



Essex Native Oyster Restoration Initiative

Habitats Regulation Assessment and MCZ Stage 1 assessment:

Management and monitoring of the *O.edulis* restoration box for the purpose of BCRC MCZ Conservation Management Plan, including dredge and grab monitoring, cultch relaying and installation of *O.edulis* settlement cages.

European Marine Site: Proposed work is based within the Essex Estuaries SAC, Mid-Essex Coast SPAs and Blackwater, Crouch, Roach and Colne Marine Conservation Zone.

Designations potentially impacted by works;

Name	Designation
Blackwater	SPA
Essex Estuaries	SAC
Blackwater, Colne, Crouch & Roach	MCZ
Colne	SSSI

1. Designations

1.1 Blackwater Estuary (Special Protection Area)

SPA Feature(s):

- Internationally important breeding populations of Annex 1 species
- Internationally important assemblage of waterfowl (wildfowl and waders)
- Internationally and nationally important populations of regularly occurring migratory species
- Nationally important breeding populations of regularly occurring migratory species (ringed plover)

This site qualifies under **Article 4.1** of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive:

During the breeding season;

- Little Tern *Sterna albifrons*, 36 pairs representing at least 1.5% of the breeding population in Great Britain (Count as at 1997)

Over winter;

- Avocet *Recurvirostra avosetta*, 76 individuals representing at least 6.0% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
- Golden Plover *Pluvialis apricaria*, 7,247 individuals representing at least 2.9% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)
- Hen Harrier *Circus cyaneus*, 4 individuals representing up to 0.5% of the wintering population in Great Britain (5 year mean, 1993/94-94/95, 1996/7-98/99)
- Ruff *Philomachus pugnax*, 51 individuals representing up to 7.3% of the wintering population in Great Britain (5 year peak mean 1991/2 - 1995/6)

- This site also qualifies under **Article 4.2** of the Directive (79/409/EEC) by supporting populations of European importance of the following migratory species:

On passage;

- Ringed Plover *Charadrius hiaticula*, 955 individuals representing up to 1.9% of the Europe/Northern Africa - wintering population (5 year peak mean 1991/2 - 1995/6)

Over winter;

- Black-tailed Godwit *Limosa limosa islandica*, 1,280 individuals representing up to 1.8% of the wintering Iceland - breeding population (5 year peak mean 1991/2 - 1995/6)
- Dark-bellied Brent Goose *Branta bernicla bernicla*, 15,392 individuals representing up to 5.1% of the wintering Western Siberia/Western Europe population (5 year peak mean 1991/2 - 1995/6)
- Dunlin *Calidris alpina alpina*, 33,267 individuals representing up to 2.4% of the wintering Northern Siberia/Europe/Western Africa population (5 year peak mean 1991/2 - 1995/6)
- Grey Plover *Pluvialis squatarola*, 5,090 individuals representing up to 3.4% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)
- Redshank *Tringa totanus*, 4,015 individuals representing up to 2.7% of the wintering Eastern Atlantic - wintering population (5 year peak mean 1991/2 - 1995/6)
- Ringed Plover *Charadrius hiaticula*, 600 individuals representing up to 1.2% of the wintering Europe/Northern Africa - wintering population (WeBS/Peter Clement)
- Shelduck *Tadorna tadorna*, 4,594 individuals representing up to 1.5% of the wintering Northwestern Europe population (5 year peak mean 1991/2 - 1995/6)

Assemblage qualification: A wetland of international importance.

The area qualifies under **Article 4.2** of the Directive (79/409/EEC) by regularly supporting at least 20,000 waterfowl

Over winter, the area regularly supports 109,815 individual waterfowl (5 year peak mean 1991/2 - 1995/6) including: Great Crested Grebe *Podiceps cristatus*, Golden Plover *Pluvialis apricaria*, Ruff *Philomachus pugnax*, Dark-bellied Brent Goose *Branta bernicla bernicla*, Shelduck *Tadorna tadorna*, Ringed Plover *Charadrius hiaticula*, Grey Plover *Pluvialis squatarola*, Dunlin *Calidris alpina alpina*, Avocet *Recurvirostra avosetta*, Redshank *Tringa totanus*, Curlew *Numenius arquata*, Cormorant *Phalacrocorax carbo*, Wigeon *Anas penelope*, Teal *Anas crecca*, Pintail *Anas acuta*, Shoveler *Anas clypeata*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Lapwing *Vanellus vanellus*, Black-tailed Godwit *Limosa limosa islandica*.

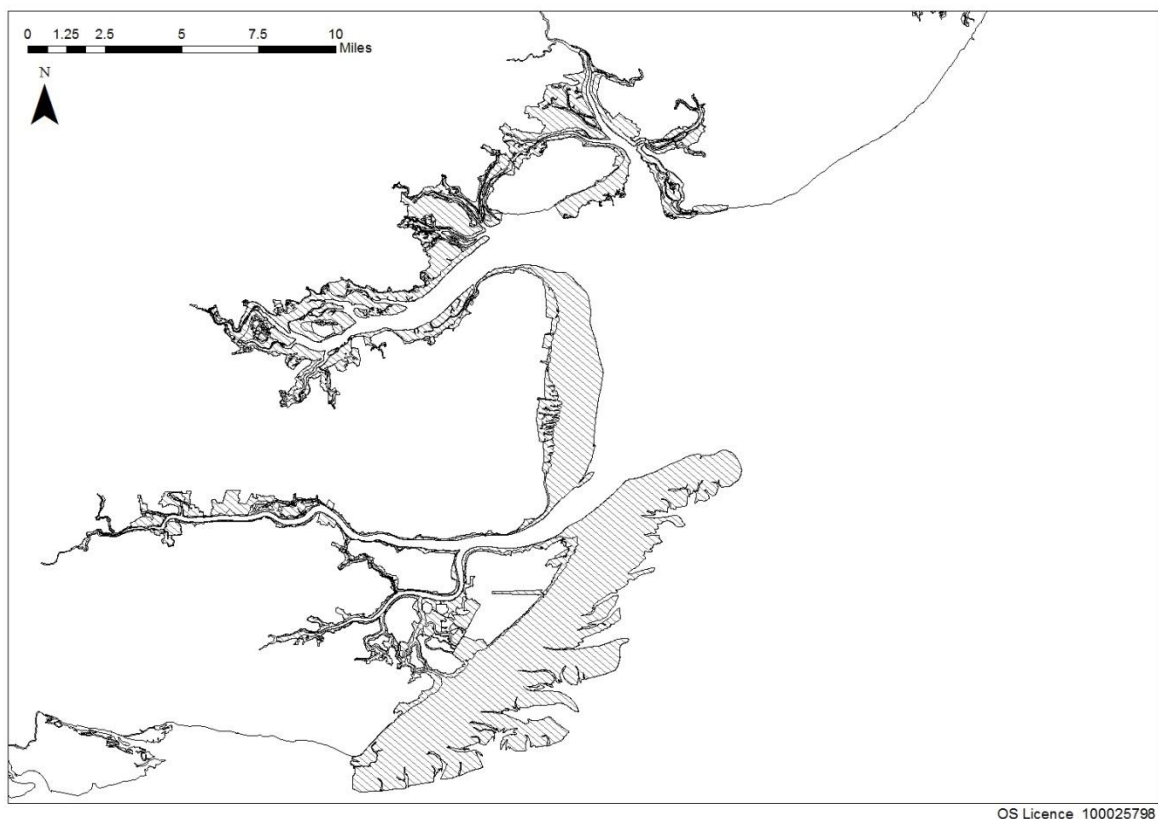


Figure 1 Mid Essex Coast Phase (1-5) SPA designated areas

1.2 Essex Estuaries Special Area Conservation

Feature of the Essex Estuaries SAC:

- H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks
- H1130. Estuaries
- H1140. Mudflats and sandflats not covered by seawater at low tide
- H1310. *Salicornia* and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand
- H1320. *Spartina* swards (*Spartinion maritima*); Cord-grass swards
- H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)
- H1420. Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*); Mediterranean saltmarsh scrub



OS Licence 100025798

Figure 2 Essex Estuaries SAC designated area

1.3 Blackwater, Crouch, Roach, Colne - Marine Conservation Zone

Features of conservation importance;

- Intertidal mixed sediments – Broad scale marine habitat
- Native oyster (*Ostrea edulis*) - Beds Marine habitat
- Native oyster (*Ostrea edulis*) - Species of marine fauna
- Clacton Cliffs and Foreshore - Feature of geological interest

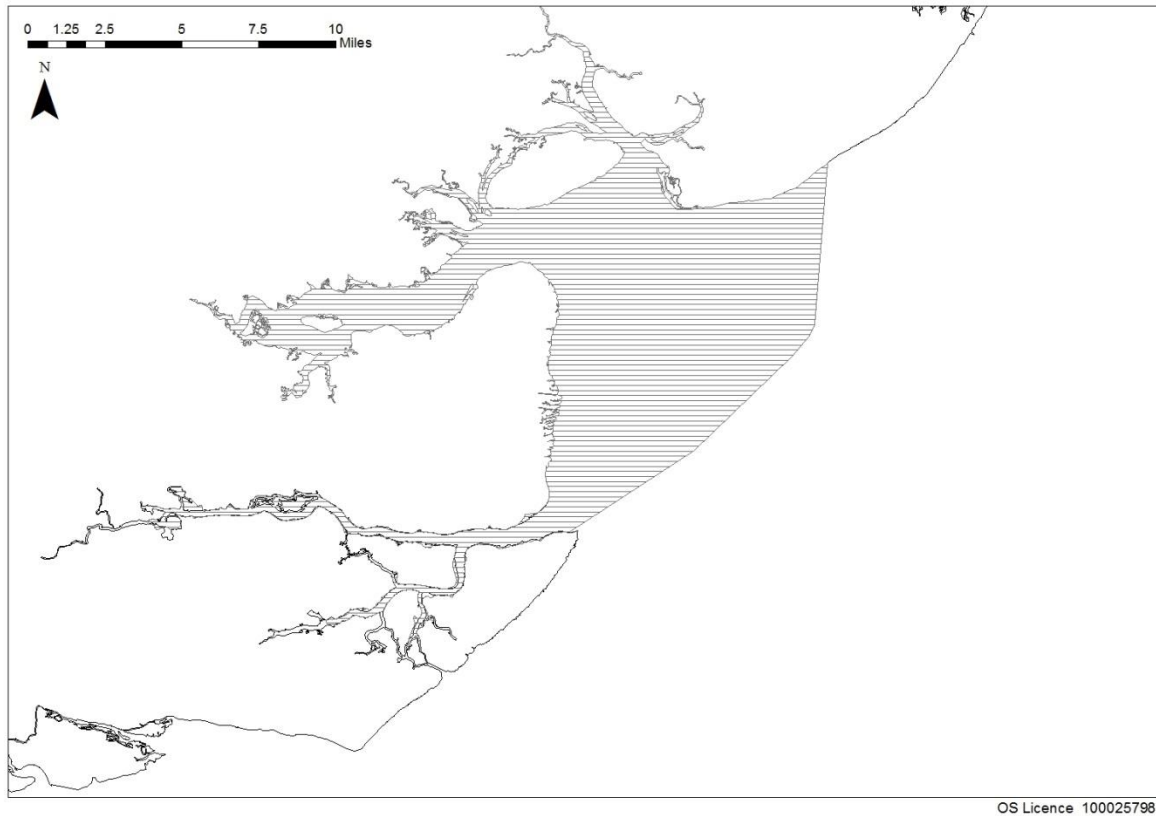


Figure 3 Blackwater, Colne, Crouch & Roach MCZ designated area

2. Introduction

The BCRC MCZ was designated in 2013. Focussing on the Native oyster and Native oyster beds features, the conservation objectives of the site were to restore the populations of Native Oyster and the habitat of Native oyster beds.

The MCZ designation overlaps the existing European designations of the Essex Estuaries SAC (protecting habitats) and the Blackwater SPA (protecting birds). Each designation has separate conservation objectives and therefore it is important to ensure that the objectives are married together rather than allowing the achievement of one to hinder another.

Following the establishment of the ENORI group, active restoration was considered to be needed to cause the recovery of native oysters and native oyster beds in the public areas of the BCRC MCZ. The ENORI group will act as a decision-making group to react to adaptive risk-based management to recover the Native oyster and Native oyster beds.

3. Activity to assess

- Monitoring of *O.edulis* translocation area using dredges and grabs
- Installation of cultch on subtidal mixed sediment and future monitoring
- Installation of *O.edulis* settlement cages (gabions) and future monitoring
- Establishment of brood stock areas for *O.edulis*

4. Site specific SAC sub features which may be affected:

- Sub tidal mixed sediment
- Subtidal mud

5. Site specific MCZ features which may be affected:

- Native oyster (*Ostrea edulis*) Beds
- Native oyster (*Ostrea edulis*)

6. Supporting documents

- HRA assessment – Relaying of *O.edulis* in co-ordination with the BCCR MCZ restoration Project (June 2016)

7. Rational for assessment

The purpose of this site specific assessment document is to assess;

- Whether or not activities undertaken to monitor and assess the health of the 2016 relay project will have a likely significant effect on the designated sites listed above.
- To assess if the installation and monitoring of settlement cages is likely to have a significant effect on the designated features listed above
- To assess if the installation and monitoring of cultch trial plots for settlement of *O.edulis* veligers is likely to have a significant effect on the designated features listed above.

All activities are to take place within the *O.edulis* restoration box, as part of the ENORI *O.edulis* restoration management plan, and on the basis of this assessment whether or not it can be concluded that the proposed works will have an adverse effect on the integrity of the designated sites. NE have previously given advice that restoration activities should be focussed within the restoration box as it represents an area of suitable habitat and supporting processes which was an area that supported native oysters historically (see Annex).

8. Documents reviewed to inform this assessment

- Natural England's conservation advice (Reg 33/35)for MCZ, SAC and SPA
- Site map(s) – sub-feature/feature location and extent (Annex 1)
- Oyster replenishment HRA (annex 2)
- NE confirmation letter (Annex 3)
- Biotope types and sensitivity (Annex 4)

9. Information about the European marine site(s)

- Essex Estuaries SAC
- Blackwater Estuary SPA

10. Proposed Works

Restoration Box Monitoring

In June 2016 25,000 live Native oysters of approximately 50mm and over in size were translocated to the restoration box. The overarching objective being to restore an active oyster bed to promote establishment of the designated feature as well as increase reproduction and future recruitment of existing or actively restored habitats in the MCZ.

This also presents an opportunity to explore the ecology of a high density oyster bed relative to surrounding habitats where oysters are now absent or at very low density. Much of the information we have on the benefits of oyster beds to biodiversity or ecosystem services are either from different habitat types or locations

As part of ongoing research projects based at the University of Essex and following a year for the relayed oysters to settle into their new habitat in the restoration box, a baseline survey has been proposed to meet the following objectives:

1. To provide baseline data on oyster density in the box post relay
2. To attempt a mark-recapture analysis or survival estimate from the marked oysters
3. To measure spat settlement and recruitment of new oysters to the site
4. To provide data on biodiversity and associated communities of oysters at a density of 5m²
5. To provide information on nitrification potential of the sea floor with and without oysters. From each grab sample we will take two 10ml substrate samples, placed in 15ml sterilised falcon tubes for measuring nitrification potential.

The Oyster restoration box is being considered as having two non-independent areas where brood enhancement has begun. One where known numbers of marked oysters were relayed (2,500) and a larger area where unmarked oysters were relayed.(approx 22,500).

The objective is to assess the Native oyster population, particularly:...

1. Mortality rate of mature oysters relayed in a 'high density' area within a designated *Bonamia* area.
2. Colonisation and assemblage of associated species to a newly created oyster bed.
3. Combined with veliger data collected post 2016 relay project assess settlement and survival rate of juvenile oysters within the relay site. (counts of year 1 *O.edulis* settlers)
4. ground truth the density of species and the selectivity of the dredge,
5. abundance and size of settled non native oyster spat will also be recorded.

To do this, we will carry out 3 replicate sample dredges using a standard 1.4m oyster dredge (ladder type (Figure 4) as opposed to the more invasive toothed type (Figure 5)



Figure 4 Modified Ladder Dredge used by oystermen in the Essex Estuaries for oyster cultivation. note, the silver bar and the silver skis are the only area of the dredge in contact with the sea bed.



Figure 5 An example of a toothed oyster dredge, now redundant in oyster cultivation practice in the Essex Estuaries in favour of less invasive ladder dredge (see figure 4)

Survey dredges will be towed for a distance of 100m in the most southerly third of the relay area, within the tagged oyster area. (see Figure 6)

Figure 6 map of relay site with tagged oysters highlighted and where we are grabbing and dredging

This represents 3 dredges in total. All surface macrofauna and substratum composition including shell budget (weight in g) will be counted, measured and photographed on board the boat and returned as best as possible to its original position. Any Pacific Oysters dredged will not be returned. This is in line with the methodology undertaken of the collection of data for the purpose of designating the BCRC MCZ and consistent with the methodology of estimating dredge efficiency undertaken by previous studies. Consistent sampling methodology allows for accurate comparison between yearly data sets. The methodology will be continually reviewed to ensure that the conservation objectives of the site are not hindered.

10 1m² grab samples will be taken from each of the three dredge tows (three dredge tows for monitoring This will represent 30 grab samples in total. From each grab sample, all surface macrofauna will be counted and measured/photographed. These 1m² grab samples will be used to assess;

- All surface macrofauna after which all will be returned, except any Pacific Oysters.

A one litre subsample of the top 20cm of the grab material from each grab will be taken for washing through a 2mm sieve to capture subsurface macrofauna. Two 5ml samples from the top 5cm of each grab sample will be taken and stored in 25ml sterile tubes – one to be frozen and the other fresh to measure the Nitrification potential of the sea bed.

The purpose of the nitrification study is to help gain a better understanding of the ecosystem services provided by Native oyster habitat Methodology for capturing nitrification potential will be conducted in line with the following studies

Li J, Nedwell DB, Beddow J, Dumbrell AJ, McKew BA, Thorpe EL, Whitby C (2015). amoA gene abundances and nitrification potential rates suggest that benthic ammonia-oxidizing bacteria (AOB) not archaea (AOA) dominate N cycling in the Colne estuary, UK. Appl. Environ. Microbiol. 81:159-165.*

Beddow J, Stolpe B, Cole PA, Lead JR, Sapp M, Lyons BP, Colbeck I, Whitby C (2016). Nanosilver inhibits nitrification and reduces ammonia-oxidizing bacterial but not archaeal amoA gene abundance in estuarine sediments. Environ Microbiol (doi: 10.1111/1462-2920.13441) ISSN 1462-2912.*

In addition to the above, a provision for up to 10 additional grabs can be conducted within the restoration box during the course of the year to ascertain biological parameters these may include but are not restricted to;

Breeding potential, *bonamia* prevalence, biological communities.

NE will be informed of any additional grabs undertaken and the results will be made available to the ENORI group.

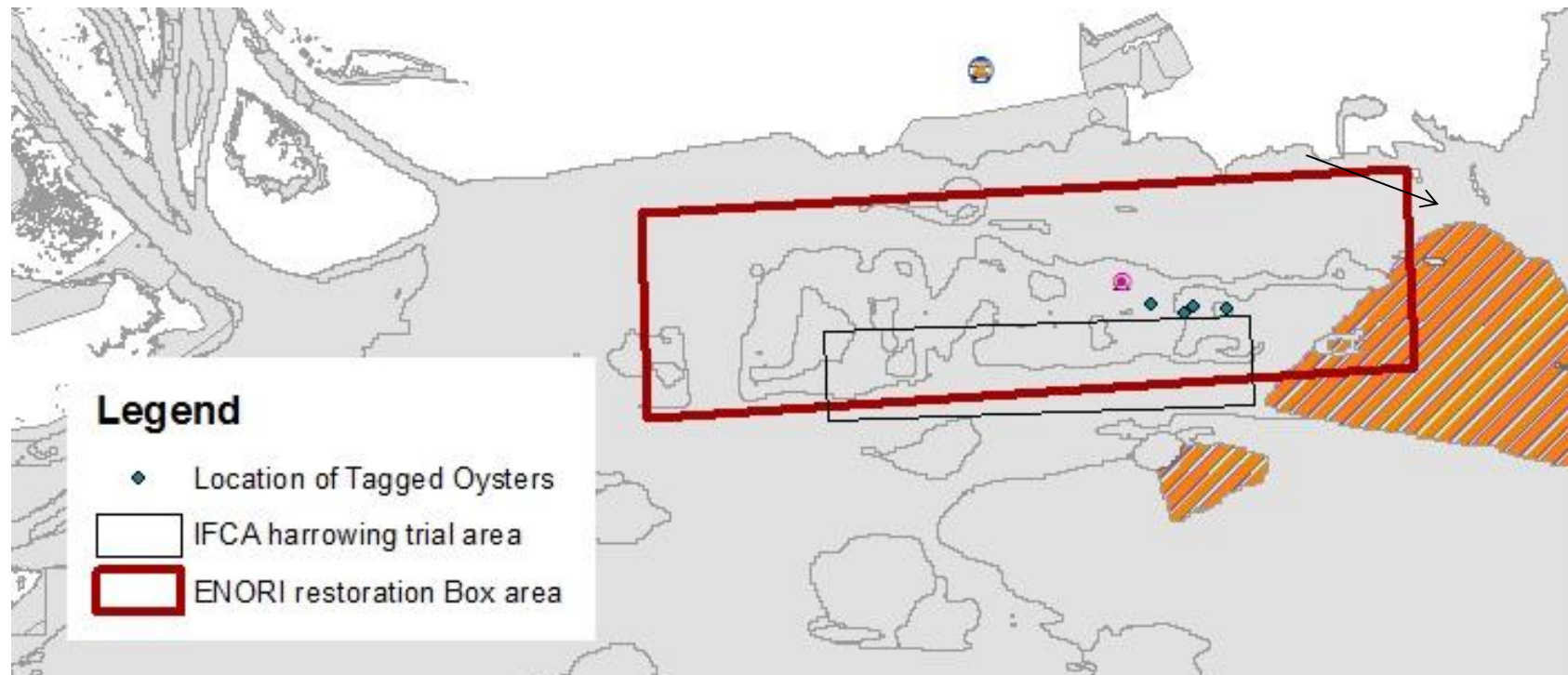


Figure 6 Map of restoration box and location of dredges and grabs, location of tagged oysters, underlying benthic substratum map

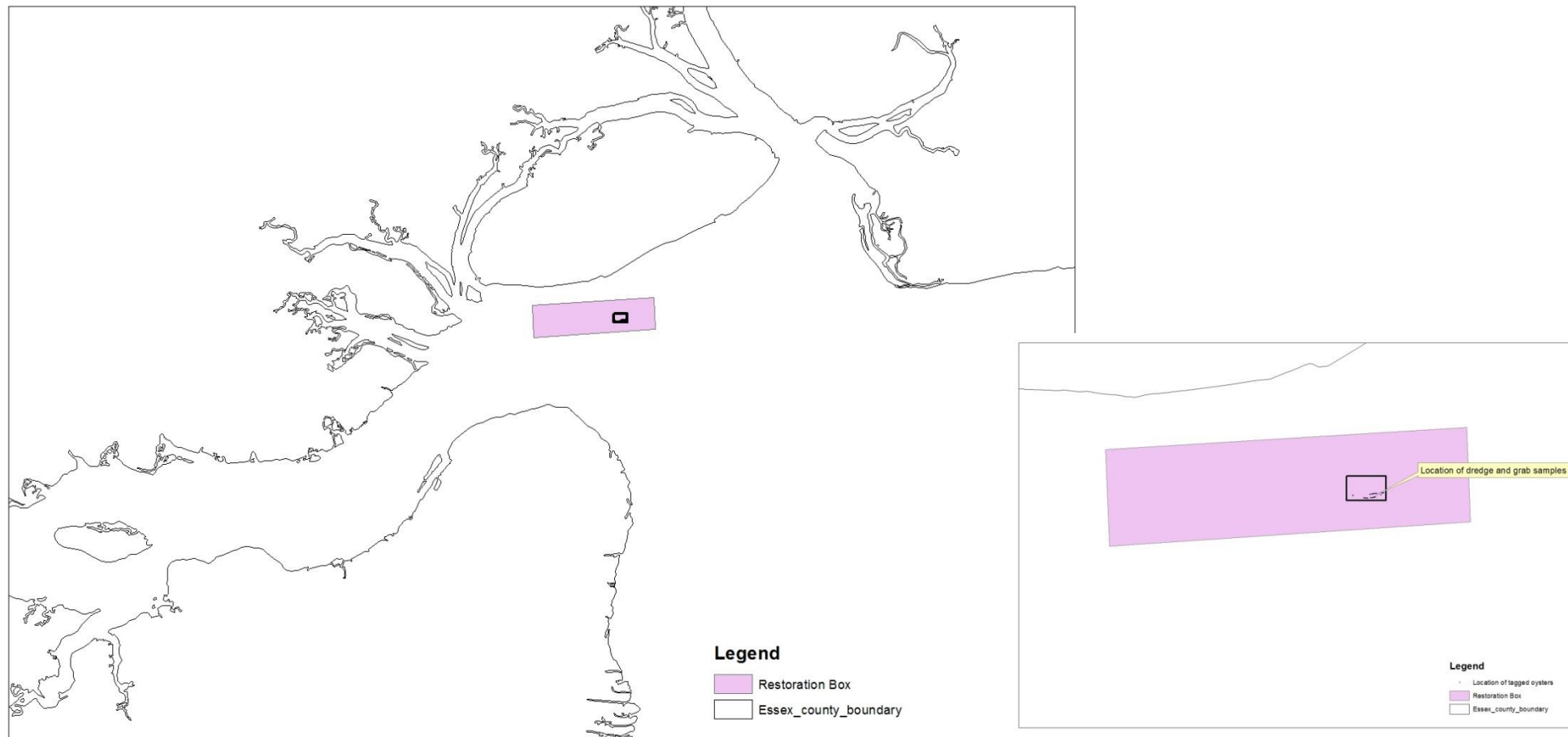


Figure 7 Location of restoration box, oyster translocation area and monitoring area (Dredge & Grab)

Installation of settlement cages (gabions)

The Gabions are steel cages are approximately 2.4x2.4x1.2 m (lxbxh) consisting of four equal square chambers (each 1.728m³) in volume. The footprint of each gabion is 5.76 m sq. a maximum of 4 gabions will be deployed covering an area of 23.04m²

The temperature of the water over the summer will trigger the installation of the gabions *O.edulis* are known to begin breeding in temperatures equal to or in excess of 16°C – a gabion will be deployed close to the downstream edge of the relay box every three to four weeks from approximately July until early September. This will result in maximum four gabions being deployed in total.

The objective is to test the efficacy of different shell cultch material for collecting native oyster spat – selectively from Pacific oyster spat as a conservation tool to be used in Gabions for spat collection or for active mixed sediment subtidal habitat restoration.

In each Gabion there are four treatments: Pacific oyster shell, cockle shell, Blue mussel cultch and dead slipper limpet (taken from existing areas located above the high tide line). The use of zebra mussel shell may be considered in the future if satisfactory biosecurity measures are put in place. The shell will be placed in mesh bags (poshes) and inserted into the Gabion. There will be up to 8 poshes per chamber.

Following deployment the Gabions will be left in place until March/April 2018 to allow for any juvenile oysters to grow to a point they can be easily differentiated between European native Oyster and Pacific Oyster. Leaving the gabions in over winter is also more realistic in terms of what would happen to cultch if used as a conservation tool. This replicates natural conditions and demonstrates that not all oyster spat, even if it settles will survive the winter

The gabions will be flushed every four weeks. This means they will be lifted from the water and washed using an on board hose and then resettled in the same place on the sea bed. This is to minimise biofouling and to reduce the risk of silt killing off all oyster spat.

The gabions will be deployed by COF on behalf of the ENORI group, the ENORI group will be informed when this happens. The washing lifts will be undertaken by COF or KEIFCA. At the end of the experiment the Gabions will be lifted and returned to COF on behalf of the ENORI group. A sorting party will be organised to record the relative shellfish settlement success per shell type per time of deployment looking at size and abundance, including % pacific oyster to native oyster spat.

The aim is to provide data on settlement rates and success on different shell types to support ongoing ENORI objectives. This is an ENORI led experiment and not tied to any student led projects. If results are clearly seen, this project will last only 1 year.

Cultch laying

Additional shell material will be added to the estuary floor in order to mitigate the lack of available suitable settlement substrate for young oysters. Studies indicate that the whole of the BCCR MCZ has a limited shell budget, Shell budget is the amount of shell accessible on the sea floor which is available to receive settlement and colonisation from marine epifauna. Over time shell can deteriorate in quality and quantity through removal from fishing activities or by breaking down into smaller fragments and becoming unsuitable for colonisation.

Installation of additional material is termed cultch laying. Oyster larvae are known to settle on a range of different substratum, but show preference for settling on or close to existing populations of living adults. Settlement prompts given off by adult individuals to veligers about to settle include but are not limited to chemical and hormonal cues (including dopamine and adrenal pathways) the installation of settlement substratum (i.e. cultch) close to a known breeding population increase the shell budget and maximises the potential for veligers to settle. The choice of shell material in oyster restoration efforts is often dictated by the cost and availability of materials. Materials trialled successfully in oyster restoration efforts include: oyster shell, other bivalve shell, concrete and limestone marl. Given the SAC status of the site, only mollusc shells will be trialled. In order not to impact negatively on the listed SAC features, it has been advised by NE that cultch improvements may only take place initially within the restoration box on areas of subtidal mixed sediments.

A number of potential shell sources for cultch have been considered by ENORI, these include locally sourced cockle shell, mussel shell, and oyster shell. In order to achieve habitat restoration, the usual practice is to lay shell on the bottom. Given the difficulties in sampling the waters of the Blackwater due to tidal conditions and turbidity, ENORI will be undertaking initial cultch trials to ascertain which type cultch yields the highest settlement potential, the cultch will be housed in gabions (methodology above). These will be used to test the adequacy of each of the available cultch materials in capturing spat (juvenile oysters). The following shell materials will be tested:

- Blue Mussel
- *Crassostrea gigas* shell
- cockle shell
- Slipper Limpet (*Crepidula fornicata*)

In the longer term after year 1 trials, as funds are secured, it is in the intention of ENORI to use the data gathered from the gabion experiments to inform larger scale cultch placement. This would be cultch relayed directly onto the seabed at abundances and densities (thickness/elevation) on appropriate sediments in an effort to create beds with different elevations. The existing oyster densities at the selected sites within the restoration box will be assessed prior to cultch placement to avoid any unnecessary impact on existing oysters. Areas that have previously had oysters

relayed within the restoration box would be avoided. The creation of areas of cultch with different elevations will allow ENORI to assess the impact of the shell adding relief to the seafloor shown that reefs or beds with greater relief tend to have higher success in recruiting oysters (Lenihan et al., 2001). Furthermore, experimental work in Europe suggests that being situated at a higher elevation on the seafloor may also benefit the Native Oyster (Sawusdee et al., 2015). Under the advice of NE all restoration activity can only take place on subtidal mixed sediments (Further costings for large scale cultch recovery project see Appendix II)

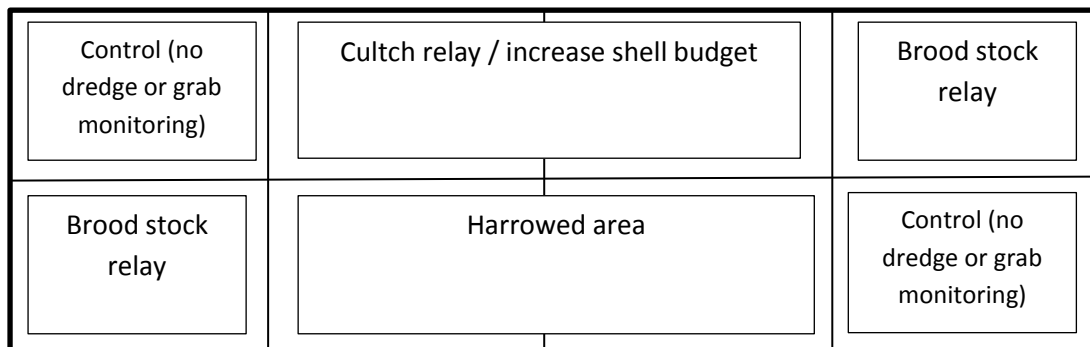


Figure 8 Schematic of the restoration box and areas where restoration will take place (arrangement may be subject to change, but total area of sea bed area will not)

Establishment of Brood stock areas for *O.edulis*

The Blackwater, Crouch, Roach and Colne Estuaries Marine Conservation Zone (BCRC MCZ) was designated in November 2013 with conservation objectives to recover native oysters and native oyster beds to favourable condition. It has been identified and acknowledged by Natural England that human intervention is necessary to recover native oysters.

A Native Oyster restoration project has been proposed by the Essex Native Oyster Restoration Initiative (ENORI). The project wishes to remove *Ostrea edulis* stocks from the private fishery (Tollesbury and Mersea oyster company ltd. several order) and relay up to 1.5 of European native oysters (*Ostrea edulis*) on a small site on the public ground.

Translocated breeding adults will act as a breeding stock, for the dispersal of veliger's throughout the MCZ. Planktonic sampling has already begun in the area to establish baseline veliger counts before the project goes ahead. Once relayed planktonic sampling will continue throughout the 2016 breeding season within the immediate area and the estuaries in order to ascertain if the translocated adults are breeding and what the breeding stock is contributing.

There are no plans to resurvey the breeding adult oysters, due to the sedimentary nature of the Estuary the favoured method of survey would be dredge, in an attempt to minimise any impact to the restoration site a dredge survey would not be advisable, however, if it is required as a condition of the project, then this can be done.

The area currently proposed for the restoration and relaying of these oysters sits within a site of sub-tidal mixed sediment to Natural England. (See Figure 1)

The project proposes to relay up to 1.5 tonnes of mature European Native oysters within the relay site (Map 1).

Oyster restoration box ongoing surveys

Future dredge/grab surveys following the above approved methodology at the relay site will be repeated annually (2017-2019) to ascertain the relative importance of oyster reproduction and survival to recruitment. Evidence shows that early results have indicated the role of high mobile benthic predators in responding to localised spatfall of native oysters. The baseline survey is funded through in kind contributions from the Blackwater and Colchester Oyster Fisheries and the University of Essex. Ongoing surveys are likely to be funded in kind through ENORI partners or through other collaborations with the University of Essex. Methods will be identical to the baseline survey.

All survey results from the above trials will be shared with the ENORI group. ENORI will act as a decision-making group and will use an adaptive risk-based approach to determining further management.

11. Test of Likely Significant Effect

11.1 Essex Estuaries SAC:

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats, and
- The supporting processes on which qualifying natural habitats rely

Feature/subfeature	Does the feature occur within the footprint of the proposed works	Is the feature likely to be impacted by the proposed works	Is the integrity of the site compromised due to the proposed works
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)	N	N	N
Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>)	N	N	N
Salicornia and other annuals colonising mud and sand	N	N	N
Spartina swards (<i>Spartinion maritimae</i>)	N	N	N
Sandbanks which are slightly covered by sea water all the time	N	N	N
Mudflats and sandflats not covered by seawater at low tide	N	N	N
Estuaries	Y	Y	N
Intertidal coarse sediment	N	N	N
Intertidal mixed sediment	N	N	N
Intertidal mud	N	N	N
Intertidal rock	N	N	N
Intertidal sand and muddy sand	N	N	N
Intertidal sea grass beds	N	N	N
Subtidal coarse sediment	Y	Y	N
Subtidal mixed sediment	Y	Y	N
Subtidal mud	Y	Y	N
Subtidal sand	N	N	N
Subtidal seagrass beds	N	N	N

11.2 Blackwater Estuary SPA:

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

Feature	Does the feature occur within the footprint of the works	Is the feature likely to be impacted by the proposed works
Dark-bellied Brent goose (<i>Branta bernicla bernicla</i>), Non-breeding	N	Y
Dunlin (<i>Calidris alpina alpina</i>), Non-breeding	N	Y
Grey plover (<i>Pluvialis squatarola</i>), Non-breeding	N	Y
Hen harrier (<i>Circus cyaneus</i>), Non-breeding	N	Y
Waterbird assemblage, Non-breeding	N	N
Ringed plover (<i>Charadrius hiaticula</i>), Breeding	N	N
Pochard (<i>Aythya ferina</i>), Breeding	N	N
Little tern (<i>Sternula albifrons</i>), Breeding	N	N

12. Test for Likely Significant Effect (LSE): Monitoring of translocation box. Dredges and Grabs, installation of settlement cages (gabions), Cultch relaying.

12.1 Blackwater Estuary (Mid Essex Coast Phase 4)

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?	No.
2. What potential pressures are likely to affect the interest features? (<i>reference to conservation objectives</i>)	Disturbance of feeding grounds Little Tern Ringed Plover
3. Are the qualifying features potentially exposed to the pressure(s)	<p>Yes. Breeding Little Tern & Ringed Plover will be present from April - August. The following birds <i>Little Tern</i> use the water column to feed: whereas the following birds: <i>Ringed Plover</i> feed on intertidal habitats and therefore the disturbance will be less.</p> <p>Disturbance may occur by increased frequency of boats at the site.</p> <p>However this will be minimal as it will likely be only 1 boat at the site at any one time and the number of trips will be a max of 5 additional trips in total (one boat trip to undertake dredge and grab samples and 4 additional trips to install gabions and flushing Given, the low maximum number of boat trips, it is unlikely that the disturbance will be significant, even when considered alongside other operations in the estuary.</p>
4. Potential scale of pressures and mechanism of effect/ impact (if known)	low
5. Is the potential scale or magnitude of any effect likely to be significant?	Alone: No in combination: No
6. Have NE been consulted on LSE? If yes, what was NE's advice?	Yes

12.2 Essex Estuaries SAC

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?	No.
2. What potential pressures such as abrasion/physical loss by gear type(s) are likely to affect the interest features? (reference to conservation objectives)	<p>Dredge: Physical abrasion</p> <ul style="list-style-type: none"> • Abrasion/disturbance of the substrate on the surface of the seabed <p>Grab: Physical abrasion</p> <ul style="list-style-type: none"> • Abrasion/disturbance of the substrate on the surface of the seabed; • Penetration and/or disturbance of the substratum below the surface of the seabed, including abrasion
3. Are the qualifying features potentially exposed to the pressure(s)	Yes
4. Potential scale of pressures and mechanism of effect/ impact (if known)	<p>The total number of dredges (n=3) and grabs (n=30) affects only areas within the restoration box, which has been confirmed by NE as the primary area to focus activity.</p> <p>The total area of the box is 197ha. This represents 69ha of subtidal mixed sediment. The estuary feature as a whole supports 3981.78 ha of subtidal mixed sediment.</p> <p>The restoration activities in the restoration box therefore represent an area of 1.73% subtidal mixed sediment of the whole SAC spatially. The estuary feature is 47200ha, the recovery operations on the subfeature affects 0.15% of the estuary feature. The biological communities in the restoration box are A5.431 & A5.422 (see Annex 6) these biotopes are dominated by slipper limpet and show a low sensitivity to abrasion and disturbance and penetration of the sea bed.</p> <p>It can be concluded that due to the small footprint affecting one of the sub features of Annex 1 feature - Estuary) and the relatively small impact on subtidal mixed sediment communities it is likely that activities are not likely to have a significant effect on the SAC. Furthermore, it is hoped that in the long-term the subtidal mixed sediment biotopes will be enhanced, marrying with the conservation objectives of the MCZ to restore native oyster beds and show a greater/more complex biodiversity.</p>
5. Is the potential scale or magnitude of any effect likely to be significant?	Alone: No in combination: No
6. Have NE been consulted on LSE? If yes, what was NE's advice?	Yes

12.3 Blackwater, Colne, Crouch & Roach MCZ

1. Is the activity/activities directly connected with or necessary to the management of the site for nature conservation?	Yes, restoration of the Native oyster & Native oyster beds within the Blackwater, Colne, Crouch & Roach Marine Conservation Zone.
2. What potential pressures such as abrasion/physical loss by gear type(s) are likely to affect the interest features? (reference to conservation objectives)	Dredge: Physical Abrasion Grab: Physical abrasion
3. Are the qualifying features potentially exposed to the pressure(s)	Native oyster: <i>Ostrea edulis</i> Native oyster beds
4. Potential scale of pressures and mechanism of effect/ impact (if known)	<p>Screening: The restoration activities are due to take place within the BCRC MCZ</p> <p>Stage 1 assessment: The activities listed above are considered to be important to further the conservation objectives of the site. The conservation objectives of the MCZ are to recover native oyster beds and native oysters (individually). It is considered that there is no significant risk of the activity hindering the conservation objectives.. However due to the effects of dredging for research or silt removal in the site, the following has been considered.</p> <p>Area: subtidal mixed sediment within the restoration box = 69ha Total amount of subtidal mixed sediment in SAC = 3981 ha Total area impacted = 1.73%</p> <p>Annual monitoring surveys will need to be conducted to track the progress of the relay site, and its progression towards a mature native oyster bed. The methodology continue unchanged and therefore the impact will remain the same.</p> <p>Cleaning within the relay site and the surrounding restoration area is not planned following the three year trial undertaken by the K&EIFCA .</p>
5. Is the potential scale or magnitude of any effect likely to be significant?	Alone: No in combination: No Rationale based on area of impact
6. Have NE been consulted on the MCZ Assessment? If yes, what was NE's advice?	Yes

13. Conclusion

13.1 Monitoring using Dredge and grab techniques

Project proposals to monitor the translocation area using 3x 100m dredges and 30 x 0.1m² grabs is primarily for the continued development and scientific understanding of how an oyster bed, cited under the conservation objectives of the BCRC MCZ can develop.

- Determine which communities are associated with the development of the *O.edulis* bed feature.
- To determine mortality rates of *O.edulis* placed in densities of 5m² (bed feature) within a *Bonamia* area.
- To ensure continued monitoring and research will seek to inform conservation advice for BCRC MCZ features in the future.

Due to the time of year, location of the works and the length of time the work will be completed over (48hours), there is no likely significant effect of SPA features: Breeding Little Tern and Breeding Ringed Plover.

A total of 3x 100m dredges and 10 x 0.1m² grabs will be taken (associated with each 100m tow) will be completed within the site, on the qualifying feature subtidal mixed sediment, *O.edulis* and *O.edulis* beds,. Due to the area impacted (303m sq. (0.03ha) total area of subtidal mixed sediment impacted) of a potential 3981ha of subtidal mixed sediment (this represents 0.00006% of the subtidal mixed sediment and 0.06% of the Estuary feature) available within the Essex Estuaries SAC a negligible impact due to size of impact has been concluded, therefore no likely significant effect has been concluded for the Essex Estuaries SAC.

Due to the operations being directly linked with the continued progression of the MCZ conservation objectives for *O.edulis* and *O.edulis* beds and as continued monitoring of an existing HRA approved project, impacts to MCZ qualifying features are concluded to have no likely significant effect.

13.2 Installation of settlement cages (Gabions)

Installation of 4x settlement cages (gabions) for the continued progression and understanding of *O.edulis* and *O.edulis* beds. Due to the proposed time of works (July – October) and length of operational time the project will be completed over (48hours total operational time) conclusion of no likely significant effect has been concluded for impact the Blackwater Estuary SPA for Breeding, Breeding Little Tern and Breeding Ringed Plover.

Due to the size of the area of the settlement cages (5.76m² total area) will impact on the effect on subtidal mixed sediment is deemed negligible and therefore no likely significant effect has been concluded for Subtidal mixed sediment)

Due to the operations being directly linked with the continued progression of the MCZ conservation objectives for *O.edulis* and *O.edulis* beds and as continued monitoring of an existing HRA approved project, impacts to MCZ qualifying features are concluded to have no likely significant effect.

13.3 Cultch Relaying

Following settlement trials (gabions) a programme of cultch relaying is proposed, all works will take place within the MCZ restoration box (see figure xx) on existing areas of subtidal mixed sediment.

Cultch relaying will commence between June/ July 2017 due to water temperatures and favourable conditions for veliger settlement. Due to the time of year no over-wintering birds will be impacted. Due to the subtidal location of the restoration site, no breeding birds will be impacted.

Due to the maximum total area of 69ha that will be impacted on of a total of 3981ha within the designated site comprising of 1.73% the impact to subtidal mixed sediment is deemed negligible and 0.15% of the Estuary feature.

Due to the operations being directly linked with the continued progression of the MCZ conservation objectives for *O.edulis* and *O.edulis* beds impacts to MCZ qualifying features are concluded to have no likely significant effect.

13.4 Establishment of Brood Stock Areas

The proposed relay and restoration project is located at the request of NE to be on sub tidal mixed sediment and therefore is not likely to have a detrimental effect on subtidal habitats and associated communities in the Essex Estuaries SAC. Due to the small geographical scale and the underlying benthic substratum we are hopeful that the proposed relaying project will enhance the features of both the EMS and the MCZ. The associated ground truthing, previous to the application for relaying, has been key in furthering our understanding of the benthic substratum in a previously unknown area of the EMS and we are confident that the project will move towards restoration of Native oyster populations and the achievement of the MCZ conservation objectives SPA features and sub features are also unlikely to be impacted due to the confinement to subtidal areas and the timing of the activity at the very start of bird breeding season. Benefits of the proposed project is the ability of the project to fill in data gaps in the benthic substratum currently un mapped and unknown to NE. The results of this trial will help to inform management decisions for the recovery of native oysters in the Blackwater, Crouch, Roach and Colne MCZ and will be incorporated into the management plan for the site.

14. ENORI

ENORI will continue to form consensus decisions based on the evolving evidence base. Decisions will take an adaptive and risk-based approach. Data from the above trials will be shared with and reviewed by ENORI once results are available. This will then inform future restoration activities.

ENORI is committed to clear and transparent communication to inform better decision-making. Any deviations from the above methods will be discussed with ENORI and NE will be informed in writing. ENORI will also seek to inform other estuary users.

Information has been sought by the MMO as to whether a license is required. Feedback from MMO licencing department to Sarah Allison in February 2017 is that a license is not required.

Installation of the gabions will follow all relevant Health and Safety procedures relevant for navigational purposes, advice will be sought by the harbour master or most relevant authority.

