Royal HaskoningDHV
Enhancing Society Together

Tees Marine Risk Assessment Study

Marine Risk & Congestion Study

Document title: Tees Marine Risk Assessment Study
Status: Final Report
Date: July 2014
Project name: York Potash
Project number: PB1586
Client: York Potash Ltd
Client contact: James Barrie

Reference: PB1586/R003 Rev3
Drafted by: James Morley [redacted]
Checked by: Stephen Pugmire
Date / initials check: July2014
Approved by: Stephen Pugmire
Date / initials approval: July 2014

Contents

References

[1] The Ports of Tees and Hartlepool, February 2003 / version 4.
[2] UKHO Easy Tide Forecast (April 2013).
[3] Admiralty Chart No 2566-1.
[4] Admiralty Chart No 2566-2.
[5] Admiralty Chart No 2567.
[6] The International Regulations for Preventing Collisions at Sea. International Maritime Organisation (IMO), 1972.

Royal HaskoningDHV
Enhancing Society Together

Executive Summary

Executive Summary

The export of polyhalite from Bran Sands will increase the number of large vessels operating on the River Tees. These vessels, as well as large vessels associated with other planned developments on the Tees may introduce congestion within the river or turning areas since deep drafted vessel movements are typically restricted to the hours around high tide.

Congestion could lead to delays in vessel scheduling, impacting both the planned polyhalite export facility as well as other river traffic.

This Marine Risk Assessment has been developed to investigate the impact of the facility and inform the environmental consenting process. The assessment uses RHDHV's Marine Traffic Model (MARTRAM), which is built upon the commercially available FlexSim simulation platform to identify the likely locations of congestion and estimate the impact on vessel scheduling.

The Assessment considers vessel movements associated with the planned Phase 1 – 6.5Mtpa and future Phase 2 – 13Mtpa (double berth and single berth arrangement) within the context of the existing traffic and potential traffic from other known planned River Tees developments. The Assessment adopts the current dredge levels as these represent a 'worst case scenario' for congestion, since this has the effect of restricting the tidal window.

The simulation results identify that the export of polyhalite from Bran Sands will increase congestion at the following principal locations: Tees Dock Turning Area and river channel adjacent to Simon Storage.

Assuming that both the Bran Sands export facility (Phase 1 and Phase 2 double berth) and other planned developments take place, the simulations predict vessel schedule delays that are of the scale that could be managed through Port Operations, rather than requiring other mitigating actions. The reported Phase 1 schedule delay is 19.1mins/day, whilst the double berth Phase 2 delays is 22.1mins/day.

However, the assessment of the single berth Phase 2 option (13Mtpa) shows a significant delay for the polyhalite vessels, 94mins/day. This delay is generally limited to the polyhalite vessels themselves, and is relatively insensitive to other vessel movements or developments on the other river. Consequently this delay is considered to be an operational constraint of the single berth arrangement.

The principal mitigation measure for the identified polyhalite export delays would be to increase the available tidal window by dredging, either to the depths advertised on the admiralty charts or other more extensive works. Further work would identify how much dredging would be required to fully mitigate the various delays identified by the simulation.

An alternative approach is to reduce delays by assuming that a more rigid arrival schedule can be applied. This alternative approach would see greatest benefit on the Phase 2, single berth option.

The investigation of these mitigating measures should be conducted under a subsequent development phase.

1 Introduction

Introduction

1.1 Project Background

York Potash Ltd is currently developing one of the world's largest polyhalite mines in North Yorkshire. The polyhalite ore will be processed in Teesside and exported through marine facilities on the River Tees at Bran Sands. A volume of 13mtpa is projected to be exported through the port facility when at full capacity, which will generate significant additional vessel movements.

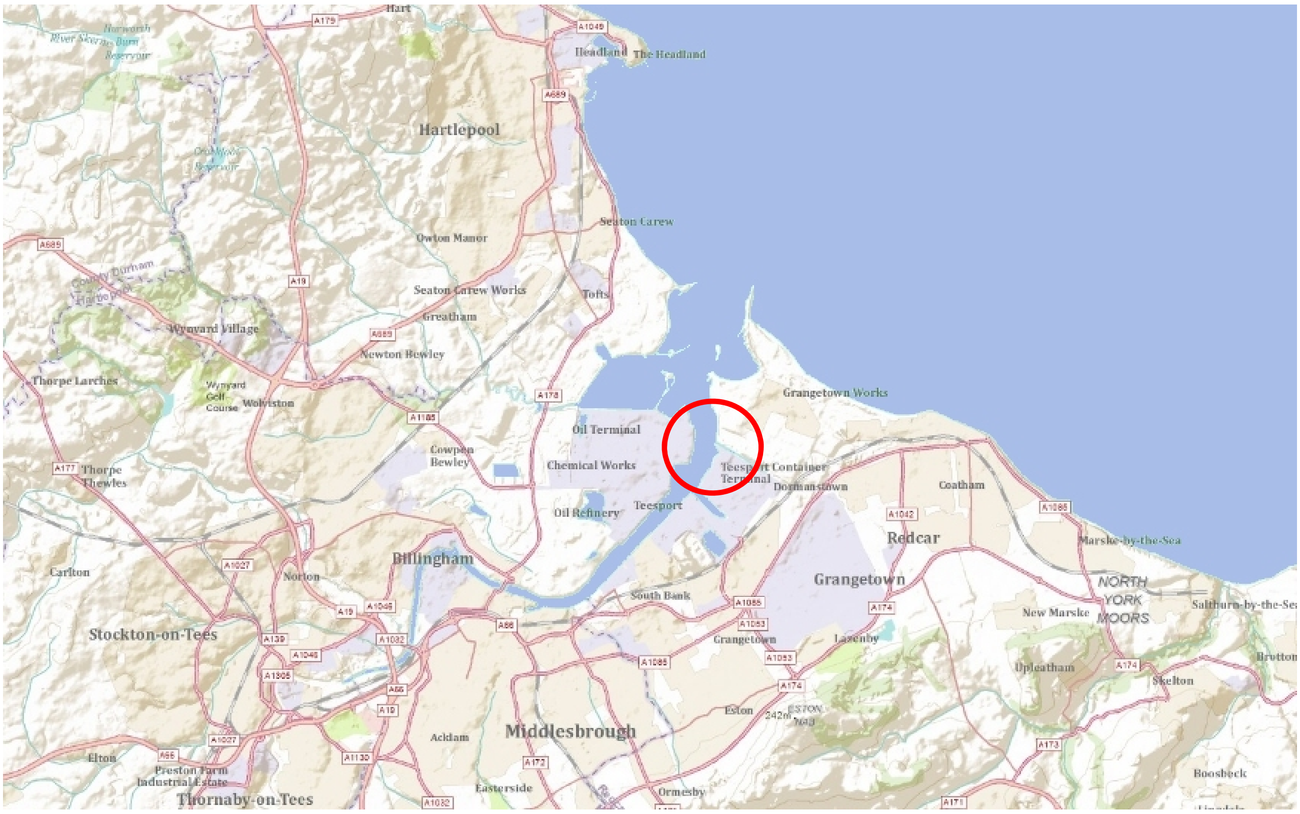
PD Teesport currently handles approximately 34 million tonnes of cargo a year with over 5,000 vessels visiting each year.

As part of the environmental consenting process YPL is investigating the impact of future increased vessel movements on the River.

The introduction of additional movements of large vessels from both polyhalite exports and other planned movements may introduce congestion into the estuary since deep drafted vessels are restricted to the hours around high tide. This congestion may lead to delays in the vessel scheduling.

In order to check the effect of these potential increases in traffic on the river channel and turning areas, a marine traffic risk study has been commissioned, the results of which are outlined in the this report.

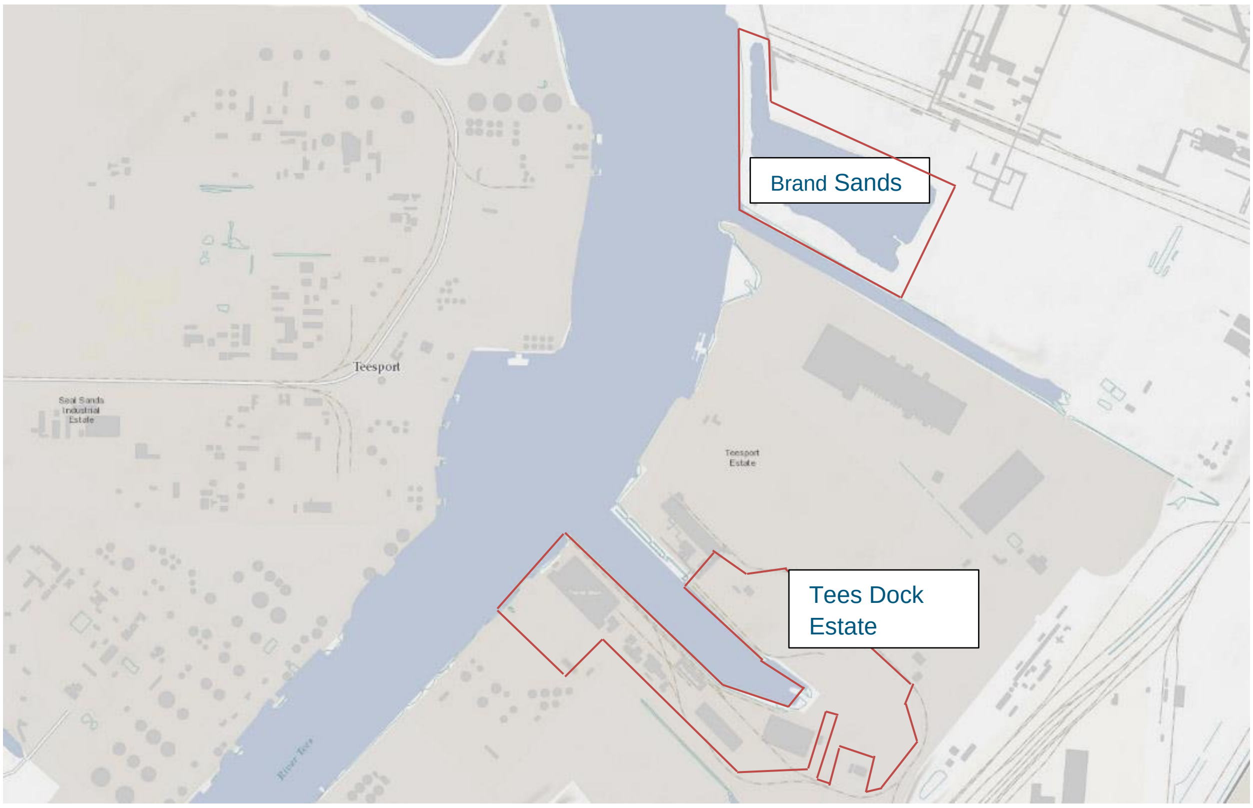
The site locations are shown in Figure 1-1 and Figure 1-2.



Source: World Topo Terrain Mapping

Figure 1-1: Site Location

Introduction



Source: World Topo Terrain
Figure 1-2: Teesport & Brand Sands Site Locations

1.2 Purpose of this Report

The purpose of this report is to inform the Environmental Impact Assessment for the proposed York Potash facility by assessing the potential impact of increased vessel movements caused by the polyhalite exports.

The potential new exports from the facility at Bran Sands are planned to be implemented in two phases as production increases. The exports may coincide with a planned increase in movements by PD Teesport.

Consideration has been made with respect to the impact of the York Potash movements both with and without these additional PD Teesport movements.

The study uses modelling software to identify and quantify the potential delays to other shipping in the estuary due to the proposed polyhalite export vessel movements.

The primary focus in this report is the marine traffic within the channel and approaches. Critically laden, deep drafted vessels can only transit through the particular sections of the channel at certain states of the tide and are typically restricted to one-way traffic within the narrower parts of the channel. By simulating the increase in ship movements, navigational and channel capacity issues can be identified and their impacts analysed for the traffic on the River. If there are no identified issues, then this gives confidence that the developments can progress without further mitigation.

Should issues be identified, then analysis of the simulation can identify the issues so as to provide information on how to mitigate these.

1.3 Structure of this Report

The Report is set out in the following Chapters:

Chapter 2: defines the criteria that were used within the simulation and the operating parameter ranges that were applied

Chapter 3: describes the simulation runs with a summary of the results and relevant information relating to the model runs

Chapter 4: outlines the conclusions that can be drawn from the simulation runs and measures to mitigate any impacts.

Information relating to the references and source data used in the models is described in the appendices at the end of the report.

2 Study Parameters

Study Parameters

2.1 Introduction

The scenarios have been assessed using Royal HaskoningDHV's (RHDHV) Marine Traffic Risk Assessment Model (MARTRAM), which is built upon the commercially available Flexsim simulation platform. The software provides a sophisticated modelling environment that has been optimised for the analysis of marine traffic flows and capacity assessments in locations where there is congestion and/or a high volume of marine traffic movements.

As with any transport network, marine navigation increasingly requires assessment and review of capacity and potential risk. Royal HaskoningDHV has been applying modelling and computational analysis to the issues of marine traffic for more than fifteen years and our current approach is reflected within the latest modelling techniques. The model incorporates a wide range of features that allow realistic representations of marine navigation while permitting the modelling of major navigational study areas without compromising speed and accuracy of the model and its output.

The tool allows full "what if" scenario analysis providing flexibility for the model analysts to manipulate routes and traffic patterns to assess a large range of options.

The initial models are used to both calibrate and validate the model set up for the existing levels of traffic and to create a base case to allow a like for like comparison of the future development.

The following sub-sections detail the model input data, including the derivation of the simulation data from records of shipping movements.

No simulation can be expected to give exact figures for delays and marine risk due to the large number of variables that need to be accounted for. However, simulation does provide a good indication of the order of magnitude of the likely impacts caused by the increase in vessel traffic.

2.2 Simulation Area

The area to be simulated runs from the entry point to the river at Tees Bay up to the Transporter bridge. Vessels travelling further upstream are still included within the model but are only considered in terms of channel capacity, marine queuing and interactions up to this point. However the primary area of interest is the area between the main channel entrance and the Tees Dock Turning area.

The extents of the site are shown in Figure 2-1 along with names of the different jetties and quays.

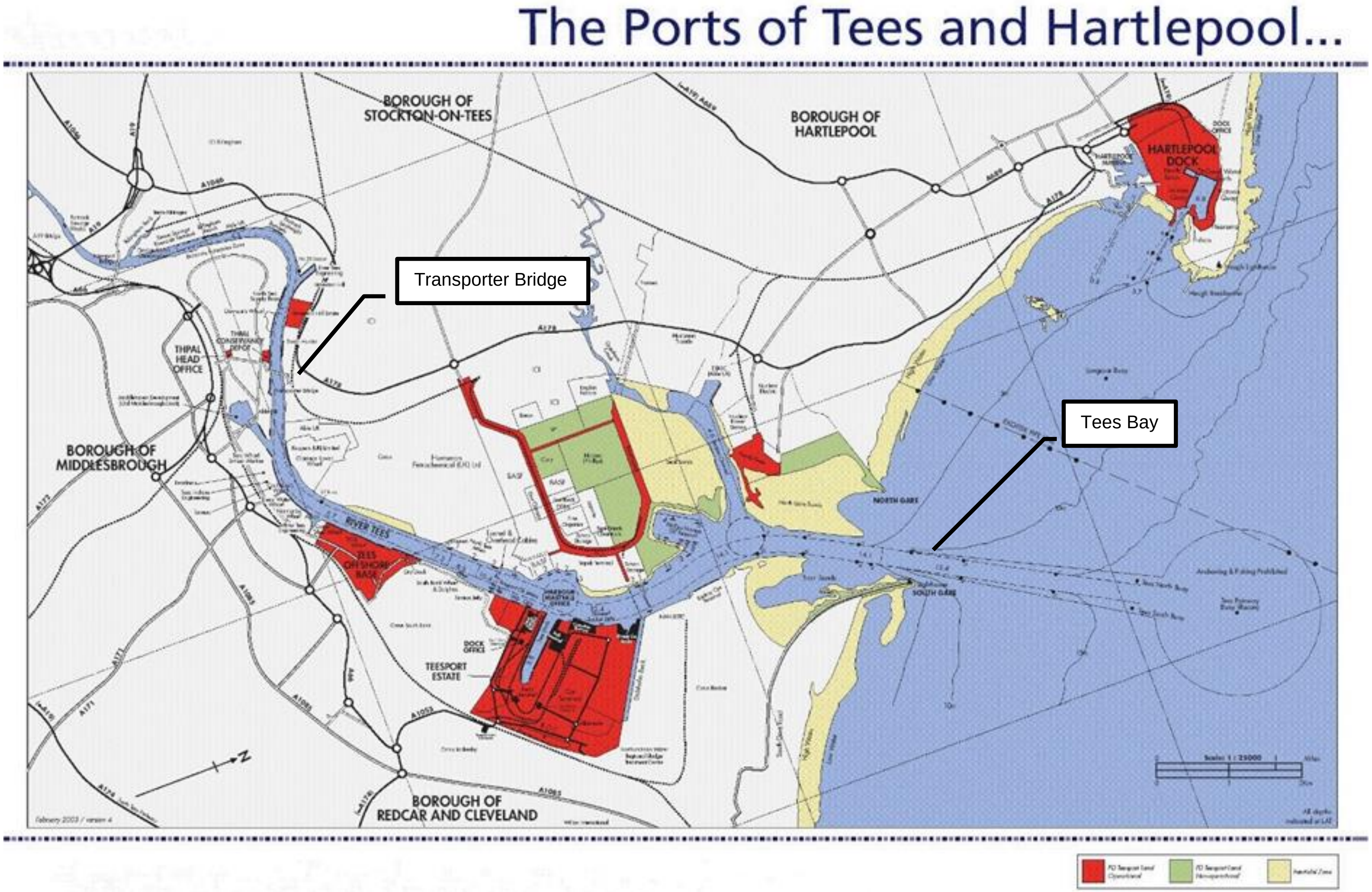


Figure 2-1: Study Extent

2.3 Navigation Channels

The marked access and navigation channels on admiralty charts 2566-1 [Ref 3] and 2566-2 [Ref 4], which have been compiled as Figure 2-2, below:

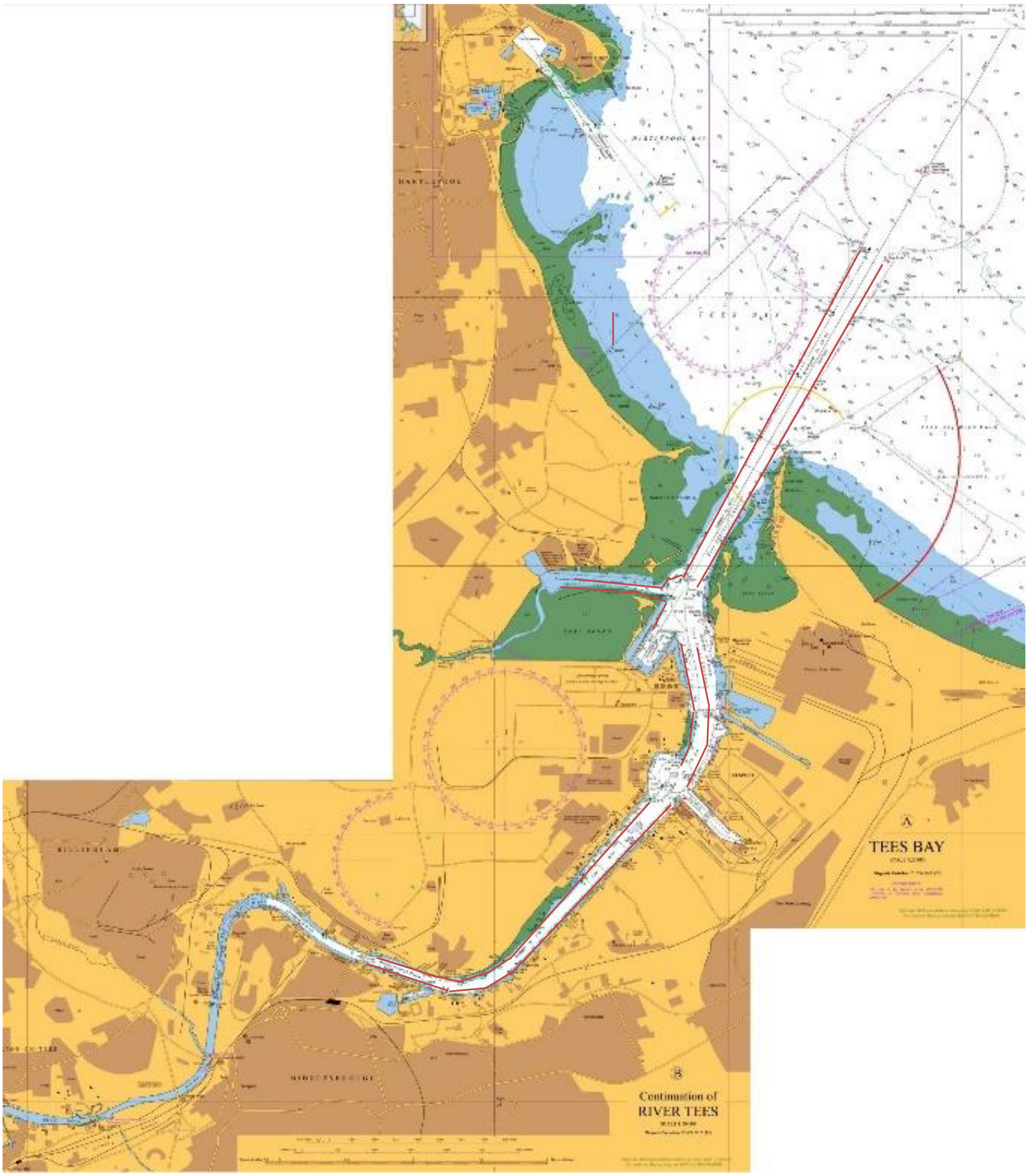


Figure 2-2: Marked Navigation Channels

Study Parameters

The effective safe useable channel depths and widths for each part have been agreed through discussions with the Harbour Master and observations of admiralty charts.

The agreed effective channel depths are at variance to those published on the admiralty charts, due to under keel clearance and issues with sedimentation of the channel. In order to model the current situation as closely as possible, the effective current depth has been used rather than the stated chart depth.

Location	Observed Dredged Depth	Margin (under keel)	Effective Depth
Channel Sea Reach	14.7m CD	2-3m	12.4m
Seaton Channel Turning Area	13.3m CD	0.9m	12.4m
Channel Lower Reach	13.3m CD	0.9m	12.4m
Channel Upper Reach	9.9m CD	0.9m	9.0m
Tees Dock Turning Area	8.3m CD	0.9m	7.4m
North Tees Berths 3 and 4 and Teesport Oil Jetties	9.9m CD	0.9m	9.0m
North Tees Berth 2 and South Bank Wharf	8.0m CD	0.9m	7.1m
Teesport Commerce Park Upstream	Generally 5.2m CD reducing to 4.5m CD at the Simon Storage facility	0.9m	4.3m reducing to 3.6m

Table 2-1: Channel Depths

It has been assumed in the model that there will be dredging for the berth pockets at the new Brans Sands site along with an extension to the Channel Lower Reach area as the boundary between Upper and lower reaches appears to overlap the Bran Sands site.

In order to enable safe and appropriate navigation in the two berth option at the Brans Sands site, the marked part of the upper reach in Figure 2-3 below will be assumed in the model to be dredged to a useable depth of at 12.4m to match the lower reach depth.

Study Parameters

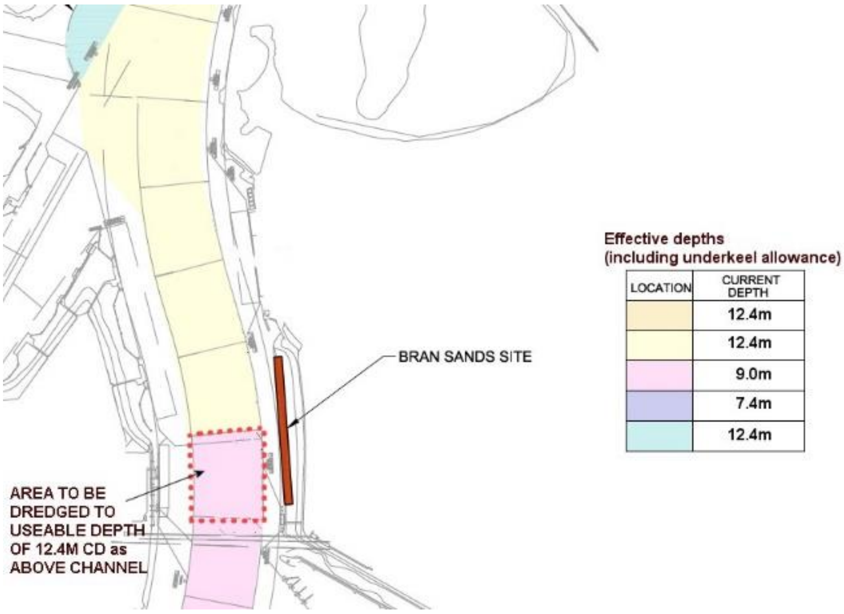


Figure 2-3: Additional Dredging Assumed for Brands Sand Site

The PIANC guideline "Approach Channels – A Guide for Design" gives guidance for the required channel width for safe navigation. For two-way traffic, it recommends a minimum channel width of around 6 times the maximum vessel beam. On this basis the river channel is suitable for two-way traffic for vessels up to Panamax size (i.e. with a maximum beam of 32.2m, typically 85,000 DWT).

There are two turning areas:

- Seaton Channel turning area has been used to turn vessels of up to 350m length, and is regularly used for turning large tankers which berth at the Teesside North Sea Oil Terminal close to the turning area, together with large bulk carrier ships visiting Redcar Ore Terminal (ROT).

- Tees Dock turning area, which is used to turn vessels which berth at Tees Dock and at the bulk liquid jetties on the north side of the river opposite and upstream of Tees Dock.

The Seaton Channel turning area has a maximum diameter of 515m and has an effective dredged depth of 12.4m CD. The Tees Dock turning area is 450m in diameter and has a current effective dredged depth of 7.4m CD. Whilst a vessel is turning in the Tees Dock turning area, the channel is effectively blocked for further traffic movements.

2.4 Routes

There are over 38 return routes used by ships within the simulation. A route consists of a start point and a destination. For vessels arriving from outside the simulation area, the simulation will assume a start point from the furthest point away in Tees Bay.

The simulation is based on a digitised and scaled admiralty chart and GIS map so that all channels can be traced accurately and checked against markers and buoys. Following the building of the model, the base map is simplified so that vessels and routes can be easily distinguished.

Figure 2-4: Simulation Model Routes

Channel depths and widths for each segment of the routes have been agreed through discussions with the Harbour Master and observations of admiralty charts. The characteristics of the each portion of the route are identified within the model which includes for instance details of each segment along with the useable width of the channel by different classes of vessels which is translated into potential allowances for one or two way passage.

In reporting several routes to the same overall location have been grouped together. For example Vopak No 1, No 2 and No 3 would be reported on as Vopak Terminal.

2.5 Tidal & Wind Impact

Wind and tidal patterns have an impact on vessel movements particularly when a large number of vessels are tidally restricted. For the simulations a period of recent vessel movements has been used as a basis for the simulations. These movements already have tidal values and weather patterns inherently imbedded within them, as they are the records of the vessels moments.

Records of the actual recorded tides (rather than those predicted in the tide tables) and weather for the simulated period have been assembled to superimpose on the existing movements when adding the additional new vessels.

The tide curves have been added into the model and during simulation, the model integrates these to represent the water level, as movements can only occur when there is sufficient depth of water.

A period of 14 days has been simulated to include the impacts of both spring and neap tides on vessel movements. The neap tides have a lower overall high tide and less variance which could impact larger vessels movements.

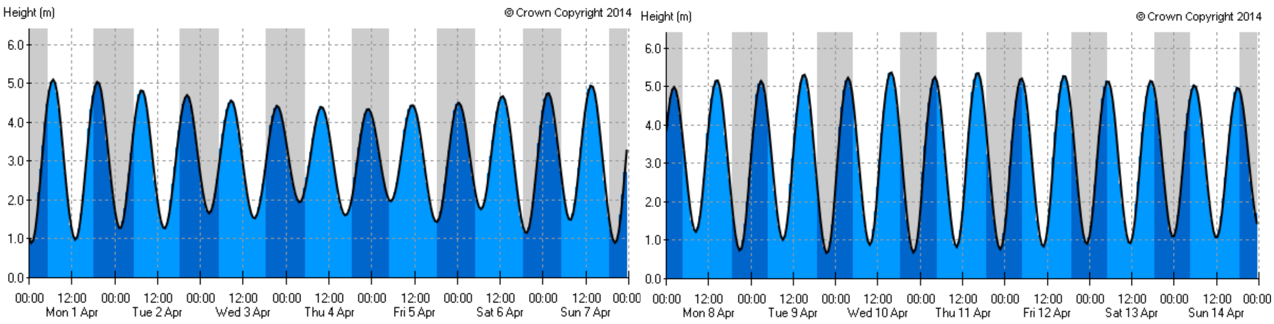


Figure 2-5: Plot of the Tide Curve for Selected Period

This information from the existing movements is also used within the model to determine the transit speeds of the vessels in each direction and at different tidal states within the simulated tidal range.

The recorded tidal values used in the model are included in Appendix E.

2.6 General Rules and Parameters

The model applies several rules to each simulation to replicate navigational logic and specific local navigational procedures.

MARTRAM focuses on both the potential for vessel interaction where one or more vessels are under navigation, and the delays that would be caused to scheduling in order to avoid such encounters. Within the model, an encounter is defined as the overlap of the safety domains of two vessels. Vessels are given an observation domain within which they check for other vessels. If the vessel detects the possibility of a collision with another vessel it initially tries to avoid it. Each individual vessel for the study has defined parameters that determine its characteristics and ability to avoid encounters. Vessel parameters include:

- physical dimensions of each vessel
- vessel draught
- safety domain
- maximum operating speed
- navigation/manoeuvring characteristics.

As a general rule, lower/smaller classes of vessel will be forced to give way in preference to larger vessels. Larger vessels will generally travel towards the centre of their side of the channel to avoid the risk of grounding whilst smaller draught vessels will generally travel towards the outer edges. Where action is required, avoidance action will be applied based on “priority to the right” and the application of The International Regulations for Preventing Collisions at Sea (ColRegs) [Ref 6] as long as it is possible within the channel width and complies with the channels defined lane disciplines.

Another avoidance method used by the model is that before a vessel departs on a journey, the model checks whether the vessels passage along the main channel would result in an overlap of its safety domain with that of another vessel which is already in transit. If such a situation would occur, the vessel which is about to start its passage is held at the berth or at sea, until it can travel the channel without hindrance. The time that a vessel is held up from departing is recorded within the model as a delay. Where there are two options and a choice is required to determine which vessel to delay, the model interrogates the tidal windows for both vessels movements and attempts to prioritise the vessel with the smallest window where possible.

The automatic avoidance and recording of delays to a vessel does not occur when the overlap of the safety domain of two vessels is caused by vessels either merging from different branches of the channel, or by a vessel turning. In these instances the model records a “potential encounter” and it is necessary to interrogate the model to establish the cause of the safety boundary encounter and to determine what delay, if any, would be necessary to avoid the safety boundary encounter occurring.

Vessel data is entered on a route by route, and vessel by vessel basis. Movement data, by vessel class, can be entered from daily, weekly, monthly or annual statistics.

The model provides a graphic display of the process and the speed of the run can be controlled by the user, from “real time” up to 60 times real time. A range of results are recorded that can be presented for the whole study area or for specific areas of concern. The model records delay events along with any vessel encounters noting the time, location and the number and vessel types involved in each case. By analysing these results it is possible to determine whether the capacity of the approach channels is exceeded and to identify measures which may increase the capacity.

2.7 Specific Rules

Together with the general model rules, there are also some specific rules applicable to this site.

Within the model it will be assumed that enough pilots are always available to pilot vessels in and out of the channel. It is also assumed that there are enough tugs available however the number of used tugs will be recorded and commented upon. It is expected that should the additional imports and exports be secured on the Tees that the tug operator would have a commercial incentive to station more tugs on the river. This premise has been verified through discussions with the Harbour Master.

Vessel speeds have been determined for the study by calculating an average speed based on the recorded journey start and end times in the vessel movement logs. This analysis indicates that vessels typically travel at speeds of between 6 and 8 knots within the simulation area.

Shipping to and from Tees Dock and the upstream Chemical Industry berths are turned at the Tees Dock turning area.

The Harbour Master in scheduling the vessels will seek to maximise vessel movements on the River within a tidal window whilst taking into consideration the duration that various vessels have been waiting. Typically Large oil tankers leaving Teesside North Sea Oil Terminal and bulk carriers arriving at Redcar Ore Terminal need to have priority at high tide.

The new vessels for York Potash bulk berth departures and Tees Dock bulk arrivals will also be given a high priority by the Harbour Master since both rely upon high tides. Second priority for vessels will be given to the Ro-Ro berth arrivals and departures which have a short turnaround time. Other vessels are slotted around the high priority vessels. These relative priorities have been reflected within the model.

If a smaller ship is travelling or is due to travel towards an oncoming ship of over 200m in length, the smaller ship is held at a safe distance (preferably on the berth) until either the larger vessel has finished using the turning area and has berthed or has passed on.

The arrival and departure of shipping to Tees Dock is occasionally restricted due to the physical space required to enter and exit the dock combined with the proximity of Berth 1 to the entrance. PD Teesport has provided a list of rules (Tees Dock shipping rules) that apply to vessel movements within the dock and when the use of Berth 1 is restricted. When entering the additional bulk vessels into the schedule the Tees Dock shipping rules will be checked to ensure that the movement is allowed given the currently occupied berths.

These rules are reflected within the model and used to best represent the future scenario in question.

The Tees Dock shipping rules are included in Appendix C.

Vessel turning times and tug requirements have been provided by PD Teesport. These times are summarised in Appendix D.

Study Parameters

2.8 Safety Zones

Safety zones are designated around each vessel within the model and these safety zones define the minimum safe distances that should be kept clear around each vessel to maintain safety. If the safety zones of two vessels start to overlap then there is an increased risk of a collision, this is classed as an encounter within the model.

The actual size of the advisable safety zone around each vessel will depend upon:

- the length and beam of the vessel
- the windage, i.e. the area of the vessel exposed to cross winds
- the experience of the vessel master/pilot
- the vessel cargo
- the strength and direction of the tidal currents.

It is not practical to include the dynamic effects of the wind in the MARTRAM program, nor to mitigate for the experience of individual vessel masters. However following much consultation over the years with experienced ship owners and masters, Royal HaskoningDHV has derived the following nominal safety zones which are considered appropriate. Vessels in the study have been allocated nominal safety zones of 2x length of a vessel at the front and 1x the length at the rear, by 1x beam to both sides. The safety zone around the vessel relative to its size is represented as the red in the boundary in the figure below.

Figure 2-6: Example Vessel Safety Zone

It is important to note that terminology of the Study ought to be fully understood. Where encounters are identified within the results, this is not a reflection on the way that the Harbour Master manages the traffic operations. There is no suggestion that there is currently or will be in the future inherent in the system areas where safety is compromised, the terminology and language seeks to identify where, if unmitigated, impingement on the safe working area could occur. It is fully understood that in reality the Harbour Master manages such potential scenarios to ensure that this does not happen.

2.9 Shipping Analysis

The following text describes the process of deriving the vessel traffic to use within the simulations from the source data. A copy of the vessel traffic movement data used within the simulation is included in Appendix B.

2.9.1 Source Data

PD Teesport operates a Vessel Tracking System (VTS) therefore has excellent records on the movement of vessels within the Port. This information has been made available to Royal HaskoningDHV for the purposes of this study.

The vessel movement data for 2013 (January to September) has been analysed to select a representative piece of data to use as a base case for the model.

Month	Vessel Movements
January	824
February	808
March	981
April	922
May	1009
June	871
July	899
August	867
September	869

Table 2-2: Vessel Movements by Month

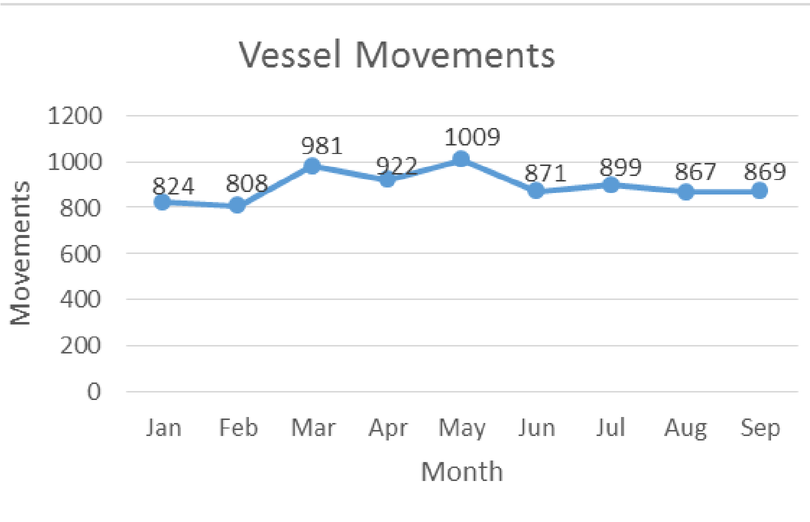


Figure 2-7: Comparison of Vessel Movements by Month

The data has been analysed and for the purposes of the study a period in April has been adopted as the base case since with 922 movements in the month, it represents approximately the midpoint of the range and was not a period affected by prolonged weather restriction or port closures.

2.9.2 Derived Forecast Data

By combining the data from the historic movements plus the forecasts for future movements a combined forecast has been made.

The following figures for the proposed vessel inputs have been used:

Study Parameters

Polyhalite Outward:

Volume: 6.5mtpa to 13mtpa

Average cargo parcel size: 70,000 tonnes

Daily load rate: 50,000 tonnes

Phase 1: 6.5mtpa

93 vessels per year @ 1.5 days per vessel: = 140 days per year

Departure draft: 13/14m

Phase 2: 13mtpa

185 vessels per year @ 1.5 days per vessel = 266 days per year

Tees Dock Bulk Imports:

Volume: 3.6mtpa

Average cargo parcel size: 40,000 tonnes

Daily discharge rate: 15,000 tonnes

90 vessels per year @ 3 days per vessel = 270 days per year.

Arrival draught 11/12m

Based on the noted arrival patterns, the following vessel types and sizes are to be included within the model.

Vessel Type	Size	Length (m)	Draft (m)	Calls
Polyhalite Bulk Carrier	55,000	200	6.9 / 12.7	27 / 54
Polyhalite Bulk Carrier	65,000	225	7.2 / 13.4	23 / 46
Polyhalite Bulk Carrier	75,000	235	7.5 / 13.9	20 / 40
Polyhalite Bulk Carrier	85,000	245	7.8 / 14.5	18 / 35
Tees Dock Bulk Carrier	30,000	150	7 / 10	40
Tees Dock Bulk Carrier	40,000	150	7 / 11	30
Tees Dock Bulk Carrier	60,000	250	7 / 12*	20

Table 2-3: Simulation Vessel Categories

***Note:** during the simulations it was identified that there were periods during the neap tide cycle that were inaccessible to the largest bulk vessels with the simulated channel depths. This indicates that the dredging would be required at the turning area outside Tees Dock.*

In order to complete the simulations with all of the movements included, the draft of the largest bulk carriers was reduced to 11.4m to enable it to enter Tees Dock during the high neap tide. This represents either the vessel arriving part loaded or a conservative approach based on additional dredging of the turning area.

The mix of vessels and sizes are defined by the expected cargo and parcel size. An equal spread of the cargo is divided by each vessel type. Therefore the following additional vessels are included in the simulations.

Vessel Type	55k Bulk	65k Bulk	75k Bulk	85k Bulk
Polyhalite - Phase 1 calls per year	30	25	22	19
Polyhalite - Phase 2 calls per year	59	50	44	38

Table 2-4: Bran Sands - Bulk Vessel Calls per Year

Vessel Type	30k Bulk	40k Bulk	60k Bulk
Tees Dock Bulk - Calls per year	40	30	20

Table 2-5: Tees Dock Bulk Vessel Calls per Year

The simulations are each run for a simulated period of 14 days and vessels are generated by pro-rating the annual forecasts for that vessel. Where this produces a fractional number, the scheduled figure is rounded up. While this may result in marginally more vessels being generated within the model, this approach is conservative.

Each vessel has an arrival and departure journey which means that every model contains approximately double the number of movements compared to vessels.

In order to generate the different arrival schedules a base schedule is defined that places the required number of vessel arrivals within applicable tidal windows at approximately regular intervals. However this is unlikely to be a realistic scenario as arrivals are rarely regular.

For each new vessel type, the available arrival & departure windows are defined based on the tidal data and effective channel depths. A distribution is then applied to the initial arrival schedule to generate random variations on the base schedule within the defined boundaries. This allows the model to be run several times each with a varied arrival timetable so that the effect of different arrivals can be determined. Combining the arrival schedule with tidal windows and probability distribution allows the different arrival scenarios to be modelled is a realistic way.

The Erlang distribution (also called Erlang 2 where 2 indicates the scale variable) has been used to create the different variations to model. The Erlang distribution is the international standard for modelling random arrival based around some degree of predictability and has been adopted by the UNCTAD Port Development Handbook to represent vessel arrivals at Ports.

The Erlang distribution is related to the gamma distribution. It can be expressed and used in a number of ways however the way it has been included in these simulations is as shown in the formula below, where the k scale is 2 and rate is adjusted to match the size of tidal window and vessel schedule.

$$f(x;k,\lambda) = \frac{\lambda^k x^{k-1} e^{-\lambda x}}{\Gamma(k)} \quad \text{for } x, \lambda \geq 0,$$

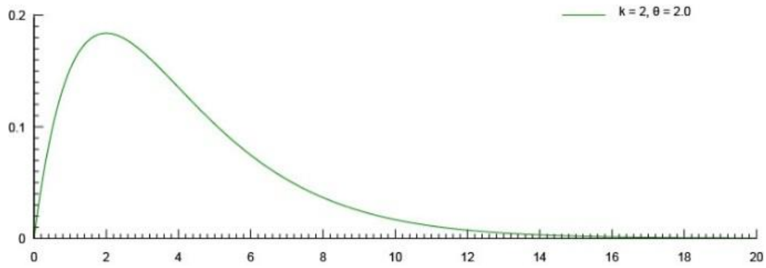


Figure 2-7: Erlang Probability Density

By combining the distribution with the tidal windows it ensures that variations to the timetabled arrivals are generated only when there is likely to be sufficient water depth to accommodate them. This avoids vessels being generated at low tides and delays being recorded while vessels await the tide. These delays would be unavoidable and not useful to record as they could mask the effect of delays which are linked to queuing and channel capacities.

2.10 Modelling Scenarios

The polyhalite vessel arrival numbers are expected to develop over two Phases as production increases and the site at Bran Sands is expanded. It is expected that the introduction of Phase 2 occurs ten years following Phase 1. Both Phase 1 and Phase 2 scenarios of export volumes have been simulated.

In Phase 2 there are currently two development options for the berth, which are to include a single berth option, with high utilisation or a two berth option at the same Bran Sands site, with a reduced berth occupancy level. The scheduling for the one berth option does not allow a significant float within the operational timetable for delays around the scheduling of the vessels. Delays identified within Phase 2 with a single berth may have significant operational implications on polyhalite export. The operational implications and effect of delays to production are not considered within the scope of this study.

For the modelling scenarios the polyhalite exports have been modelled for both phases, both with and without the proposed Tess Dock bulk imports.

It is understood from discussions with the Harbour Master that the Tees Dock bulk imports are likely to be commenced prior to the polyhalite exports, however by modelling both scenarios, the impact of the polyhalite exports alone can be measured.

Study Parameters

Scenario	Description
Scenario 0 - Validation model	Existing vessel movements are entered into the model from historical records. Analysis is completed to check that the model rules for navigation are correctly entered and are representative.
Scenario 1 – One berth, 6.5mtpa Polyhalite export	Simulation is used to run several varying arrival and departure patterns of polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules breached (e.g. Two vessels pass too close to each other) or vessels unable to complete journeys investigated.
Scenario 2 – One berth, 13mtpa Polyhalite export	Simulation is used to run several varying arrival and departure patterns of polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules are breached (e.g. two vessels pass too close to each other) or vessels are unable to complete journeys, are investigated.
Scenario 3 – Two berths, 13mtpa Polyhalite export	Simulation is used to run several varying arrival and departure patterns of polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules are breached (e.g. two vessels pass too close to each other) or vessels are unable to complete journeys, are investigated.
Scenario 4 – One berth, 6.5mtpa Polyhalite export + 3.6mtpa Tees Dock bulk import vessels	Simulation is used to run several varying arrival patterns of Tees Dock bulk and polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules breached (e.g. Two vessels pass too close to each other) or vessels unable to complete journeys investigated.
Scenario 5 – One berth, 13mtpa Polyhalite export + 3.6mtpa Tees Dock bulk import vessels	Simulation used to run several varying arrival patterns of Tees Dock bulk and polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules are breached (e.g. two vessels pass too close to each other) or vessels are unable to complete journeys, are investigated.
Scenario 6 – Two berths, 13mtpa Polyhalite export + 3.6mtpa Tees Dock bulk import vessels	Simulation is used to run several varying arrival patterns of Tees Dock bulk and polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules are breached (e.g. two vessels pass too close to each other) or vessels are unable to complete journeys, are investigated.

Table 2-6: Modelling Scenarios

3 Simulation

Simulation

3.1 Introduction

Each simulation model was run for a simulation period of 14 days. Each simulation was monitored on screen to check for the smooth running of the model. Special attention was given to the occasions where vessels over 150 meters in length are in transit as the largest vessels with deepest draft are usually the most critical and sensitive movements.

Each simulation has been run several times, and due to the random variance element, each run of the model generated a slightly different vessel schedule and therefore slightly different results. Since there is a random element in the model, a run cannot be exactly replicated and the results of the modelling were formed from the statistical analysis of the output from all the runs.

The impact of the proposed additional shipping movements on existing shipping movements in the simulations is measured in terms of potential encounters, failed movements and waiting time.

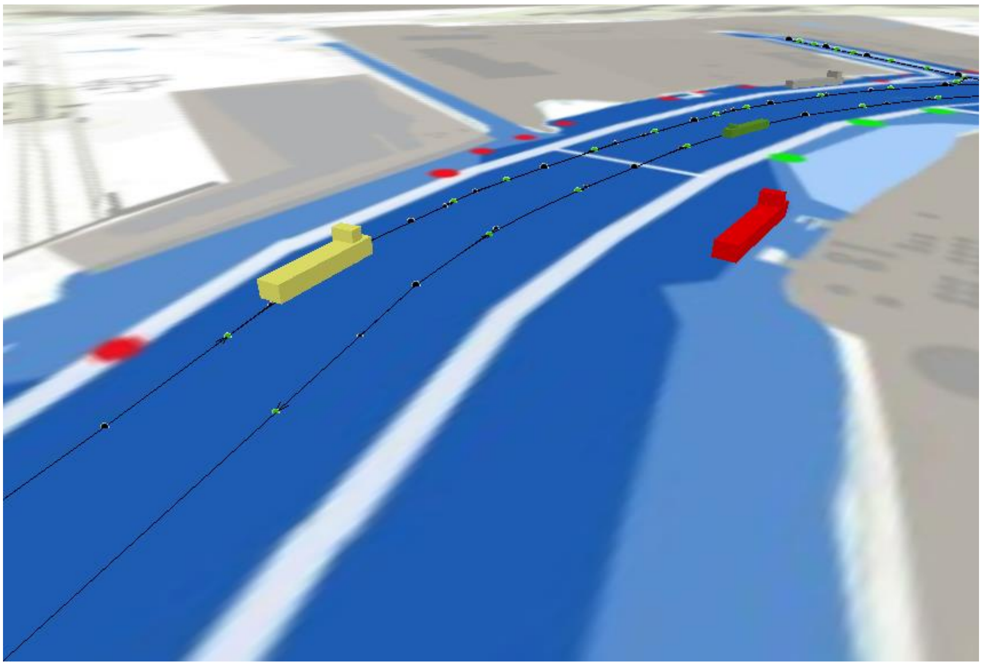


Figure 3-1: Example of Model Colour Coding

Waiting time is recorded within the model where the model can identify in advance that the passage of two vessels would result in the overlap of their safety domains. If the model holds one vessel back, either on the berth or at a safe distance, then the delay to that vessel is recorded. The model identifies the vessels' status by means of its colour as shown in figure 3-1. Green represents a vessel underway, grey is inactive (in terms of movement), red indicates a delayed vessel, yellow indicates the vessel is causing delay and purple indicates a failed movement.

On some occasions (for example when two vessels are converging from minor channels into the main navigation channel or approaching a sharp bend), it is possible that the model does not automatically identify a potential interaction and keep a safe separation between vessels. In this case, either the simulation operator can intervene, either manually slowing one vessel or holding it back at a safe distance resulting in the waiting time being collected to prevent a potential encounter being recorded.

When a potential encounter is recorded, the data has been viewed and interpreted to determine whether:

- the simulation is being overzealous in identifying encounters i.e. an apparent encounter where two safety domains overlap, but which would in practice be avoided by minor adjustments of the course of the vessels, or;
- the two vessels really were in danger of a collision and some mitigation methods were required to enable safe navigation.

In the latter situation, the event is recorded and analysed to determine what action would need to be taken to avoid the incident. This could be holding a vessel on the berth for a short period, adjusting the speed of one vessel so that it arrives at a point later or earlier or some other form of mitigation measures.

The last type of event that is recorded in the model is when a vessel is unable to complete the planned move for some reason. This could be that there was insufficient water depth to start or complete the move or that the designated berth was not available for a significant period as it was already occupied. After a period of 24 hours has elapsed the movements will be recorded as failed and removed from the model. After the model has completed the failed movements can be investigated to identify the cause and if it could have been completed under different circumstances.

3.2 Validation

In order to calibrate and validate the simulations, the initial model is set up to run only the existing vessel movements from the selected base case.

It might then be expected that the simulation of existing shipping movements on the approach channel would show no waiting time. However, waiting time could and is likely to still be indicated as the data only specifies the number of movements along with a start and complete time for each movement. The simulation creates the journeys along each route based on the journey start and end times but doesn't know the exact speeds of the vessel at any given point and therefore differences could occur to the exact historical vessel movement. It could create a scenario where due to vessel arriving close together some queuing or waiting is encountered.

Model Number	Run Description	Total Waiting Time (Averaged)	Model Vessel Movements	Max Potential Encounters	Failed Moves
0	Existing Vessel Movements	44 minutes	372	0	0

Table 3-1: Validation Model Summary

***Note:** *Duration of each simulation is 14 days.*

The Total Waiting Time (Averaged) is the sum of any waiting time incurred during the run for all vessels averaged across all runs for the model in minutes. This figure is therefore represents the summation of all the recorded delays over a simulated 14 day period. Analysing in this way factors out the highest and lowest values and provides a good value for comparison between model runs. In this case the 44 minute total waiting time equates to a 3.1 minute daily delay.

Where a large proportion of the waiting time relates to one vessel or mainly to a specific group of vessels then this figure has been split out to and the reason for this identified separately.

The Maximum Potential Encounter figures are the highest recorded number of encounters in any of the completed simulation runs.

The Model Vessel Movements specifies the average number of movements included in each model. When the total waiting time is divided between all vessel movements, the average waiting time per vessel equates to a very small amount, at less than one minute per vessel movement.

It can be seen from the validation runs that as only a small amount of delay is recorded and there are no potential encounters the simulation is behaving as expected. None of the validation model runs are completely without waiting time however this can be attributed to the small variances in speed where pilots have likely observed another vessel in the distance and taken minor action (slowing down or speeding up) in order to maintain safe separation. This is also confirmed by visual observation of the model at a slower speed to manually check movements are being generated within the model at the correct time.

The validation runs serve as a baseline on which to measure the subsequent runs. To remove repeated reporting in the next section of the report, the minor delays recorded within the validation models will not be further commented on unless they significantly increase due to compound delays from the additional vessel moments.

3.3 Model Run Description and Results

Each of the model scenarios has been run at least 10 times in order to generate several different variations on vessel arrivals. These models were run in fast time and the results are averaged. The models have also been monitored on screen at a much slower speed on at least one occasion to check for the smooth running of the model, with special attention given to the turning area.

While monitored at a slower speed on screen the operator can assist the model in making the most realistic decisions. For example if the operator identifies a potential scenario where two vessels have a potential encounter and the model has not intervened, then the operator can manually intervene. This mirrors how pilots and the Harbour Master would manage traffic through the channels and helps to ensure realistic results.

In reporting delays on routes if a terminal has several berths the delays to different berths have been combined into one number for the terminal. For example the Simon Storage No 1 and No 2 berths are reported on as Simon Storage.

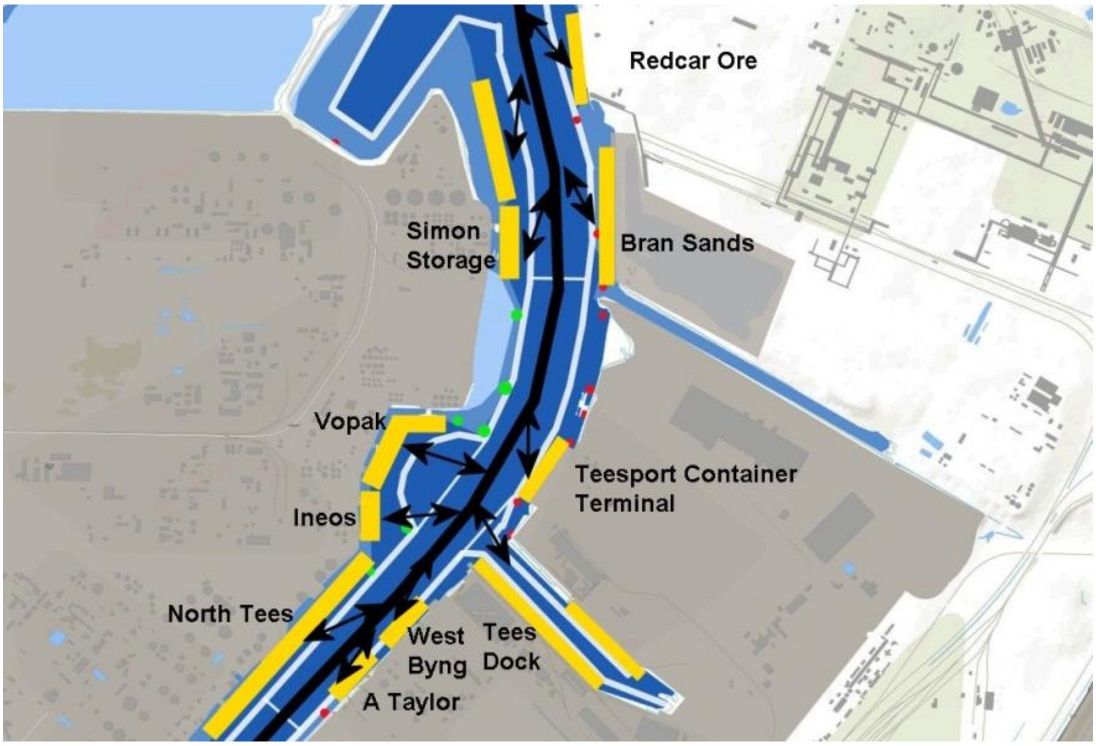


Figure 3-2: Illustration of Berth Groupings

Examples of berth groupings and names are shown in Figure 3-2. Please note that not all berths are shown on this illustration due to the scale.

Where the route is listed as a return route, the figures for inbound and outbound vessel movement delays have been combined.

3.3.1 Additional Polyhalite Vessels only – Phase 1

In order to quantify the effect of the additional Polyhalite vessels within phase 1, they have been modelled without the Tees Dock imports, but with the historical movements. The Brands Sand site is assumed to export 6.5 million tonnes of Polyhalite per annum during Phase 1. With the split of vessel types and their associated capacities, the start-up of this facility adds an additional four vessels and eight movements over the modelled 14 day period in addition to the existing baseline movements on the Tees.

Model Number	Run Description	Total Waiting Time (Averaged)	Average Model Vessel Movements	Max Potential Encounters	Failed Moves
1	Existing Movements + Phase1 Polyhalite – 1 berth	113 mins	380	0	0

Table 3-2: Model Summary

***Note**: Duration of each simulation is 14 days.*

The averaged results show a small increase in waiting time for all sites and vessels, compared to the validation runs. This is mainly spread across a number of small incidents. The routes and vessel types are identified in Tables 3.3 and 3.4 below. The delays to vessel types other than those in the table are minimal when compared to the validation case.

Route	Total Waiting Time (Averaged)	Max Potential Encounters	Failed Moves
Tees Bay to Bran Sands (return route)	39 mins	0	0
Tees Bay to Simon Storage (return route)	22 mins	0	0
Tees Bay to Phillips (return route)	6 mins	0	0
Other	46 mins	0	0

Table 3-3: Delays by Route (Scenario 1)

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (Polyhalite)	39 mins
IMO Chemical Tanker	31 mins
IMO Gas Tanker	27 mins
Other	16 mins

Table 3-4: Delays by Vessel Type (Scenario 1)

The Phase 1 Polyhalite export only results indicate that the total delay over the whole modelled period associated with the imposition of these movements is 113 minutes, which equates to 8.1 minutes per day, this is against the background delay of 3.1 minutes a day.

.

3.3.2 Additional Polyhalite Vessels only – Phase 2 – One Berth and Two Berths

The second phase of the Brans Sands development includes 13 million tonnes per annum export of Polyhalite. This equates to up to eight polyhalite vessels and 15 movements on average over the course of the 14 days of the simulation. Options for both a single and double berth have been modelled without the Tees Dock bulk import movements and are presented below:

Model Number	Run Description	Total Waiting Time (Averaged)	Average Model Vessel Movements	Max Potential Encounters	Failed Moves
2	Existing Movements + Phase 2 Polyhalite – 1 berth	804 mins	387	0	1
3	Existing Movements + Phase 2 Polyhalite – 2 berth	166 mins	387	0	0

Table 3-5: Model Summary

***Note**: Duration of each simulation is 14 days.*

There is a large difference between the results of the one and two berth polyhalite phase 2 scenarios. Whilst the delays associated with the one berth option at 166 minutes, which equates to11.9 minutes per day is not significantly higher than the phase 1 scenario, the one berth option results indicate an overall delay of 804 minutes, or 57.4. minutes per day.

The results have been tabulated below to show the routes and vessel types where these delays are incurred.

Route	Total Waiting Time (Averaged)	Max Potential Encounters	Failed Moves
Tees Bay to Bran Sands (return route)	686 mins	0	1
Tees Bay to Simon Storage (return route)	38 mins	0	0
Tees Bay to Phillips (return route)	6 mins	0	0
Other	74 mins	0	0

Table 3-6: Delays by Route (Scenario 2 - Phase 2, Single Berth)

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (Polyhalite)	686 mins
IMO Chemical Tanker	44 mins
IMO Gas Tanker	38 mins

Other	36 mins

Table 3-7: Delays by Vessel Type (Scenario 2 - Phase 2, Single Berth)

Route	Total Waiting Time (Averaged)	Max Potential Encounters	Failed Moves
Tees Bay to Bran Sands (return route)	56 mins	0	1
Tees Bay to Simon Storage (return route)	33 mins	0	0
Tees Bay to Phillips (return route)	11 mins	0	0
Other	66 mins	0	0

Table 3-8: Delays by Route (Scenario 3 - Phase 2, Two Berth)

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (Polyhalite)	56 mins
IMO Chemical Tanker	41 mins
IMO Gas Tanker	33 mins
Other	36 mins

Table 3-9: Delays by Vessel Type (Scenario 3 - Phase 2, Two Berth)

Analysis reveals that the significant increase in delays for the single berth is attributed to a small number of polyhalite vessels waiting at the anchorage for the single berth to become free. The delays to other traffic on the river is very similar to previous runs.

The recorded failed movements are occasions where the waiting time at the anchorage due to berth availability exceeded the time limit and the movements were removed from the model.

For the single berth option, there appear to be significant delays to the Polyhalite export vessels. Through interrogation of the model it appears that with high berth utilisation, and an arrival of vessels modelled around the Erlang 2 distribution, there is a significant chance that the single berth will be occupied when another vessel arrives, causing a delay. With a very high occupancy rate, as would be required to export 13Mtpa from a single berth, any small variation to the departure and arrival pattern can lead to significant consequential delays. For the two berth option, the berth utilisation is significantly reduced and it is more likely that there will be an available polyhalite berth on arrival.

With both the single and two berth options on a small number of runs, a large Polyhalite vessels either delays or is delayed by interactions with either a chemical or gas tanker due to movements taking place in close proximity to each other. This however only occurs on a small number of runs (<10%) indicating that the probability of such events is not high. Additional delays of up to 120 minutes are recorded on these runs depending on which vessel is underway first.

3.3.3 Additional Tees Dock Bulk Import and Polyhalite Export Vessels Phase 1

There are also other planned potential tidally bound vessel movements on the Tees within the immediate future, with potential for 3.6Mtpa of bulk imports at Tees Dock. These additional movements within the modelled 14 day period impose an additional four vessels, or eight movements. These have been superimposed on the polyhalite vessel export movements identified above.

Model Number	Run Description	Total Waiting Time (Averaged)	Average Model Vessel Movements	Max Potential Encounters	Failed Moves
4	Existing Movements, Tees Dock Bulk Import + Phase1 Polyhalite – 1 berth	267 mins	388	0	1

Table 3-10: Model Summary

***Note**: Duration of each simulation is 14 days.*

The averaged results show another small increase in waiting time compared to the previous runs. Again this is mainly spread across a number of small incidents.

Route	Total Waiting Time (Averaged)	Max Potential Encounters	Failed Moves
Tees Bay to Tees Dock (return route)	103 mins	0	1
Tees Bay to Bran Sands (return route)	58 mins	0	1
Tees Bay to North Tees Jetties (return route)	26 mins	0	0
Tees Bay to Simon Storage (return route)	22 mins	0	0
Tees Bay to Vopak (return route)	20 mins	0	0
Tees Bay to Phillips (return route)	5 mins	0	0
Other	33 mins	0	0

Table 3-11: Delays by Route (Scenario 4)

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (new Tees Dock)	90 mins
Bulk Carrier (polyhalite)	58 mins
Container Ship	8 mins
General Cargo	1 mins
IMO Chemical Tanker	39 mins
IMO Gas Tanker	32 mins
RoRo / Ferry	4 mins
Other	35 mins

Table 3-12: Delays by Vessel Type (Scenario 2)

One failed move was recorded in the model on a small number of variants. This occurred when a polyhalite vessel departure, a Tees Dock bulk vessel arrival and a Redcar ore bulk carrier were all scheduled at very similar times. Either a polyhailite vessel or Tees Dock bulk vessel are heavily impacted depending on the particular timings and order of movements in the run.

The Redcar Ore bulk vessel was scheduled first and completed successfully. The polyhalite vessel next departed before the Tees Dock bulk vessels inbound movement. The compound delays caused the Tees Dock bulk vessel to miss the tidal window and therefore had to wait to a later high tide.

After analysis it was concluded that this situation would have been better managed in real life by the Harbour Master and could have been avoided. Bringing in the Tees Dock bulk vessel before the polyhalite vessel departure would have allowed all three movements to have been completed with less delay as the polyhalite vessel had a larger tidal window. The model did not judge the order of arrivals and departures correctly in this scenario. It is therefore concluded that this recorded failed move should not be a significant cause for concern.

3.3.4 Additional Tees Dock Bulk Import and Polyhalite Export Vessels Phase 2 – One Berth & Two Berth

The second phase of the Brans Sands development includes 13 million tonnes per annum export of Polyhalite. This equates to an average of seven polyhalite vessels over the course of the 14 days of the simulation. Both one and two berth options were modelled.

Model Number	Run Description	Total Waiting Time (Averaged)	Average Model Vessel Movements	Max Potential Encounters	Failed Moves
5	Existing Movements + Tees Dock Bulk + Phase 2 Polyhalite – 1 berth	1317 mins	395	0	2
6	Existing Movements + Tees Dock Bulk + Phase 2 Polyhalite – 2 berth	309 mins	395	0	1

Table 3-13: Model Summary

***Note**: Duration of each simulation is 14 days.*

There is a large difference between the results of the one and two berth polyhalite scenarios.

The modelling indicates that delays will be significantly increased for the single berth scenario.

These delays are tabulated below, and the causes identified and discussed in the section below.

Route	Total Waiting Time (Averaged)	Max Potential Encounters	Failed Moves
Tees Bay to Tees Dock (return route)	394 mins	0	1
Tees Bay to Bran Sands (return route)	777 mins	0	2
Tees Bay to North Tees Jetties (return route)	27 mins	0	0
Tees Bay to Simon Storage (return route)	38 mins	0	0
Tees Bay to Vopak (return route)	28 mins	0	0

Tees Bay to Phillips (return route)	6 mins	0	0
Other	47 mins	0	0

Table 3-14: Delays by Route (Scenario 5)

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (New Tees Dock Bulk)	322 mins
Bulk Carrier (polyhalite)	777 mins
Container Ship	28 mins
General Cargo	5 mins
IMO Chemical Tanker	57 mins
IMO Gas Tanker	51 mins
RoRo / Ferry	31 mins
Other	46 mins

Table 3-15: Delays by Vessel Type (Scenario 5)

Route	Total Waiting Time (Averaged)	Max Potential Encounters /	Failed Moves
Tees Bay to Tees Dock (return route)	123 mins	0	1
Tees Bay to Bran Sands (return route)	62 mins	0	0
Tees Bay to North Tees Jetties (return route)	25 mins	0	0
Tees Bay to Simon Storage (return route)	34 mins	0	0
Tees Bay to Vopak (return route)	24 mins	0	0
Tees Bay to Phillips (return route)	5 mins	0	0
Other	36 mins	0	0

Table 3-16: Delays by Route (Scenario 6)

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (New Tees Dock Bulk)	112 mins
Bulk Carrier (polyhalite)	62 mins
Container Ship	7 mins
General Cargo	3 mins
IMO Chemical Tanker	43 mins
IMO Gas Tanker	42 mins
RoRo / Ferry	6 mins
Other	34 mins

Table 3-17: Delays by Vessel Type (Scenario 7)

Analysis reveals that the increase can be attributed to a small number of polyhalite and Tees Dock bulk vessels waiting at the anchorage for a berth to become free. The delays to other traffic on the river is very similar to previous runs.

The recorded failed movements are occasions where the waiting time at the anchorage due to berth availability exceeded the time limit and the movements were removed from the model.

For the single berth option, the model indicates there are significant delays to the polyhalite vessels. Through interrogation of the model it appears that with high berth utilisation, and an arrival of vessels modelled around the Erlang 2 distribution, there is a significant chance that the single berth will be occupied when another vessel arrives, causing a delay. For the two berth option, the berth utilisation is significantly reduced and it is more likely that there will be an available polyhalite berth on arrival.

It would therefore be an operational decision to decide whether the delays could be accommodated into the storage capacity at the polyhalite facilities or whether delays could be reduced by vessel scheduling.

Simulation

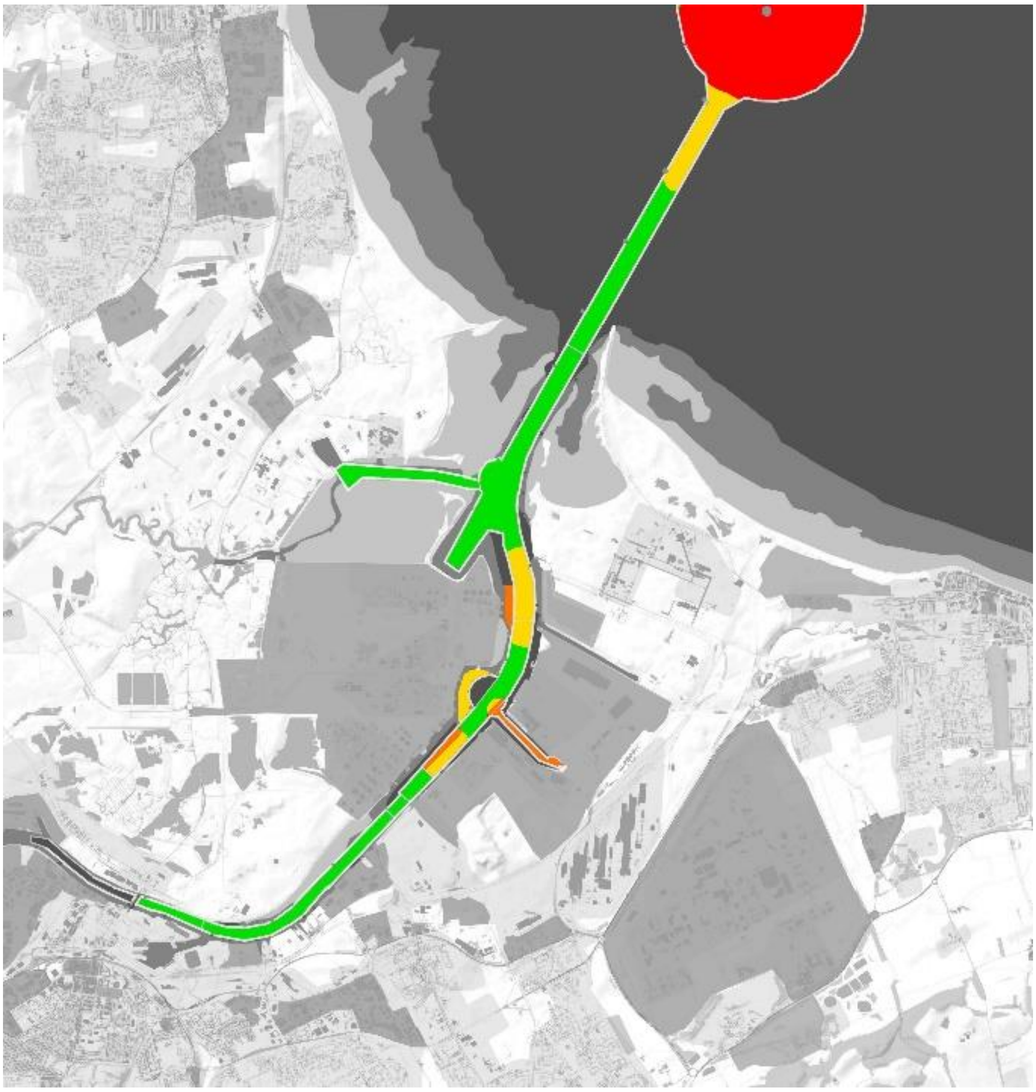


Figure 3-4: Congestion Locations (Scenario 4)

The simulations recorded delays occurring at similar locations. However, in scenario 4 additional delays were identified at Simon Storage jetties opposite the Bran Sands site. Up to 60 minutes of delay was recorded when the patterns for arrivals and departures to the Bran Sands site and Simon Storage site were on the same tide.

As with the Phase 1 simulations, a small number of failed movements (delays > 24 hrs) were recorded within the results due to Tees Dock bulk vessels missing their tidal window due to other traffic movements. However when analysed each of these incidents could be managed and avoided with minor modifications to the order of movements.

4 Conclusion

Conclusion

This study has investigated and reported on a number of expansions scenarios on the Tees that will results in increased traffic. A key output is the recording of time delays, which result from congestion or conflicts between planned vessel movements (within the bounds of the model rules).

Assuming that the York Potash vessels are the only additional traffic (over the base case) on the Tees, the forecast delays are modest at for phase 1 and phase 2 with a double berth, at 8.1 minutes and 11.9 minutes per day respectively.

For the phase 2 scenario with a single berth, there is a much more significant average delay of over 55 minutes per day.

Should the new Tees Dock bulk import vessels also be introduced to the Tees, then more severe delays can be expected. For the Phase 1 polyhalite export volumes (6.5mtpa), the model indicates a total cumulative delay over the 14 days of 267 minutes, which equates to 19.1 minutes per day.

During Phase 2 of the polyhalite development for the double berth option there is a total cumulative delay over the 14 days of 309 minutes, which equates to 22.1 minutes per day, which is not significantly higher than Phase 1.

For a single berth during Phase 2 however, there are significant delays encountered with a total cumulative delay over the 14 days of 1,317 minutes which equates to 94 minutes per day.

The majority of this delay is associated with delays to the polyhalite vessels rather than other vessels on the river. This operational constraint will need to be considered in detail by York Potash in the development of the investment in the Port facilities.

Mitigation of these delays (either for Phase 1 or Phase 2 of the polyhalite exports) would principally require dredging.

The dredged depths assumed within the model are those effective depths as discussed in section 2 of the report. If the river were maintained to the advertised depths on the admiralty chart, then tidal windows would be wider.

Delays to polyhalite vessel movements would be reduced if the approach channel were to be dredged further to a level of -15.1mCD, to allow export of the polyhalite at all states of tide. Again this is a commercial decision that York Potash will need to consider within their operational plan. Further modelling could be carried out to consider the effects of increased dredging on all the potential scenarios.

Royal HaskoningDHV
Enhancing Society Together

Appendix A – Model Run Summaries

	Safety Encounters			Failed Movements			Total Delay (mins)			
Scenario	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Runs
1	0	0	0	0	0	0	64	113	230	6

Scenario 1 Summary:

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Safety Encounter Analysis (Scenario 1)

Vessel	Location	Reason	Further Investigation?
None recorded			

Failed Movement Analysis (Scenario 1)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for clear passage.	N
North Tees	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N
Vopak	Delays relate to holding vessels at the anchorage whilst waiting for clear passage.	N

Location Analysis (Largest Delays)

	Safety Encounters			Failed Movements			Total Delay (mins)			
Scenario	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Runs**
2	0	0	0	0	1	1	263	804	1801	6

Scenario 2 Summary:

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Safety Encounter Analysis (Scenario 2)

Vessel	Location	Reason	Further Investigation?
65k Polyhalite Bulk Carrier	Tees Bay	Berth Occupied. Wait required at anchorage until berth is free.	N

Failed Movement Analysis (Scenario 2)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for the turning circles to clear or berth availability.	N
Brans Sands	Delays recorded whilst vessels berthing at Simon Storage and Phillips when Brans Sands vessels ready to depart. Vessels held on berth until clear	N
Simon Storage	Delays recorded whilst vessels berthing at Brands Sands due to close proximity. Vessels held on berth until clear	N

Location Analysis (Largest Delays)

	Safety Encounters			Failed Movements			Total Delay (mins)			
Scenario	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Runs**
3	0	0	0	0	0	0	82	166	416	8

Scenario 3 Summary:

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Safety Encounter Analysis (Scenario 3)

Vessel	Location	Reason	Further Investigation?
None recorded			

Failed Movement Analysis (Scenario 3)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for clear passage.	N
Brans Sands	Delays recorded whilst vessels berthing at Simon Storage and Phillips when Brans Sands vessels ready to depart. Vessels held on berth until clear	N
Simon Storage	Delays recorded whilst vessels berthing at Brands Sands due to proximity. Vessels held on berth until clear	N

Location Analysis (Largest Delays)

	Safety Encounters			Failed Movements			Total Delay (mins)			
Scenario	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Runs**
4	0	0	0	0	0	1	150	267	566	6

Scenario 4 Summary:

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Safety Encounter Analysis (Scenario 4)

Vessel	Location	Reason	Further Investigation?
60k Bulk Carrier	Tees Bay	Insufficient water available to complete movement as scheduled. Window missed due to delays with a redcar ore vessel and polyhalite vessel due to movements being carried out on a first come first served basis. Re-ordering movements to move the polyhalite vessel after the bulk vessel would have allowed all movements to take place.	N

Failed Movement Analysis (Scenario 4)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for the turning circles to clear or berth availability.	N
Tees Dock	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N
North Tees	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N
Vopak	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N

Location Analysis (Largest Delays)

	Safety Encounters			Failed Movements			Total Delay (mins)			
Scenario	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Runs
5	0	0	0	1	2	2	616	1317	2844	6

Scenario 5 Summary:

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Safety Encounter Analysis (Scenario 5)

Vessel	Location	Reason	Further Investigation?
60k Bulk Carrier	Tees Bay	Berth occupied. Wait required at anchorage until berth is free.	N
65k Polyhalite Bulk Carrier	Tees Bay	Berth Occupied. Wait required at anchorage until berth is free.	N

Failed Movement Analysis (Scenario 5)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for the turning circles to clear or berth availability.	N
Tees Dock	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N
Brans Sands	Delays recorded whilst vessels berthing at Simon Storage and Phillips when Brans Sands vessels ready to depart. Vessels held on berth until clear	N
Simon Storage	Delays recorded whilst vessels berthing at Brands Sands due to close proximity. Vessels held on berth until clear	N

Location Analysis (Largest Delays)

	Safety Encounters			Failed Movements			Total Delay (mins)			
Scenario	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Runs
6	0	0	0	0	1	1	153	309	544	6

Scenario 6 Summary:

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Safety Encounter Analysis (Scenario 6)

Vessel	Location	Reason	Further Investigation?
60k Bulk Carrier	Tees Bay	Berth occupied. Wait required at anchorage until berth is free.	N

Failed Movement Analysis (Scenario 6)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for the turning circles to clear or berth availability.	N
Tees Dock	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N
Brans Sands	Delays recorded whilst vessels berthing at Simon Storage and Phillips when Brans Sands vessels ready to depart. Vessels held on berth until clear	N
Simon Storage	Delays recorded whilst vessels berthing at Brands Sands due to proximity. Vessels held on berth until clear	N

Location Analysis (Largest Delays)

Appendix B – Source Movement Data

Royal HaskoningDHV

Ship Type	JOURNEY	From Location	To Location	Start Time	Complete Time	Length	Beam	Draught	No Tugs	No Pilots
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	01/04/2013 04:53	01/04/2013 05:51	140.64	21.0	6.2	0	1
Non-IMO Oil Tanker	out	Phillips No. 1 Jetty	Tees Bay	01/04/2013 05:19	01/04/2013 08:20	243	43	12.2	2	2
Crane Barge	internal	A & P Tees Ltd Frontage	A & P Tees Ltd No 1 Drydock	01/04/2013 05:24	01/04/2013 08:44	53.34	20.73	2.3	0	1
Tug	out	A & P Tees Ltd Frontage	Tees Bay	01/04/2013 05:24	01/04/2013 07:10	21.0	6.5	2	0	0
Dredger	out	Tees Dock No. 1 Berth	Tees Bay	01/04/2013 06:02	01/04/2013 07:52	25.97	10.06	2.3	0	0
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Phillips No. 6 Jetty	01/04/2013 06:23	01/04/2013 07:56	86.9	15.3	4.3	1	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees No. 3 Jetty	Tees Bay	01/04/2013 11:57	01/04/2013 13:23	230	36.6	9	2	1
IMO Gas (Type 2G/2PG) Tanker	out	Vopak No. 2 Jetty	Tees Bay	01/04/2013 15:30	01/04/2013 16:06	88.35	14.22	5	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 3 Jetty	01/04/2013 15:33	01/04/2013 16:29	99.9	17.05	5.7	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 2 Jetty	01/04/2013 16:04	01/04/2013 17:09	99.9	15	6.2	0	1
IMO Chemical (Type 1) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	01/04/2013 16:30	01/04/2013 17:13	169.5	23.75	7	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	01/04/2013 16:47	01/04/2013 17:32	88	14.8	5.6	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	01/04/2013 16:48	01/04/2013 17:53	88.35	14.2	5.5	0	1
RoRo Ship/Ferry	out	Tees Dock No.2 RoRo Berth	Tees Bay	01/04/2013 17:31	01/04/2013 18:26	195.4	26.7	6	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Phillips No. 6 Jetty	Tees Bay	01/04/2013 17:58	01/04/2013 18:36	98.63	17.5	6.3	0	1
IMO Chemical (Type 2) Tanker	out	West Byng Jetty	Tees Bay	01/04/2013 21:30	01/04/2013 22:16	124.33	17.19	7.3	0	1
Container Ship	out	Tees Dock No. 7 Berth	Tees Bay	01/04/2013 23:02	02/04/2013 00:[illegible]	133.31	18.7	6.8	0	1
IMO Chemical (Type 2) Tanker	out	Vopak No. 2 Jetty	Tees Bay	02/04/2013 05:59	02/04/2013 07:18	88.9	15	4.7	0	1
IMO Chemical (Type 1) Tanker	in	Tees Bay	Vopak No. 2 Jetty	02/04/2013 06:59	02/04/2013 08:02	177.75	23	6.2	1	1
IMO Chemical (Type 2) Tanker	out	Vopak No. 3 Jetty	Tees Bay	02/04/2013 08:14	02/04/2013 08:57	99.1	17.06	6.6	0	1
General Cargo Ship	out	Hpool Victoria Quay	Tees Bay	02/04/2013 11:03	02/04/2013 12:43	118.4	13.35	5.5	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	02/04/2013 11:25	02/04/2013 12:39	88.35	14.2	4.75	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	02/04/2013 11:29	02/04/2013 12:44	88	14.8	4.3	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	02/04/2013 12:16	02/04/2013 13:21	99.63	15.4	6	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	02/04/2013 12:20	02/04/2013 13:11	88.9	17.5	6.7	0	1
RoRo / General Cargo	internal	Europoort	Tees Dock No.2 RoRo Berth	02/04/2013 12:43	02/04/2013 13:51	162	26.2	6.3	0	1
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	02/04/2013 15:54	02/04/2013 16:51	141.2	21.3	7.2	0	1
General Cargo Ship	out	Hamlets Wharf	Tees Bay	02/04/2013 16:16	02/04/2013 17:34	77.69	10.3	3.4	0	0
General Cargo Ship	out	Hpool Deep Water Berth	Tees Bay	02/04/2013 16:58	02/04/2013 17:34	68	12.5	3.8	0	0
General Cargo Ship	in	Tees Bay	Hamlets Wharf	02/04/2013 17:03	02/04/2013 18:26	90.6	13.75	4.7	0	1
Bulk Carrier	out	Redcar Ore Terminal	Tees Bay	02/04/2013 20:03	02/04/2013 21:41	289	45	10.5	4	2
RoRo / General Cargo	internal	Tees Dock No.2 RoRo Berth	Europoort	02/04/2013 20:30	02/04/2013 21:12	162	26.2	6.2	0	1
Bulk Carrier	in	Tees Bay	Redcar Ore Terminal	02/04/2013 20:55	02/04/2013 22:12	225	32.26	9.7	3	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Arthur Taylor Jetty	02/04/2013 21:04	02/04/2013 22:01	96	15	4.8	1	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 3 Jetty	02/04/2013 21:41	02/04/2013 22:32	96.14	17	4.9	0	1
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	02/04/2013 23:05	02/04/2013 23:53	141.2	21.3	7.4	0	1
General Cargo Ship	in	Tees Bay	Hpool Deep Water Berth	02/04/2013 23:42	03/04/2013 00:23	95	13	3.4	0	0
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	03/04/2013 00:00	03/04/2013 01:00	99.93	15.4	5.7	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees 'A' Jetty	03/04/2013 00:33	03/04/2013 01:45	139	16.9	5.1	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	03/04/2013 00:43	03/04/2013 01:24	99.87	17.14	5.2	0	1
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	03/04/2013 04:40	03/04/2013 05:30	154.64	22	7.2	0	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	03/04/2013 04:43	03/04/2013 05:42	87.5	11.3	2.8	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Riverside Terminal	03/04/2013 06:36	03/04/2013 07:57	99.93	15.4	5.7	0	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	03/04/2013 07:51	03/04/2013 08:50	82.23	11.43	3.4	0	0
General Cargo Ship	in	Tees Bay	North Sea Supply Base	03/04/2013 08:08	03/04/2013 09:13	82.5	12.4	6.4	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	03/04/2013 09:02	03/04/2013 10:21	99.1	17.6	5	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	03/04/2013 09:49	03/04/2013 10:30	73.3	14.02	5	0	1
RoRo Ship/Ferry	in	Tees Bay	Tees Dock No.2 RoRo Berth	03/04/2013 11:12	03/04/2013 12:34	195.4	26.7	6.1	0	1
IMO Chemical (Type 2) Tanker	out	Vopak No. 3 Jetty	Tees Bay	03/04/2013 12:[illegible]	03/04/2013 13:36	95.14	17	5.7	0	1
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	03/04/2013 15:00	03/04/2013 15:55	154.64	22	6.4	0	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	03/04/2013 16:04	03/04/2013 17:00	58.75	11.74	3	0	0
IMO Chemical (Type 2) Tanker	out	Clarence Wharf - Koppers	Tees Bay	03/04/2013 17:00	03/04/2013 18:33	82.76	11.84	4.6	0	1
General Cargo Ship	out	Hpool Deep Water Berth	Tees Bay	03/04/2013 17:52	03/04/2013 18:41	95	13	4.0	0	0
IMO Gas (Type 2G/2PG) Tanker	out	North Tees 'A' Jetty	Tees Bay	03/04/2013 18:30	03/04/2013 20:08	139	16.9	6.1	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees 'A' Jetty	03/04/2013 19:21	03/04/2013 20:39	114.616	15.7	5.2	0	1
IMO Chemical (Type 2) Tanker	out	Simon Riverside Terminal	Tees Bay	03/04/2013 19:20	03/04/2013 21:00	98.90	15.4	6.4	0	1
General Cargo Ship	out	North Sea Supply Base	Tees Bay	03/04/2013 19:42	03/04/2013 21:24	82.5	12.4	3.7	0	1
RoRo Ship/Ferry	out	Tees Dock No.2 RoRo Berth	Tees Bay	03/04/2013 20:24	03/04/2013 21:24	195.4	26.7	6.4	0	1
Harbour Tug	in	Tees Bay	Svitzer - Tees Wharf	03/04/2013 20:54	03/04/2013 21:06	30.63	9.3	4	0	0
IMO Chemical (Type 1) Tanker	out	Vopak No. 2 Jetty	Tees Bay	03/04/2013 22:05	04/04/2013 00:56	177.75	23	7	1	1
IMO Gas (Type 2G/2PG) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	04/04/2013 01:33	04/04/2013 02:45	73.6	14.02	4.2	0	1
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	04/04/2013 01:56	04/04/2013 02:50	99.87	17.14	5.2	0	1
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	04/04/2013 06:06	04/04/2013 06:56	139.6	22.2	5.5	0	1
General Cargo Ship	in	Tees Bay	Tees Dock No. 4 Berth	04/04/2013 06:23	04/04/2013 07:22	94.21	15.4	5.4	0	1
Non-IMO Oil Tanker	out	Tetney Terminal	Tees Bay	04/04/2013 06:34	04/04/2013 06:34	248.98	43.01	8.6	0	0
IMO Chemical (Type 2) Tanker	in	Tees Bay	West Byng Jetty	04/04/2013 07:04	04/04/2013 07:52	99.87	17.14	5.0	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	North Tees No. 3 Jetty	04/04/2013 07:09	04/04/2013 08:04	99.90	15.4	5.3	0	1
General Cargo Ship	in	Tees Bay	Hpool Deep Water Berth	04/04/2013 07:17	04/04/2013 07:48	88.5	12.5	3.5	0	1
Bulk Carrier	out	Redcar Ore Terminal	Tees Bay	04/04/2013 08:25	04/04/2013 09:26	225	32.23	7.9	3	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Ineos No. 1 Jetty	04/04/2013 09:02	04/04/2013 09:49	98.07	17.14	4.7	0	1
General Cargo Ship	in	Tees Bay	North Sea Supply Base	04/04/2013 09:23	04/04/2013 10:26	64.22	10.51	2.1	0	0
Bulk Carrier	in	Tees Bay	Redcar Ore Terminal	04/04/2013 09:37	04/04/2013 10:31	167	24.3	7.35	2	1
IMO Gas (Type 2G/2PG) Tanker	out	Arthur Taylor Jetty	Tees Bay	04/04/2013 12:39	04/04/2013 13:33	96	15	5.6	1	1
Survey Vessel	out	A & P Tees Ltd Frontage	Tees Bay	04/04/2013 13:28	04/04/2013 14:35	68.5	15	5.7	0	1
RoRo / General Cargo	internal	Europoort	Tees Dock No.2 RoRo Berth	04/04/2013 13:56	04/04/2013 14:50	152	25.2	5.6	1	1
Container Ship	out	Tees Dock No. 8 Berth	Tees Bay	04/04/2013 13:57	04/04/2013 14:47	139.6	22.2	5.9	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees No. 4 Jetty	04/04/2013 14:45	04/04/2013 15:45	97.39	15.9	5	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	04/04/2013 16:34	04/04/2013 17:29	115.5	18.7	7.05	1	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees 'A' Jetty	Tees Bay	04/04/2013 18:21	04/04/2013 19:07	114.616	15.7	6.5	0	1
IMO Gas (Type 2G/2PG) Tanker	internal	North Tees No. 4 Jetty	North Tees 'A' Jetty	04/04/2013 18:48	04/04/2013 19:26	97.39	15.9	5	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Phillips No. 6 Jetty	04/04/2013 19:08	04/04/2013 20:05	96	15	4.6	1	1
General Cargo Ship	out	North Sea Supply Base	Tees Bay	04/04/2013 19:46	04/04/2013 21:14	64.22	10.51	3.4	0	0
General Cargo Ship	internal	Cleveland Potash Terminal	North Sea Supply Base	04/04/2013 20:14	04/04/2013 21:32	58.75	11.74	3	0	0
General Cargo Ship	in	Tees Bay	Hpool Victoria Quay	04/04/2013 20:25	04/04/2013 21:07	82.22	11.3	3.5	0	0
RoRo / General Cargo	internal	Tees Dock No.2 RoRo Berth	Europoort	04/04/2013 21:25	04/04/2013 22:21	162	26.2	6.4	0	1
General Cargo Ship	out	Hpool Irvines Quay	Tees Bay	04/04/2013 22:56	05/04/2013 00:[illegible]	138.17	21	5.1	1	1
IMO Chemical (Type 2) Tanker	out	West Byng Jetty	Tees Bay	05/04/2013 02:06	05/04/2013 02:54	99.87	17.14	5.8	0	1
Bulk Carrier	out	Redcar Ore Terminal	Tees Bay	05/04/2013 04:32	05/04/2013 05:43	157	24.8	5.2	2	1
Bulk Carrier	in	Tees Bay	Redcar Ore Terminal	05/04/2013 05:30	05/04/2013 06:43	228.99	32.25	12.5	3	1
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	05/04/2013 06:06	05/04/2013 06:56	140.55	21.8	5.5	0	1
IMO Chemical (Type 2) Tanker	out	North Tees No. 3 Jetty	Tees Bay	05/04/2013 07:40	05/04/2013 08:28	99.93	15.4	7	0	1
Gas tanker - CO2	in	Tees Bay	West Quay (TCP)	05/04/2013 08:35	05/04/2013 09:29	82.5	12.5	4.1	0	1
Non-IMO Oil Tanker	in	Tees Bay	Phillips No. 6 Jetty	05/04/2013 08:53	05/04/2013 10:05	243	42	8	4	2

Harbour Tug	internal	Svitzer - Tees Wharf	A & P Tees Ltd No 2 Drydock	05/04/2013 10:10	05/04/2013 10:58	30.58	9.8	4	0	0
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	05/04/2013 10:11	05/04/2013 11:11	97.39	15.9	6	0	1
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	05/04/2013 11:00	05/04/2013 11:31	140.64	21.8	6.5	0	1
General Cargo Ship	out	Hpool Victoria Quay	Tees Bay	05/04/2013 11:01	05/04/2013 11:30	82.22	11.3	2.8	0	0
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	05/04/2013 11:03	05/04/2013 12:07	107.86	17.8	4.9	1	1
RoRo Ship/Ferry	in	Tees Bay	Tees Dock No.2 RoRo Berth	05/04/2013 11:24	05/04/2013 12:43	195.4	26.7	6.6	1	1
General Cargo Ship	out	Bamlets Wharf	Tees Bay	05/04/2013 12:20	05/04/2013 13:42	90.6	13.75	3.7	0	1
Container Ship	in	Tees Bay	Tees Dock No. 7 Berth	05/04/2013 12:38	05/04/2013 13:20	139.6	22.2	7.2	0	1
General Cargo Ship	out	Hpool Deep Water Berth	Tees Bay	05/04/2013 13:52	05/04/2013 14:31	88.6	12.5	5.4	0	1
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	05/04/2013 13:52	05/04/2013 14:21	140.56	21.8	6.6	0	1
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	05/04/2013 14:34	05/04/2013 15:28	115.5	18.7	5.7	1	1
General Cargo Ship	out	North Sea Supply Base	Tees Bay	05/04/2013 17:17	05/04/2013 18:26	58.75	11.74	3.6	0	0
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Arthur Taylor Jetty	05/04/2013 18:27	05/04/2013 19:54	105.56	11.92	2.9	0	1
RoRo Ship/Ferry	out	Tees Dock No.2 RoRo Berth	Tees Bay	05/04/2013 19:54	05/04/2013 20:43	195.4	26.7	6.2	0	1
IMO Chemical (Type 1) Tanker	in	Tees Bay	North Tees No. 4 Jetty	05/04/2013 21:05	05/04/2013 22:10	144.24	23	8.2	0	1
IMO Chemical (Type 2) Tanker	out	Ineos No. 1 Jetty	Tees Bay	05/04/2013 21:43	05/04/2013 22:34	99.87	17.14	6	0	1
Gas-tanker - CO2	in	Tees Bay	East Quay (TCP)	05/04/2013 22:33	05/04/2013 23:29	82.5	12.5	3.95	0	1
Container Ship	out	Tees Dock No. 8 Berth	Tees Bay	05/04/2013 23:23	06/04/2013 00:22	140.64	21.8	6.7	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	06/04/2013 00:26	06/04/2013 01:27	95.15	17	4.9	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Phillips No. 8 Jetty	Tees Bay	06/04/2013 00:56	06/04/2013 02:20	96.9	15.6	5.45	0	1
General Cargo Ship	out	Cleveland Potash Terminal	Tees Bay	06/04/2013 04:30	06/04/2013 05:32	82.38	11.46	5	0	0
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	06/04/2013 05:02	06/04/2013 05:57	158.4	21.7	7.3	0	1
NLS Certified Oil Tanker	in	Tees Bay	Redcar Ore Terminal	06/04/2013 05:02	06/04/2013 05:53	53	10	4.1	0	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	06/04/2013 05:36	06/04/2013 06:24	89.99	12.5	2.8	0	0
Non-IMO Oil Tanker	in	Tees Bay	Phillips No. 1 Jetty	06/04/2013 06:52	06/04/2013 08:02	248	43	8.7	4	2
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	06/04/2013 08:28	06/04/2013 11:40	107.86	17.8	6.8	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	06/04/2013 09:28	06/04/2013 10:43	105.57	11.98	2.8	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Arthur Taylor Jetty	Tees Bay	06/04/2013 09:58	06/04/2013 11:41	105.56	11.92	3.1	0	1
Non-IMO Oil Tanker	out	Phillips No. 5 Jetty	Tees Bay	06/04/2013 10:19	06/04/2013 11:19	243	42	11.8	2	2
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Vopak No. 2 Jetty	06/04/2013 10:57	06/04/2013 11:50	88.35	14.22	6.7	0	1
NLS Certified Oil Tanker	out	Redcar Ore Terminal	Tees Bay	06/04/2013 11:19	06/04/2013 12:00	53	10	3.8	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	06/04/2013 12:00	06/04/2013 12:55	99.9	16.5	6.9	0	1
Bulk Carrier	out	Tees Dock No. 3 Berth	Tees Bay	06/04/2013 13:10	06/04/2013 15:28	224.97	32.25	12	3	1
General Cargo Ship	out	Cleveland Potash Terminal	Tees Bay	06/04/2013 13:57	06/04/2013 15:28	87.5	11.3	4.3	0	0
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	06/04/2013 14:03	06/04/2013 15:00	87	13	3.5	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Riverside Terminal	06/04/2013 14:26	06/04/2013 16:36	99.99	16.5	5.4	0	1
Bulk Carrier	in	Tees Bay	Tees Dock No. 2 Berth	06/04/2013 14:26	06/04/2013 15:22	182.98	32.26	7.6	3	1
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	06/04/2013 15:30	06/04/2013 17:01	158.4	21.7	7.1	0	1
General Cargo Ship	in	Tees Bay	Tees Dock No. 6 Berth	06/04/2013 15:46	06/04/2013 16:47	126.87	20.4	6.7	0	1
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	06/04/2013 17:01	06/04/2013 18:18	95.15	17	5.2	0	1
IMO Chemical (Type 1) Tanker	out	North Tees No. 4 Jetty	Tees Bay	06/04/2013 19:29	06/04/2013 20:24	144.24	23	6.5	0	1
Container Ship	out	Tees Dock No. 7 Berth	Tees Bay	06/04/2013 19:57	06/04/2013 21:00	139.6	22.2	5.3	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	06/04/2013 20:38	06/04/2013 21:09	75	14.2	6.3	0	1
Container Ship	in	Tees Bay	Tees Dock No. 7 Berth	06/04/2013 20:49	06/04/2013 21:45	134.44	22.5	9	0	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	06/04/2013 22:01	06/04/2013 22:56	105.57	11.98	2.9	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	06/04/2013 22:50	06/04/2013 23:57	108	16.8	4.9	0	1
Bulk Carrier	out	Redcar Ore Terminal	Tees Bay	06/04/2013 23:05	07/04/2013 00:13	228.99	32.26	8	3	1
IMO Chemical (Type 2) Tanker	internal	Simon Storage No. 1 Jetty	Vopak No. 3 Jetty	07/04/2013 00:04	07/04/2013 00:36	99.9	16.5	6.3	0	1
Bulk Carrier	in	Tees Bay	Redcar Ore Terminal	07/04/2013 00:15	07/04/2013 01:54	171.6	27	9	2	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	07/04/2013 04:03	07/04/2013 04:45	96.35	15.32	6.6	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Vopak No. 2 Jetty	Tees Bay	07/04/2013 05:21	07/04/2013 06:13	88.35	14.22	4.9	0	1
Non-IMO Oil Tanker	out	Phillips No. 1 Jetty	Tees Bay	07/04/2013 05:40	07/04/2013 06:37	248	43	12.2	2	2
General Cargo Ship	out	Tees Dock No. 6 Berth	Tees Bay	07/04/2013 05:56	07/04/2013 06:48	126.87	20.4	6.8	0	1
RoRo / General Cargo	internal	Europoort	Tees Dock No.2 RoRo Berth	07/04/2013 06:12	07/04/2013 07:10	152	25.2	5.6	0	1
General Cargo Ship	in	Tees Bay	Tees Dock No. 1 Berth	07/04/2013 08:49	07/04/2013 09:45	89.78	13.17	3.9	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	North Tees No. 4 Jetty	07/04/2013 09:41	07/04/2013 11:23	182.5	27.34	10.2	2	1
IMO Chemical (Type 2) Tanker	internal	Simon Riverside Terminal	Ineos No. 2 Jetty	07/04/2013 10:41	07/04/2013 12:29	99.99	16.5	4.5	0	1
General Cargo Ship	out	Cleveland Potash Terminal	Tees Bay	07/04/2013 10:47	07/04/2013 11:47	89.99	12.5	5	0	0
IMO Chemical (Type 2) Tanker	internal	Vopak No. 3 Jetty	Simon Riverside Terminal	07/04/2013 11:46	07/04/2013 13:44	99.9	16.5	5.8	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Phillips No. 8 Jetty	07/04/2013 12:01	07/04/2013 12:38	97.24	16.5	4.7	1	1
RoRo / General Cargo	internal	Tees Dock No.2 RoRo Berth	Europoort	07/04/2013 12:32	07/04/2013 13:23	152	25.2	5.4	0	1
RoRo Ship/Ferry	in	Tees Bay	Tees Dock No.2 RoRo Berth	07/04/2013 12:32	07/04/2013 13:48	195.4	26.7	6.6	0	1
Crane Ship	in	Tees Bay	Hpool Irvines Quay	07/04/2013 13:03	07/04/2013 14:04	136.4	40	4.7	0	2
General Cargo Ship	in	Tees Bay	Hpool Irvines Quay	07/04/2013 13:28	07/04/2013 14:07	168.14	25.2	6.6	2	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 3 Jetty	07/04/2013 14:08	07/04/2013 15:17	134.16	20.5	7.8	1	1
IMO Gas (Type 2G/2PG) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	07/04/2013 15:17	07/04/2013 16:02	75	14.2	5.3	0	1
IMO Gas (Type 1G) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	07/04/2013 15:56	07/04/2013 16:51	97.24	16.5	5.9	1	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	07/04/2013 16:55	07/04/2013 17:53	108	16.8	6	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees No. 3 Jetty	07/04/2013 18:04	07/04/2013 19:17	99.97	16.8	4.2	0	1
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	07/04/2013 21:29	07/04/2013 22:28	139.6	22.2	6.4	0	1
General Cargo Ship	out	Cleveland Potash Terminal	Tees Bay	07/04/2013 22:01	07/04/2013 23:23	87	13	5	0	1
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	07/04/2013 23:05	08/04/2013 00:27	133.39	18.7	6.4	0	1
IMO Chemical (Type 2) Tanker	out	Simon Riverside Terminal	Tees Bay	08/04/2013 01:00	08/04/2013 02:47	99.9	16.5	5.9	0	1
Bulk Carrier	out	Redcar Ore Terminal	Tees Bay	08/04/2013 02:43	08/04/2013 04:18	171.6	27	8	2	1
Container Ship	out	Tees Dock No. 8 Berth	Tees Bay	08/04/2013 02:59	08/04/2013 03:36	139.6	22.2	5.7	0	1
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	08/04/2013 03:36	08/04/2013 04:17	133.6	19.4	7.1	0	1
Bulk Carrier	in	Tees Bay	Redcar Ore Terminal	08/04/2013 03:47	08/04/2013 05:24	255.28	43	12.9	4	2
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	08/04/2013 05:04	08/04/2013 06:06	96.35	15.32	4.6	0	1
Gas-tanker - CO2	internal	West Quay (TCP)	East Quay (TCP)	08/04/2013 06:48	08/04/2013 07:41	82.5	12.5	4.3	0	1
Gas-tanker - CO2	internal	East Quay (TCP)	West Quay (TCP)	08/04/2013 06:49	08/04/2013 07:35	82.5	12.5	3.95	0	1
Container Ship	out	Tees Dock No. 7 Berth	Tees Bay	08/04/2013 08:12	08/04/2013 09:14	134.44	22.5	7.1	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 2 Jetty	08/04/2013 08:44	08/04/2013 09:30	99.93	15.5	6.5	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Phillips No. 6 Jetty	Tees Bay	08/04/2013 11:02	08/04/2013 11:57	96	15	5.6	0	1
Dredger	in	Tees Bay	Tarmac Cochranes Wharf	08/04/2013 12:11	08/04/2013 13:56	107.02	19.99	7.1	0	1
IMO Gas (Type 1G) Tanker	internal	Simon Storage No. 2 Jetty	Phillips No. 6 Jetty	08/04/2013 13:30	08/04/2013 14:30	97.24	16.5	4.8	1	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	08/04/2013 13:45	08/04/2013 14:29	91.27	12	5.5	0	1
Non-IMO Oil Tanker	in	Tees Bay	Phillips No. 5 Jetty	08/04/2013 13:59	08/04/2013 15:03	246.8	42	8.5	4	2
Container Ship	out	Tees Dock No. 8 Berth	Tees Bay	08/04/2013 15:04	08/04/2013 15:51	133.6	19.4	5.1	0	1
General Cargo Ship	out	Tees Dock No. 1 Berth	Tees Bay	08/04/2013 15:22	08/04/2013 16:50	89.78	13.17	5.7	0	1
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	08/04/2013 15:22	08/04/2013 16:50	133.39	18.7	6.4	0	1
IMO Chemical (Type 2) Tanker	out	Ineos No. 2 Jetty	Tees Bay	08/04/2013 16:18	08/04/2013 17:07	99.99	16.5	5.1	0	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees No. 3 Jetty	Tees Bay	08/04/2013 17:45	08/04/2013 18:48	99.97	16.8	5.2	0	1
RoRo Ship/Ferry	in	Tees Bay	Hpool Deep Water Berth	08/04/2013 18:10	08/04/2013 18:41	91.01	13.54	4	0	1
RoRo Ship/Ferry	out	Tees Dock No.2 RoRo Berth	Tees Bay	08/04/2013 20:26	08/04/2013 21:18	195.4	26.7	6.1	0	1

IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	08/04/2013 21:50	08/04/2013 23:01	97.39	15.9	5	0	1
General Cargo Ship	in	Tees Bay	Wilton Eng. Riverside Berth	08/04/2013 22:49	09/04/2013 00:25	74.84	10.5	3.1	0	0
IMO Chemical (Type 2) Tanker	out	Vopak No. 3 Jetty	Tees Bay	08/04/2013 23:59	09/04/2013 01:02	134.16	20.5	4.5	1	1
IMO Chemical (Type 2) Tanker	out	Vopak No. 2 Jetty	Tees Bay	09/04/2013 00:15	09/04/2013 01:45	99.93	15.5	5.7	0	1
Dredger	out	Tarmac Cochranes Wharf	Tees Bay	09/04/2013 00:28	09/04/2013 02:01	107.02	19.99	5	0	1
IMO Chemical (Type 1) Tanker	in	Tees Bay	Vopak No. 3 Jetty	09/04/2013 01:03	09/04/2013 02:06	90.9	15.6	5.3	0	1
IMO Chemical (Type 2) Tanker	out	North Tees No. 4 Jetty	Tees Bay	09/04/2013 04:36	09/04/2013 06:20	182.5	27.34	6.4	2	1
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	09/04/2013 05:04	09/04/2013 05:55	141.2	21.3	7.2	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	West Byng Jetty	09/04/2013 05:10	09/04/2013 06:12	96	15	5.4	1	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	North Tees No. 4 Jetty	09/04/2013 05:20	09/04/2013 06:38	144.1	23	7.8	0	1
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	09/04/2013 05:57	09/04/2013 06:44	91.27	12	3.9	0	1
Non-IMO Oil Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	09/04/2013 06:39	09/04/2013 08:00	145	22.5	7.7	1	1
IMO Gas (Type 1G) Tanker	out	Phillips No. 6 Jetty	Tees Bay	09/04/2013 07:29	09/04/2013 08:14	97.24	16.5	5.4	1	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 2 Jetty	09/04/2013 07:55	09/04/2013 08:52	90	12	4.2	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Phillips No. 6 Jetty	09/04/2013 09:12	09/04/2013 10:23	95.5	15.5	5.5	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Arthur Taylor Jetty	09/04/2013 11:59	09/04/2013 13:06	99.75	15.8	4.55	1	1
RoRo / General Cargo	internal	Europoort	Tees Dock No.2 RoRo Berth	09/04/2013 13:00	09/04/2013 13:55	152	25.2	5.5	1	1
Bulk Carrier	out	Saldanha Bay	Tees Bay	09/04/2013 14:00	09/04/2013 14:00	295	46	17	0	0
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	09/04/2013 14:08	09/04/2013 14:57	97.39	15.9	6	0	1
Non-IMO Oil Tanker	out	Phillips No. 5 Jetty	Tees Bay	09/04/2013 14:18	09/04/2013 15:21	246.8	42	13.2	2	2
General Cargo Ship	out	Wilton Eng. Riverside Berth	Tees Bay	09/04/2013 14:55	09/04/2013 16:02	74.84	10.5	3	0	0
Container Ship	in	Tees Bay	Tees Dock No. 7 Berth	09/04/2013 15:18	09/04/2013 16:14	134.65	21.5	6	0	1
Cable Layer	internal	Heavy Lift Quay (TCP)	Heavy Lift Quay (TCP)	09/04/2013 15:51	09/04/2013 16:55	105.5	20	6.2	0	1
IMO Chemical (Type 3) Tanker	out	UK Continental Shelf	Tees Bay	09/04/2013 16:08	09/04/2013 16:08	183.25	27	7.3	0	0
General Cargo Ship	in	Tees Bay	Hpool Irvines Quay	09/04/2013 16:12	09/04/2013 16:43	74.84	10.5	3	0	0
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	09/04/2013 17:29	09/04/2013 18:17	141.2	21.3	6.9	0	1
General Cargo Ship	in	Tees Bay	Wilton Eng. Riverside Berth	09/04/2013 18:21	09/04/2013 19:41	115.62	15.8	3.6	0	1
RoRo / General Cargo	internal	Tees Dock No.2 RoRo Berth	Europoort	09/04/2013 20:33	09/04/2013 21:47	152	25.2	5.6	0	1
Container Ship	out	Tees Dock No. 7 Berth	Tees Bay	09/04/2013 21:56	09/04/2013 23:19	134.65	21.5	5.7	0	1
IMO Chemical (Type 2) Tanker	out	North Tees No. 4 Jetty	Tees Bay	10/04/2013 00:33	10/04/2013 01:20	144.1	23	6.6	0	1
Container Ship	in	Tees Bay	Tees Dock No. 7 Berth	10/04/2013 01:21	10/04/2013 02:06	139.6	22.2	6.3	0	1
Cable Layer	out	Heavy Lift Quay (TCP)	Tees Bay	10/04/2013 01:33	10/04/2013 03:40	105.5	20	6.3	0	1
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	10/04/2013 04:28	10/04/2013 05:26	154.64	21	8.1	0	1
IMO Chemical (Type 2) Tanker	internal	Vopak No. 2 Jetty	Simon Riverside Terminal	10/04/2013 06:01	10/04/2013 07:41	90	12	3.4	0	1
IMO Chemical (Type 1) Tanker	in	Tees Bay	Vopak No. 2 Jetty	10/04/2013 06:04	10/04/2013 06:55	126.76	19.7	6.5	0	1
IMO Chemical (Type 1) Tanker	out	Vopak No. 3 Jetty	Tees Bay	10/04/2013 06:39	10/04/2013 07:25	90.9	15.6	6.3	0	1
Non-IMO Oil Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	10/04/2013 09:25	10/04/2013 11:01	145	22.5	5.5	0	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	10/04/2013 10:02	10/04/2013 11:03	88.6	12.5	3	0	0
RoRo Ship/Ferry	in	Tees Bay	Tees Dock No.2 RoRo Berth	10/04/2013 11:25	10/04/2013 12:39	195.4	26.7	6.7	0	1
RoRo Ship/Ferry	out	Hpool Deep Water Berth	Tees Bay	10/04/2013 12:55	10/04/2013 14:25	91.01	13.54	3.7	0	0
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	10/04/2013 12:57	10/04/2013 14:07	108	16.8	4.9	0	1
Non-IMO Oil Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	10/04/2013 13:03	10/04/2013 14:24	168	26.4	9	1	1
Bulk Carrier	out	Redcar Ore Terminal	Tees Bay	10/04/2013 14:27	10/04/2013 16:08	255.28	43	8.83	4	2
Bulk Carrier	out	Tees Dock No. 2 Berth	Tees Bay	10/04/2013 15:03	10/04/2013 16:51	182.98	32.26	11.24	2	1
Container Ship	out	Tees Dock No. 7 Berth	Tees Bay	10/04/2013 15:30	10/04/2013 16:51	139.6	22.2	6	0	1
Crane Ship	out	Hpool Irvines Quay	Tees Bay	10/04/2013 15:46	10/04/2013 16:00	136.4	40	5.2	0	2
Bulk Carrier	in	Tees Bay	Tees Dock No. 2 Berth	10/04/2013 16:03	10/04/2013 17:10	229	36.8	7.9	3	1
Bulk Carrier	in	Tees Bay	Redcar Ore Terminal	10/04/2013 17:31	10/04/2013 19:00	225	32.25	14.12	3	1
Bulk Carrier	in	Tees Bay	Tees Dock No. 1 Berth	10/04/2013 17:40	10/04/2013 19:02	199.99	23.5	6.5	2	1
Rig Tender	in	Tees Bay	Heavy Lift Quay (TCP)	10/04/2013 17:47	10/04/2013 19:06	85.25	18.8	5.5	0	1
General Cargo Ship	out	Hpool Irvines Quay	Tees Bay	10/04/2013 18:09	10/04/2013 19:07	74.84	10.5	3.15	0	0
General Cargo Ship	out	Tees Dock No. 4 Berth	Tees Bay	10/04/2013 18:32	10/04/2013 19:36	94.21	15.4	3.5	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Phillips No. 8 Jetty	Tees Bay	10/04/2013 18:45	10/04/2013 19:36	97.24	16.5	5.25	1	1
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	10/04/2013 19:29	10/04/2013 20:18	154.64	21	6.9	0	1
Gas-tanker - CO2	internal	East Quay (TCP)	West Quay (TCP)	10/04/2013 19:30	10/04/2013 19:45	82.5	12.5	4.3	0	1
Gas-tanker - CO2	out	West Quay (TCP)	Tees Bay	10/04/2013 19:30	10/04/2013 20:26	82.5	12.5	4	0	1
IMO Chemical (Type 2) Tanker	out	Simon Riverside Terminal	Tees Bay	10/04/2013 20:04	10/04/2013 21:33	90	12	4	0	1
RoRo Ship/Ferry	out	Tees Dock No.2 RoRo Berth	Tees Bay	10/04/2013 20:33	10/04/2013 21:28	195.4	26.7	6.1	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	North Tees No. 2 Jetty	10/04/2013 21:28	10/04/2013 22:24	118.14	18.8	7	0	1
IMO Gas (Type 2G/2PG) Tanker	out	West Byng Jetty	Tees Bay	10/04/2013 22:23	10/04/2013 23:18	96	15	4.7	1	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	West Byng Jetty	10/04/2013 23:10	10/04/2013 23:59	99.9	11.45	3.2	0	1
IMO Chemical (Type 1) Tanker	out	Vopak No. 2 Jetty	Tees Bay	11/04/2013 01:59	11/04/2013 03:00	126.76	19.7	6.6	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 2 Jetty	11/04/2013 02:48	11/04/2013 03:46	89	13.32	5.5	0	1
Crane Barge	internal	A & P Tees Ltd No 1 Drydock	A & P Tees Ltd Frontage	11/04/2013 03:45	11/04/2013 04:40	53.34	20.73	0.65	1	1
Tug	in	Tees Bay	A & P Tees Ltd Frontage	11/04/2013 05:01	11/04/2013 06:23	24.8	9.5	2.8	0	0
General Cargo Ship	out	Cleveland Potash Terminal	Tees Bay	11/04/2013 05:23	11/04/2013 06:14	88.6	12.5	5.5	0	0
General Cargo Ship	in	Tees Bay	Tees Dock No. 3 Berth	11/04/2013 06:06	11/04/2013 07:23	89.25	13.4	3.9	0	0
Tug	out	A & P Tees Ltd Frontage	Tees Bay	11/04/2013 07:00	11/04/2013 08:36	24.8	9.5	2.8	0	1
Crane Barge	out	A & P Tees Ltd Frontage	Tees Bay	11/04/2013 07:00	11/04/2013 08:36	53.34	20.73	0.65	0	0
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	11/04/2013 08:25	11/04/2013 09:18	139.6	22.2	5.5	0	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	11/04/2013 08:43	11/04/2013 09:59	108	16.8	6.6	0	1
Survey Vessel	internal	Hpool Deep Water Berth	NOT KNOWN	11/04/2013 10:19	11/04/2013 11:00	17	6.1	2	0	0
Survey Vessel	internal	Hpool North Basin (S)	NOT KNOWN	11/04/2013 10:19	11/04/2013 10:40	12	6	1.2	0	0
IMO Gas (Type 2G/2PG) Tanker	out	West Byng Jetty	Tees Bay	11/04/2013 10:47	11/04/2013 11:52	99.9	11.45	3.6	0	1
General Cargo Ship	out	Wilton Eng. Riverside Berth	Tees Bay	11/04/2013 12:56	11/04/2013 14:33	115.62	15.8	3.6	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 3 Jetty	11/04/2013 13:00	11/04/2013 13:49	89	13	5.7	0	1
RoRo / General Cargo	internal	Europoort	Tees Dock No.2 RoRo Berth	11/04/2013 13:53	11/04/2013 14:44	152	25.2	5.6	0	1
Container Ship	out	Tees Dock No. 8 Berth	Tees Bay	11/04/2013 14:26	11/04/2013 15:25	139.6	22.2	5.6	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	11/04/2013 14:56	11/04/2013 15:43	114.616	15.7	5	0	1
Pontoon Barge	in	Tees Bay	Haverton Hill East	11/04/2013 14:59	11/04/2013 17:15	91	27.4	3	3	1
Tug	internal	Rotterdam	River Only - Did Not Berth	11/04/2013 15:00	11/04/2013 16:46	26.09	7.95	4	0	1
General Cargo Ship	out	New Holland	Tees Bay	11/04/2013 15:53	11/04/2013 15:53	98.8	14	3.8	0	0
Tug	internal	River Only - Did Not Berth	Rotterdam	11/04/2013 16:48	11/04/2013 17:58	26.09	7.95	4	0	1
IMO Chemical (Type 2) Tanker	out	Vopak No. 2 Jetty	Tees Bay	11/04/2013 16:57	11/04/2013 17:58	89	13.32	4.3	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 2 Jetty	11/04/2013 17:36	11/04/2013 18:15	99.87	17.14	5.2	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Ineos No. 2 Jetty	11/04/2013 17:40	11/04/2013 18:26	99.93	15.5	5.5	0	1
IMO Chemical (Type 2) Tanker	internal	Ineos No. 2 Jetty	Simon Storage No. 2 Jetty	11/04/2013 19:48	11/04/2013 20:36	99.93	15.5	5.5	0	1
Non-IMO Oil Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	11/04/2013 19:49	11/04/2013 21:07	168	26.4	8	1	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	11/04/2013 20:17	11/04/2013 21:02	88.35	14.2	6.6	0	1
RoRo / General Cargo	internal	Tees Dock No.2 RoRo Berth	Europoort	11/04/2013 21:28	11/04/2013 22:35	152	25.2	5.4	0	1
Non-IMO Oil Tanker	in	Tees Bay	Phillips No. 1 Jetty	11/04/2013 22:49	12/04/2013 00:10	243	42	8	4	2
IMO Chemical (Type 2) Tanker	out	Vopak No. 3 Jetty	Tees Bay	12/04/2013 01:18	12/04/2013 02:50	89	13	5.25	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Arthur Taylor Jetty	Tees Bay	12/04/2013 02:38	12/04/2013 04:15	99.75	15.8	5.6	1	1
General Cargo Ship	in	Tees Bay	Hpool Deep Water Berth	12/04/2013 03:51	12/04/2013 04:54	105.7	15.42	7.3	0	1

Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	12/04/2013 04:33	12/04/2013 05:31	140.6	21.8	6.15	0	1
IMO Chemical (Type 2) Tanker	out	North Tees No. 2 Jetty	Tees Bay	12/04/2013 05:10	12/04/2013 07:19	118.14	18.8	5.3	0	1
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	12/04/2013 05:15	12/04/2013 07:08	99.93	15.5	5.6	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	12/04/2013 05:58	12/04/2013 06:51	95.15	17	4.8	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Phillips No. 8 Jetty	12/04/2013 07:08	12/04/2013 08:00	96.9	15.6	4.5	0	1
General Cargo Ship	out	Tees Dock No. 3 Berth	Tees Bay	12/04/2013 08:51	12/04/2013 09:46	89.25	13.4	5.9	0	0
IMO Chemical (Type 2) Tanker	out	Vopak No. 2 Jetty	Tees Bay	12/04/2013 11:05	12/04/2013 11:50	99.87	17.14	5	0	1
RoRo Ship/Ferry	in	Tees Bay	Tees Dock No.2 RoRo Berth	12/04/2013 11:25	12/04/2013 12:41	195.4	26.7	6.7	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 2 Jetty	12/04/2013 11:42	12/04/2013 12:27	93.63	12.5	4.6	0	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	12/04/2013 12:44	12/04/2013 13:50	114.616	15.7	6	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 3 Jetty	12/04/2013 14:10	12/04/2013 15:11	134.3	20.82	8.1	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	12/04/2013 14:34	12/04/2013 15:18	88.35	14.2	4.8	0	1
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	12/04/2013 15:15	12/04/2013 16:11	140.6	21.8	6.5	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	12/04/2013 16:06	12/04/2013 16:59	97.39	15.9	4.9	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Riverside Terminal	12/04/2013 18:55	12/04/2013 20:29	99.87	17.14	5.2	0	1
Bulk Carrier	out	Redcar Ore Terminal	Tees Bay	12/04/2013 19:13	12/04/2013 21:08	225	32.25	6.6	3	1
Bulk Carrier	in	Tees Bay	Redcar Ore Terminal	12/04/2013 20:15	12/04/2013 21:03	224.98	32.26	13.8	3	1
RoRo Ship/Ferry	out	Tees Dock No.2 RoRo Berth	Tees Bay	12/04/2013 21:13	12/04/2013 22:36	195.4	26.7	6.1	0	1
Non-IMO Oil Tanker	out	Phillips No. 1 Jetty	Tees Bay	12/04/2013 21:48	12/04/2013 22:52	243	42	12.35	2	2
IMO Chemical (Type 2) Tanker	in	Tees Bay	West Byng Jetty	12/04/2013 22:52	12/04/2013 23:47	118.14	18.8	5.3	0	1
General Cargo Ship	in	Tees Bay	Tees Dock No. 4 Berth	13/04/2013 00:05	13/04/2013 01:21	88	11.41	3.1	0	0
IMO Chemical (Type 2) Tanker	out	Simon Storage No. 2 Jetty	Tees Bay	13/04/2013 03:00	13/04/2013 04:14	95.15	17	6.2	0	1
IMO Chemical (Type 3) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	13/04/2013 03:53	13/04/2013 05:06	183.25	27	7.3	1	1
Crane Ship	in	Tees Bay	Hpool Irvines Quay	13/04/2013 04:22	13/04/2013 05:38	136.4	40	5.5	0	2
IMO Chemical (Type 2) Tanker	out	Vopak No. 2 Jetty	Tees Bay	13/04/2013 04:42	13/04/2013 05:36	93.63	12.5	4.3	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 2 Jetty	13/04/2013 05:24	13/04/2013 06:27	129.5	19.8	8.2	1	1
Rig Tender	in	Tees Bay	TERRC No 10 Berth	13/04/2013 05:27	13/04/2013 06:22	81.08	18.01	3.6	0	1
IMO Chemical (Type 2) Tanker	internal	Simon Riverside Terminal	Ineos No. 1 Jetty	13/04/2013 06:02	13/04/2013 07:07	99.87	17.14	5	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Arthur Taylor Jetty	13/04/2013 06:53	13/04/2013 07:48	105.56	11.92	2.9	0	1
Container Ship	in	Tees Bay	Tees Dock No. 6 Berth	13/04/2013 08:08	13/04/2013 09:02	154.64	22	7	0	1
Tug	in	Tees Bay	West Quay (TCP)	13/04/2013 08:14	13/04/2013 10:41	22.51	6.6	3.2	0	1
Barge - General Cargo	in	Tees Bay	West Quay (TCP)	13/04/2013 08:18	13/04/2013 10:44	24.4	17.08	3	1	0
IMO Gas (Type 2G/2PG) Tanker	out	Phillips No. 6 Jetty	Tees Bay	13/04/2013 09:23	13/04/2013 10:15	95.5	15.5	6.1	0	1
Rig Tender	out	TERRC No 10 Berth	Tees Bay	13/04/2013 09:40	13/04/2013 10:19	81.08	18.01	3.6	0	0
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	13/04/2013 10:01	13/04/2013 10:45	97.39	15.9	6	0	1
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	13/04/2013 10:46	13/04/2013 11:19	140.64	21.8	6.6	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	13/04/2013 10:47	13/04/2013 11:41	105.57	11.98	2.8	0	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	13/04/2013 10:52	13/04/2013 11:55	90.4	12.5	2.8	0	0
Container Ship	out	Tees Dock No. 6 Berth	Tees Bay	13/04/2013 13:31	13/04/2013 14:30	154.64	22	6.9	0	1
NLS Certified Oil Tanker	in	Tees Bay	Heavy Lift Quay (TCP)	13/04/2013 14:12	13/04/2013 15:20	53	10	3.5	0	1
Rig Tender	internal	Heavy Lift Quay (TCP)	Heavy Lift Quay (TCP)	13/04/2013 14:29	13/04/2013 14:57	85.25	18.8	5.5	0	1
Crane Ship	internal	Hpool Irvines Quay	Hpool Heerema Berth	13/04/2013 15:20	13/04/2013 16:24	136.4	40	5.5	0	1
General Cargo Ship	out	Tees Dock No. 4 Berth	Tees Bay	13/04/2013 15:26	13/04/2013 16:19	88	11.41	4.5	0	0
IMO Chemical (Type 2) Tanker	out	Vopak No. 3 Jetty	Tees Bay	13/04/2013 15:53	13/04/2013 16:45	134.3	20.82	6.2	0	1
General Cargo Ship	out	Hpool Irvines Quay	Tees Bay	13/04/2013 16:23	13/04/2013 17:46	168.14	25.2	6.9	2	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 3 Jetty	13/04/2013 16:45	13/04/2013 17:20	90	12	4.8	0	1
Gas-tanker - CO2	in	Tees Bay	West Quay (TCP)	13/04/2013 16:55	13/04/2013 18:07	82.5	12.5	5.1	0	1
Crane Ship	internal	Hpool Heerema Berth	Hpool Irvines Quay	13/04/2013 17:17	13/04/2013 18:22	136.4	40	5.5	0	1
Bulk Carrier	in	Tees Bay	Hpool Irvines Quay	13/04/2013 17:25	13/04/2013 18:33	185	23.5	7.4	2	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Clarence Wharf - Koppers	13/04/2013 18:24	13/04/2013 19:27	75.72	11.1	3.5	0	1
IMO Chemical (Type 2) Tanker	out	West Byng Jetty	Tees Bay	13/04/2013 19:10	13/04/2013 20:17	118.14	18.8	6.4	0	1
Container Ship	out	Tees Dock No. 8 Berth	Tees Bay	13/04/2013 19:54	13/04/2013 20:40	140.64	21.8	5.9	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	West Byng Jetty	13/04/2013 20:16	13/04/2013 20:54	99.9	11.45	3.1	0	1
NLS Certified Oil Tanker	out	Heavy Lift Quay (TCP)	Tees Bay	13/04/2013 21:01	13/04/2013 22:02	53	10	3.1	0	0
Container Ship	in	Tees Bay	Tees Dock No. 7 Berth	13/04/2013 22:57	13/04/2013 23:41	134.65	21.5	6.4	0	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	13/04/2013 23:12	14/04/2013 00:55	105.57	11.98	3	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	14/04/2013 00:01	14/04/2013 00:55	107.86	17.08	5	0	1
IMO Gas (Type 2G/2PG) Tanker	out	Arthur Taylor Jetty	Tees Bay	14/04/2013 01:52	14/04/2013 02:55	105.56	11.92	3.2	0	1
General Cargo Ship	in	Tees Bay	Tees Dock No. 6 Berth	14/04/2013 04:32	14/04/2013 05:30	126.87	20.4	6.6	0	1
Non-IMO Oil Tanker	in	Tees Bay	North Tees No. 3 Jetty	14/04/2013 05:25	14/04/2013 07:00	177.75	28	9.6	2	1
RoRo / General Cargo	in	Tees Bay	Tees Dock No.2 RoRo Berth	14/04/2013 05:50	14/04/2013 07:20	152	25.2	5.6	2	1
Non-IMO Oil Tanker	in	Tees Bay	Phillips No. 1 Jetty	14/04/2013 07:03	14/04/2013 08:44	243.8	42	8.4	4	2
IMO Gas (Type 2G/2PG) Tanker	out	West Byng Jetty	Tees Bay	14/04/2013 08:06	14/04/2013 09:35	99.9	11.45	3	0	1
IMO Chemical (Type 2) Tanker	out	Clarence Wharf - Koppers	Tees Bay	14/04/2013 08:11	14/04/2013 09:55	75.72	11.1	4.4	1	1
Container Ship	out	Tees Dock No. 7 Berth	Tees Bay	14/04/2013 08:38	14/04/2013 09:35	134.65	21.5	6.2	1	1
Rig Tender	internal	Heavy Lift Quay (TCP)	Heavy Lift Quay (TCP)	14/04/2013 09:10	14/04/2013 09:28	85.25	18.8	5.5	0	1
General Cargo Ship	in	Tees Bay	Clarence Wharf - Koppers	14/04/2013 09:13	14/04/2013 10:10	98.8	14	3.8	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Phillips No. 6 Jetty	14/04/2013 11:00	14/04/2013 11:54	93	17.6	4.2	1	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	14/04/2013 11:22	14/04/2013 12:02	64.22	10.51	2.1	0	0
IMO Chemical (Type 2) Tanker	out	Vopak No. 3 Jetty	Tees Bay	14/04/2013 11:30	14/04/2013 12:40	90	12	3.5	0	1
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	14/04/2013 12:08	14/04/2013 13:05	133.6	19.4	5.9	1	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Vopak No. 3 Jetty	14/04/2013 12:24	14/04/2013 13:24	89	13	5.3	1	1
IMO Chemical (Type 2) Tanker	out	Vopak No. 2 Jetty	Tees Bay	14/04/2013 13:24	14/04/2013 13:58	129.5	19.8	5.9	1	1
RoRo / General Cargo	internal	Tees Dock No.2 RoRo Berth	Europoort	14/04/2013 13:32	14/04/2013 14:39	152	25.2	5.5	1	1
RoRo Ship/Ferry	in	Tees Bay	Tees Dock No.2 RoRo Berth	14/04/2013 13:40	14/04/2013 14:55	195.4	26.7	6.3	1	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Vopak No. 2 Jetty	14/04/2013 14:08	14/04/2013 15:01	88.35	14.22	6.7	0	1
IMO Chemical (Type 3) Tanker	out	Simon Storage No. 1 Jetty	Tees Bay	14/04/2013 14:50	14/04/2013 16:41	183.25	27	7.3	1	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Storage No. 1 Jetty	14/04/2013 15:37	14/04/2013 16:22	99.9	16.48	6.8	0	1
IMO Chemical (Type 2) Tanker	in	Tees Bay	Simon Riverside Terminal	14/04/2013 16:00	14/04/2013 17:52	117.6	17	5.3	1	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	Simon Storage No. 2 Jetty	14/04/2013 17:42	14/04/2013 18:21	96	15.5	5.5	2	1
Gas-tanker - CO2	out	West Quay (TCP)	Tees Bay	14/04/2013 17:50	14/04/2013 18:54	82.5	12.5	4.1	0	1
General Cargo Ship	out	Tees Dock No. 6 Berth	Tees Bay	14/04/2013 18:02	14/04/2013 18:47	126.87	20.4	6.8	1	1
IMO Chemical (Type 2) Tanker	out	Ineos No. 1 Jetty	Tees Bay	14/04/2013 18:04	14/04/2013 18:59	99.87	17.14	5.7	0	1
Container Ship	out	Tees Dock No. 8 Berth	Tees Bay	14/04/2013 18:19	14/04/2013 18:59	133.6	19.4	6.2	0	1
IMO Gas (Type 2G/2PG) Tanker	out	North Tees "A" Jetty	Tees Bay	14/04/2013 19:00	14/04/2013 19:55	107.86	17.08	6.7	0	1
IMO Gas (Type 2G/2PG) Tanker	in	Tees Bay	North Tees "A" Jetty	14/04/2013 19:50	14/04/2013 20:56	108	16.8	4.7	0	1
General Cargo Ship	in	Tees Bay	Cleveland Potash Terminal	14/04/2013 19:55	14/04/2013 20:52	58.27	9.4	2.3	0	0
Container Ship	in	Tees Bay	Tees Dock No. 8 Berth	14/04/2013 20:55	14/04/2013 21:51	139.6	22.2	6.7	0	1
Container Ship	in	Tees Bay	Tees Dock No. 7 Berth	14/04/2013 23:47	15/04/2013 01:23	133.39	18.7	7	1	1

Appendix C – Tees Dock Vessel Shipping Rules

Tees Dock Steel Slab Vessels - Arrival and Departure Criteria

Vessel Groups	Maximum Dimensions	[redacted]					
				Tidal Requirements		Berth Requirements	
	Length or beam	Tugs	Pilots	Entry time	Formula	Tees Dock 1	Cleveland Potash
Handymax / Supramax	200m or 33m	3	1	On formula	Tees Dock (including TD1 extension "patch")	<45m Up to max beam	< 35m Up to max beam
Panamax	230m or 33m	3 *	1	On formula	Turning circle	Up to max beam	Up to max beam
Post Panamax / Mini Cape	270m or 46m	3 / 4 *	2	Optimum time (for predicted conditions) between 3hrs before HW and 2Hrs after	Turning circle	Clear	Up to max beam

* If size indicator (LOA x beam x moulded depth) >180000, then additional towage to be considered.

Vessel Groups	Maximum Dimensions	Departure					
				Tidal Requirements		Berth Requirements	
	Length or beam	Tugs	Pilots	Order time	Formula	Tees Dock 1	Cleveland Potash
Handymax / Supramax	200m or 33m	2	1	1 hr before HW (if draught > 10.5m)	Tees Dock (including TD1 extension "patch")	Up to max beam	Up to max beam
Panamax	230m or 33m	3 *	1	1 hr before HW (if draught > 10.5m)	Turning circle	Up to max beam	Up to max beam
Post Panamax / Mini Cape	270m or 46m	3 / 4 *	2	1.5 Hrs Before HW	Turning circle	Clear	Up to max beam

* If size indicator (LOA x beam x moulded depth) >180000, then additional towage to be considered.

The vessel must be ready to sail in all respects at the indicated order time.
TD1 extension "patch" formula is currently 7.5m

Appendix D – Observed Vessel Manoeuvre Timings

			Maximum				INWARD (elapsed time)													OUTWARD (elapsed time)							
		Berth	DWT	LOA	Beam	TYPE	TFB	SG	T/C	No13BN	TD	NTA	Dk Pt	NSSB	SRT	BERTH		BERTH	SRT	NSSB	Dk Pt	NTA	TD	No13 Bn	SG	TFB	
Conoco Phillips		5	160000	305	48	Crude Oil tkr	0	20								90	4 tugs										
		4	160000	305	48	Crude Oil tkr												0							30	45	2 tugs
		3	48000	213	28																						
		6	6500	115	20	LPG	0	15	25							50	no tug										
		7	6500	115	20																						
		8	6500	115	20	LPG	0	15	25							60	1 tug										
		2	160000	305	48	Crude Oil tkr												0							30	45	2 tugs
		1	160000	305	48																						
Redcar Ore Terminal			190000	305	48	Bulker	0	20								90	4 tug										
Simon		1	30000	190	35	Chemical	0	15								60	2 tugs	0							30	40	0 tugs
		2	6000	110	30	LPG	0	15								50		0							30	40	0 tugs
Excelerate Jetty			100000	280	45																						
Vopak		3	20000	150	30	Chemical	0	15		35						60	0 tugs	0						25	35	45	0 tugs
		2	40000	200	33	Chemical	0	15		25						60	2 tugs	0						25	35	45	1 tug
		1	6000	100	20																						
Cleveland Potash Terminal			60000	200	35	Dry Cargo	0	15								45	0 tugs	0								40	0 tugs
Tees Dock Berths	Steel / General	1	100000	180	40	Supply	0	15		30	40																
		2	60000	180	40	Bulker	0	15		30	40					70	3 tugs	0						45	55	70	2 tugs
		3	60000	180	40	Bulker	0	15		30	40					70	3 tugs	0						45	55	70	2 tugs
		4	60000	180	40																						
		5	60000	200	40																						
	Ro Ro	Ro Ro 1	20000	175	30																						
		Ro Ro 2	60000	200	40																						
		Riverside Ro Ro	20000	180	30																						
	Container	6	60000	195	35	Container	0	15		25	35					55	0 tugs	0						25	35	50	0 tugs
		7	60000	180	35	Container	0	15		25	35					55	0 tugs	0						25	35	50	0 tugs
		8	14000	155	30																						
		9	9000	155	30																						
Ineos		2	8100	145	30																						
		1	10500	145	30																						
Teesport		QE2	25000	198	40																						
		West Byng	35000	200	40																						
		Arthur Taylor	5000	100	19	LPG	0	15		25	35					60	1 tug	0						30	40	50	1 tug
Tarmac Slag Jetty			5000	100	18																						
North Tees		4	95000	271	45	Chemical	0	15		25	35					80	1 tug	0							45	60	0 tugs
		3	40000	250	37	LPG	0	15		25						90	3 tugs	0							50	70	2 tugs
		2	30000	201	28	Chemical	0	15		25						55	0 tugs	0						25	35	45	0 tugs
		1A	6000	140	40	LPG	0	15		25	35					65	0 tugs	0						25	35	45	0 tugs
South Bank		6	40000	180	30																						
		5	10000	200	25																						
A & P Frontage			12000	180	25	Dry Cargo	0	15		25	35					80	1 tug	0						40	50	60	0 tugs
Teesport Commerce Park		Heavy Lift Quay	12500	120	27																						
		East Quay	6000	100	20																						
		West Quay	60000	200	30																						
		Cargo Fleet Wharf	105000	250	45																						
Normanby Wharf			6000	120	18																						
Tarmac Cochranes Wharf			7500	145	22																						
Cochranes Wharf			3000	85	20																						
Clarence Wharf			5000	180	30	Chemical	0	15		25	35					60	0 tugs	0						30	40	50	0 tugs
Bex Quay			100000	220	45																						
Central Quay			26000	145	40																						
Vulcan Quay			12000	91	31																						
Wilton Engineering Inset Quay			22000	130	25																						
Wilton Engineering Riverside Berth			10000	120	36	Dry Cargo	0	15		25	35					80	0 tugs	0						40	50	60	0 tugs
Dawsons Wharf			4000	120	20																						
North Sea Supply Base			12000	150	36	Dry Cargo	0	15		25	35					80	0 tugs	0						50	60	70	0 tugs
East Quay (Haverton Hill)			5000	135	20																						
Bamletts Wharf			4000	110	20																						
Able UK			9500	100	20																						
Simon Riverside Terminal			5000	120	19	Chemical	0	15		25	35	45	55	65		90	1 tug	0		25	35	45	50	60	70	80	0 tugs
Heerema Berth			15000	92	30																						
Victoria Quay			8000	150	24.5																						
Deepwater Berth			25000	190	24.5																						
North Basin (North)			5000	170	20																						
North Basin (South)			5000	170	20																						
Irvines Quay			30000	190	33																						

Appendix E – Recorded Tidal Values

HARBOUR OFFICE									
TIDAL RECORDS FOR 2013									
								772-101-3	
(N.B. All times in G.M.T.)									
DATE		HIGH WATER				LOW WATER			
		PREDICTED		ACTUAL		PREDICTED		ACTUAL	
		Time	Height	Time	Height	Time	Height	Time	Height
01/04/2013	a.m.	0642	5.10	0645	5.27	0040	0.90	0040	0.93
01/04/2013	p.m.	1912	5.00	1905	5.29	1258	1.00	1310	1.06
02/04/2013	a.m.	0734	4.80	0735	5.09	0128	1.30	0110	1.43
02/04/2013	p.m.	2015	4.70	2015	4.93	1353	1.30	1340	1.38
03/04/2013	a.m.	0838	4.60	0850	4.77	0228	1.70	0230	1.68
03/04/2013	p.m.	2130	4.40	2130	1.64	1506	1.50	1500	1.51
04/04/2013	a.m.	0954	4.40	0950	4.57	0347	1.90	0350	1.98
04/04/2013	p.m.	2255	4.40	2255	4.60	1636	1.60	1645	1.60
05/04/2013	a.m.	1117	4.50	1100	4.59	0516	2.00	0530	1.99
05/04/2013	p.m.					1807	1.40	1810	1.47
06/04/2013	a.m.	0019	4.50	2355	4.59	0633	1.80	0625	1.70
06/04/2013	p.m.	1234	4.70	1235	4.71	1915	1.20	1920	1.12
07/04/2013	a.m.	0122	4.80	0125	4.76	0732	1.50	0745	1.44
07/04/2013	p.m.	1333	5.00	1335	5.01	2008	0.9	2000	0.89
08/04/2013	a.m.	0211	5.00	0215	5.00	0820	1.20	0830	1.23
08/04/2013	p.m.	1420	5.20	1415	5.20	2052	0.70	2055	0.79
09/04/2013	a.m.	0253	5.10	0255	5.29	0902	1.00	0910	1.20
09/04/2013	p.m.	1501	5.30	1500	5.51	2131	0.70	2120	0.76
10/04/2013	a.m.	0331	5.20	0320	5.33	0941	0.90	0930	0.93
10/04/2013	p.m.	1538	5.40	1540	5.48	2205	0.70	2155	0.72
11/04/2013	a.m.	0405	5.30	0410	5.38	1016	0.80	1015	0.95
11/04/2013	p.m.	1614	5.40	1625	5.50	2238	0.80	2235	0.83
12/04/2013	a.m.	0437	5.20	0435	5.46	1050	0.80	1045	1.03
12/04/2013	p.m.	1649	5.30	1645	5.49	2308	0.90	2310	0.99
13/04/2013	a.m.	0508	5.20	0510	5.28	1123	0.90	1125	1.03
13/04/2013	p.m.	1724	5.20	1730	5.20	2337	1.10	2340	0.98
14/04/2013	a.m.	0540	5.00	0555	4.72	1156	1.10	1155	0.92
14/04/2013	p.m.	1802	5.00	1820	5.17				
15/04/2013	a.m.	0615	4.90	0615	4.87	0007	1.30	0025	1.41
15/04/2013	p.m.	1842	4.70	1835	5.27	1231	1.30	1210	1.69
16/04/2013	a.m.	0655	4.70	0655	4.67	0041	1.60	0105	1.84
16/04/2013	p.m.	1927	4.50	1920	4.51	1309	1.50	1325	1.23
17/04/2013	a.m.	0741	4.40	0745	4.83	0120	1.80	0140	2.21
17/04/2013	p.m.	2019	4.20	2005	4.17	1356	1.80	1400	1.92
18/04/2013	a.m.	0837	4.20	0835	4.34	0209	2.10	0210	1.79
18/04/2013	p.m.	2122	4.10	2125	4.46	1500	2.00	1440	2.24
19/04/2013	a.m.	0944	4.10	0935	4.21	0323	2.30	0340	2.56
19/04/2013	p.m.	2234	4.00	2230	3.87	1624	2.00	1620	1.87
20/04/2013	a.m.	1057	4.20	1040	4.06	0457	2.30	0500	2.12
20/04/2013	p.m.	2345	4.20	2345	4.17	1739	1.80	1740	1.79
21/04/2013	a.m.					0608	2.10	0625	2.00
21/04/2013	p.m.	1203	4.40	1215	4.33	1839	1.60	1845	1.57

22/04/2013	a.m.	0043	4.40	0045	4.50	0701	1.80	0715	1.85
22/04/2013	p.m.	1257	4.60	1255	4.56	1928	1.20	1915	1.40
23/04/2013	a.m.	0131	4.70	0125	5.18	0747	1.50	0750	1.61
23/04/2013	p.m.	1343	4.90	1400	5.14	2012	0.90	2005	1.17
24/04/2013	a.m.	0212	5.00	0210	5.14	0829	1.10	0825	1.08
24/04/2013	p.m.	1425	5.20	1445	5.27	2054	0.70	2105	0.80
25/04/2013	a.m.	0253	5.20	0255	5.28	0911	0.90	0915	0.83
25/04/2013	p.m.	1507	5.40	1505	5.44	2135	0.50	2140	0.53
26/04/2013	a.m.	0333	5.40	0330	5.49	0952	0.70	1005	0.70
26/04/2013	p.m.	1549	5.60			2217	0.40	2220	0.38
27/04/2013	a.m.	0414	5.50	0415	5.54	1035	0.50	1040	0.45
27/04/2013	p.m.	1634	5.60	1640	5.50	2259	0.50	2305	0.27
28/04/2013	a.m.	0456	5.50	0450	5.29	1118	0.50	1115	0.48
28/04/2013	p.m.	1722	5.50	1715	5.62	2342	0.60	0001	0.59
29/04/2013	a.m.	0541	5.40	0535	5.48				
29/04/2013	p.m.	1813	5.30	1800	5.41	1204	0.60	1205	0.67
30/04/2013	a.m.	0629	5.20	0630	5.34	0028	0.90	0030	0.97
30/04/2013	p.m.	1909	5.10	1905	4.95	1255	0.80	1250	0.70

Note / Memo

HaskoningDHV UK Ltd.
Maritime & Waterways

To:	James Barrie
From:	RHDHV
Date:	15 July 2015
Copy:	
Our reference:	PB1586 - N013 - Rev 1
Classification:	Project related

Subject: **YPL Traffic Simulation Addendum**

Introduction

Addendum Background

Subsequent to the completion of Tees Marine Risk Assessment Study (PB1586/R003-Rev 3) the berth arrangement has been further developed to take account of various constraints relating to the under-river pipelines.

To account for these constraints the useable berth length has reduced from 574m to 495.5m and consequently a two berth option in Phase 2 cannot be realised. However, there are certain vessel combinations that can utilise the berth simultaneously, resulting in a berth that has more operational flexibility than a single berth, but less than that of two berths.

In updating the marine risk assessment study to consider the effects of the revised operational berth length the vessel range and mix distribution have also been modified to expand York Potash's potential export market and more closely represent the distribution of bulk carriers within the world fleet.

Purpose of this Addendum

The purpose of this addendum is to assess the potential impact of the vessel movements associated with the revised operational berth length and vessel characteristics for Phase 2 (13mtpa), as this represents the more critical scenario based on previous analysis.

Consideration has been made with respect to the impact of the York Potash vessel movements, both with and without a planned increase in vessel movements by PD Teesport (+3.6mtpa), in identifying and quantifying potential delays to shipping in the estuary.

If there are no identified issues, then this gives confidence that the developments can progress without further mitigation. Should any issues be identified then analysis of the simulation can provide information on potential mitigation measures.

Study Parameters

For the purposes of clarity only study parameters that have been altered from the Marine Risk Assessment Study (PB1586/R003-Rev 3) are presented within this section.

Vessel Mix Distribution

In order to maintain a correlation and link to the previous studies, an analysis of the new vessel categories and mix in comparison to the previous studies has been completed and briefly summarised below in Table 1.

DWT Class	Vessel Category	Length	Draft	Cargo Share	Shipments		Previous Study Share	Previous Study Shipments
	[t]	[m]	[m]	[%]	[-]		[%]	[-]
30,000 - 39,999	35,000	180	10.3	15%	61		0%	0
40,000 - 49,999	45,000	193	11.4	12%	37		0%	0
50,000 - 59,999	55,000	205	12.7	31%	77		25%	59
60,000 - 79,999	75,000	220	13.8	35%	66		50%*	94*
80,000 - 85,000	85,000	231	14.5	7%	11		25%	39
	Total Vessels per Year				**252**			**192**

Table 1: Vessel Sizes and Split of Traffic
*** denotes merged 65,000 DWT and 75,000 DWT vessels from the previous study**

- Two new categories of smaller vessel (35,000 DWT and 45,000 DWT) have been added to expand York Potash's potential export market.
- The previous study contained both 65,000 and 75,000 DWT vessels. In these latest runs these categories have been merged into the 75,000 DWT class in order to reflect the output categories from the world fleet source data.
- The total number of additional vessels per year has increased compared to the previous study. However the proportion of traffic has moved from being equally distributed between vessel classes to include fewer large vessels and more small vessels.

The tidal windows for the new vessels have been re-calculated based on the vessel draft. The smaller vessels shallower draft allows for unrestricted navigation to the Bran Sands facility at all states of the tide. The 55,000 DWT bulker is marginally restricted, while the 75,000 and 85,000 DWT are restricted to navigation around high tide when fully loaded.

Berth Arrangements

Previously the options of either a one or two berth facility were analysed and compared. This addendum investigates the impact of the facility operating a single berth that can be utilised by two vessels simultaneously where space allows. A maximum of 495.5 metres is available on the berth and the combination of vessels that can be accommodated is summarised as follows in Table 2.

	Secondary Vessel [DWT]				
Primary Vessel [DWT]	85,000	75,000	55,000	45,000	35,000
35,000	✓	✓	✓	✓	✓
45,000	x	✓	✓	✓	✓
55,000	x	x	✓	✓	✓
75,000	x	x	x	✓	✓
85,000	x	x	x	x	✓

Table 2: Berth Combinations

Where one vessel is occupying the berth and another vessel arrives which is too large, the arriving vessel will be required to wait at the anchorage until sufficient space on the berth is available.

On Berth Timings

A more detailed process modelling of the operations at the Bran Sands Facility for each vessel category has been implemented within the simulations to ensure that the service and on berth times are more representative. The previous studies used a constant loading rate of 50,000 tonnes per day in order to estimate the time on berth of each vessel.

Timings relating to delays have been removed (weather delays, waiting at anchorages, travel times, etc.) to avoid double counting as delays will be dynamically modelled.

The operations allowed for and the timings used are shown in Table 3.

		Vessel Categories (Avg Size DWT)				
Service Times (mins)		35000	45000	55000	75000	85000
Procedures Time	Berthing operations, includes turning	45	45	45	45	45
	Authorities, Shipping Agent	30	30	30	30	30
Start-up of operations	Start-up conveyors and processes and convey material	31	31	31	31	31
Theoretic Operating Time	Based on Design Capacity	605	777	950	1295	1468
Performance Time Losses	Lower cycle time, filling degree	103	132	161	220	249
Operational Time Losses	Changing holds	171	178	214	255	262
Breakdown Time Losses	Stop due to technical failures	75	93	113	151	169
Organizational Time Losses	Breaks, shift change, other	68	84	103	137	154
Induced Time Losses	Port, Authorities, Ship, Shipping Agent	15	15	15	15	15
Procedures Time	Authorities, Shipping Agent	30	30	30	30	30
	De-berthing operations	15	15	15	15	15
	Total Service Time (mins)	**1,188**	**1,430**	**1,707**	**2,224**	**2,467**
	Total Service Time (hrs)	**19.8**	**23.8**	**28.4**	**37.1**	**41.1**

Table 3: Facility Processes

Whilst the above process times are averages, they represent a more accurate and representative method of estimating the service time at the York Potash Facility compared to the previous method.

Modelling Scenarios

The scenarios that have been modelled for this addendum are summarised in Table 4.

Scenario	Description
Scenario 7 – Existing Movements + Phase 2 Polyhalite - 495.5 metre berth (Revised Vessel Mix)	Simulation is used to run several varying arrival and departure patterns of Polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules are breached (e.g. two vessels pass too close to each other) or vessels are unable to complete journeys, are investigated.
Scenario 8 - Existing Movements + Tees Dock Bulk + Phase 2 Polyhalite – 495.5m berth (Revised Vessel Mix)	Simulation used to run several varying arrival patterns of Tees Dock bulk and polyhalite vessels on top of existing traffic to statistically analyse the probabilities of delays. Situations where marine risk rules are breached (e.g. two vessels pass too close to each other) or vessels are unable to complete journeys, are investigated.

Table 4: Model Scenarios

Summary

The changes made to the modelling are summarised below:

- Single berth length modelled with berth length limitations.
- 35,000 DWT and 45,000 DWT Polyhalite Bulk Carriers added.
- The 65,000 DWT vessel has been removed as this category is merged with the 75,000 DWT vessels in the world fleet source data.
- Ship movement schedule updated to reflect new vessel mix distribution.;
- On berth timings updated to reflect more detailed procedures and process steps.

All other rules remain the same.

Simulation

Additional validation model runs have been completed (but not reported on) to test the rules surrounding the split berth length and that only allowable combinations are berthed simultaneously.

The impact of the proposed additional shipping movements compared to the previous simulations is again measured in terms of potential encounters, failed movements and waiting time.

Each simulation has been run several times, and due to the random variance element and statistical distribution, each run of the model generated a slightly different vessel schedule and therefore slightly different results. The results are summarised by averaging results over each iteration. The minimum and maximum recorded results are also reported separately for reference.

Additional Polyhalite Vessels Only - Phase 2 - 495.5 Metre Split Berth

In order to quantify the effect of the Polyhalite vessels at Phase 2, they have been modelled without the additional Tees Dock imports, but with historical movements. The Bran Sands site is assumed to export 13 million tonnes of Polyhalite per annum during Phase 2. The results are summarised in Table 5, Table 6 and Table 7 below.

Model Number	Run Description	Total Waiting Time (Averaged)	Average Model Vessel Movements	Max Potential Encounters	Failed Moves
7	Existing Movements + Phase 2 Polyhalite - 495.5 metre berth (Revised Vessel Mix)	122 mins	391	0	0

Table 5: Scenario 7 Summary

Route	Total Waiting Time (Averaged)	Max Potential Encounters	Failed Moves
Tees Bay to Bran Sands (return route)	41 mins	0	0
Tees Bay to Simon Storage (return route)	24 mins	0	0
Tees Bay to Phillips (return route)	5 mins	0	0
Other	52 mins	0	0

Table 6: Scenario 7 Largest Delays Grouped by Route

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (Polyhalite)	41 mins
IMO Chemical Tanker	33 mins
IMO Gas Tanker	27 mins
Other	21 mins

Table 7: Scenario 7 Largest Delays Grouped by Overall Vessel Category

The additional traffic equates to between 17 and 20 additional vessel movements either inwards or outwards to the Bran Sands Facility during a 14 day model run. As every run is generated dynamically based on an approximate schedule and arrival probability distribution, each run has a number of movements within the above range. The results of all runs are averaged to indicate the overall impact.

The averaged results show a reduced amount of waiting time for all sites and vessels when compared to the previous scenarios. This is in part due to the change in vessel mix meaning there is a reduction in vessels requiring to get underway during peak periods. The delays that are recorded are mainly spread across a number of small incidents.

Further outputs are summarised below in Table 8, Table 9 and Table 10.

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Table 8: Safety Encounter Analysis (Scenario 7)

Vessel	Location	Reason	Further Investigation?
None recorded			

Table 9: Failed Movement Analysis (Scenario 7)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for the turning circles to clear or berth availability.	N
Tees Dock	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N
Bran Sands	Delays recorded whilst vessels berthing at Simon Storage and Phillips when Brans Sand vessels ready to depart. Vessels held on berth until clear	N
Simon Storage	Delays recorded whilst vessels berthing at Bran Sands due to proximity. Vessels held on berth until clear	N

Table 10: Location Analysis (Largest Delays) Scenario 7

Analysing the model runs with the largest amount of waiting time, the primary cause of the delays relates to several small incidents requiring one or more vessels to wait either on the berth or at the anchorage.

A small amount of delays is also due to berth availability at the Bran Sands Facility and waiting time out at the anchorage. However the waiting time for a berth is not excessive enough to cause any additional failed vessel movement (delay > 24 hours) and indicates that there is a small overlap in a vessel arriving before the previous vessel has departed and the arriving vessel is required to wait.

Due to the close proximity of the Brans Sands Facility to Simon Storage some delay is again recorded on a small number of runs when a large Polyhalite vessel either delays or is delayed by interactions with a chemical or gas tanker. This is due to movements occasionally taking place at a similar time around the tides. The small number of occurrences indicates that the probability of such events is not high.

Additional delays of up to 90 minutes are recorded on these runs depending on which vessel is underway first.

Overall the impact of the additional movement to Bran Sands is observed to be small.

Additional Polyhalite Vessels and Tees Dock Bulk Import - Phase 2 - 495.5 Metre Split Berth

There are also other planned potentially tidally bound vessel movements on the Tees within the immediate future, with potential for 3.6mtpa of bulk imports at Tees Dock. The eighth scenario simulates these additional vessel movements in combination with the Polyhalite vessel movements identified above. The Bran Sands site is again assumed to export 13 million tonnes of Polyhalite per annum. The results are summarised in Table 11, Table 12 and Table 13 below.

Model Number	Run Description	Total Waiting Time (Averaged)	Average Model Vessel Movements	Max Potential Encounters	Failed Moves
8	Existing Movements + Tees Dock Bulk + Phase 2 Polyhalite – 495.5m berth (Revised Vessel Mix)	269 mins	398	0	1

Table 11: Scenario 8 Summary

Route	Total Waiting Time (Averaged)	Max Potential Encounters	Failed Moves
Tees Bay to Tees Dock (return route)	95 mins	0	1
Tees Bay to Bran Sands (return route)	52 mins	0	0
Tees Bay to North Tees Jetties (return route)	22 mins	0	0
Tees Bay to Vopak (return route)	31 mins	0	0
Tees Bay to Simon Storage (return route)	22 mins	0	0
Tees Bay to Phillips (return route)	5 mins	0	0
Other	42 mins	0	0

Table 12: Scenario 8 Largest Delays Grouped by Route

Vessel Type	Total Waiting Time (Averaged)
Bulk Carrier (New Tees Dock Bulk)	95 mins
Bulk Carrier (Polyhalite)	52 mins
Container Ship	7 mins
General Cargo	4 mins
IMO Chemical Tanker	37 mins
IMO Gas Tanker	30 mins
RoRo / Ferry	5 mins
Other	39 mins

Table 13: Scenario 8 Largest Delays Grouped by Overall Vessel Category

The additional traffic equates to between 24 and 32 additional vessel movements either inwards or outwards to the Bran Sands Facility during a 14 day model run.

Introducing additional vessels imports to Tees Dock as well as the new vessels to Brans Sands does result in another increase in vessel delays. This is primarily due to the fact that the new vessel movements into Tees Dock are severely tidally restricted by the current useable channel depths at the Tees Dock turning circle and arrivals to Tees Dock can coincide with departures from Bran Sands.

Further outputs are summarised below in Table 14, Table 15 and Table 16.

Encounter ID	Location	Vessel 1	Vessel 2	Reason	Further Investigation?
None recorded					

Table 14: Safety Encounter Analysis (Scenario 8)

Vessel	Location	Reason	Further Investigation?
60k Bulk Carrier	Tees Bay	Berth occupied. Wait required at anchorage until berth is free.	N

Table 15: Failed Movement Analysis (Scenario 8)

Location	Primary Reason	Further Investigation?
Tees Bay	Delays relate to holding vessels at the anchorage whilst waiting for the turning circles to clear or berth availability.	N
Tees Dock	Delay to vessels leaving due to occupied turning circle. Vessels held on the berth until clear.	N
Brans Sands	Delays recorded whilst vessels berthing at Simon Storage and Phillips when Brans Sands vessels ready to depart. Vessels held on berth until clear	N
Simon Storage	Delays recorded whilst vessels berthing at Bran Sands due to proximity. Vessels held on berth until clear	N

Table 16: Location Analysis (Largest Delays) Scenario 8

A failed movement is recorded on a small number of runs. This relates to one of the larger Bulk Carriers travelling to Tees Dock. Due to the tidal window of this vessel being small, the order of movements generated caused the vessel to have to wait a significant amount of time. On analysis though the movement could likely have been completed successfully with less waiting with a small amount of traffic management and reordering of surrounding movements.

On the model results with the largest amount of waiting time recorded, there is a significant amount of waiting for the berth to become available. This occurred when a 55,000 DWT and a 75,000 DWT vessel are looking for service at a similar time. The waiting time for space on the berth is not excessive enough to cause any additional failed vessel movement though but causes a peak in waiting time.

Conclusion

Implementing a 495.5m operational berth length and revised vessel mix distribution has resulted in a decrease in average waiting times compared to the 1 berth and 2 berth options modelled previously even though the number of vessel movements has increased.

This is predominately a result of the revised vessel range and mix, with more smaller vessels that are not tidally restricted and less larger vessels which are tidally restricted to peak vessel movement periods.

Model Number	Run Description	Total Waiting Time (Averaged per day)	Average Model Vessel Movements	Max Potential Encounters	Failed Moves
0	Existing Vessel Movements	3.1 mins	372	0	0
2	Existing Movements + Phase 2 Polyhalite – 1 berth	57.4 mins	387	0	1
3	Existing Movements + Phase 2 Polyhalite – 2 berth	11.9 mins	387	0	0
7	Existing Movements + Phase 2 Polyhalite – 495.5m berth (Revised Vessel Mix)	8.7 mins	391	0	0
5	Existing Movements + Tees Dock Bulk + Phase 2 Polyhalite – 1 berth	94.1 mins	395	0	2
6	Existing Movements + Tees Dock Bulk + Phase 2 Polyhalite – 2 berth	22.1 mins	395	0	1
8	Existing Movements + Tees Dock Bulk + Phase 2 Polyhalite – 495.5m berth (Revised Vessel Mix)	19.2 mins	398	0	1

Table 17: Comparison of Scenarios

Assuming that the York Potash vessels are the only additional traffic (over the base case) on the Tees, the forecast delay for the 2 berth option (Scenario 3) of 11.9 minutes per day was considered modest and this forecast delay is further reduced to 8.7 minutes for the reduced berth length with revised vessel mix (Scenario 7).

Should the new Tees Dock bulk import vessels also be introduced to the Tees, then increased delays are to be expected. The forecast delay for the 2 berth option (Scenario 6) rises to 22.1 minutes per day, which is reduced to a forecast delay of 19.2 minutes per day for the reduced berth length with revised vessel mix (Scenario 8).