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ASCO UK LIMITED

GREAT YARMOUTH SHIP TO SHORE FACILITY
C736 ASSESSMENT

APRIL 2023

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1 INTRODUCTION

1.1 General

1.1.1 Wardell Armstrong has been commissioned by ASCO Group Ltd to develop a waste storage facility (tank farm) at its 'ship to shore' site on South Denes Road, Great Yarmouth.

1.1.2 This report presents the findings of a containment risk assessment a review of the existing facility along with any recommendations for improvement as required.

1.2 Site Location

1.2.1 The facility is located on the quayside of Great Yarmouth Harbour on the tidal River Yare, South Denes Road, Great Yarmouth NR30 3LX. The NGR for the facility is TG 52665 05690. The location of the site is shown on drawing BM12124-001

1.2.2 Surrounding the site are a mixture of commercial and residential premises. Several environmentally sensitive areas are in the wider geographical area of the site. These receptors include Breydon Water SSSI, North Denes SSSI, residential areas and commercial areas. These are detailed in the Amenity and Accident Risk Assessment.

1.2.3 The River Yare directly borders the facility and the North Sea is some 600m to the East.

1.3 Environmental Setting

1.3.1 Geological information for the site has been obtained from the British Geological Survey website.

1.3.2 There are no groundwater Source Protection Zones within 2km of the facility.

Made Ground

1.3.3 While no intrusive surveys have been carried out at the site, given its previous use, it is reasonable to assume that there is a definite layer of surface and subsurface made ground that was used to construct some of the harbour area. The age and composition of this is unknown.

Natural Superficial Deposits

1.3.4 British Geological Survey records shows that the surface deposits are made up of sand and gravel deposits of Tidal River and Creek sands & gravels.

Solid Strata

1.3.5 The bedrock is comprised of Crag Group sand and gravel deposits according to data from the British Geological Survey website.

Surface Water Features

1.3.6 The Environment Agency's flood information for planning shows the site to be in a Flood Zone 3 area with a high risk of flooding. This is predominantly from the River Yare that runs north to south along the western boundary of the site.

1.3.7 The site is approximately 500m away from the open sea (to the east) and so any tidal events that might cause flooding could affect the site.

1.3.8 Apart from the River Yare there are no graded watercourses within 2km of the site. The Yare is classified as "moderate" under ecological and chemical classification.

Other Activities in The Vicinity of The Site

1.3.9 There are several discharge consents in the immediate and surrounding area of the proposed facility. Given that the facility will have sealed and impermeable surfaces then the facility will not impact upon these.

2 PERMITTED ACTIVITIES

2.1.1 The permit boundary is shown on drawing BM12124-003 and includes the tank farm, all related pipework and an area adjacent to the bund for out loading to road tankers. Five storage tanks are provided with a total storage capacity of 550m^3. All tanks will be located within a single bund with a capacity of c. 392m^3 that provides sufficient capacity for 110% of the largest tank (c. 177m^3) or 25% of the total storage capacity (137.5m^3).

2.1.2 The site will be operated according to the operator's management procedures and Environmental Management System (EMS) utilising best available techniques (BAT) to reflect best practice and ensure environmental protection.

2.1.3 Wastes will arrive on resupply ships. Following checks, the wastes will be offloaded into one of the tanks on site according to its properties. At appropriate times, these tanks will be emptied to road tanker and the wastes removed to appropriately permitted facilities.

2.1.4 Wastes will be segregated in terms of their nature and characteristics including hazardous classification or state.

2.1.5 The proposed permitted wastes are a known type and composition due to the mature nature of the offshore oil and gas industry however, all appropriate Duty of Care and documentation will be exchanged and appropriately retained at the site in regard to the wastes accepted and dispatched from the site.

2.1.6 Due to tide and resupply requirements in the industry ships may arrive at varying times through the day and night. The site will therefore operate and be able to accept waste 24 hours a day, 365 days a year.

2.1.7 An appropriately qualified Technically Competent Manager and trained staff will be on site during opening hours and waste deliveries or dispatch to ensure that the site complies with its permit conditions and does not cause pollution. The Technically Competent Manager will be present at the site in line with Environment Agency guidance requirements.

2.1.8 All waste storage tanks will have appropriate over-fill alarms and non-return valves fitted.

2.1.9 Tanks and pipework will be cleaned and flushed at appropriate times and between waste transfer to prevent the contamination of non-hazardous wastes with hazardous

wastes. The effluent from this cleaning will be collected and removed by tanker to an appropriately permitted facility.

2.1.10 Further information is provided in the Operating Techniques report.

3 RISK ASSESSMENT

3.1 Methodology

3.1.1 Section 2 of the CIRIA C736 "Containment Systems for the Prevention of Pollution" provides guidance for undertaking a risk assessment of secondary and tertiary containment systems.

3.1.2 The methodology assesses the risk of a site, based on a source, pathway, and receptor model to determine the containment classification required.

3.1.3 The assessment classifies the level of risk for the site, based on the nature of the substances used or stored on site (source), the potential routes (pathway) via which a hazardous substance may reach a potential receptor, and the types of receptors that surround the site that could potentially be affected.

3.1.4 The following sections discuss the source, pathways and receptors for the ASCO ship to shore site following the guidance given in the CIRIA C736 document and provide an overall site hazard rating.

3.1.5 A site visit has also been carried out by a competent Civil Engineer the details of which are also presented in Sections 4 and 5 below.

3.2 Source Materials

3.2.1 In the context of Section 2 of the CIRIA C736 "Containment Systems for the Prevention of Pollution" source materials comprise the following.

Table 3.1: Source Materials

Substance	Use/source
Hazardous drilling fluids and slops	Offshore oil and gas drilling
Non-hazardous drilling fluids and muds	Offshore oil and gas drilling

3.2.2 The source materials have been assessed to have low, medium, or high risk on Table 1 which can be seen in Appendix 1.

3.3 Pathways

3.3.1 Four main pathways have been considered in this assessment: surface runoff, superficial deposits, the River Yare and the North Sea. These sources have been assessed to have low, medium or high risk on Table 2 which can be seen in Appendix 1.

3.3.2 ***Surface Runoff***

3.3.3 Spillages or leakages of contaminants may migrate via simple overland flow by and contaminate nearby receptors directly. Contaminants may preferentially flow into the River Yare and be subsequently transported further from site.

Superficial Deposits

3.3.4 Although the site is underlain by hardstanding, contaminants can potentially flow through any disparities within this layer and into the superficial sands and gravels. The soil could act as a pathway for contaminants to migrate off site.

River Yare

3.3.5 If contaminants reach the River Yare, tidal action will transport contaminants both northwards and southwards, to Breydon Water and the North Sea respectively.

North Sea

3.3.6 Wave and tidal action can transport contaminants to other coastal regions on the east of the UK and potentially further.

3.4 Receptors

3.4.1 All potentially sensitive receptors have been identified and the site operations have been subject to rigorous scrutiny to ensure that all risks have been understood.

3.4.2 Potentially sensitive receptors may include but are not limited to:

- surface water bodies; streams and rivers;
- townships and residential areas;
- industrial estates;
- conservation areas (nature reserves SSRIs, special protection areas).

3.4.3 Potentially sensitive receptors may be impacted by the following activities:

- spillages;
- leakages.

3.4.4 More detail on the potential receptors are given in Table 3.2.

Table 3.2: Potential Receptors Within 2km of the ASCO Waste Transfer Facility

Receptor	Type of receptor	Direction	Distance from facility
ASCO COMAH installation	Industrial	North	<50m
Harfreys Industrial estate	Industrial	West	660m
Industrial estate	Industrial	North, South and East	<50m – 370m
Shops and retail outlets	Retail	North west	1.12km
Residential housing	Residential	North west	380m
Housing	Residential	North west	1.12km
Housing estate	Residential	North east	330m
Housing estate	Residential	South west and west	276m and 240m
Southtown Common recreation ground	Leisure	West	431m
Kingsgate Community Church	Commercial/ Leisure	West north west	580m
Breydon Water	Environmental	North west	2.7km
Great Yarmouth North Denes	Environmental	North	3.5km
Southern North Sea Special Area of Conservation (Candidate)	Environmental	North East, East, South East	621m
Outer Thames Estuary - Marine Special Protection Area	Environmental	North East, East, South East	621m
Coastal habitat Corton Cliffs	Environmental	South	3.7km

3.4.5 The receptors have been assessed to have low, medium, or high risk on Table 3 which is shown in Appendix 1.

3.4.6 The locations of the receptors are shown on Figures 1 and 2, the receptor numbers are referenced in Appendix 1.

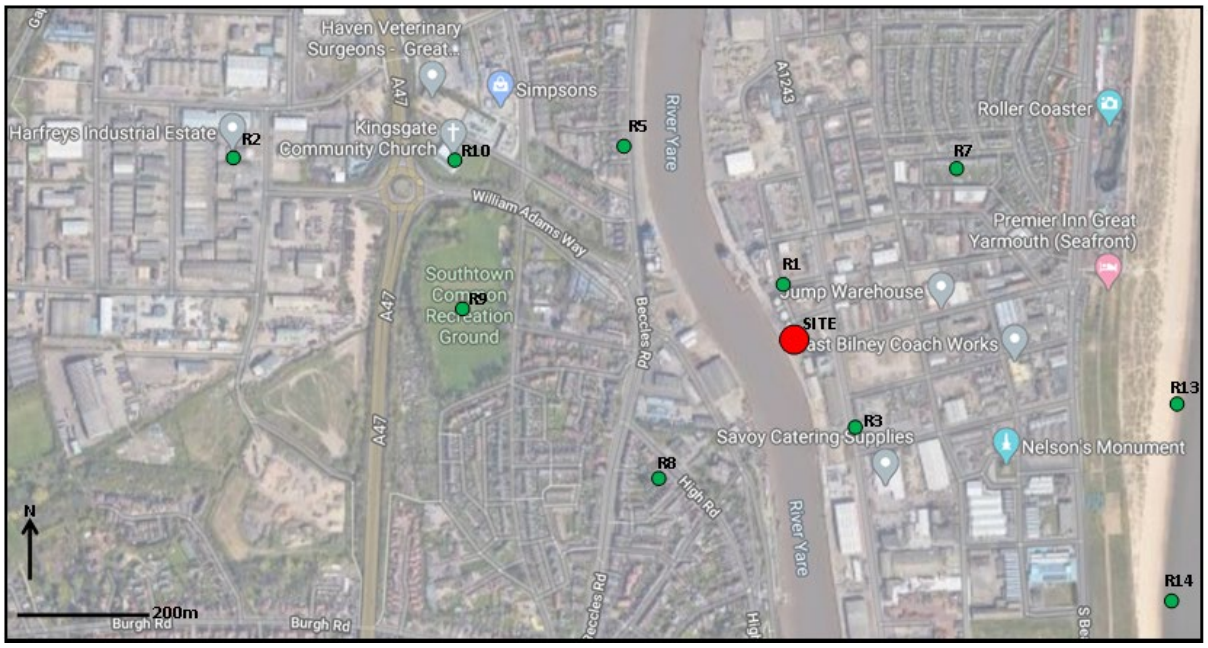

Figure 1. Map showing site location and proximal receptors.

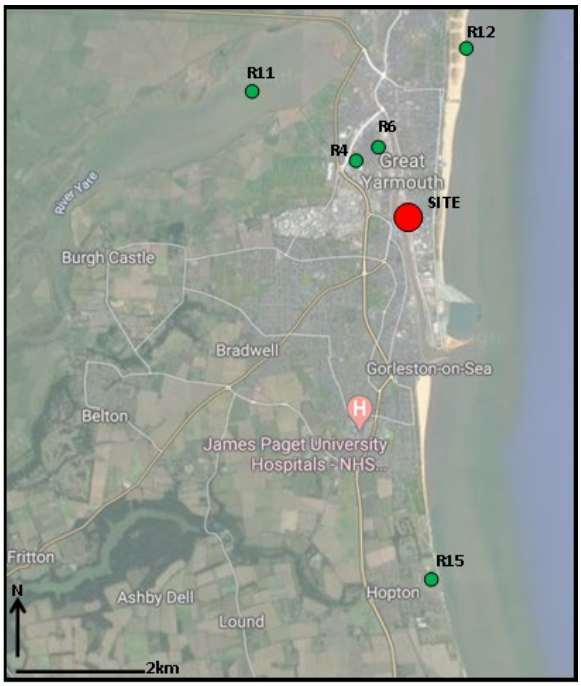

Figure 2. Map showing site location and distal receptors.

3.5 Risk Assessment

3.5.1 As part of the requirements for CIRIA C736 "Containment Systems for the Prevention of Pollution", (specifically Section 5, Figure 5.1) it is necessary to have a baseline asset schedule in place which is in accordance with the above guidance document. This allows for the class of secondary containment to be determined and compared to the required class for the site. In situations where there is not an existing baseline asset schedule; it is a requirement to obtain information on the infrastructure in place, typically involving a site visit to inspect the site.

3.6 Site Hazard Rating

3.6.1 The site hazard rating has been assessed on Table 4 which can be found in Appendix 1.

3.6.2 The overall site hazard rating is calculated by combining the residual source hazard rating, the pathway hazard rating and the receptor hazard rating.

3.6.3 The worst site hazard rating is assessed to be Low Medium High which gives an overall Site Hazard Rating of Moderate.

3.7 Site Risk Rating

3.7.1 The assessment to calculate the site risk rating is shown in Table 5 in Appendix 1.

3.7.2 Table 5 assessed the following mechanisms which will result in loss of containment:

- fire;
- flooding;
- vandalism;
- harmful gas emissions;
- operational failure;
- earthquakes;
- lightning strikes;
- landslides/land subsidence.

3.7.3 Without control measures the likelihood of these mechanisms occurring is considered from high to low.

3.7.4 Control measures are assessed with a resulting in a residual likelihood rating of Low for each mechanism.

3.7.5 This is then assessed against each source and its risk rating to give an overall Site Risk Rating

3.7.6 The site has an overall Site Risk Rating of Low.

3.7.7 As a result of the site risk being low, a containment type **Class 1** is required (i.e. base level of integrity).

4 REVIEW OF AS-BUILT INFORMATION

4.1.1 Limited as built information was available from the client, The following information was reviewed as part of this assessment:

- Hipwell Consulting inspection report dated 7th September 2010;
- ASCO Drawings 16447 001-004;
- Plandescil Drawing 16447-004 – Storm Drainage – Layout & Emergency Procedure.

4.1.2 Hipwell Consulting Ltd undertook and inspection of the concrete structures in 2010. Their report refers to the proposed tank location as the 'Unused Tank Farm'. Hipwell understood that the eastern side of the southern wall appears to have been built on top of an existing plinth wall. This could therefore be simply dowelled into the existing wall and hence the strength capacity of this section was in doubt. Hipwell recommended additional investigations if this area was to be utilised in the future. It is our understanding that this has not been undertaken. We would recommend that this is assessed to confirm the wall is capability of withstanding forces that would be placed on the wall if the bunded area was to be flooded.

4.1.3 The site has a suitable emergency storm drainage system as shown on Plandescil Drawing 16447-004. Automated shut off valves were installed at all discharge points. These engage it hydrocarbon are detected in the runoff from site preventing contamination entering the River Yare.

5 REVIEW OF AS-BUILT FACILITY

5.1 General

5.1.1 An inspection was undertaken by Wardell Armstrong on the 19th January 2021. This inspection was to allow a full visual check of the As-Built condition of the bund to be carried out, along with a review of the on-site construction details to ensure it aligned with the available As-Built data.

5.1.2 For the purpose of the report the bund construction will be broken down into three specific sections, the walls, the tank bases and the slabs. Each section will detail the overall condition of the construction along with any deviations from the construction drawings.

5.2 Walls

5.2.1 The bund walls have been constructed using reinforced concrete. The walls were generally in good condition.

5.3 All joins and cracks had been sealed using Sikaflex Tank N elastic sealant, a product designed to seal joints exposed to chemicals. This appeared this had been undertaken to a good standard. The sealant joints appeared smooth and were of a consistent width.

5.3.1 It was observed that in isolated areas some chipping to the concrete walls had occurred, typically the chipping was to maximum depth of 20mm and had not exposed any reinforcement. Although not affecting the structural capacity it would be advised to repair these with a concrete repair mortar or similar to ensure long-term that the reinforcement is not affected by a lack of concrete cover.

5.3.2 Overall, the detailing, design and over all condition of the walls is acceptable with the only recommendation being that the localised areas of chipping to the top of the walls be repaired with a repair mortar to stop future issues with reinforcement corrosion.

5.3.3 On the southern wall there was a metal pipe of approx. 150mm in diameter protruding the concrete wall. This would require a blanking flange fitting to the inside flange and the seal on the interface with the pipe and the concrete wall checking.

5.4 Base Slab Tank Plinths

5.4.1 In general, the quality of the bund slab construction was good with a good quality surface finish. Parts of the slab were under surface water at the time of inspection

5.4.2 Within the bund there are a series of separate foundation plinths that support the tanks. 2no of the plinths have tanks on them. It is understood an additional 3no tanks will be installed on some of the others. We assume these plinths have been designed as independent foundations and have been designed to support the loadings that will be exerted by the new proposed tanks.

5.4.3 WA have not reviewed reinforcing details for these plinth foundations or associated calculations.

5.4.4 Vertical settlement may not have an impact on the tank stability or the design of the concrete plinth but it may impact on any pipework connections to the tank, and will also have a significant impact on the suitability of the joint at the interface of the plinths and the bund base slab.

5.4.5 Based on the observations made during the site inspection it was apparent that the quality of surface finish to the tank slab and plinths was of a good standard. It was observed that in isolated areas some chipping and historical groves to the concrete had occurred, typically the chipping was to maximum depth of 20mm and had not exposed any reinforcement. Although not affecting the structural capacity it would be advised to repair these with a concrete repair mortar or similar to ensure long-term that the reinforcement is not affected by a lack of concrete cover.

5.4.6 No details have been made available for the interface of walls and the tank bases. It therefore cannot be confirmed that there are any hydrophilic strips or hydrophilic coatings between the two surfaces. For the purpose of the report, it will be assumed that there is not.

5.4.7 The interfaces between the base slab and plinths have been sealed with a flexible sealant, there did not appear to be any gaps in the sealant at the time of inspection and it appeared to have bonded well to the substrate. Due to the lack of hydrophilic strip regular inspection and maintenance of the sealant will need to be undertaken to ensure the seal is maintained and no pathway for liquids to escape the bund is allowed. This is of particular importance due to the lack of settlement calculations for the plinth foundations.

5.5 Bund Sizing

5.5.1 Within the information provided to WA there was a calculation that had been undertaken to establish the storage capacity of the bund.

5.5.2 The calculations indicate the bund has sufficient capacity and freeboard when considered against the guidelines within CIRIA C736. This needs to be reviewed once the exact dimensions of the tanks have been decided.

5.5.3 It is also notable that the rules of C736 and in particular Section 4.2.1 make only nominal allowances for rainwater inclusion in the storage calculations. Should there be a tank failure the process of emptying the bund should be undertaken as soon as practicably possible to avoid over topping of the bund should prolonged period of rain an extreme weather event or a occur.

6 CONCLUSIONS

6.1.1 A risk assessment has been undertaken in accordance with CIRIA 736 which concludes that Class 1 containment is required for this site.

6.1.2 The overall quality of construction on site appears to be to a good standard. There were minimal defects observed during the site inspection all of which are easily repairable. The reservations Wardell Armstrong have is with the detailing as opposed to the build quality.

6.1.3 To allow the bund to be accepted as compliant by Wardell Armstrong the following will need to be confirmed or carried out:

- confirmation that the original designer has considered the lack hydrophilic protection in the depth of the bund base slab joints;
- confirmation of proposed inspection and maintenance regime for the joint in the base slab to allow for lack of hydrophilic protection;
- confirmation that the joint detail at the interface of the bund slab and the tank plinths is capable of withstanding the potential plinth settlements;
- confirmation that repairs to any slab cracking has been carried out;
- confirmation that the protruding pipe has been sealed;
- conformation that the eastern side of the southern wall would be able to support the subjected forces of a full tank.

6.1.4 Wardell Armstrong are able to validate the construction of the bund, subject to the responses above, and therefore consider the facility when assessed against CIRIA 736 guidance as having a Class 1 rating i.e. a low site risk rating.

APPENDIX 1

CIRIA Risk Assessment

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