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C6278

Glaslyn-Dwryd Estuary Provisional RMP Assessment

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28/08/2015

Cefas Document Control

Report Title	Glaslyn-Dwyrhyd Estuary
Project Name	Provisional RMP and boundary assessment for new shellfish harvesting areas – England & Wales
Client/Customer	Food Standards Agency
Cefas Project Reference	C6728
Document Number	C6728-2015-W1
Revision	V1.0
Date	28/08/2015

Revision History

Revision number	Date	Pages revised	Reason for revision
1.0	28/08/2015	-	Report for submission to customer

Approvals

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Fishery

An application was received for shellfish hygiene classification of wild cockles (*Cerastoderma edule*) within the Glaslyn and Dwyrd estuary, near to Porthmadog, Gwynedd. This area falls within the Glyn Estate. The extent of the area identified for harvesting is within lines bounded by 52°54'5"N 4°5'53"W to 52°54'20"N 4°6'2"W to 52°54'17"N 4°7'37"W to 52°53'50"N 4°7'34"W.

Permission has been obtained from the Glyn and Brogyntyn Estates to establish a self-sustaining cockle fishery. The requested production zone falls within the Morfa Harlech National Nature Reserve, the Pen Llyn a'r Sarnau Special Area of Conservation and the Morfa Harlech Site of Special Scientific Interest. It is therefore advised that additional advice is sought from the appropriate conservation authority.

The application estimated stock levels to be about 500 tonnes. An internet search was undertaken for information on cockle stocks in the area however none was found. Harvesting will be conducted by hand raking when the fishery is open for harvest according to Welsh Government.

Sources of Contamination

Figure 1 shows the location of potentially significant sources of contamination to the Glaslyn and Dwyrd estuary, including all sewage discharges within 2 km of estuarine waters. Table 1 lists the continuous sewage discharges within this area which have permitted flow rates exceeding 5 m³/day.

Table 1: Continuous sewage discharges of over 5 m³/day to watercourses within 2 km of the area requiring classification

Name	Dry weather flow m ³ /day	Treatment type	NGR	Receiving environment
Llandecwyn STW	36	Biological Filtration	SH 62050 37810	Nant Yr Efail
Maentwrog WWTW	53.4	Biological Filtration	SH 66002 40200	Afon Dwyryd (Estuarial Waters)
Morfa Bychan WWTW	752	Biological Filtration	SH 53365 35907	Tremadog Bay
Penrhyndeudraeth WWTW	977.2	Biological Filtration	SH 61819 38360	Dwyryd
Porthmadog WWTW	1332.1	UV Disinfection	SH 57065 38491	Glaslyn Estuary
Talsarnau STW	95	Biological Filtration	SH 60890 35940	Cyt Mawr Stream
Ynys STW	20	Biological Filtration	SH 59970 35580	Y Glyn
Oakeley Arms Hotel Tan-Y-Bwlch Maen	8.1*	Septic Tank	SH 66080 40790	Trib Of Afon Dwyryd

*Maximum daily flow m³/day
Data from Environment Agency

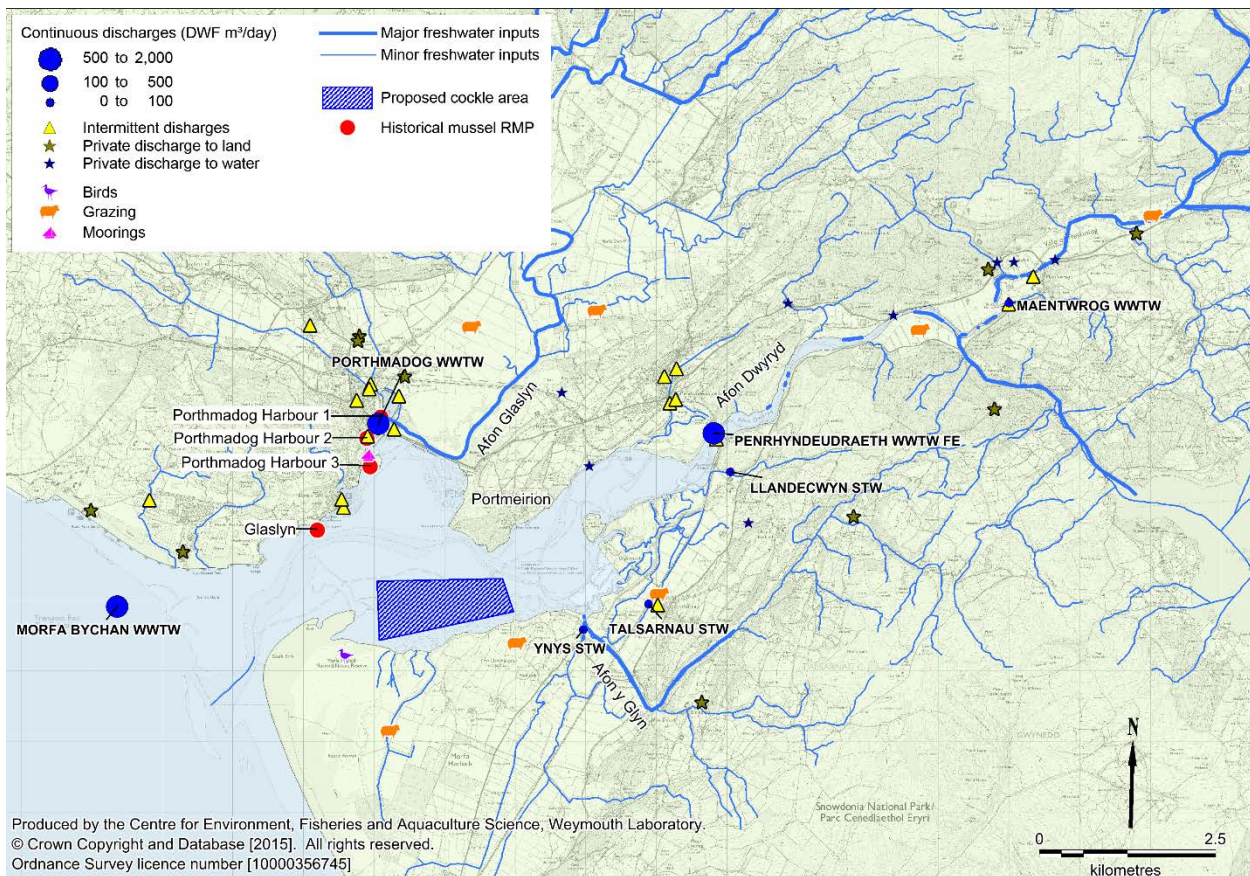


Figure 1: Potential sources of contamination to the Glaslyn and Dwyrd estuary

Figure 1 shows the location of potentially significant sources of contamination to the cockle bed, including all nearby sewage discharges taken from the Environment Agency permit database (March 2014). More recent complete discharge information was unavailable from Natural Resources Wales at the time of writing.

Talsarnau STW and Ynys STW are located in close proximity to the application area, and have consented dry weather flows of 95 and 20 m³/day respectively. Talsarnau discharges to a tributary of the Afon y Glyn, approximately 2.5 km upstream of the cockle beds. Ynys STW also discharges to the Afon y Glyn, approximately 1.2 km upstream of the application area. Both effluents undergo biological filtration, and will be of some influence on water quality at the cockle beds locally. There is a storm overflow also associated with Talsarnau STW, and when this is in operation the flows will be potentially significant as they will consist of untreated effluent.

Porthmadog WWTW is located on the opposite side of the estuary to the application area, and has a relatively large consented dry weather flow of 1332 m³/day. This discharge receives UV disinfection and as such, if operating effectively, its bacterial loading will be relatively low. There are several water company intermittent overflows associated with the sewerage system in proximity to Porthmadog and when in operation these have the potential to be significant to water quality in the Afon Dwyrd. Their influence at the cockle beds will depend on water circulation locally, and the volume of any overflow.

Penrhyndeudraeth WWTW discharges biologically treated effluent approximately 3.8 km upstream of the application area and has a consented dry weather flow of 977 m³/day. This

discharge will contribute to bacterial loadings in the Afon Dwyryd. There are several water company storm discharges located in this part of the catchment and these will contribute to loadings in the estuary associated with storm discharge events.

The Morfa Bychan WWTW continuous discharge and storm overflow outfall is located outside the estuary mouth, approximately 3.7 km from the nearest edge of the application area. The Morfa Bychan continuous discharge has a consented dry weather flow of 752 m³/day, and whilst it receives biological filtration, will potentially be of influence at the proposed beds on a flood tide.

There are further discharges, both community and private, to the main rivers outwith the buffer area considered in this report. Within this assessment, the rivers have been considered as point sources in their own right at the tidal limit. Because two of the main discharges are within the estuary of these rivers, the contributions from above the tidal limit will simply add to the effect of those main discharges.

There are various private discharges located within the area of interest, but most of these discharge to groundwaters or land and, provided they are operating correctly, will not contribute to bacterial loadings in the estuary. Those that discharge to water will contribute to the bacterial loading in those watercourses to varying degrees, depending on size and location.

Portmeirion has various events throughout the year, and is a popular tourist destination. This may lead to an increased population at the time of events, and during the summer in particular, with an associated rise in discharge volumes. It is assumed the sewage from Portmeirion goes to Porthmadog WWTW for treatment and as such, this would be the location from which any associated increased flows would take place. An annual music festival at Portmeirion occurs in September and may also result in some diffuse pollution depending on arrangements for visitor accommodation, if not in properties connected to the sewerage network, e.g. camping.

Sources of fresh water to the estuary include Afon Glaslyn, Afon Dwyryd and Afon y Glyn. The main channel of Afon Glaslyn drains approximately 800 m to the west of the requested classification area. The main channels of Afon Dwyryd and Afon y Glyn flow across the eastern most end of the requested classification area.

Investigation of aerial photographs (Google Earth, 2015) shows that many of the fields adjacent to the harvesting area and the rivers are used for grazing. Run off from these fields is likely to enter the watercourses and may be a significant source of contamination for the production area.

The proposed cockle harvesting area lies within the Morfa Harlech national nature reserve, which supports large bird populations that may present a diffuse source of contamination to the shellfish.

Approximately 150 moorings at Porthmadog (Google Earth, 2015) to the north of the proposed harvesting area may also be a source of contamination if sewage is discharged overboard.

Classification and monitoring history

Table 2: Classification history of the area from 2005 to present

Bed name	Species	Classification										
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Porthmadog	Mussels	-	-	B	B	dc	-	-	-	-	-	-

dc denotes area was declassified this year

A mussel harvesting area adjacent to Porthmadog was intermittently classified from 1993 to 2009. Parts of the Glaslyn and Dwyryd estuary were classified for cockle harvesting from 1993 to 2004. These beds were class B from 1993 to 2002 and class C from 2003 to 2004.

Table 3: Summary statistics for *E. coli* monitoring results (MPN/100g) by RMP from 2005 to present

Sampling Site	Species	No.	Date of first sample	Date of last sample	Geometric mean	Min.	Max.	% over		
								230	4,600	46,000
Porthmadog Harbour 1	Mussel	23	18/10/2006	13/07/2009	485.2	<20	16,000	69.6	4.3	0.0
Porthmadog Harbour 2	Mussel	23	18/10/2006	13/07/2009	400.9	20	16,000	56.5	8.7	0.0
Porthmadog Harbour 3	Mussel	23	18/10/2006	13/07/2009	372.0	<20	3,500	65.2	0.0	0.0
Glaslyn	Mussel	6	25/03/2010	12/04/2011	539.4	40	5,400	66.7	16.7	0.0

There have been four monitoring points within the Glaslyn and Dwyryd estuary, all of which were for mussels and were located to the west of what of the Afon Glaslyn main channel. The geometric mean *E. coli* result and proportion of results exceeding 4,600 *E. coli* MPN/100g was highest at Glaslyn, although this was only sampled on six occasions, and through a different period than the other three.

Water circulation

The Glaslyn and Dwyryd estuary is an enclosed estuary which faces south west and drains into Cardigan Bay. It covers an area of approximately 12 km², of which around 69% is intertidal (Futurecoast, 2002). A large proportion of water will be exchanged on each tide, but the dilution potential will be quite low away from the main channels. At low tide extensive sandflats are exposed leaving several channels. The maximum depth (4.6 m below chart datum) is at the mouth however while the majority of the estuary is 1 m below chart datum.

Currents in coastal waters are predominantly driven by a combination of tide, wind and freshwater inputs. The Glaslyn and Dwyryd estuary is macrotidal with a tidal range of above 5 m on spring tides (Admiralty TotalTide).

There are no tidal diamonds available for the Glaslyn and Dwyryd estuary however it can be assumed that tidal flows flood into the estuary in a north easterly direction and ebb in the opposite direction. The estuarine system is flood dominant (Futurecoast, 2002) suggesting tides are asymmetrical, with a shorter duration and faster moving flood tide in the outer

estuary. It is possible that water entering the estuary during a flood tide may gyre, moving water from Cardigan Bay and the Afon Glaslyn over the cockle area.

Provisional RMP(s) and production area

The production area for cockles should cover the entire area requested for classification, and extend to mean high water on the southern shore of the Glaslyn and Dwyrdd estuary. The most significant sources of contamination for this area are likely to be from the ebb plume of Afon Dwyrdd and to some extent the ebb plume from Afon y Glyn. Both of these watercourses will contain sewage effluent from upstream sewage discharges as well as run off from grazing land. Other potential sources of contamination are from Afon Glaslyn, the Porthmadog WWTW and the Morfa Bychan WWTW. However, these sources are likely to only affect the cockle production area during a flood tide, when the gyre of water entering the estuary may bring water southwards. The main sources of contamination are therefore likely to be from Afon Dwyrdd and Afon y Glyn and so the RMP for this production area should be located in the north-eastern corner of the production area near to the where the channels from these two rivers intersect.

The species sampled should be cockles of a harvestable size. A total of 10 samples taken not less than one week apart will be required for the issue of a provisional classification. Following this, sampling should be monthly, assuming a continued classification is required. A standard tolerance of 100 m applies. Samples should be collected by hand.

Table 4: Provisional Sampling Plan

Production Area	South Glaslyn Dwyrdd
RMP name	Dwyrdd a y Glyn
NGR	SH 5891 3623
Latitude	52°54.298'N
Longitude	04°05.957'W
Species	Cockles
Collection Method	Hand
Sampling tolerance	100 m
Sampling frequency	10 samples at least one week apart for provisional classification. Monthly sampling thereafter if continued classification is required.
Production area boundary	Area contained within lines bounded by 52°54.050'N 04°7.886'W to 52°54.302'N 04°7.898'W to 52°54.338'N 04°5.896'W to 52°54.029'N 04°5.881'W and extending to MHWS

(Lat/Long datum WGS84)

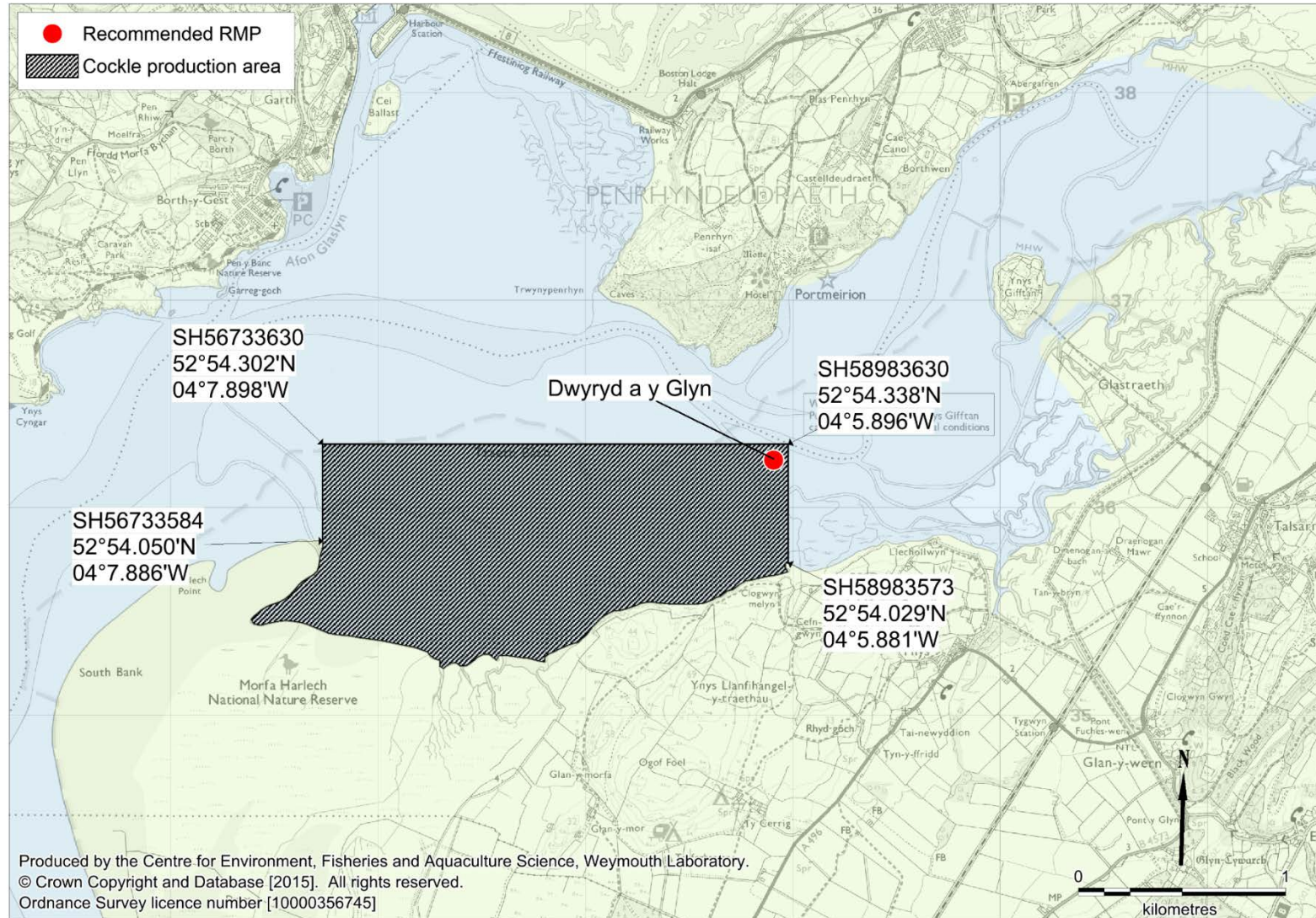


Figure 2: Recommended interim classification zones and RMP

References

Futurecoast, 2002. Department of Environment, Food and Rural Affairs (Defra), Halcrow Group Ltd 3 CD set.

Google Earth. 2015. Google.



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