

Carmarthenshire County Council

Burry Port Harbour - Maintenance Dredging and Disposal of Dredged Material

Coastal Processes Assessment Report

August 2025

Project Nr

682

The Bates Partnership
Beech Croft, 7 Hen Parc Lane
Upper Killay, Swansea
SA2 7EY, UK

tel: +44 1934 732380

e-mail: info@thebatespartnership.com

web: www.thebatespartnership.com

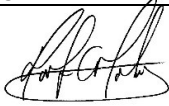


Burry Port Harbour - Maintenance Dredging and Disposal of Dredged Material: Coastal Processes Assessment Report

Client: Carmarthenshire County Council
Project: Burry Port Harbour – Maintenance Dredging and Disposal of Dredged Material
Title: Coastal Processes Assessment Report

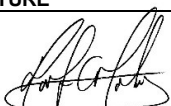
Prepared by:

Reviewed by:

DRAFT	NAME	NAME
	S Challinor	M Maloney
DATE	SIGNATURE	SIGNATURE
20/08/2025		

Prepared by:

Reviewed by:

FINAL	NAME	NAME
	S Challinor	M Maloney
DATE	SIGNATURE	SIGNATURE
29/08/2025		

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1 Introduction

1.1 Background

- 1.1.1 Carmarthenshire County Council (CCC) are proposing to undertake maintenance dredging at Burry Port Harbour to restore the required water depths. Maintenance dredging will remove predominantly sand material from the Approach Channel and Outer Harbour using excavators and will deposit this material on the upper foreshore of the beach to the east of the harbour (known as Burry Port East Beach) using dumper / tipper trucks. These activities will be undertaken in 'dry conditions' when the tide is sufficiently low. Coastal processes - particularly wave action, on subsequent high tides - will distribute the deposited material across a larger area of the beach. By taking this approach, the sand material will be retained within the same sediment cell from where it originated, which is the generally preferred dredged material management option set out in the Welsh National Marine Plan (Welsh Government, 2019).
- 1.1.2 CCC as the statutory harbour authority (SHA) have powers conferred by the Burry Port Harbour Revision Order 2000 (hereafter referred to as 'the 2000 HRO') to undertake maintenance dredging, but need a marine licence granted by Natural Resources Wales (NRW) under the Marine & Coastal Access Act 2009 to undertake the deposit of dredged material on the adjacent beach.
- 1.1.3 Initial pre-application advice from NRW indicated that the marine licence application should be accompanied by a Coastal Processes Assessment for a small-scale project in accordance with relevant NRW guidance and evidence. Accordingly, this report has been prepared with reference to the following NRW documents:
- NRW Guidance Note 019 on completing a coastal or physical processes assessment for small-scale projects (NRW, 2024).
 - NRW Evidence Report 624 on advice on physical processes for small-scale marine and coastal projects (Brooks et al., 2022).
- 1.1.4 The content of this report is based on the project-specific information requirements set out in the 'topic card' for small-scale dredging and disposal projects at Appendix A of NRW Evidence Report 624, and is structured as follows:
- Chapter 2 - project definition.
 - Chapter 3 - description of the existing environment.
 - Chapter 4 - impact assessment.
 - Chapter 5 – findings and conclusions.

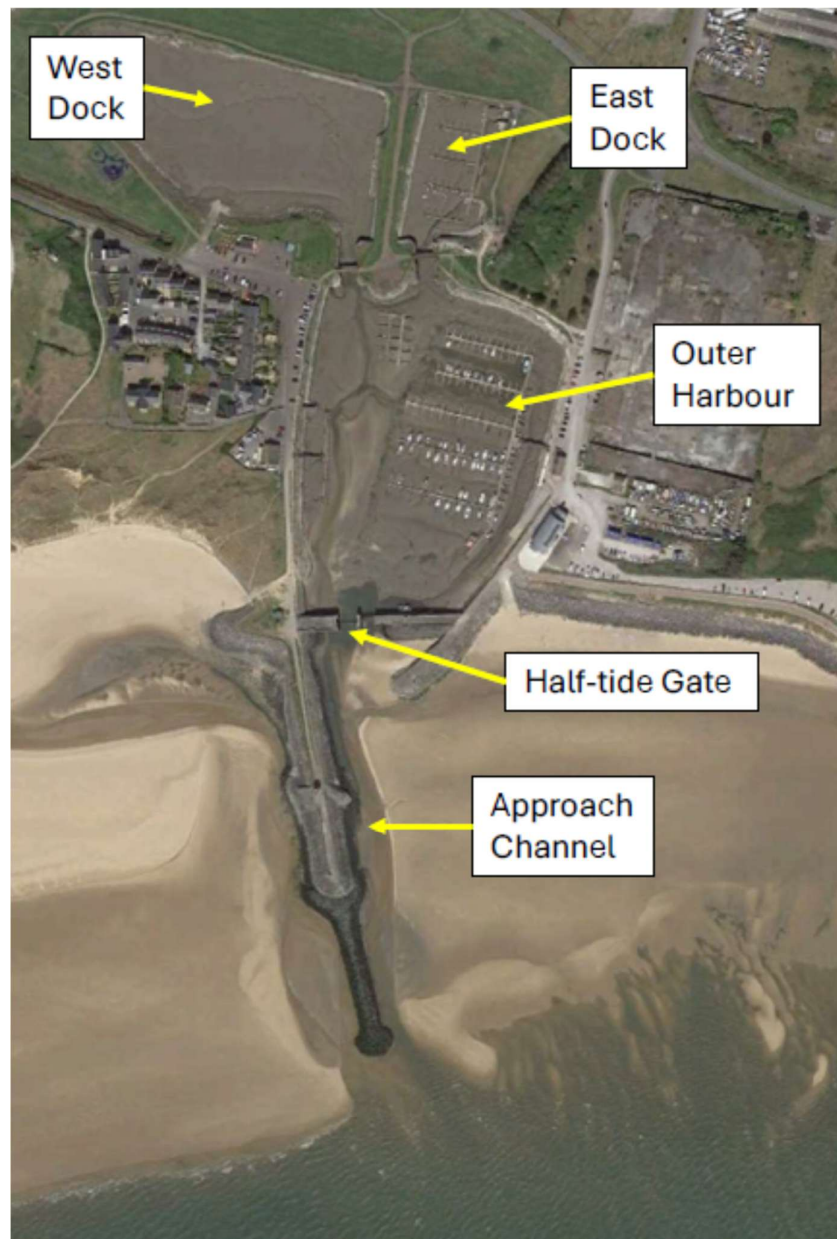
2 Project Definition

2.1 Burry Port Harbour

- 2.1.1 Burry Port Harbour is situated on the northern bank of the Burry Inet (the River Loughor's estuary), approximately 5km west of Llanelli. It comprises an Outer Harbour and an inner West Dock and East Dock and a half-tide gate, is protected by two breakwaters, and is accessed by boats via an Approach Channel aligned parallel to the western breakwater (**Figure 1**). The half-tide gate was constructed at the entrance of the Outer Harbour in 2000 to impound water within the Outer Harbour so that boats remain afloat irrespective of tidal conditions.



Figure 1 – Layout of Burry Port Harbour



2.2 Previous Maintenance Dredging Activities

- 2.2.1 Since construction of the half-tide gate, the Approach Channel has experienced progressive infill of sand originating from the adjacent foreshore. Sand that has accumulated in the Approach Channel can overtop the sill of the half-tide gate when open and migrate into the Outer Harbour during periods of high flow and high wave activity. This sand settles out in the more benign conditions in the Outer Harbour, reduces the water depth, and causes significant access and egress problems for boat users.



- 2.2.2 The Approach Channel and Outer Harbour have been subject to a series of maintenance dredging campaigns. In 2010, the Outer Harbour was dredged using a Cutter Suction Dredger (CSD) and the dredged material was pumped and discharged onto the upper foreshore of Burry Port East Beach. Since 2012, the Outer Harbour and Approach Channel have been dredged using land-based plant (e.g., excavators), with each campaign removing approximately 20,000-25,000m³ per annum from the Approach Channel and approximately 6,000-10,000m³ per annum from the Outer Harbour.
- 2.2.3 The dredged material has been transported by pipeline or by truck and deposited onto upper foreshore area of Burry Port East Beach. Relocating the predominantly sandy material to the adjacent beach has retained the material within the same sediment cell from where it originated. This has helped to maintain the amount of natural beach material that offers protection to the historic pulverised fuel ash (PFA) deposits located along the shoreline on this part of the beach and has helped to protect the eroding shoreline behind this part of the beach.

In 2017, CCC carried out a trial using Water Injection Dredging (WID) to remove approximately 5,000m³ of silty material from the Outer Harbour to Burry Inlet on the falling tide. Relocating the predominantly silty material to the estuary has retained the material within the same sediment cell from where it originated. Since 2017, WID has been used periodically in the Outer Harbour to relocate accumulations of silty material back into Burry Inlet.

2.3 Proposed Maintenance Dredging and Deposition Activities

Dredging and Deposition Locations

- 2.3.1 Maintenance dredging will be undertaken to remove sand material that has accumulated within the Approach Channel and Outer Harbour. The dredged material will be deposited within a placement area on the upper foreshore of Burry Port East Beach, but only within the area below mean high water on spring tides (MHWS). The locations and coordinates for the Approach Channel and Outer Harbour dredging areas and the Burry Port East Beach deposit area are provided at **Appendix 1**.

Dredged Material Characteristics

- 2.3.2 In line with NRW sample plan SP2501, sediment samples were collected from nine sampling locations: three locations in dredging area of the Approach Channel, five locations in the dredging area of the Outer Harbour, and one location in the deposit area on Burry Port East Beach. Sediment samples were taken at the surface (i.e., 0m) and at 1m intervals down to the required dredge depth, which required sampling down to 3m for the dredging areas in the Approach Channel and Outer Harbour, and sampling at the surface for the deposition area on Burry Port East Beach. The sampling locations are presented at **Appendix 2**.
- 2.3.3 Particle size analysis was undertaken on the sediment samples to determine the distributions of sediment sizes and proportions of dominant sediment types (i.e., gravel, sand and silt). The particle size distributions and corresponding dominant sediment types are presented at **Appendix 3**.



- 2.3.4 Particle size analysis determined that the sediment samples are characterised by the following dominant sediment types across the dredging and deposition locations:
- Sand within the Approach Channel, southwestern part of the Outer Harbour and deposition area on Burry Port East Beach.
 - Silty sand / sandy silt material within the central part of the Outer Harbour.
 - Silt material in the northeastern part of the Outer Harbour.
- 2.3.5 Particle size analysis showed that the sand material in the dredging areas to be virtually the same as the sand material at the deposit area with all but one of the sediment samples containing more than 97.5% sand. This correlation is to be expected as the beach material is believed to be the principal source of the material that accumulates in the Approach Channel and Outer Harbour.

Dredging and Deposition Methods

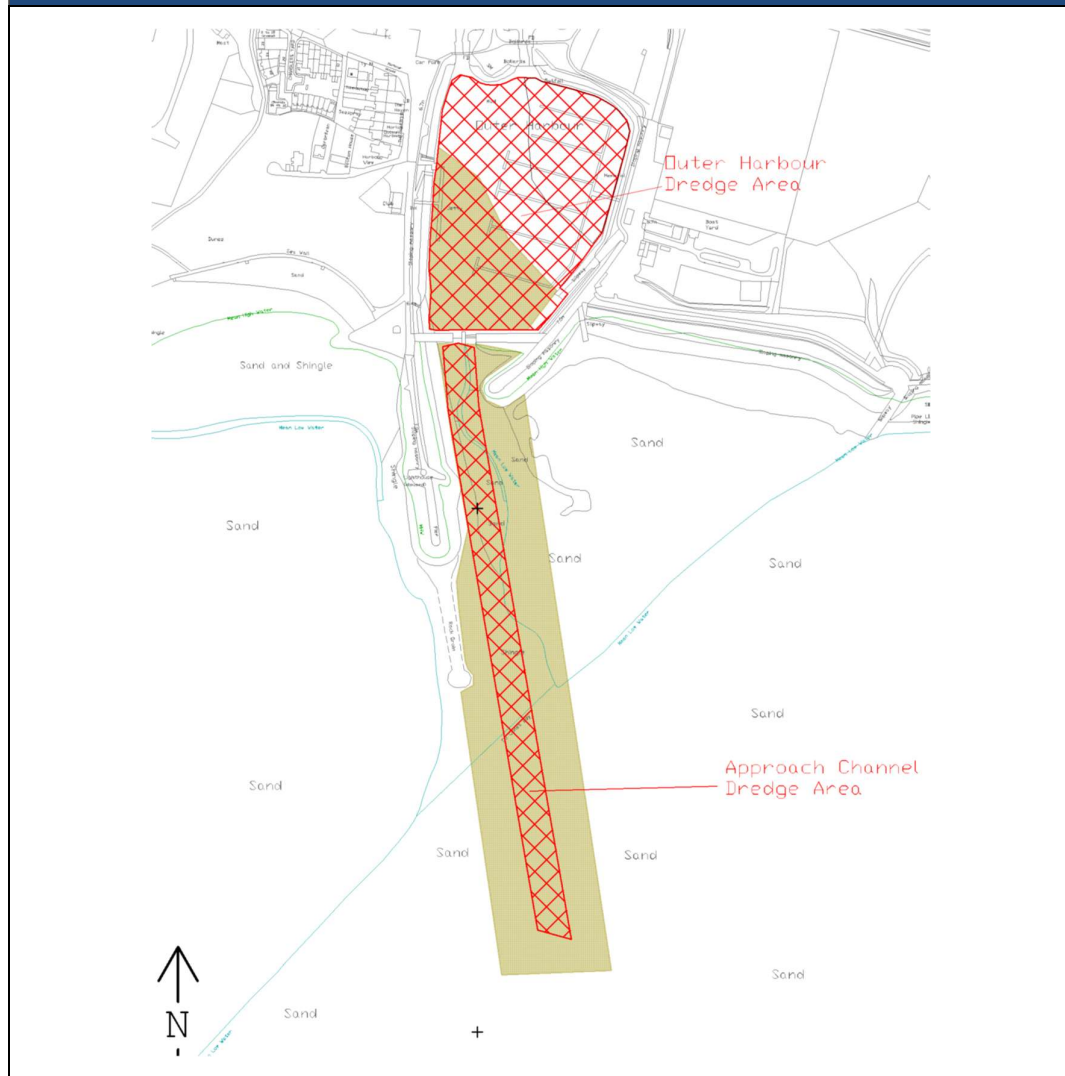
- 2.3.6 The intended method for dredging the sand material will involve land-based plant including excavators supported by dumper / tipper trucks working on the beach in 'dry' conditions when the tide has receded sufficiently. The excavators will remove the sand material from the Approach Channel and Outer Harbour and place it within trucks parked immediately adjacent to the dredging activity.
- 2.3.7 The deposition method will involve land-based plant including dumper / tipper trucks working on the upper beach in 'dry' conditions when the tide has receded sufficiently. The trucks will transport the material eastwards across the beach and place it within the deposit area below MHWS. Following deposition, coastal processes - particularly wave action, on subsequent high tides - will distribute the deposited material across a larger area of the beach. This approach will retain the deposited dredged material within the sediment cell from where it originated.

Dredging and Deposition Programme

- 2.3.8 Maintenance dredging of the Approach Channel and/or Outer Harbour and deposition on Burry Port East Beach is proposed to take place over a series of campaigns over the next ten years. The maximum volume of sand material to be dredged and deposited within each 12-month period will be 70,000m³.
- 2.3.9 The first campaign is expected to dredge up to 70,000m³ of sand from the length of the Approach Channel and southwestern part of the Outer Harbour, as shown in **Figure 2**. Given historical maintenance dredging requirements, subsequent campaigns are expected to dredge and deposit less than 70,000m³ of sand and be focussed on the Approach Channel and southwestern part of the Outer Harbour.
- 2.3.10 For each campaign, dredging and deposition of material is expected to be undertaken for approximately 7 hours per day (3 to 3.5 hours either side of low water), 7 days per week. The dredging rate is expected to be approximately 1,500m³ per day, if using two dredge spreads (i.e., 2 excavators and 4 dumper trucks), equating to approximately 47 days (±5 days) to remove approximately 70,000m³ of sediment to restore the bed depth within the Approach Channel to -2mOD and Outer Harbour to -1.5mOD. Depending on the tidal states at the time, the dredging and deposition activity may not all be completed in one continuous period but may be split into two or more campaigns to make best use of the most suitable tides and daylight hours.



Figure 2 – Indicative Extent of Dredging Activity during the First Campaign (red hatched area)



3 Description of the Existing Environment

3.1 Setting

- 3.1.1 Burry Inlet is the estuary of the River Loughor. It extends from the River Loughor at Pontarddulais to Carmarthen Bay and is characterised by a central deeper channel flanked on either side by extensive tidal flats. It is a relatively large, shallow macro-tidal estuary typical of the UK coastline, with a surface area of approximately 45km² at mean sea level (MSL). It is approximately 16km long and up to 6.6km wide with a spit (Whiteford Point) restricting the width of its mouth to 3km (Robins, 2015).
- 3.1.2 The estuary originally developed through fluvial erosion but has progressively in-filled with undifferentiated Holene marine sediment from Carmarthen Bay (www.renewables-atlas; accessed 20-06-2025) such that it is dominated by sediment with mean grainsize quoted as 0.125mm by Pye and Blott (2009) and 0.15mm by Robins (2015). At these



grainsizes, the sediment equates to fine sand.

- 3.1.3 Burry Port Harbour and Burry Port East Beach are situated on the northern bank of Burry Inlet, approximately 3km upstream of the estuary's mouth. They are sheltered to a large extent from most wind and wave directions and are sheltered from the prevailing south-westerly wind and wave directions on all but the spring high tides by sandbanks in the outer estuary and by the limited width of the estuary's mouth and the presence of the harbour breakwaters. The Approach Channel is aligned parallel to and partially protected by the western breakwater but is exposed in its southern half to the south-westerly winds over the high water period and to the east along its full length over high waters. The Approach Channel is progressively in-filled by sand predominantly from the west on the rising tides, but also from the east on falling tides. In turn, the Outer Harbour is progressively in-filled by sand from the Approach Channel overtopping the half-tide gate sill during periods of high flow and high wave activity.

3.2 Tidal Ranges and Currents

- 3.2.1 Based on Admiralty data, tide heights at Burry Port are quoted to be +3.9mOD at mean high water on spring tides (MHWS), +1.9mOD at mean high water on neap tides (MHWN), -1.7mOD at mean low water on neap tides (MLWN) and -3.6mOD at mean low water on spring tides (MLWS). Accordingly, tidal ranges are 7.5m on spring tides and 3.6m on neap tides.
- 3.2.2 Peak tidal velocities in Burry Inlet occur through the estuary mouth and reach 1.01 to 1.25m/s on spring tides (www.renewables-atlas; accessed 20-06-2025). Pye and Blott (2009) reported that ebb dominant residual tidal currents occur in the main channel upstream from the estuary's mouth but flood dominant residual tidal currents occur in smaller channels and over the intertidal areas, with field measurements recording surface flood and ebb velocities of 0.9 m/s and 0.7 m/s on neap tides and 1.7 m/s and 1.2 m/s on spring tides (Elliot & Gardiner, 1981 and Carling, 1981 reported in Pye and Blott, 2009).

3.3 Wave Heights

- 3.3.1 There is no readily available data for wave heights in Burry Inlet, but mean significant wave heights are expected to be lower than those in Carmarthen Bay; that is, less than 1.25m (www.renewables-atlas; accessed 20-06-2025).

3.4 Wind Speeds

- 3.4.1 Mean wind velocities are less than 7.1m/s (www.renewables-atlas; accessed 20-06-2025).

3.5 Shoreline Management / Coastal Erosion

- 3.5.1 The approach to shoreline management at Burry Port Harbour, Burry Port East Beach and the wider Burry Inlet are covered by the Lavernock Point to St Ann's Head Shoreline Management Plan 2 (SMP2) (Halcrow, 2012).
- 3.5.2 The management policy for the section of shoreline including Burry Port East Beach (policy unit 12.11) is driven in part by the potential contamination risk along this frontage due to ongoing coastal erosion exposing the site of a former coal-fired power station.
- 3.5.3 Accordingly, the management policy is to "continue to manage the risk of coastal erosion and flooding by maintaining and upgrading existing defences, subject to the future



availability of public funding for coastal erosion and flood risk management, under a policy of hold the line. Although there are limited socio-economic assets at risk (an industrial estate, local access road and railway infrastructure - which is some distance inshore), there is a risk of coastal erosion to a potentially contaminated area and the Millennium Coastal Path”.

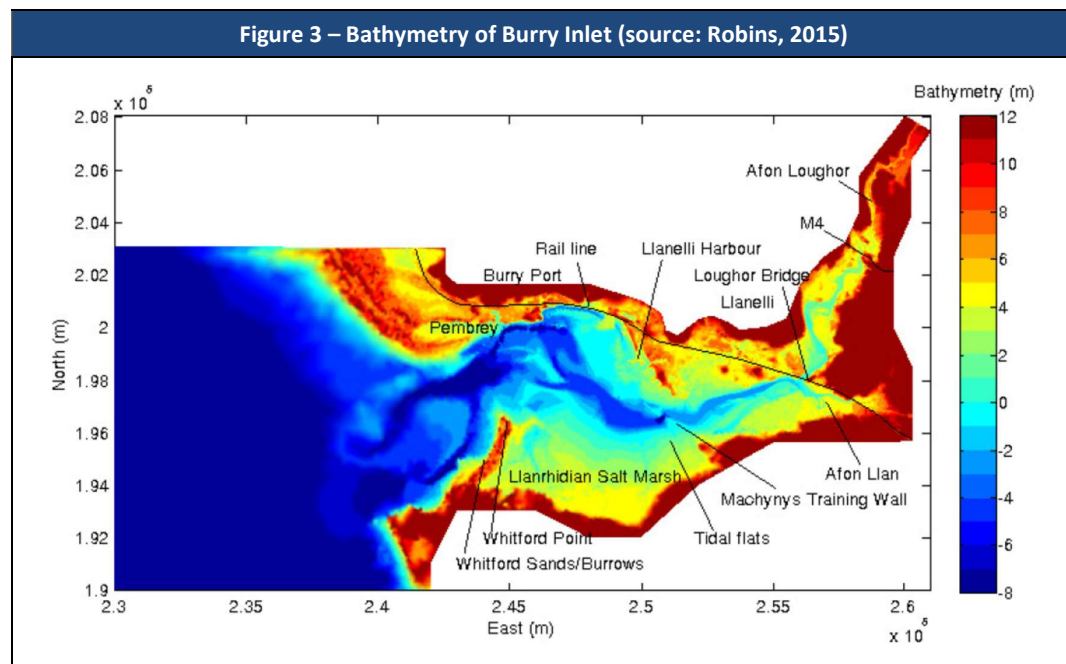
- 3.5.4 The proposed approach to shoreline management includes the assumption that Burry Port Harbour “would remain operational, which will require the continued maintenance and improvement of breakwaters and associated structures and maintenance dredging of the Approach Channel”.

3.6 Sediment Transport

- 3.6.1 There is an overall flood-dominant bedload sediment transport regime from eastern Carmarthen Bay into the Burry Inlet. The rate is not quantified but is expected to reduce over the next 50 to 100 years due to sea level rise and the flood-dominant sediment transport direction (Pye and Blott, 2009).

3.7 Seabed Morphology

- 3.7.1 The bathymetry of Burry Inlet (**Figure 3**) exhibits various features including channels, tidal flats including sand banks, a spit, and glacial troughs and scars. These features have been shaped by storm events, tidal currents, waves and sediment transport in post-glacial times and, more recently, in response to human interventions (e.g., breakwaters, training walls, land reclamation) to form the existing seabed morphology.





4 Impact Assessment

4.1 Screening of Potential Impacts

- 4.1.1 Reference to Table 1 in NRW Evidence Report 624 (Brooks et al., 2022) indicates that the proposed maintenance dredging and deposit of dredged material could cause the following changes to coastal processes:
- Sediment disturbance causing an increase in suspended sediment concentrations.
 - Sediment disturbance causing sediment deposition or smothering.
 - Changes to seabed level (formation of pits and mounds) causing changes in patterns of currents and waves.
 - Changes to seabed level (formation of pits and mounds) causing changes in patterns of sediment transport.
 - Changes to seabed level (formation of pits and mounds) causing indirect changes in seabed morphology.
- 4.1.2 These impacts are considered in the following paragraphs using the guidance set out in NRW Evidence Report 624 (Brooks et al., 2022) and NRW Guidance Note 19 (NRW, 2024).

4.2 Impact Assessment for Sediment Disturbance causing an Increase in Suspended Sediment Concentrations and/or Sediment Deposition or Smothering

- 4.2.1 As described in **Section 2**, the proposed maintenance dredging and deposition of dredged material will take place in dry conditions when the tide has receded sufficiently to allow the use of land-based plant to excavate material from the Approach Channel and Outer Harbour and to transport it to and deposit on Burry Port East Beach. For this reason, there is no potential for the either the dredging activity or the deposition activity to disturb and release sediment into the water column and, therefore, no potential to cause an increase in suspended sediment concentrations and/or cause sediment deposition or smothering.

4.3 Impact Assessment for Changes to Seabed Level (by Formation of Pits) causing Changes in Patterns of Currents and Waves, Sediment Transport and/or Seabed Morphology

- 4.3.1 As described in **Section 2**, the proposed maintenance dredging will excavate material from the Approach Channel and Outer Harbour, thereby changing (i.e., deepening) the seabed level at these locations. Although the existing seabed level is artificial (i.e., dredged) and varies relative the required bed depth in the Approach Channel and Outer Harbour, for the purposes of this assessment the dredging activity is assumed to modify (deepen) the elevation of the bed by more than 5% of total water depth at high tide.
- 4.3.2 Using the guidance set out in NRW Evidence Report 624 (Brooks et al., 2022), the dredging activity could cause changes to occur over a distance of (up to) approximately five times the maximum dimensions of the dredging area (**Appendix 4**). However, this calculation of impacts on patterns of currents and waves, on sediment transport and on seabed morphology needs to be contextualised given the shelter provided by the breakwaters alongside the Approach Channel and the half-tide gate fronting the Outer Harbour. For this reason, the calculation of changes shown in **Appendix 4** is made for the fully exposed section of the Approach Channel that extends beyond the western



breakwater and the partially exposed section of the Approach Channel that is aligned to the east of the western breakwater, and is excluded for the Outer Harbour given that it is positioned behind a half-tide gate and fully enclosed by dock wall structures.

- 4.3.3 The footprints for impacts on patterns of currents and waves, on sediment transport and on seabed morphology are likely to be less than five times the dredging area. This is because the changes to seabed level caused by the proposed dredging will take place where the existing seabed level has been modified and routinely maintained by dredging for the purposes of navigation for many years, and where the existing hydrodynamic conditions - including the winds, waves and currents that drive sediment erosion, transport and deposition changes and seabed morphological changes – have adapted to the modified seabed level. On this basis, the changes to seabed level caused by the proposed dredging are unlikely to cause changes to patterns of currents and waves and, accordingly, are unlikely to cause changes to sediment transport and seabed morphology, that are discernible from the baseline conditions for current velocities, wave heights, sediment transport and bathymetry in Burry Inlet that are described in **Section 3**.

4.4 Impact Assessment for Changes to Seabed Level (by Formation of Mounds) causing Changes in Patterns of Currents and Waves, Sediment Transport and/or Seabed Morphology

- 4.4.1 As described in **Section 2**, the proposed deposition of dredged material will deposit material on Burry Port East Beach, thereby changing (i.e., raising) the seabed level at this location. Although the existing seabed level varies relative to the deposit area's location within the tidal range over Burry Port East Beach, for the purposes of this assessment the deposit activity is assumed to modify (form mounds) the elevation of the bed by more than 5% of total water depth at high tide.
- 4.4.2 Using the guidance set out in NRW Evidence Report 624 (Brooks et al., 2022), the dredging activity could cause changes in patterns of currents and waves to occur over a distance of (up to) approximately 5 times the maximum dimensions of the placement area (**Appendix 4**). However, this calculation of impacts on patterns of currents and waves, on sediment transport and on seabed morphology needs to be contextualised given that the mounds formed by the deposited material will be relatively quickly redistributed over Burry Port East Beach by wave action during the high tides immediately following deposition. For this reason, the changes shown in the figure in **Appendix 4** are expected to be temporary and of relatively short duration.
- 4.4.3 The footprints for impacts on patterns of currents and waves, on sediment transport and on seabed morphology are likely to be less than five times the deposit area. This is because the changes to seabed level caused by the proposed deposition will be very short-term in duration because the mounds of deposited dredged material will be rapidly reduced and redistributed by wave action over several tides. On this basis, the changes to seabed level are unlikely to cause changes to patterns of currents and waves and, accordingly, are unlikely to cause changes to sediment transport and seabed morphology, that are discernible from the baseline conditions for current velocities, wave heights, sediment transport and bathymetry in Burry Inlet that are described in **Section 3**. The deposition will have several beneficial effects. In the very short-term, the deposition and redistribution of sand at the top of the foreshore in the high tide wave zone will provide protection to the upper foreshore until it is reworked and redistributed over the beach area by successive high tides. In the longer-term, the redistribution of the sand over a much larger area of Burry Port East Beach will help to retain the sand within the local sediment cell and, as a result, will help to reduce the rate of sand loss from



Burry Port East Beach. This is also beneficial because the retained sand will help to reduce exposure of the historic PFA deposits on this part of the beach and will help to protect the eroding shoreline behind this part of the beach.

5 Findings and Conclusions

- 5.1.1 A Coastal Processes Assessment has been undertaken for the proposed maintenance dredging of the sand material in the Approach Channel and Outer Harbour at Burry Port Harbour in accordance with NRW Guidance Note 019 (NRW, 2024) and NRW Evidence Report 624 (Brooks et al., 2022). The assessment considered impacts of sediment disturbance on suspended sediment concentrations and/or sediment deposition or smothering, and impacts of seabed level on patterns of currents and waves, sediment transport and/or seabed morphology.
- 5.1.2 The assessment found dredging and deposition activities will have no potential to disturb and release sediment into the water column and, therefore, no potential to cause changes in suspended sediment concentrations and sediment deposition or smothering rates. Also, the assessment found dredging and deposition activities will have some potential to change seabed levels through the formation of pits (due to dredging) and mounds (due to deposition) but will not cause changes to patterns of currents and waves, sediment transport and/or seabed morphology that are discernible over baseline conditions. On this basis, it is concluded that the proposed dredging and deposition of the sand material will not cause changes to marine and coastal physical processes that either directly or indirectly impact on Burry Inlet's flood and coastal erosion risk, coastal leisure and tourism, coastal habitats and coastal ecology.

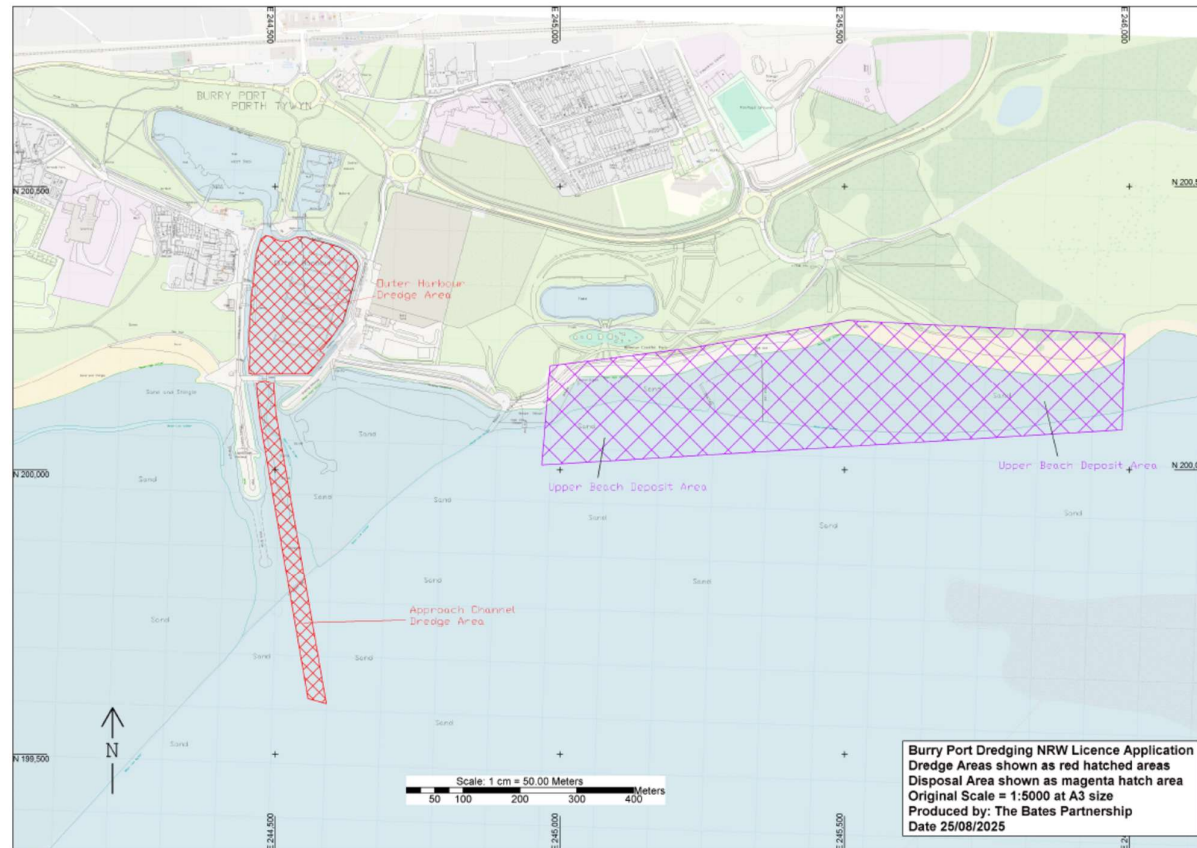
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- Robins, P.E. (2015). Development of a morphodynamic model of the Burry Inlet to inform future management decisions. Countryside Council for Wales CCW Contract Science Report No 898b.
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APPENDIX 1: LOCATIONS AND COORDINATES OF PROPOSED DREDGING AND DEPOSITION ACTIVITIES

Dredging Locations within the Approach Channel and Outer Harbour and Deposition Location on Burry Port East Beach





Approach Channel Dredging Area Coordinates	Outer Harbour Dredging Area Coordinates	Burry Port East Beach Deposit Area Coordinates
The dredging area for the Approach Channel is defined by the following OSGB coordinates (eastings and northings): • 244520.56 200157.90 • 244545.14 200153.24 • 244524.70 200134.93 • 244508.89 200120.62 • 244507.38 200114.22 • 244507.94 200108.14 • 244519.95 200095.29 • 244600.71 199641.94 • 244535.55 199629.91 • 244475.91 199949.68 • 244468.68 200011.92 • 244474.90 200027.24 • 244465.37 200052.93 • 244454.60 200110.50 • 244447.97 200158.55 • 244520.56 200157.90	The dredging area for the Outer Harbour is defined by the following OSGB coordinates (eastings and northings): • 244559.42 200167.38 • 244448.71 200167.38 • 244444.94 200234.41 • 244448.33 200300.31 • 244453.98 200354.91 • 244463.40 200401.98 • 244471.68 200428.72 • 244499.92 200427.21 • 244507.83 200413.66 • 244526.28 200415.54 • 244538.71 200423.07 • 244559.42 200423.07 • 244572.22 200412.53 • 244615.90 200398.97 • 244641.51 200380.14 • 244650.17 200365.08 • 244644.52 200334.96 • 244559.42 200167.38	The deposit area on Burry Port East Beach below mean high water on spring tides is defined by the following OSGB coordinates (eastings and northings): • 244982.42 200184.68 • 245228.38 200216.14 • 245505.80 200264.76 • 245992.00 200240.45 • 245987.71 200070.28 • 244968.12 200008.79 • 244982.42 200184.68



APPENDIX 2: SEDIMENT SAMPLING LOCATIONS (NRW SAMPLE PLAN SP2501)

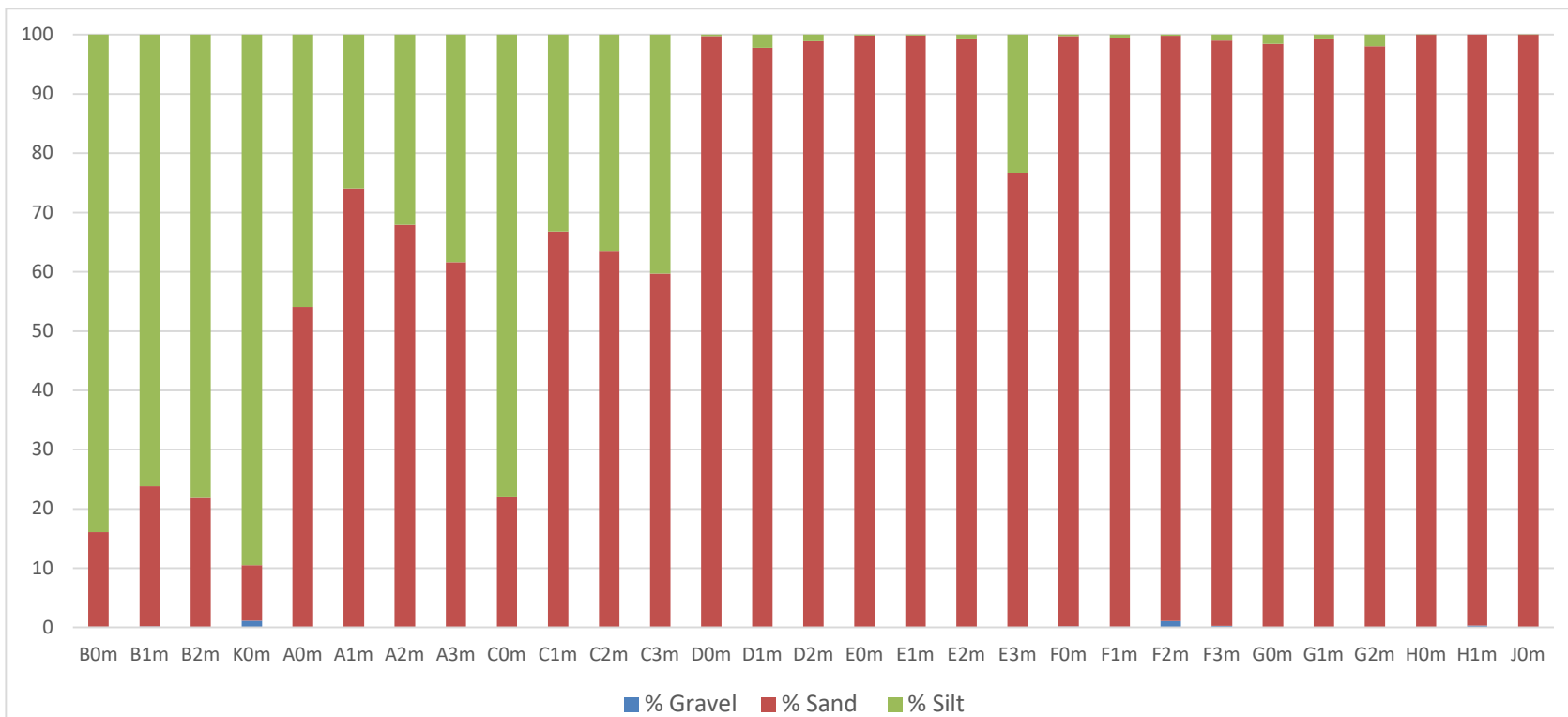
Sediment Sampling Locations in the Outer Harbour (Samples A, B, C, D, E, K), Approach Channel (Samples F, G, H) and Burry Port East Beach (Sample J)





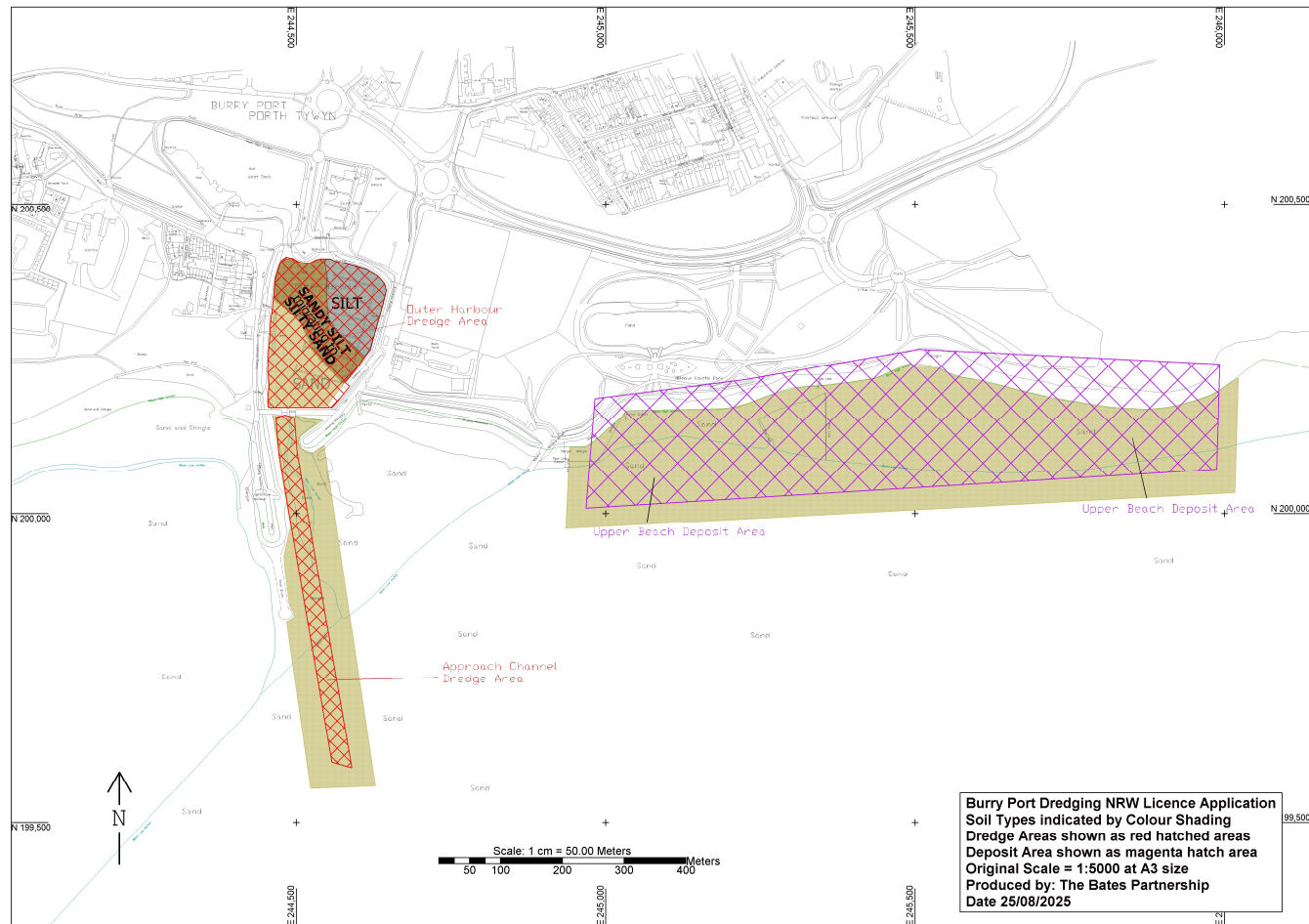
APPENDIX 3: PHYSICAL CHARACTERISATION OF DREDGED MATERIAL (NRW SAMPLE PLAN SP2501)

Dominant Sediment Type based on Particle Size Distributions: Silt in the Outer Harbour (Samples B, K), Silty Sand / Sandy Silt in the Outer Harbour (Samples A, C), Sand in the Outer Harbour (Samples D, E), Sand in the Approach Channel (Samples F, G, H) and Sand at Burry Port East Beach (Sample J)



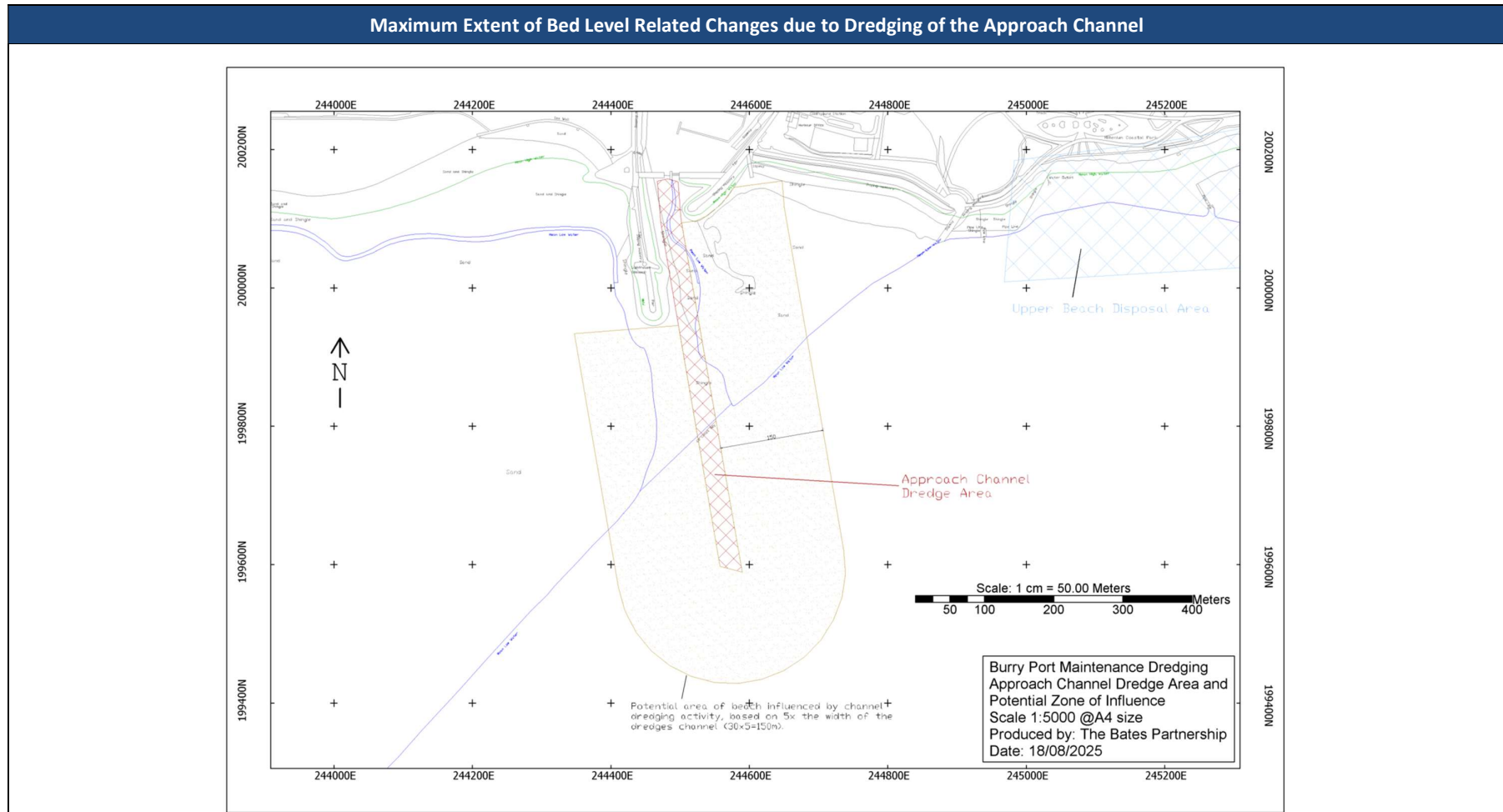


Dominant Sediment Type based on Particle Size Distributions





APPENDIX 4: COASTAL PROCESSES ASSESSMENT – BED LEVEL RELATED CHANGES





Maximum Extent of Bed Level Related Changes due to Deposition of Dredged Material on Burry Port East Beach

