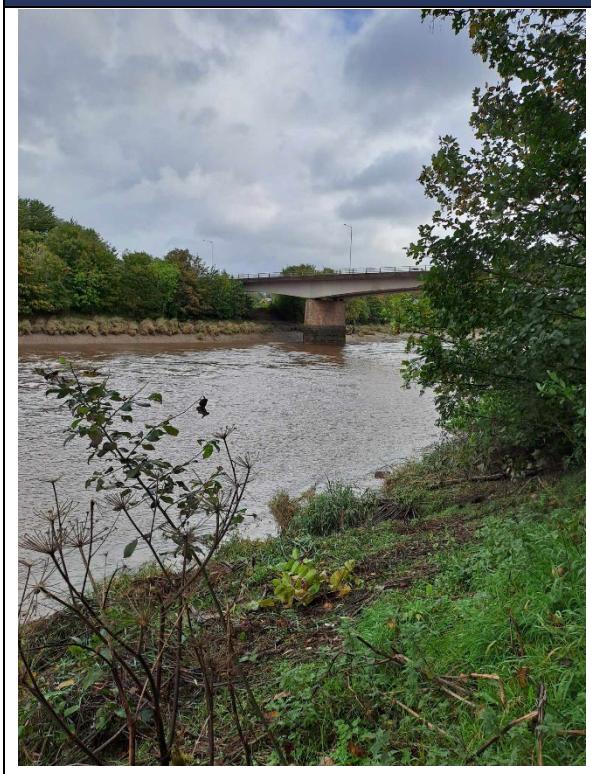
Appendix A: Photographs

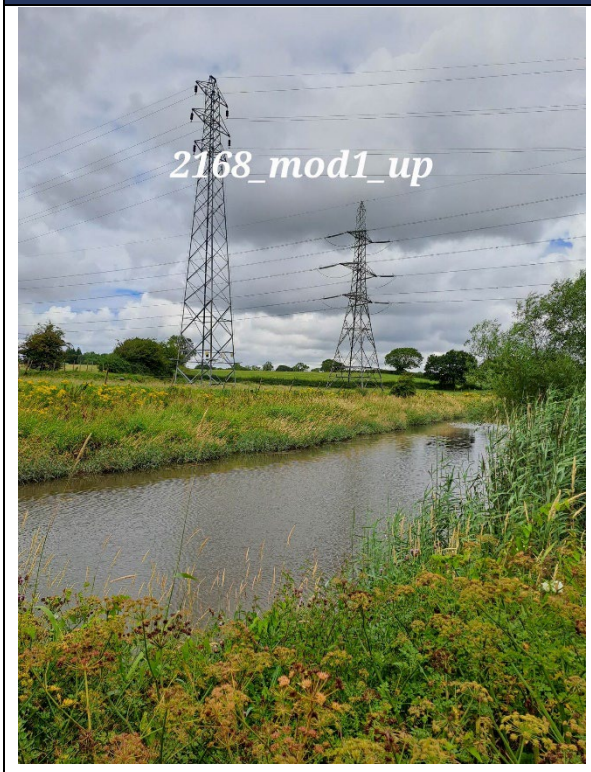
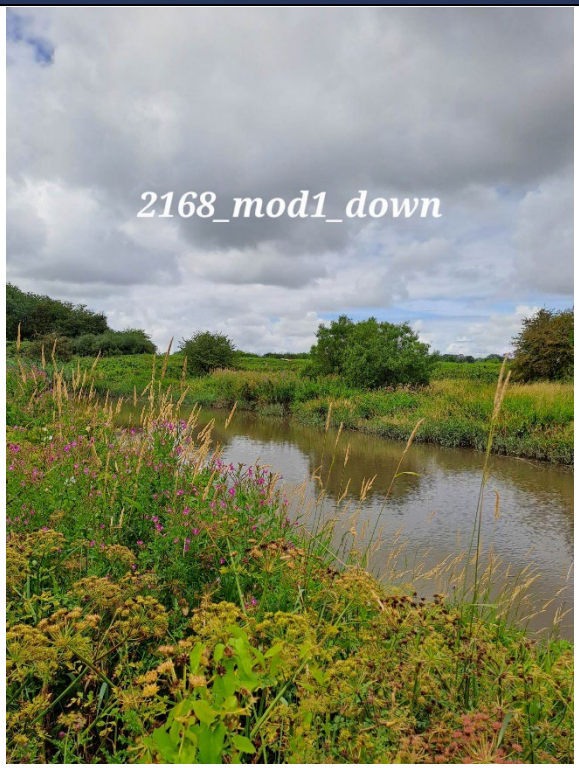
Watercourse ID	Dow Brook (watercourse reference D)
Upstream	Downstream
	

Watercourse ID	Freckleton Pool (watercourse reference R)
Upstream	Downstream
	

Watercourse ID	Middle Pool (watercourse reference S)
Upstream	Downstream
	

Watercourse ID	Mill Brook (watercourse references N and P)
Upstream	Downstream
	

Watercourse ID	River Ribble (watercourse reference T)
Upstream	Downstream
	

Watercourse ID	Savick Brook (watercourse reference I)
Upstream	Downstream
	

Watercourse ID	Wrea Brook (watercourse reference C)
Upstream	Downstream