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**C6728**

# **Fal Estuary, Turnaware Point Provisional RMP Assessment**

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David Walker  
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## Cefas Document Control

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### Approvals

	Name	Position	Date
<b>Author</b>	David Walker	Provisional RMP Assessment team	03/03/2017
<b>Checked</b>	Andrew Younger	Senior Shellfish Hygiene Scientist	15/03/2017
<b>Approved</b>	Michelle Price-Hayward	Group Manager Food Safety	15/03/2017

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Centre for Environment, Fisheries & Aquaculture Science, Weymouth Laboratory, Barrack Road, The Nothe, Weymouth DT4 8UB. Tel 01305 206 600 [www.cefas.defra.gov.uk](http://www.cefas.defra.gov.uk)

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## Fishery

An application was received for shellfish hygiene classification of a wild mussels (*Mytilus* spp.) production area along the intertidal zone in the eastern Fal Estuary between Turnaware Point (50°12.152'N 05°2.069'W) and Messack Point (50°10.93'N 05°1.538'W). This area falls within the Fal Fishery Order 2016. The northern half of this area falls within the historical Turnaware Point relay area, which is prohibited due to high *E. coli* results between 2014 and 2015. The southern half of the requested area lies within the East Bank native oyster (*Ostrea edulis*) production area. The proposed method of harvest is hand picking, with harvest predicted to occur year-round.

The application did not estimate an annual yield, but indicated that mussels of marketable size (>50 mm) were present.

## Sources of Faecal Contamination

Figure 1 shows the location of potentially significant sources of contamination to the east bank of the Fal estuary, including all sewage discharges within 5 km of the application area. Table 1 lists the continuous sewage discharges within this area which have permitted flow rates of at least 5 m<sup>3</sup>/day.

**Table 1: Continuous sewage discharges of over 5 m<sup>3</sup>/day to watercourses within 2 km of the area requiring classification**

Name	Dry weather flow m <sup>3</sup> /day	Treatment type	NGR	Receiving environment
St Just in Roseland STW	27	Biological Filtration	SW8561035810	Trib Of River Percuil
St Mawes STW	800	UV Disinfection	SW8379033120	Carrick Roads
Falmouth STW	9500	UV Disinfection	SW8314032200	Carrick Roads
Portscatho STW	261	Biological Filtration	SW8798035150	English Channel

Data from Environment Agency

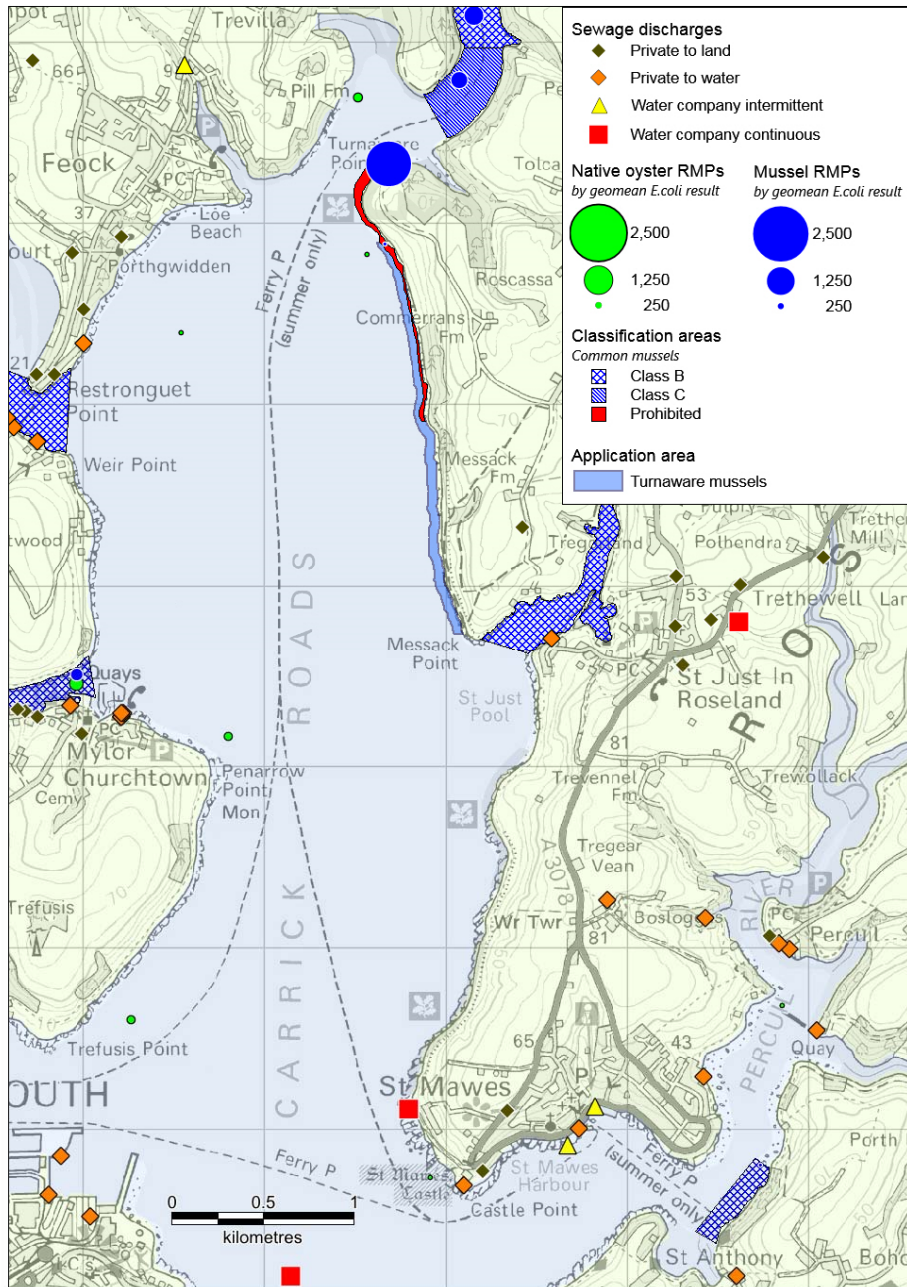
Falmouth STW is the largest continuous sewage discharge in proximity to the application area, with a consented Dry Weather Flow of 9,500 m<sup>3</sup>/day of tertiary treated effluent 3.6 km south-southwest of the southern extent of the application area. The nearest water company sewage discharge is at St. Mawes, 2.6 km south of the southern end of the application area.

The STW at St. Just in Roseland discharges to a tributary of the River Percuil which although near to the application area in distance overland, the distance contaminants would have to travel via water is substantially greater and any contamination arising from this source is unlikely to significantly impact water quality the proposed mussel bed.

Portscatho STW discharges to the English Channel waters on the east side of the Roseland Peninsula, 5 km northeast of Zone Point at the entrance to the estuary and over 10 km by

sea from the southern end of the Turnaware mussel area. Contaminants from this source are not considered likely to have a significant impact on water quality at the shellfishery.

The nearest sewage discharge to the application area is from a boatyard that discharges UV treated effluent to the estuary approximately 500 metres east of the southern end of the application area. The majority of reported discharges are located along the west side of the estuary which are less likely to directly influence contamination levels along the east shore, and along the rivers upstream of Turnaware Point.



**Figure 1: Potential sources of contamination to the east bank of the Fal Estuary**

Farms along the east shore of the application area may pose a source of faecal contamination from livestock droppings, application of slurry to arable land, or overflow of slurry storage

facilities. From Commerans Farm southward, a buffer of woodland separates the farmland from the shoreline, which may reduce the risk of contaminated runoff from arable and grazed land except around any small watercourses that might drain through the woodland to the estuary.

## Classification and monitoring history

Table 2 shows the classification history of the area since 2007. The northern part of the requested area lies within the Turnaware Point relay area which is prohibited due to high *E. coli* results in mussel samples collected from the Turnaware Point RMP (50°10.29'N 05°1.842'W) between November 2014 and April 2015. Subsequently, 18 mussel samples have been taken from the East Bank Relay RMP (50°9.821'N 05°1.829'W) between July 2015 and January 2017. These samples had a geometric mean *E. coli* level of 155 MPN/100 g, a maximum of 2,300 MPN/100 g and a minimum of <18 MPN/100 g. The southern half of the requested area lies within the East Bank native oyster production area, which has a long-term B classification.

**Table 2: Classification history of the area from 2007 to present**

Bed name	Species	Classification										
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Turnaware Bar	Native oysters	B	B	B	B-LT	B-LT	B-LT	B-LT	B-LT	B-LT	B-LT	B-LT
East Bank	Native oysters	B-LT	B-LT	B-LT	B-LT	-	-	-	-	-	B-LT	B-LT
St. Just Relay	Mussels	-	-	-	-	-	-	-	-	B	B	B
Turnaware Point Relay (Upper zone)	Mussels	-	-	-	-	-	-	-	-	P	P	P

P = prohibited

Samples additional to those used for classification purposes have been collected from East Bank Relay. A summary of monitoring results for the last five years is shown in Table 3. Except for a single sample at East Bank North in 2015, samples collected from East Bank North and East Bank Relay have consistently fallen below the Class B threshold of 4600 *E. coli* MPN/100g.

**Table 3: Summary statistics for *E. coli* monitoring results (MPN/100g) by RMP – 2012 to 2017**

Sampling Site	Species	No.	Date of		Geometric mean	Min.	Max.	% over		
			first sample	Date of last sample				230	4,600	46,000
Turnaware Point	Mussel	13	16/07/2014	14/04/2015	2,013.6	45	>1,800,000	69.2	23.1	23.1
St Just Upper	Mussel	28	16/07/2014	18/01/2017	156.8	<18	16,000	28.6	3.6	0.0
East Bank Relay	Mussel	18	07/07/2015	18/01/2017	155.1	<18	2,300	27.8	0.0	0.0
East Bank North	Native oyster	24	26/05/2015	18/01/2017	127.8	<18	54,000	20.8	4.2	4.2

High results at Turnaware Point do not appear to relate to any identified sources of sewage contamination. This monitoring point lies near the outlet of a small watercourse that may receive input from farm-related sources, however.

## Chemical contaminants

Mining has been historically an important activity within the Fal catchment, particularly within the Carnon Valley to the west of the application area. China clay quarrying occurs in the upper Fal river catchment (Langston *et al* 2006). Although discharge of waste from this activity to watercourses has been banned since the late 1960's, some of the intertidal sediments of the upper Fal are made up of this waste. Therefore, areas with these sediments may contain relatively abundant concentrations of zirconium, cesium, lanthanum, and yttrium. Although these compounds are generally found in very low concentrations and are not generally acutely toxic, there is some evidence to suggest that lanthanum is bioaccumulated in shellfish and can have negative effects on reproduction and nervous system function in aquatic animals (Chassard-Bouchad and Hallegot 1984, Huang and Wang 2016, Oosterhout *et al* 2014, Kulaksiz and Bau 2013). The potential human health effects are not as clear in this case, but may warrant consideration.

A review of chemical contaminants to the Fal catchment was conducted in 2006 as part of a characterisation study for the Fal and Helford candidate SAC (Langston, *et al* 2006). The review identified that sediments in the lower Fal, including Mylor Creek, were contaminated by pollution from a variety of substances including metals (As, Cu, Zn, Cd, and Fe), TBT, and hydrocarbon oils. Although much of this contamination persists as a legacy of previous mining and shipyard activities, it still affects the biota in the estuary (Pirrie, *et al* 2003). Native oysters from the area were found to have adaptations consistent with exposure to relatively high levels of metals (Langston, *et al* 1998). The review identified that TBT concentrations in parts of the Fal were high and had not decreased following regulation of its use on small vessels in 1987. All contaminants present in sediments will be remobilised by dredging activities, propeller scour from boat traffic, and any tidal or weather conditions that would disturb the sediment and increase contaminant availability for uptake in shellfish.

## Water circulation

The Fal estuary is a drowned river valley, or ria, which faces south and drains into Falmouth Bay. A study on water circulation within the wider Fal Estuary was commissioned by South West Water, and this identified that tidal currents were generally low within the estuary, and that complete vertical mixing of the water column was likely within a short time (1-3 hours) of contaminant release.

Currents in coastal waters are predominantly driven by a combination of tide, wind and freshwater inputs. The Fal estuary is macrotidal with a mean spring tidal range of above 4.7 m on spring tides (South West Water Services Ltd. 1992).



There is likely to be some stratification due to influence of freshwater coming from the Truro River and the River Fal. Contaminants arising upstream of the harvesting area are likely to be carried across the fishery on the ebb tide. The area at Turnaware is exposed to the west and may be less affected by riverine sources than areas further up the estuary. Contaminants arising to the south of the area, such as from St. Mawes and Falmouth STWs, may under prevailing wind conditions be expected to impact shellfish in the upper Carrick Roads (Cefas, 2012).

## Provisional RMP(s) and production area

To allow the area to be immediately be given an interim classification, the production area for mussels should cover the area from the East Bank Relay monitoring point in the north to the southern extremity of the requested area, extending from mean high water to 50 m seaward of high water to allow sampling at any point in the tidal cycle. The recommended provisional sampling plan is given in Table 4. Due to the length of the area and the uncertainty regarding the prevalence of northward vs southward flow of contaminants along this shore, it is recommended that a second point at the southern end of the proposed classification area be monitored in parallel to the existing monitoring point at the northern end of the shellfish bed. The provisional sampling plan can be reviewed after sufficient monitoring results have been obtained to establish whether monitoring can be discontinued at one or other point.

**Table 4: Provisional Sampling Plan**

Production Area	East Bank Mussels	East Bank Mussels
RMP name	East Bank Relay N	East Bank Relay S
NGR	SW 8366 3789	SW 8406 3576
Latitude	50°12.084'N	50°10.945'N
Longitude	05°1.973'W	05°1.564'W
Species	Mussels	Mussels
Collection Method	Hand	Hand
Sampling tolerance	50 m	50 m
Sampling frequency	Monthly	Monthly
Production area boundary	Area contained within lines bounded by 50°12.084'N 05°1.968'W to 50°10.93'N 05°1.53'W and extending 50 m seaward from mean high water.	

*(Lat/Long datum WGS84)*





Figure 2: Recommended interim classification zones and RMP

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### Head office

Centre for Environment, Fisheries & Aquaculture  
Science  
Pakefield Road  
Lowestoft  
Suffolk  
NR33 0HT  
Tel: +44 (0) 1502 56 2244  
Fax: +44 (0) 1502 51 3865

### Weymouth office

Barrack Road  
The Nothe  
Weymouth  
DT4 8UB

Tel: +44 (0) 1305 206600  
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