Centre for Environment Fisheries & Aquaculture Science

Cefas

MARINE AND COASTAL ACCESS ACT (2009). REVIEW OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE SOUTH BANK QUAY PROJECT (PHASE 1) ON THE RIVER TEES BY SOUTH TEES DEVELOPMENT CORPORATION.

Reference Number: MLA/2020/00506.

FISHERIES ADVICE

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To: **Emmanuel Mulenga** – **MMO (by MCMS)**
Cc: Fisheries Advice – Cefas, Lowestoft
Joe Perry – SEAL Case Officer Cefas, Lowestoft

1. With reference to the above request to review the Environmental Impact Assessment report for the South Quay Project (phase 1) on the River Tees by South Tees Development Corporation and your request for comments dated 23 December 2020, please find my comments below in my capacity as advisor on fish ecology and fisheries.

2. This minute is provided in response to your advisory request in relation to the above proposal in my capacity as scientific and technical advisor for fish and fisheries. The response pertains to those areas of the post-application request that are of relevance to this field. This minute does not provide specialist advice regarding benthic ecology, marine processes, shellfisheries or underwater noise as, whilst these are within Cefas' remit, they are outside my area of specialism.

3. In providing this advice I have spent 7.5 hours of the allocated 7.5 hours by the MMO. I have booked my time to C8167B373.

Documents reviewed

4. South Bank Quay, EIA Report, Royal Haskoning DHV, 6 November 2020.

Description of the proposed works

5. South Tees Development Corporation (STDC), the Applicant, has applied for a Marine Licence to construct a new quay at South Bank in the Tees estuary (please see **Annex 1** for site location plan). It is envisaged that the new quay would be utilised predominantly by the renewable energy industry, as well as supporting more general industrial and storage/distribution activities.

6. The proposed scheme will comprise the following works: demolition, capital dredging, offshore disposal of dredged material, construction and operation of a new quay wall and the installation of a rock blanket (please see **Annex 2** for further details).

7. Works are estimated to commence during 2021 and be completed by 2023 with works undertaken 24 hours a day, 7 days per week. The quay will be constructed in two phases; **phase 1** for an initial berth length of approximately 450-630m and **phase 2** to extend the quay up to 1,050m based on market demands. Thus, phase 2 might not be constructed if market conditions do not require it. **This consultation refers to phase 1 of this project,** however, as the documents presented for review are exactly the same and the impacts for the two phases are not separated within the EIA, the responses given to the questions are the same (with only slight modifications) for the two construction phases.

Summary of advice

8. At this stage, further information and modelling is requested from the applicant in order to inform the assessment and to determine whether additional mitigation measures are required. I have listed the information required below:
    I. Revised modelling of the plume that takes into account other dredging activity which may be occurring concurrently – e.g. NGCT, please refer to points 22-24.
    II. Clarification on the proposed exact times (i.e. months) of dredging works so that the likelihood of potential impacts to fish receptors can be more accurately assessed as per points 22-24.
    III. As per point 33, I recommend that the applicant considers the feasibility of undertaking dredging works outside the peak upstream migration season for salmon (July-August).

Questions raised by MMO case officer:

Please note that all responses are observations unless stated.

Question 1. To the best of your knowledge is the description of the environment and potential impacts accurate?

9. Yes, the information presented in the EIA report correctly acknowledges the potential impacts to fish ecology and commercial fisheries within Tees Bay and the Tees Estuary. Most of the relevant commercial and sensitive key fish species as well as the spawning and nursery grounds and main associated commercial fisheries in the area have been considered through Chapter 13 (in particular, tables 13.3, 13.4 and 13.7). The report also acknowledges the presence of high intensity nursery grounds for herring (*Clupea harengus*), cod (*Gadus morhua*) and whiting (*Merlangius merlangus*) within the ICES rectangle relevant to the Tees, and that certain stocks of herring are also reported in estuarine areas (as per Ellis *et al.,* 2012). The report correctly acknowledges that other species may use the Tees estuary and coastal areas as spawning and/or nursery grounds.

10. I am content with the applicant's recognition that the Tees is one of the main salmon (*Salmo salar*) rivers in England and Wales and that migratory species such as sea trout (*Salmo trutta),* European eel (*Anguilla anguilla*), sea lamprey (*Petramyzon marinus*) and river lamprey (*Lampetra fluviatilis*) also inhabit the Tees. The report also acknowledges that all of these species are listed under Section 41 of the NERC Act 2006, with salmon, sea lamprey and river lamprey afforded additional protection as Annex II species in the EU Habitats Directive.

11. In the context of commercial fisheries, section 13.4.1.3 (table 13.5) identifies commercial fish species in this area from 2014-2018, including whiting, plaice and lemon sole as the most landed fish species. In section 13.4.2 commercial and recreational fisheries have been correctly identified using appropriate sources (as per comment 17).

12. The EIA report describes the likely key impacts on fish and shellfish ecology from the effects of marine works associated with the proposed scheme. For instance:

Construction phase

i. Changes in marine water quality (i.e. increased suspended sediment) due to dredging activity;
ii. Entrainment of fish and fish eggs by dredging gear;
iii. Underwater noise during dredging;
iv. Underwater noise from land-based piling activities;
v. Direct loss/alteration of habitat and food source;
vi. Displacement or disturbance of fishing activities;

Operational phase

vii. Noise disturbance from increased vessel traffic;
viii. Impacts from quayside lighting;
ix. Change in maintenance dredging regime affecting supporting habitats and
x. benthic prey resources;

13. I note that no piling has been proposed in the river channel, thus it has been assumed that all piling works will be undertaken on land. In my opinion, the description of the potential impacts to fish ecology and fisheries arising from the construction and operation of the proposed scheme is appropriate assuming no piling is undertaken below the water level.

Question 2. Has the appropriate evidence base been used? Is the evidence complete for its intended use i.e. is there sufficient information to allow a decision on the application to be made? If not please explain why and what you would expect to see and any additional work

14. Section 13.3.2 of the EIA report refers to the methodology used to describe the existing environment regarding fish and fisheries. I note that a desk-based assessment has been used to inform the baseline of fish ecology referring to data collated for nearby developments in the area, specifically the benthic surveys undertaken for the NGCT scheme (Royal HaskoningDHV, 2020), the Hartlepool Approach Channel deepening (Royal HaskoningDHV, 2018), the consented Anglo American Harbour Facilities scheme (Royal HaskoningDHV, 2015) and the Dogger Bank Teesside A and Sofia project (Forewind, 2014).

15. Additionally, the results of the benthic survey conducted in the lower Tees Estuary for NGCT in 2019, two epibenthic beam trawl surveys undertaken in the Tees in July 2014, and benthic trawls undertaken in October 2018 in the Hartlepool Approach Channel have been used to inform the baseline characterisation of fish in this area. Although the gear used in these surveys is not specifically designed to target fish, the findings of the surveys have been used to inform the description of fish demersal species likely to inhabit the lower Tees, which is appropriate to complement the fish characterisation. I appreciate the applicant has also acknowledged some of the data limitations of these surveys (i.e. underestimation of pelagic species). Please note that in addition to pelagic species, beam trawls do not adequately target larger / adult demersal fish.

16. The report has referred to appropriate data sources including the Environment Agency's Tees Barrage fish counter, information collated and compiled from previous impact assessments for

developments in the nearby area, and from appropriate literature and peer reviewed sources such as Ellis *et al*., (2012) and Coull *et al.* (1998).

17. I note that the report uses a range of available published criteria to assess the potential physiological and behavioural effects of underwater noise on fish and I support the proposed use of Popper *et al*., (2014). In addition, based on previous concerns raised by the Environment Agency during the scoping opinion (Table 13.2), a review of potential underwater noise (UWN) impacts from land-based piling works has been undertaken by Subacoustech (2020). I agree this is appropriate, though I defer to my colleague in the Noise and Bioacoustics team for their technical comments.

18. Regarding commercial fisheries, I note that ICES data and UK fisheries statistics from the period 2014/2015 to 2018/2019 have been used and consultation with the relevant conservation authority (NEIFCA) has been undertaken to inform the fishing activity in this area. I agree that this is appropriate, and I am content with this approach to inform the baseline for commercial fishing activity at this site. I also recommend the use of vessel monitoring system (VMS) data to describe and contrast the information provided relating to commercial fishing activity in the area.

Question 3. Do you agree with the conclusions reached?

Dredging activities in the river Tees

19. I recognise that PD Teesport (PDT) has undertaken regular maintenance dredging to maintain navigation within the Tees estuary since 2005. Most dredging within the Tees occurs in the approach channel and low-middle estuary using a trailing suction hopper dredger (TSHD) supported by ploughing where required. PDT employs two TSHDs each with a 1,500m³ hopper volume to maintain depths within the navigable channel and berths within the Tees estuary and Hartlepool for an average of 924,247m³ dredged from the Tees reaches and berths. A summary of the maintenance dredged volumes (m³) by each reach from 2001 to 2019 is provided in Figure 2.

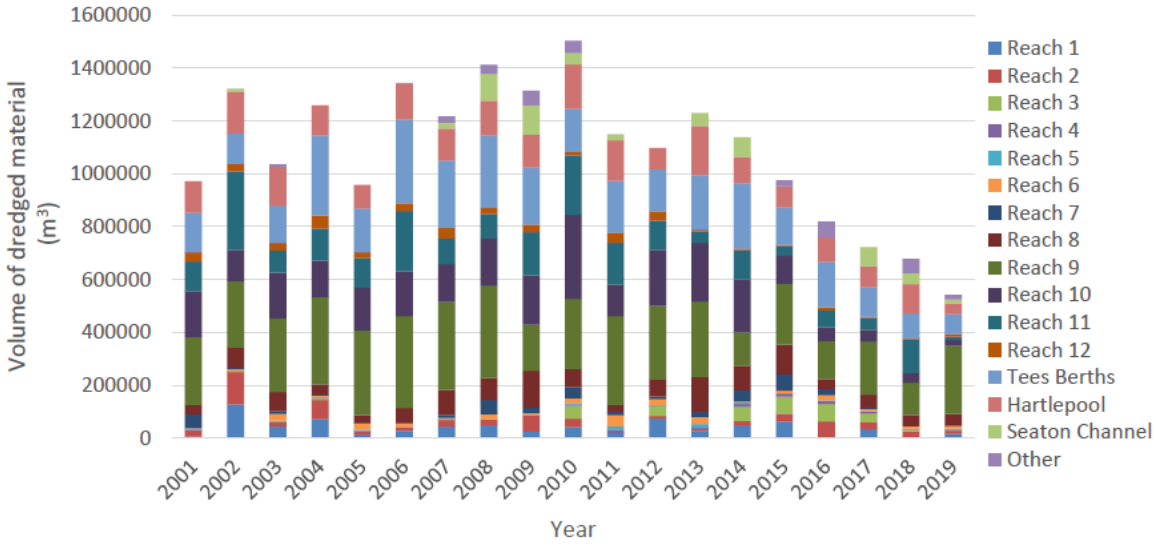

Figure 2. Summary of volumes (m³) dredged and deposited offshore during the period 2001 to 2019 (extracted from figure 6.30 of document 4).

20. For the proposed development, an additional 1.8 million (M) m^3 of marine sediment is predicted to be dredged from the Tees, resulting in sediment plumes. The effects of the plumes have been modelled using a sediment dispersion model run for the entire four-month dredging period covering all proposed dredging and disposal activities (See section 6 and Appendix 5 of document 4). Based on the sediment plume model presented, the applicant concluded that peak concentrations from dredging will be localised, with the lateral extent of the plume across the river channel predicted to be narrow and short in duration. However, when considering the worst-case scenario (i.e. maximum enhanced SSCs) from the four modelled dredging phases set out in Section 6, the maximum area affected by increased SSC includes the entire width of the Tees (see Figures 6.48* for the near-bed layer and Figure 6.49 for the near-surface layer), meaning that there is the potential for a cross-sectional area of the river to be influenced. Further, the EIA report concludes that the plume effects arising from dredging will be observed throughout the whole dredging continuous period of 4 months. *please note that figure 6.48 is wrongly named as figure 6.3 in page 101.

21. In the context of background SSC within the Tees, I note that the 2020 met ocean survey reported low SSC from 0 to 8.5 mg/l. Modelling of the sediment plume during capital dredging indicates that an increase in SSC of up to 350 mg/l is predicted in the direct vicinity of the dredging activity, falling below 50 mg/l at a short distance from the area being dredged. Further, five water quality monitoring points were set in the Tees estuary to investigate potential levels of SSC from March to June 2020. Figure 28.4 of the ES report illustrates how the monitoring at point 3 (Smiths Dock), just upstream of the proposed dredging works, showed increases in SSC above the baseline, up to 85 mg/l, as a result of the ongoing dredging activities. Elevated SSC have been acknowledged to affect dissolved oxygen levels in the water.

22. Additional dredging activities have also been proposed for nearby projects such as Northern Gateway Container Terminal (NGCT) which, if consented, will include capital dredging using a TSHD in Phase 1, and a Cutter Suction Dredger (CSD) and/or Backhoe Dredger (BD) in Phase 2. Dredging for NGCT would be undertaken 24 hours a day for approx.120 weeks until 2028 equating to the removal by dredging of up to 4.8 million m^3 of material. NGCT has been included within the cumulative impact assessment (Section 27.5.9) along with the Anglo-American Harbour facilities and ongoing maintenance works. The applicant has recognised that '*should two or more dredging activities be undertaken simultaneously, the sediment plumes, could result in additive effect which might increase the risk of barrier effects across the estuary preventing migration when dredging occurs during the peak migration season'*. To this, the applicant has suggested that the mitigation measure proposed for South Bank and NGCT of dredging along one axis of the river at any one time, as well as seasonal restrictions for the Anglo-American facilities scheme, will reduce the impact as far as possible. However, it is stated that '*the additive effect of the sediment plumes from separate dredging campaigns cannot be completely avoided if the campaigns are undertaken simultaneously'*.

Major comments

23. Taking into account the duration and timing (i.e. 24 hours of continuous operations) of dredging activities proposed within the river Tees I have concerns regarding the potential cumulative impacts arising from dredging at nearby projects such as NGCT, Anglo-American and maintenance dredging, which may result in high SSC, turbidity and poor water quality. These impacts have the

potential to affect fish physiologically, e.g. abrasion to skin and tissue, clogging of gills and increased respiration, as well as inhibit fish movement during their migratory seasons en-route to spawning sites (see **Annex 3** for further information on impacts).

24. I appreciate that the applicant has proposed limiting dredging to working on one side of the river at a time in order to reduce the extent and impact of the sediment plume. However, in my opinion, based on the evidence provided, it is unclear whether the cumulative noise and SSC from simultaneous dredging operations are likely to cause an acoustic/physical barrier and behavioural effects to migratory fish that may prevent or delay migration. In this regard, and in consideration that the Tees Estuary is recognised at the main salmon river in England and Wales with a Salmon Action Plan enforced by the Environment Agency, due to the unknown start dates of the dredging works and the 24-hour working day, it is my concern that there may be prolonged disturbance and potential impacts to migratory species in their up/downstream movements during their migration season (e.g. salmon), as a result of increased suspended sediment concentrations, poor water quality and underwater noise causing an acoustic/physic barrier to fish movement. Therefore, I believe that more evidence is required in order to improve confidence in the assessment. For instance, the timing of the proposed dredging activities should take into account the peak migration times (July-August) for those protected and sensitive species such as salmon and European eel (Moore & Potter, 2014).

25. I recommend that the applicant presents a revised sediment dispersion model that includes the dredging proposed for NGCT and regular maintenance dredging (i.e. dredge material quantities, times and locations). This would enable Cefas advisors to evaluate the adequacy of the proposed measure of limiting dredging to one side of the river at a time and better determine the likelihood of potential cumulative effects to fish.

Question 4. Are the proposed mitigation and monitoring measures sufficient?

MITIGATION MEASURES PROPOSED DURING CONSTRUCTION PHASE

CHANGES IN MARINE WATER QUALITY DUE TO DREDGING ACTIVITY

Minor comments

26. The applicant has acknowledged some of the potential effects arising from SSC on fish receptors in section 13.5.1 concluding low likelihood for potential impacts on fish due to the following reasons. I have provided comment for each of the points raised:

    i. ***"****Fish resilience to changes in SSC due to natural variations in estuarine systems such as tidal activity, discharges during rainfall and wave actions during storms"*. Please note these events are, in general, short in duration or cyclical, compared with 4 months of continuous dredging.

    ii. The applicant has stated that "*adult fish are mobile and therefore able to move away from areas with increased SSC"*. They have acknowledged that juvenile fish and larvae are less mobile and have assumed that resident fish would be acclimatised to the disturbance associated to regular maintenance dredging. However, migratory fish arriving on this side of the river sporadically during spawning or migration events may not have the ability to move away from increased SSC when heading up/downstream, resulting in a restriction of

migratory pathways.

iii. In the context of migratory fish movement up/downstream within the river Tees, the applicant has acknowledged the potential risk of a barrier effect that could cause disruption to annual migration patterns during peak migration times. However, the applicant maintains that the predicted increase in SSC will only affect the vicinity of dredging activity (no more than a few hundred meters from the site of dredging). However, as per comment 19, the applicant acknowledges that '*when considering the worst-case scenario from the four modelled dredging phases set out in Section 6, the maximum area affected by increased SSC includes the entire width of the Tees'*. In addition, considering the duration of the proposed dredging activities (4-5 months), the worst-case situation would be that this period covers a significant proportion of the peak migratory window, hence the magnitude of the impact is considered to be high. Therefore, the following mitigation measure has been proposed by the applicant to reduce potential impacts on migratory fish: *Limiting both the TSHD and BHD to working within one side of the river at a time. 'Operations will therefore be undertaken in long strips along the axis of the estuary rather than dredging across the width of the river. This is to reduce both the extent and impact of the dredged plume, as any plume generated by operations is predicted to remain on the same side of the river as the dredging operation, as with other capital dredge operations in the Tees (e.g. Royal HaskoningDHV, 2020)'*.

27. With the implementation of the above mitigation measure (point 26.iii), the applicant expects that suspended sediment concentrations and the extent of the plume across the river channel will be limited to one side of the river at a time, leaving the other side relatively unaffected for migratory fish to be able to move past the dredging activity.

Major comments

28. Potential risks from elevated SSC are known to impact fish in many different ways (see **Annex 3** for more details). In particular, migrating species, such as salmonids, are known to exhibit avoidance reactions and move away from the vicinity of adverse sediment conditions, if refuge conditions are present (Sigler *et al*., 1984; Bash *et al*., 2001). The effects of suspended sediment on swimming ability of juvenile brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) were explored by Berli *et al*. (2014) who found both species experienced a decrease in swimming performance as turbidity increased due to impairment in the ability of the fish to utilise anaerobic metabolic pathways in high sediment environments. The authors concluded that the ability of salmonids to maintain swimming performance is hindered when fish are exposed to environmentally relevant, suspended sediment-generated turbidities.

29. As per my previous comments 18-21, dredging activities occurring simultaneously within the river Tees and estuary as a result of the proposed and nearby developments are likely to increase both UWN and SSC within the river at specific locations which may cause a barrier to migratory fish during peak migratory season. In my opinion, at this stage, based on the precautionary approach, there is not enough evidence to make a decision on whether the proposed mitigation measure will be sufficient to protect fish migrating (especially salmon).

ENTRAINMENT OF FISH AND FISH EGGS BY DREDGING GEAR

30. The applicant has acknowledged (section 13.5.2) some of the potential effects arising from the dredging gear on fish species such as injury, mortality and displacement. However, these effects were considered unlikely due to avoidance reactions by mobile fish resulting in temporal relocation of fish, thereby avoiding direct uptake. In the case of fish eggs and benthic fish species such as plaice or lemon sole, the applicant suggests that the area is unsuitable for spawning activity due to the regular maintenance dredging undertaken, and that any level of entrainment would be of low magnitude and limited to the dredge footprint. Therefore, no mitigation has been proposed.

Major comment

31. The assumption that fish can distance themselves beyond the range of impact overlooks the different swimming speeds and capabilities of fish depending on their species or developmental stages and does not consider the biological drivers and philopatric behaviours which some fish species exhibit. At this stage, as per comments 22-24 & 27-28 of this advice minute, there are some issues that need to be addressed in order to consider the need for additional mitigation measures.

UNDERWATER NOISE DURING DREDGING

32. The applicant has acknowledged (section 13.5.3) that underwater noise arising from the dredging is expected to fall within the hearing ranges of fish species present in the Tees including those migratory species which transit through the Tees to access upstream or downstream spawning grounds. However, the significance of temporary/permanent physical effects as well as recoverable injury and/or temporary threshold shift (TTS) are considered negligible. I defer to Cefas underwater noise specialist to further comment on the assessment presented.

33. Table 13.9 indicates that noise levels of at least 130-140 dB SPL_{RMS} (above the background noise levels of 103 to 115 dB re 1µPa SPL_{RMS}) will be present across the entire width of the river during the use of TSHD. Although these levels are within the same range as that generated by passing vessels, the noise will be sustained for a continuous period of approximately four months. Noise levels from backhoe dredging are considerably lower, and only significantly exceed background levels within a short distance (<100m) of the source. Therefore, the existing risk of an acoustic barrier effect preventing migratory fish movements up/downstream, particularly if dredging is undertaken during key migratory periods, has been acknowledged by the applicant. However, given that the TSHD works are expected to last 4 weeks, the applicant has suggested that the duration of the impact will not overlap the entire migratory season with normal migratory patterns expected to recommence once the dredging works cease.

Major comments

34. In my opinion, when taking into account the effects of SSC and UNW generated by existing maintenance dredging and dredging proposed for other projects (e.g. NGCT), in combination with the UWN and SSC that will be generated by the Tees South Bank project, there is potential for cumulative and inter-related impacts of high SCC and underwater noise to cause significant adverse impacts to fish (see **Annex 3** for evidence based potential impacts on fish from dredging). Taking into account the sensitivity of some migratory species and the duration of the proposed works, I recommend that the applicant considers the feasibility of undertaking dredging works outside the peak upstream migration season for salmon (July-August). I defer to Cefas underwater noise specialists to determine the potential magnitude of any UWN disturbance.

UNDERWATER NOISE FROM LAND-BASED PILING ACTIVITIES

35. While piling works are to be undertaken on land at least 20 m from the river edge, consultation with the Environment Agency (see Section 13.2.1) during the scoping stage, raised the issue of noise emissions from the landside piling propagating into the water column and potentially affecting migratory fish during upstream migration. Therefore, the applicant contracted Subacoustech to review the risk of transmission of underwater noise into the river from the land-based piling activities and the potential impacts on migratory fish (Appendix 8). The conclusion of this assessment, based on the more recent criteria for potential injury to fish (Popper *et al.* 2014), is that the risk of noise passing through the bank and into the River Tees and adversely affecting sensitive receptors is unlikely, even under highly precautionary assumptions. As per my comment 13, if no piling is undertaken below the water level, I am content with the UWN assessment conclusions. However, I defer to our underwater noise specialist to comment on the accuracy and sufficiency of the UWN assessment presented.

DIRECT LOSS/ALTERATION OF HABITAT FOOD RESOURCES

36. Excavation of the berth pocket on the south bank of the Tees will result in 2.5ha of intertidal habitat being converted to subtidal habitat, culminating in a loss of sheltering and nursery habitat for juvenile fish. However, the following environmental enhancement measure has been proposed: *the incorporation of 'verti-pools' in the quay face at different heights within the tidal frame. Such water retentive measures would provide new shelter for small and juvenile fish from larger marine predators as well as aerial predators.* I welcome this initiative and defer to Cefas benthic specialists and the Environment Agency for further comments on the suitability of this 'new habitat' to support fish species.

DISPLACEMENT OR DISTURBANCE OF FISHING ACTIVITIES

37. Although most commercial fishing activity takes place outside of the Tees estuary, there are limited seasonal lobster and velvet swimming crab fisheries in the lower estuary during summer months. I defer to the Cefas shellfish advisor for further comments on the commercial shellfish fisheries sections within the report.

Major comments

38. As construction works (i.e. dredging) are proposed to take place 24 hours a day, it is my understanding that additional lighting further out into the estuary will be required at night, which is likely to result in further disturbance to fish. Therefore, I would have expected the effect of light on fish populations to be included within the assessment of potential impacts during the construction phase.

39. At this stage, as per comments 22-24 & 27-28 of this advice minute, there are some issues that need to be addressed in order to consider the need for additional mitigation measures.

MITIGATION MEASURES PROPOSED DURING THE OPERATIONAL PHASE

NOISE DISTURBANCE FROM INCREASED VESSEL TRAFFIC

40. The applicant has stated that because fish within the Tees are already exposed to a high degree of vessel-associated disturbance (including noise levels elevated above ambient levels), they are

considered to be accustomed to such impacts and therefore no mitigation is required. However, concerning marine species habituation to increase human pressures, as per points 22 & 33, I do have concerns regarding the cumulative impacts arising from an increase in vessel traffic from other nearby developments and existing vessel traffic noise reaching an unsustainable threshold for fish inhabiting this area of the Tees.

IMPACTS FROM QUAYSIDE LIGHTING

41. For safety reasons, 18 new lighting towers (each up to 30m in height) will be present on the quayside during the operational phase. Consequently, there is the potential for additional disturbance to fish as result of light spill compared to the present-day scenario. The applicant has concluded that this will result in a highly localised redistribution of fish within the area, and will not affect the population as a whole. Therefore, mitigation is not proposed beyond the best practice of directing the light away from the estuary where possible. I support the best practice measure of the use of directional lighting away from the estuary to prevent excessive light spill.

Question 5. Are there any minor technical or presentational comments that affect the overall confidence in the conclusions? Please insert as an annex.

42. None that affect the overall conclusions.

Question 6. Is the project description clearly presented and consistent throughout the ES?

43. Yes, the project description is clearly presented and acknowledges potential impacts on the marine environment as a result as the proposed works.

Question 7. Is there an adequate description of the baseline physical and biological environment?

44. Please see comments in response to questions 1 and 2.

Question 8. Is the EIA methodology and assessment presented clearly and fully justified?

45. To the best of my knowledge the EIA methodology and assessment are presented clearly and are fully justified through Chapter 7 and Sections 9 and 12.

Question 9. Is there an adequate description of the potential project impacts and effects on the physical and biological environment?

46. Please see responses to questions 1 and 2.

Question 10. Is there an adequate description of the potential cumulative and inter-related impacts and effects on the physical and biological environment?

Major comments

47. Cumulative impacts have been correctly considered within section 27 of the EIA report (document 4). However, I note that the Net Zero Teesside (NZT) is missing from the list of projects identified in the vicinity of the proposed scheme (Table 27.1). The NZT site, if consented, will comprise works affecting marine receptors in the river Tees therefore, I would expect this project to be included and further assessed.

48. As per my previous comments (18-22), there is potential for dredging proposed for South Bank quay to occur concurrently with routine maintenance dredging, and with dredging by other projects (e.g. NGCT). To this, the applicant has suggested that the mitigation measures proposed (or in place) for these other developments will reduce the risk of creating a barrier to migratory fish and concluded that the cumulative effect will be minor adverse. However, as per my comments 22-24, at this stage, further information and modelling is needed to support the applicant's conclusions.

Question 11. Is there an adequate description of the potential transboundary impacts and effects on the physical and biological environment?

49. Not applicable as transboundary impacts are unlikely to arise from this project due to the distance to the median line.

Question 12. Are measures to avoid, reduce or remedy significant adverse effects clearly presented and appropriately justified?

50. Please see responses to Question 4.

Question 13. Are monitoring proposals and recommendations clearly presented and appropriately justified?

51. Please see responses to Question 4.

Question 14. In collecting data have details of any quality standards or assurance methods been given? If not please explain what you would expect to see and if they have, please explain if such standards and methods are suitable.

52. The data used to inform the fish and fisheries baseline is appropriate (as per my comments to Question 2). However, quality standards or assurance methods have not been provided as part of this report.

Question 15. Please assess the methodology used to prepare and gather evidence. Have they used standard practices?

53. A desk-based assessment has been used to prepare and gather evidence for the characterisation and impact assessment for fish and fish ecology, which is standard practice for an application of this nature. No fisheries specific surveys have been undertaken to inform the EIA.

Question 16. Is the timeliness of the data appropriate for the intended use?

54. The benthic surveys and sediment sampling used to inform the assessment on marine ecology were undertaken in 2006 (NGCT benthic survey), 2014 (Anglo-American harbour facilities) and 2019 (NGCT benthic survey, epibenthic trawls) (see section 9.4.3 of the EIA for more details of these surveys). In my opinion, the timeliness of these data is appropriate and up to date. However, I defer to Cefas' benthic advisor to comment on the accuracy and appropriateness of these data.

Question 17. Is the evidence that has been supplied appropriate (i.e. proportionate and targeted) for its intended use?

55. Please see comments provided for Question 2.

Question 18. Is the evidence consistent with that submitted for operations of a similar nature?

56. Generally, yes. I believe the evidence is mostly consistent with that submitted for operations of a similar nature, but there are aspects of the assessment which need to be addressed.

Question 19. For evidence that relies on modelled data has an unbiased statistical accuracy assessment been carried out?
57. There is no evidence that relies on modelled data in the context of fish.

Maria Gamaza
Fisheries Regulatory Advisor

Quality Check	*Date*
Georgina Eastley	*05/02/2021*
Joe Perry	*08/02/2021*

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Annex 1. Site location plan for South Bank Quay

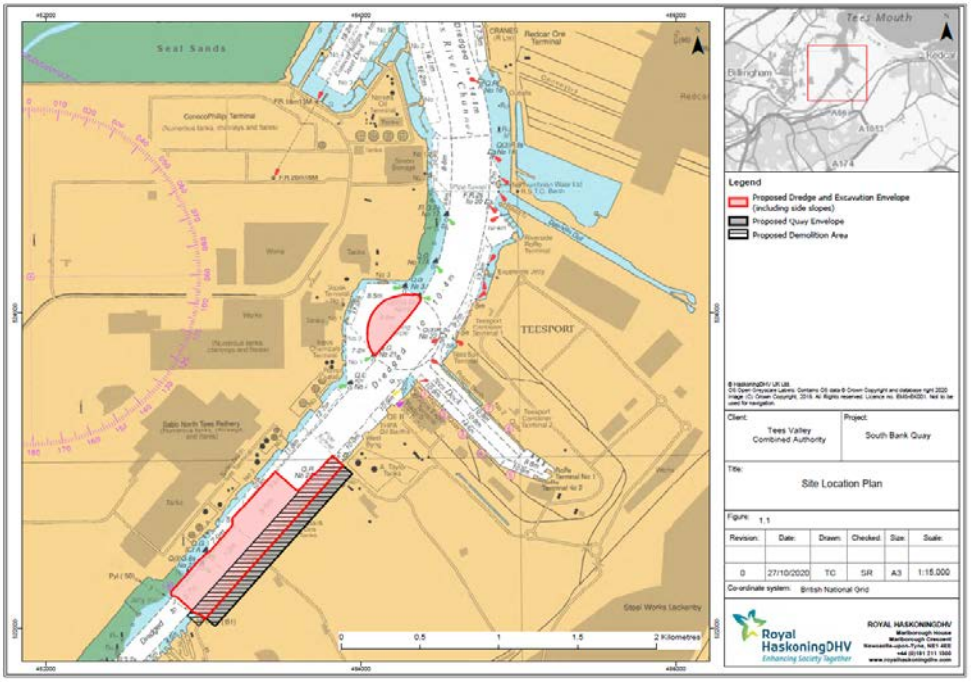

Figure 1. Site location plan extracted from document 4.

Annex 2. Construction works (extracted from ES, chapter 3)

1. Demolition of the existing wharf (approx. 750 m length), three jetties downstream the wharf, live electrical substation and pipework which previously abstracted water from the Tess estuary associated with the pumping station. The piles supporting the concrete jetties and the wharf, as well as the pipe work feeding the pumping station would be removed by using vibration techniques.

2. Construction and operation of a new quay of approx. 30m wide (50m overall footprint) and 1,230m length. The assessed form of construction for the quay wall is a combi-wall comprising steel tubular king piles with steel sheet pile infills. The wall would be constructed at a level of approximately 8.64m chart datum (CD) using percussive techniques to installed up to 400 piles.

No piling has been proposed in the river channel, thus it has been assumed that all piling works will be undertaken in land.

3. Excavation of approx. 275,000m^3 of existing soils behind the proposed combi-wall.

4. Capital dredging to deepen the norther half of the Tees Dock turning circle and create a berth pocket to a depth of 15.6m bCD (below Chart Datum). The total volume for marine sediments to be dredge is predicted to be approx. 1,8Mm^3 which would be undertaken in two phases (phase 1 ~ 820,000 m^3 and phase 2 ~ 980,000m^3- as per table below).

Table 3.2 Proposed volumes of marine sediments to be dredged (excluding over-dredge volumes)

Material classification	Phase 1 dredge volume (m^3)	Phase 2 dredge volume (m^3)	Total dredge volume (m^3)
Soft material	670,000	790,000	1,460,000
Hard material (mudstone)	150,000	190,000	340,000
Total	**820,000**	**980,000**	**1,800,000**

It is anticipated that dredging will be undertaken using a combination of a Trailing Suction Hopper Dredger (TSHD) and a backhoe dredger (BD) and will comprise an approximate duration of 19 weeks.

5. Installation of rock blanket within the footprint of the proposed berth pocket. Approximately 200,000m3 of rock is proposed to form the rock blanket, with a weight of 400,000 tonnes.

6. Offshore disposal of dredge material at Tees Bay C (TY 150).

Annex 3. Potential impacts on marine and migratory fish from dredging and disposal of marine sediments

Elevated concentrations of suspended sediment can have the following physical effects on all life stage of fish, particularly salmonids (Salmon & Trout Conservation, 2017) by:

i. Damage to gills as a result of erosion of the mucus coating and abrasion of tissue (Redding and Schreck, 1982). The extent of damage depends on size and shape of particles, suspended sediment concentration, water velocity and gill dimensions (Appleby and Scarratt, 1989). Fish species have been found with increasing levels of deformities, eroded fins, lesions, tumours, gill flaring and 'coughing', all related to increasing SS in the water column (Berg, 1982; Schleiger, 2000).
ii. Disruption of gaseous exchange by fine particles which bind with the gill epithelium and clog gill rakers and filaments.
iii. A reduction in feeding and foraging effort by visual predators as a result of increased turbidity (Henley et al. (2000)).
iv. An increase in respiration and heart rate (Redding and Schreck,1982) and altered blood physiology (Salmon & Trout Conservation, 2017).

v. An increase in energy expenditure and reserves resulting from the above impacts is likely to inhibit migration activities for species such as sea trout and river lamprey as they attempt to negotiate estuarine environments on their upstream migrations.
vi. Entrainment of demersal and benthic fish, fish eggs and larvae taken up through the drag head of the dredger.
vii. Potential disturbance caused by underwater noise from the dredging process.
viii. Reduction in suitable spawning habitat and declines in egg/early life stage success (Salmon & Trout Conservation, 2017)

Settlement of sediment around areas of dredging and disposal can have the following impacts:

i. Smothering of benthic foraging grounds by settlement of sediment.
ii. Smothering of benthic eggs and larvae by settlement of sediment.
iii. Reduced oxygen levels in water due to release of sediments containing high organic matter.
iv. Exposure to contaminants contained within dredged sediment.
v. Re-suspension of sediments causes nutrient enrichment promoting the formation of algal blooms, causing a reduction in water quality by decreasing oxygen levels or release of toxins.
vi. Resuspension of sediments resulting from dredging can smother organisms and hinder growth, feeding and survival rates. (Gilmour 1999).