

Technical Memorandum

11 December 2023

To	ABP	Contact No.	N/A
Copy to	DFDS, DTA, Stenaline	Email	N/A
From	GHD	Project No.	12578580
Project Name	Immingham Eastern Ro-Ro Terminal DCO Application – PINS Reference TR030007		
Subject	ISH5 Action Point 22 – Summary of Yard Capacity		

1. Introduction

Following the recent Issue Specific Hearing 5 (ISH5) associated with the Immingham Eastern Ro-Ro Terminal (IERRT) project, the Inspectors identified several actions for ABP (the Applicant) or Interested Parties to respond to (EV10-016). Action point 22 as published on the PINS website relate to onshore elements of the application and requests that DFDS '*Undertake an update to DFDS terminal capacity modelling using inputs provided by Applicant and submit results as an Examination document*'.

This Technical Memorandum provides the necessary information to respond to the request of the Examining Authority. The purpose of this information is to present a high-level review of the IERRT terminal yard capacity.

DFDS have identified concerns with the yard capacity of the IERRT project as captured in comments raised in REP6-038, paragraphs 99 through to 115. During ISH5, ABP, Stenaline and DTA identified variations to inputs which were being utilised within the capacity assessment which superseded prior parameters identified by the Applicant. As a result, the Applicant requested an update to the terminal capacity assessment that was prepared by DFDS and presented within REP6-038.

The following provides a summary of the assessments inputs, methodology and outputs.

1.1 Summary of Communications

The following summarises the communications that have occurred between DFDS and the Applicant during the preparation of this technical memorandum.

During ISH5, DFDS and the Applicant met to discuss the findings of the capacity assessment presented with REP6-038. During this discussion, the Applicant identified that a number of the inputs have been recently updated and requested a revised capacity assessment to be completed based on the new inputs. The Applicant committed to providing the new inputs as a response to Action Point 21 following ISH5.

To aid the Applicant in providing the inputs for the assessment, GHD prepared a summary of the inputs used within the model for works presented in REP6-038 that the Applicant could revise where updates were necessary. This summary of inputs spreadsheet was shared with the Applicant on the 24th of November 2023. The email provided to the Applicant included a summary of the scope of work to be completed as part of the assessment, as presented within section 1.2 of this technical memorandum. The Applicant then provided the revised inputs Tuesday the 28th of December.

GHD then undertook a revised assessment of the terminals yard capacity and provided a work in progress version of this document to ABP, Stena, DTA Monday 4th of December. Comments were provided by ABP, Stena and DTA during a meeting held on the 8th of December with DFDS and the Applicant various parties.

Subsequently revisions have been made to this report and areas where the inputs have been confirmed by the Applicant are noted in each section.

1.2 Scope and limitations

This assessment has focused on the following:

- Due to time constraints between ISH5 and Deadline 7, plus to allow all parties sufficient time to review and comment on the yard capacity assessment, the assessment has been limited to what can be completed within the week of w/c 27th of November.
- This has meant that the assessment has focused on UK Imports of RoRo unaccompanied units only. The assessment does not consider accompanied RoRo (imports or exports), Containers (imports or exports), trade import, or UK exports of RoRo unaccompanied units.
- The scope of the assessment is to define the number of trailer bays that are required to store the unaccompanied RoRo UK Imports.
- If deemed necessary and agreed by all parties involved (ABP and DFDS), the assessment may look to be extended to consider all other freight units (accompanied, containers, trade imports and RoRo unaccompanied UK RoRo exports), however this will only be able to completed post the Deadline 7 submission due to the time needed to prep the necessary assessment and modify the model.

The assessment can only be used to support discussions with the Examiners. The assessment and its outcomes shall not be relied upon for any other purposes, including detailed design of the terminal and operations. DFDS, GHD and any other parties supporting DFDS disclaims responsibility to ABP, DTA, Stenaline and any other parties arising in connection with this assessment. We also exclude implied warranties and conditions, to the extent legally permissible.

2. Inputs

The following inputs have been utilised for the yard capacity assessment.

Note: the status of agreement of the inputs by the Applicant is noted under each table. A status of 'confirmed' indicates that the Applicant has provided this data, or has been provided this data and has during the meeting of the 8th of December confirmed that the inputs are applicable to the modelling.

A status of 'To Be Confirmed' indicates that the inputs have been suggested by DFDS to the Applicant for confirmation.

2.1 Daily Throughput

Table 1 Daily Throughput

Design Variable	Daily Throughput (Freight Units Per day)	Peaking Factor (% against average)
Min	1,152	80%
Average	1,440	100%
Peak	1,800	125%

Status¹: Confirmed

2.2 Import versus Export Distribution

Table 2 Import versus Export Distribution

Direction	Distribution (% of daily throughput)
Import	50%
Export	50%

Status: Confirmed

2.3 Modal Distribution

Table 3 Modal Distribution

Mode	Distribution (% of daily throughput)
Accompanied	28%
Unaccompanied	72%

Status: Confirmed

¹ Status refers to the position of the information provided and whether ABP, DTA or Stenaline have confirmed this as the appropriate design variable.

2.4 Unaccompanied Units Breakdown

The unaccompanied units are anticipated to be formed of three categories: Unaccompanied RoRo, Trade Imports and Containers with the volume of containers and trade imports as described in the following table:

Table 4 Unaccompanied Units Breakdown

Mode	Number of units per day
Containerised Imports ²	50
Trade Imports	6

Status: Confirmed

2.5 Vessel Arrival Schedule

The following table presents the indicative arrival and departure times of the vessels. Vessels 1 and 2 are based on current Stenaline sailings into the Humber region. The timing of arrival and departure of the third vessel however is currently unknown and could change.

A change in the arrival and departure profile can influence the results of the yard capacity assessments as vessels with a closer arrival or departure time of each other would result in a higher utilisation for short duration around the arrival and departure times. Vessels with a more even distribution of arrival and departure times across the day would spread the demand for the yard capacity.

Any changes to the vessel arrival and departure times should be reflected within the arrival and departure schedule of vehicles coming to / leaving the terminal for the Transport Assessment.

Table 5 Vessel Arrival Schedule

Vessel Name	Arrival Time (GMT +00:00)	Departure Time (GMT +00:00)
Vessel 1 – RoPax	06:30	20:00
Vessel 2 – RoRo	07:30	19:45
Vessel 3 – RoRo	09:00	22:00

Status: Confirmed

2.6 Dwell Rates

Table 6 Dwell Rates

Freight Unit and Direction	Min Dwell (days per unit)	Average Dwell (days per unit)	Max Dwell (days per unit)
Accompanied Import	Not utilised in assessment		
Unaccomp. RoRo Import	0.08	2.45	3.00 to 3.50
Unaccomp. LoLo Import	1.5	2.45	3.00 to 3.50
Accompanied Export	Not utilised in assessment		
Unaccomp. RoRo Export	Not utilised in assessment		
Unaccomp. LoLo Export	Not utilised in assessment		

Status: Confirmed

² The unit of measurement for the containers is understood to be number of containers, not Twenty-foot Equivalent Units (TEU).

2.7 Yard Configuration

Table 7 Yard Configuration

Area and Purpose	Trailer Bays or Container Slots
Ground Import Slots	1,446
Trade Import	25
Container Slots	65 slots at a max height of 3. Total capacity = 195
Export	228

Status: Confirmed

In addition to the above areas, post ISH5 the Applicant has also advised that the following areas provide additional capacity:

Table 8 Yard Configuration – Additional Areas

Area and Purpose	Trailer Bays or Container Slots
Pre-Gate Check In	50
Marshalling Lanes	63
Unallocated	100 (estimate – further details required)

Status: Confirmed

3. Methodology

This section of the report summarises the methodology used within the assessment to determine the yard capacity requirements.

3.1 Volume of Units

As mentioned in the scope of work (refer section 1.2), this assessment focuses on RoRo Unaccompanied import units only, however the daily throughput is provided as the total number of units inclusive of all modes and import and export.

The daily throughput needs to be broken down into import versus export, and accompanied versus unaccompanied units. This is done via:

$$\begin{aligned} \text{Unaccompanied Units} &= \text{Daily Throughput} * \text{Import \%} * \text{unaccompanied \%} = 1,440 * 50\% * 72\% \\ &= 518 \text{ units per day on average} \end{aligned}$$

The unaccompanied units consists of three various mode types, including RoRo unaccompanied, containerised and trade imports. Each of these forms of unaccompanied units utilise a different designated zone within the port under normal operations (note, under maximum operations, these areas can be repurposed, however this depends on the use requirement and level of residual capacity).

To determine the number of RoRo unaccompanied units to be assessed, the volume of containerised and trade imports needs to be taken away from the total number of unaccompanied units.

$$\text{RoRo unaccompanied units} = 518 - 50 - 6 = 462 \text{ units per day on average}$$

The volume of RoRo unaccompanied units can vary between the minimum and maximum values described within Table 1, as such the number of RoRo unaccompanied import units to be considered within the assessment are:

- Minimum: 370 units per day
- Average: 462 units per day
- Maximum: 578 units per day

3.2 Dwell Rate Distribution

Information advised by the Applicant has indicated a minimum, average and maximum dwell rate for unaccompanied RoRo import units. There a number of units (around 10% of all units delivered) that may be carrying on demand goods and are generally picked up fairly close to the vessel arrival time. These goods tend to have a dwell rate of around 2 hours.

To represent these variations in probability, a negatively skewed distribution curve has been developed with:

- 10 percentile set at 0.08 days;
- Average set at 2.45 days; and
- 99 percentile set at 3.50 days.

An approximated probability curve is provided within Figure 1 with the above metrics.

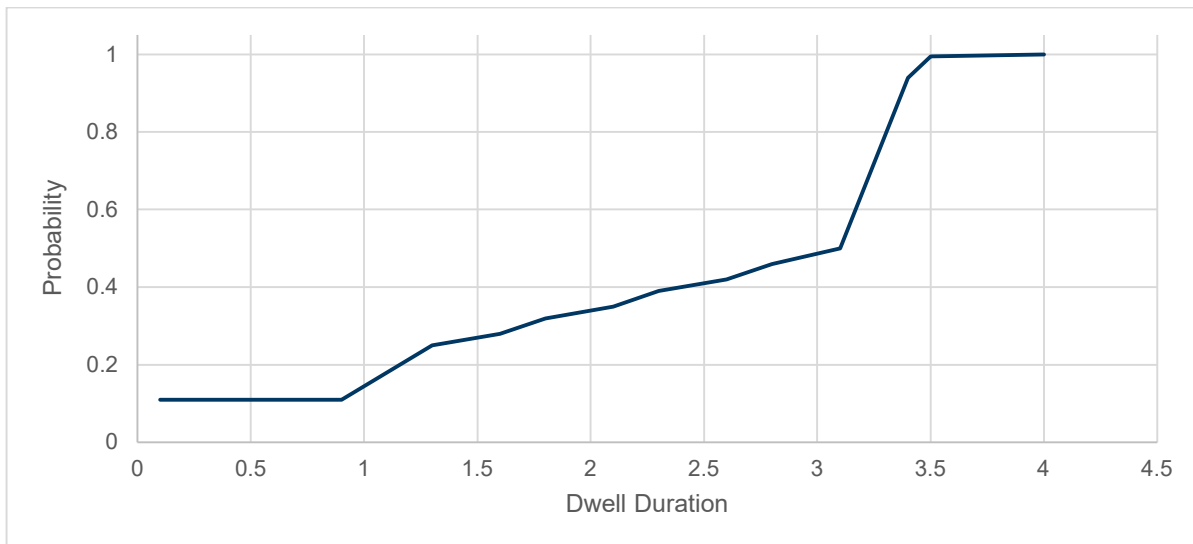


Figure 1 Dwell Period Probability Distribution

The above dwell rate probability distribution is utilised to randomly assign a dwell rate to each unit as they come off the vessel. (i.e. as the unit is discharged from the vessel, it is assigned a random dwell rate between 0.08 days to 3.50 days based on the probability shown in Figure 1). The unit is then added to the yard in one of the available slots and remains in location until the dwell period has lapsed.

3.3 Unload Volume Distribution

The assessment has considered three scenarios, including:

- Max case at 578 units per day.
- Average day case at 462 units per day.
- Random throughput case with daily throughputs ranging from the minimum of 370 units per day, to the maximum of 578 units per day, with the average across the multiple runs of the model equating to 462 units per day. For this case, a uniform distribution of probability is considered across the full range between the minimum and maximum figures.

The various model runs have been utilised to help determine the general requirements of the yard for maximum and normal operating periods.

The 'Max Case' run defines the number of slots required under peak conditions. Whereas the 'Average Day Case' provides a view on what the terminal capacity would need to be to support the average day throughput.

As the terminal capacity needs is influenced by the number of arrivals from vessels up to two days beforehand, it is expected that several consecutively busy days is required for the terminal to need the same level of capacity as shown in the max case. The 'Random Throughput Case' provides a view on this aspect by identifying how sensitive the terminal is to changes in daily throughputs, with a focus on identifying how many consecutive days of above average volumes is required for the full yard capacity to be needed. (i.e. the first and second day with above average throughputs, and third day with maximum

3.4 Model Runs

The inputs identified within section 2 of this report, and the methodology described in section 3 is then utilised to run a dynamic simulation model of the yard prepared in a proprietary GHD Python platform. The model:

1. For the day of consideration, identifies the vessel arrival times of the various three vessels. These arrival times are as per Table 5.
2. Assumes that Vessel 1 is carrying mostly accompanied units and therefore only assigns 20 unaccompanied units to Vessel 1. This is a consistent assumption across all three scenarios.

3. Assumes that the remaining unaccompanied units are equally distributed across Vessel 2 and 3.
4. A randomised probability ratio is assigned to each unit that is unloaded from each vessel. The probability ratio is then assessed against the probability distribution curve shown in Figure 1³.
5. Each unit is then assigned a 'slot' within the yard with the dwell rate identified.
6. The model is calculated at hourly intervals. As each hour passes, every active 'slot' remaining dwell time is reduced by one hour. If the 'slots' remaining time reduces to zero, the slot is then made available for the next unit.
7. At each hour, the number of active slots (i.e. those with a dwell rate greater than or equal to 1 hour) is counted.
8. The model repeats this process for a full year (365 days)

The model undertakes the same process for the three scenarios, with the inputs amended in accordance with the scenarios conditions. After the model run is completed the first three days of results are removed (as day one starts with zero units in the yard, it takes the first three days to fill the yard to normal conditions), and then:

- For the maximum day scenario and the average day scenario, the average peak yard demand of the remaining 362 days is identified and the full results of the specific day this value refers to, plus the day prior and the day after are extracted from the results to present in the yard capacity assessment findings.
- For the random throughput case, the average peak yard capacity demand (or closest number to this figure) of the maximum day scenario is identified. Once the specific day has been found, the days leading up to this peak yard capacity demand are investigated to determine how many days of consecutive above average demand is required for the peak yard capacity to occur.

³ Note: as the distribution is negatively skewed (or left-skewed), the mode (50% probability) does not equal the average which is found at a lower probability (circa 42%)

4. Yard Capacity Assessment

The model has been run over a full year (i.e. 365 days), creating various scenarios of randomised dwell rates.

The assessment has found the following:

1. Under the max case, a peak average total of 1,709 trailer bays are required for UK RoRo unaccompanied imports only. Reviewing all of the results across the 365 day run period, this total varies by plus or minus 5% (i.e. the result is fairly consistent) and therefore a tolerance of $\pm 5\%$ should be adopted.
2. Under the average case, a peak average total of 1,411 trailer bays are required for UK RoRo unaccompanied imports only. As above, a tolerance of $\pm 5\%$ should be adopted.
3. It takes around two consecutive days of above average throughput prior to a peak day event for the peak demand (i.e. 1,709 trailer bays) to be required.

Figure 2 presents the day before, the day of, and the day after the event of the above results for the max case and the average case scenarios.

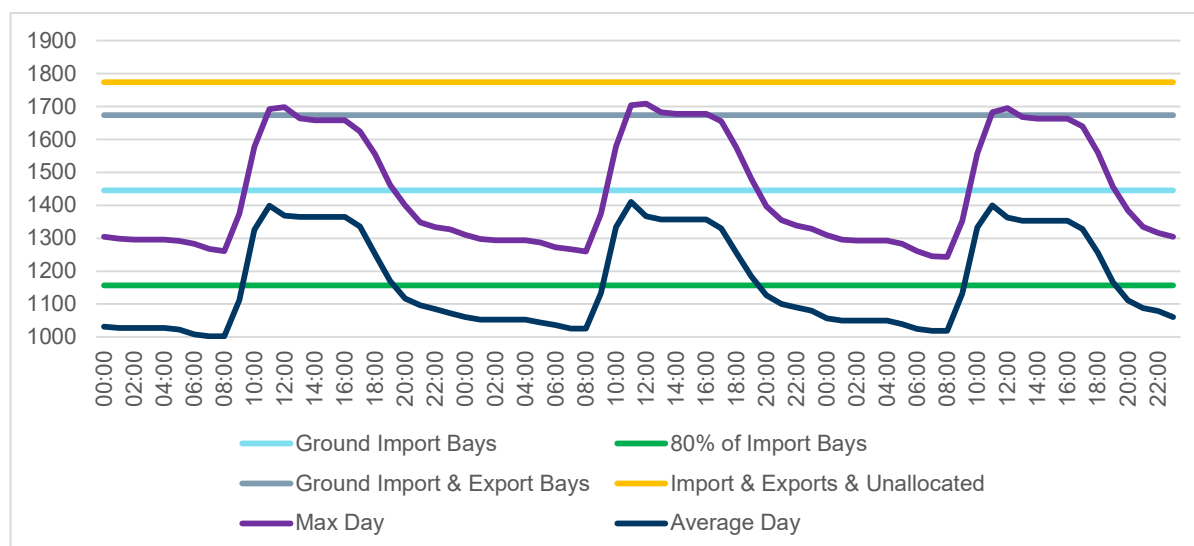


Figure 2 Trailer bays required within the yard to support UK Unaccompanied RoRo Exports

These results are approximately 100 units less than those previously presented by DFDS in REP6-038 paragraphs 110 to 116, namely due to the arrival sailing time of Vessel 3 being moved away from the arrival of Vessels 1 and 2. Albeit, these results remain in line with the conclusions made in paragraphs 113 to 115 of REP6-038 "Under peak operations, the yard will exceed capacity for UK Imports alone. And under normal operations, the import operations will still exceed operating targets, albeit within the capacity of the site, however without consideration for UK Exports. For normal conditions, the yard would need to be meticulously managed, with full control over vessel arrivals, haulier arrivals, tug units within the yard, unloading processes, and movement of accompanied units within the terminal."

It is understood that the Applicant intends to provide a summary of the operations approach to the proposed development as part of Action Point 23, and consider the need of a freight management plan as part of Action Point 25. Since the number of RoRo unaccompanied imports exceeds the available ground slots indicated for RoRo imports, DFDS awaits these documents for review prior to finalising comments on the yards capability to handle the demand without influencing the external road network or other port users.

It is also recommended that the Applicant consider the entirety of all mode and direction types to understand if periodic reconfiguration of the yard, and utilisation of additional spaces will be sufficient to operate the terminal under all circumstances.

Table 9 Results for Average Max day

Time	Trailer Bays Required for RoRo Unaccompanied UK Imports
Day 1 - 00:00	1305
Day 1 - 01:00	1298
Day 1 - 02:00	1296
Day 1 - 03:00	1296
Day 1 - 04:00	1296
Day 1 - 05:00	1292
Day 1 - 06:00	1283
Day 1 - 07:00	1267
Day 1 - 08:00	1261
Day 1 - 09:00	1374
Day 1 - 10:00	1578
Day 1 - 11:00	1692
Day 1 - 12:00	1699
Day 1 - 13:00	1665
Day 1 - 14:00	1658
Day 1 - 15:00	1658
Day 1 - 16:00	1658
Day 1 - 17:00	1625
Day 1 - 18:00	1555
Day 1 - 19:00	1462
Day 1 - 20:00	1400
Day 1 - 21:00	1349
Day 1 - 22:00	1334
Day 1 - 23:00	1327
Day 2 - 00:00	1310
Day 2 - 01:00	1297
Day 2 - 02:00	1294
Day 2 - 03:00	1294
Day 2 - 04:00	1294
Day 2 - 05:00	1287
Day 2 - 06:00	1273
Day 2 - 07:00	1266
Day 2 - 08:00	1260
Day 2 - 09:00	1374
Day 2 - 10:00	1579
Day 2 - 11:00	1704
Day 2 - 12:00	1709
Day 2 - 13:00	1683
Day 2 - 14:00	1678
Day 2 - 15:00	1678

Time	Trailer Bays Required for RoRo Unaccompanied UK Imports
Day 2 - 16:00	1678
Day 2 - 17:00	1656
Day 2 - 18:00	1576
Day 2 - 19:00	1480
Day 2 - 20:00	1397
Day 2 - 21:00	1355
Day 2 - 22:00	1339
Day 2 - 23:00	1329
Day 3 - 00:00	1309
Day 3 - 01:00	1296
Day 3 - 02:00	1293
Day 3 - 03:00	1293
Day 3 - 04:00	1293
Day 3 - 05:00	1283
Day 3 - 06:00	1261
Day 3 - 07:00	1245
Day 3 - 08:00	1243
Day 3 - 09:00	1352
Day 3 - 10:00	1557
Day 3 - 11:00	1683
Day 3 - 12:00	1695
Day 3 - 13:00	1668
Day 3 - 14:00	1663
Day 3 - 15:00	1663
Day 3 - 16:00	1663
Day 3 - 17:00	1640
Day 3 - 18:00	1561
Day 3 - 19:00	1456
Day 3 - 20:00	1384
Day 3 - 21:00	1335
Day 3 - 22:00	1317
Day 3 - 23:00	1305