Royal HaskoningDHV
Enhancing Society Together

Appendix 17.1
York Potash Project
Harbour Facilities
Flood Risk Assessment

[Blank Page]

Document title: York Potash Project Harbour facilities – Flood Risk Assessment
Status: Final Report - Revision 1
Date: March 2015
Project number: 9Y0989
Client: York Potash Ltd
Client contact: James Barrie

Drafted by: Peter Stout
Checked by: Steve Graham
Date / initials check: 02-12-2014 SG
Approved by: Granville Davies and Sian John
Date / initials approval: 19/03/2015 GD and 19/03/2015 SJ

[Blank Page]

1 INTRODUCTION 1
1.1 Introduction 1
1.2 Aims of the Flood Risk Assessment 1
1.3 Structure of the report 2
2 STUDY AREA 3
2.1 Site location 3
2.2 Existing site description 3
2.3 Proposed scheme development 3
3 POLICY, GUIDANCE AND CONSULTATION 4
3.1 National Policy and Guidance 4
3.2 Local Policy and Guidance 7
3.3 Consultation 10
4 POTENTIAL SOURCES OF FLOODING 12
4.1 Flood vulnerability 12
4.2 Flooding from rivers (fluvial) 12
4.3 Flooding from the sea (tidal or coastal) 13
4.4 Pluvial Flooding 13
4.5 Sewer Flooding 14
4.6 Groundwater Flooding 14
4.7 Flooding from Reservoirs 15
4.8 Climate Change Impacts 15
4.9 Summary of Site Specific Flood Risk Issues 16
5 IMPACT ON LOCAL FLOODING REGIME 17
5.1 Fluvial Flood Risk Impacts 17
5.2 Flooding from the Sea (Tidal Flooding) 17
5.3 Pluvial and Surface Water Flooding 17
6 FLOOD RISK MANAGEMENT ISSUES 18
6.1 Flood Risk to Proposed Development 18
6.2 Surface Water Drainage Strategy 18
6.3 Residual Risk Management 18

6.4 Summary 19
7 CONCLUSIONS 20
8 REFERENCES 21
9 ANNEX 22

1 INTRODUCTION

1.1 Introduction

1.1.1 This Flood Risk Assessment (FRA) assesses the Harbour facilities component of the York Potash Project (YPP), including the following:

- A port terminal on the southern bank of the Tees estuary (with capital dredging of an associated berth pocket and approaches) and associated infrastructure.
- A conveyor system to transfer product to the port terminal from the proposed Materials Handling Facility (MHF) at Wilton (the MHF at Wilton is the subject of a separate planning application; it is not considered in this assessment).
- Product storage facilities adjacent to the port terminal in the form of surge bins.

1.1.2 **Table 1-1** summarises key facts relevant to the site and FRA.

Table 1-1 Summary of key FRA site information

Location	Teesside
NGR (approx. centre point)	455700, 524600
Development Type	Materials handling and export
Flood Risk Vulnerability Classification	Less Vulnerable / Water Compatible
EA Flood Zone	Flood Zone 1, 2 and 3
EA Office	Northumberland, Durham and Tees
Local Planning Authority	Redcar and Cleveland Borough Council

1.2 Aims of the Flood Risk Assessment

1.2.1 This FRA has been guided and informed by relevant policy, legislation, standards, guidance documents and consultation. This subsection summarises the key guidance and consultation relevant to the FRA process.

1.2.2 This FRA has been produced in accordance with the National Planning Policy Framework (NPPF) published in March 2012, and associated guidance from the National Planning Practice Guidance: Flood Risk and Coastal Change (NPPG), updated in March 2014.

1.2.3 The FRA assesses the relationship between the proposed scheme and flood risk, considering the schemes vulnerability to flooding. The various potential sources of flood risk to the site are considered and mitigation measures proposed where appropriate. It also considers potential impacts of the proposed scheme on the local flooding regime more widely.

1.2.4 The flood risk principles within the NPPF are to avoid inappropriate development in areas at risk of flooding and, wherever possible, to direct development away from areas of highest risk. Local authorities should steer development to Flood Zone 1 (low risk), and only consider development in, sequentially, Flood Zones 2 and 3 if there are no appropriate and reasonably available sites in an area of lower flood risk. Further, new development should not cause an increase in flood risk elsewhere.

1.2.5 The National Policy Statement (NPS) for Ports, Department for Transport (2012) has been considered, specifically in relation to flood risk and key policy. It provides guidance as to the minimum requirements for FRAs for ports. In addition, the requirements for a sequential and exception test are dealt with.

1.2.6 Most planning applications for new development need to be accompanied by a FRA. The FRA should be appropriate to the scale, nature and location of the development. The assessment should demonstrate to the decision-maker how flood risk would be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users[1].

1.3 Structure of the report

1.3.1 Following this introduction, **Section 2** of this FRA describes the study area and provides a description of the proposed scheme. **Section 3** describes the relevant legislative and regulatory regime in the context of the proposed Harbour facilities. **Section 4** covers the potential sources of flood risk to the site and **Section 5** discusses the impacts of the proposed scheme on the local flooding regime. In **Section 6** potential options for flood risk mitigation are explored for the site, with conclusions presented in **Section 7**.

[1] Planning Practice Guidance: Flood Risk and Coastal Change, 2014, Department for Communities and Local Government

2 STUDY AREA

2.1 Site location

2.1.1 The Harbour facilities are located on the Tees estuary. The port terminal site is located at Bran Sands, Teesside. The site is centred at approximately National Grid Reference 455700, 524600, shown in *The York Potash Harbour Facilities Order 201x Layout Plans (Permanent) Regulations 5 (2)(o) Document 3.4a* (**Drawing PB1586/SK58**) and *The York Potash Harbour Facilities Order 201x Layout Plans (Permanent) Regulations 5 (2)(o) Document 3.4b* (**Drawing PB1586/SK59**).

2.2 Existing site description

2.2.1 The site is not fully developed at the present time. It stretches from the MHF to the east and the Tees Estuary at the west. It is located adjacent to the SSI Steelworks to the north and the Northumbria Water Ltd (NWL) sewage treatment works to the east. The western extent of the site is dominated by the Bran Sands Lagoon. Dabholm Gut (a small watercourse) runs parallel to the south of the site. The eastern extent of the site crosses multiple railway lines and the A1085 before meeting the boundary of the MHF.

2.2.2 The site includes the existing NWL sludge unloading jetty and pumping station, in the south-west corner of the site, which is linked to the sewage treatment plant to the east by pipelines. A landfill site (Bran Sands landfill) is located within the site (although the area of landfill is outside the site boundary, Bran Sands lagoon, which is within the site, falls within the waste management boundary of the landfill site). The rest of the site remains undeveloped. The site has gentle topography, sloping down towards the Dabholm Gut to the south. The landward elements of the site lie above the level of the estuary and above the Mean High Water Springs (MHWS) level

2.3 Proposed scheme development

2.3.1 The proposed Harbour facilities would consist of the port terminal, conveyor system and product storage facilities. The port facility would include a double berth for vessels up to 85,000 Deadweight Tonnage (DWT) to accommodate a throughput of 13 million tonnes per annum (mtpa).

3 POLICY, GUIDANCE AND CONSULTATION

3.1 National Policy and Guidance

2008 Planning Act

3.1.1 The Planning Act 2008 sets out the thresholds for Nationally Significant Infrastructure Projects (NSIPs). For the ports sector, applications for development consent will be referred to the Planning Inspectorate (PINS) if the estimated incremental annual capacity exceeds:

- 0.5 million Twenty Foot Equivalent Units (TEU) for a container terminal;
- 250,000 movements for roll-on roll-off (ro-ro);
- 5 million tonnes for other (bulk and general) traffic; or
- A weighted sum equivalent to these figures taken together.

3.1.2 As noted, the proposed scheme, once fully developed and operational, will provide for an export weight of 13mtpa of bulk product from the terminal, and this value clearly exceeds the threshold of 5mtpa capacity for the export of bulk materials. The Harbour facilities, therefore, constitute a NSIP.

3.1.3 The planning process for dealing with proposals for NSIPs was established by the Planning Act 2008. This process, as amended by the Localism Act, 2011, involves an examination of major proposals relating to energy, transport, water, waste and waste water. It provides the opportunity for public consultation prior to a decision being made by the Secretary of State.

National Policy Statement for Ports (NPS for Ports)

3.1.4 The minimum requirements for FRAs (as outlined within the NPS for Ports, paragraph 5.2.5 Department for Transport, 2012) are that they should:

- be proportionate to the risk and appropriate to the scale, nature and location of the project;
- consider the risk of flooding arising from the project, in addition to the risk of flooding to the project;
- take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made;
- be undertaken by a competent person, as early as possible in the process of preparing the proposal;
- consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure;
- consider the vulnerability of those using the site, including arrangements for safe access;
- consider and quantify the different types of flooding (whether from natural or human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- consider the effects of a range of flooding events, (including extreme events) on people, property, the natural and historic environment and river and coastal processes;

- include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project;
- consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems;
- consider if there is a need to be safe and remain operational during a worst case flood event over the development's lifetime; and
- be supported by appropriate data and information, including historical information on previous events.

3.1.5 The requirements identified above have been incorporated into this FRA and the assessment of potential impacts to coastal protection and flood defence has been made with reference to the NPS for Ports. The NPS for Ports states that all applications for port development of 1 hectare or greater in Flood Zone 1, as well as all proposals for projects in Flood Zone 2 and 3, should be accompanied by a FRA. Given the location of the proposed scheme within Flood Zone 1, 2 and Flood Zone 3, an FRA has been undertaken.

3.1.6 The NPS for Ports remains consistent with the NPPF and sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

3.1.7 The NPS states that the sequential test, and when deemed necessary the exception test, should be used when locating projects, to minimise flood risk.

The Sequential Test

3.1.8 The sequential test requires that preference should be given to locating projects in Flood Zone 1[2]. If there is no reasonably available site in Flood Zone 1, then projects can be located in Flood Zone 2. If there is no reasonably available site in Flood Zones 1 or 2, then essential infrastructure (including NSIPs) can be located in Flood Zone 3, subject to the Exception Test.

The Exception Test

3.1.9 If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the project to be located in zones of lower probability of flooding than Flood Zone 3, the Exception Test can be applied. The test provides a method of managing flood risk while still allowing necessary development to occur.

3.1.10 The Exception Test is only appropriate for use where the Sequential Test alone cannot deliver an acceptable site, taking into account the need for essential infrastructure to remain operational during floods. It may also be appropriate to use it where, as a result of the alternative site(s) at lower risk of

[2] The Flood Zones are defined in NPPF, see paragraph 3.1.13 of this FRA.

flooding being subject to national designations such as landscape, heritage and nature conservation designations (e.g. Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS)), it would not be appropriate to require the development to be located on the alternative site(s).

3.1.11 All the three elements of the Exception Test will have to be passed for development to be consented. For the Exception Test to be passed:

- it must be demonstrated that the project provides wider sustainability benefits to the community that outweigh flood risk;
- the project should be on developable previously-developed land or, if it is not on previously-developed land, that there are no reasonable alternative sites on developable previously-developed land; and
- an FRA must demonstrate that the project will be safe, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.

National Planning Policy Framework (2012) and Planning Practice Guidance: Flood Risk and Coastal Change (2014)

3.1.12 The publication of the NPPF and National Planning Policy Guidance sets out the requirements for FRAs. The information contained in the Planning Practice Guidance, together with the NPPF and the British Standard (BS) 8533-2011 *Assessing and managing flood risk in development. Code of practice* (British Standards Institution, 2011), form the basis of flood risk documentation. Due consideration has also been given to the Flood and Water Management Act, 2010.

3.1.13 The NPPF sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. However, where development is necessary in areas at risk of flooding, the development must be made safe and must not increase flood risk elsewhere (paragraph 100 of the NPPF). The key definitions that come from Section 1 of the Planning Practice Guidance: Flood Risk and Coastal Change (DCLG, 2014) are:

- "Areas at risk of flooding" for fluvial (river) and sea flooding means land within Flood Zones 2 and 3 or land within Flood Zone 1 that has critical drainage problems and has been notified to the local planning authority by the Environment Agency.

- "Flood risk" is a combination of the probability and potential consequences of flooding from all sources, including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems and from reservoirs, canals and lakes and other artificial sources.

3.1.14 The Environment Agency's Flood Zones categorises flood risk from rivers and the sea into three zones, as defined below:

- **Flood Zone 3** represents areas with a high probability of flooding which may flood from a 1 in 100 year fluvial (1 in 200 tidal) event or more (i.e. with an annual probability of flooding of >1% (>0.5% tidal).
- **Flood Zone 2** has a medium flood risk classification and refers to areas that may flood from between a 1 in 100 and 1 in 1,000 year fluvial event (1 in 200 and 1 in 1,000 tidal) (i.e. with an annual probability of flooding of 1%-0.1% (0.5%-0.1% tidal)).
- Any areas not shown in Environment Agency Flood Zones 2 or 3 are classed as **Flood Zone 1**, low fluvial and tidal flood risk.

3.1.15 The Environment Agency Flood Zones show the probability of flooding, without taking account of the beneficial impacts of flood risk management infrastructure or the presence of significant man-made structures such as bridges.

Flood and Water Management Act 2010

3.1.16 The Flood and Water Management Act combines and progresses principles from three previously published UK Government papers: Future Water (2008); Making Space for Water (2004) and the Pitt Review (2008).

3.1.17 In conjunction with the Environment Agency's strategic role in flood risk management, the Act gives Local Authorities responsibility for managing flood risk from groundwater, surface water, and ordinary watercourses in their areas. In particular, the Act emphasises the importance of understanding the impacts of surface water flooding and ensuring effective management of surface water runoff.

3.2 Local Policy and Guidance

Strategic Flood Risk Assessment

3.2.1 A Strategic Flood Risk Assessment (SFRA) is a study carried out by one or more Local Planning Authorities to assess the risk to an area from flooding from all sources, now and in the future, taking account of the impacts of climate change. The SFRA also assesses the impacts that land use changes and development in the area is predicted to have on flood risk.

3.2.2 A Level 1 SFRA is produced for planning purposes, assisting a Council in identifying planning policy relevant to their area and identifying general areas of flood risk from all sources of flooding. The assessment should be applied to Local Authority areas where flooding is not a major issue and where development pressures are low. However, the assessment should be thorough enough to allow for the application of the Sequential Test and to identify whether the development can be located outside of high and medium flood risk areas (i.e. towards Flood Zone 1).

3.2.3 A Level 2 SFRA is less strategic and provides more detailed guidance on appropriate flood risk management measures for adoption on potential sites within Flood Zones 2 and 3. A Level 2 SFRA should consider the detailed nature of the flood characteristics within a Flood Zone including flood

probability, depth, velocity, the rate of onset and duration of flooding. This detailed information should allow for the application of the Exception Test where appropriate.

Redcar and Cleveland Strategic Flood Risk Assessment

3.2.4 The Redcar and Cleveland SFRA describes the Borough as being made up of a number of small river catchments that originate in the northern tip of the North York Moors. As the catchments are small, so are the rivers. However, due to the physical characteristics of the catchment, the rivers have a rapid hydrological response time to rainfall events, which can be hazardous when the rivers are in flood. Consequently, the main fluvial flood risk comes from these small watercourses which pass through towns and villages within the Borough. However, the flood extents from these watercourses are generally confined to relatively small areas.

3.2.5 The north-west part of the Borough is bounded by the Tees Estuary, which is the main source of tidal flooding. Water levels within the estuary and its associated tributaries are influenced by high tides and wave action. The Borough also has an extensive coastline, and in low lying areas there is a risk of coastal flooding.

3.2.6 The SFRA identifies surface water flooding as a potentially significant source of flood risk within the Borough. In rural areas, surface water flooding is associated with the rapid runoff generated from the steep, small catchments with overland flows reaching low lying developed areas following heavy rainfall events. Although this type of surface water flooding is localised, there is the potential for fast flowing surface water flow pathways. Secondly in urbanised areas, surface water can pass through a series of sewers, culverted, straightened or confined watercourses, sometimes with inadequate capacity, further increasing the flood risk. Due to the flatter landscape in the urban areas, the flooding is more widespread, but fast flowing surface water pathways are generally less of a hazard.

SFRA Critical Drainage Areas

3.2.7 Critical Drainage Areas (CDAs) are identified within the SFRA as areas recognised for suffering from historical flood events or areas where modelled data suggests they are at significant risk from surface water flooding. The Harbour facilities do not fall within a CDA, although it is close to CDAs located at Eston (to the south west) and Dormanstown (to the north east).

Catchment Flood Management Plan

3.2.8 Catchment Flood Management Plans (CFMPs) consider all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding) which is covered in Shoreline Management Plans (SMP). They also take into account the likely impacts of climate change, the effects of how we use and manage the land and how areas could be developed to meet our present day needs without compromising the ability of future generations to meet their own needs.

3.2.9 CFMPs will be used to help the Environment Agency and partners to plan and agree the most effective way to manage flood risk in the future.

3.2.10 The role of the CFMP is to establish flood risk management policies which will deliver sustainable flood risk management over a long term timescale.

3.2.11 The River Tees CFMP sets out various strategies for the management of the River Tees Catchment for the future based on current information and the anticipated future situation. The CFMP identifies the major flood risk in the catchment as generated by large frontal storm events.

3.2.12 The CFMP identifies the coastal areas of the catchment as most at risk to future flood risk changes due to their low-lying nature, the tidal influence, building development and the increased rainfall intensity increase the risk of surface water flooding.

Shoreline Management Plan2

3.2.13 The final Draft of SMP2 for the River Tyne to Flamborough Head covers the mouth of the Tees and was written in February 2007 (Royal Haskoning, 2007). The SMP2 does not cover the footprint of the Harbour facilities as there are no defined Policy Units that extend up the Tees estuary to the development site.

Redcar and Cleveland Borough Council Local Plan

3.2.14 RCBC adopted its Core Strategy in July 2007 and this provides the development framework for the Borough over the planned period to 2021. At the same time the Council adopted its Development Policies Document, which provides detailed development control policies that are intended to deliver the overarching policy objectives of the Core Strategy.

3.2.15 Development Plan Document policies of relevance in the context of the FRA for the proposed scheme include the following adopted Core Strategy policies:

- Core Policy CS2 - The location of new development will avoid areas at risk of flooding in line with the requirements set out in PPG25. (Note that PPS 25 referenced in CS2 is now superseded as discussed in paragraph 3.1.1).
- Core Policy CS10 promotes the continued development and expansion of the port industry and port-related development along the River Tees.
- Development Policy DP3 (Sustainable Design) states a development should incorporate infrastructure and services to serve the development including recycling and waste facilities and Sustainable Drainage Systems if appropriate

3.2.16 It is noted that RCBC is currently in the process of reviewing its Local Development Framework (LDF) with the intention of reverting back to a single Local Plan. The draft Publication Version Local Plan was considered by the Council in July 2014 prior to its issue for consultation, but was not approved. The Council has now restarted the Local Plan review process, with the intention of issuing a draft for consultation in September 2015.

3.3 Consultation

3.3.1 An initial consultation meeting on flood risk was carried out with the Environment Agency on 7 January 2014 to introduce the proposed scheme at the harbour site and the Wilton MHF site. The key points raised were as follows:

- The Environment Agency was not aware of any recent flood impacts to / around the proposed scheme footprint from tidal events during December 2013 and January 2014.
- The Environment Agency was aware of local flood issues within the Tees estuary, including a recent (December 2013 and January 2014) breach at Greatham South embankment (north Tees / Seal Sands) and recent flooding at Port Clarence (north Tees). The Environment Agency was not aware of any flooding experienced along the south side of the Tees estuary or within Teesport during these events.
- The Environment Agency informed Royal HaskoningDHV that it has completed an update of the tidal Flood Zones along the Tees estuary.
- The Environment Agency stated that, in accordance with PPS25 requirements, a sequential and exception test will be required and it was recognised that the port facility will be a water compatible development[3].
- The FRA undertaken for the Northern Gateway Container Terminal (NGCT) predicted an increase of 1 to 2mm on upstream tidal levels as a result of the dredging required for the NGCT. The Environment Agency confirmed that this order of impact will be considered negligible.
- The Environment Agency stated that free discharge of water will be acceptable at the proposed estuarine location, as this will not have any flood risk implications elsewhere.
- The Environment Agency stated that the drainage design for the proposed scheme will need to address tide-locking.

3.3.2 Informal consultation was also carried out with RCBC Senior Drainage Officer in relation to both the Harbour and MHF on 14 January 2014. The key points from the discussion were as follows:

- RCBC stated that they were in general agreement with the proposed approach to the FRA.
- RCBC confirmed that Sustainable urban Drainage Systems (SuDS) would not be obligatory for the drainage for flood risk purposes and that direct discharge of surface water drainage into the Tees estuary would likely be acceptable; on the basis that this would not exacerbate flood risk elsewhere.
- RCBC stated that surface water attenuation may be required with regard to water quality.
- RCBC stated that drainage attenuation may be required if discharging from the proposed scheme footprint into Dabholm Gut (this is not proposed).

3.3.3 As part of the wider consultation process, an Environmental Scoping Report was issued for consultation to PINS. It identified the potential impacts of the proposed scheme on coastal protection and flood

[3] Although this comment was made by EA in the meeting, it is noted that PPS25 is now withdrawn. Therefore this FRA has been produced to satisfy NPPF and NPS for Ports.

defence and the Scoping Opinion received from PINS identified issues to be addressed as part of the EIA process. The only FRA relevant comment raised by PINS for the assessment of impacts on flood defences was that it should also consider the potential for breaching / overtopping of the flood defence under present and projected sea level scenarios.

3.3.4 A further meeting was held on the 25 June 2014 with RCBC staff (namely their Development Manager, Flood Risk Officer and Transport Strategy Officer) to discuss the Conveyor route crossing over the A1085 and operational access from Steel House Roundabout. The purpose of the meeting was to review the design options for the conveyor route from the MHF at Wilton to the Port. The opportunities and constraints associated with each of the options were discussed.

3.3.5 Two issues were discussed with respect to flood risk. Firstly, the product's sensitivity to water and therefore flooding and, secondly, the potential introduction of flood water pathways associated with the conveyor, potentially exacerbating flooding and extending the flood routing and extents

4 POTENTIAL SOURCES OF FLOODING

4.1 Flood vulnerability

4.1.1 In terms of flood risk and vulnerability Table 2 of the NPPF Technical Guidance classifies the type of development planned at the port terminal as 'Water Compatible'.

4.1.2 Table 3 of the Guidance indicates that developments of this classification are considered to be appropriate in all Flood Zones, as shown in **Table 4-1** below.

4.1.3 The Guidance classifies the type of development planned for the conveyor route as 'Less Vulnerable'; while the NPPF indicates that developments of this classification are considered to be appropriate in Flood Zones 1, 2 and 3a, as shown in **Table 4-1** below. However, under this classification, no development is permitted within the Functional Floodplain (Flood Zone 3b).

Table 4-1 Flood Risk Vulnerability and Flood Zone 'Compatibility' (Table 3, NPPF Technical Guidance)

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
× Development should not be permitted.

4.1.4 The Technical Guidance that supports the NPPF states that there are a number of sources of flooding which need to be considered within an FRA. The potential sources of flooding to the port terminal and conveyor routes are discussed in the sections below.

4.2 Flooding from rivers (fluvial)

4.2.1 The Environment Agency's Flood Map for Planning (Rivers and Sea) has been used to assess the current risk of flooding at the Harbour facilities, as shown in **Drawing PB1110-HF-FRA-001** in the Annex. The majority of the site is located within Flood Zone 1 (low probability).

4.2.2 The areas of the site adjacent to the Tees estuary and the Bran Sand Lagoon are within Flood Zones 2 and 3, see **Drawing PB1110-HF-FRA-001** in the Annex. It is felt that tidal flooding would pose a greater flood risk to the site when compared with fluvial flooding.

4.3 Flooding from the sea (tidal or coastal)

Tidal locking

4.3.1 The port terminal and conveyor route is at risk from tidal flooding, and this represents the predominant source of flood risk to the proposed scheme. The areas of the proposed port terminal adjacent to the River Tees and the Bran Sand Lagoon lie within Flood Zones 2 and 3; the rest of the site is in Flood Zone 1 at or above 5.5m Above Ordnance Datum (AOD), approximately 2m above present day Highest Astronomical Tide (HAT).

4.3.2 The southern conveyor envelope follows Dabholm Gut and is in Flood Zones 2 and 3; the northern conveyor envelope lies within Flood Zone 1. However, it is proposed that the conveyor would be elevated to a minimum of 5.25mAOD above the predicted extreme flood level and, therefore, the conveyor is not deemed to be at risk from tidal flooding.

4.3.3 The Environment Agency stated that the drainage design for the proposed scheme will need to acknowledge potential tide-locking. Tidal locking is a risk to this site with regard to surface water drainage; the Environment Agency stated that free discharge of water would be acceptable at the proposed estuarine location, as this would not have any flood risk implications elsewhere.

4.3.4 Informal consultation was also carried out with RCBC's Senior Drainage Officer in 14 January 2014 in relation to both the Harbour and MHF. Of relevance here is that direct discharge of surface water drainage into the Tees estuary was determined to be likely to be acceptable; on the basis that this would not exacerbate flood risk elsewhere, i.e. would not affect tidal locking.

4.4 Pluvial Flooding

4.4.1 Surface water flooding occurs when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. This source of flooding can be caused by local runoff from hill-slopes and impermeable areas, especially after periods of very wet weather or intense rainfall. This surface water runoff will naturally flow to lower areas of land, leading to pooling of flood water and the creation of surface water flow pathways.

4.4.2 As mentioned in **Section 3.2**, the Redcar and Cleveland SFRA discusses two types of surface water flooding within the Borough; firstly from rapid runoff from small, steep sided catchments in rural areas; and secondly from surface water being confined when passing through a heavily urbanised area. Overall the SFRA considers surface water flooding to be a significant issue within the Borough.

4.4.3 Specific to the port facility site, the Environment Agency's 'Risk of Flooding from Surface Water' map, see **Drawing PB1110-HF-FRA-002** in the Annex, shows that the site is affected by limited areas of surface water flooding risk. For the majority of the site the surface water flood risk is defined as very low. This means that the site is only likely to flood on a surface water flood event more extreme than a 1 in 1,000 years.

4.4.4 The pluvial flood risk maps indicate that the conveyor could be at risk of flooding, between the MHF and port terminal. On the port terminal, the southern conveyor envelope is at risk of pluvial flooding; while the northern conveyor envelope is not. However the conveyor is proposed to be elevated above the ground due to the product being water sensitive. The conveyor would be elevated to at least 5.25mAOD, i.e. above the extreme tidal water level.

4.5 Sewer Flooding

4.5.1 Sewer flooding can occur as a result of inadequate hydraulic capacity within the sewage network. This is therefore more common in urban areas that in rural areas, as in urban locations the extent of impermeable area is greater and runoff rates into the sewage system are higher. Urban underground sewerage and drainage systems can be completely overwhelmed during a surface water flooding event, preventing drainage and exacerbating the flooding problem.

4.5.2 The Redcar and Cleveland SFRA reported that sewer flooding within the Borough mainly occurs in dense urbanised areas where sewers have an inadequate capacity and the sewer infrastructure often becomes overwhelmed and blocked.

4.5.3 NWL is currently unable to provide information on flooding from sewers and any planned improvement schemes. A list was provided, however, by NWL of upcoming or completed sewer improvement schemes, that identifies sewer flooding problem locations and also summarises proposed works to reduce the risk, as part of the SMP2 process. However, the development site was not mentioned within this list as having a known sewer flooding issue.

4.6 Groundwater Flooding

4.6.1 Groundwater flooding can occur when water stored beneath the ground reaches the surface and is generally associated with porous rocks, e.g. sands and gravels. The emergence of groundwater through springs or seeps often occurs during periods of high groundwater levels.

4.6.2 The Redcar and Cleveland SFRA and the Tees CFMP stated that there is little documented evidence of groundwater flooding in the Tees Catchment.

4.6.3 The Environment Agency Groundwater Source Protection Zones (SPZ) map indicates that there are no SPZs within the site and the Redcar and Cleveland SFRA states that the site is not located within a critical drainage area. Additionally there has been no groundwater flooding instances reported at the site, conveyor route, or in the vicinity of the site. Therefore it is considered that there is no flood risk from this source at the site.

4.7 Flooding from Reservoirs

4.7.1 Flooding from reservoirs defines the implications of a large uncontrolled release of water from an impounded source. Reservoir flooding in the UK is considered to be an extremely unlikely event, that will occur only if the reservoir breaches, or in an extreme (>1 in 10,000 year) flood event.

4.7.2 On review of the Environment Agency Reservoir Inundation Mapping, five brine reservoirs have been identified to the south of the Wilton MHF site which are a known source of reservoir flood risk. However, if these reservoirs were to breach, according to the mapping, the potential flood outline would not affect the port facilities.

4.7.3 The reservoir flood mapping does suggest that the conveyor route could be at risk from reservoir flooding. However, the conveyor route is proposed to be raised to 5.25mAOD, avoiding this risk. The conveyor would be raised for its entirety from the MHF to the Port.

4.8 Climate Change Impacts

Fluvial

4.8.1 Climate change may increase peak rainfall intensity and river flow, which could result in more frequent and severe flood events. Changes in the spatial extent of flooding are likely to be negligible in narrower floodplains, but can be dramatic in very flat areas. This means that a site currently in a lower risk zone could in future be in a higher risk zone due to climate change. The NPPF Technical Guidance states that increases of 20% and 30% should be applied to peak river flows and rainfall intensities respectively.

4.8.2 The impact of climate change on the 1% AEP flood event, in the current situation, is provided in **Section 4.2** above. As outlined previously, the 1% AEP fluvial flood event does not affect the site. Therefore, consideration of this event on the proposed scheme is not discussed further within this report. Consideration of climate change would need to be incorporated into the design of any SuDS schemes.

Tidal

4.8.3 A comparison between the 0.5% event and the same event with climate change added, according to the JBA (2011) Tidal Tees TUFLOW hydraulic model, shows that the current Flood Zone 2 extents can be used as an indication of what Flood Zone 3 may look like when considering the effects of climate change. The main impacts of climate change on flood extent are summarised below:

- Flood extents do not appear to increase significantly on the fluvial watercourses. This is because they predominantly flow through narrow valleys and flood extents become constrained by the steep hills on either side. The extents may not increase significantly but flood frequency may. On the Harbour site it is not envisaged that a major change would arise to flood extents, just to the frequency.
- The increase in extreme tide levels as a result of climate change will be greater. The 0.5% annual probability flood level for the Tees Estuary is currently 4.19mAOD. In 100 years' time

it is predicted that this will be 5.07mAOD. This is likely to increase the likelihood of flooding on the site and is the most notable effect; exacerbating the existing flood risk issues. However, the extent of tidal flooding will not increase significantly for the site, with the same areas still being affected at Dabholm Gut and Bran Sands Lagoon and climate change increasing the level of tidal inundation but not increasing the flood risk. Finally, the port terminal element of the Harbour facilities is proposed to be at 5.6mAOD which is higher than the increased tidal levels predicted due to climate change.

- The frequency and extent of surface water flooding could increase significantly in the future and rain storms become heavier and more frequent. This could affect the A1085 area and, therefore, increase the flood risk around the conveyor route.

4.8.4 UKCIP02 climate change scenarios suggest that winters will become wetter over the whole of England, by as much as 20% by the 2050s. A shift in the seasonal pattern of rainfall is also expected, with summers and autumn becoming much drier than at present; increasing surface water flooding potential in the future.

4.8.5 Peak river flows are predicted to increase by around 20% over the next 50 years; this translates into higher water levels in rivers. In addition, sea level rise due to climate change will increase the risk of tidal flooding. In the north east part of the UK, sea levels are currently rising by 2.5mm/year. However, by 2085, levels will be increasing by 13mm/year. This will increase sea levels by around 900mm over the next 100 years,

4.9 Summary of Site Specific Flood Risk Issues

4.9.1 From the work that has been undertaken, the following key issues with regard to flood risk to the proposed development have been highlighted:

- Fluvial flood risk is not considered to be significant for the port facility nor the conveyor routes.
- The main flood risk is from tidal sources, for both the port and conveyor, particularly along the Dabholm Gut and the Tees Estuary.
- Surface water flooding poses a flood risk to this site in extreme conditions.
- Groundwater and reservoir flooding is not considered to pose a risk.
- Climate change could increase the risk of flooding from all sources, but based on current estimates is unlikely to affect the site significantly other than potential increases in tidal and surface water flood risk for the port facility, and fluvial and surface water risk for the conveyor routes.
- Climate change will increase the magnitude of flood events from all sources. This increase in magnitude will be insufficient to affect the site for the proposed scheme and would not alter the flood risk to the port facilities or conveyor routes.

5 IMPACT ON LOCAL FLOODING REGIME

5.1 Fluvial Flood Risk Impacts

5.1.1 The site is not at risk from fluvial flooding. The proposed development of the quay and conveyor is deemed to not alter the site flood risk.

5.2 Flooding from the Sea (Tidal Flooding)

5.2.1 The tidal flood risk (the major flood risk to this site) would be diminished, to some extent, on the site by the construction of the quay at the water's edge, significantly above the highest tide level, though climate change Sea Level Rise may counteract this. Wave action could still cause overtopping on site.

5.2.2 It is acknowledged that the conveyor structure and associated piers would be positioned within the known floodplain, but are not predicted to affect flood risk. The piers would have a negligible impact on the flood plain. The conveyor itself would be raised to 5.25mAOD and so would not impact on the level of tidal flood risk.

5.3 Pluvial and Surface Water Flooding

5.3.1 The proposed port facility site has been previously developed and parts of the site have an impermeable surface area. This would be increased following the development of the port, increasing the level of flood risk. As with tidal flooding, there is a risk that pluvial flooding would be exacerbated by the effects of climate change, e.g. due to increase rainfall intensities.

5.3.2 Because the Conveyor would be elevated, it would not impact on surface water drainage at the site. The piers to elevate the conveyor route would have a negligible impact on the surface area of the floodplain for the Dabholm Gut.

6 FLOOD RISK MANAGEMENT ISSUES

6.1 Flood Risk to Proposed Development

6.1.1 The major flood risks to this site are posed by tidal sources, but these are mainly confined to the western extents and the southern extents of the port terminal near to the Bran Sands Lagoon and Dabholm Gut. Therefore, for the majority of the site, additional flood risk mitigation measures are not required. Pluvial flooding could increase in the future as a result of increased impermeable surface area on site.

6.1.2 The conveyor route is located within the Flood Zones 2 and 3. However the proposed design for the conveyor would prevent it from being at risk. The conveyor would be raised along its entire route to a minimum invert of 5.25mAOD (predicted extreme tidal level). The piers are predicted to have a negligible impact on the floodplain surface area, and not exacerbate flood risk.

6.1.3 There is a concern that the Dabholm Gut and River Tees could become tidally locked in periods of high flow, increasing the flood risk. However, the 5.6mAOD proposed quay level should prevent this. Any flood waters would follow the established flood pathway of the Dabholm Gut limiting *any* affects to the southern part of the site.

6.1.4 The western and southern parts of the site would be most at risk, however, there would be limited activity on the western extent due to the Bran Sands lagoon limiting access. The quay wall would be 2m above current high water levels, affording the same level of protection from both fluvial and tidal flooding.

6.2 Surface Water Drainage Strategy

6.2.1 The impermeable area of the site would be increased due to the works. As a result, some areas of the site could see increased flood risk as a result of the development and, therefore, mitigation (drainage) would be required.

6.2.2 An adequate drainage system, discharging into the Tees (the preferred option identified from consultation with RCBC), is proposed. SuDs were not deemed to be necessary at this site by RCBC, as the water can freely discharge into the Tees and Dabholm Gut.

6.3 Residual Risk Management

6.3.1 Relevant measures will be included in the final design to ensure that, on completion of construction, there would be a low residual risk to the whole site. With little residual risk of flooding associated with the development, only commonly used mitigation measures are suggested. The residual flood risk here would be due to external factors, for example, a storm exceeding the design storm event for the site or a failure of one of the site flood risk mitigation measures.

6.4 Summary

6.4.1 In summary, the mitigation described above would be applied at the site. This would ensure that the site does not cause any increased effects on surrounding areas due to the potential for increased surface water runoff.

6.4.2 As noted in **Section 3.3**, it is understood that there is a surface water flood alleviation scheme in preparation by RCBC and the Environment Agency for Dormanstown. However, because timeframes, likelihood of implementation, scheme details and its implications for the Wilton site are not certain or definite at this stage, this proposed scheme has not been considered further within this FRA.

7 CONCLUSIONS

7.1.1 The site has been assessed regarding flood risk to the proposed development and also with respect to its potential impacts, given the information currently available. Mitigation has been identified where appropriate. The key conclusions from the FRA are:

- The major potential flood risk to the port is from tidal sources. The harbour facility is in Flood Zones 1, 2, and 3. The port terminal is in Flood Zone 1. The areas along the Tees estuary and by the Bran Sands lagoon are in Flood Zones 2 and 3 due to tidal and fluvial flood risk. The conveyor route from the port terminal to the MHF is also within Flood Zones 1, 2, and 3.
- Although the Harbour facilities do lie within Flood Zones 1, 2 and 3 it is considered to be a water compatible development, and therefore suitable for this location.
    - The Sequential Test was not applied in detail as the development has to be located at the water's edge due to the specific requirements of the proposed scheme and its' usage. Furthermore, and in any case (as stated above), the majority of the site lies within Flood Zone 1 and therefore satisfies the Sequential Test. In addition, as the development is considered to be 'water compatible' the Exception Test is not required.
- There is no past evidence of flooding events occurring at the site.
- The conveyor route is within Flood Zones 1, 2 and 3 for tidal and pluvial flood risk. However the proposed design of the conveyor is to raise it to a minimum invert of 5.25mAOD (above the extreme tidal level), preventing it from being at risk from flooding.
- At the western extent of the Harbour facilities by the Bran Sands Lagoon; the northern conveyor route is in Flood Zone 1, and the southern conveyor route (adjacent to the Bran Sands Lagoon) is in Flood Zone 2 and 3.
- The port facility should not cause a change to the local flood regime; apart from the increase in impermeable surface area potentially increasing the pluvial flood risk.
- The conveyor is not predicted to affect the flood risk. The conveyor piers are predicted to have a negligible impact on the flood plain surface area.
- The River Tees and Dabholm Gut should provide more than sufficient capacity for discharge from the site and there is no need for attenuation or SuDs. The RCBC SFRA highlights that the geology is unsuitable for SuDs. The proposed quay structure should reduce the fluvial and tidal flood risk.
- Climate change is likely to exacerbate the existing situation and the situation post-development. More frequent rainfall events are likely to increase the surface water flood risk and more intense and frequent storms, and high river flows, are likely to increase both the fluvial and tidal flood risk, but the port site elevation would still prevent it from flooding, and the conveyor would be raised above the future flood risk levels.

7.1.2 Based on the information gathered and using the technical guidance provided in the NPPF and NPS for Ports; the port facility and conveyor are considered to be appropriate in terms of flood risk. The conveyor is not deemed to be at risk from flooding due to its raised elevation, nor would it raise the flood risk in the future.

8 REFERENCES

ARUP (2010) *North East Yorkshire Strategic Flood Risk Assessment.*

British)Standards Institution, (2011 British Standard BS 8533-2011 Assessing and managing flood risk in development. Code of practice, October 3011 Available at: http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030203836

Department for Communities and Local Government (2012) *National Planning Policy Framework, March 2012.*

Department for Communities and Local Government (2014) *Planning Practice Guidance: Flood Risk and Coastal Change.*

Department for Transport (2012) *National Policy Statement for Ports.*

Environment Agency (2009a) River Tees Catchment Flood Management Plan.

Environment Agency (2009b) Tees Tidal Flood Risk Management Strategy.

Environment Agency (2014a) Flood Map for Planning (Rivers and Sea).

Environment Agency (2014b) Risk of Flooding from Surface Water.

Environment Agency (2005) Tidal Tees Flood Risk Management Strategy Scoping Report. March 2005.

JBA (2010a) Strategic Flood Risk Assessment Level 1 Volume I – SFRA Understanding the SFRA process.

JBA (2010b) Strategic Flood Risk Assessment Level 1 Volume II – Final Report.

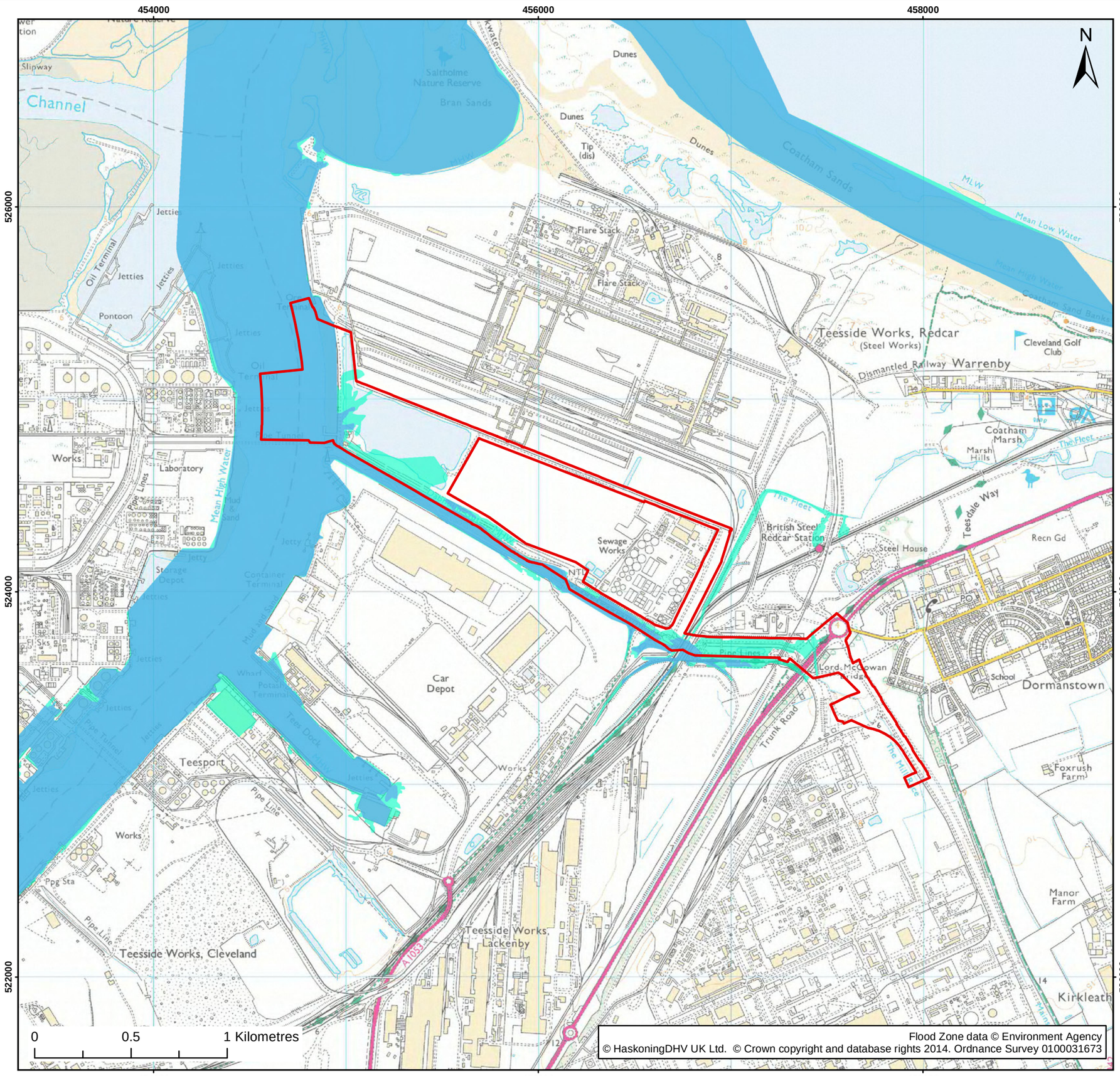
JBA (2011) Tidal Tees Integrated Flood Risk Management Study.

Royal Haskoning (2007) Shoreline Management Plan 2 River Tyne to Flamborough Head.

[Blank Page]

9 ANNEX

[Blank Page]



Legend:

- DCO Order Limits
- Flood Zone 2
- Flood Zone 3

DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title: Fluvial Water Flood Risk

Part:	Figure:	Drawing No:
HF	1	PB1110-HF-FRA-001

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
1	06/03/2015	GC	PS	A3	1:20,000
0	05/12/2014	GC	PS	A3	1:20,000

Co-ordinate system: British National Grid

Royal HaskoningDHV
Enhancing Society Together

ROYAL HASKONINGDHV
INDUSTRY, ENERGY & MINING
RIGHTWELL HOUSE
BRETTON
PETERBOROUGH
PE3 8DW
+44 (0)1733 33 44 55
www.royalhaskoningdhv.com

[Blank Page]

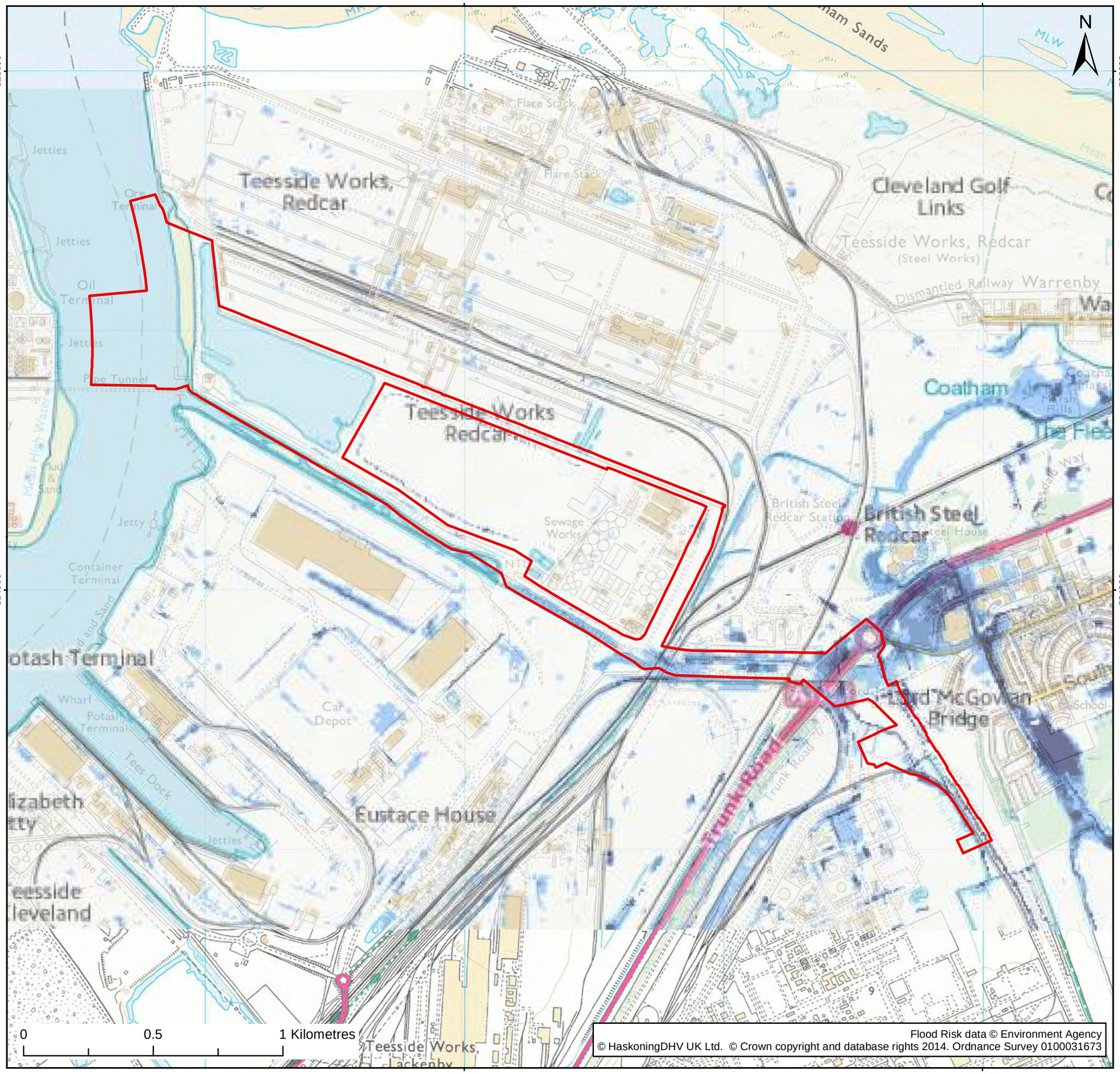
456000

458000

526000

524000

N



0 0.5 1 Kilometres

Flood Risk data © Environment Agency

Legend:

- DCO Order Limits
- High
- Medium
- Low
- Very Low

DCO Order Limits as of 24/02/15

Client:	Project:
York Potash Limited	York Potash Project Harbour Facilities

Title: Risk of Flooding from Surface Water

Part:	Figure:	Drawing No:
HF	2	PB1110-HF-FRA-002

Rev:	Date:	Drawn:	Checked:	Size:	Scale:
1	06/03/2015	GC	PS	A3	1:15,000
0	05/12/2014	GC	PS	A3	1:15,000

Co-ordinate system: British National Grid

ROYAL HASKONINGDHV
INDUSTRY, ENERGY & MINING
RIGHTWELL HOUSE
BRETTON
PETERBOROUGH
PE3 8DW
+44 (0)1733 33 44 55
www.royalhaskoningdhv.com

[Blank Page]