Aberdeen Harbour Maintenance Dredging Works
Method Statement

AHB will engage a dredge contractor to carry out the maintenance dredging works which will comprise of Trailing Suction Hopper Dredging and Bed Levelling operations within Aberdeen Harbour with dredged material disposed of at the licenced Sea Disposal Site CR110.

All works will be carried out in accordance with the requirements of Aberdeen Harbour Board (AHB), Marine Licence conditions and relevant legislation.

Prior to commencement of operations, appropriate risk assessments will be undertaken.

The dredge contractor's Trailing Suction Hopper Dredger (TSHD) will undertake the dredging, transportation and disposal of dredge material and will operate 24 hours per day 7 days per week

The dredge contractor's Bed Levelling vessel will be employed to support the TSHD, levelling off any high spots/ridges left by the TSHD, and will operate 12 hours per day 7 days per week.

In addition to this, the AHB Sea Herald vessel will be used to carry out pre-dredge, interim and post-dredge surveys along with bed levelling operations to further support the contractor's dredging plant and will operate 8 hours per day 5-7 days per week.

The annual maintenance dredging campaign is anticipated to be carried out once a year, however, there have been occasions in the past where a winter dredging campaign has been required due to inundated accretion of material in the Navigation Channel and River Dee caused by severe winter storms.

It is expected that the annual maintenance dredging campaign will typically be carried out in spring each year, after any winter storms, depending on the availability of dredging plant and the duration of the campaign will vary from three to four weeks depending on the dredge volumes required to be removed.

The order of areas to be dredged will be as follows – subject to operational restrictions:-
Priority 1 – Dredge Area B (River Dee)
Priority 2 – Dredge Area C (Tidal Harbour / Telford Dock / Victoria Dock / Upper Dock / Albert Basin)
Priority 3 – Dredge Area A (Navigation Channel)

The following hydrographic surveys will be carried out for each maintenance dredging campaign:-
Pre-dredge survey - to be carried out prior to commencement of dredging operations in order to establish areas and in-situ volumes required to be dredged.
Interim surveys – to be carried out throughout the dredging works to monitor dredging progress.
Post-dredge survey – to be carried out upon completion of the dredging works to show dredge levels achieved and in-situ volumes removed.

Trailing Suction Hopper Dredger (TSHD) General Method Statement:-

Dredging is an excavation activity or operation carried out at least partly underwater with the purpose of gathering up seabed sediments and disposing them at a different location.
The Trailing Suction Hopper Dredger (TSHD) will be the main dredging equipment to be deployed to dredge and dispose of dredge material at areas required to be dredged at Aberdeen Harbour in order to maintain working depths to ensure the safe operation of the port. The TSHD is a vessel that is suited for deep-sea navigation with the ability to load into its own hold, called the hopper, by means of centrifugal pump(s) and suction pipe(s). TSHDs are not stationary dredgers they are required to sail (trail) during dredging operations.
Each cycle of consecutive operations is called a trip, the sequence of each trip is displayed below and will go on continuously for 24 hours per day 7 days per week until the required dredge volume has been sufficiently removed from all scheduled dredge areas:-

Sequence of TSHD Trip:

1. Dredging (loading) (average dredging time per load expected = 1 hour 20 minutes)
2. Sailing full (average sailing time per load expected = 30 minutes)
3. Disposal (unloading) (average disposal time per load expected = 10 minutes)
4. Sailing empty (average sailing time per load expected = 30 minutes)

The average time for one load per trip is expected to be 2 hours 30 minutes depending on accessibility of the area, local conditions (currents, wind, waves, etc), type of material being dredged, marine traffic and any other delays.

1. Dredging (loading):

Once arrived in the required dredge area the TSHD will start dredging, this will mark the start of the dredge trip, loading fill material from the seabed into the hopper (hold).
The TSHD will reduce speed and lower the suction pipe overboard. The draghead at the end of the suction pipe will be kept above the seabed until the scheduled dredging area has been reached. Once near to the desired dredge area, the dredge pumping system will be started whereby the seawater will be taken in. The flow of seawater is created as the draghead is touching the seabed hereafter the loading of the hopper starts. The fill material will be transported by the flow of seawater into the hopper. During this process, the position of the draghead will be controlled both horizontally and vertically to achieve the desired dredge level.
While dredging, the TSHD will sail very slowly at a speed of 1 to 2 knots, depending on the dredge location, surrounding marine activities, sea condition and material being dredged. Due to the speed of the vessel, the draghead will loosen the seabed sediments. This way a mixture of sediments and water will be sucked up into the suction pipe, which will be loaded into the hopper, creating troughs in the seabed at the required dredge level along the sail track. Water-jets in the draghead, can assist in loosening stiff seabed sediments if required, hence optimising the production.

The sailing tracks of the TSHD will be optimised for each load in order to maximise production and minimise manoeuvring time.

The position of the draghead and suction pipe can be checked by the following measurements:

- Measuring the angle from the vessel in combination with the draught and trim of the vessel.
- Measurement devices mounted on the draghead and suction pipe will indicate the angles of the separate portions of the suction pipe.
- Depths of the different portions of the suction pipe will be determined by using pressure readings from specially installed sensors.

A TSHD has a certain load it can carry. This depends on sediment characteristics such as in-situ density, particle size distributions and other parameters. The quantity that can be loaded into the hopper is limited by volume and / or weight, given the TSHD's specifications, or is a result of an optimisation to determine the most economical loading time.

The production of a TSHD and time required for filling up the hopper and the load per trip will vary depending on many factors:- sediment characteristics such as in-situ density, particle size distribution, dredging depth, weather conditions, sailing distance, marine traffic, tides, currents, etc.

2. Sailing Full:

When the hopper is fully loaded, the dredge pumping system will be shut off and the draghead will be raised. The suction pipe will be hoisted and secured on board.
After loading the dredge contractor will measure the volume of dredge material in the hopper on every trip. The volume will be measured as the sum of the volume of settled solids and the volume of suspended solids. The settled solids will be measured by 1.2t/m³ density hemisphere soundings from six representative positions in the hopper to obtain the average depth, with the volume of settled solids being obtained by reference to the TSHD's ullage table.
The volume of the suspended solids will be measured by taking a mid-liquid representative sample, which will be left to stand in an undisturbed condition for 24 hours, at which point the proportion of settled solids to clear liquid will be measured in the sample jar. This ratio of solids to liquid will be applied to the volume of liquid in the hopper from the load from which the sample was taken.
The TSHD will leave the harbour area and proceed to travel to the Sea Disposal Site CR110. The TSHD will follow the travel route shown on the Transport Plan on the Marine Licence to and from the Sea Disposal Site recording all marine mammal sightings if present or not.
During sailing the hopper will remain closed with watertight bottom doors.

3. Disposal (unloading):

On arrival at the Sea Disposal Site the TSHD will reduce speed to a maximum of approximately 2 knots. Once the TSHD is in the correct location the bottom opening doors of the hopper will then be slowly opened to allow disposal of the dredged material from the hopper. When the hopper is empty, the bottom doors will be closed.

The dredge contractor will ensure that a dedicated watch will be kept by a member of their staff following the general guidance for, and acting in the role of, a MMO. A watch will be undertaken on approach to the Sea Disposal Site and prior to disposal commencing to ensure that no marine mammals are sighted within 200 metres of the authorised disposal area. If marine mammals are observed within this area then disposal operations shall be ceased until the area

has been clear for at least 20 minutes. The dredge contractor will ensure that a formal log is maintained, whether or not marine mammals are sighted and the completed logs will be returned to the licensing authority.

4. Sailing empty:

After disposal of the load in the Sea Disposal Site the TSHD will start to sail back towards the harbour for the next load. Arriving back in the harbour to the next dredge area will mark the end of a dredge trip. The sailing time, both full and empty will depend on traffic speed limits, marine traffic, currents, tides, weather conditions, sailing distances, etc.

Bed Levelling Method Statement:-

The bed levelling vessel(s) will be deployed in all areas where the TSHD has dredged and will level off any high spots and ridges left by the TSHD by shifting the material into areas of suitable over depth or troughs created by the dredging operation of the TSHD. The bed levelling vessel(s) will also be deployed in all areas where the TSHD is unable to effectively dredge (for example where it has limited or no manoeuvring area or restricted water depth) and will shift the material to a location where it can be dredged by the TSHD. The bed levelling vessel(s) will also level areas too small to warrant the use of a TSHD.

1. The plough box will be suspended overboard aft of the bed levelling vessel on one or more wires which are guided by one or more sheaves to the winches which vertically control the plough box.

2. The bed levelling vessel will sail to the required dredge area and once on location will lower the plough box to the required dredge level.

3. Once the plough box is set to the required dredge level, the bed levelling vessel will proceed to move forward to shift the seabed material with the plough box, aiming to shift the material at high spots and ridges into areas of suitable over depth or troughs created by the TSHD dredging. The plough box will be lowered in small vertical increments, usually 100mm increments, to gradually shave layers of high spots and ridges down to the required maintained dredge level in order to minimise dispersal of seabed sediments into the water column. When levelling over an area dredged by a TSHD, the bed levelling vessel will sail short tracks perpendicular to the TSHD dredge tracks shifting small layers of the high ridges into the troughs created by the TSHD dredging and will continue to do this for the full length of the TSHD dredge tracks until the required maintained dredge level has been achieved.

4. Once the bed levelling vessel has completed the bed levelling in a dredge area, the plough box will be raised up out of the water and the bed levelling vessel will sail to the next scheduled dredge area. This bed levelling process will continue until the required maintained dredge levels have sufficiently been achieved in all scheduled dredge areas. Interim surveys may highlight the need for further bed levelling works to be carried out in an area where the bed levelling vessel has levelled previously, If this occurs then the bed levelling vessel will return to the area to complete the bed levelling works.