

Pembroke CCGT Power Station

Haven Monitoring Programme 2015 - 2020

Prepared for: NRW

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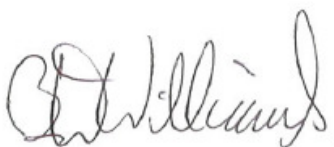
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Haven Monitoring Programme 2015

Prepared for:

Natural Resources Wales	
Client Contact :	N/A

Prepared by:

	
	Ben Williams

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1. Introduction

This document is submitted to detail the Haven monitoring programme for Pembroke Power Station for 2015 – 2020. This programme is undertaken in line with EPR permit DP3333TA conditions PO4 (a) and (c) and Abstraction Licence 22/61/6/156 condition 9.4 and has been agreed with Natural Resources Wales (NRW).

This document contains details of monitoring locations and frequencies but does not include detailed survey methodology. Detailed survey methodology can be found in previous submissions.

The surveys described in this document are aspirational and may change following review and discussions with NRW, for example in relation to statistical review by either party or changes as a result of the findings of the annual monitoring reports.

Changes may also occur due to other circumstances beyond the control of RWE such as weather or availability of suitable vessels etc. Survey frequencies are described as ‘target months’ as these may vary.

Although the monitoring programme has been agreed between NRW and RWE, some additional elements that could add value to the programme are under investigation, these are detailed in the text.

It should also be noted that the agreed programme below describes surveys that are undertaken on an annual basis. As the data set of these surveys increases there may be merit in implementing further changes to the monitoring programme, for example switching to biennial surveying in some instances. This will be discussed and agreed between NRW and RWE prior to making this type of change to the programme.

2. 2015 - 2020 Survey Programme

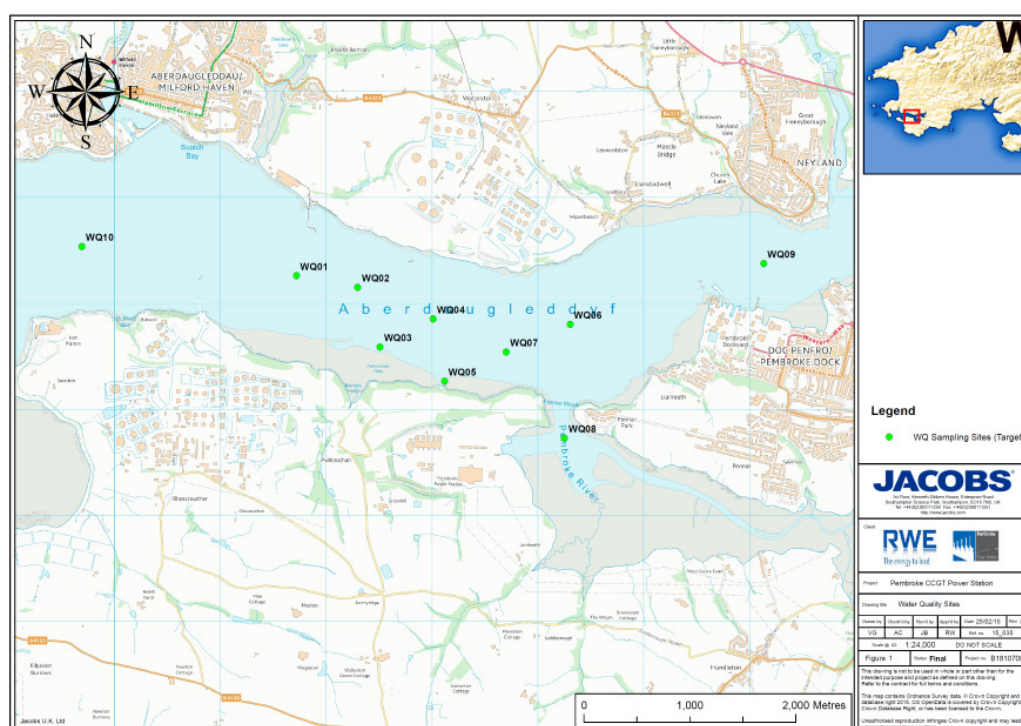
2.1. Marine Water Quality

Sampling of marine water quality will be undertaken four times a year, (target months are February, May, August and November).

Ten locations will be sampled in Milford Haven for water quality determinands; these are detailed in Figure 1. All samples will be analysed by a UKAS accredited laboratory for the following:

- total alkalinity, total suspended solids (TSS), dissolved organic carbon (C)
- dissolved nutrients including ammoniacal nitrogen, nitrite, nitrate and orthophosphate

Figure 1. Target water quality monitoring locations



2.2. Bathymetric Surveys

Bathymetric surveys will be undertaken at the cooling water intake and outfall areas once a year in autumn, (target month October).

2.3. Haven Temperature Monitoring

Temperature and salinity monitoring is undertaken at twenty minute intervals through a network of 12 monitors located throughout the Haven.

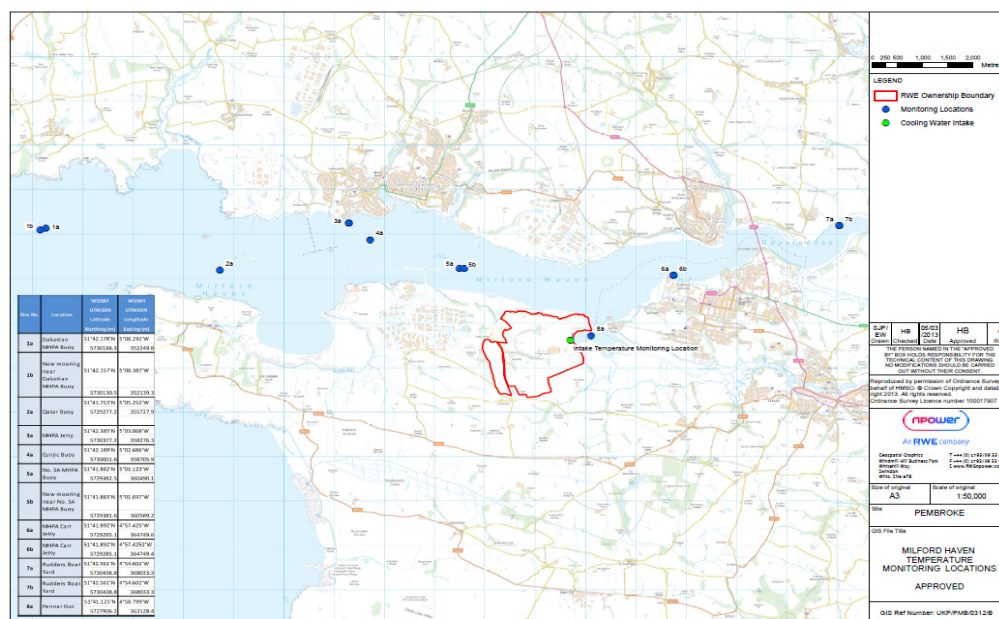
Locations are divided between near sea-bed (7 sensors) and near surface (5 sensors); the depth of sensors is as follows:

- Near surface: 0.9 m below sea surface
- Near sea bed: approximately 1 m above sea bed

The agreed monitoring locations are shown in Figure 2 below.

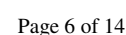
The original proposal for the temperature network was based on a five year deployment ending in April 2016. Prior to this time a review of the network will take place to assess its condition and its continued relevance in order to determine whether or not it continues and if it is to continue, in what format. Any changes will be agreed with NRW prior to implementation.

Figure 2. Haven Temperature Monitoring locations



- Subtidal otter trawls will be undertaken at 7 sites from 2016 – The original programme consisted of 13 sites; these will be monitored until the end of 2015 (with the exception of the spring survey which will survey the reduced number of 7 sites) in order to ensure 3 years of post-operational data has been collected at the original sites.
- Intertidal seine netting surveys will be undertaken at 7 sites

Figure 3. Location of Subtidal Trawl and Intertidal Seine Net Sites

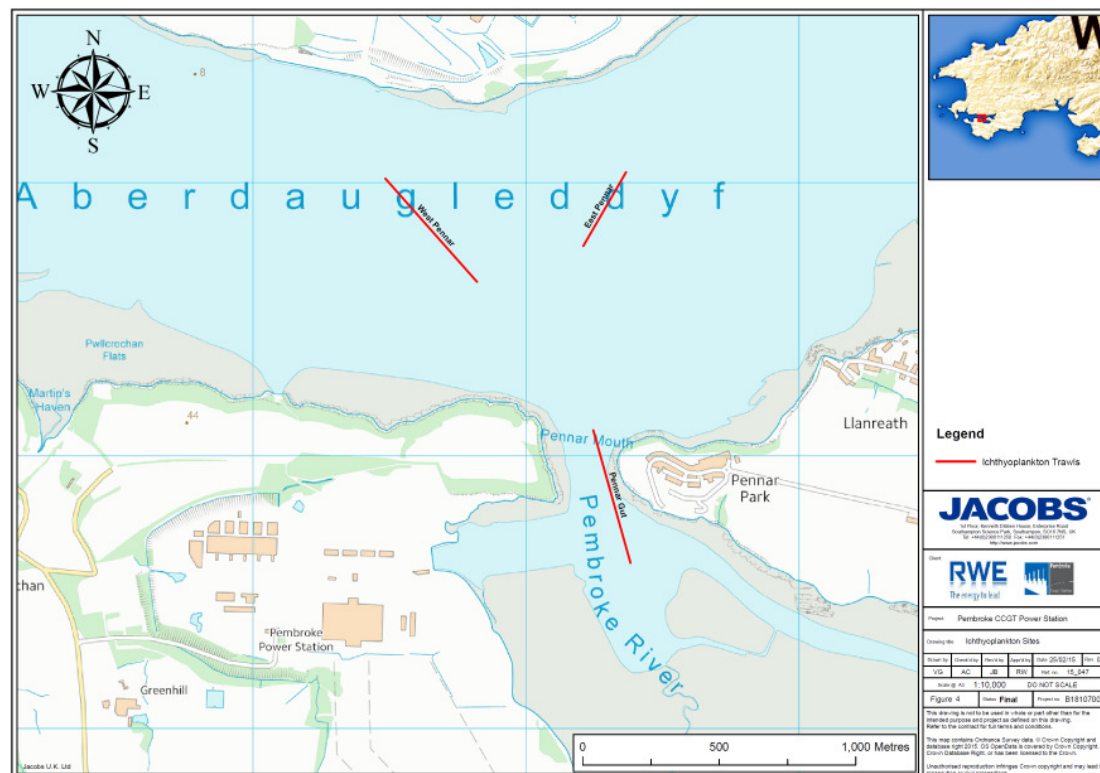


2.5. Ichthyoplankton

Ichthyoplankton surveys will be undertaken once a month in April, May, June, July and August to coincide with the period of highest ichthyoplankton abundance, and one month either side. Surveys will take place on both the ebb and flood tides.

Ichthyoplankton will be surveyed at three locations shown in Figure 4 below.

Figure 4. Location of Ichthyoplankton tow sites



2.6. Phytoplankton

Phytoplankton sampling will take place monthly at 5 water quality sites (WQ3, WQ4, WQ5, WQ7 and WQ8) March to October, inclusive. The location of these sites can be seen on Figure 1 above.

Chlorophyll-a samples will also be collected alongside the phytoplankton samples for analysis at an accredited laboratory.

2.7. Zooplankton

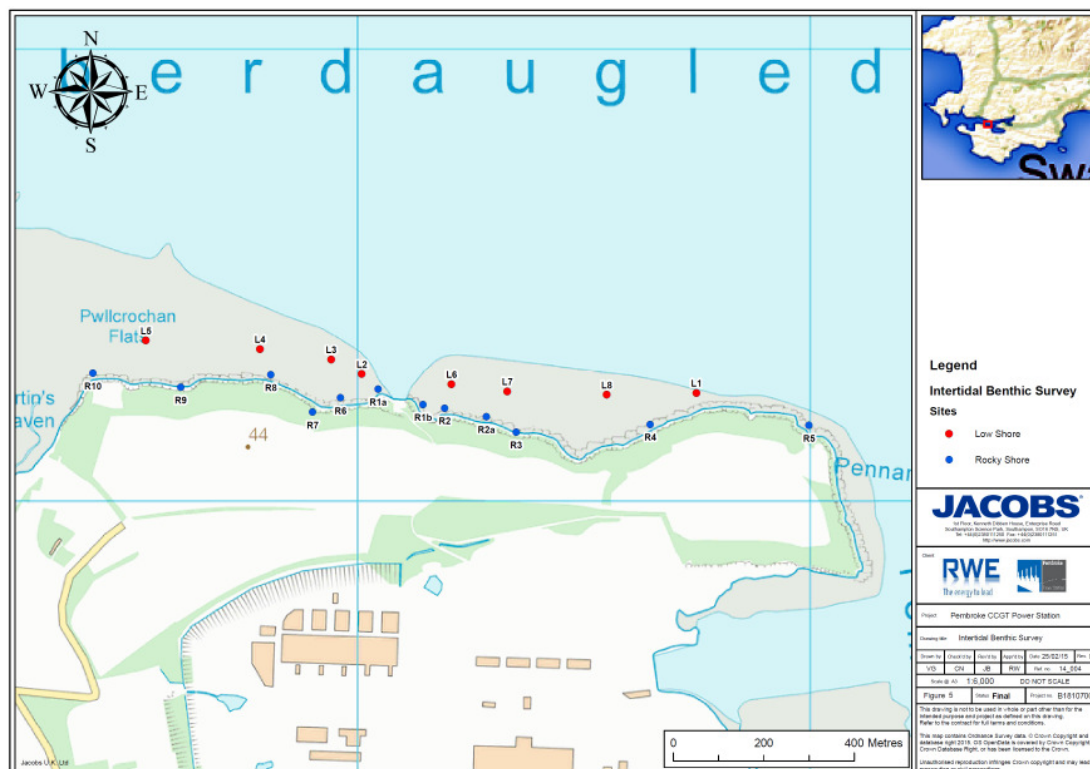
Zooplankton sampling will take place at the 10 water quality sites (see Figure 1) twice a year in spring and autumn, (target months April and October).

2.8. Intertidal Ecology

Intertidal Ecology surveying will be undertaken once a year in the autumn, (target month September/October), at 12 rocky shore sites and 9 low/ mid shore sites.

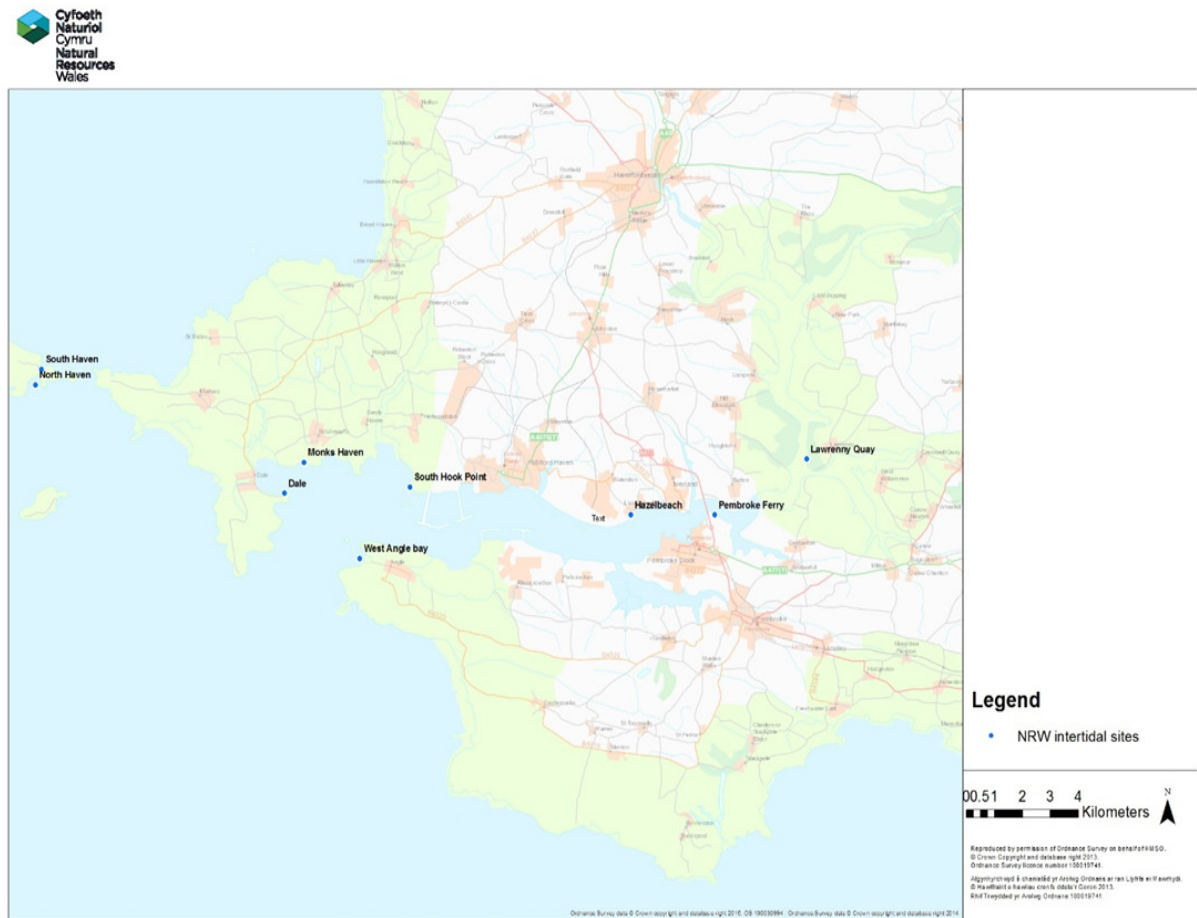
The locations of the 12 rocky shore sites (sites 'R'), and nine low shore sites (sites 'L') are shown in Figure 5.

Figure 5. Location of RWE Intertidal ecology sites



NRW also undertake a programme of intertidal monitoring at various sites in and around the Haven, these are shown in Figure 6 below. The methodologies used by NRW differ slightly from those used by Jacobs, this is currently being reviewed. Should the proposed sites and methods be deemed comparable the data will be included in future reporting alongside RWE monitoring sites. If the data or sites are not deemed comparable, RWE will continue to work with NRW to identify suitable control sites, these may be surveyed by RWE if deemed appropriate.

Figure 6. Location of NRW Intertidal ecology sites



2.9. Eelgrass Surveys

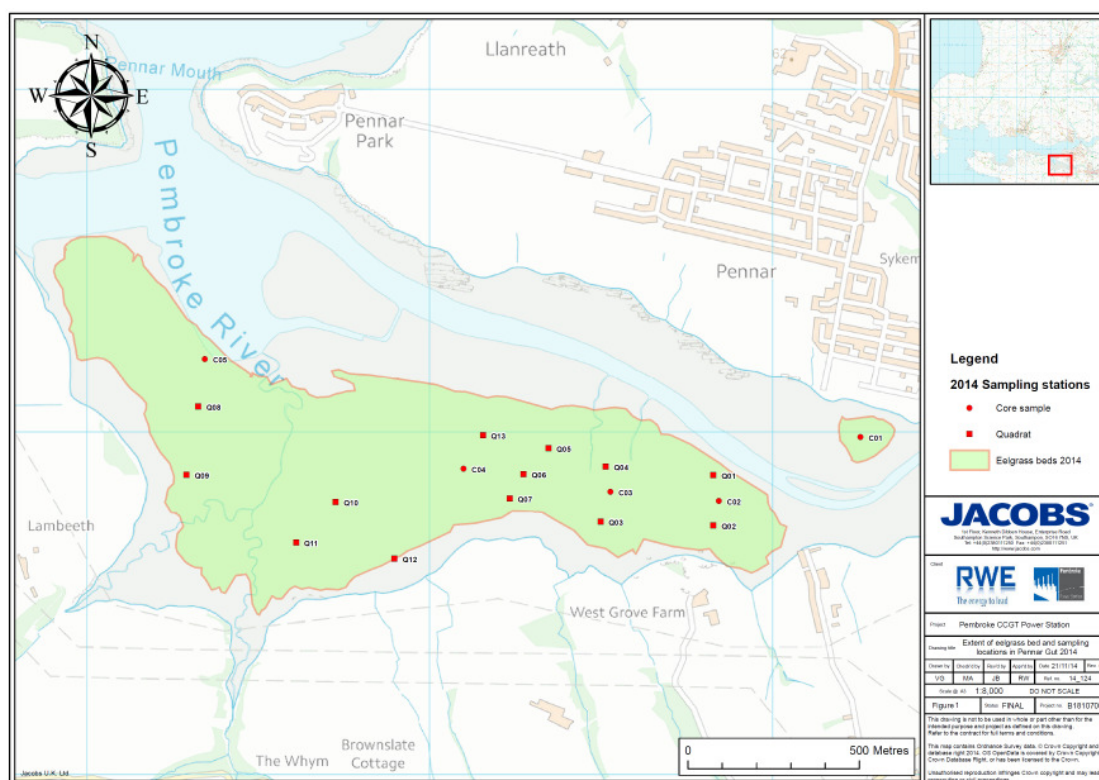
Eelgrass surveys will be undertaken once a year (target month September).

The spatial extent of the eelgrass bed will be established using a handheld GPS whilst taxonomic composition will be surveyed using 1 m² quadrats at 18 randomly selected sites (Figure 6). All three key monitoring WFD metrics (taxonomic composition, bed extent and shoot density) will be examined.

In addition, an assessment of the importance of the eelgrass bed for sediment dwelling fauna will be undertaken at five sites (C01 – C05), randomly selected.

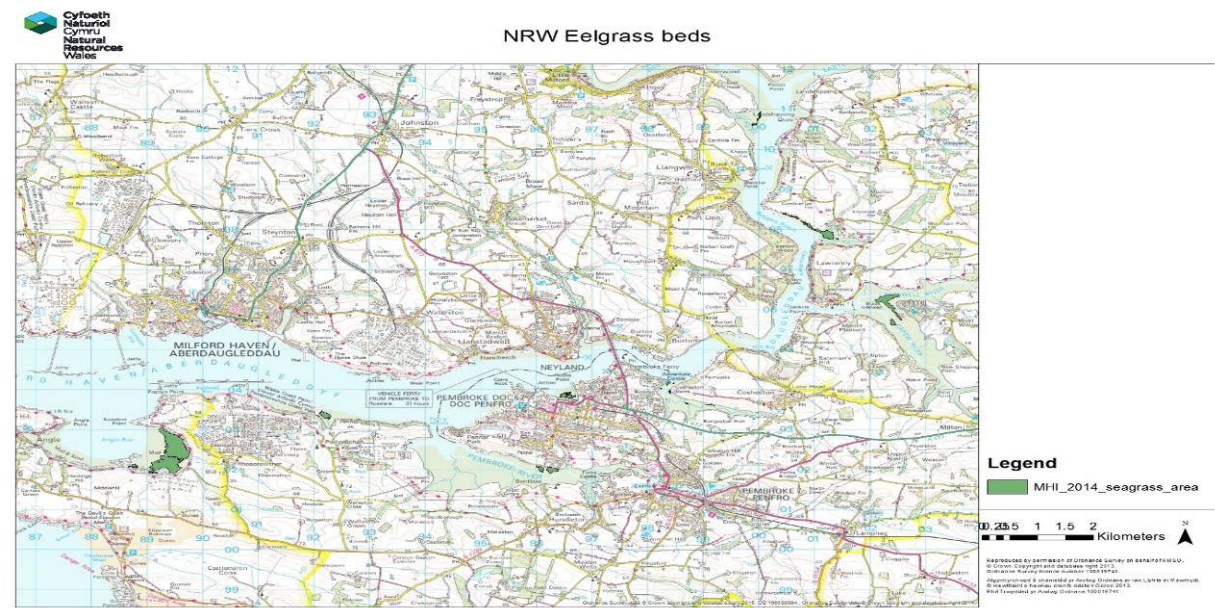
An additional core will be taken at each site for physicochemical analysis, sediment type, colour, smell, texture, depth of Redox Potential Discontinuity (RPD) layer and particle size analysis.

Figure 7. RWE Eelgrass Survey Target Locations



NRW also undertake a programme of eelgrass monitoring at various sites within the Haven, these are shown in Figure 8 below. The methodologies used by NRW differ slightly from those used by Jacobs however the standard suite of metrics gathered (including bed extent, % cover of eel grass) are the same and therefore directly comparable. This data will be used in future reporting alongside the RWE monitoring data to serve as control sites.

Figure 8. NRW Eelgrass Survey Target Locations



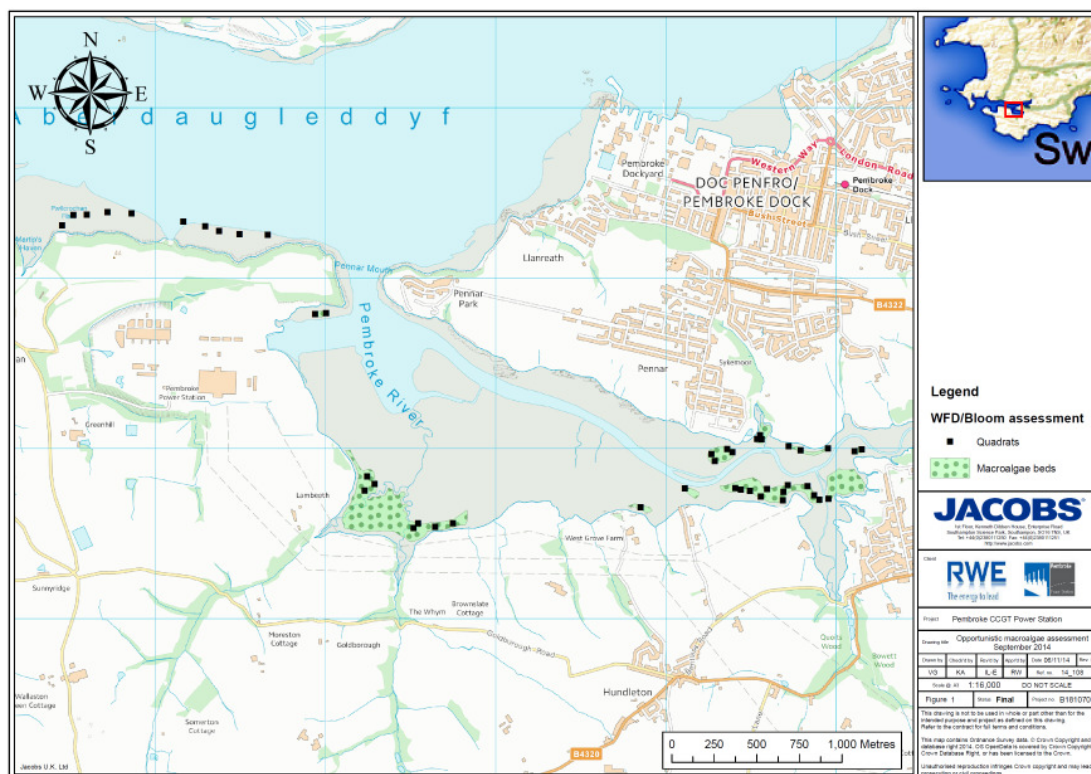
2.10. Opportunistic Macroalgae Surveys

Opportunistic macroalgae surveys will be undertaken once a year (target month August).

The spatial extent of opportunistic macroalgae beds (areas with more than 5% cover) within Pembroke River and Pwllcrochan Flats will be established using a handheld GPS unit (Figure 9). Percentage cover, percentage of entrained algae and estimate of total biomass will be completed through placing of quadrats, following both the Environment Agency Operation instruction 201-07 and the WFD methodology.

Sample locations are shown in Figure 9 below.

Figure 9. Opportunistic Macroalgae Survey Locations



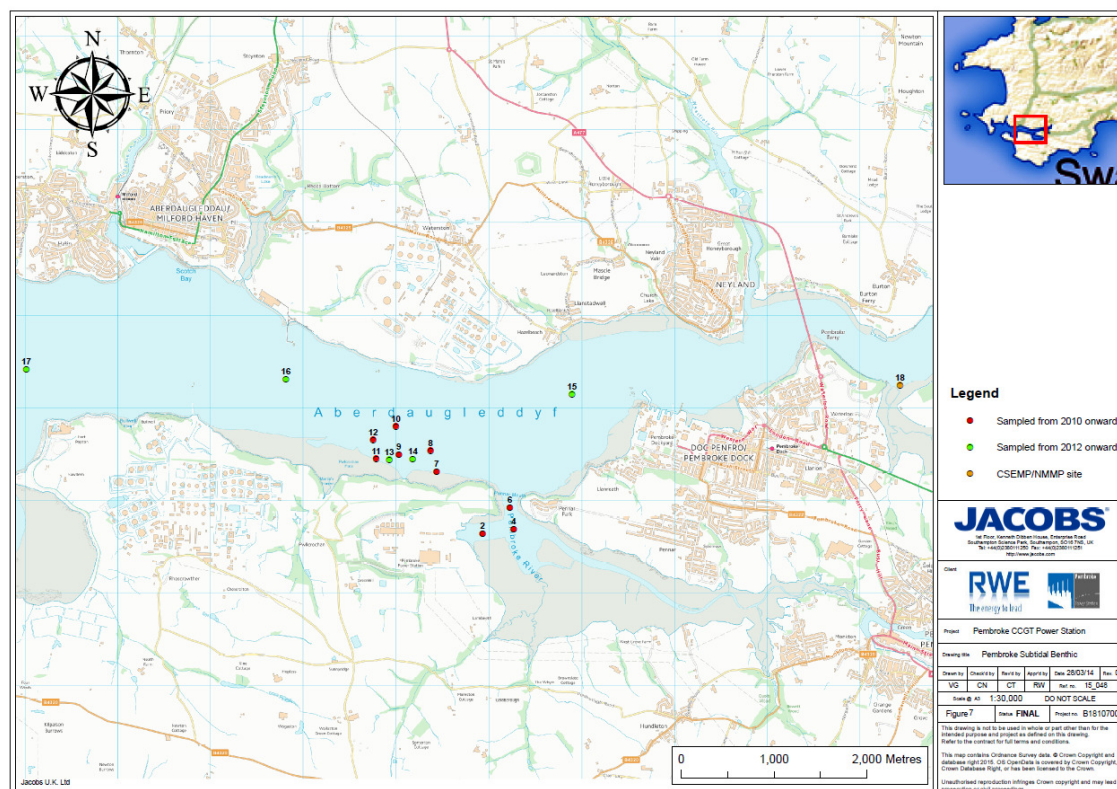
2.11. Subtidal Benthic Ecology

Subtidal benthic ecology surveying will be undertaken once a year (target month July).

Six replicate grabs will be collected at each of the 14 sites, five of which will be retained for biological analysis and one for the physico-chemical and particle size analysis.

Sample locations are shown in Figure 10 below.

Figure 10. Subtidal benthic ecology survey target locations



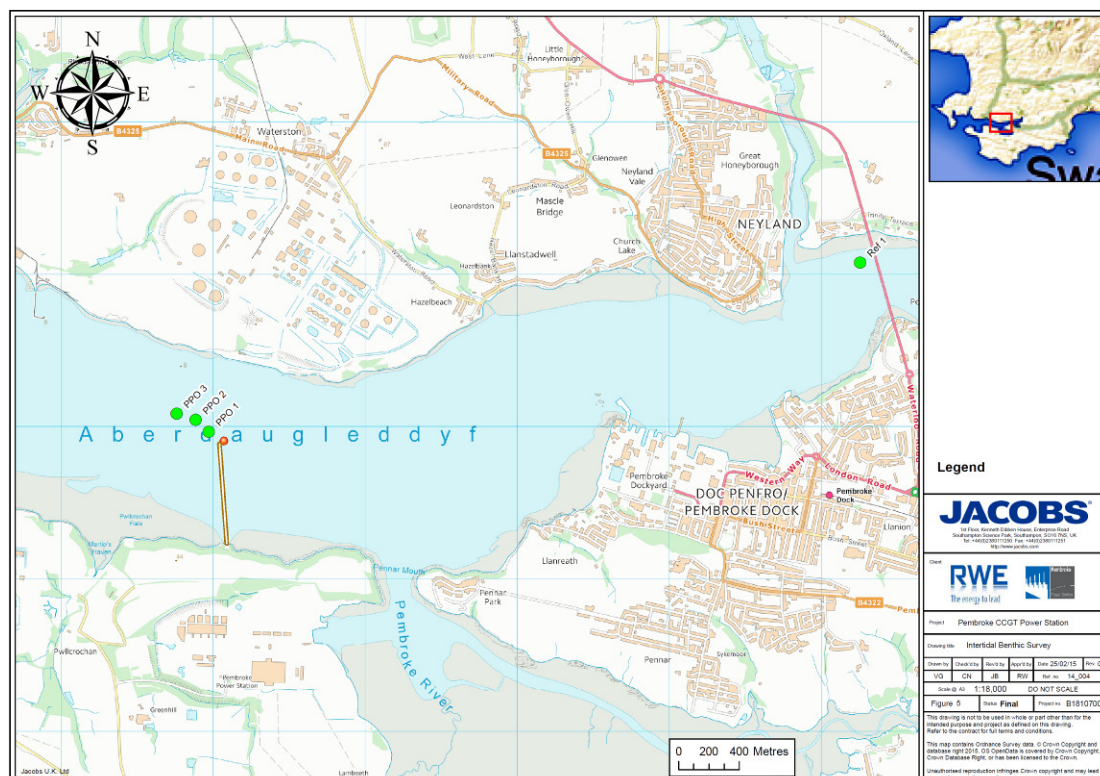
In addition, NRW hold an extensive suite of data from their own subtidal benthic monitoring programme which will be provided to RWE for consideration when the reports are being written.

2.12. Subtidal Epifauna (Reef) Surveys

Subtidal epifauna surveying will be undertaken once a year (target month July).

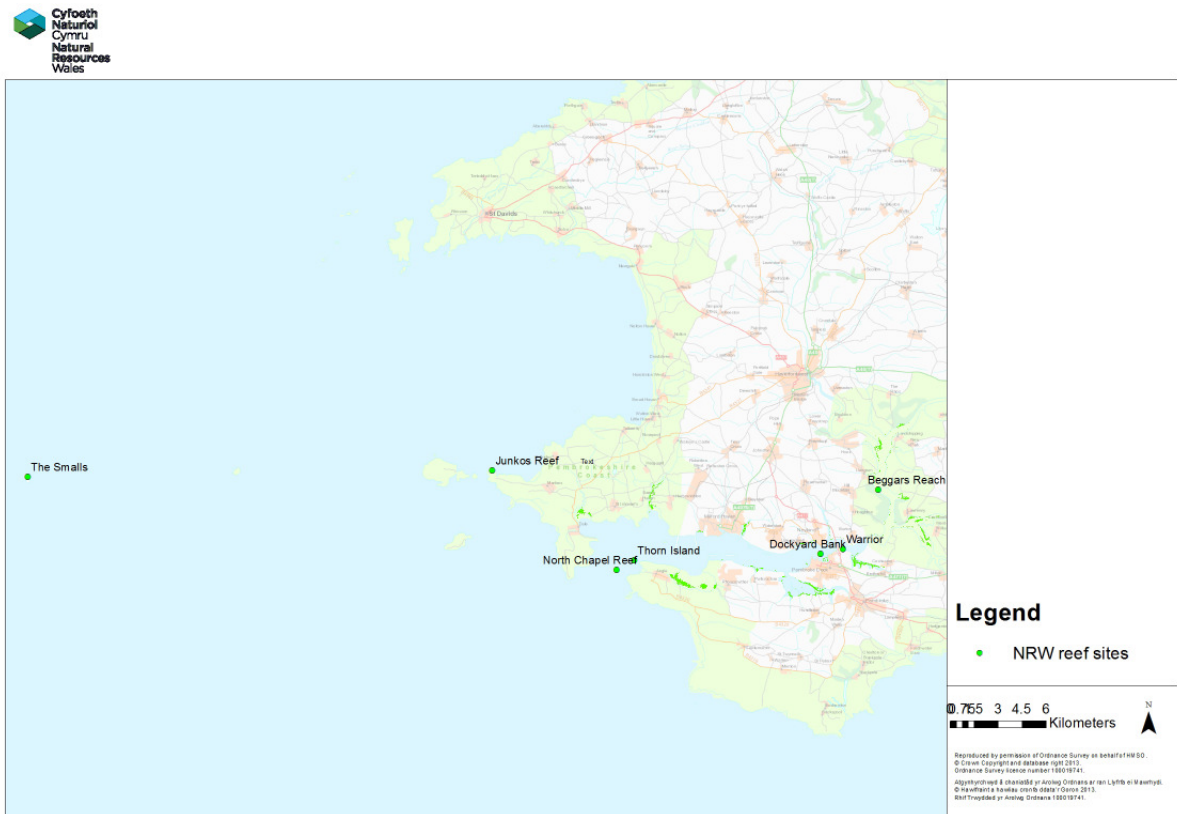
Three reef sites are surveyed in the vicinity of the cooling water outfall and a reference site near the Cleddau bridge (Figure 11). Each survey site will have five replicate quadrats; each quadrat is permanently installed in order to maintain continuity between sampling years. Percentage cover and/or counts will be recorded for each species and then converted into the SACFOR abundance scale post dive.

Figure 11. Survey locations for subtidal epifauna (reef) surveys



NRW also undertake a programme of subtidal epibenthic monitoring at various sites in the Haven. Data from relevant NRW monitoring sites (to be decided in collaboration with NRW) will be used in future reporting alongside the RWE monitoring data, to serve as additional control sites. Figure 12 below shows all the NRW sites, RWE will not necessarily use data from all of these sites.

Figure 12. Survey locations for all of NRW's subtidal epifauna (reef) surveys



2.13. Chlorinated by-products (CBPs) - Water

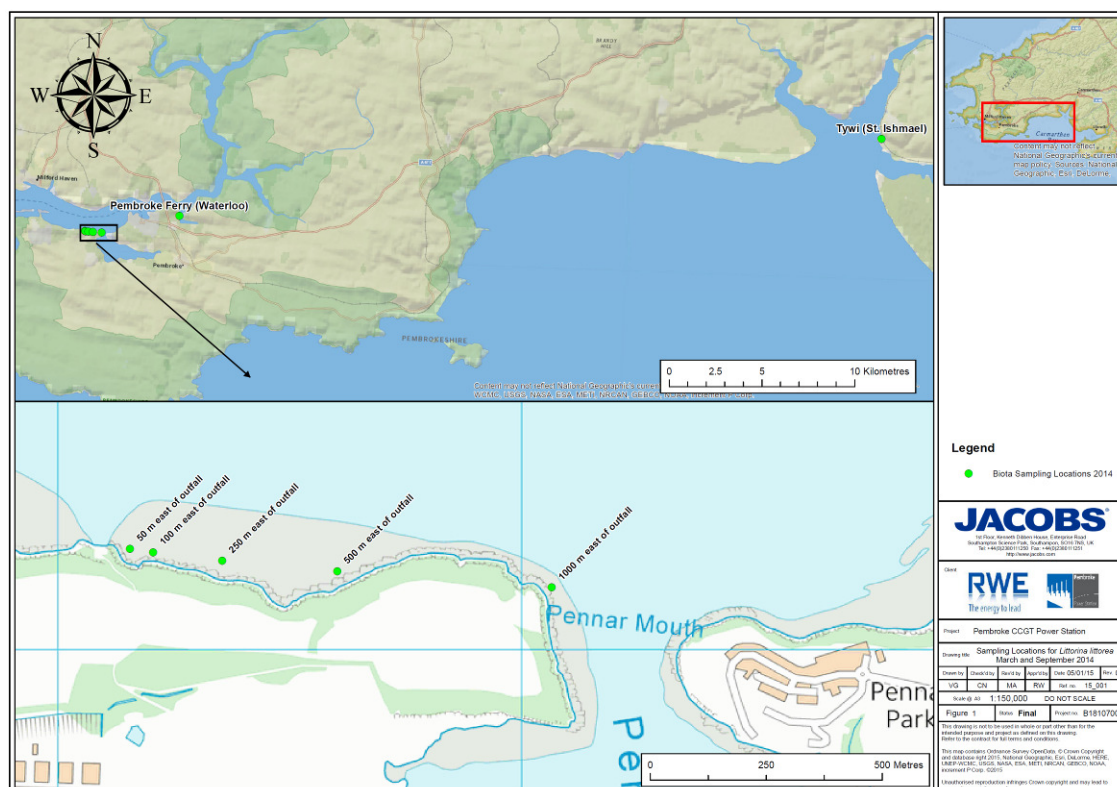
CBP sampling in water will be undertaken during the period the station is allowed to dose biocide to its cooling water system (April to December inclusive), with additional pre-dosing samples collected in March. Samples will be taken once a month from the station intake and outfall at three hour intervals over a tidal cycle, alternating between a spring and a neap tide. Sampling in the Haven will be at the five water quality sites (WQ3, WQ4, WQ5, WQ7 and WQ8 – see Figure 1) plus one reference site (water quality site WQ10) at the surface only.

2.14. Chlorinated by-products (CBPs) – Biota

CBP Biota sampling will be undertaken prior to the biocide dosing regime commencing (target month February). A second survey will be undertaken during the dosing season (target month September).

Sampling will take place at five survey locations at increasing distances from the cooling water outfall and two reference sites, one at Pembroke Ferry and one in the Tywi estuary. The locations are shown in Figure 13.

Figure 13. Survey locations for CBPs biota



2.15. Intake impingement

Impingement of organisms at the cooling water intake will be monitored in forty (40) twenty four hour surveys.

Impingement processing from both the fish return channel and the trash will be as follows:

- All fish will be identified to species level (where possible), weighed and measured (either individually or in batches).
- All invertebrates will be recorded on a SACFOR scale.
- Shore crab (*Carcinus maenas*), brown crab (*Cancer pagurus*), lobster (*Homarus gammarus*) and crayfish (*Palinurus elephas*) will be counted* and bulk weighed.
- Seaweeds will be categorised into reds, greens and browns and the approximate volume recorded. In addition a note will be made of dominant species present.

*Detail of scaling approaches for invertebrate enumeration during period of higher catches are recorded elsewhere.

2.16. Intake entrainment

Entrainment of ichthyoplankton at the cooling water intake will be monitored in twenty four hour surveys twice a month in May June and July, and once a month in April and August, to coincide with the ichthyoplankton monitoring surveys.

RWE Generation UK plc

RWE Generation UK plc
Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire
SN5 6PB

T +44 (0)1793 877777
F +44 (0)1793 892525
I <http://www.rwegeneration.com>

Registered Office:
RWE Generation UK plc
Windmill Hill Business Park
Whitehill Way
Swindon
Wiltshire
SN5 6PB
Registered in England
& Wales: No. 3892782