APPENDIX 24

NAVIGATION SAFETY ASSESSMENT

2026

Navigation Safety Report

NORTHLAND SHIPYARD AND DRYDOCK FACILITY AT MARSDEN POINT WHANGAREI HARBOUR

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Contents

1.1 Project Description

The development and operation of a shipyard and drydock facility abutting the western side of the existing Northport port facility at Marsden Point, Whangārei Harbour. The project includes a reclamation, vessel haul-out system, and associated wharf structures, dredging and supporting infrastructure. This proposal is put forward by the Ministry of Business Innovation and Employment (MBIE).

1.2 Introduction

This report reviews the impact on navigation safety for the proposed shipyard and drydock facility abutting the western side of the existing Northport port facility at Marsden Point. The report covers commercial shipping operations, recreational considerations and environmental influences for shipping. The report should be read in association with the Operational Window Report which provides detail on proposed movements of ships into and out of the shipyard and dry dock facility, and which is attached as Appendix 2. The Operational Window Report is a desktop ship simulation study which uses the proposed design of the shipyard and dry dock facility, several design ships proposed for the facility and environmental effects. The simulation study provides the operational window expected for the facility under wind and tide conditions experienced in the area. The simulation will detail the degree of difficulty for a design ship to enter or leave the facility under set conditions of wind and tide. Allowance is made for different combinations of tugs. As a result of Operational Window Report, the layout of the dredge pocket was changed (see July Simulations Appendix 5) to enable safer manoeuvring of ships above 175m length over all. Qualifications and experience of people preparing this report is set out in Appendix 7.

1.3 Proposed Northland Shipyard and Drydock Facility

The proposal is to develop and operate a shipyard and drydock facility abutting the western side of the existing Northport facility. The project includes a reclamation, vessel haul-out system, and associated wharf structures, dredging and supporting infrastructure. The shipyard will extend 370m to the west from the present western edge of Northport's facility as shown in Figure 1 over page.

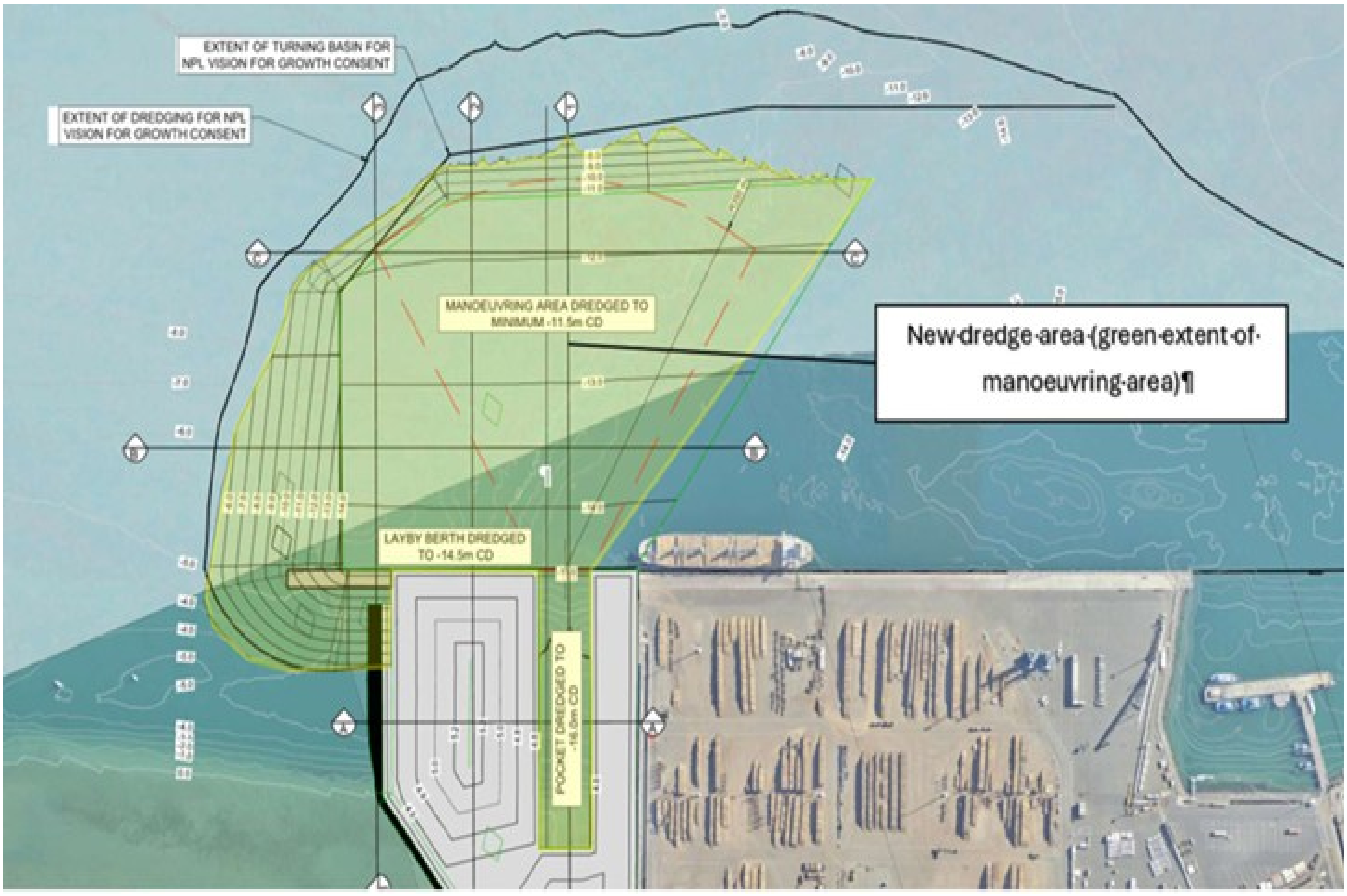


Figure 1 Location of proposed shipyard and drydock facility

1.4 Existing Port Configuration and Ship Size

Northport Limited currently operates three multipurpose berths with a total berth frontage of 570 metres. Berth overhangs are allowed up to 5 m at the western end of the berths and up to 20m at the eastern end of the wharves. An overhang of up to 50 m is allowed at the eastern end of the wharves for pre-simulated container vessels. Berth overhang at the western end is limited to 5m due to the presence of strong ebb tides which is relevant to the shipyard and drydock facility proposed in that location.

Northport also operates a multipurpose jetty which is set back east of the multipurpose berths. The berths and jetty configuration are shown in Figure 2.

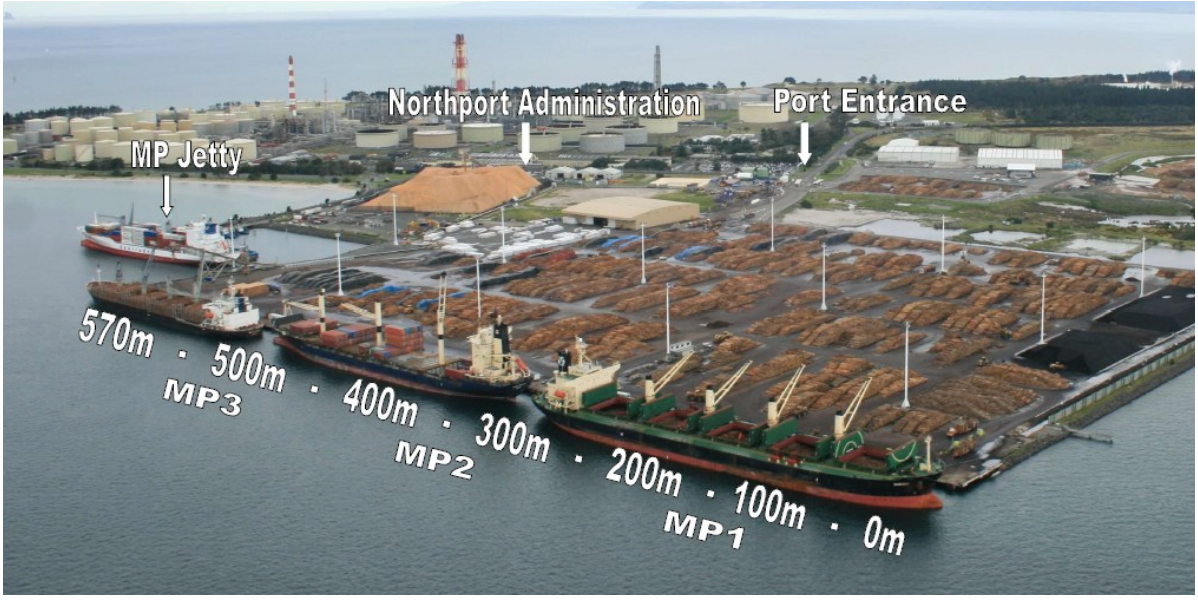


Figure 2 Berth layout at Northport

The port currently has facilities for log export, wood chip export, bulk cargo, and breakbulk cargo and container operations. Maximum ship sizes[1] using the Northport Facilities are as follows in Table 2:

	Berth 1 (MP1)	Berth 2 (MP2)	Berth 3 (MP3)	Multipurpose Jetty
LOA	294 m based on current Channel Configuration but not berth length.			130m
Max Beam (m)	35		38	20
Max Draft (m)	12.7	12.7	14.2	7.8

Table 1 Maximum ship sizes

In general, ship sizes have increased since the port was first developed. Now the port is handling up to 200m LOA for logships and bulk vessels, up to 294m LOA for containerships, and up to 215m for woodchip carriers. Northport has accepted a 224m cruise ship to berth at the multipurpose berths.

1.5 Northport Expansion Footprint

Northport Limited has consent to expand eastwards towards Channel Terminal Services Jetty 2. The eastwards expansion will add two new multipurpose berths and remove the existing tug jetty[2]. The timeline for the eastwards expansion is likely within the next 10 to 20 years, and in the meantime, multipurpose berth 3 can be extended by 175m. The extension of multipurpose berth 3 is possible within the next 5 years.

1.6 Current Channel Configuration

The Marsden Point and Northport fairway has a minimum depth of 14.7 metres, a minimum width of 200 metres in the vicinity of Home Point and is subject to spring tidal streams of up to 3 knots. The channel has a critical turn of 40° in the vicinity of buoy 14. For these reasons, the channel is challenging for pilotage, particularly in spring ebb tides and strong winds between Home Point and buoy 16. The channel is marked by navigation buoys from the fairway buoy to the Northport Berths. A PEL Leading Light is used to define the centreline of the approach channel from fairway buoy to buoys 3 and 6. In addition there are three sets of leads located in the vicinity of Marsden Cove / One Tree Point to assist

[1] Larger ship sizes are allowed subject to simulated risk assessment and DUKC calculation as appropriate
[2] https://www.vision4growth.co.nz/

in determining cross distance off the Northport berths when approaching. The current shipping channel is shown in Figure 3 below.

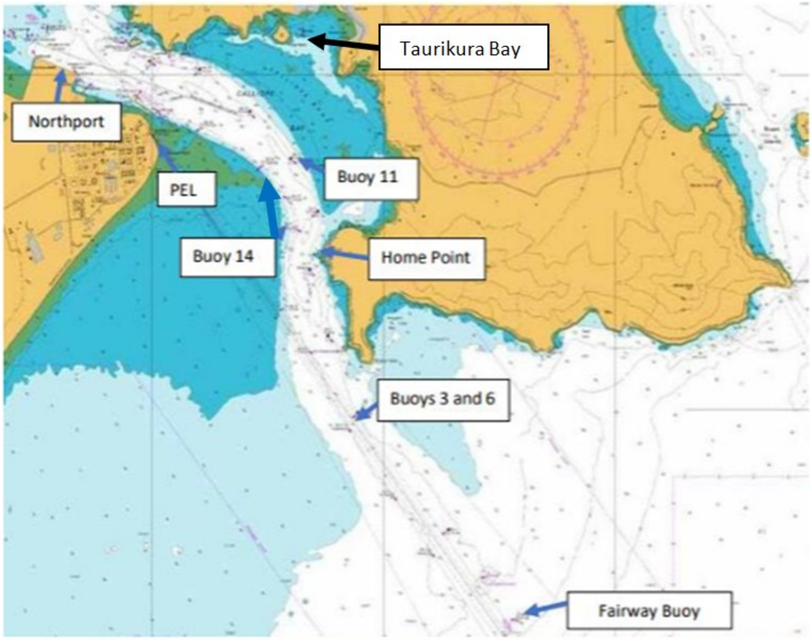


Figure 3 Shipping Channel

For the proposed shipyard and drydock facility, the leads off Northport will assist navigation for the ships using the facility. Additional navigation aids are recommended to assist recreational craft approaching the facility, to correctly delineate the shipping channel and turning basin. More detail on the operational area for ships using the facility is included in the Operational Window Report (Appendix 2).

The Northland Regional Council Navigation Safety Bylaws 2017 will need to be amended to show the proposed shipyard and drydock facility if it is consented. The operational area for the facility is shown in Figure 1 (green shaded area)

1.7 Safety Management Systems

Northport has a good example of a port operator safety management system (SMS) which is annually audited internally and externally every four years. Northport SMS covers navigation safety issues within the port operational area. Wider Whangārei Harbour navigation safety matters are managed within the Northland Harbour SMS which is operated by the Northland Regional Council (NRC). Six weekly Harbour safety meetings ensures both Northport port operator and Northland Harbour SMS are co-ordinated and meet the requirements of the NZ Port and Harbour Marine Safety Code. Both the Northport SMS and Northland Harbour SMS were reviewed in 2025 by Maritime New Zealand and found to be compliant with the Code.

Other harbour stakeholders run their own port SMS. These stakeholders are Channel Terminal Services (CTS) and Golden Bay Cement (GBC) and they all operate under the Northland Harbour SMS.

The operator of the proposed shipyard and drydock facility will need an SMS and to participate in the Harbour safety meetings. Co-operation and good communications are required with all harbour stakeholders especially Northport, to ensure safety and transparency of harbour operations.

1.8 DUKC System and Transit Analyst

The dynamic underkeel clearance (DUKC) system from OMC International has associated two wave rider buoys in the vicinity of the fairway buoy and also transmitting tide gauges to better assess under keel clearance. Northtugz, the towage provider, operates the DUKC for Northport Limited and Channel Terminal Services. Upgraded in 2020, the current DUKC system is Series 5. DUKC Series 5 offers greater environmental data display to the marine pilot whilst conducting the pilotage. In particular, awareness of available UKC and tidal current velocities is available on the Pilot PPU (Portable Pilotage Unit). An additional tool is available from OMC International since 2022. Transit Analyst (TA), records all movements of piloted vessels in the harbour and small vessels fitted with an Automatic Identification System (AIS). This information is available to the harbourmaster and pilots for training and analysis of shipping movements. TA contributes greatly to navigation safety on Whangārei harbour.

1.9 Channel Optimization by Refining New Zealand

Refining New Zealand (now Channel Terminal Services) reviewed the existing channel in 2015/2018, from fairway buoy to the RNZ (CTS) jetties, with the intention of deepening the channel to accept Suezmax crude tankers to a draft of 16.6m[3]. Consent for the channel optimization was obtained in 2018 but there are no immediate indications of these consents being given effect to.

Channel optimization would bring benefits for Northport and CTS in that the Channel will be widened in the vicinity of Home Point and buoys 11 and 14 which will improve navigation safety in this critical area. It is possible the Channel could be optimized with minimal dredging. Channel optimization is not required for the proposed shipyard and drydock facility as ships using the proposed facility will be smaller and have lighter drafts.

1.10 Northport Ship Simulator

Northport Limited installed an in-house marine simulator in November 2018. Marine simulation is a recognized tool by the United Nations and International Maritime Organization[4] for training of seafarers. The purpose of the Northport simulator is to:

- Undertake port design and development
- Provide risk assessments for navigational safety
- Review mooring line arrangements for ships berthed during periods of strong offshore winds.

The simulator software is DNV GL compliant for full mission bridge simulation Class A. The simulator is primarily for Northport Limited but is also used by the following companies:

- Refining New Zealand (Channel Terminal Services) and Golden Bay Cement
- Greater Wellington Regional Council
- Australian ports Bell Bay, Darwin and Cairns.

The simulator is being used to assist with the design of the proposed shipyard and dry dock facility and to undertake risk assessments for navigation safety at the proposed facility. The simulation results are set out in the Operational Window Report (Appendix 2).

The simulation software has been benchmarked against equivalent systems operating in New Zealand and Australia (Appendix 1). The simulator achieves a number of objectives for both Northport and others. By thoroughly investigating the response of ships to wind, wave and tidal effects, it is possible

[3] Refining NZ Desktop Simulation Study Be-Software2015/ Refining NZ Full Bridge Simulation Study Be-Software 2016

[4] https://imo.org/

to refine the procedures used by marine pilots and tug masters to effect safe movement of existing shipping in the harbour. The simulator is used to find the most effective response of marine pilots and tugmasters and VTS for given incidents in their harbour. The simulator mimics the environment in which ships safely operate. By imposing high winds, strong tides and large waves, the marine pilot and tug master can trial environmental conditions not often experienced in normal operations. This can be used to set realistic environmental limitations on the movement of ships to ensure they can be at all times controlled.

New classes of ships to the harbour, such as containerships, car carriers and cruise ships may be outside the experience of the marine pilots and tugmasters in the harbour. By modelling such ships and testing them in the simulator before they arrive, it is possible to develop procedures and conduct risk assessments to make safe operating conditions for these new arrivals. Modelling of the ships is based on data provided from the ships themselves, literature research, Portable Pilotage Units (PPU) and drone footage. Shore based monitoring of shipping movements is conducted through Local Port Services or Vessel Traffic Services and Transit analyst. LPS operators must monitor compliance with regulations and bylaws and can train in the simulator to provide the most effective communications with shipping. New channel designs, to give more manoeuvring space for ships, have been successfully trialled on the simulator. In the future, new berths can be thoroughly tested to meet the Northland Harbour Safety Management Systems. Risk assessments can be undertaken, and training effected for new channel designs. Simulation work undertaken by the Marine Simulator to date is shown in Appendix1.

1.11 Turning Basin Size

There are two existing turning basins at Marsden Point which are shown in Figure 5, and these will not be impacted by the proposed shipyard and drydock facility. The first turning basin is off CTS Jetty 1 which has a diameter of 550m. This turning basin is sufficient for departures of ballasted Suezmax tankers of 275 m LOA and drafts less than 12m.

The second turning basin is east of Northport Berth MP3 which has a diameter of 500m. It has been recognized practice for ships that they can be swung off MP Berths 2 and 3. Ships are not to be swung off MP Berth 1. The maximum ship length successfully swung in the Northport turning basin is 294m LOA with drafts less than 12m.

A new third turning basin is proposed for the facilitation of ship movements into and out of the proposed shipyard and drydock facility. The dimensions of this basin were originally proposed at 315m x 200m as shown in Figure 4 and in the Operational Window Report (OWR). However, it was recognised that the turning basin dimensions would be reviewed through ship simulation studies including the OWR and July simulations (Appendix 5). It is further acknowledged that full mission simulation will be later undertaken as part of detailed design.

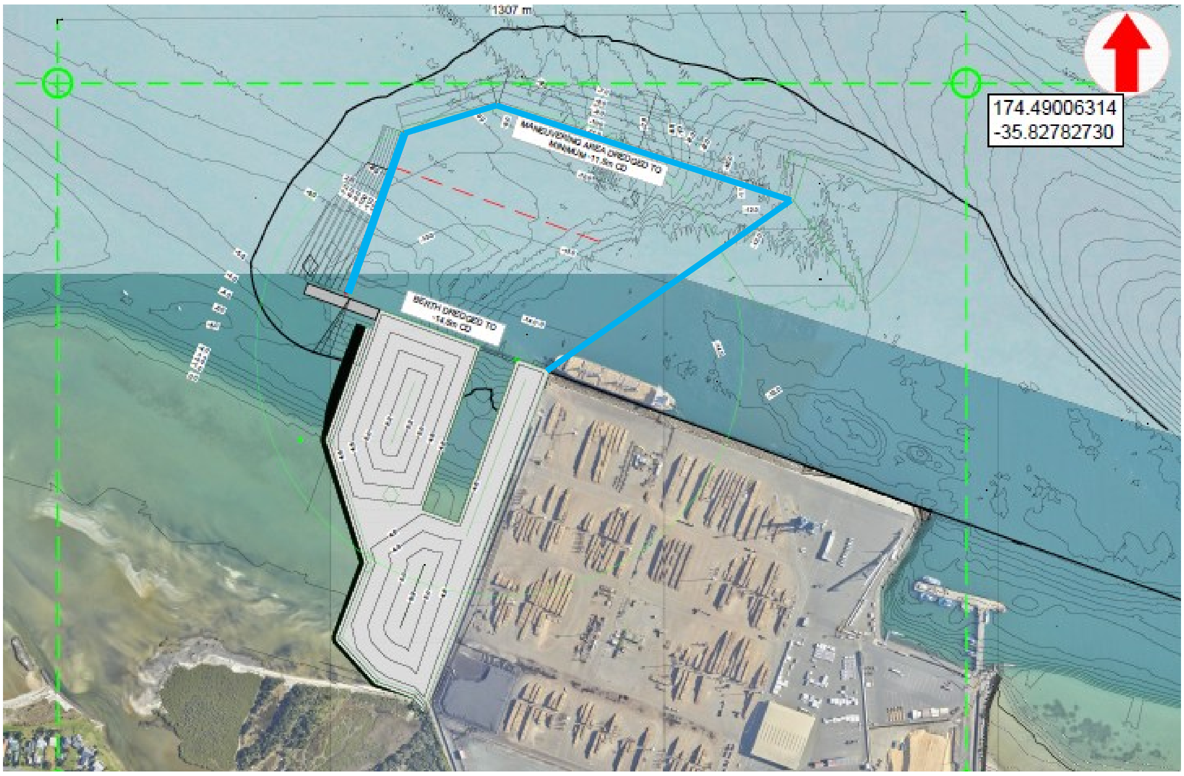


Figure 4 New Turning Basin dimensions outlined in blue. Original basin dimensions are shown by the red pecked line

Turning basin design is referenced to Guidelines published by the Permanent International Association of Navigational Congresses (PIANC). PIANC criteria for size of turning basins is 2 x LOA of the maximum size ship using the basin which is recommended at the concept design stage for a port[5]. Experience and use of simulation prudently allow a reduction in the size of turning basins to LOA + 2 x Beam + tug allowance at the detailed design stage for a port[6]. In the July simulations (Appendix 5) a new turning basin was successfully trialled based on the Force Technology formula [6].

Using the Northport in-house simulator and experienced consultants, a maximum ship size has been identified, based on which a proposed turning basin is to be designed based on limiting environmental conditions and towage capability. Based on this design vessel, the OWR had found the original design needed recalculation to meet internationally recognized turning basin criteria.

Real time simulation has been undertaken to test the suitability of other potential turning basin designs for the area west of the Northport facility, and the results of those tests are shown in Table 3.

[5] PIANC Report No. 121-2014 pg. 97

[6] Port Engineering Planning, Construction, Maintenance, and Security G. Tsinker pg. 714; and **https://forcetechnology.com/en/articles/turning-basin**

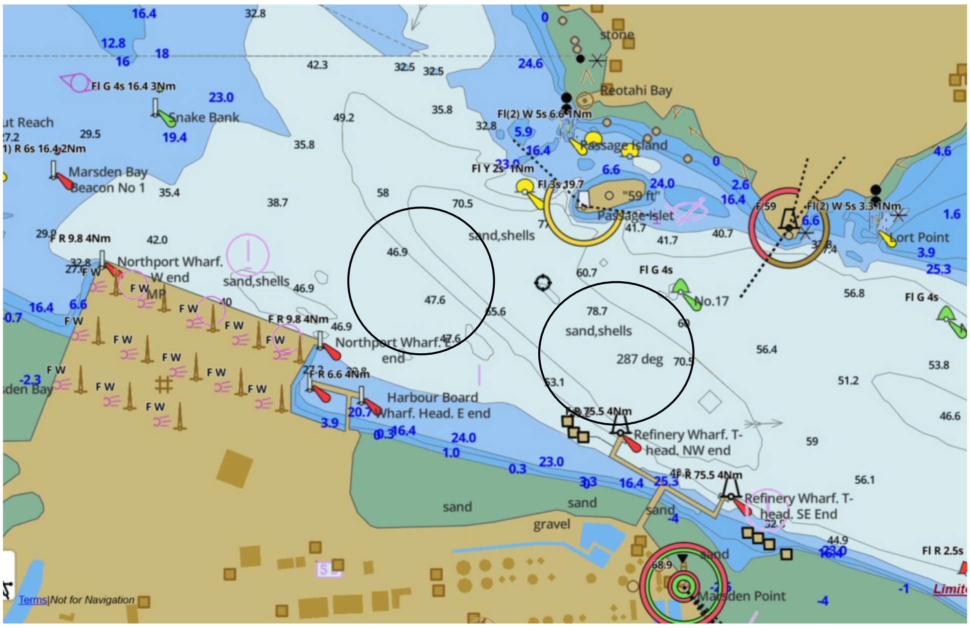


Figure 5 Existing turning basins (shown as black circles)

Study	Purpose	LOA	Beam	BASIN	Year	Status
RNZS Aotearoa Manoeuvring at Western End of Northport Facility Appendix 1	Risk Assessment Manoeuvrability associated with shipyard facility	173.2m	24.5m	Western	2020	Complete
Floating Dry Dock Simulation Study Phase 1 Appendix 1	Port Development	245m	32m	Western	2019	Complete

Table 3 Previous simulation studies for turning basins in the study area

1.12 Environmental Limitations

Lower Whangārei harbour shipping is currently subject to environmental limitations of tide, wind and wave. Current tidal limitations at the Northport facility are shown in Table 4.

Displacement	Draft	Length	Tidal Limitation
≤ 45,000 T	≤11.8m	≤200m	Berth or depart any time
>45,000 T	>11.8m	>180m	Berth or depart any time but restricted to tidal window
>45,000 T	>11.8m but ≤ 13.0m	>200m	Berth on ebb tide only.
All vessels	>13.0m	Any	Movements restricted to 1 hr before slack water only
All vessels requiring berthing starboard side to		Any	Berth on flood tide only

Table 4 Northtugz Pilotage Criteria

The greatest limitation for Northport shipping is with deep ships with drafts greater than 13m. These ships' movements are restricted to 1hr before slack water only. Wind conditions impose another environmental limitation on shipping movements at the Northport facility. The current wind limitations are:

- Indicative maximum wind strength for standard ship handling is 30 knots mean wind strength from any direction.
- For high sided vessels such as 200m+ container ships and woodchip ships indicative maximum wind strength is 20 knots mean wind speed from all directions.

Fog and limited visibility due rain do occur in the Lower Whangārei harbour and this will delay shipping movements, however these conditions occur less than five days per year based on operational records at Northport.

These environmental criteria provide an indicative base for environmental limitations at the proposed shipyard and dry dock facility. The Operational Window Report further assesses the operational environmental limitations on the proposed shipyard and dry dock facility.

1.12.1 Tides

Tidal stream studies for the main shipping channel were undertaken using an Acoustic Doppler Current Profiler (ADCP) with the latest data from 2015. This data has been updated by Metocean New Zealand to extend over the Northport area in 2018. Further modelling was undertaken in 2024, by Calypso Science (appendix 7) for Northtugz Limited, which covers all Whangārei Harbour. This updated tidal data has been loaded into the Northport in-house simulator.
The further tidal stream studies for the areas of the existing Northport Berths and Swing Basin are being reviewed for the proposed shipyard and drydock facility. The latest Calypso Science study has resulted in an internet based real time tidal stream display called Seascope, which shown in Figure 6 below.

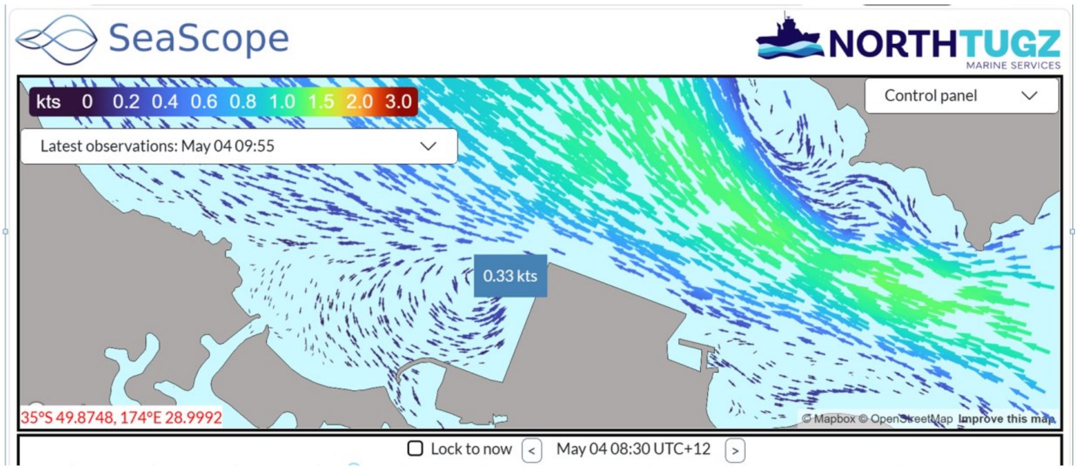


Figure 6 Sea Scope real time tidal stream display

Use of Seascope provides a substantial improvement for Navigation Safety in Whangārei Harbour.

1.12.2 Winds

There are a number of anemometers across Whangārei Harbour which have collected data during the past 10 years. MetOcean Solutions is analysing this wind data for the benefit of shipping movements and for the proposed shipyard and drydock facility. This wind data has been loaded into the simulator.

Wind at Northport is influenced by the topography on the northern side of the harbour which causes sudden wind shifts in direction and gusting. Real time monitoring of wind direction and speeds and trends are available through the Northport website which provides a substantial improvement for navigation safety in Whangārei Harbour. The Northport website shows the positions of the anemometers.
The wind and tidal limitations for the movement of ships into and out of the proposed shipyard and drydock facility have been modelled using the Northport simulator. It has also been used for:

- Large cruise ships berthing and departing.
- Large container ships berthing and departing.
- Mooring line analysis for high sided ships alongside in strong offshore winds.

1.12.3 Waves

There are two waverider buoys at the entrance to Whangārei Harbour. These provide wave heights, periods and directions. A third smaller waverider has been deployed inside the harbour for monitoring of inner harbour waves. The proposed shipyard and drydock facility is located well inside the harbour where wave action is not considered to significantly affect operational shipyard movement. This has been reviewed as part of the Operational Window Report (Appendix 2).

1.13 Future Shipping

Northport and other harbour stakeholders, such as CTS and GBC, are evolving to meet the requirements of the New Zealand economy [7].

Log trade has predominated at Northport since it was established in July 2002. However, there is a predicted decline in log cargoes in Northland[8].

Increased container trade had occurred with the establishment of a second mobile harbour crane in early 2020. Cruise ship bookings have been initiated. Potential exists for the establishment of a car trade in Northport and an increase in established bulk and breakbulk cargoes. Ship types and dimension are shown in Table 5 which can service this future trade.

Ship Type	**Class**	**LOA (m)**	**Beam (m)**	**Draft (m)**
Container 8,500 TEU	Post Panamax	340	43	14.5
Container 4,500 TEU	Panamax	290	32	12.5
Car Carrier	Green lake	200	32	9.5
Cruise Ships	Norwegian Jewel	294	32	8
Cruise Ships	Ovation of the Seas	348	43	8.9
Log ships	Handy Max and Supra Max	200	30	11.5
Bulk/ B Bulk	Handy Max and Supra Max	200	30	11.5
Woodchip	Handy Max	200	32	10.5
Oil Tanker	Long Range Product Tankers LR1	228	32	12
Oil Tanker	Long Range Product Tankers LR2	250	42	14
Cement Carriers	Mini/ Small bulk carriers	225	20	7

Table 5 Possible future ship types to service future trade in Northland

[7] https://www.transport.govt.nz/assets/Import/Uploads/Research/Documents/Cabinet-Papers/1.-MOT10025-UNISCS-Final-Report_final_8-11-19.pdf

[8] https://forme.co.nz/projects/log-supply-logistics/

1.14 Towage Capability

Towage and pilotage for large commercial shipping in Whangārei harbour is provided by Northtugz Limited. Northtugz operate a fleet of vessels to facilitate Northport, CTS and Golden Bay Cement shipping operations (see Table 6). Two tugs are generally used for all shipping movements- the Bream Bay and the Takahiwai. For the larger containerships, of length between 261m to 294m, three tugs have been used. The available bollard pull of the tugs has proven adequate for Northport and CTS shipping operations to date. CTS operations require the two larger tugs plus one to two smaller tugs as workboats to run lines to CTS jetties. Golden Bay Cement occasionally requires a single smaller tug.

The tug Takahiwai is due for replacement in the near future. Northtugz and Northport are reviewing tug requirements and investigating whether a stronger bollard pull tug should replace the Takahiwai because of the potential increase in ship lengths and drafts in the future.

The proposed shipyard and drydock facility could be serviced by the existing Northtugz tugs (see Table 6). These tugs are presently based at the existing tug jetty and in the future, a proposed new facility east of the new berths at Northport.

Tugs	**Bream Bay**	**Takahiwai**	**Marsden Bay**	**Kemp**	**Hobson**
Type	ASD	ASD	Conventional	Conventional	Conventional
Manning	2	2	2	2	2
Bollard Pull	68T	50T	27T	14T	3T
Build Date	2007	2000	2015	1992	1976

Table 6 Existing tugs operated by Northtugz

Additional tugs may be required in the future if the proposed shipyard and drydock facility is consented and as shipping needs change over time. Additional tugs could be based west in Whangārei or the Marsden Cove Marina.

1.14.1 Escort Towage Capability

Escort towage is undertaken for Northport and CTS shipping in the main shipping channel at the present time. Active escorting is used for arrivals with the tugs made fast between buoy 3 and buoy 11. Passive escorting is used for departures and the tugs will remain with the vessel until clear of buoy 14. The existing tugs are not escort rated and are limited in their ability to provide active assistance at speeds in excess of six knots.

With a potential increase in ship length and draft in the future, Northtugz and Northport Limited are reviewing whether additional escort capability be added to the existing fleet of tugs. The primary reason for this review is that the larger containerships handle better at a higher speed of about 9 knots in the critical turn around buoy 14. Also from the nature of their trade, the larger containerships will be arriving and departing at deeper drafts than is presently handled. The deeper drafts will mean the need for active escort assistance will be considered for departures as well as arrivals. Simulation results indicate that for larger, deeper draft containerships, a stronger escort rated tug is preferred for both arrivals and departures.

For the proposed shipyard and drydock facility, additional tugs could potentially assist in the procurement of escort towage. The recent TAIC report on the breakdown of the Kaitaki (https://taic.org.nz[9]) has highlighted the need for salvage tugs on the New Zealand coast. Certain escort towage could provide a salvage tug capability for the Upper North Island.

1.15 Pilot/ Tugmaster Training

Northtugz Limited provides the pilotage and towage service to Northport. Northtugz currently employs six marine pilots and has up to 15 staff available to man a total of five tugs/workboats and a pilot boat. Pilots follow a structured twenty-four month training program to receive an unrestricted licence. Additional rigor has been introduced into the marine pilot program in the last few years by:

- Improved simulation training
- Extensive use of Portable Pilotage Units (PPU) and Electronic Master Pilot Exchange (EMPX)
- An annual assessment process
- An extended audit process of all training.

Tugmasters follow a similar structured training program which consists of understudy of senior tug masters and tug engineers with on-the-job training. In the last few years more simulation training has been incorporated for tugmasters. Future expansion of the port may require more pilots and tugmasters which will be managed through the existing training programs.

For the proposed shipyard and drydock facility, specialist Pilot and Tugmaster training will need to be incorporated into the existing training programs. The intended manoeuvres for shipping into the floating drydock/ shiplift will be a new unique movement for pilots and tug masters and they will need specialist training to safely execute the required manoeuvres.

1.16 Navigation Aids

Northport Limited manages and owns the main shipping channel navigation aids from sea to Portland. Northland Regional Council is responsible for all navigation aids on Whangārei Harbour and manages Portland to Whangārei navigation aids. The Northport navigation aids are serviced and maintained by Northport Limited staff and external contractors under a structured maintenance program which categorizes each aid on its relative importance for navigation safety. The planned optimization of the shipping channel[10] identified changes to the navigation aids to improve navigational safety. Additional buoyage and additional sets of leads will provide redundancy in case of outages. Northtugz has implemented PPU (Portable Pilotage Units) carriage on all pilotage to improve the pilot's situational awareness when on the harbour. Northport Limited is providing active assistance by facilitating PPU training within the in-house simulator and is also implementing a Virtual Aids to Navigation (VToN) program for the harbour. The virtual aids provide an electronic navigation aid visible on the pilot PPU and for the ship Electronic Chart Display and Information System (ECDIS) which supplements and provides redundancy for the existing navigational buoys. Use of PPUs provides a substantial improvement for navigation safety on Whangārei Harbour. New navigation aids will be required to define the outer limits of the new turning basin of the proposed shipyard and dry dock facility.

1.17 Traffic Movements

Shipping numbers have been recorded over the last several years and Table 6 below shows the shipping numbers for Northport and the entire Whangārei Harbour (including CTS, Portland and Upper Harbour). The Upper Harbour figures are typically 85% small vessels under 100GRT.

	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019	2019/ 2020	2020/ 2021	2021/ 2022	2022/ 2023	2023/ 2024	2024/ 2025	2025/ 2026

[9] www.1news.co.nz 8th May 2026
[10] Refining NZ Desktop Simulation Study Be-Software2015/ Refining NZ Full Bridge Simulation Study Be-Software 2016

Northport	271	257	303	283	309	298	262	237	211	226	242
CTS	221	192	202	198	220	159	146	122	123	105	93
Portland	185	134	62	94	60	139 (P+UH)	126 (P+UH)	125 (P+UH)	109 (P+UH)	99 (P+UH)	104 (P+UH)
Upper Harbour	23	56	19	12	12						
Whangārei Harbour Total	700	639	586	847	952	596	534	484	443	430	439

Table 6 Total movements = ship numbers x 2

Shipping numbers dropped during and after COVID (from 2020 - 2024) and the transition of the refinery to a storage terminal in 2022. The effects of Cyclone Gabrielle in 2023 impacted on containership trade due to uncertainty in operability of rail and road transport systems. Existing total traffic movements to Northport and CTS are safely handled with available tug capacity and existing operating procedures.

The proposed shipyard and drydock facility is expected to increase shipping numbers slightly (24-48 ships annually[11]). Northport, if it extends Berth 3, can expect a small increase in shipping. CTS can expect a small increase in shipping due to new bitumen carriers and increases in fuel storage capacity for New Zealand. There is no expected increase in Portland and Upper Harbour shipping numbers[11].

Overall, a small to moderate increase in ship numbers using lower Whangārei Harbour over the next ten years is anticipated. As traffic movements increase due to the proposed shipyard and dry dock facility operations, there will be a need for traffic management. It is expected that pilot numbers and towage capability will need to increase to meet these increased demands. NRC Harbourmasters Department, Northport, MBIE on behalf of the future shipyard facility operators and other stakeholders are reviewing future traffic movements to provide the best efficiencies and risk management for the future harbour.

Provided there are adequate available pilots and tugs and vessel traffic management using time and distance separation between traffic movements, the impact on the other stakeholders will be minimized.

Ships with a tidal constraint will need to be given a priority for berthing/unberthing. At the present time the assignment of priority rests with the Harbourmaster in consultation with Northtugz and the port operator stakeholders.

1.18 Recreational Traffic

Recreational traffic in Whangārei Harbour is concentrated in the major marinas and mooring areas through the harbour. In the lower Harbour in the vicinity of Northport, Marsden Cove marina and moorings are to the west and other moorings exist at Urquhart and McLeod's Bays to the east as shown in Figure 7. It is not anticipated that these areas will be impacted by the proposed shipyard and dry dock facility because they are sufficiently remote from the proposed facility.

Recreational traffic passes Northport travelling to and from Whangārei Heads. The presence of destinations elsewhere, deep water, significant tidal streams, and security requirements (restricted area) mean that most recreational craft do not anchor or stop in the vicinity of Northport. Due to the presence of commercial shipping, local yacht clubs do not organize regattas in the vicinity of Northport. Other aquatic events are kept clear of Northport due to commercial shipping movements. Small craft fishing in the commercial shipping channel does occur but mainly in the vicinity of buoy 7 during summer months. A few small craft fishing can be a hazard to commercial shipping around the

[11] NRC, CTS, GBC meetings May 2026

Northport berths. Interference of small craft with commercial shipping is the number one risk on Whangārei Harbour[12]. This is managed presently through the Local Port Service and the pilotage provider (Northtugz). Because the proposed shipyard and drydock facility abuts the western side of Northport, recreational traffic is not expected to be impacted by the facility, however because of the specific risks of the drydock manoeuvres (directly across the prevailing tidal streams and partially blocking the channel), there will be a need for an escort boat to keep small craft clear for arrivals and departures at the proposed facility. Fortunately, Whangārei Harbour is very broad and small craft can easily be diverted around a shipping movement to areas outside the proposed turning basin with minimal loss of time and fuel.

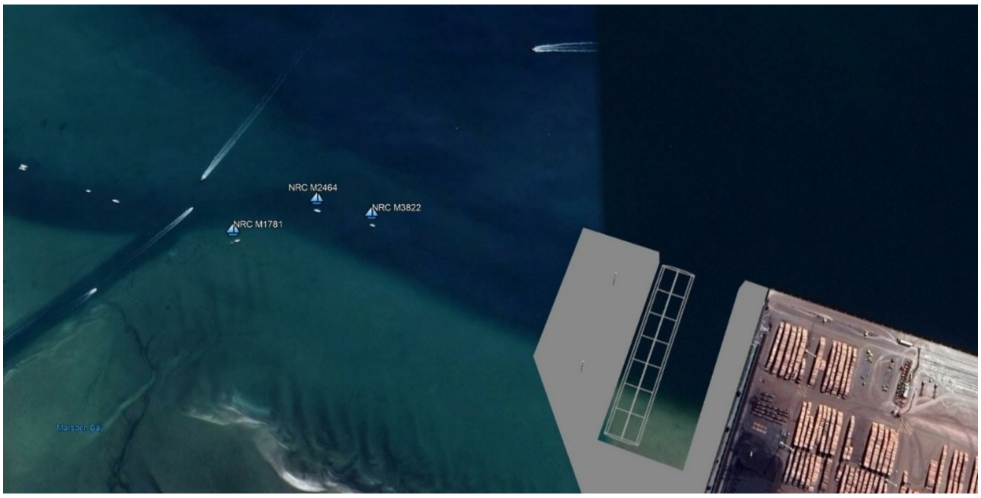


Figure 7

1.19 Vessel Traffic Service

A VTS is a service implemented by a Competent Authority, designed to improve the safety and efficiency of vessel traffic and to protect the environment[13]. It is a traffic management tool.

The service should have the capability to interact with the traffic and respond to traffic situations developing in the VTS Area. Formal VTS has not been declared as yet in New Zealand by the Competent Authority. Northport Limited runs a Local Port Service (LPS) through Whangārei Harbour Radio. The service is operated 24/7 and has been established since 2016. It is audited annually by the NRC Harbourmaster department. Provision of LPS is designed to improve port safety and co-ordination of port services within the port community by dissemination of port information to vessels and berth or terminal operators. It is mainly concerned with the management of the port, by the supply of information on berth and port conditions. Provision of LPS can also act as a medium for liaison between vessels and stevedores or allied services, as well as providing a basis for implementing port emergency plans. The

[12] Maritime New Zealand SMS Peer Review 2025.

[13] Source: IMO Resolution A.857(20)

full differences between VTS and LPS are explained in the UK Maritime and Coastguard Agency Marine Guidance Note 401[14].

The Northport Local Port Service (LPS) meets the prerequisites for an LPS in that:

- It is equipped appropriate to task.
- Manned by trained and mostly qualified staff.
- Does not require to be authorised by the competent authority.

Equipment operated by Northport staff meets the standards required for a VTS Information Service. Staffs are largely trained to the IALA V-103 standard as required for VTS. Potential traffic movements for Northport and Whangārei Harbour in the next ten years indicate that density of shipping does not warrant implementation of VTS however due to the cultural and environmental importance of Whangārei Harbour, VTS could be implemented to protect the environment. The competent authority to authorise VTS can be defined as Maritime New Zealand.

1.20 Operational Recommendations

Several studies using simulation have been undertaken to define the operating requirements for the proposed shipyard and drydock facility[15]. This assessment has been informed by those previous studies, the Operational Window Report (Appendix 2) and the July simulations (Appendix 5). From a navigation safety consideration, it is recommended that five operational matters are addressed by the detailed design and before operations begin:

1. The safety of vessels and personnel during storm events. A shiplift will have commercial shipping on the shipyard deck exposed to strong wind conditions (cyclones). A floating drydock will provide a measure of protection for the docked ship. If a shipyard is constructed, the operator will need to ensure vulnerable ships exposed to cyclonic winds are adequately secured as they will not be able to be evacuated when the port is closed. This includes ships on the deck of the shipyard and ships tied to layup berths. Storm bollards will be required in the case of the layup berths. Historically when the port is closed all ships are put to sea from Northport, CTS and Portland. This will not necessarily be possible with shipyard ships due to various states of repair. Tugs are moved to safety during a cyclone to either Whangārei or Marsden Cove marina. It is possible during a cyclone some tugs could be placed within the dock pocket or floating dry dock itself however that will really depend on the shipyard operations at that time. There is a risk that ships secured at a layup berth will not have tugs available to assist in the case of mooring line failure. This point must be addressed in the Safety Management System for the shipyard and dry dock operator. The SMS should contain a Cyclone Emergency Management Plan.

2. The operational window for the movement of ships into and out of the proposed facility will be defined by winds and tides across a narrow entrance. Full mission simulation will be required to refine a safe operational window for the operations. Included will be an additional simulation if required of any floating drydock into the dock pocket. Participation of pilots, tugmasters and dock masters will be necessary to fully validate the operation before moving to a detailed design. The lower Whangārei harbour is subject to strong winds and tidal streams

[14] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/461544/MGN_401.pdf

[15] This includes studies undertaken since 2019 for the Northland Port Western Expansion Project Appendix 1

and is not a benign environment as is evidenced by ships breaking mooring lines at Northport wharves and CTS jetties due to strong winds and tides[16].

3. Navigation aids to correctly delineate the shipping channel and new turning basin are recommended to assist recreational craft approaching the facility.

4. Ships using the dock will be constrained by large ships moored at the layup berth if positioned too far east (See Appendix 5)

5. A peer review is recommended of this report as has previously been recommended in earlier studies.[15] Requirements for the draft and displacement of the design ships have been at variance to information supplied from the proposed operator. Docking reports from ships involved in this study are available and differ considerably from supplied information. A copy of a docking report is shown in Appendix 6. Full mission simulation should be used as an integral part of the peer review

1.21 Summary of impact of the Shipyard and Drydock Facility on Navigation Safety in Whangārei Harbour

The proposed shipyard and drydock facility will not materially impact on Navigation Safety for both commercial and recreational vessels, given the following existing initiatives.

Management of the Harbour has been improved since 2016 by:

- Implementation of a Local Port Service.
- Establishment of a ship handling simulator for conducting risk assessments and training of marine service staff.
- Improvements to pilot and tugmaster training and extensive use of PPUs
- Availability of Virtual Aids to Navigation
- Real time wind speeds and trends displayed on Northport website.
- Implementation of the real time tidal stream monitoring program Seascope.
- Analysis by Metocean of wind anemometer readings at Northport berths to review wind gusting effects.
- Analysis of traffic movements by Transit Analyst.

These practices and systems will assist to adequately manage navigation safety for the proposed shipyard and drydock facility.

Safety Management systems exist for the Whangārei Harbour and all the port operators. All operators require a risk assessment and a SMS under the NZ Port and Harbour Safety Code. They must also participate in the six weekly harbour safety meetings.

The proposed shipyard and drydock will result in a low to moderate increase in shipping movements. This can be managed by existing maritime services and an increase in tug and pilot numbers.

An updated turning basin has been developed following feedback from the OWR and an early draft of this report. That updated turning basin is based on safely accommodating the largest design vessel to

[16] Hazman II incident database MNZ SMS Peer Review 2025

be accommodated (see Appendix 5). It is acknowledged that movements will later need to be full mission bridge simulated to fully refine the safe operational window of the facility. Full mission bridge simulation will involve pilots, tugmaster, docking master and harbourmasters in a coordinated simulation environment to verify the results from this report.

Use of the proposed shipyard and drydock facility must address safety of the ships at the shipyard and layup berth during cyclonic activity. This must be addressed by the operator in the Safety Management System. A cyclone management plan is required.

Channel navigation by other commercial users is not considered to be significantly impacted by the proposed facility with respect to navigation safety. Existing navigation safety systems (improvements listed above), adequate tugs, available pilots and time and distance separation between ship movements will lessen the effects on the other harbour operators (Northport, CTS, GBC)

Recreational boating will not be significantly restricted or affected by the proposed shipyard and drydock facility for the following reasons.

- Recreational traffic moving to and from Whangārei Heads is restricted to the northern part of the shipping channel which is the existing situation today due to the presence of both the existing Northport berths and CTS jetties.
- The shipyard and drydock facility is considered as not impacting the mooring area east of Marsden Cove Marina. It will not need to be moved.
- The shipyard and drydock facility area is not used by many recreational craft as the existing Northport berths and strong tidal streams already curtail recreational boating use.
- A dedicated escort boat can be used to prevent small craft impeding the movement of larger vessels entering and leaving the floating drydock/ shiplift facility.

There are other wider potential improvements to harbour safety that could be implemented, although these are not necessary due to the proposed drydock facility itself. One example is the establishment of a harbourmaster at Marsden Point to further improve oversight of the navigation safety of the Harbour [12].

Appendix 1 Summary of Simulation Studies undertaken by Northport

Studies directly relevant to this navigation safety report are shown in bold. Other shiplift facility simulations are in red.

Activity	Purpose	Client	Year	Status
Channel Optimization	Port Development	RNZ	2015/19	Complete
Containership 231m	Risk Assessment Manoeuvrability	Northport	2018	Complete
Containership 260m	Risk Assessment Manoeuvrability	Northport	2018	Complete
Car Carrier 200m	Risk Assessment Manoeuvrability	Northport	2018	Complete
Floating Dry Dock Simulation Study Phase 1 Be Software	**Port Development**	**Northport**	**2019**	**Ongoing**
Pilot Training	Professional Development	NorthTugz	2019/20	Ongoing
LPS Training	Local Port Service Course	Northport	2019/20	Ongoing
Emergency Response	Oil Spill Response	NRC/MNZ	2019	Ongoing
Pilot Training	Professional Development	Eastport	2019/20	Ongoing
Pilot Training	Professional Development	NRC	2020	Ongoing
Berth overhangs	Risk assessment mooring line analysis	Northport	2019	Complete
LPS Training	Local Port Service Course	GWRC	2020	Ongoing
Containership 294m	Risk Assessment Manoeuvrability	Northport	2020/21	Complete
Containership 318m	Risk Assessment Manoeuvrability	Northport	2020	Ongoing
Containership 366m	Risk Assessment Manoeuvrability	Northport	2020	Ongoing
Operational Use of RNZ Jetty 3 with Proposed Northport Berths 4 and 5	Risk Assessment Manoeuvrability	Northport	2020	Complete
RNZS Aotearoa Manoeuvring at Western End of Northport Facility	**Risk Assessment Manoeuvrability associated with shipyard facility**	**Northport**	**2020**	**Complete**
Yacht Carrier Berth 3 Semi-submersible	Risk assessment mooring lines	Northport	2021	Complete
Northport Vision for Growth	Simulation of proposed new berths 4 and 5	Northport	2023	Complete
GBC New vessel	Simulation of a proposed new cement carrier for GBC	Golden Bay Cement	2024	Complete
Darwin Shiplift	Design of manoeuvring space for proposed new Darwin shiplift Facility	WGA	2024	Complete
Review of Proposed Layup Berths and Floating Dock	**Update design of proposed floating dry dock.**	**Northport**	**2024**	**Complete**
Mandurah Ferry Terminal	Design of a new manoeuvring basin for a passenger terminal ferry servicing Mandurah and Darwin	WGA	2024	Complete
Bell Bay Channel Review	Review of the approach channel into Bell Bay Tasmania for wind farm installation vessels	TASPORTS	2025	Complete
Cairns Shiplift	Review of proposed shiplift facility	WSP	2026	Ongoing
Darwin Marine Supply Base	Development of a new approach channel and turning basin for the Marine Supply Base Darwin	WSP	2025/26	Ongoing
Shipyard and drydock facility	**Proposed shipyard with either a floating drydock or shiplift haul out facility**	**MBIE**	**2026**	**Ongoing**
Henderson Naval Maintenance Facility Fremantle WA	RAN naval supply and maintenance base	WSP	2026	Commence
Hastings Channel and Turn Basin Review	Review of the approach channel into Hastings Victoria for wind farm installation vessels	WSP	2026	Commence

Additional non simulation study under BECA Northport Drydock Operability Assessment 2025

Appendix 2 Operational Window Report OWR

2.0 Simulation Project Description

The development and operation of shipyard and drydock facility abutting the western side of the existing Northport port facility at Marsden Point, Whangarei Harbour. The project includes a reclamation, vessel haul-out system, and associated wharf structures, dredging and supporting infrastructure. This simulation study tested the proposed design of the facility in a simulated environment using expected design ships and tugs operating into and out of the facility. Both the floating dock/ shiplift, turning basin and layup berth were tested against expected environmental conditions at the facility.

2.1 Simulation Introduction

This simulation was conducted by Northport using their in-house simulator at Northport and Melbourne. The aim of the simulation was to determine an operational window for the facility for both haul out and return to water. A range of ships were selected by MBIE to be representative of the ships intending to use the drydock (either floating or shiplift).

2.2 Simulation Attendees

Bruce Goodchild (Northport Simulation Manager)

Paul Watchman, (Northport modeller and Simulation Instructor.)

See Appendix 7 for qualifications and experience of the simulation attendees

2.3 Northport and Melbourne simulator

The Northport simulator is a Lanterna system developed by Be-Software of Italy and the current software version is 4-1-7. Identical software exists in Melbourne. The system has been benchmarked against Smartships Brisbane and MIT Auckland and K-Sim NZ Navy Devonport. Lanterna is specifically designed for port development and research projects and has the following key features:

- Advanced Under Keel Clearance (UKC) calculations based on accurate squat, roll, pitch and heave movements in wave conditions.
- Hydrodynamic and visual representations of both primary & secondary swells as well as wind waves.
- Computational speed for 10-15 milliseconds for all interactive and UKC calculations.
- Tidal stream calculations based on 11 points along the ship's hull (more than competing systems). Tidal streams can be calculated based on a 20 metre grid with changes in tidal velocity every six minutes.
- Accurate interaction effects for channel banks and passing ships.
- Highly developed ship modelling capability for both hydrodynamics and visuals.
- Capability to rapidly change drafts, windages and stability criteria to investigate effects of wind heel or wave induced motions on UKC.
- Ship hydrodynamic modelling based around ABS Ratings Based manoeuvrability standards.

- All ship motions (track swept paths, roll, pitch, wind heel, ground speed, water speed, Rate of Turn), UKC, rudder angles, engine orders, tug forces and interactive effects are stored and available for graphical analysis. Track envelopes can be developed for analysis of dredging requirements.

The Northport Simulator is featured in Figure 1 below. The software operates in real time with accelerated time capability. Typically, 20-30 simulation runs can be completed in a single day, and the system can be operated by one or two people comfortably.

Figure 1: Northport Simulator.

2.4 Simulated Area used

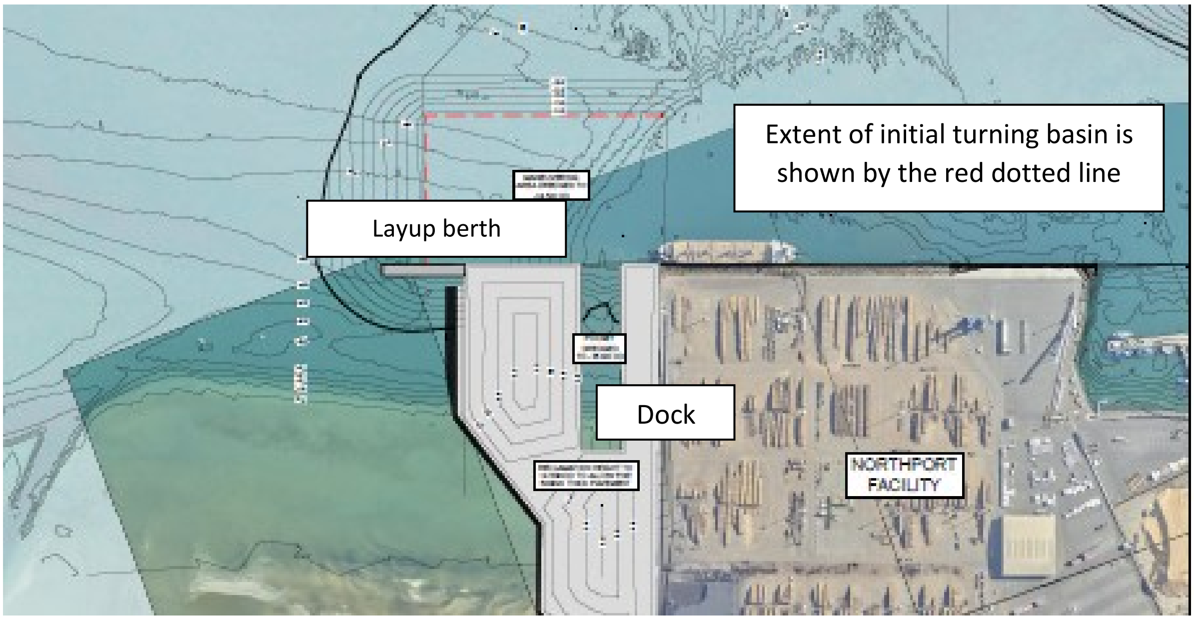


Figure 2: Simulated Area used in May June Simulations.

The area Marsden 6 was developed to show the proposed shipyard and drydock facility at the western end of the Northport site as shown in Figure 2. The environmental conditions, bathymetry, design ships and tugs were loaded into the simulator. The run plots shown separately define the operating area including the layup berth and dock.

The design ships used in the simulations and the available tugs are shown in Table 1 and 2.

2.5 Simulation Design Ships Available

Ship	LOA	Beam	Draft	Type
Spirit of Tasmania 5	212	31	5.1/ 5.3	Ferry
Banu	231	32	5.39/6.35	Container
Shansi	200	28	4.9/ 5.08	Container
ANZAC	118	14.8	6.1/ 6.3	Frigate
Tanzanite	120	20	4.6/4.8	Mega Yacht
HMNZS Aotearoa	168.7	24.5	4.5/4.7 8.3/8.3	Fleet Tanker
Awanuia	79.9	15	3.9/4.1	Oil Tanker
Yanghu_B	228	32.3	7.05/ 9.05	Oil Tanker

Table 1: Design Ships used in simulations.

2.6 Simulation Tugs Available

Tugs **Abbreviation**	**Bream Bay** **BB**	**Takahiwai** **Taka**	**Marsden Bay MB**	**Kemp**	**Hobson**
Type	ASD	ASD	Conventional	Conventional	Conventional
LOA	24m	22m	17m	16.5m	13.8m
Bollard Pull	68T	50T	27T	14T	3T
Build Date	2007	2000	2015	1992	1976

Table 2: Tugs used in simulations.

Table 2 shows the Northtugz fleet. The tugs all have differing bollard pulls. Four tugs are necessary with the majority of the design ships and manoeuvres required. It was found in the simulation it was necessary to have two or three of particular size tugs to successfully attempt a manoeuvre.

2.7 Simulation Methodology

The simulation tested the movements of ships from layup berth to dock and then dock back to the layup berth. See Figure 2 and simulation run plots. It was considered useful to test the operability of both dock and layup berth in these simulations. Ship movements direct from/to sea will be simulated later due to considerations of adequate space with the initial design turning basin. All the manoeuvres simulated are deadship (no engines or thrusters).

To determine the feasibility of the facility, three scenarios are tested.

1. Firstly, arrivals from the layup berth. The simulation will look at holding ships safely in position just off the dock entrance and perpendicular to it. Need to be able to demonstrate the ship can maintain position for 15 minutes either bow first or stern first and make fast lines or mules. It will require reviewing both spring and intermediate tides for the different design ships. Requirements for towage will be investigated.
2. Secondly, moving ship into dock with mules or lines and maintaining control under different tidal conditions. This has been simulated in earlier studies but will be reviewed again here (see references 2.14 pg31 [1,2,3 and 4]). Shore based mules running on tracks (similar to what is used in the Panama Canal) were used in this and the earlier studies to provide a moving winch for ship mooring lines. Mule power was rated at 30 tonnes bollard pull.
3. Thirdly, departures from the dock and maintaining control to bring the ship back to the layup berth.

The simulation was conducted in 2D only; there was no visual scene display. The simulator was operated by a single person to control tugs and mules.

2.8 Environmental Modelling Tidal streams and heights

Tidal stream modelling was undertaken by Calypso Science to provide a range of intermediate and spring tides to determine likely effects on the design vessels entering and leaving the facility. For this study, a spring tide of range 2.5m was used. An intermediate tide of range 2.0m was also used. Based on the Seascope program developed for Northtugz, the application allows the user to select a date for review. Can be a spring, neap or intermediate tide and then choose the interval in relation to high water. The display will show the predicted stream and also the effect of the proposed drydock structure. This case in Figure 3 shows 2hrs after high water for a 2.3m range spring tide. The left screen shows the tide across the dock entrance of 0.78 knots and on the right screen it shows the effect of the structure has on the tide stream, about 25% higher at dock entrance. This data is loaded into the simulator as a tidal diamond file for the entire area. MetOcean Solutions (Metocean) also provided hydrodynamic modelling in the area which provided a useful check on the Calypso Science stream modelling. It was considered the tidal modelling was largely in agreement.

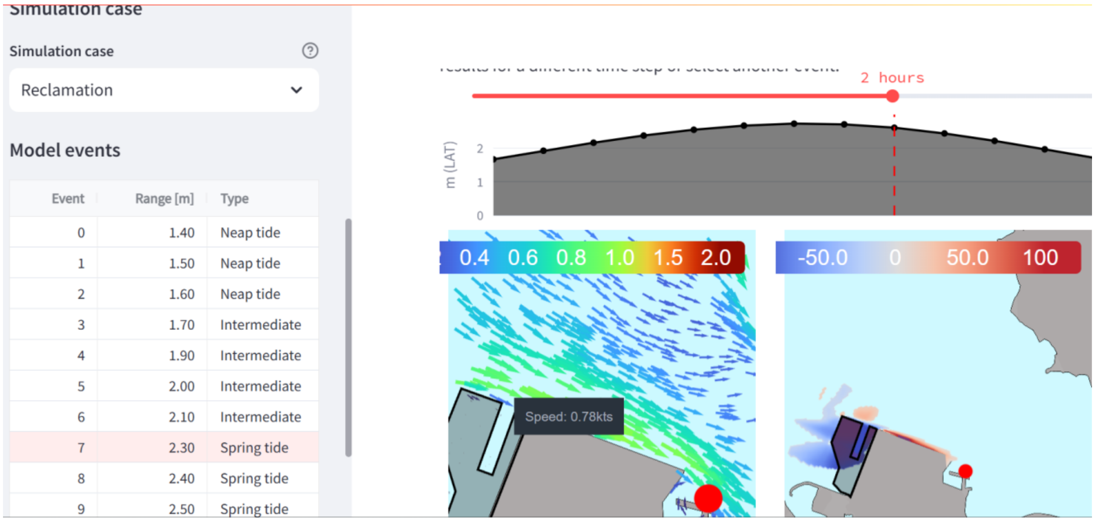


Figure 3 Calypso Science Tidal Application

2.8.1 Environmental Modelling Wind effects

Wind effects were modeled by Metocean based on anemometer locations around Northport. These locations are shown on the Northport website and in the Metocean study report (see References 2.14 pg 31[7]).

Preliminary analysis was done of the Northport A3 light tower anemometer at berth 2. This is the closest anemometer to the dock. The results are shown here in Figure 4 and 5.

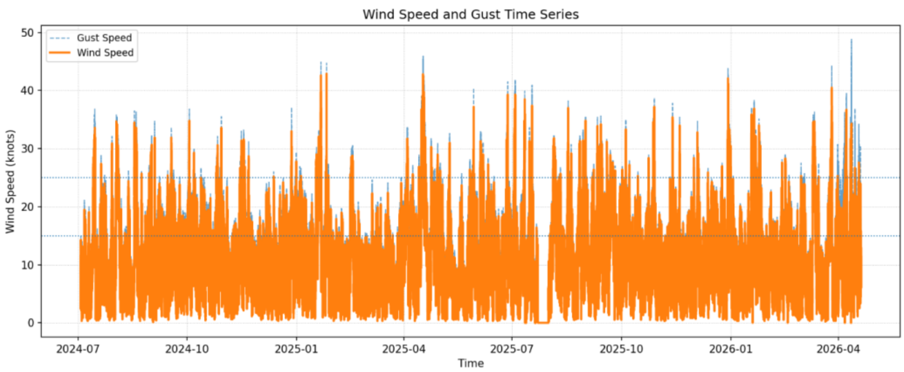


Figure 4: Anemometer data from A3 light tower at berth 2.

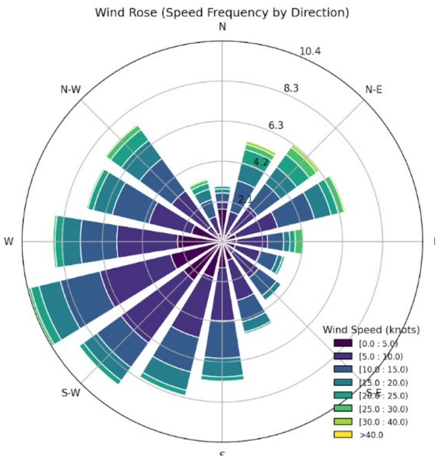


Figure 5: Wind Rose Directions

The wind rose in Figure 5 shows that the predominate winds are WSW during the period analyzed. Wind speeds less than 15 knots are the most common with gusts from 5% to 10% above that.

2.8.2 Environmental Modelling Wave effects

Wind waves were considered for this simulation study; however the wind speeds simulated were unlikely to create waves likely to affect the design ships used. Swell effects were not allowed for in the simulation study but were not considered to have an appreciable effect due to the location of the facility within the harbour and observations from wave monitoring buoys and pilots (see References 2.14 pg31[1,4]).

2.9 Shiplift or Floating drydock considerations

The simulation considered a floating drydock which had fendering to protect the dock. It was considered a shiplift would have similar fendering arrangements. It was considered that the shiplift would not be materially different from the floating drydock in terms of handling of ships through the dock. Both floating dry dock and shiplift were considered to be able to offer a winching system using mechanical mules similar to the original locks in the Panama Canal. Additional mooring lines were not simulated for this study but in practice would be available to assist in maintaining alignment within the dock. The critical area for the study focus was being able to maintain position at the entrance and largely into the dock to safely transfer from tug assist to mule assistance. This was investigated for both arrival and departure and it was considered a waiting time of 10 to 15 minutes was necessary to change between tugs and mules or vice versa.

Guide to simulation run viability

This coloured guide gives an indication of the success or otherwise in safely manoeuvring a simulated ship into or out of the proposed shipyard and drydock facility under different environmental conditions and using stated towage conditions.

1. Unacceptable — not achievable for some conditions
2. Marginal — quite challenging for some conditions
3. Acceptable — could be further optimized
4. Good — easy achievable for most conditions
5. Excellent — easy achievable for all conditions

2.10 Summary of Simulation Runs

Below is a summary of the individual simulation runs conducted during this study and comments re viability. The run sheet information in Appendix 3 provides greater detail re the individual runs and the simulation plots in appendix 4 show a graphical analysis of the movement of the design ship.

Runs 01 -03: Arrival from Layup berth to entrance to Dock. Frigate ANZAC used in ebb and flood spring tides to maximum rate. Winds were kept to 15 to 20 knots. Used tugs Bream Bay and Takahiwai plus two tugs size of Kemp. Successfully maintained positions off dock to enable attach lines ready for entering dock.

Runs 04 -05: Arrival from Layup berth to entrance to Dock. Fleet tanker Aotearoa used in ebb and flood spring tides. Winds were kept to 15 to 20 knots. Used tugs Bream Bay and Takahiwai plus two tugs size of Kemp. Maintained ship positions successfully off dock to enable attach lines ready for entering dock. However it was found ship went outside turning basin and Kemp size tugs were underpowered. Runs were acceptable.

Runs 06 -07: Arrival from Layup berth to entrance to Dock. Mega yacht Tanzanite used in maximum ebb spring tides. Winds were kept to 15 to 20 knots. Used four tugs the size of Kemp. Successfully maintained positions off dock to enable attach lines ready for entering dock.

Runs 08 -10: Arrival from Layup berth to entrance to Dock. Containership Shansi used in ebb and flood spring tides. Winds were kept to 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus Kemp and Marsden Bay. Difficulty experienced in maintaining position off the dock, to enable attaching lines ready for entering dock. However it was found ship went outside turning basin and brushed the wharf in one instance. Runs were unacceptable to acceptable.

Runs 011 - 014: Arrival from Layup berth to entrance to Dock. Ferry Spirit of Tasmania used in ebb and flood spring tides. Winds were kept to 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay tugs. Difficulty experienced in maintaining position off the dock, to enable attaching lines ready for entering dock. It was found ship went outside turning basin and some wrong tug orders got the ship out of position. Runs were unacceptable to acceptable.

Runs 015 - 020: Entry from entrance of dock to secure position inside the dock. Ferry Spirit of Tasmania used in ebb and flood spring tides. Winds were kept to 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay tugs. Ran into dock in control and successful. Runs were all good.

Runs 021-025: Departure from dock to the layup berth. Ferry Spirit of Tasmania used in ebb and flood spring tides. Winds were kept to 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay tugs. Ran out of the dock ok, and then swung ship to starboard to clear dock. Some difficulty was experienced in controlling the ship in the wind and tide. Wrong tug order made one of the runs unacceptable. The other runs were acceptable to good.

Runs 026-027: Departure from dock to the layup berth. Fleet Tanker Aotearoa used in maximum ebb spring tides. Winds were varied from 15 to 20 knots to 20 to 25 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay tugs. Ran out of the dock ok, and then swung ship to starboard to clear dock. Some difficulty was experienced in controlling the ship in the stronger wind set up to 25 knots. Runs were good to acceptable.

Runs 028-029: Departures from dock to the layup berth. Containership Shansi used in maximum ebb spring tides. Winds were 20 to 25 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay tugs. Ran out of the dock ok, and then swung ship to starboard to clear dock. Some difficulty was experienced in controlling the ship in the stronger wind set up to 25 knots. Runs were both marginal.

Runs 030-031: Departure from dock to the layup berth. Mega yacht Tanzanite used in maximum ebb spring tides. Winds were 20 to 25 knots. The tugs used were Marsden Bay and Kemp tugs. Ran out of the dock ok, and then swung ship to starboard to clear dock. Some difficulty was experienced initially controlling the ship in the stronger wind set up to 25 knots. Kemp tugs were found underpowered. Better to use four Marsden Bay tugs. Runs were acceptable to good.

Runs 032-033: Departure from dock to the layup berth. ANZAC Frigate and Awanuia used in maximum ebb spring tides. Winds were 20 to 25 knots. The tugs used were Marsden Bay and Kemp tugs. Ran out of the dock ok, and then swung ship to starboard to clear dock. Runs were good to acceptable.

Runs 034-035. Departure from dock to the layup berth. Containership Banu used in ebb and flood spring tide. Winds were 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay tugs. Ran out from dock ok then swung ship to starboard. First run was only acceptable due to a wrong tug configuration but the second run was good and much more controlled. Ship too big for turning basin.

Runs 036: An arrival from the layup berth to the entrance of the dock. Containership Banu used in low water ebb spring tide. Winds were kept to 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay. No difficulty experienced in maintaining position off the dock, to enable attaching lines ready for entering dock. Run was good. Ship was too big for turning basin.

Runs 037-042: Arrivals from Layup berth to dock entrance. Containership Banu used in intermediate flood and ebb tide. Tidal range was 2.0m Winds were kept to 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay. No difficulty experienced in maintaining position off the dock, to enable attaching lines ready for entering dock. Runs were good to acceptable. Misjudgement by pilot on run 38 caused ship to hit the wharf hard which was unacceptable. Ship was too big for turning basin.

Runs 043-044: Arrival from Layup berth to dock entrance. Spirit of Tasmania used in intermediate flood tide. Tidal range was 2.0m Winds were kept to 15 to 20 knots then increased to 20-25knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay. Some difficulty experienced with the higher wind speed. Runs were acceptable at 20 knots then marginal with the higher wind speed 25 knots. Ship was too big for turning basin.

Runs 045-046: Arrival from Layup berth to dock entrance. Aotearoa used in intermediate flood tide. Tidal range was 2.0m Winds were 20-25knots then reduced to 15-20knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay. Some difficulty experienced with the higher wind speed. Runs were good at 20 knots then unacceptable with the higher wind speed 25 knots. Ship hit the dock on Run 046.

Runs 047-048: Departures from dock to the layup berth. Aotearoa and Spirit of Tasmania were used in intermediate flood tide. Tidal range was 2.0m. Winds were 15 to 20 knots. The tugs used were Bream Bay, Takahiwai plus two Marsden Bay. Ran out of the dock ok, and then swung ship to starboard to clear dock. Runs were both acceptable. Aotearoa was kept in swing basin but a wrong order on tug made it difficult to realign for the lay up berth. SPOT went out of the swing basin and had difficulty with the wind but managed to land ok on the layup berth.

Run 049: A departure from dock to the layup berth. Yanghu_B was used in an intermediate flood tide. Tidal range was 2.0m. Winds were 15 to 20 knots. The tugs used were Bream Bay, and three Takahiwai. Cleared dock ok but was unable swing the vessel enough to turn clear. Tidal force was too strong on the 9m draft ship. Possibly four Bream Bay tugs could achieve the swing. This run was unsuccessful.

Run 050: Departure from dock to the layup berth. Aotearoa at 8m was used in an intermediate maximum flood tide. Tidal range was 2.0m. Winds were 15 to 20 knots. The tugs used were Bream Bay, and three Takahiwai. Cleared dock and swung to starboard successfully. Ship stayed in the turning basin but difficult to control and landed heavily at the layup berth. This run was marginal but considered achievable at a HW slack.

2.11 Conclusions from the May June Simulation Runs

Arrivals and departures of the design ships were simulated from layup berth to dock and return during spring tide and intermediate tide conditions. The simulation found shipyard and drydock facility safely workable within the operational window for these design ships, as shown in Table 3.

Three scenarios were tested across 50 simulations:

1. Scenario 1 simulated ship arrival from layup berth to just off the entrance of dock perpendicular to wharf face. The simulation demonstrates that ships can safely maintain position for 15 minutes until lines/ mules are made fast.
2. Scenario 2 simulated ships moving into the dock. It was necessary to hold the ship in position when largely inside the dock to enable 2nd set of mules to be made fast to replace the quarter tugs. Aft tug on centre lead aft was used to control stern of ship. Had to allow about 10 mins for the aft mules to be made fast. The simulation has found this was largely successful.
3. Scenario 3 simulated the ship moving out of the dock safely and placing back at layup berth. Again the ship had to be held in position to enable transfer of mules back to tugs and this required about 10 minutes with the ship stable in position largely out of the dock. The simulation has found this was largely successful for differing wind conditions.

The simulations identified the following matters:

Larger ships Banu, SPOT and Shansi when swinging toward the drydock enter into the 10 metre contour which is beyond the extent of the proposed Turning Basin. This is for both arrivals and departures. Ships entering the 10 metre area can expect larger tidal forces acting on that part of the ship in the reduced underkeel clearance area (see References 2.14 pg 31 [5]).

1. If forces from winds and tides can be balanced, the ship will remain safely in position ready for lines or tugs. Any mistakes in tug orders will cause an imbalance which is time consuming and difficult to correct with larger ships. There is no guiding wall or dolphins for the entrance to the dock which is the normal for most dry docks. As such the pilot must use the tidal stream or wind to push the ship against to hold in position. Effectively a moving wall which will work but it is very delicate operation for Pilot and tugmasters (4) to co ordinate together.
2. Tugs in the push mode were found easier to handle than tugs on a line. Tugs used are existing tugs in the Northtugz fleet however more tugs would be required. Two additional tugs based on Kemp and Marsden Bay should be considered. The additional tugs should be reviewed

carefully. A bollard pull of 27 tons would be the minimum based on the simulation. If deeper draft ships are expected regularly then stronger additional tugs of bollard pull 50-70 tons should be considered.

2.12 Indicative Operational Window based on May June Simulations

The following table 3 describes the indicative Operational Window for the proposed Floating Dry Dock/ Ship lift facility based on stipulated turning basin dimensions shown in Figure 2 (red dotted line), maximum spring and intermediate tides and stated wind limits. These figures were established from this simulation study and earlier simulation studies (see References 2.14 pg31[1,2,3,4]).

. All manoeuvres were deadship (no engines or thrusters available). Additional full mission simulation should be conducted to verify the findings.

Ships	Drafts	Tidal Range	Tidal Conditions	Wind Limits
Ships > 199m<230m	Up to 6.5 m	Full Spring	HW +- 1 hr	15-20kts
Ships 150-199m	Up to 6.5 m	Full Spring	HW/LW +-2 hrs	15-20 knots
Ships 100-150m	Up to 5.5 m	Full Spring	HW/LW +- 3 hrs	20-25 knots
Ships < 100m	Up to 5.0m	Full Spring	HW/LW +- 3hrs	20-25 knots
Ships > 199m<230m	Up to 6.5 m	Intermediate Tide Range 2.0	HW/LW +- 3 hrs	15-20kts
Ships 150-199m	Up to 6.5 m	Intermediate Tide Range 2.0	HW/LW +-3 hrs	15-20 knots

Table 3

2.13 Recommendations

1. It is considered necessary to put a draft restraint on the ships using the facility due to the ships exiting the designated turning basin shown in Figure 2 (red dotted line). Ships outside of the turning basin area will be subject to stronger tidal forces due to reduced underkeel clearance. This makes the docking manoeuvres more risky due to the ship having more difficulty reaching an equilibrium state under tug control. Deeper drafts than those in the operational table can be attempted at different tidal ranges but it will require further simulation. It is possible that deeper draft ships will require larger tugs of 50 to 70 bollard pull.
2. Turning basin dimensions need to be defined properly for the size of ships using the basin. International guidelines must be followed. The dimensions of the basin are needed for enforcement of bylaws for small craft to help prevent recreational craft impeding the passage of larger ships using the dock.
3. Full mission simulation will be necessary to ensure pilots/ tugmasters and dockmasters can fully co-ordinate the control of the ship. Most of the movements will require 4 tugs and 4 sets of mules which mean the pilot and dockmasters must correctly interpret the movement of the ship across potentially six other individuals. (See figure 6). The tugmasters and mule operators must also correctly understand the orders and forces to apply. It is a coordinated movement which is achievable but must be trained for and simulated first under full 3D mission simulation.
4. Knowledge of the actual tidal stream is critical. A current meter deployed initially to calibrate the tidal model used in Seascope will be an essential. Having a current meter available operationally at the dock entrance would be of great assistance for the pilot and dockmasters.

5. Any additional tugs should be highly manoeuvrable. Additional conventional tugs should be avoided. It is recommended to have ASD or Tractor tugs if new towage units are provided. Tugs which can lay alongside the ship to push such as Rotor Tugs or Transverse tugs would bean an advantage.

Katsushika Hokusai Figure 6

2.14 References

1. Northport Floating Dry Dock Simulation Study Phase 1 2019
2. Northport Review of Proposed Layup Berths and Floating Dock 2024
3. BECA Northport Drydock Operability Assessment 2025
4. Conversations Northtugz Pilots and Tugmasters 2019-2025
5. Hydrodynamic Update Version 1.0 May 2026 Effects of Proposed Reclamation and Dredging Layout on Hydrodynamics Metocean
6. Whangarei Report b196-prod.app.oceanum.io Calypso Science 12/03/26
7. Analysis of model and measured wind data for Northport Shipyard. Metocean May 2026

Appendix 3 Operational Window Report Detailed Simulation Runsheet

Run Number	**Maneuver**	**Tide Range**	**Tide HW**	**Wind**	**Ship**	**Viability of run**	**Tugs**	**Comment**
001	Arrival from layup	9	HW +2	NE 15 gusting 20	ANZAC		BB aft Taka FWD 2 x Kemp	Swung to stbd. Tugs used at 30%-60% power. Tak was up to 60% holding in tide. Held in position off dock for 15mins as mules attached. Successfully balanced forces on ship
002	Arrival from layup	9	HW -2	NE 15 gusting 20	ANZAC		BB aft Taka FWD 2 x kemp	Swing to port. Ship wanting to rush ahead. Tugs 30-40%. Held in position off dock for 15mins as mules attached. More difficult to balance forces than the previous run
003	Arrival from layup	9	HW +3	NW 15 gusting 20	ANZAC		BB aft Taka FWD 2 x kemp	Swing to stbd. Ship wanting to rush astern. Tugs 30-40%. Held in position off dock for 15mins as mules attached. Less difficult to balance forces and ok
004	Arrival from layup	9	HW -2	E 15 gusting 20	Aotearoa		BB aft Taka FWD 2 x kemp	Swing to port. Ship wanting to rush ahead. Tugs 30-40%. Held in position off dock for 15mins as mules attached. Difficult with larger ship. Outside basin. Needed both tugs to control speed at 100% therefore need a bigger tug for fore and aft control Ship too big for turn basin
005	Arrival from layup	9	HW 2	NW 15 gusting 20	Aotearoa		BB aft Taka FWD 2 x kemp	Swing to stbd. Ship wanting to rush ahead. Tugs 30-50%. Held in position off dock for 15mins as mules attached. Difficult with larger ship. Outside basin. Needed both tugs to control speed at 100% therefore need a bigger tug for fore and aft control. Ship too big for turn basin
006	Arrival from layup	9	HW 3	NE 15 gusting 20	Tanzanite		Kemp aft Kemp FWD	Swing to stbd. Ship wanting to rush ahead. Tugs 10-50%. Held in position off dock for 15mins as mules attached. Wind and tide balanced. Quite simple to control. Very little adjustment need of the tugs. In equilibrium

							2 x kemp	
007	Arrival from layup	9	HW 3	NE 15 gusting 20	Tanzanite		Kemp aft Kemp FWD 2 x kemp	Swing to port. Ship wanting to rush ahead. Tugs 50-80%. Held in position off dock for 15mins as mules attached.. Quite simple this ship to control. Very little adjustment need of the tugs. In equilibrium
008	Arrival from layup	9	HW -1	SW 15 gusting 20	Shansi		BB aft Taka FWD 1 x MB 1 x Kemp	Swing to port. Ship wanting to rush ahead. Tugs 50-80%. Hit dock lightly on swing. Hit at fender so ok. Difficult to control fore and aft speed. Difficult to maintain position as mules attached. Great difficulty in reaching equilibrium. Unsuccessful. Ship too big for swing basin.
009	Arrival from layup	9	HW -0.5	SW 15 gusting 20	Shansi		BB aft Taka FWD 1 x MB 1 x Kemp	Swing to Stbd. Ship wanting to rush ahead. Tugs 20-30%. Successful. Reached equilibrium and maintained position to attach mules Ship too big for swing basin.
010	Arrival from layup	9	HW 2	W 15 gusting 20	Shansi		BB aft Taka FWD 1 x MB 1 x Kemp	Swing to Stbd. Ship wanting to rush ahead. Tugs 20-30%. Successful. Reached equilibrium and maintained position to attach mules Ship too big for swing basin.
011	Arrival from layup	9	HW 1	W 15 gusting 20	SPOT		BB aft Taka FWD 2 x MB	Swing to Stbd. Ship wanting to rush ahead. Tugs30-40%. Successful. Reached equilibrium and maintained position to attach mules Ship too big for swing basin.
012	Arrival from layup	9	HW -2	SW 15 gusting 20	SPOT		BB aft Taka FWD 2 x MB	Swing to Port. Ship wanting to rush ahead. Tugs40-50%. Marginal Difficult to reach equilibrium and maintained position to attach mules. Tugs pulling not pushing. Wrong tug order got 15 degrees out of alignment. Recovered but not felt good. Marsden bay working hard

								to maintain longitudinal position. Probably better to swing to starbd. Ship too big for swing basin.
13	Arrival from layup	9	HW -2	SW 15 gusting 20	SPOT		BB aft Taka FWD 2 x MB	Swing to Stbd. Ship wanting to rush ahead. Tugs40-50%. Marginal. Turned early and ran back to dock perpendicular to wharf Difficult to reach equilibrium and maintain position to attach mules. Tugs pulling and pushing. Wrong tug order again got 30 degrees out of alignment. Recovered ok but 30 mins to get into position. Marsden bay working hard to maintain longitudinal position. Attached mules and rearranged tugs and came back into dock. In dock after 70 mins. Four mules used. Ship too big for swing basin.
14	Arrival from layup	9	HW -5	NE 15 gusting 20	SPOT		BB aft Taka FWD 2 x MB	Swing to Stbd. Ship wanting to rush ahead. Tugs40-50%. Marginal. Turned early and ran back to dock perpendicular to wharf Ok to reach equilibrium and maintain position to attach mules. Tugs pulling and pushing. Marsden bay working hard to maintain longitudinal position. Ship too big for swing basin.
15	Run into dock	9	HW-5	NE 15 gusting 20	SPOT		BB aft 2 x MB	Used mules to drag into dock from stable position. Tricky with alignment. BB and Marsden aft on either side to push. Other MB on stbd midship to push up while it could. Taka free. Got in ok using four mules. Consider Taka shifted to a line aft
16	Run into dock	9	HW +4	W 15 gusting 20	SPOT		BB aft 2 x MB Taka on centre lead aft	Used mules to drag into dock from stable position. Better with alignment. BB and Marsden aft on either side to push. Other MB on stbd midship to push up while it could. Taka on a line aft. Got in ok using four mules. Better arrangement
17	Run into dock	9	HW -1	SSW 15 gusting 20	SPOT		BB aft quarter 2 x MB	Used mules to drag into dock from stable position. Better with alignment. BB and Marsden aft on either side to push. Other MB on stbd midship to push up while it could. Taka on a line aft through

							Taka on line aft	centre lead. Got in ok using four mules. Better arrangement
18	Run into dock	9	HW -1	NE 15 gusting 20	SPOT		BB aft quarter 2 x MB Taka on line aft	Used mules to drag into dock from stable position. Better with alignment. BB and Marsden aft on either side to push. Other MB on stbd midship to push up while it could. Taka on a line aft through centre lead. Got in ok using four mules. Managed to maintain position for 10 mins with Taka alone while aft mules made fast
19	Run into dock	9	HW -2	E 15 gusting 20	SPOT		BB aft quarter 2 x MB Taka on line aft	Used mules to drag into dock from stable position. Alignment ok. BB and Marsden aft on either side to push or pull. Other MB on stbd midship to push up while it could. Taka on a line aft through centre lead. Got in ok using four mules. Managed to maintain position for 15 mins with Taka alone while aft mules made fast
20	Run into dock	9	HW 2	WSW 15 gusting 20	SPOT		BB port shoulder 2 x MB Taka on Centre lead forward	Used mules to drag into dock from stable position. Alignment just ok. BB and Marsden forward on either side to push or pull. Other MB on port midship to push up while it could. Aft mules taking weight. Taka on a line forward through centre lead. Got in ok using four mules. Managed to maintain position for 15 mins with Taka alone while forward mules made fast
21	Depart dock	9	HW -2	NE 15 gusting 20	SPOT		Taka line forrard centre lead 2 x MB BB aft	Used mules to drag out to the dock entrance. Alignment just ok. BB standing by. Mules taking weight. Taka on a line forward through centre lead. Got out ok. Tug BB came in aft and put up a line as stern cleared the dock. MB pushing port quarter. Other MB on a line starboard shoulder. Cleared dock and to layup in30 minutes.
22	Depart dock	9	HW 2	WSW 15 gusting 20	SPOT		Taka line forrard centre lead 2 x MB BB aft	Used mules to drag out to the dock entrance. Alignment just ok. BB standing by. mules taking weight. Taka on a line forward through centre lead. Got out ok. Tug BB came in aft and put up a line as stern cleared the dock. Both MB pushing starboard shoulder. Cleared dock but wrong tug orders and ship back into MP! Under wind and tide. Very difficult to recover Unsuccessful maneuver. Eventually reached lay up berth after 40 minutes.
23	Depart	9	HW	WxS 15	SPOT		MB line forrard centre lead	Used mules to drag out to the dock entrance. Alignment ok. Mules

	dock		2	gusting 20			Taka stbd shoulder 1 x MB spare BB aft	taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast. Pulled out. BB to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as BB made fast on stbd quarter. With BB fast pulled out of dock and clear after 25 mins. Once again difficult to control in wind and tide. Kept clear of MP1 but well to north and outside of turning basin. Stabilized eventually and pushed into layby berth after 60 mins. Operation is only marginal at spring tides for the SPOT. Kept 1 MB spare to simplify communications
24	Depart dock	9	HW 0.5	SW 15 gusting 20	SPOT		MB line forrard centre lead Taka stbd shoulder 1 x MB spare BB aft	Used mules to drag out to the dock entrance. Alignment ok. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast. Pulled out. BB to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as BB made fast on stbd quarter. With BB fast pulled out of dock and clear after 20 mins. Much easier to control in wind and tide. Kept clear of MP1 but still to north and outside of turning basin. Stabilized and pushed into layby berth after 60 mins. Operation is ok at slack spring tides for the SPOT. Kept 1 MB spare to simplify communications.
25	Depart dock	9	HW 5	S 15 gusting 20	SPOT		MB line forrard centre lead Taka stbd shoulder 1 x MB spare BB aft	Used mules to drag out to the dock entrance. Alignment ok. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast. Pulled out. BB to midship stbd side when it was clear. Pulled ship out and stabilized for 12 mins as BB made fast on stbd quarter. With BB fast pulled out of dock and clear after 25 mins. Much easier to control in wind and tide. Kept clear of MP1 but still a

								bit to north and outside of turning basin. Stabilized and pushed into layby berth after 40 mins. Operation is ok at LW slack spring tides for the SPOT. Kept 1 MB spare to simplify communications.
26	Depart dock	9	HW 3	WSW 15 gusting 20	Aotearoa		MB line forrard centre lead Taka stbd shoulder 1 x MB spare BB aft	Used mules to drag out to the dock entrance. Alignment ok. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast. Pulled out. BB to midship stbd side when it was clear. Pulled ship out and stabilized for 11 mins as BB made fast on stbd quarter. With BB fast pulled out of dock and clear after 25 mins. Much easier to control in wind and tide. Kept just clear of MP1 inside of turning basin. Stabilized and pushed into layby berth after 35 mins. Operation is ok at maximum ebb spring tides for the Aotearoa. Kept 1 MB spare to simplify communications.
27	Depart dock	9	HW 3	WSW 20 gusting 25	Aotearoa		MB line forrard centre lead Taka stbd shoulder 1 x MB spare BB aft	Used mules to drag out to the dock entrance. Alignment difficult. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast. Pulled out. BB to midship stbd side when it was clear. Pulled ship out and stabilized for 12 mins as BB made fast on stbd quarter. With BB fast pulled out of dock and clear after 24 mins. Harder to control in stronger wind and tide. Kept just clear of MP1 inside of turning basin. Stabilized and pushed into layby berth after 35 mins. Operation is at limit at maximum ebb spring tides for the Aotearoa and 20-25 knots of wind . Kept 1 MB spare to simplify communications.
28	Depart dock	9	HW 3	SW 20 gusting 25	Shansi		MB line forrard centre lead Taka stbd shoulder 1 x MB spare	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast. Pulled out. BB to midship stbd side when it was clear. Pulled ship out

							BB aft	and stabilized for 10 mins as BB made fast on stbd quarter. Need power to prevent the ship moving out of dock until BB made fast With BB fast pulled out of dock and clear after 18 mins. Harder to control in stronger wind and tide. Ship reached 1.8 knots ahead in the basin. Moved spare MB to a line aft. Well outside turning basin. Stabilized and pushed into layby berth after 30 mins. Operation is at limit at maximum ebb spring tides for the Shansi and 20-25 knots of wind .
29	Depart dock	9	HW 3	W 20 gusting 25	Shansi		MB line forrard centre lead Taka stbd shoulder 1 x MB spare BB aft	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast. Pulled out. BB to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as BB made fast on stbd quarter. Need power to prevent the ship moving out of dock until BB made fast With BB fast pulled out of dock and clear after 15 mins. Harder to control in stronger wind and tide. Ship reached 2.1 knots ahead in the basin. Moved spare MB to a line aft. Well outside turning basin. Stabilized and pushed into layby berth after 30 mins. Landed heavy on layby berth. Operation is at limit at maximum ebb spring tides for the Shansi and 20-25 knots of wind.
30	Depart dock	9	HW 3	W 20 gusting 25	Tanzanite		MB line forrard centre lead Kemp stbd shoulder 1 x MB spare Kemp aft	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. Kemp to stbd shoulder when ready. Kept ship at entrance to make Kempfast. Pulled out. Other Kemp to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as Other Kemp made fast on stbd quarter. With BB fast pulled out of dock and clear after 15 mins. Harder to control in stronger wind and tide. Ship reached 2.6 knots ahead in the basin. Outside turning basin. Stabilized and pushed into layby berth after 30 mins.

								Operation is at limit at maximum ebb spring tides for the Tanzanite and 20-25 knots of wind. Possibly larger tugs would help control the speed in the basin
31	Depart dock	9	HW 3	SW 20 gusting 25	Tanzanite		MB line forrard centre lead MB stbd shoulder 1 x MB spare MB aft	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. MB to stbd shoulder when ready. Kept ship at entrance to make MB fast Used 4 x MB tugs. Much better result. Pulled out. Other MB to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as Other MB made fast on stbd quarter. With MB fast pulled out of dock and clear after 15 mins. Easier to control with the larger tugs and kept speed below 1 knot in Basin. Inside turning basin. Stabilized and pushed into layby berth after 30 mins. Operation was comfortable
32	Depart dock	9	HW 3	SW 20 gusting 25	ANZAC		MB line forrard centre lead Kemp stbd shoulder 1 x MB spare Kemp aft	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. Kemp to stbd shoulder when ready. Kept ship at entrance to make Kemp fast Used 2 x MB tugs. 2 x Kemp Pulled out. Other MB to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as other Kemp made fast on stbd quarter. With Kemp fast pulled out of dock and clear after 15 mins. Managed to control with the smaller tugs and kept speed below 1 knot in Basin. Inside turning basin. Stabilized and pushed into layby berth after 30 mins. Operation was comfortable
33	Depart dock	9	HW 3	SW 20 gusting 25	Awanuia		MB line forrard centre lead Kemp stbd shoulder	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. MB to stbd shoulder when ready. Kept ship at entrance to make MB

							1 x MB spare Kemp aft	fast Used 3 x MB tugs. 1 x MB spare Pulled out. Other MB to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as other MB made fast on stbd quarter. With MB fast pulled out of dock and clear after 15 mins. Managed to control with the MB tugs and kept speed below 1 knot in Basin. Inside turning basin. Stabilized and pushed into layby berth after 30 mins. Operation was acceptable as difficult to find equilibrium however managed ok
34	Depart dock	9	HW -0.5	SW 15 gusting 20	Banu		MB line forrard centre lead Taka stbd shoulder 1 x MB spare BB aft	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast Used Taka, BB, 1x MB tugs. 1 x MB spare Pulled out. BB to midship stbd side when it was clear. Pulled ship out and stabilized for 15 mins as BB made fast on stbd quarter. Went out of alignment due a wrong tug order but eventually recovered. With BB fast pulled out of dock and clear after 28 mins. Managed to control with the large tugs tugs and kept speed below 1.5 knot in Basin. Inside turning basin. Needed extra MB aft to pull up ship as approaching western extremity of basin. Stabilized and pushed into layby berth after 40 mins. Operation was acceptable as difficult to slow up ship at the end. Better tug configuration advised. Well outside Basin to the north.
35	Depart dock	9	HW 0.5	WSW 15 gusting 20	Banu		MB line forrard centre lead Taka stbd shoulder 1 x MB midship lashed up	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. Taka to stbd shoulder when ready. Kept ship at entrance to make Taka fast

							BB aft	Used Taka, BB, 2x MB tugs Pulled out. MB to midship stbd side when it was clear. Pulled ship out and stabilized for 10 mins as BB made fast on stbd quarter. With BB fast pulled out of dock and clear after 22 mins. Managed to control much better with the four tugs working. Speed 1.4 knots Inside turning basin. Stabilized and pushed into layby berth after 30 mins. Operation was good with a better tug configuration. Well outside Basin to the north.
036	Arrival from layup	9	HW 5	SW 15 gusting 20	Banu		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to Stbd. Ship wanting to rush ahead. Tugs 20-30%. Successful. 1 MB on line forward. 1 MB midship lashed up to push astern Reached equilibrium and maintained position to attach mules for 15mins Ship too big for swing basin.
								Intermediate Tides
037	Arrival from layup	5	HW 2	WSW 15 gusting 20	Banu		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to Stbd. Ship wanting to rush ahead. Tugs 10-20%. Successful. 1 MB on line forward. 1 MB midship lashed up to push astern Reached equilibrium and maintained position to attach mules for 10mins After 30 mins ready to enter dock Ship too big for swing basin.
038	Arrival from layup	5	HW 3	W 15 gusting 20	Banu		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to Stbd. Ship wanting to move ahead. Tugs 10-20%. Successful. 1 MB on line forward. 1 MB midship lashed up to push astern Hit wharf face in the turn. Not clear enough when swinging. Expected ship to run ahead more. Unsuccessful .

039	Arrival from layup	5	HW 3	W15 gusting 20	Banu		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to Stbd. Ship wanting to move ahead. Tugs 10-20%. Successful. 1 MB on line forward. 1 MB midship lashed up to push astern Reached equilibrium and maintained position to attach mules for 15mins After 30 mins ready to enter dock Ship too big for swing basin. .
040	Arrival from layup	5	HW 3	NW15 gusting 20	Banu		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to Stbd. Ship wanting to move ahead. Tugs 20-30%. Successful. 1 MB on line forward. 1 MB midship lashed up to push astern Reached equilibrium eventually and maintained position to attach mules for 10mins After 30 mins ready to enter dock Ship too big for swing basin. .
041	Arrival from layup	5	HW -2	NE15 gusting 20	Banu		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to port. Ship wanting to move ahead. Tugs 20-30%. Successful. 1 MB on line aft. 1 MB midship lashed up to push ahead Reached equilibrium quickly and maintained position to attach mules for 14mins After 29 mins ready to enter dock Ship too big for swing basin. .
042	Arrival from layup	5	HW -3	E15 gusting 20	Banu		BB stbd quarter Taka Stbd Shoulder 1 x MB	Swing to port. Ship wanting to move ahead. Tugs 20-30%. Successful. 1 MB on line aft. 1 MB midship lashed up to push ahead. Needed a lot of tug power to control the fore and aft speed. 90% on one and 70% on other. Must not allow ship to build up too much forward momentum or tug power is insufficient.

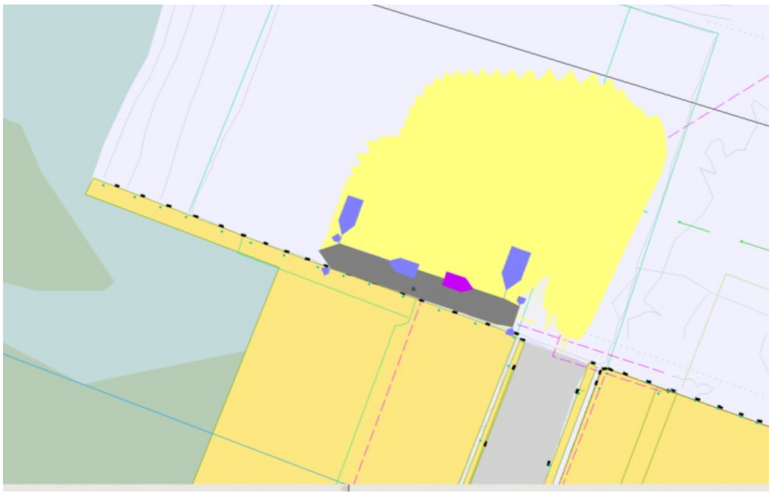
							1 x MB	Reached equilibrium slowly and maintained position to attach mules for 15mins After 30 mins ready to enter dock Ship too big for swing basin. .
043	Arrival from layup	5	HW -3	E15 gusting 20	SPOT		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to port. Ship wanting to move ahead. Tugs 30-40%. Successful. 1 MB on line aft. 1 MB midship lashed up to push ahead. Needed a lot of tug power to control the fore and aft speed. 90% on one and 70% on other. Must not allow ship to build up too much forward momentum or tug power is insufficient. Reached equilibrium slowly and maintained position to attach mules for 15mins After 30 mins ready to enter dock Ship too big for swing basin. .
044	Arrival from layup	5	HW -3	E20 gusting 25	SPOT		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to port. Ship wanting to move ahead. Tugs 50-60%. Successful. 1 MB on line aft. 1 MB midship lashed up to push ahead. Needed a lot of tug power to control the fore and aft speed. 90% on one and 70% on other. Must not allow ship to build up too much forward momentum or tug power is insufficient. Reached equilibrium with great difficulty and maintained position to attach mules for 10mins. Was difficult to align. Passed within meters of wharf in swing. After 30 mins ready to enter dock Ship too big for swing basin. .
045	Arrival from	5	HW	E20 gusting	Aotearoa		BB stbd quarter	Swing to port. Ship wanting to move ahead. Tugs 50-60%. Unsuccessful.

	layup		-3	25			Taka Stbd Shoulder 1 x MB 1 x MB	1 MB on line aft. 1 MB midship lashed up to push ahead. Needed a lot of tug power to control the fore and aft speed. 90% on one and 70% on other. Must not allow ship to build up too much forward momentum or tug power is insufficient. Unable to reach equilibrium Was difficult to align. Hit wharf .
046	Arrival from layup	5	HW -3	E15gusting 20	Aotearoa		BB stbd quarter Taka Stbd Shoulder 1 x MB 1 x MB	Swing to port. Ship wanting to move ahead. Tugs 40-50%. Successful. 1 MB on line aft. 1 MB midship lashed up to push ahead. Needed a lot of tug power to control the fore and aft speed. 90% on one and 30% on other. Must not allow ship to build up too much forward momentum or tug power is insufficient. Reached equilibrium at 12mins and starting making mules fast. Alignment good. Kept within swing basin .
047	Depart dock	5	HW -3	E 15 gusting 20	Aotearoa		MB line forward centre lead Taka port shoulder 1 x MB midship push pill BB port quarter	Used mules to drag out to the dock entrance. Alignment good. Mules taking weight. MB on a line forward through centre lead. Taka to port shoulder when ready. Kept ship at entrance to make Taka fast Used Taka, BB, 2x MB tugs. Pulled out. MB to midship port side when it was clear. Pulled ship out and stabilized for 15 mins as BB made fast on port quarter. With BB fast pulled out of dock and swung to stbd. Wrong tug order and needed full power on tugs to realign for entry to layup berth Kept in swing basin.
048	Depart dock	5	HW -3	E 15 gusting 20	SPOT		MB line forward centre lead Taka port shoulder 1 x MB midship push pill BB port quarter	Used mules to drag out to the dock entrance. Alignment difficult. Mules taking weight. MB on a line forward through centre lead. Taka to port shoulder when ready. Kept ship at entrance to make Taka fast Used Taka, BB, 2x MB tugs.

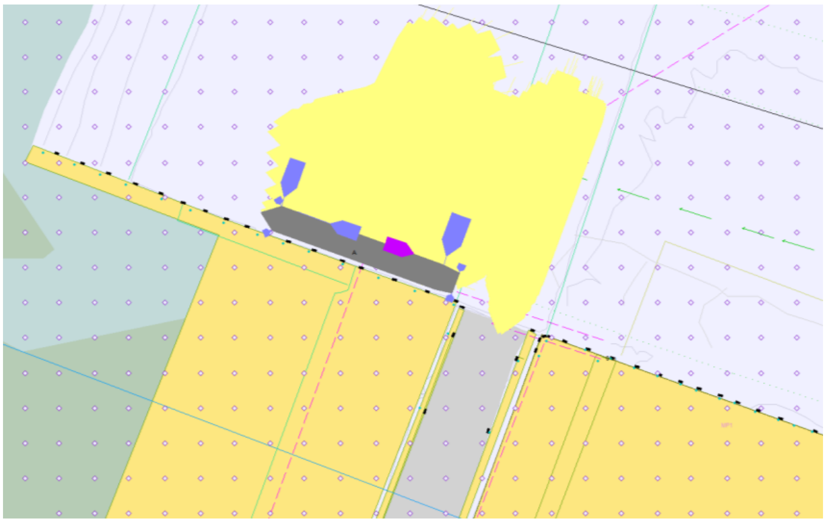
								Pulled out. MB to midship port side when it was clear. Pulled ship out and stabilized for 10 mins as BB made fast on port quarter. With BB fast pulled out of dock and swung to stbd. Tricky landing on lay up berth. Seems limit for wind with this ship Out of the swing basin.
049	Depart dock	5	HW -1	E 15 gusting 20	Yanghu_B		BB line forward centre lead Taka port shoulder Taka x MB midship push pill Taka port quarter BB + 3 x tak	Used mules to drag out to the dock entrance. Alignment ok. Mules taking weight. BB on a line forward through centre lead. Taka to port shoulder when ready. Kept ship at entrance to make Taka fast Used Taka, BB, 2x Takatugs. Pulled out. Taka to midship port side when it was clear. Pulled ship out and stabilized for 10 mins as Taka made fast on port quarter. With Taka fast pulled out of dock and swung to stbd. Unable to generate enough rate of turn and difficult to decelerate. Need larger tugs for this maneuver. Possibly 4 x BB Out of the swing basin. Unsuccessful
050	Depart dock	5	HW -3	E 15 gusting 20	Aotearoa 8m		BB line forward centre lead Taka port shoulder Taka midship push pill Taka port quarter BB + 3 x taka	Used mules to drag out to the dock entrance. Alignment ok. Mules taking weight. BB on a line forward through centre lead. Taka to port shoulder when ready. Kept ship at entrance to make Taka fast Used Taka, BB, 2x Takatugs. Pulled out. Taka to midship port side when it was clear. Pulled ship out and stabilized for 10 mins as Taka made fast on port quarter. With Taka fast pulled out of dock and swung to stbd. Managed to turn but not comfortable reaching an equilibrium. Landed hard on the layup berth Within swing basin. Marginal

Appendix 4 Operational Window Report Plots of Simulation Runs

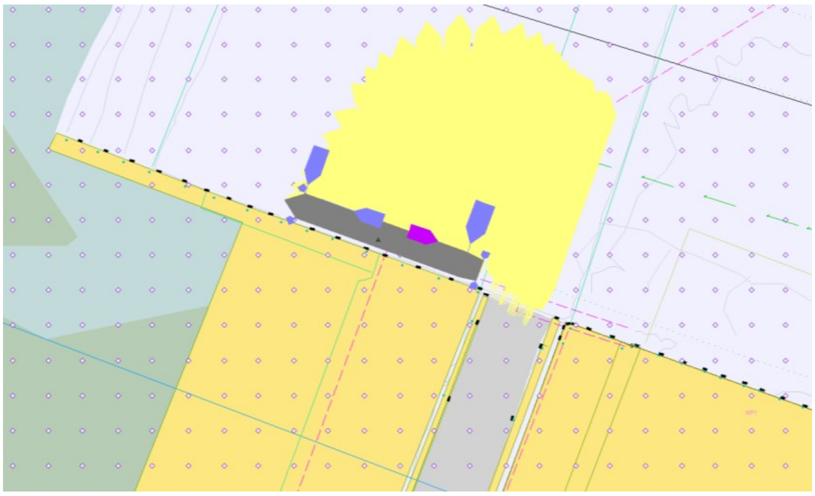
The following plots of the simulation runs display graphically the path of the design ship in the operational area. The path can be shown in multiple colours and displays a ship position every 30 seconds. In some plots the interval between plots is increased to show better clarity of the movement of the ship. Track envelope plots show multiple simulation runs for a given design ship. The starting position of the ship is shown in grey and the positions of the tugs are in blue or pink.



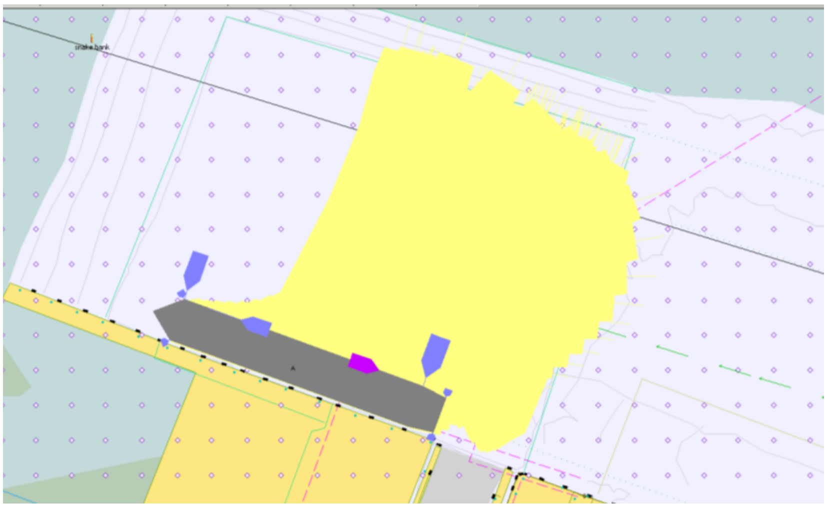
Run 001 ANZAC HW+2 NE 15-20 Spring tides



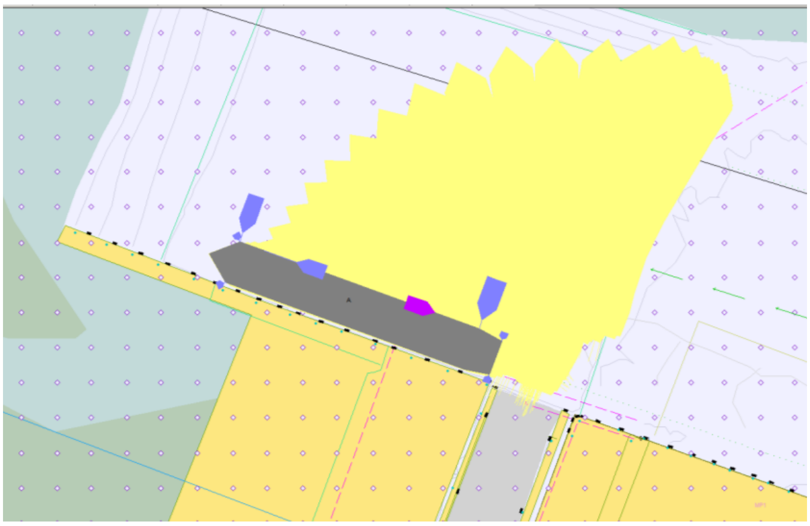
Run 002 ANZAC HW -2 NE 15-20 Spring tides



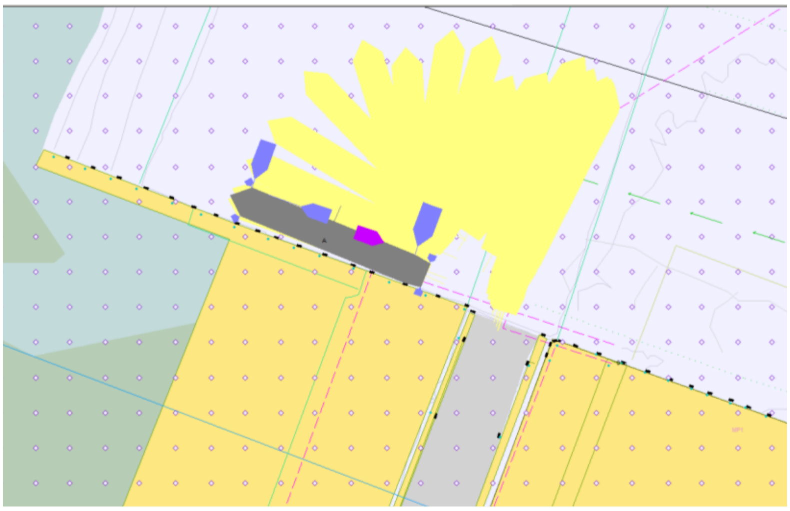
Run003 ANZAC HW +3 NW 15-20 Spring tides



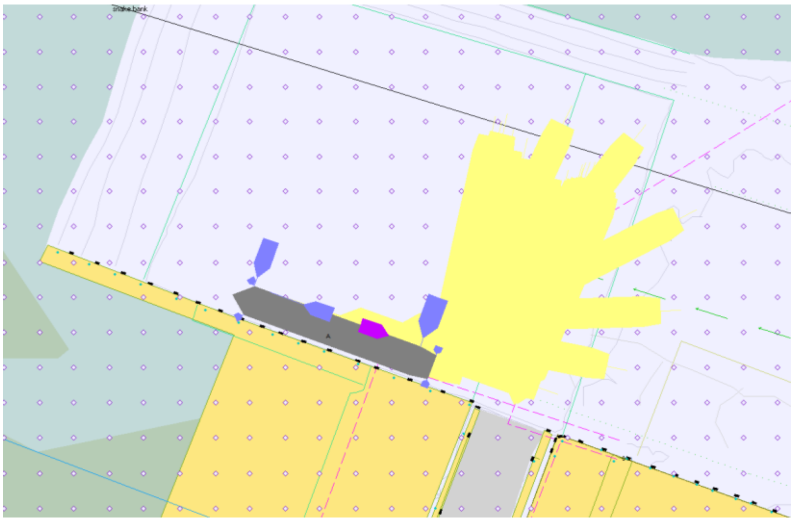
Run 004 Aotearoa HW -2 E 15-20 Spring tides



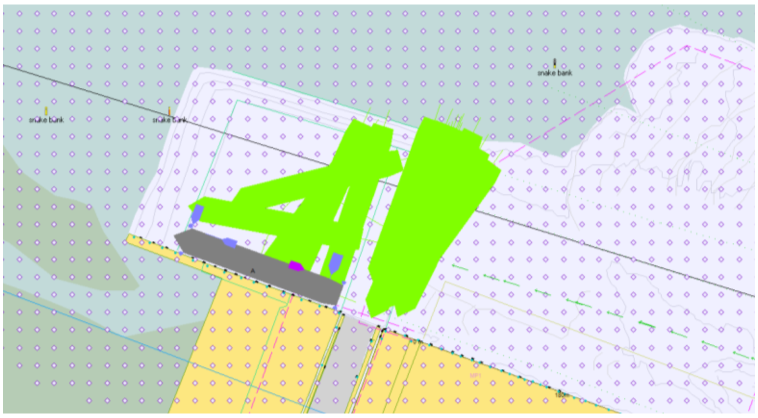
Run005 Aotearoa HW +2 NW 15-20 Spring tides



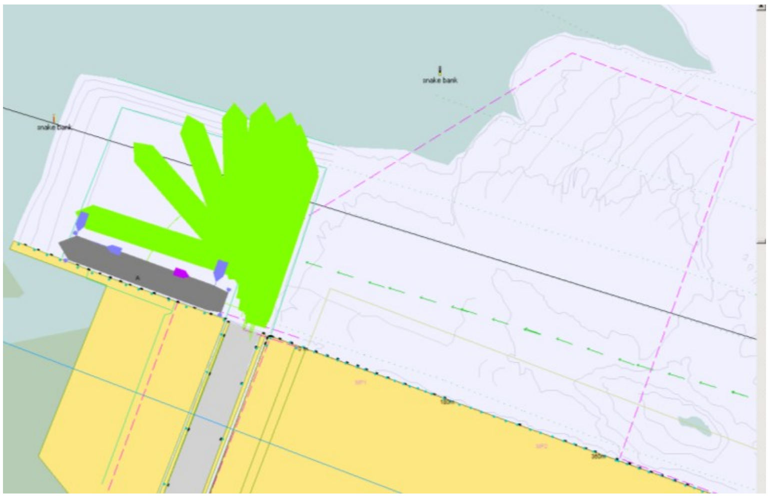
Run 006 Tanzanite HW+3 NE 15-20 Spring tides



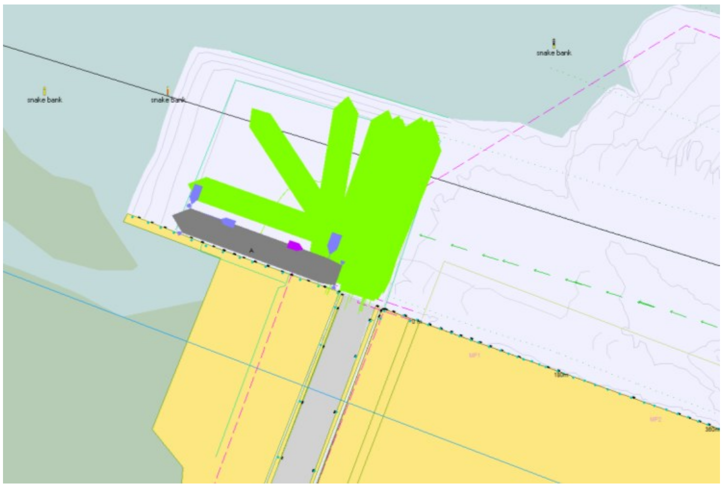
Run 007 Tanzanite HW +3 NE 15-20 Spring Tides



Run 008 Shansi HW-1 SW 15-20 Spring Tides



Run 009 Shansi HW -0.5 SW 15-20 Spring Tides

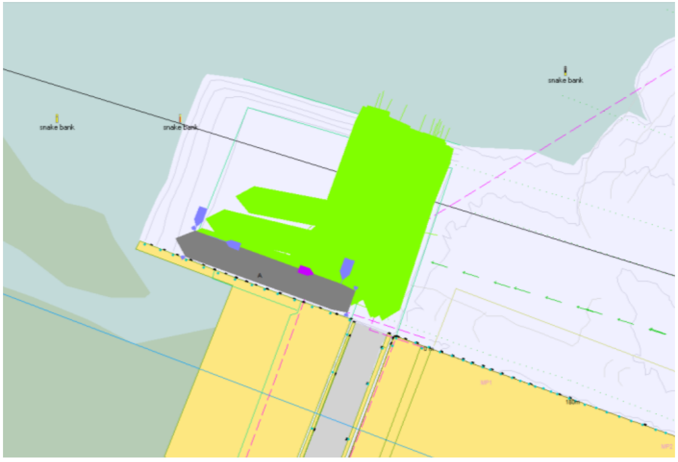


Run 010 Shansi HW =2 W 15-20 Spring Tides

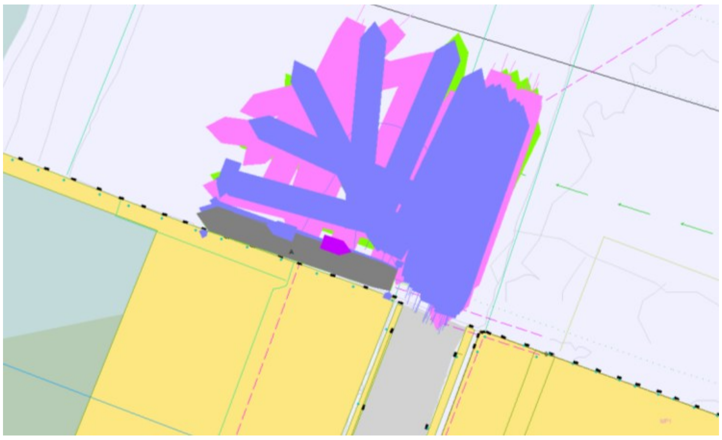
Run 011 SPOT HW+1 W 15-20 Spring Tides

Run 012 SPOT HW-2 SW 15-20 String Tides

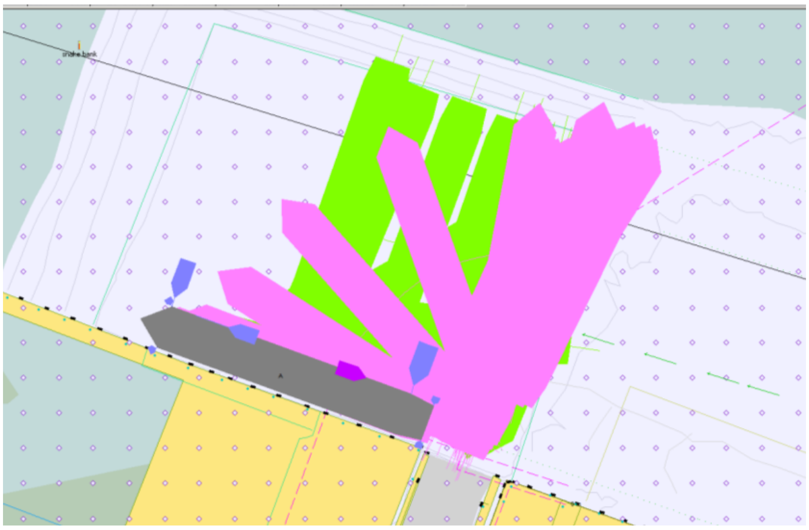
Run 013 SPOT HW -2 SW 15-20 Spring Tides



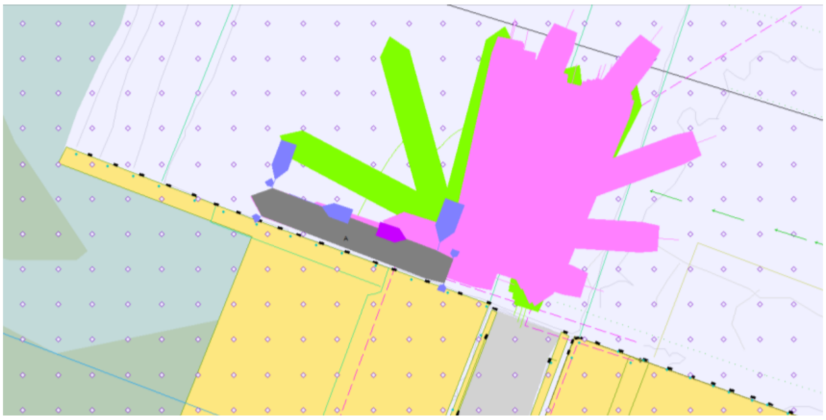
Run 014 SPOT HW -5 NE 15-20 Spring Tides



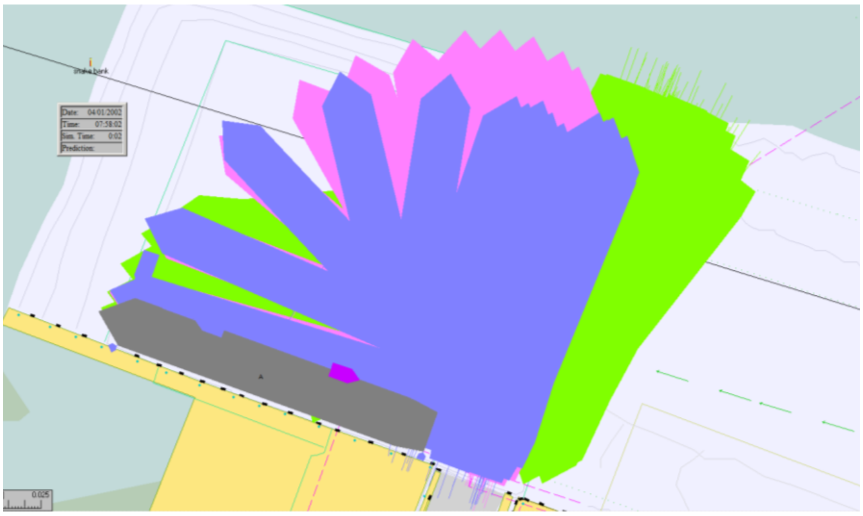
ANZAC Track envelope Arrivals Spring Tides



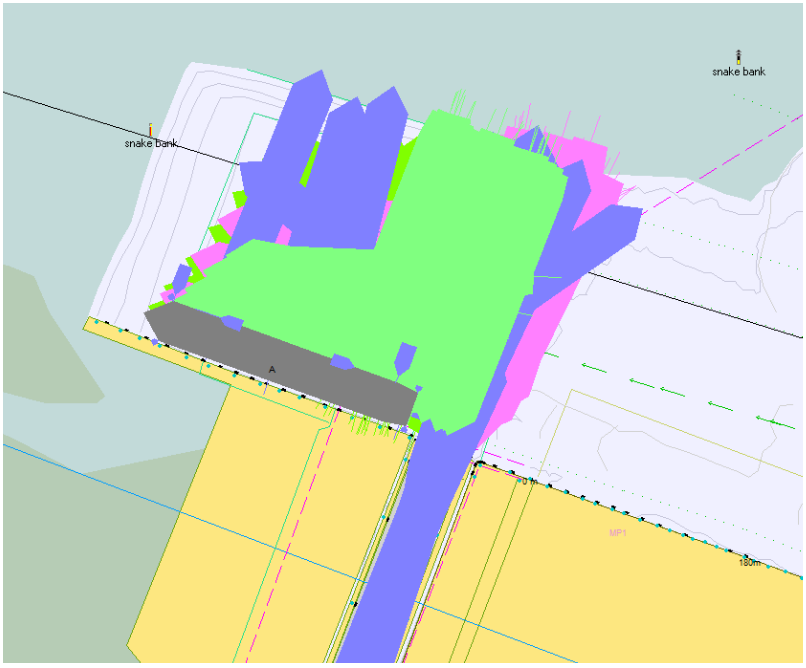
Aotearoa Track envelope Arrivals Spring Tides



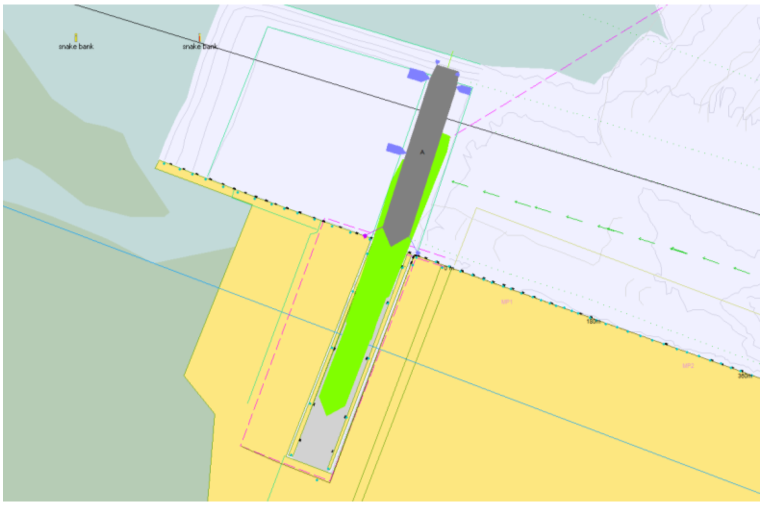
Tanzanite Track envelope Arrivals Spring Tides



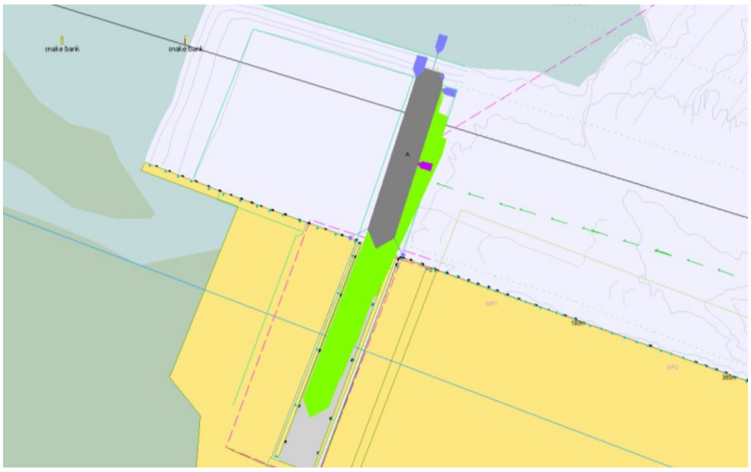
Shansi Track envelope Arrivals Spring Tides



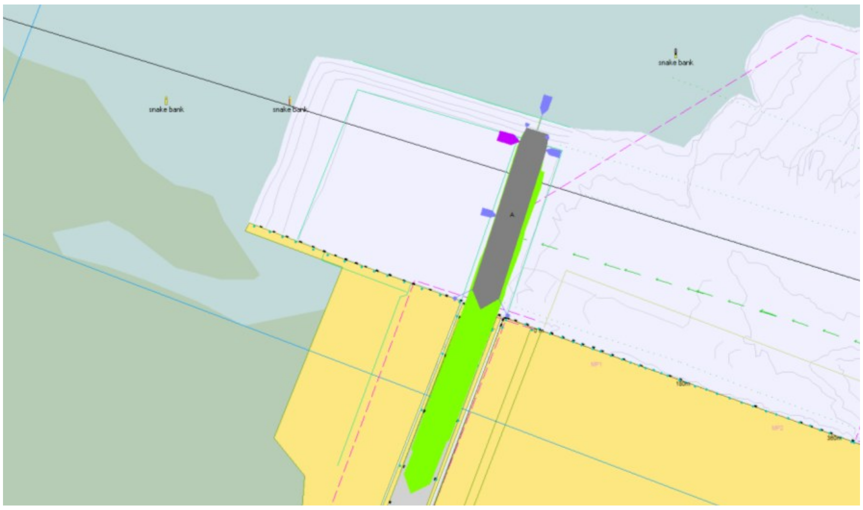
SPOT Track envelope Arrivals Spring Tides



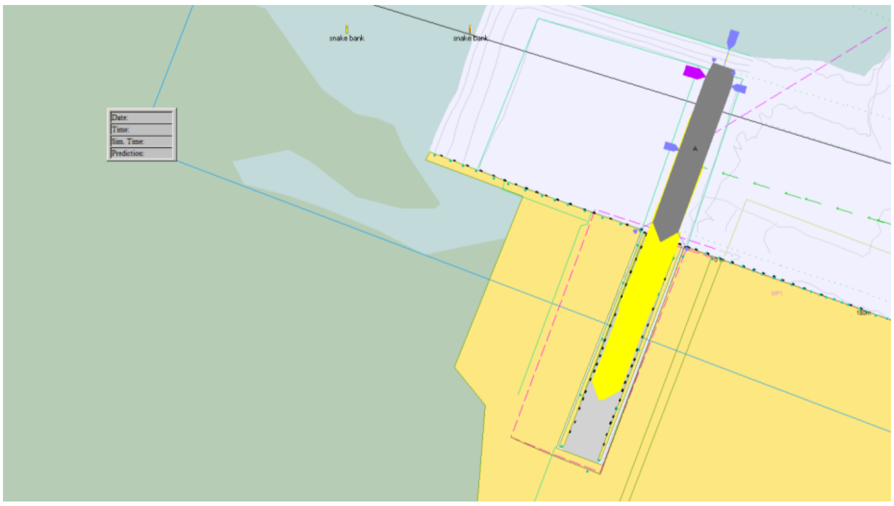
Run 015 SPOT into dock HW-5 hrs NE 15-20 kns Spring Tide



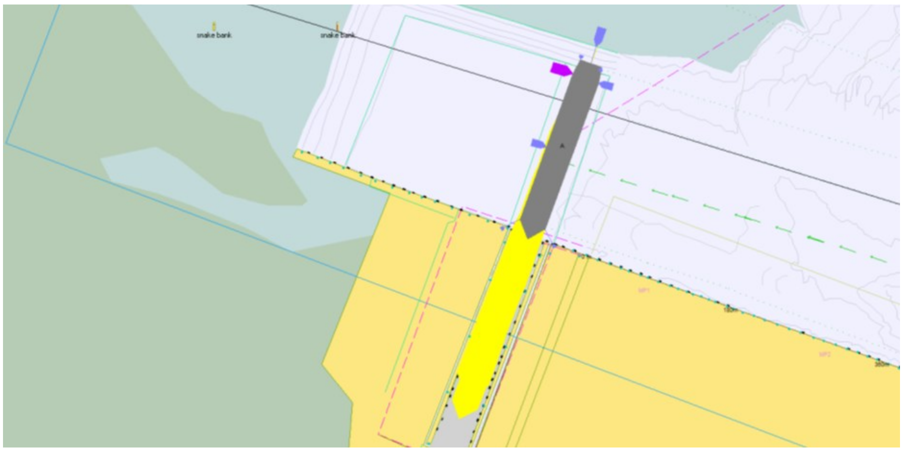
Run 016 SPOT into dock HW +5 hrs W 15-20 kns Spring Tide



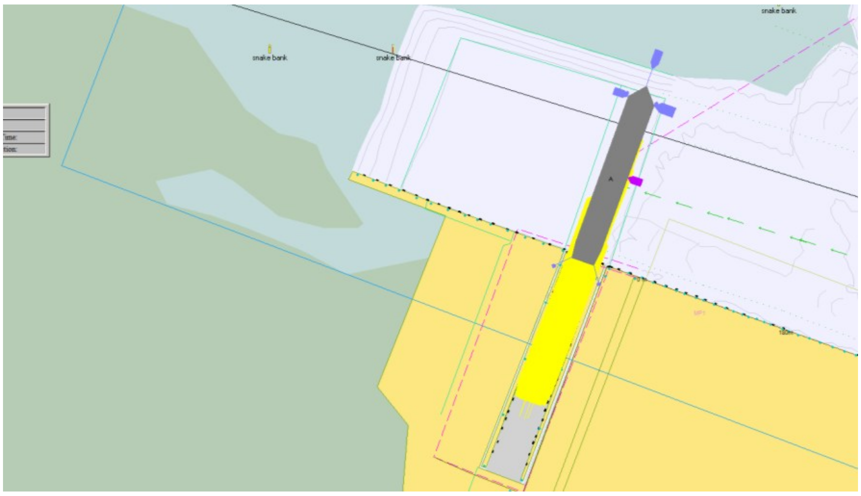
Run 017 SPOT HW -1 hr SSW 15-20k Spring Tide



Run 018 SPOT HW-1 NE 15-20 Kts Spring Tide

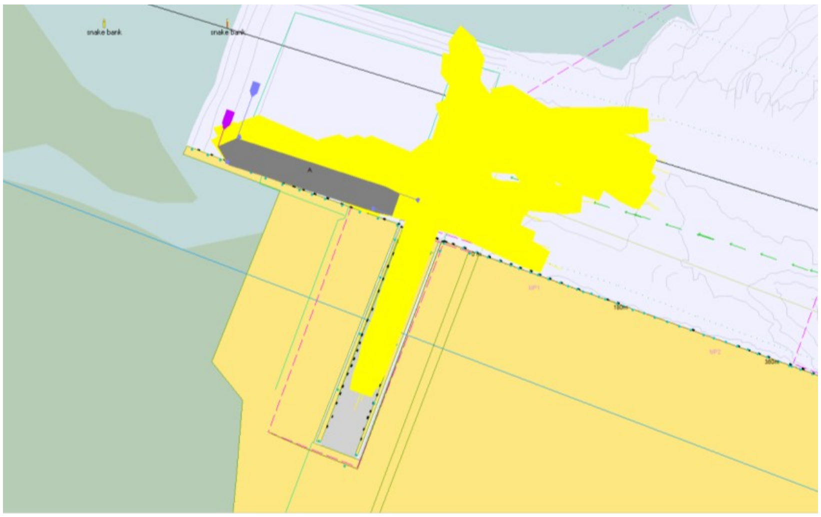


Run19 SPOT HW-2hrs E 15-20 Knots Spring tide



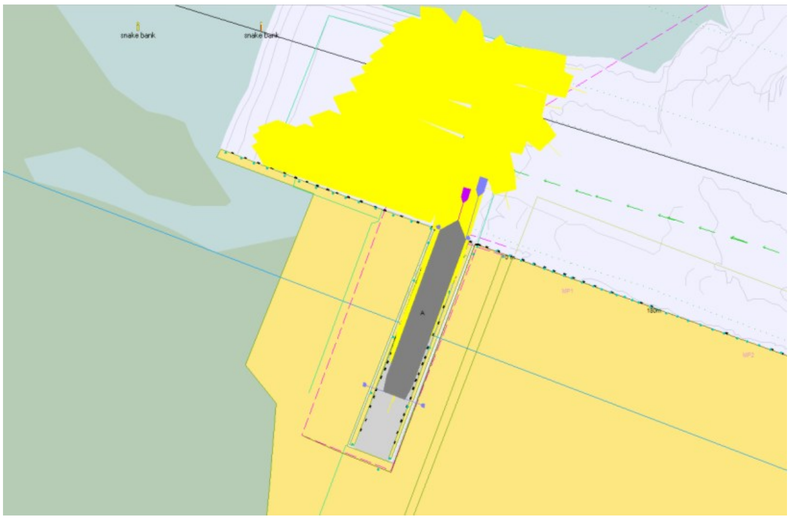
Run20 SPOT HW +2hrs WSW 15-20 knots Spring Tide

Run21 SPOT Depart Dock HW-2 hrs NE 15-20 knots Spring Tides

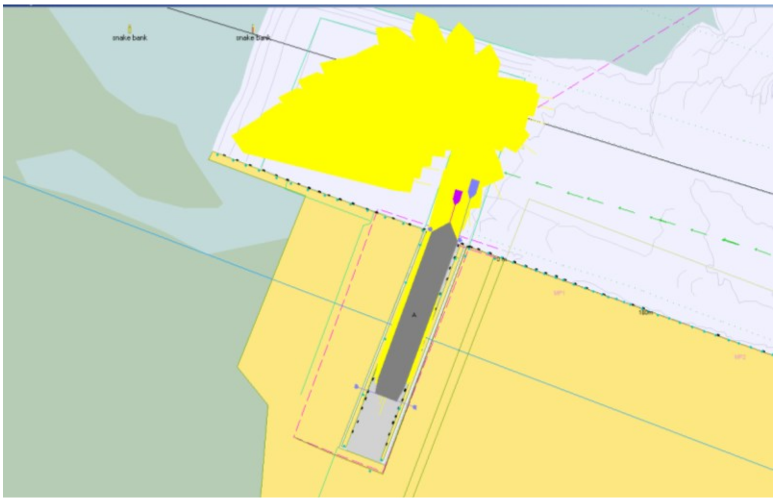


Run022 SPOT Depart Dock HW2 hrs WSW 15-20 knots Spring Tides

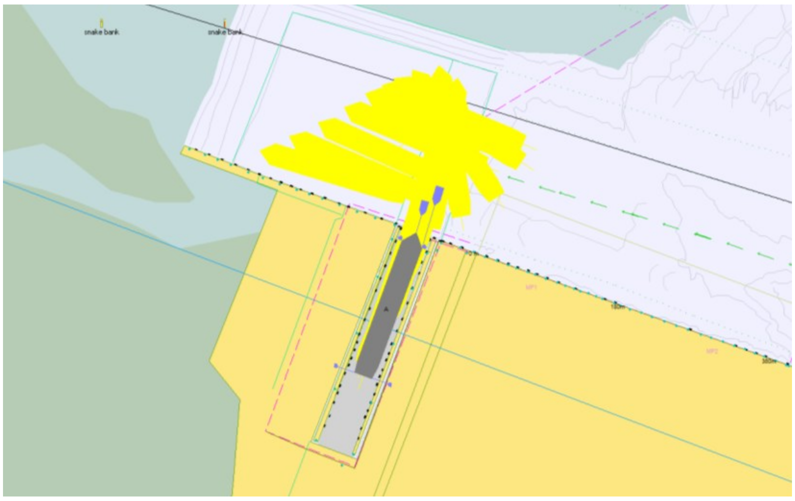
Run023 SPOT Depart Dock HW2 hrs WxS 15-20 knots Spring Tides



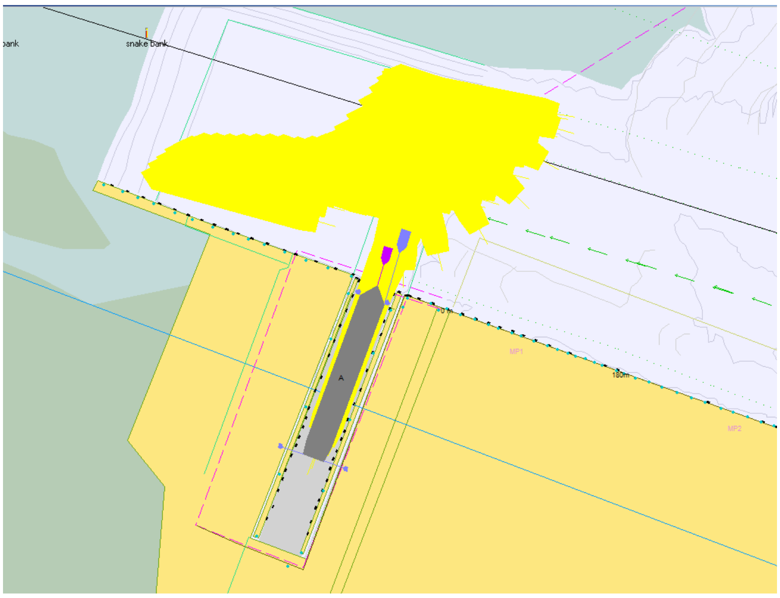
Run024 SPOT Depart Dock HW+0.5 hrs SW 15-20 knots Spring Tides



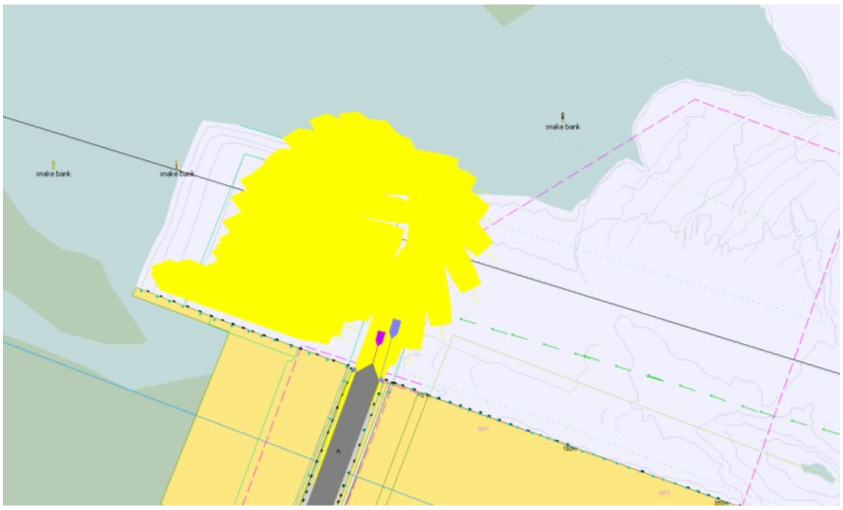
Run025 SPOT Depart Dock HW+ 5 hrs S 15-20 knots Spring Tides



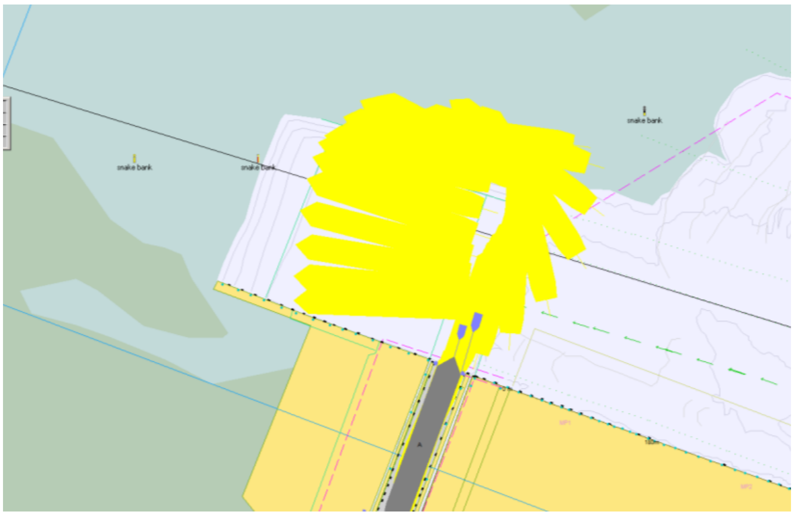
Run026 Aotearoa Depart Dock HW3 hrs WSW 15-20 knots Spring Tides



Run027 Aotearoa Depart Dock HW+3 hrs WSW 20-25 knots Spring Tides

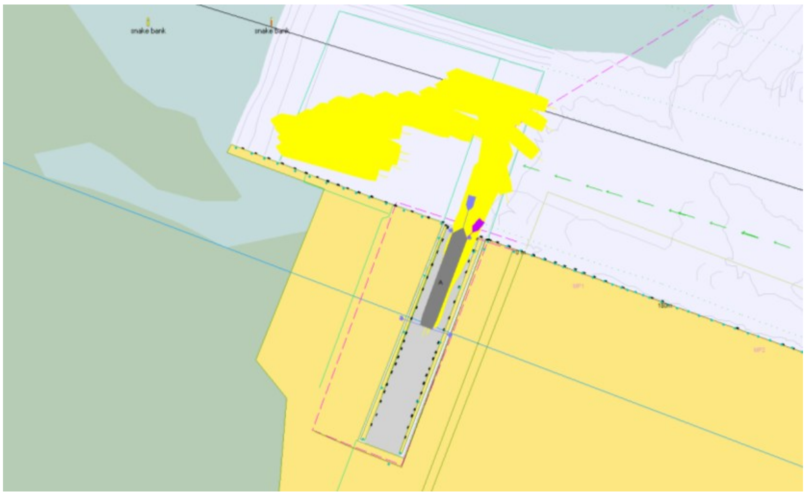


Run028 Shansi Depart Dock HW+3 hrs SW 20-25 knots Spring Tides

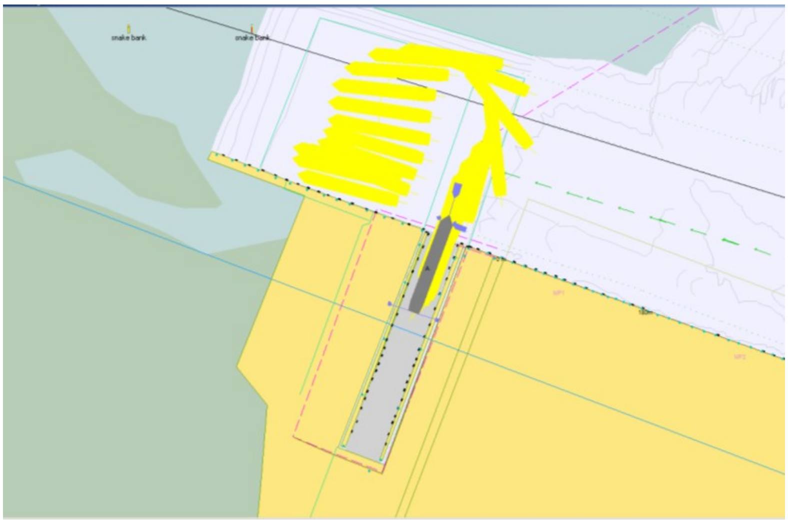


Run029 Shansi Depart Dock HW+3 hrs W 20-25 knots Spring Tides

Run030 Tanzanite Depart Dock HW+3 hrs W 20-25 knots Spring Tides

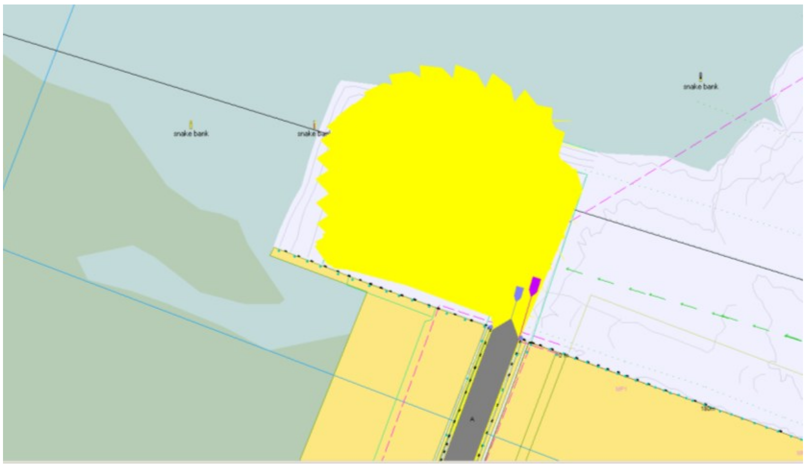


Run031 Tanzanite Depart Dock HW+3 hrs SW 20-25 knots Spring Tides



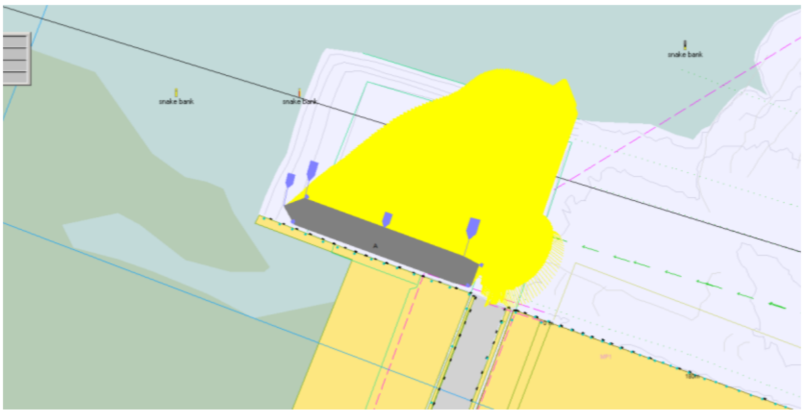
Run032 ANZAC Depart Dock HW+3 hrs SW 20-25 knots Spring Tides

Run033 Awanuia Depart Dock HW+3 hrs SW 20-25 knots Spring Tides



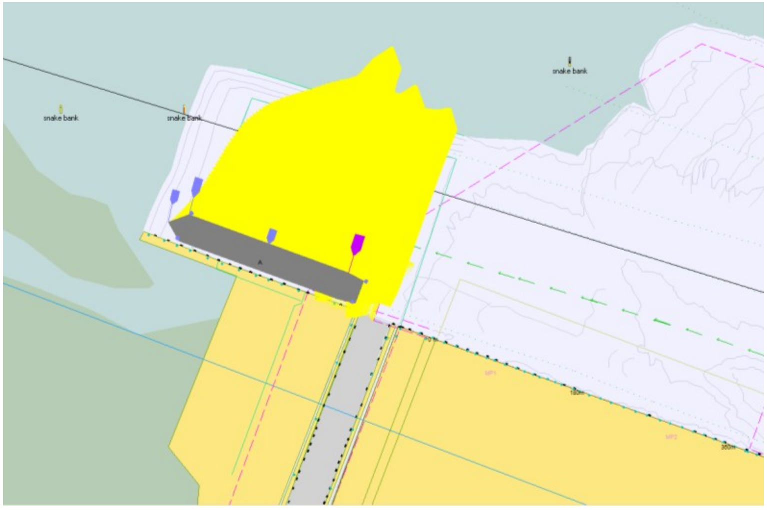
Run034 Banu Depart HW-0.5 SW 15-20 knots Spring Tides

Run035 Banu Depart HW+0.5 WSW 15-20 knots Spring Tides



Run036 Banu Arrival HW+ 5 WSW 15-20 knots Spring Tides

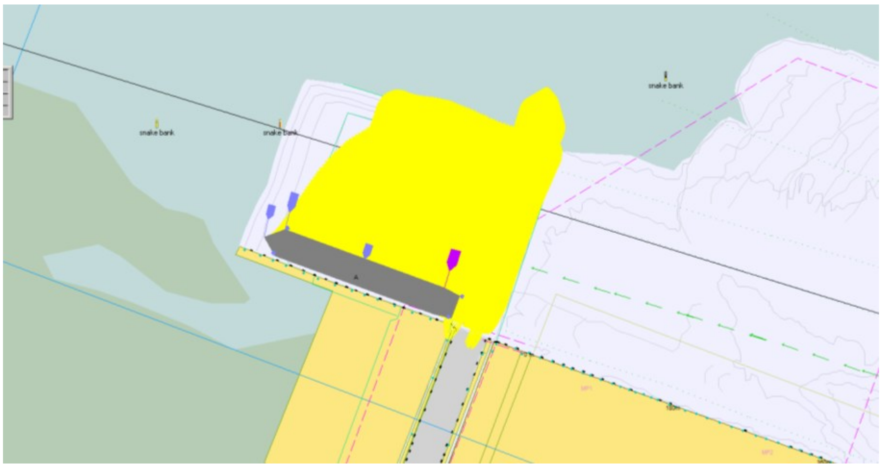
OWR Plots of Simulation Runs Intermediate Tides



Run037 Banu Arrival HW+ 2 WSW 15-20 knot Intermediate Tides Range 2.0m

Run038 Banu Arrival HW+ 3 W 15-20 knot Intermediate Tides Range 2.0m

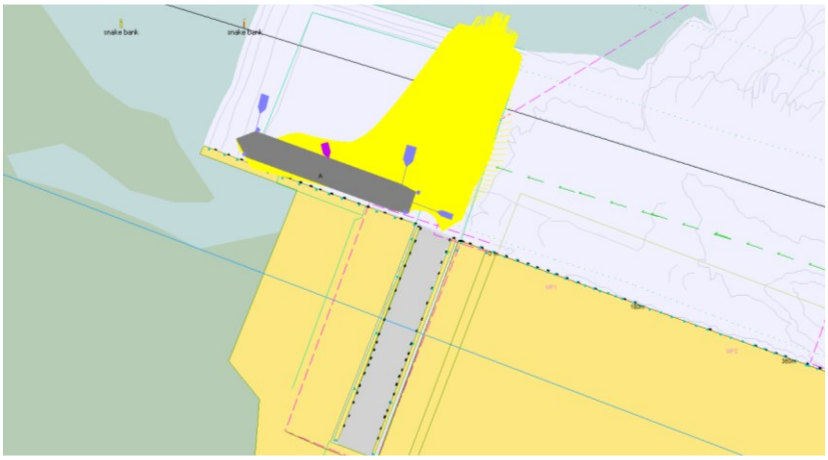
Run039 Banu Arrival HW+ 3 W 15-20 knot Intermediate Tides Range 2.0m



Run040 Banu Arrival HW+ 3 NW 15-20 knot Intermediate Tides Range 2.0m

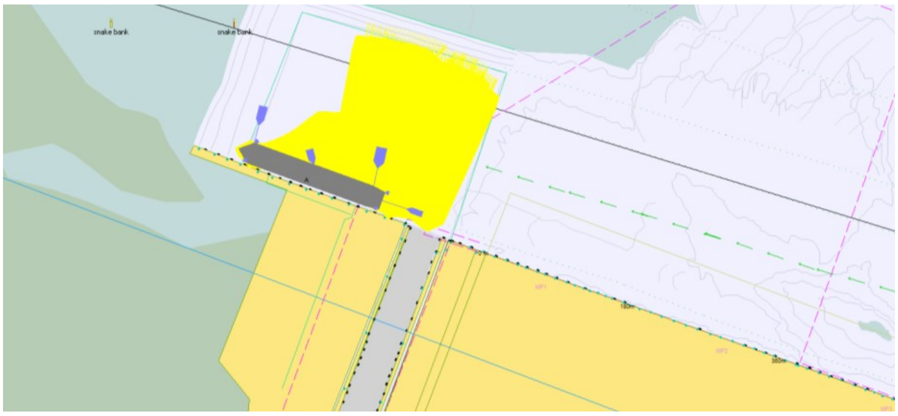
Run041 Banu Arrival HW-2 NE 15-20 knot Intermediate Tides Range 2.0m

Run042 Banu Arrival HW-3 E 15-20 knot Intermediate Tides Range 2.0m

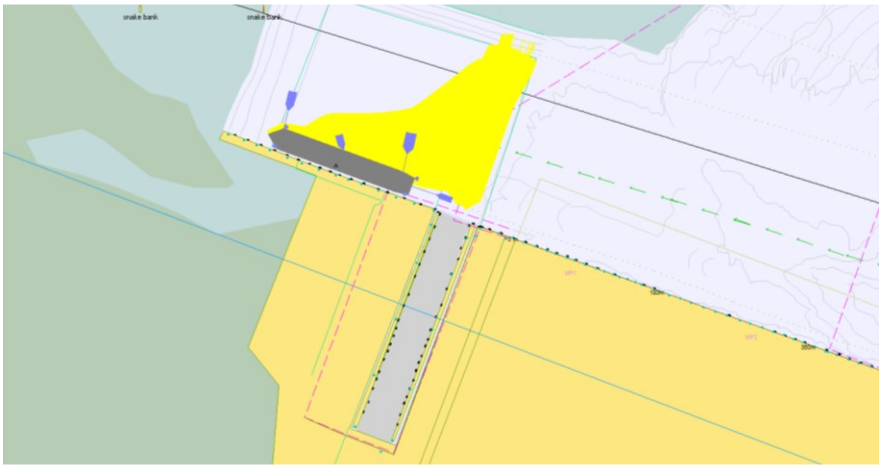


Run043 SPOT Arrival HW-3 E 15-20 knot Intermediate Tides Range 2.0m

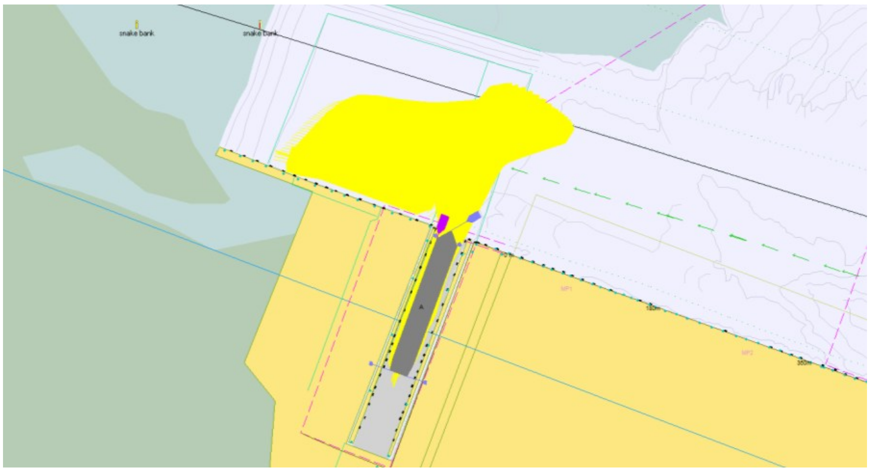
Run044 SPOT Arrival HW-3 E 20-25 knot Intermediate Tides Range 2.0m



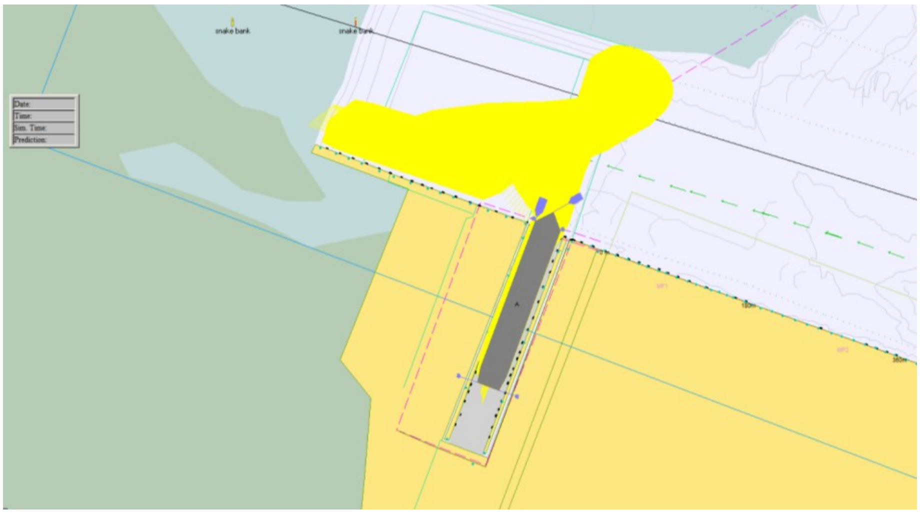
Run045 Aotearoa Arrival HW-3 E 20-25 knot Intermediate Tides Range 2.0m



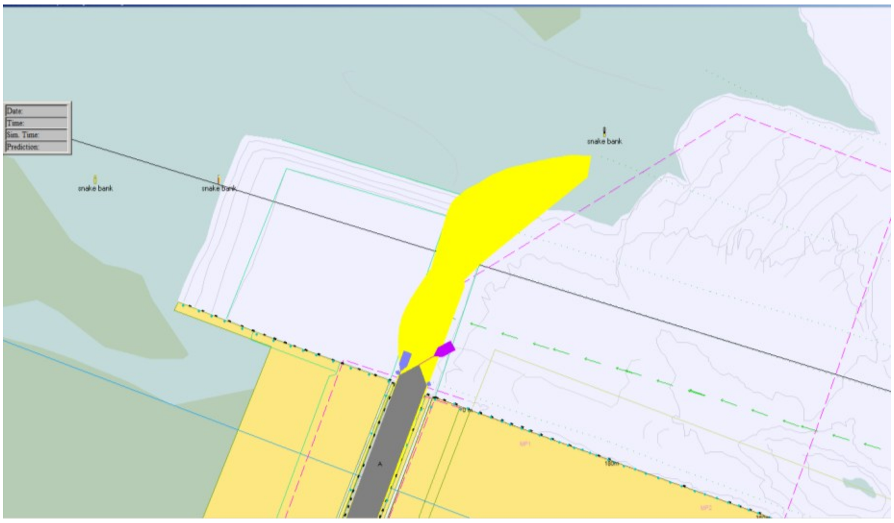
Run046 Aotearoa Arrival HW-3 E 15-20 knot Intermediate Tides Range 2.0m



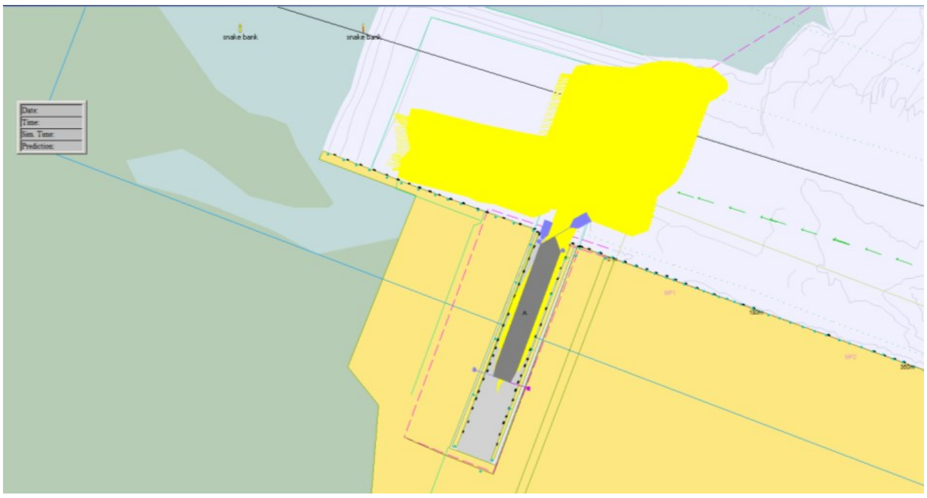
Run047 Aotearoa Depart HW-3 E 15-20 knot Intermediate Tides Range 2.0m



Run048 SPOT Depart HW-3 E 15-20 knot Intermediate Tides Range 2.0m



Run049 Yanghu_B Depart HW-1 NE 15-20 knot Intermediate Tides Range 2.0m



Run050 Aotearoa draft 8m Depart HW-3 NE 15-20 knot Intermediate Tides Range 2.0m

Appendix 5 Redesign of Turning Basin July Simulations

5.0 Introduction

This July simulation study was conducted by Northport using their in-house simulator at Northport and Melbourne. The aim of this simulation was to review changes to the Turning Basin as required by the earlier Operational Window Report conducted in May June 2026 (Appendix 2). A considerable increase in the size of the turning basin was simulated and a phased depth reduction in the basin from 14.5m to 11.5m. The simulation needed to determine if the new design basin will provide adequate underkeel clearance for ships intending to use the basin. At the request of a potential operator of the shipyard and dry dock facility, a new design ship (Banu_DD)was introduced with a much deeper stern draft and trim to meet marketing requirements for the facility. A third container ship (ND_DD) was also used with a draft of 6.7 aft and a 1m trim.

5.1 Attendees

- Bruce Goodchild Northport Simulation Manager
- Paul Watchman Northport modeller and simulation instructor

5.2 Simulated Area used

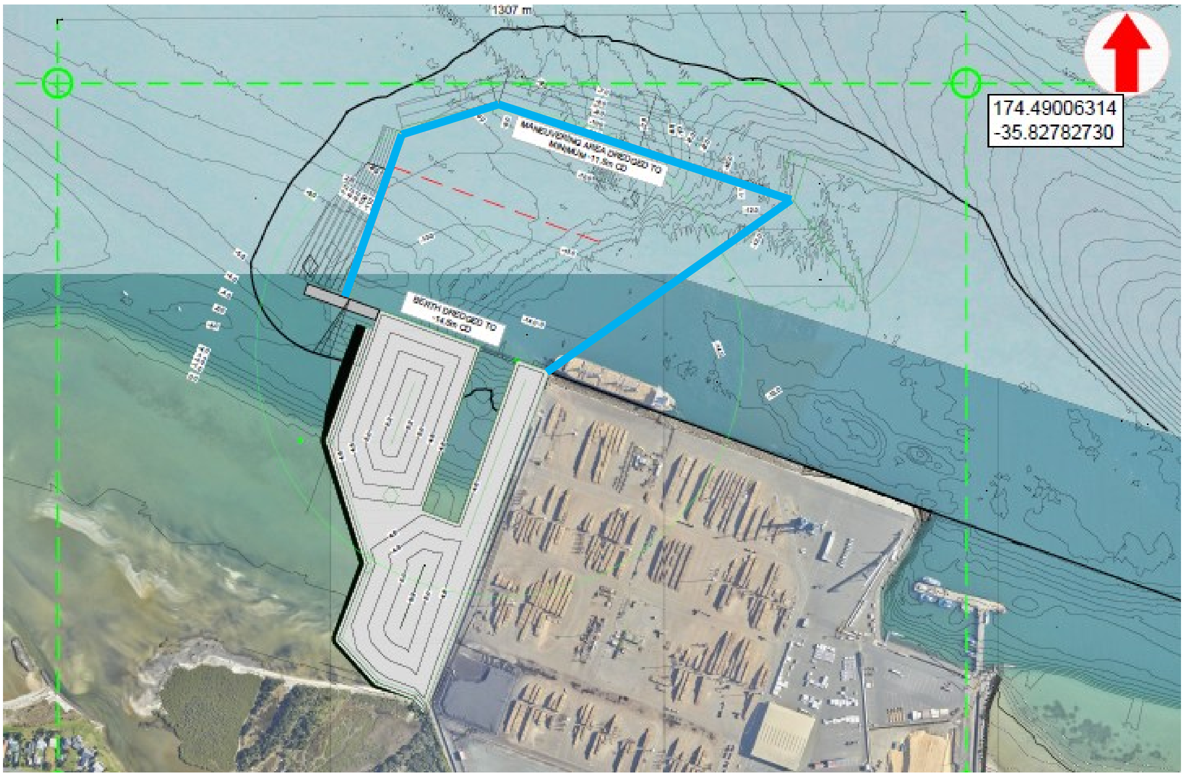


Figure 1 New Turning Basin dimensions outlined in blue. Original basin dimensions are shown by the red pecked line

The area Marsden 6 was amended to show the new turning basin and the proposed shipyard and drydock facility at the western end of the Northport site as shown in figure 1. The modifications to the turning basin were to extend the basin northwards some 160m to allow ships more room to manoeuvre when entering and departing the shipyard and dry dock facility. The turning basin depth was also modified to be shallower. Rather than the original 14.5m depth, the new basin is 14.5m at the southern boundary to 11.5m at the northern boundary. The environmental conditions, bathymetry, design ships and tugs were loaded into the simulator. The run plots shown separately define the operating area and the swept path of the ship.

5.3 Design Ships Available (Design ships used for this July Simulation study shown in bold)

Ship	LOA	Beam	Draft	Type
Spirit of Tasmania 5	212	31	5.1/ 5.3	Ferry
Banu **Banu DD** **ND_DD**	**231** **231** **231**	**32** **32** **32**	**5.39/6.35** **6.5/ 8.5** **5.7/6.7**	Container Container Container
Shansi	200	28	4.9/ 5.08	Container
ANZAC	118	14.8	6.1/ 6.3	Frigate
Tanzanite	120	20	4.6/4.8	Mega Yacht
HMNZS Aotearoa	168.7	24.5	4.5/4.7 8.3/8.3	Fleet Tanker
Awanuia	79.9	15	3.9/4.1	Oil Tanker
Yanghu_B	228	32.3	7.05/ 9.05	Oil Tanker

Table 1

5.4 Tugs Available for simulation

Tugs **Abbreviation**	**Bream Bay** **BB**	**Takahiwai** **Taka**	**Marsden Bay** **MB**	**Kemp**	**Hobson**
Type	ASD	ASD	Conventional	Conventional	Conventional
LOA	24m	22m	17m	16.5m	13.8m
Bollard Pull	68T	50T	27T	14T	3T
Build Date	2007	2000	2015	1992	1976

Table 2

Table 2 shows the Northtugz fleet. The tugs all have differing bollard pulls. Four tugs are necessary with the majority of the design ships and manoeuvres required. It was found in the simulation it was necessary to have two or three of particular size tugs to successfully attempt a manoeuvre.

5.5 Methodology

The methodology was similar to what was undertaken in the OWR. The ship was moved from layup berth to dock and then from dock to layup berth. A number of simulations direct from sea to dock and dock to sea were undertaken. Of particular importance is the finding of the effect of reduced UKC of the deep draft ship in the shallower turning basin with a sloping bottom. Primary consideration is the required depth of the northern boundary of the turning basin. Can the depth be 11.5m at the northern boundary or must it be deeper to maintain control over the moving ship? Initially the northern boundary was set at 11.5m

To determine the feasibility of the facility, three scenarios are tested.

1. Firstly arrivals from the layup berth or from sea. The simulation will look at holding ships safely in position just off the dock entrance and perpendicular. Need to be able to demonstrate the ship can maintain position for 15 minutes either bow first or stern first and make fast lines or mules. It will require reviewing intermediate tides for the design deep draft ship. Requirements for towage will be investigated.
2. Secondary will look at moving ship into dock with mules or lines and maintaining control under different tidal conditions. This has been simulated in the OWR and not be reviewed again here as the basin at the southern end is essentially the same is in the original design.
3. Thirdly looking at departures from the dock and maintaining control to bring the ship back to the layup berth or sea

The simulation was conducted in 2D only; there was no visual scene display. The simulator was operated by a single person to control tugs and mules.

5.6.0 Environmental Modelling Tidal streams and heights

Calypso Science modified tidal stream modelling to provide a range of intermediate and spring tides in the new modified turn basin. Tidal streams will be stronger in shallower water and have more effect on deep draft ship[5, 6]. Therefore it was necessary to remodel the tidal streams for the dimensions and depths proposed for the new modified turning basin. Calypso Science remodelled the Seascope program used in the OWR to reflect the likely changes. For this study a number of tidal ranges were used. Ranges varied from 2.0m to 2.3m to thoroughly test the UKC in the northern part of the new turning basin. Based on the Seascope program developed for Northtugz, the application allows the user to select a date for review. Can be a spring, neap or intermediate tide and then choose the interval in relation to high water. The display will show the predicted stream and also the effect of the proposed drydock structure. This data is then loaded into the simulator. The latest current modelling is labelled V2 in the simulation run sheet.

5.6.1 Environmental Modelling Wind effects

Wind effects were modelled by Metocean based on anemometer locations around Northport. These locations are shown on the Northport website and in the Metocean study report[7]. Significantly from the Metocean Study, changes in wind directions during gusting periods were increased to reflect topography effects on winds from northerly directions. This was allowed for in the simulations for both the OWR and this July report.

5.6.2 Environmental Modelling Wave effects

Wind waves were considered for this simulation study; however the wind speeds simulated were unlikely to create waves likely to affect the design ships used. Swell effects were not allowed for in the simulation study but were not considered to have an appreciable effect due to the location of the facility within the harbour and observations from pilots[4] and wave monitoring buoys[1].

5.7 Shiplift or Floating drydock considerations

The simulation considered a floating drydock which had fendering to protect the dock. It was considered a shiplift would have similar fendering arrangements. It was considered that the shiplift would not be materially different from the floating drydock in terms of handling of ships through the dock. Both floating dry dock and shiplift were considered to be able to offer a winching system using mechanical mules similar to the original locks in the Panama Canal. Additional mooring lines were not simulated for this study but in practice would be available to assist in maintaining alignment within the dock. The critical area for the study focus was being able to maintain position at the entrance and largely into the dock to safely transfer from tug assist to mule assistance [1, 3]. This was investigated for both arrival and departure and it was considered a waiting time of 10 to 15 minutes was necessary to change between tugs and mules.

1. Northport Floating Dry Dock Simulation Study Phase 1 2019
2. Northport Review of Proposed Layup Berths and Floating Dock 2024
3. BECA Northport Drydock Operability Assessment 2025
4. Conversations Northtugz Pilots and Tugmasters 2019-2025
5. Hydrodynamic Update Version 1.0 May 2026 Effects of Proposed Reclamation and Dredging Layout on Hydrodynamics Metocean
6. Whangarei Report b196-prod.app.oceanum.io Calypso Science 12/03/26
7. Analysis of model and measured wind data for Northport Shipyard. Metocean May 2026

5.8 Guide to simulation run viability

This coloured guide gives an indication of the success or otherwise in safely manoeuvring a simulated ship into or out of the proposed shipyard and drydock facility under different environmental conditions and using stated towage conditions.

1. Unacceptable not achievable for some conditions
2. Marginal quite challenging for some conditions
3. Acceptable could be further optimized
4. Good easy achievable for most conditions
5. Excellent easy achievable for all conditions

5.9 Summary of July Simulation Runs

Below is a summary of the individual simulation runs conducted during this study and comments re viability. The run sheet information provides greater detail re the individual runs and the simulation plots show a graphical analysis of the movement of the design ship.

Runs 051 –054 Arrivals from layup berth to dock. Low water slack tide (intermediate tides to weak spring tides) E winds 15 to 20 knots. Banu was deep draft with excessive stern trim. Runs were from acceptable to good. Turning basin provided sufficient UKC at low water to manage the weaker tides. Turn basin north boundary at 11.5 m depth.

Runs 055-057 Arrivals from sea to dock. Used for these runs low water slack weak spring tide. Winds were E 15 to 20 knots. Banu was deep draft with excessive stern trim. Runs were from acceptable to good. Banu with a shallow draft and less stern trim was used in run 056 and was considered excellent in these conditions. Turning basin provided sufficient UKC at low water to manage the weaker tides. Turn basin north boundary at 11.5 m depth.

Runs 058-060 Departures from dock to layup berth and sea. Used for these runs low water slight ebbing weak spring tide. Winds were W 15 to 20 knots. Banu was deep draft with excessive stern trim. Runs were acceptable. Felt constrained landing on layup berth with size of basin on western end of berth and bow in proximity to the dock. Turning basin provided sufficient UKC at low water to manage the weaker tides. Turn basin north boundary at 11.5 m depth.

Run 061 Departures from dock to sea. Used for these runs slight ebbing low water weak spring tide. Winds were W 15 to 20 knots. Banu was shallower draft and less displacement. Run was good. Turning basin provided sufficient UKC at low water to manage the weaker tides. Turn basin north boundary at 11.5 m depth.

Run 062 Departure from dock to layup berth. Used for this run slight ebbing low water weak spring tide. Winds were SW 15 to 20 knots. Banu was deep draft with excessive stern trim. Run was very difficult and needed excessive tug power so only marginal success. Felt constrained landing on layup berth with size of basin on western end of berth and bow in proximity to the dock. Turning basin provided sufficient UKC at low water to manage the weaker tides. Turn basin north boundary at 11.5 m depth.

Run 063 Departure from dock to layup berth. Used for this run tide flooding near high water during a period of a weak spring tide. Winds were SW 15 to 20 knots. Banu was deep draft with excessive stern trim. Run was acceptable. It was noticed the ebb started earlier before HW. Felt constrained landing on layup berth with size of basin on western end of berth and bow in proximity to the dock. Sufficient water is available due to high water.

Run 064 Departure from dock to layup berth. Used for this run tide flooding near high water during a period of a weak spring tide. Winds were SW 15 to 20 knots. Banu was deep draft with excessive stern trim. Run was acceptable. Felt constrained landing on layup berth with size of basin on western end of berth and bow in proximity to the dock. Sufficient water is available due to high water.

Run 065 Departure from dock to layup berth. Used for this run tide ebbing with a weak spring tide. Winds were SW 15 to 20 knots. Banu was deep draft with excessive stern trim. Run was marginal as needed excessive tug power to keep ship from drifting into MP1 berth pocket. Felt constrained landing on layup berth with size of basin on western end of berth and bow in proximity to the dock. Sufficient water is available as it is close to HW.

Run 066 Departure from dock to sea. Used for this run tide flooding near high water during a period of a weak spring tide. Winds were NW 15 to 20 knots. Banu was deep draft with excessive stern trim. Run was unacceptable as the ship passed too close to the large ship moored at the layup berth. Pilot error but illustrative of the constraint imposed on ships using the dock when there is a large ship moored too far to the east on the layup berth.

Runs 067-069 Departure from dock to sea with constraints of ship at layup berth and MP1. Used for these runs tide flooding near high water, during a period of a weak spring tide. Winds were NE 15 to 20 knots. Banu was deep draft with excessive stern trim. These runs used different combinations of tugs due to the restricted space. Found that by limiting the speed more when departing the dock, the manoeuvre became acceptable to good.

Run 070 Departure from dock to lay up berth. Tugs 2 x BB and 1 x Taka. Winds w 15-20 with an ebbtide HW + 1 hour.BB on starboard shoulder and starboard quarter and Taka on centre lead forward. Banu was deep draft with excessive stern trim. Lost aft tug when swinging. Bow tug released and sent aft to starboard quarter to push up. Able to reach ship in time (3 minutes) to maintain ship within turning basin. Better with additional tug MB on standby.

Run 071 Departure from dock to lay up berth. Tugs 2 x BB and 1 x Taka and 1 x MB. Winds w 15-20 with an ebbtide HW + 1 hour.BB on starboard shoulder and starboard quarter and Taka on centre lead forward. Lost forward tug when swinging. Bow tug pulled bow to port. Better with additional tug MB midships pushed to control fore and aft speed.

Runs 072-074 Arrivals from sea to dock. Tugs 2 xx BB and 1 x Taka and 1 x MB. Winds NE 15-20 knots with a slight flooding tide. Banu was deep draft with excessive stern trim. Simulations covered the loss of a tug when arriving. Was successfully able to abort the entry and keep the ship safe and stabilized in the confines of the turning basin. Run 074 showed the effects of ships on layup and MP1 (230m on layup and 180m on MP1. Having four tugs provides enough redundancy in the case of losing a tug at a critical moment to safely abort and retain control.

Runs 075-076 Departures to sea. Tugs 2 xx BB and 1 x Taka and 1 x MB. Winds E 15-20 knots with a strong flooding tide. Banu was deep draft with excessive stern trim. Northern Diplomat (ND_DD) was lighter and with less trim. The Banu_DD run was marginal as it was difficult to hold the ship in position as the aft mules were released and there was a risk to the fenders on the western side of the dock being damaged. The ND_DD run was more successful. Both runs showed the size of the turning basin is adequate for these manoeuvres.

Runs 077-078 Arrivals from layup berth. Tugs 2 xx BB and 1 x Taka and 1 x MB. Winds E 15-20 knots with a strong flooding tide. Banu was deep draft with excessive stern trim. Northern Diplomat (ND_DD) was lighter and with less trim. The Banu_DD run was marginal as it exited the swing basin and needed nearly double the tug power to control. The ND_DD run was acceptable; she neared the northern boundary of the swing basin but found equilibrium easily using less tug power. Basin size was adequate for the lighter ship.

Runs 079-080 Arrivals from layup berth. Tugs 2 xx BB and 1 x Taka and 1 x MB. Winds SW 15-20 knots with a strong ebbing tide. Banu was deep draft with excessive stern trim. Northern Diplomat (ND_DD) was lighter and with less trim. The Banu_DD run was marginal as it exited the swing basin and needed nearly double the tug power to control. The ND_DD run was acceptable. She developed strong sternway but was recovered within the swing basin. Found equilibrium easily using less tug power. Basin size was adequate for the lighter ship.

5.10 July Simulation Run Sheet

Run Number	Manoeuvre	Tide Range	Tide HW	Wind	Ship	Viability of run	Tugs	Comment
051	Arrival from layup	5 V1	HW -6	E 15 gusting 20	Banu DD		BB stbd shoulder Taka Stern BB Stbd quarter MB standby	Swung to port Tugs used at 50% power. Wind effect noticeable on the bo. Held in position off dock for 15mins as mules attached. Adequately balanced forces on ship. Ship maintained within the turning basin. Tidal stream V1 based on older turn basin
052	Arrival from layup	5 V2	HW -6	E 15 gusting 20	Banu DD		BB stbd shoulder Taka Stern BB Stbd quarter MB standby	Swung to port. Tugs used at 40% power. Wind effect noticeable on the bow. Held in position off dock for 14mins as mules attached. Balanced forces on ship. Ship maintained within the turning basin. No strong forces from tidal stream at stern. Height of LW 0.63
053	Arrival from layup	6 V2	HW -5.5	E 15 gusting 20	Banu DD		BB stbd shoulder Taka Stern BB Stbd quarter MB standby	Swung to port. Tugs used at 50% power. Wind effect noticeable on the bow. Held in position off dock for 10mins as mules attached. Balanced forces on ship. Ship slightly out of turning basin. Due pilot reacting too slow. Noticeable force from tidal stream at stern but easily counteracted.. Height of LW 0.56
054	Arrival from layup	7 V2	HW -5.5	E 15 gusting 20	Banu DD		BB stbd shoulder Taka Stern BB Stbd quarter MB standby	Swung to port. Tugs used at 50% power. Wind effect noticeable on the bow. Held in position off dock for 10mins as mules attached. Balanced forces on ship. Ship maintained within the turning basin. Noticeable force from tidal stream at stern but easily counteracted... Height of LW 0.46 Weak spring tide used
055	Arrival from sea	7 V2	HW -5.5	E 15 gusting 20	Banu DD		BB stbd shoulder Taka Stern BB Stbd quarter MB standby	Swung to port. Tugs used at 70% power. Wind effect noticeable on the bow. Held in position off dock for 12mins as mules attached. Balanced forces on ship. Ship maintained within the turning basin. Noticeable effect of tidal stream carrying ship forward. Needed 70% on aft tug to pull her up from 1.4 knots. Effect when off dock was needed a constant 20 percent on aft tug to stop forward movement.

								Height of LW 0.46 Weak spring tide used
056	Arrival from sea	7 V2	HW -5.5	E 15 gusting 20	Banu		BB stbd shoulder Taka Stern BB Stbd quarter MB port quarter	Banu at lighter draft Needed MB to provide some forward movement but could also use BB angled on starboard shoulder Swung to port. Tugs used at 30% power.. Held in position off dock for 13mins as mules attached. Balanced forces on ship very well. Ship maintained within the turning basin. No noticeable effect of tidal stream carrying ship forward. Needed 10% on aft tug to pull her up from 1.0 knots. Effect when off dock was needed a constant 5 percent on aft tug to stop forward movement. Height of LW 0.46 Weak spring tide used. Much easier with the ship in a lighter condition aft but Taka could not push on transom hence needed MB
057	Arrival from sea	7 V2	HW -4.5	NE 15 gusting 20	Banu DD		BB stbd shoulder Taka Stern BB Stbd quarter MB standby	Swung to port. Tugs used at 70% power. Wind effect noticeable on the bow. Held in position off dock for 13mins as mules attached. Balanced forces on ship. Ship maintained within the turning basin. Noticeable effect of tidal stream carrying ship forward. Needed 70% on aft tug to pull her up from 1.4 knots. Effect when off dock was needed a constant 25 percent on aft tug to stop forward movement. Height of LW 0.46 Weak spring tide used
058	Depart to sea	7 V2	HW + 5	W 15 gusting 20	Banu DD		BB Bow Taka port shoulder MB Midships stbd BB Port quarter	Swung to stabd Tugs used up to 70% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and needed a lot of power to get stern up into the wind . Used tugs to control forward speed but no tug on stern until ship had cleared the dock. Sailed down the turn basin and gradually came around to starboard ready to use engines. Deadship depart through out. Used a lot of the turn basin.
059	Depart to layby berth	7 V2	HW + 5.5	W 15 gusting 20	Banu DD		BB Bow Taka port shoulder MB Midships stbd	Swung to stbd Tugs used up to 70% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and difficult to get stern up into the wind . Used tugs to control forward speed but no tug on stern until ship had cleared the dock. Used plenty of tug power to try and balance ship. Difficult manoeuvre but kept ship in turn basin.

							Then onto stern BB Port quarter	
060	Depart to layby berth	7 V2	HW + 5.5	W 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder MB Midships stbd BB Stbd quarter	Swung to port Tugs used up to 60% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swun to port and after some time managed to stabilize on a course of 290. MB placed at stern when clear of dock .. Deadship depart through out. Acceptable. Ebb tide is more difficult than flood.
061	Depart to sea	7 V2	HW + 5.5	W 15 gusting 20	Banu		BB Bow Taka port shoulder MB Midships stbd then shifted to transom BB Port quarter	Swung to stbd Tugs used up to 50% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and needed power to get stern up into the wind . Used tugs to control forward speed but no tug on stern until ship had cleared the dock. Turned comfortably to stbd. ready to use engines. Deadship depart through out. Much lighter displacement with Banu at this draft which made the departure easier.
062	Depart to layby berth	7 V2	HW + 5	SW 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder MB Midships stbd then shifted to transom BB Stbd quarter	Swung to stbd Tugs used up to 60% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd and after some time managed to stabilize MB placed at stern when clear of dock .. Deadship depart through out. Stronger Ebb tide is more difficult than flood. Find equilibrium near layup berth was difficult. Landed heavy aft on the layup berth. Marginal
063	Depart to layby berth	7 V2	HW -1	SW 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder MB Midships stbd then shifted to transom	Swung to stbd Tugs used up to 70% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd and after some time managed to stabilize MB placed at stern when clear of dock .. Deadship depart through out. Flood tide but ebb started early. Found equilibrium near layup berth.. Landed under control on the layup berth. Acceptable. Turn basin is acceptable space to manage the manoeuvre.

							BB Stbd quarter	
064	Depart to layby berth	7 V2	HW -2	SW 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder MB Midships stbd then shifted to transom BB Stbd quarter	Swung to stbd Tugs used up to 70% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd and after some time managed to stabilize MB placed at stern when clear of dock . Deadship depart throughout. Flood tide. Found equilibrium near layup berth.. Landed under control on the layup berth. Acceptable. Turn basin is acceptable space to manage the manoeuvre. Needed MB to provide astern speed then shift to centre lead aft
065	Depart to layby berth	7 V2	HW +2	SW 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder MB Midships stbd BB Stbd quarter	Swung to stbd Tugs used up to 70% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd and after some time managed to stabilize MB placed at stern when clear of dock . Used full power on tugs to stop ship drifting into MP1 berth pocket. Deadship depart throughout. Ebb tide. Found equilibrium near layup berth.. Landed under control on the layup berth. Marginal as needing excessive tug power. Ebb is stronger than the flood. Turn basin is acceptable space to manage the manoeuvre.
066	Depart to sea	7 V2	HW -1	NE 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder MB Midships stbd BB Stbd quarter	Swung to stbd Tugs used up to 40% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd. Passed too close to ship on layup berth. Unacceptable. Pilot error, should have pulled further out into swing basin. However the large ship at layup berth will constrain ships using the dock if allowed to be positioned too mar east.
067	Depart to sea	7 V2	HW -1	NE 15 gusting 20	Banu DD		MB Bow MB stbd shoulder MB Midships stbd MB Stbd quarter	Used 4 x MB tugs due restricted space. Swung to stbd Tugs used up to 80% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd. Ship accelerated out of dock up to 1.2 knots. Unable to pull up ship and ship trapped in NW corner of basin. Speed as too fast.
068	Depart to sea	7 V2	HW -1	NE 15 gusting 20	Banu DD		MB Bow MB stbd shoulder	Used 4 x MB tugs due restricted space. Swung to stbd Tugs used up to 80% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd. Very slowly using midship tug. Speed kept to 0.5 knots leaving docks.

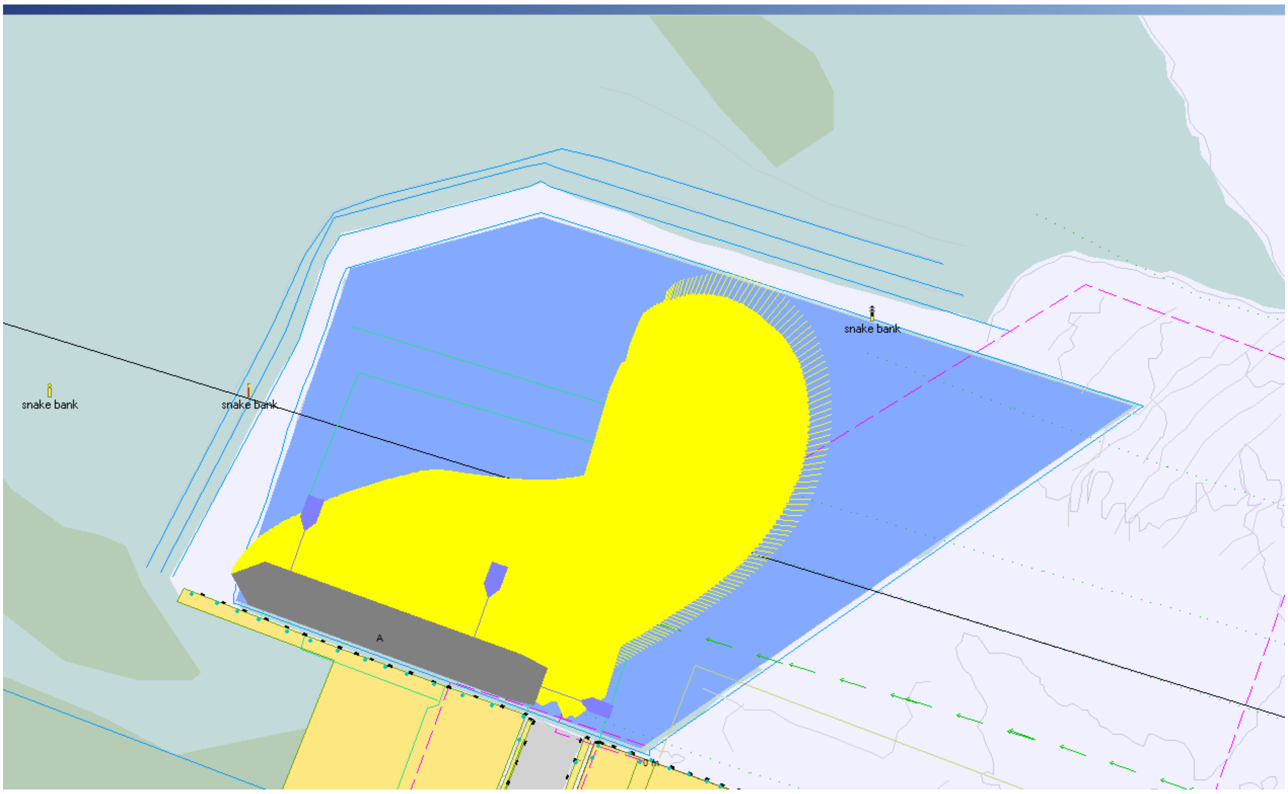
							MB Midships stbd MB Stbd quarter	Swung to stbd in control pulling on shoulder tug and pushing quarter. 80% pull. Much more acceptable result however consider using a bigger tug again.
069	Depart to sea	7 V2	HW -1	NE 15 gusting 20	Banu DD		Taka Bow Taka stbd shoulder MB Midships stbd BB Stbd quarter	Used 2 x Taka tugs + BB and MB due restricted space. Swung to stbd Tugs used up to 60% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to stbd. Very slowly using midship tug. Speed kept to 0.5 knots leaving docks. Swung to stbd in control pulling on shoulder tug and pushing quarter. 50% pull. Good result using the larger tugs
070	Depart to layup berth	7 V2	HW 1	W 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder BB Stbd quarter	Used 2 x BB tugs + Taka Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to port. Speed up to 1.5 knots as clearing dock. Forward BB push up 70% and aft BB pull back 60%. Aft tug failed at 0014. Taka released and sent aft to stbd quarter. Controlling bow with BB forward. Taka in position to push after 3mins and kept ship in turn basin. Acceptable outcome.
071	Depart to layup berth	7 V2	HW 1	W 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder BB Stbd quarter MB Stbd midships	Used 2 x BB tugs + Taka + MB Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock and swung to port. Speed up to 0.5 knots as clearing dock. MB controlling forward speed. Forward BB push up 70% and aft BB pull back 60%. Forward tug failed at 0012. Taka swung and pulled bow to port immediately. Controlling bow with TAKA forward. Able to take action quickly and retained ship within swing basin.
072	Arrival from sea	7V2	HW-1	NE 15 gusting 20	Banu DD		Taka aft BB stbd Shoulder BB stbd Quarter MB port Quarter	Used 2 x BB tugs + Taka + MB. Approached dock at 1.2 knots. Stbd shoulder tug failed approaching entrance to dock. Used Taka on the stern at 80% power to get all way off and start to pull the ship back from the dock. Bow within 30m of dock entrance Aborted entry to dock. MB sent forward to port shoulder to assist in controlling ship. Ship swung to stbd and stabilized off MP1 and well clear. Sufficient room in the turning basin to maintain the ship in navigable water and in control.
073	Arrival from sea	7V2	HW-1	NE 15 gusting 20	Banu DD		Taka aft BB stbd Shoulder	Used 2 x BB tugs + Taka + MB. Approached dock at 1.2 knots. Stbd quarter tug failed approaching entrance to dock. Used Taka on the stern at 80% power to get all way off and start to pull the ship back

							BB stbd Quarter MB port Quarter	from the dock. Bow within 30m of dock entrance Aborted entry to dock. MB remained on port quarter to assist in controlling ship. Ship pulled back from MP1 berth pocket using BB forward and Taka pulling aft. When clear of the pocket the ship was swung to port and stabilized off the docket entrance but well clear. Sufficient room in the turning basin to maintain the ship in navigable water and in control.
074	Arrival from sea	7V2	HW-1	E 15 gusting 20	Banu DD		Taka aft BB stbd Shoulder BB stbd Quarter MB port Quarter	Used 2 x BB tugs + Taka + MB. Constrained by berthed Aft tug failed approaching entrance to dock. Used BB quarter tug and MB on quarter to ease ship back from dock. Aborted entry to dock. MB remained on port quarter to assist in controlling ship. When clear of the berthed ships the ship was swung to port and stabilized in the turn basin facing out. Took some time to develop forward speed Sufficient room in the turning basin to maintain the ship in navigable water and in control.
075	Depart to sea	7 V2	HW -3	E 15 gusting 20	ND_DD		Taka Bow BB stbd shoulder MB Midships stbd BB Stbd quarter	Swung to stbd Tugs used up to 60% Departed dock and held in position to make fast BB on quarter and release mules. Pulled out from dock safely and swung to stbd and managed to stabilize. Deadship depart. Full flood tide and a weak spring period. Acceptable. Turn basin is acceptable space to manage the manoeuvre.
076	Depart to sea	7 V2	HW -3	E 15 gusting 20	Banu DD		Taka Bow BB stbd shoulder MB Midships stbd BB Stbd quarter	Swung to stbd Tugs used up to 80% Departed dock and held in position to make fast BB on quarter and release mules. Difficulty in controlling ship when outside dock and stern passed close to fenders when removing aft mules. Mules may need more bollard pull for this displacement size ship. Just cleared dock and swung to stbd and managed to stabilize after some time. Deadship depart. Full flood tide and a weak spring period. Marginal. Turn basin is acceptable space to manage the manoeuvre.
077	Arrival from layup	7 V2	HW -3	E 15 gusting 20	ND_ DD		BB stbd shoulder Taka Stern BB Stbd quarter MB midship stbd	Swung to port. Tugs used at 30% power. Got towards northern boundary but controlled Held in position off dock for 15mins as mules attached. Balanced forces on ship. Ship maintained within the turning basin. Noticeable force from tidal stream at stern but easily counteracted... Weak Spring tide used

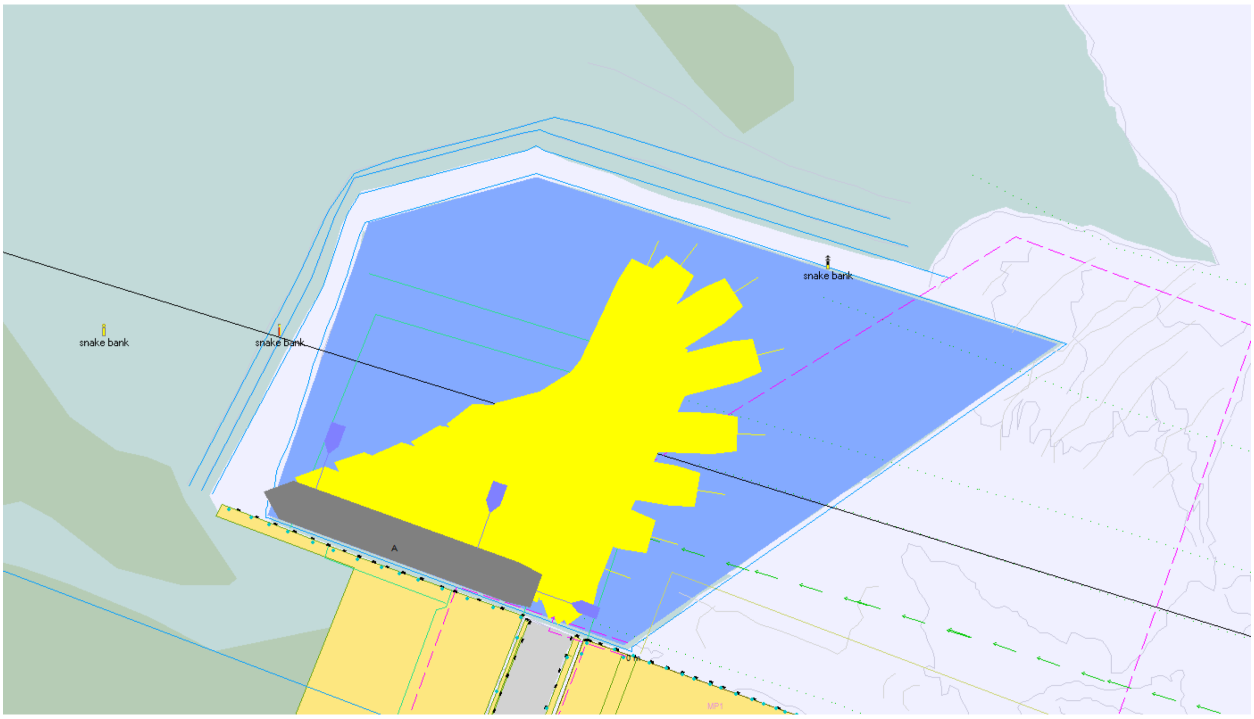
078	Arrival from layup	7 V2	HW -3	E 15 gusting 20	Banu_ DD		BB stbd shoulder Taka Stern BB Stbd quarter MB midship stbd	Swung to port. Tugs used at 60% power. Exited turning basin but recovered. Held in position off dock for 15mins as mules attached. Some difficulty in balancing forces initially. Noticeable force from tidal stream at stern but counteracted using more tug power. Weak spring tide used
079	Arrival from layup	7 V2	HW 3	SW 15 gusting 20	Banu_ DD		BB stbd shoulder Taka Stern BB Stbd quarter MB midship stbd	Swung to port. Tugs used at 70% power. Significant stern speed needed to be taken off using the tugs. Exited turning basin but recovered. Some difficulty in balancing forces initially. Held in position off dock for 15mins as mules attached. Noticeable force from tidal stream at stern but counteracted using more tug power. Weak spring tide used
080	Arrival from layup	7 V2	HW 3	SW 15 gusting 20	ND_ DD		BB stbd shoulder Taka Stern BB Stbd quarter MB midship stbd	Swung to port. Tugs used at 60% power. Got towards northern boundary but controlled using available tug power. Noticeable stern speed (2knots) as able to be taken off without pushing on stern. Held in position off dock for 15mins as mules attached. Balanced forces on ship. Ship maintained within the turning basin. Noticeable force from tidal stream at stern but easily counteracted... Weak Spring tide used

5.11 July Simulation Run Plots

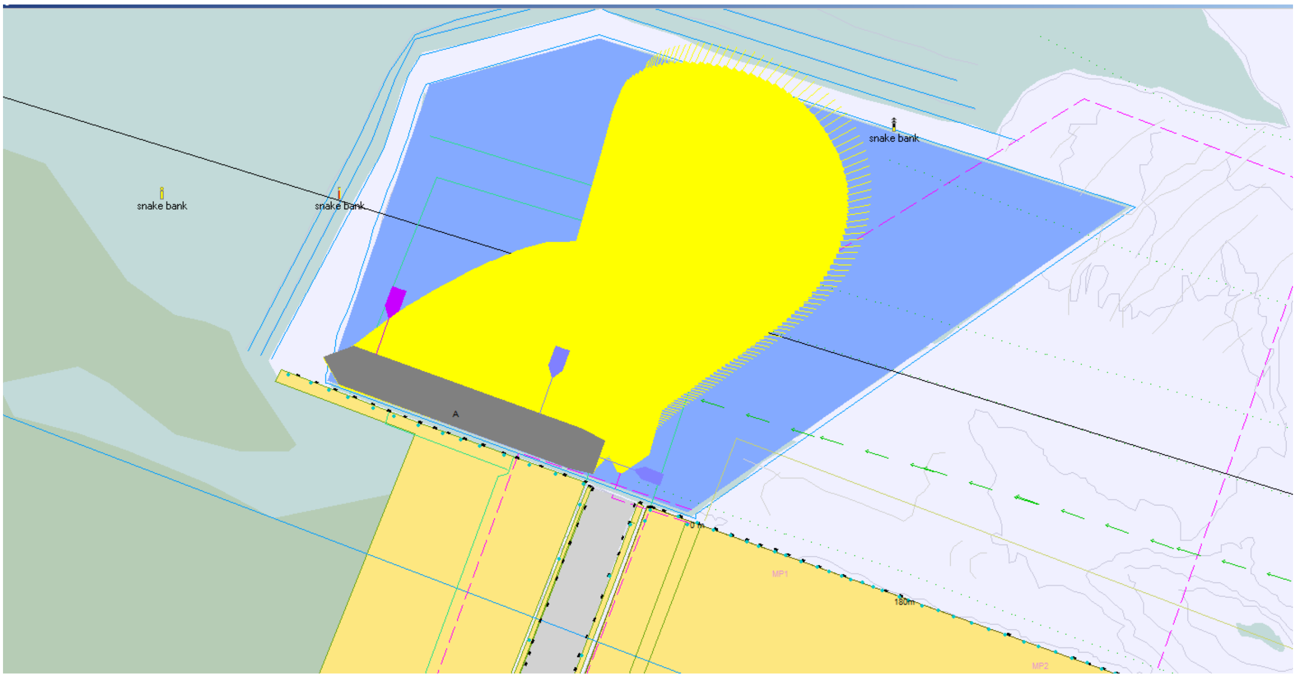
The following plots of the July simulation runs display graphically the path of the design ship in the operational area. The path can be shown in multiple colours and displays a ship position every 30 seconds. In some plots the interval between plots is increased to show better clarity of the movement of the ship. Track envelope plots show multiple simulation runs for a given design ship. The starting position of the ship is shown in grey and the positions of the tugs are in blue or pink. The blue polygon shows the new turning basin design.



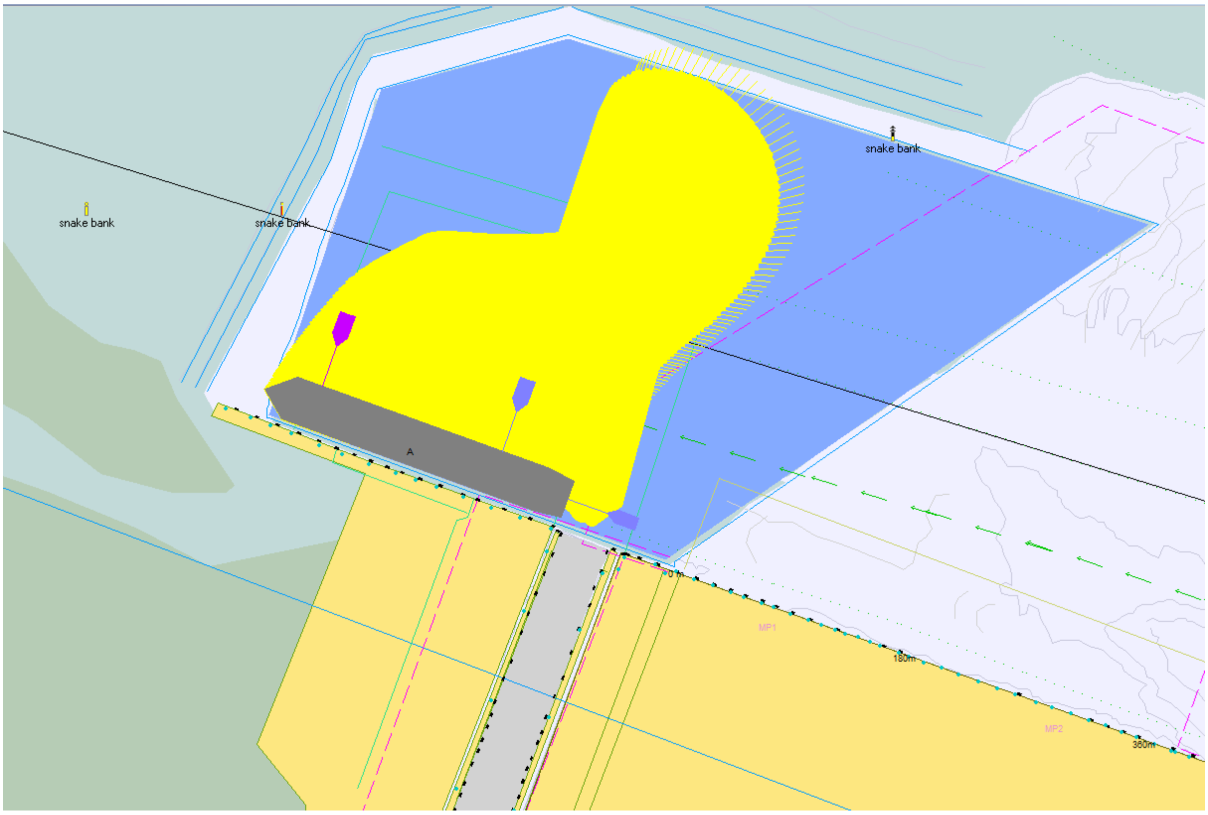
Run 051 Banu DD Arrival from Layup Berth



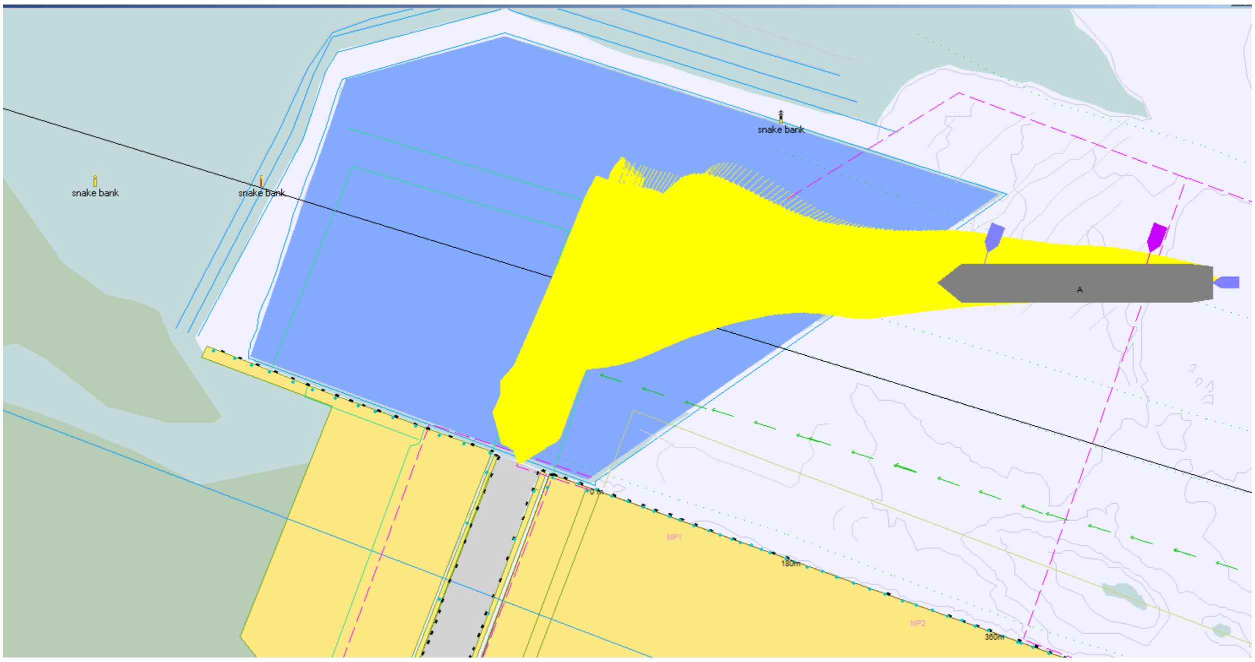
Run 052 Banu DD Arrival from Layup Berth



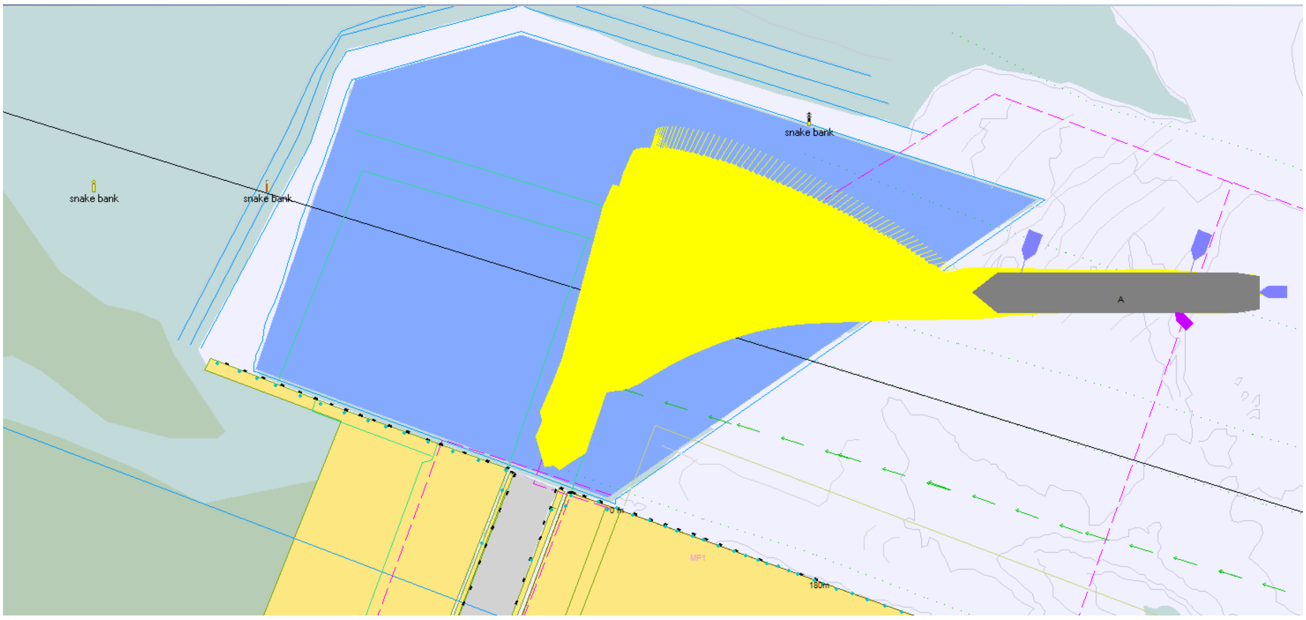
Run 053 Banu DD Arrival from Layup Berth



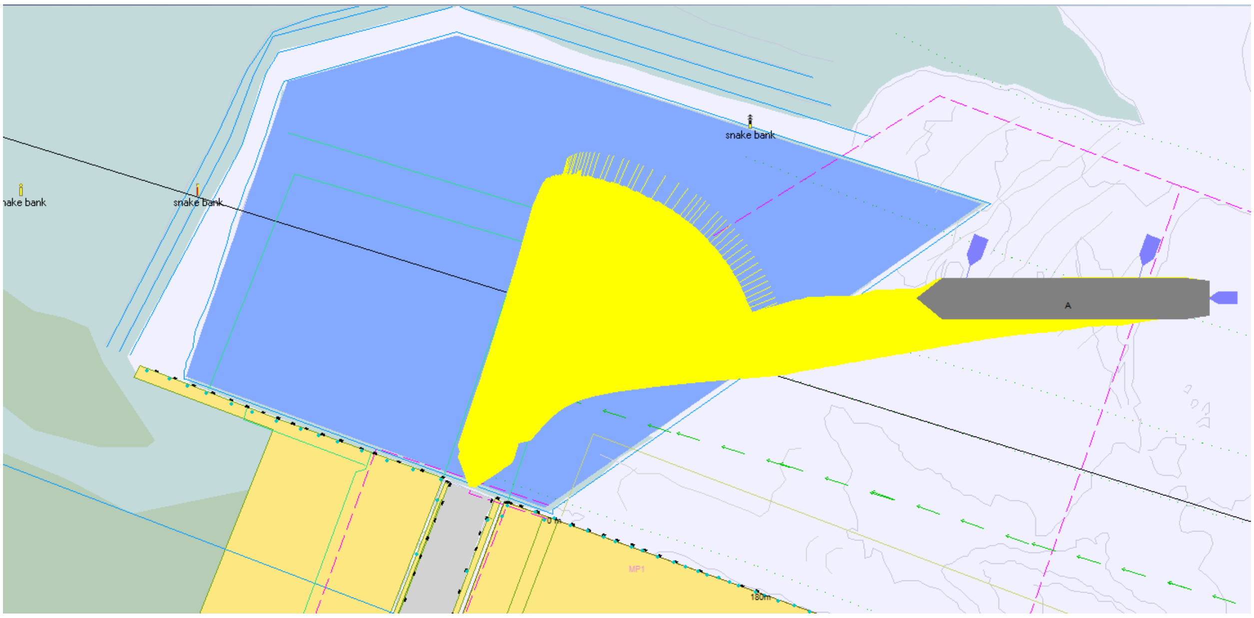
Run 054 Banu DD Arrival from Layup Berth



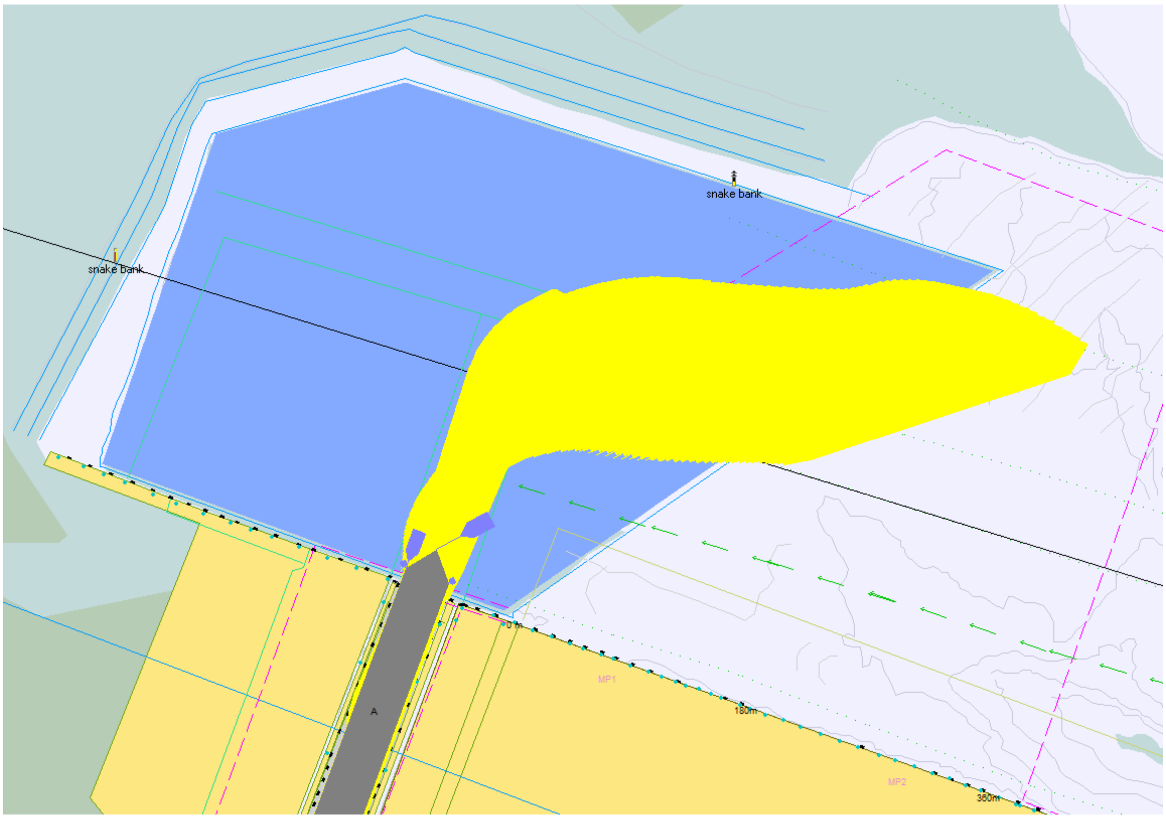
Run 055 Banu DD Arrival from sea



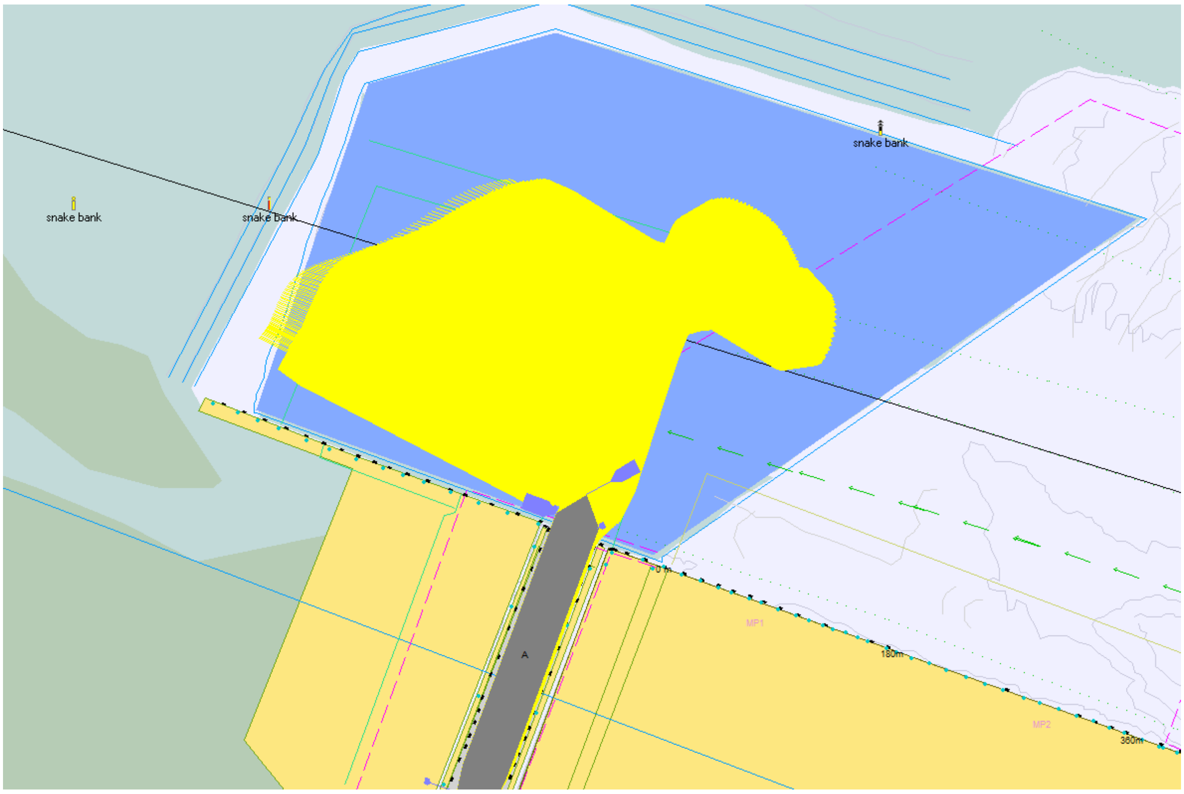
Run 056 Banu Arrival from sea



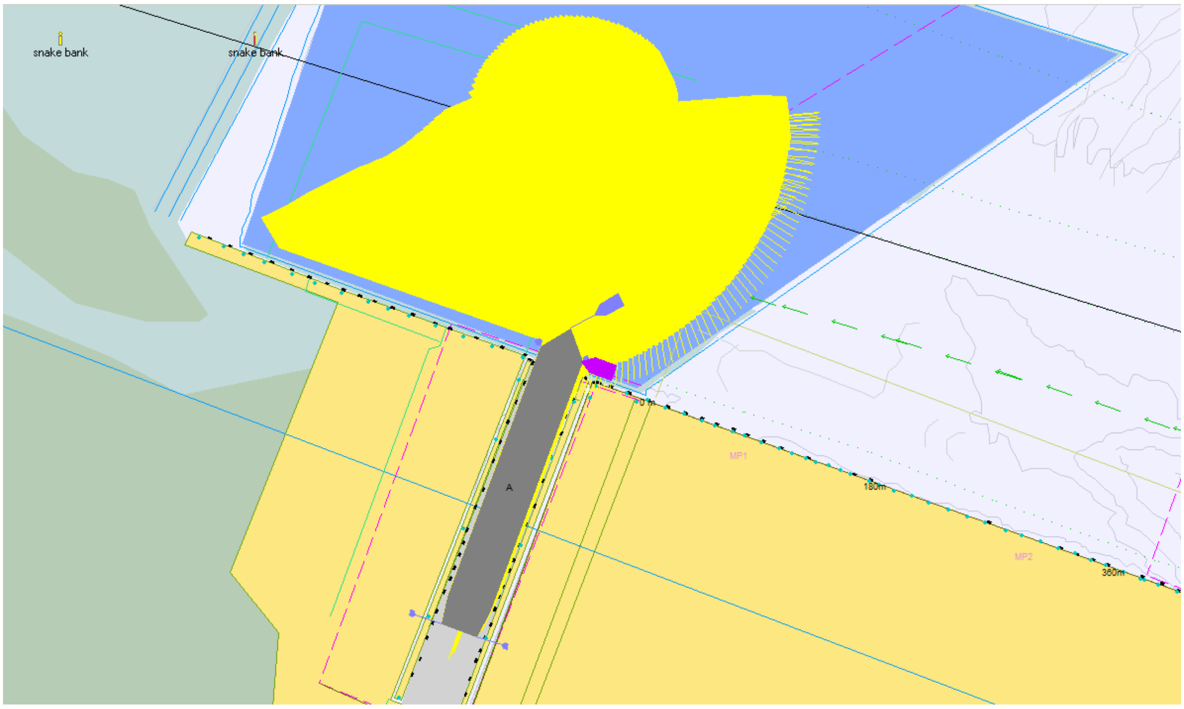
Run 057 Banu DD Arrival from sea



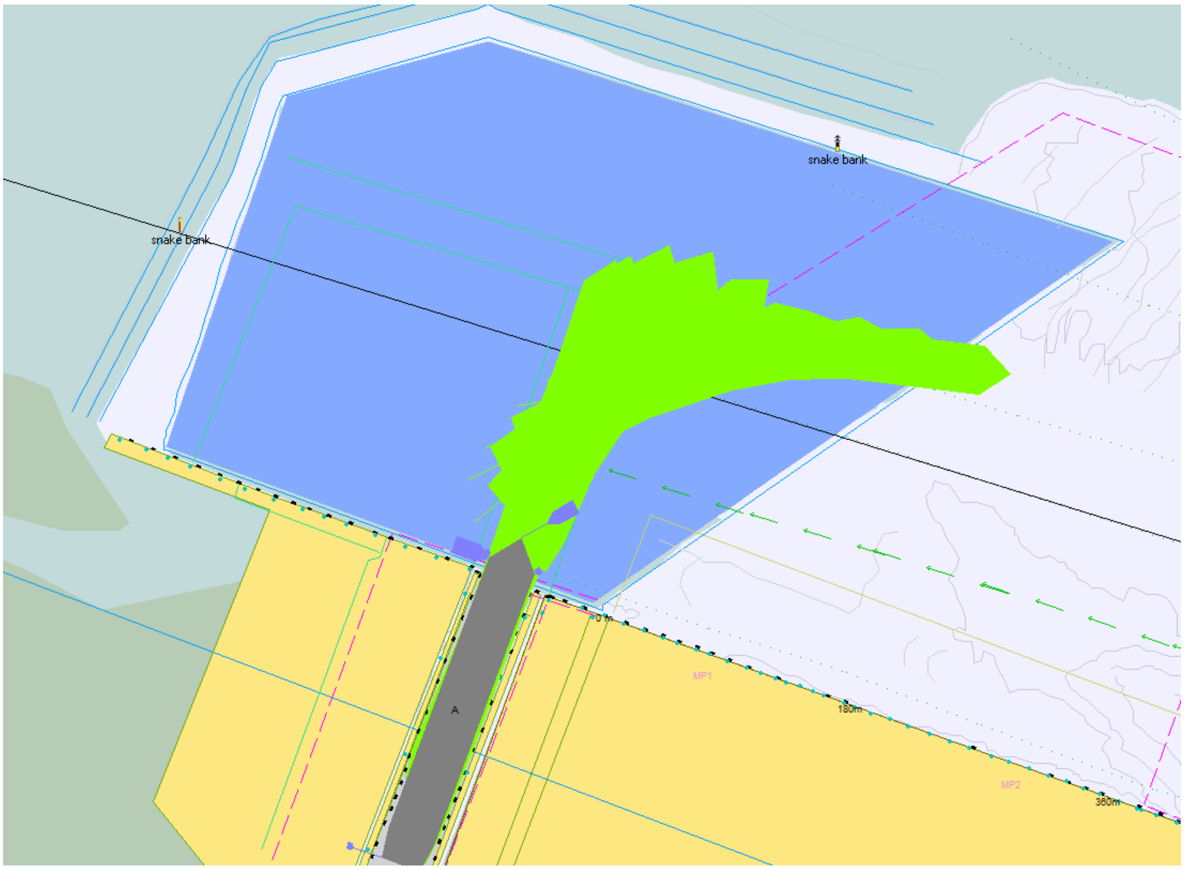
Run 058 Banu DD Departure to sea



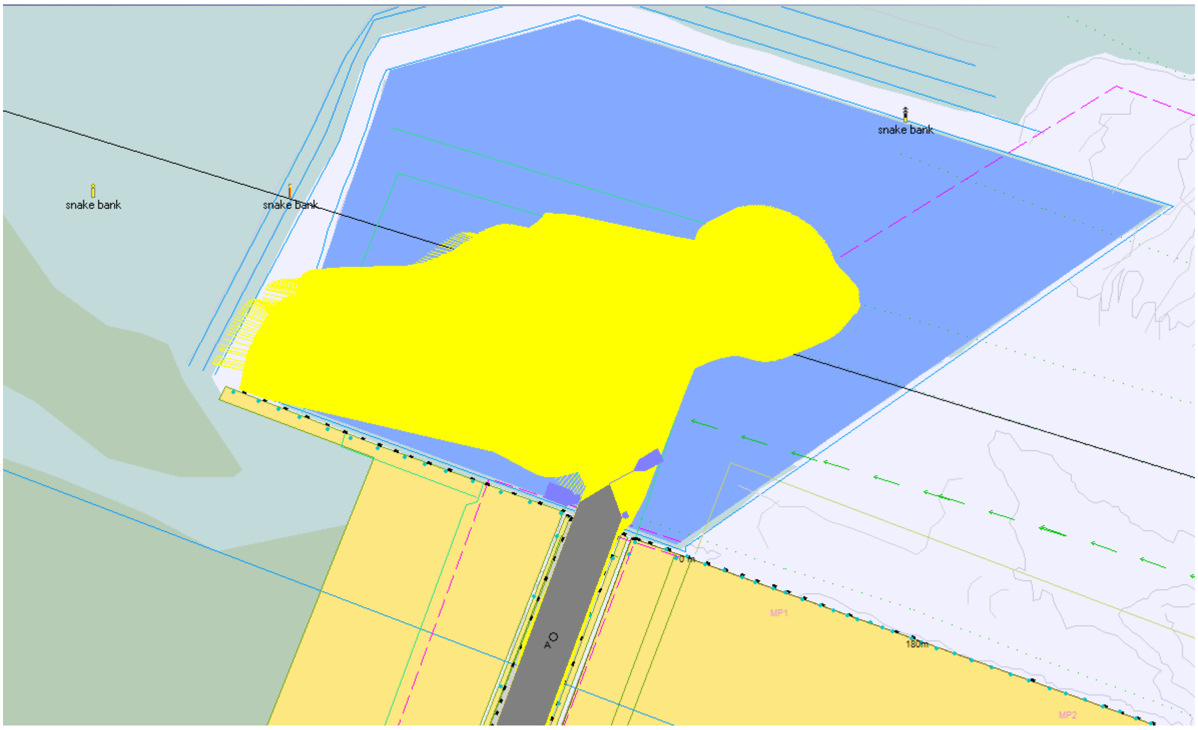
Run 059 Banu DD departure to layup berth



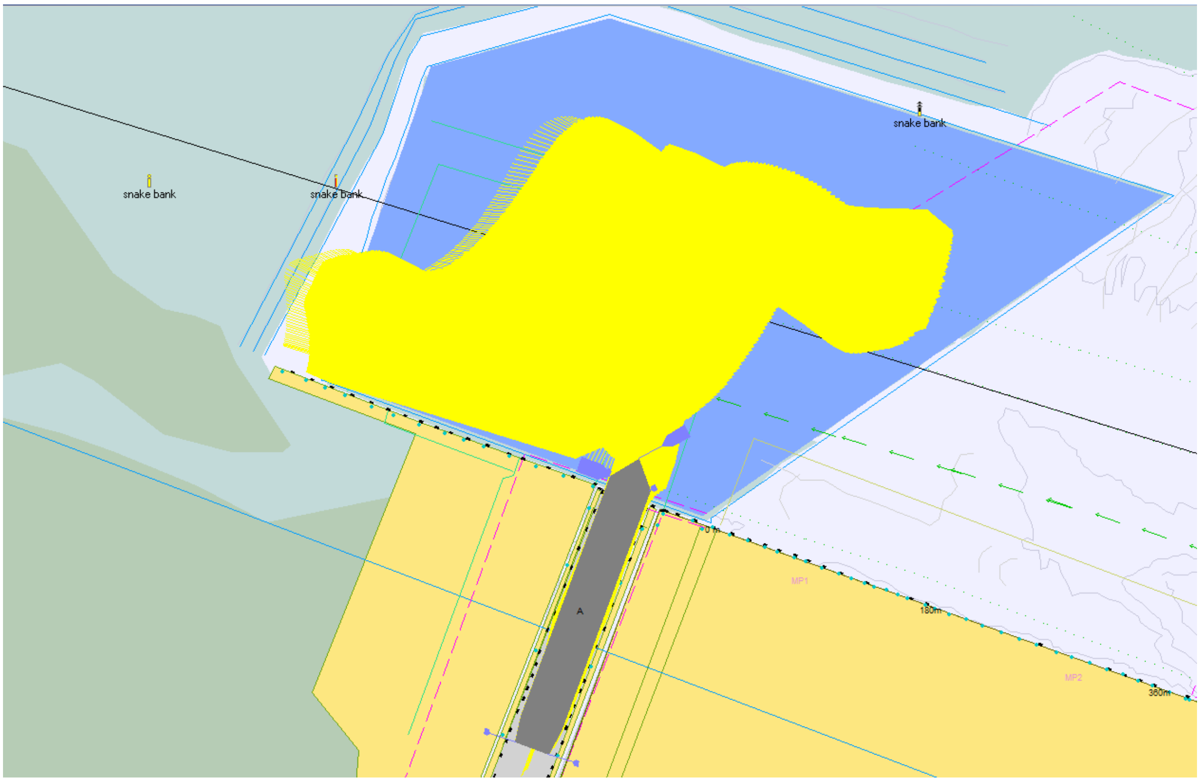
Run 060 Banu DD departure to layup berth



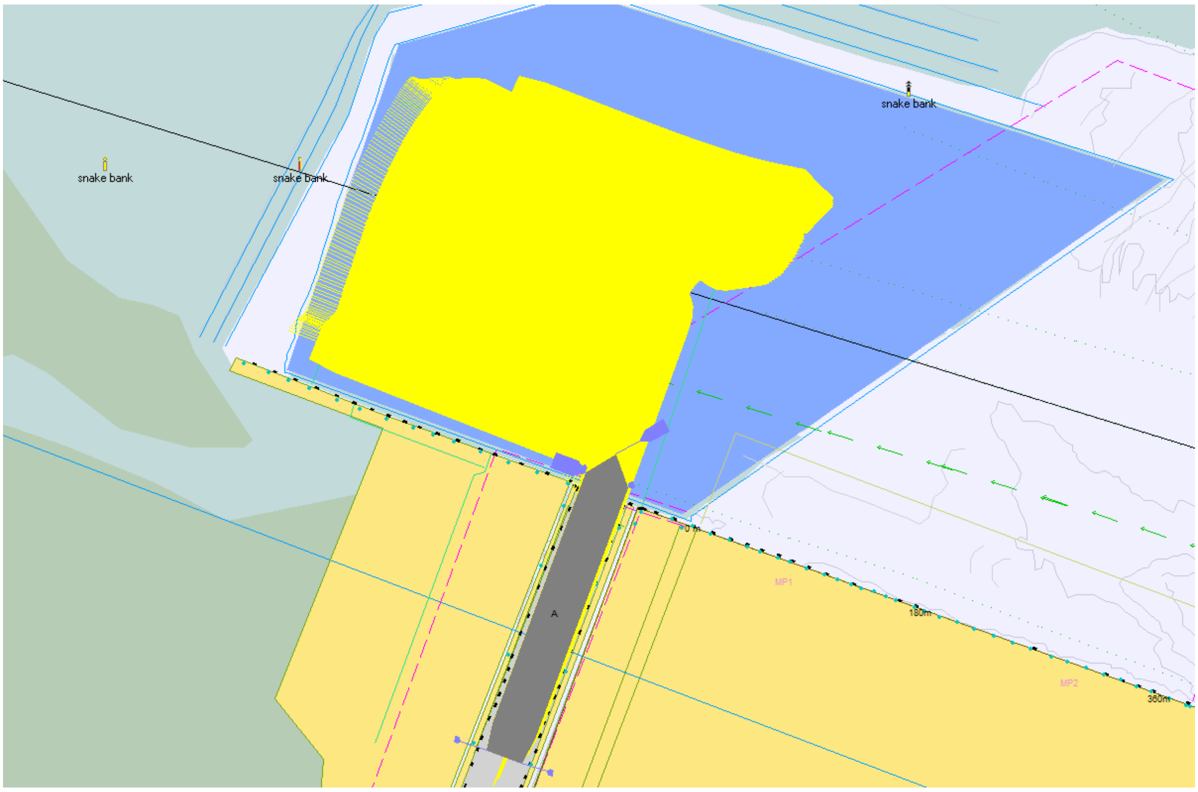
Run 061 Banu Departure to sea



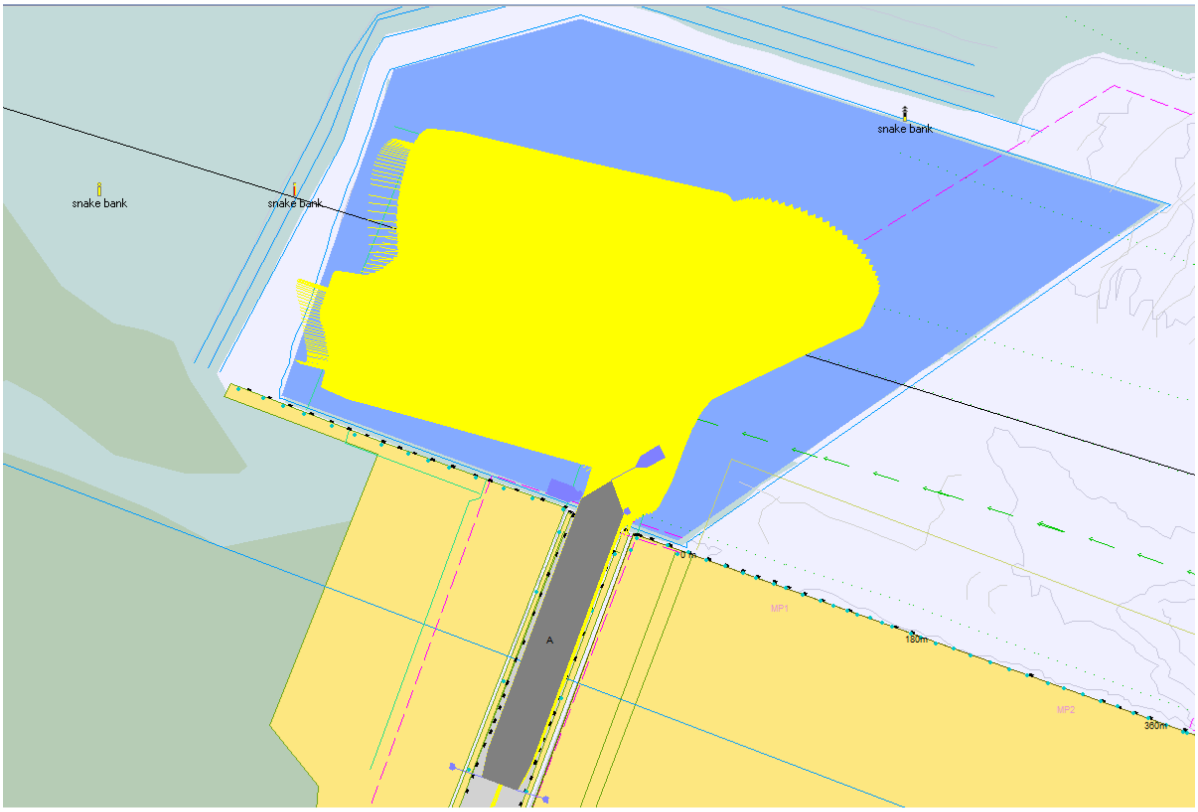
Run 062 Banu DD departure to layup berth



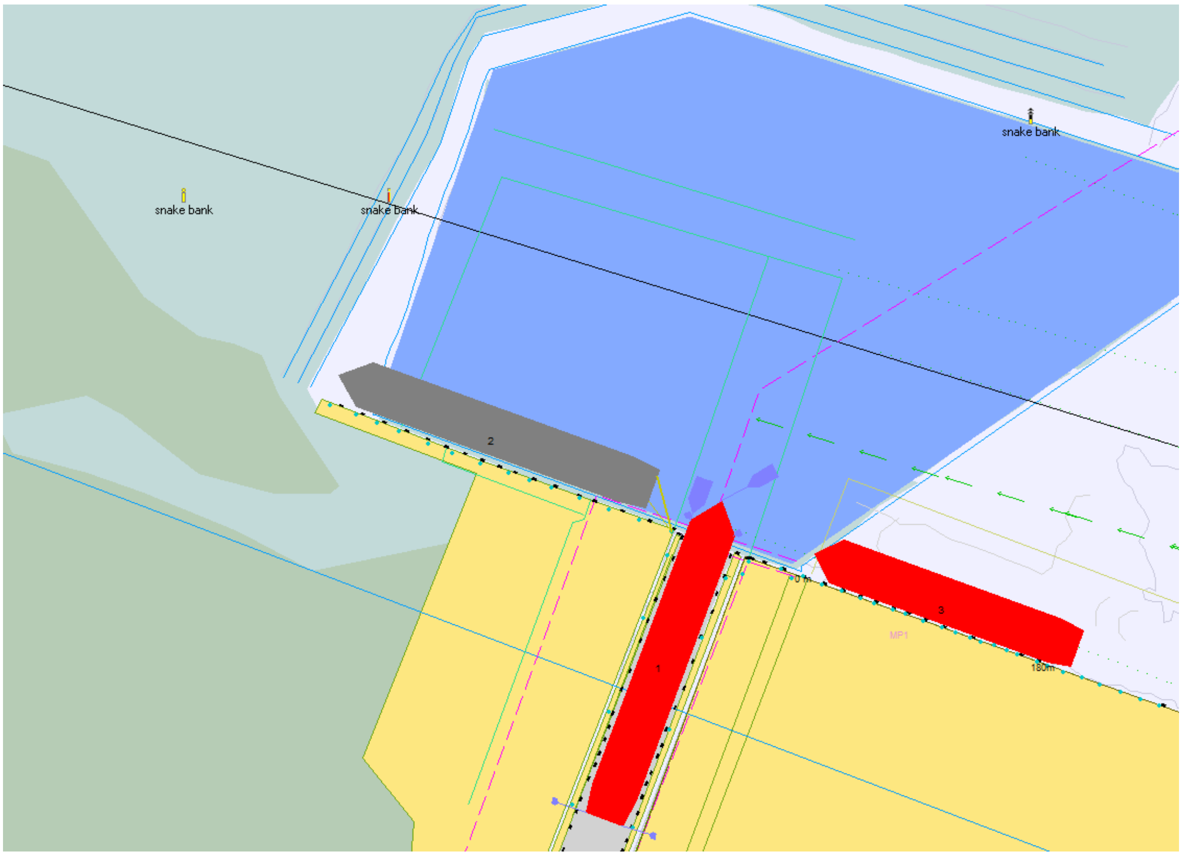
Run 063 Banu DD departure to layup berth



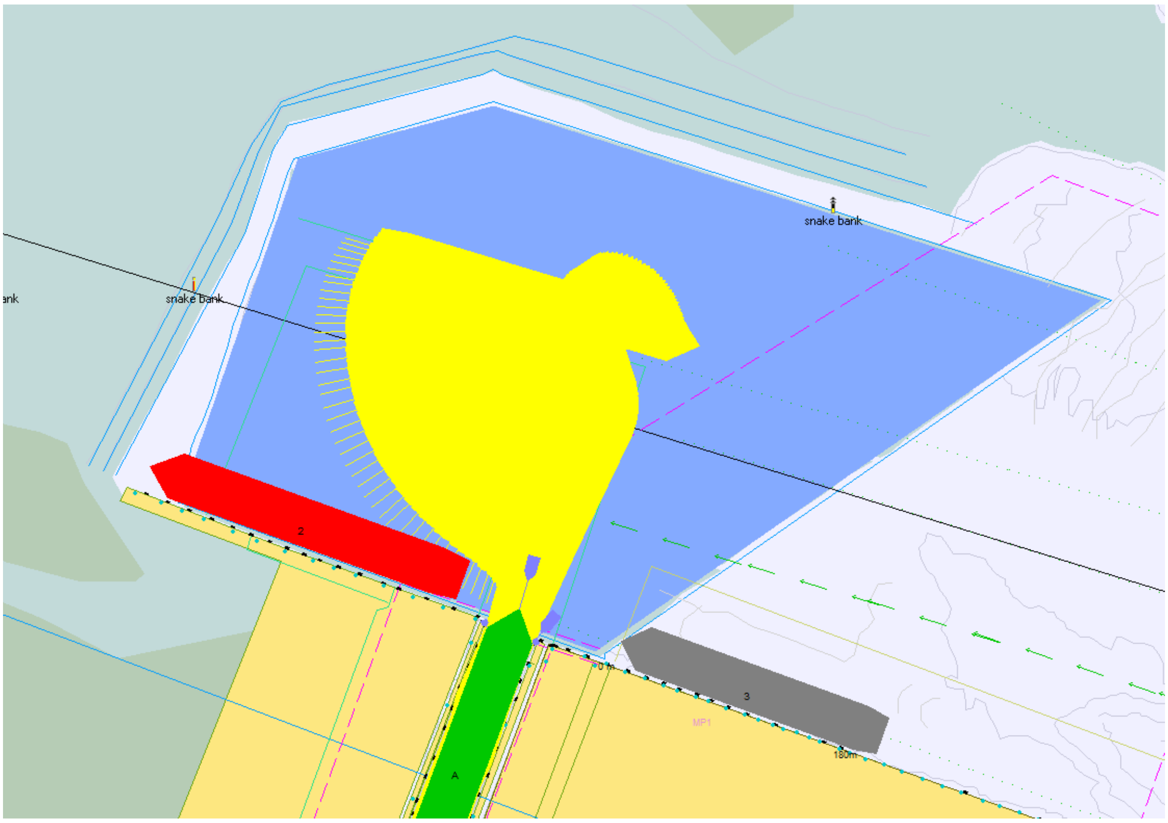
Run 064 Banu DD departure to layup berth



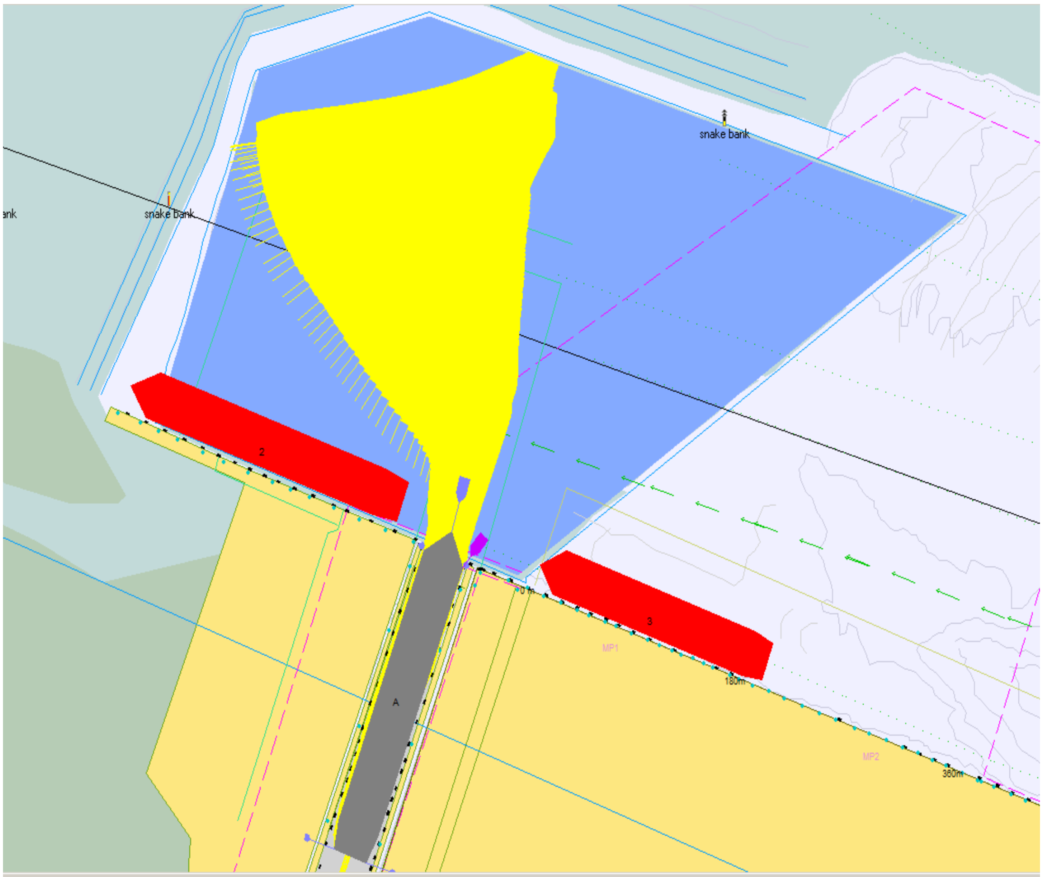
Run 065 Banu DD departure to layup berth



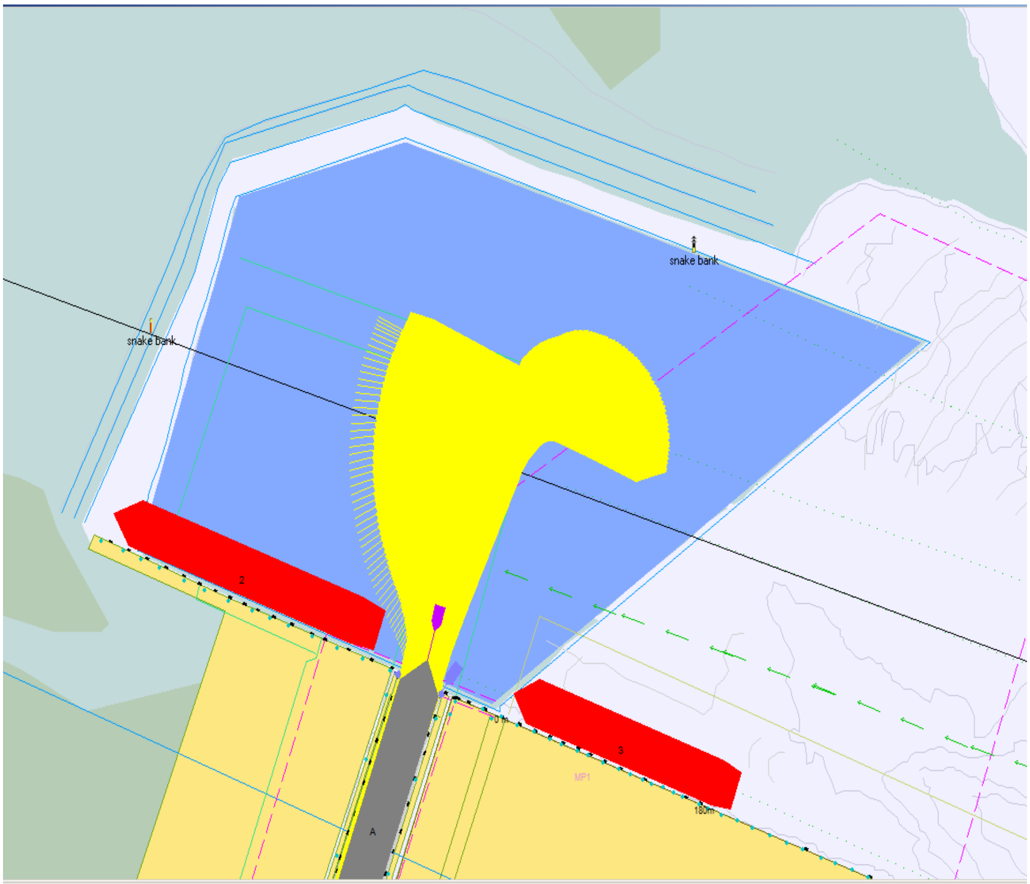
Constraint caused by a 228m ship at layup berth, acting on a departing ship by. Ship at MP1 is 50m clear of dock. Mooring lines from ship at layup berth will interfere with tug on port bow.



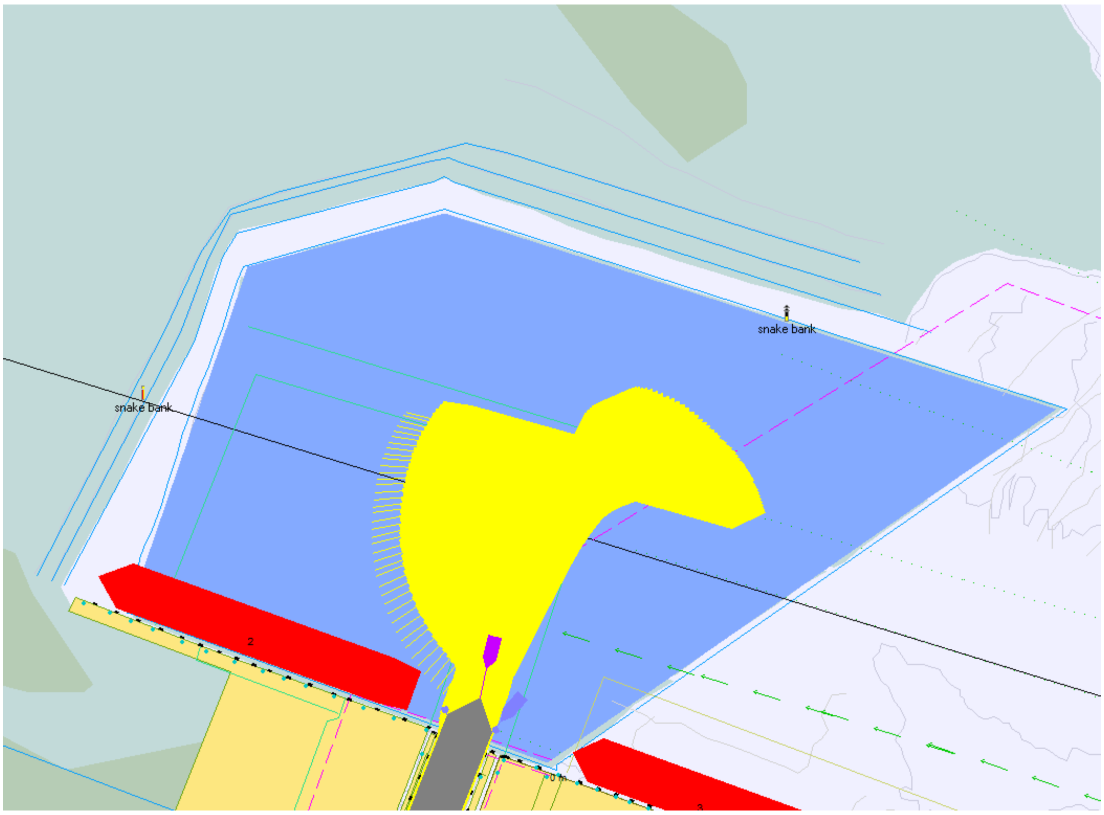
Run 066 Banu DD departure to sea. Constrained by ship on layup berth



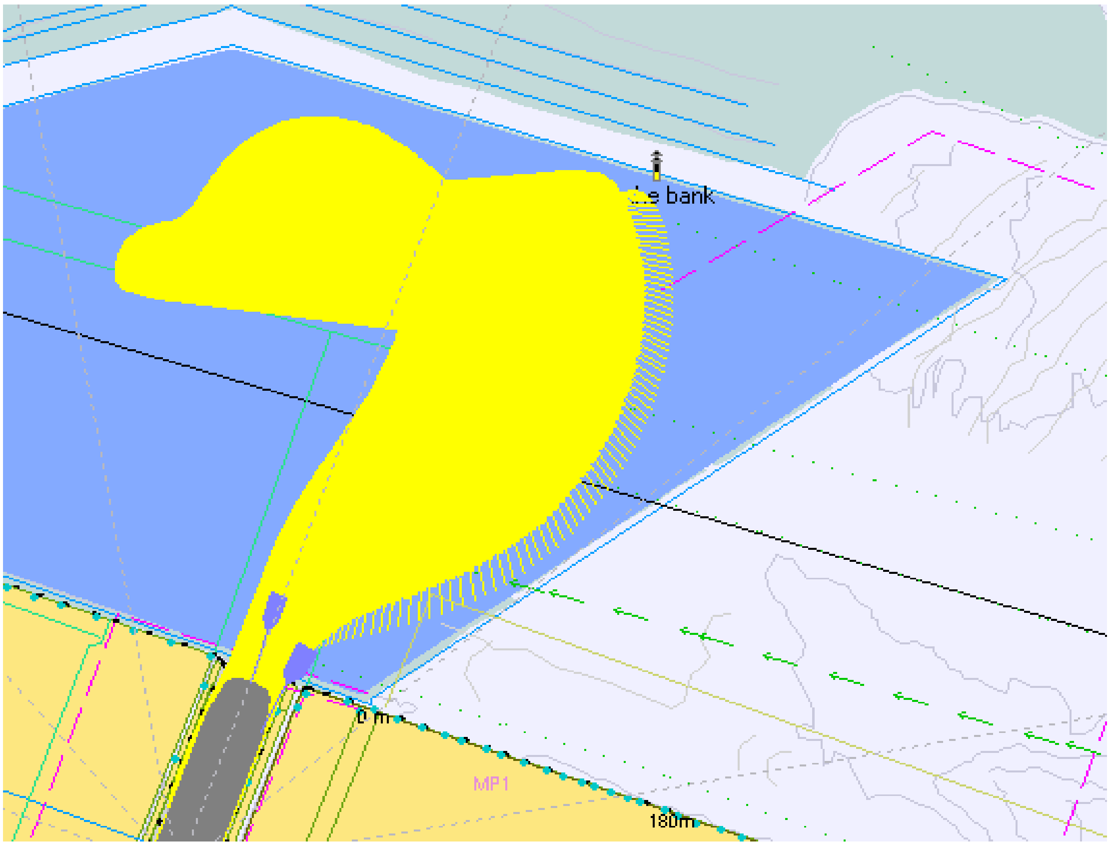
Run 067 Banu DD departure to sea. Constrained by ship on layup berth



Run 068 Banu DD departure to sea. Constrained by ship on layup berth

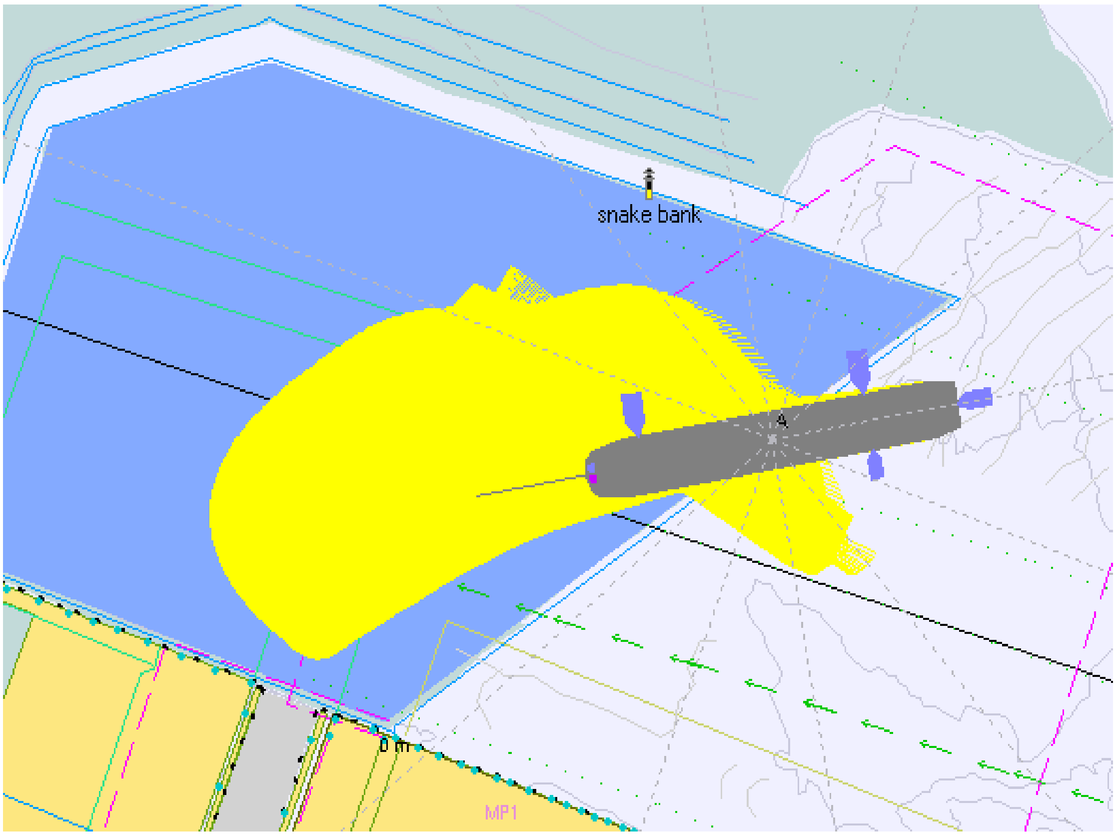


Run 069 Banu DD departure to sea. Constrained by ship on layup berth

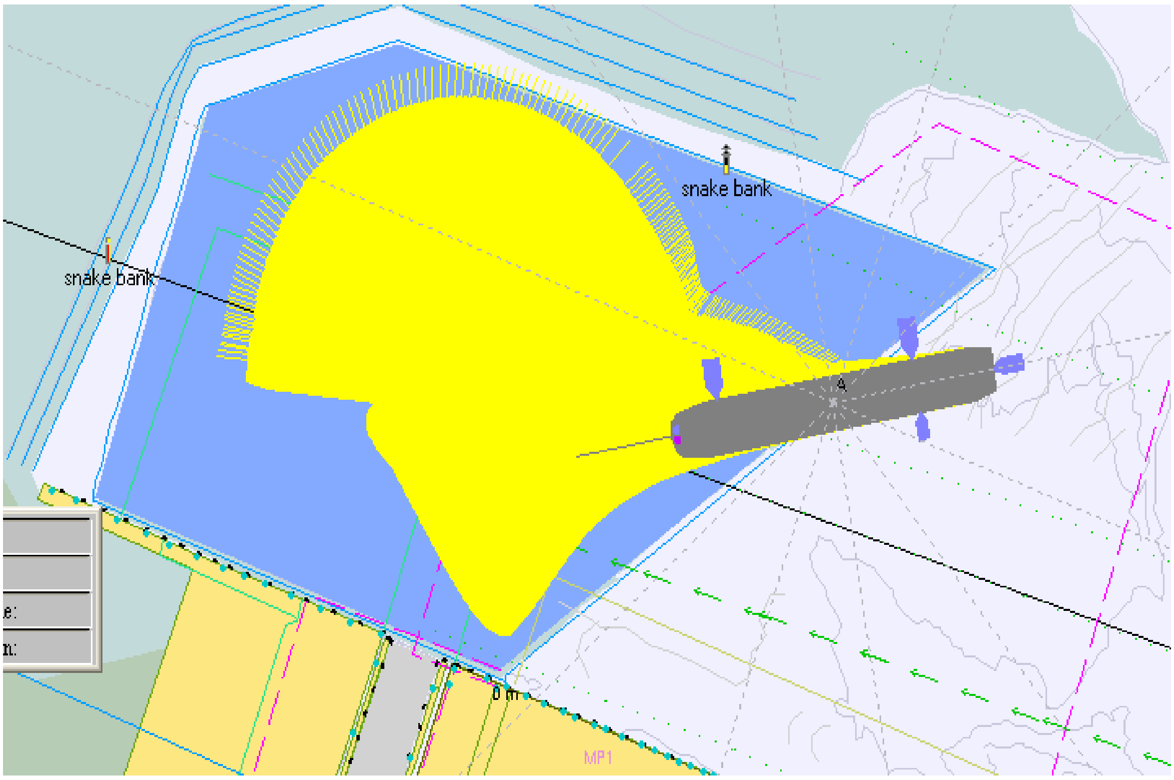


Run 070 Banu DD Departure to Layup berth Aft tug Failure

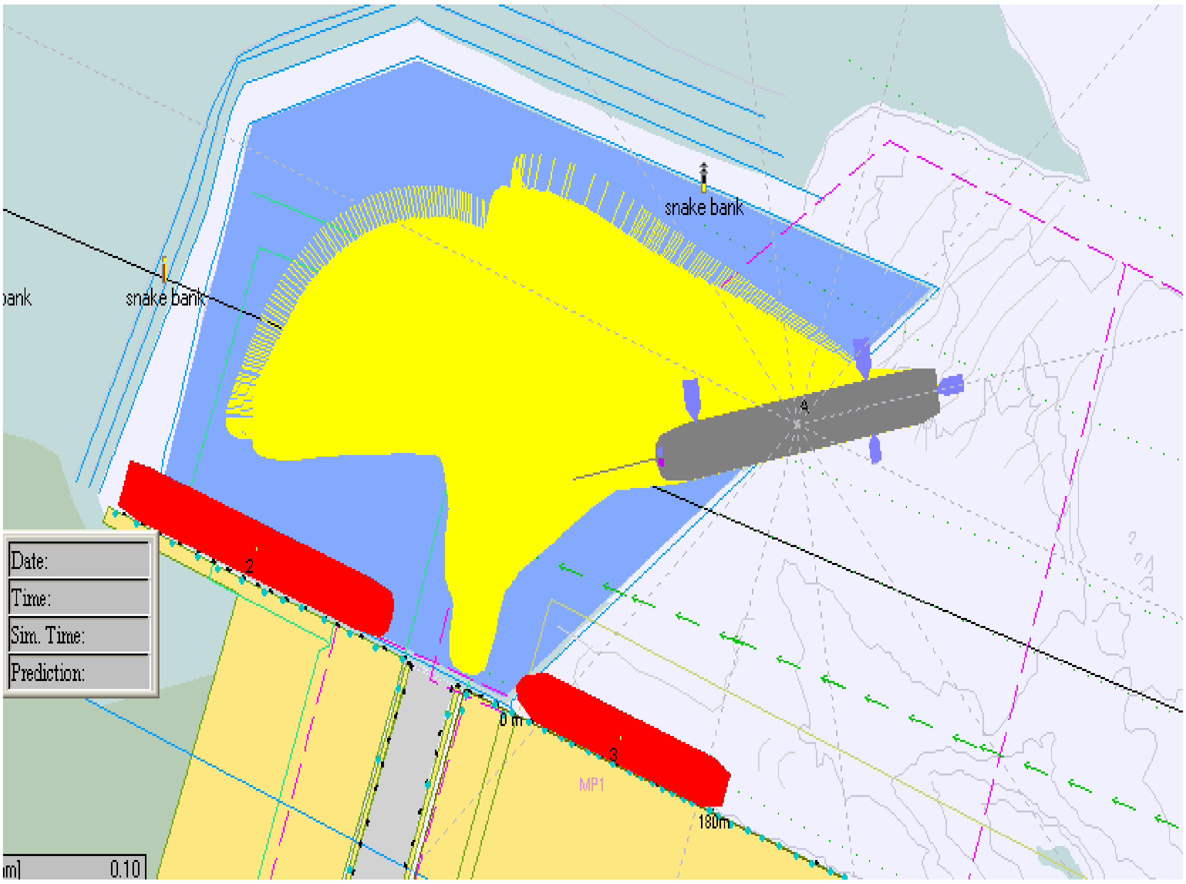
Run 071 Banu DD Departure to Layup berth Forward tug Failure



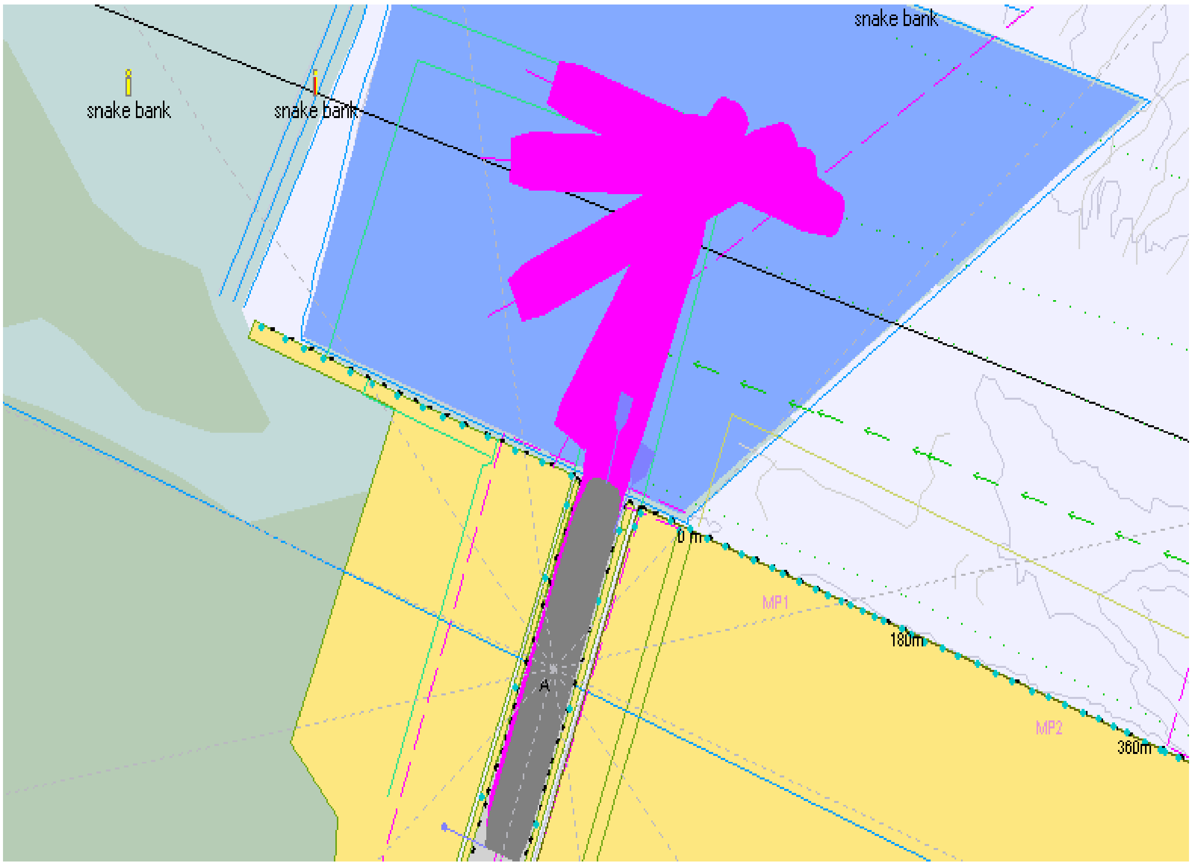
Run 072 Banu DD Arrival from sea. Shoulder tug Failure



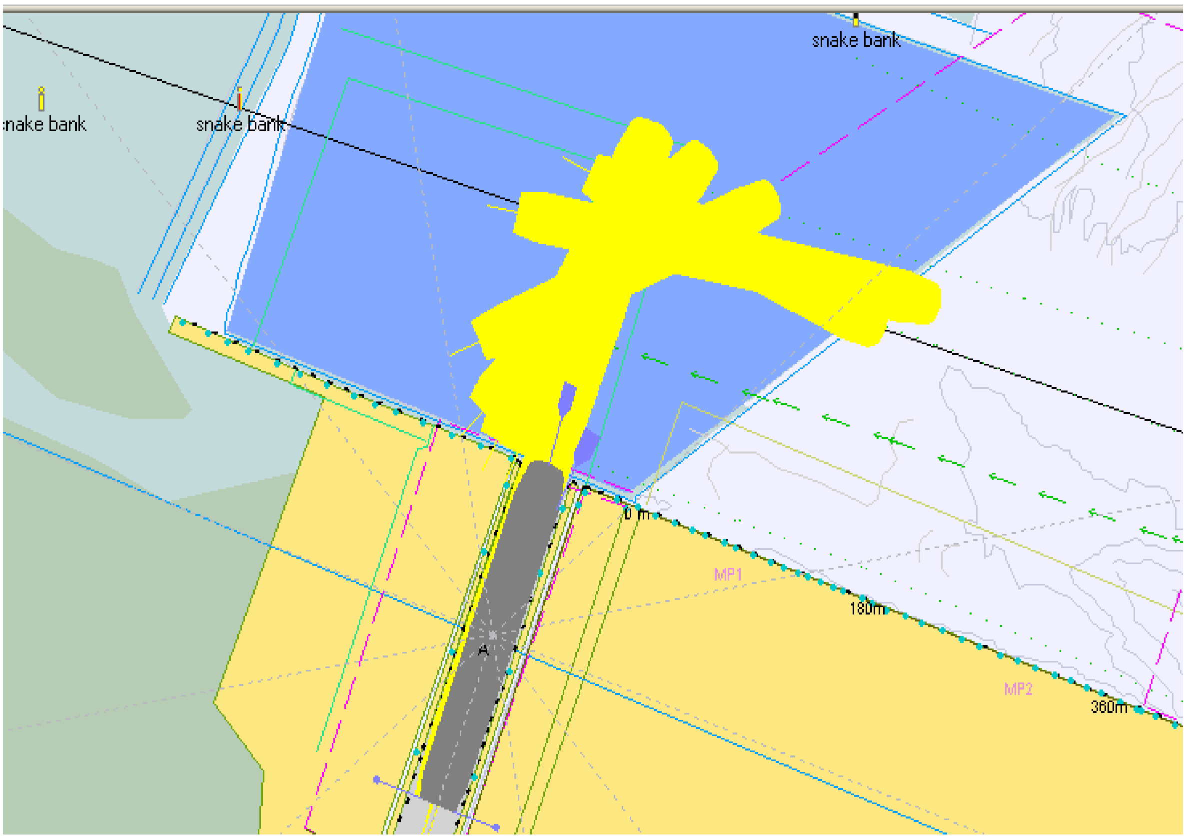
Run 073 Banu DD Arrival from sea. Quarter tug Failure



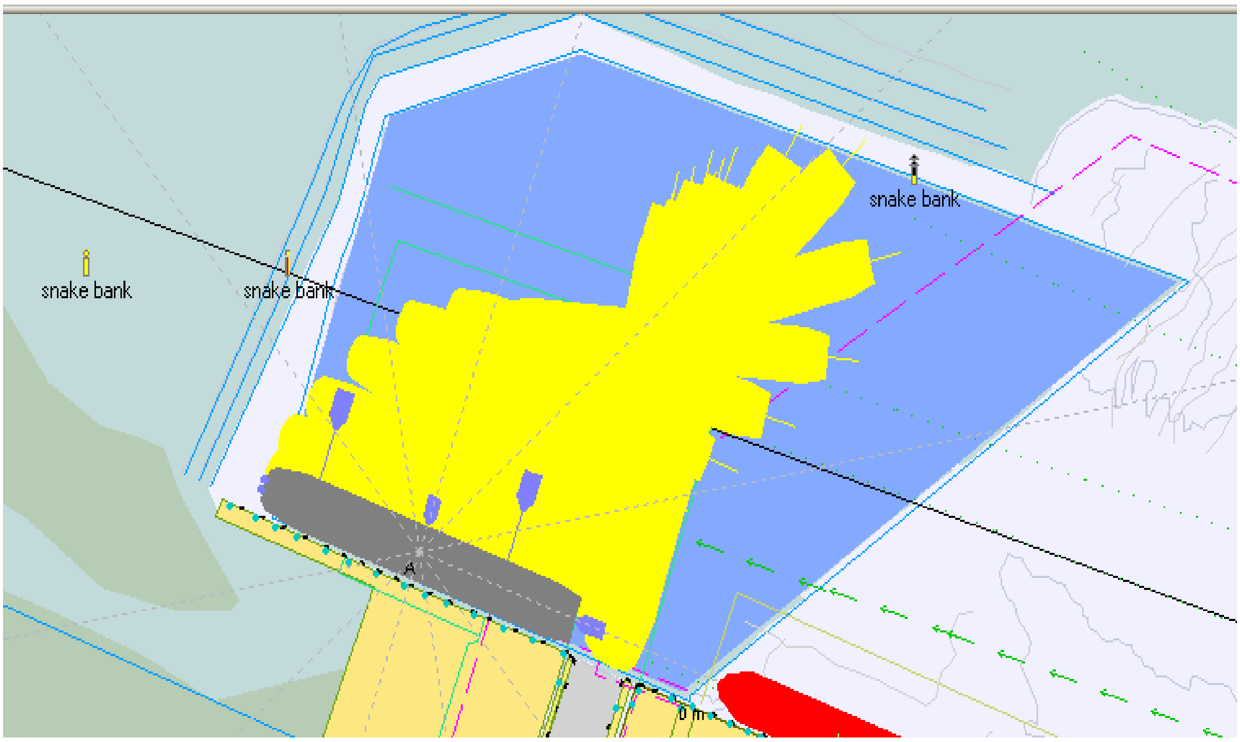
Run 074 Banu DD Arrival from sea. Stern tug failure



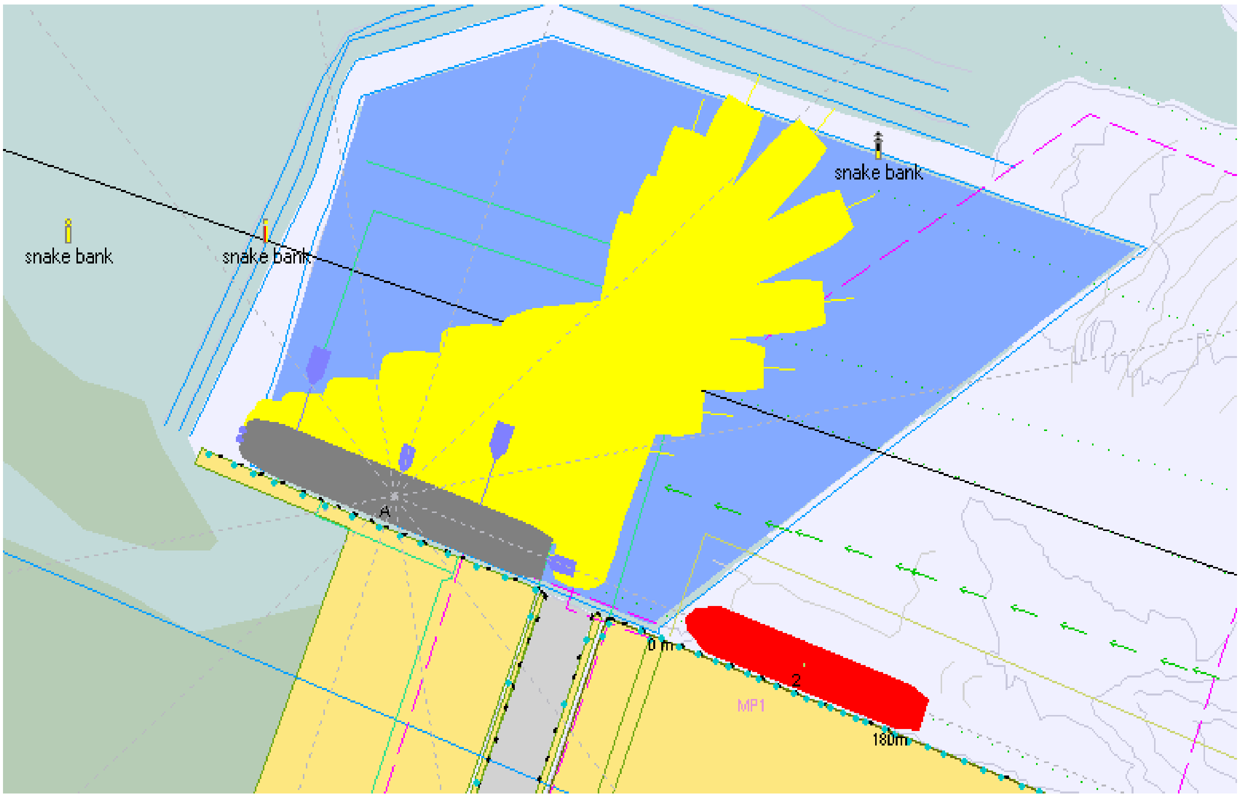
Run 075 Departure to sea ND_DD full flood tide



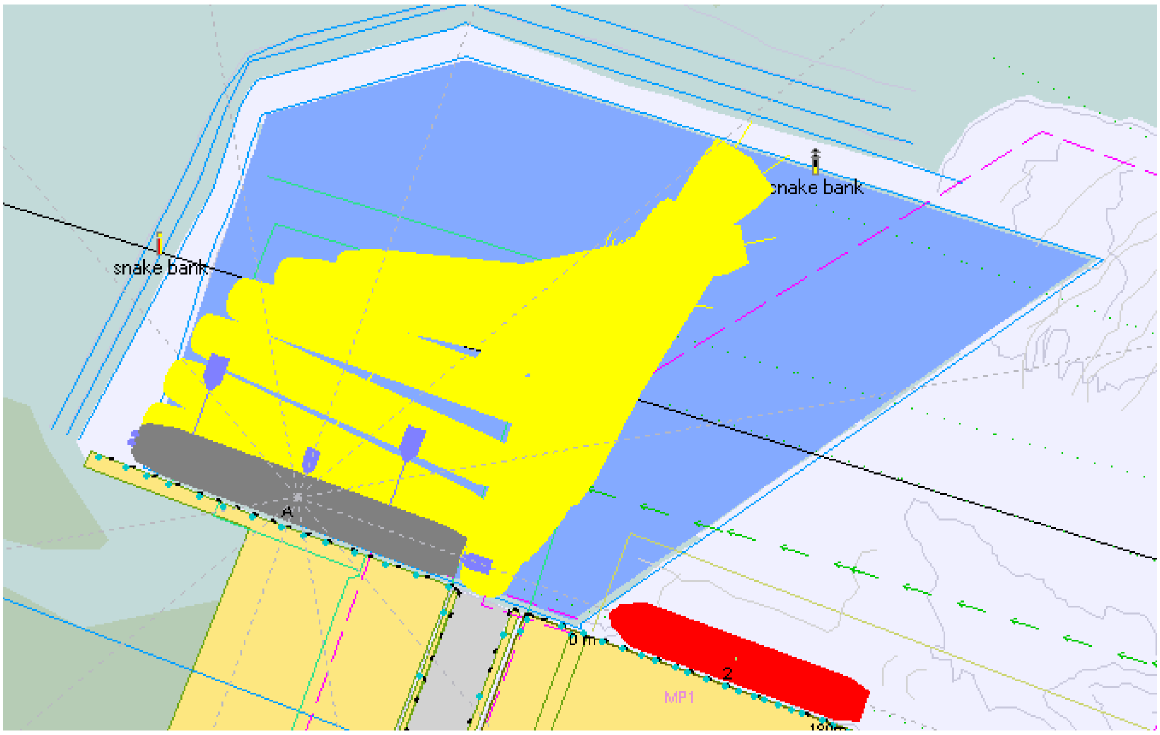
Run 076 Departure to sea Banu_DD full flood tide



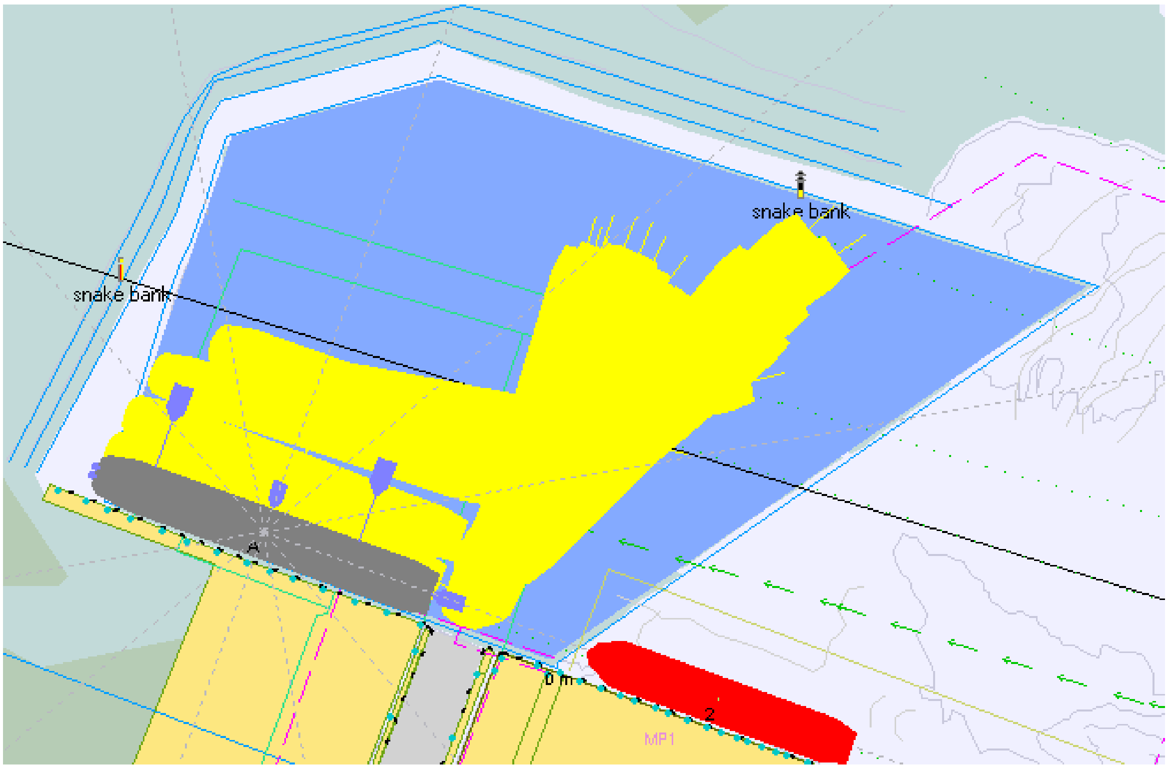
Run 077 Layup Berth to Dock ND_DD full flood tide



Run 078 Layup Berth to Dock Banu_DD full flood tide



Run 079 Layup Berth to Dock Banu_DD full ebb tide

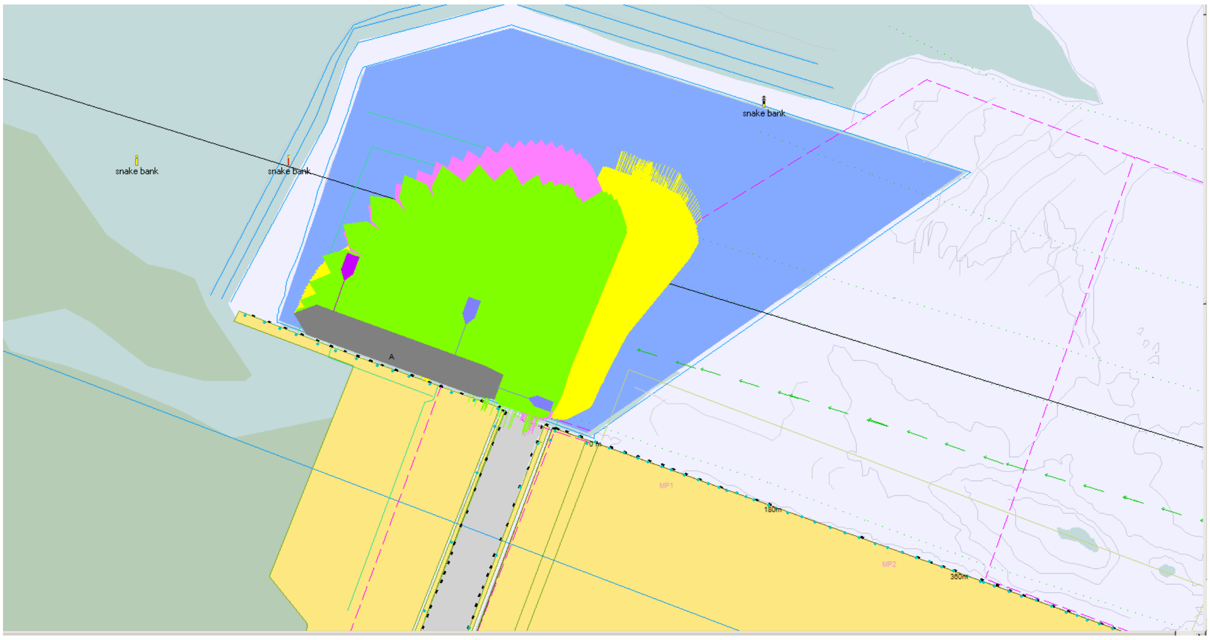


Run 080 Layup Berth to Dock ND_DD full ebb tide

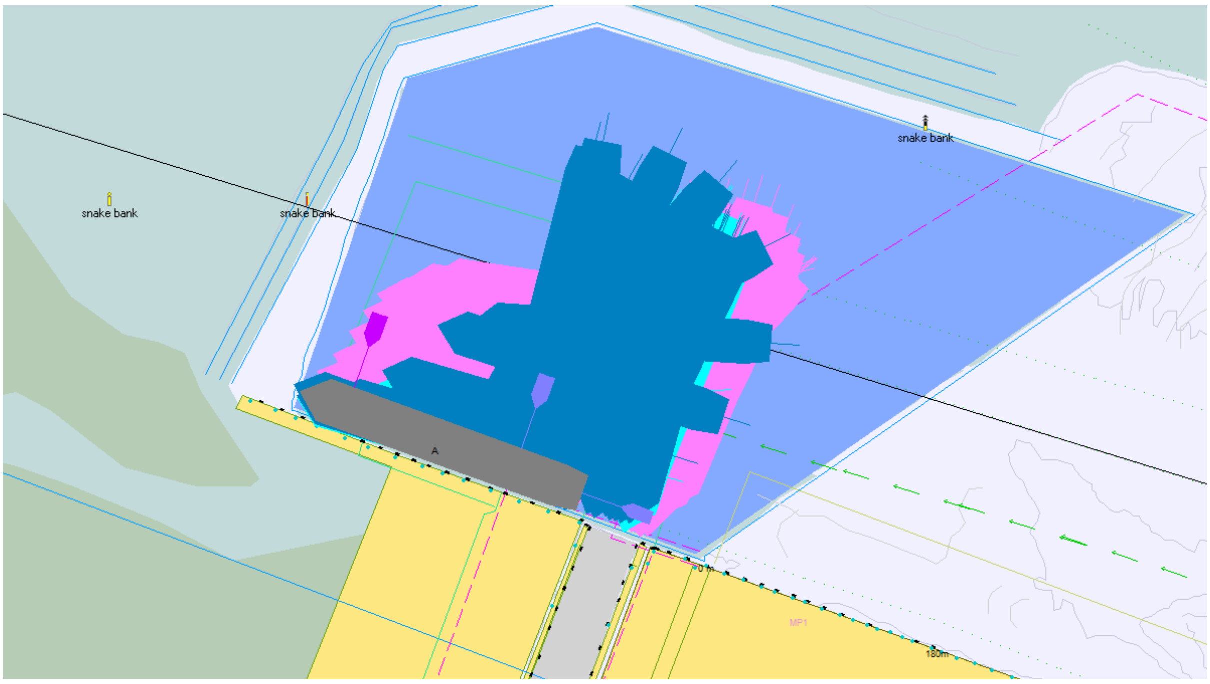
5.12 May/ June Simulations superimposed on new turning basin

The following track envelope plots of the May/ June simulation runs are superimposed on the new turning basin. The blue polygon shows the new turning basin design. The path can be shown in multiple colours and displays a ship position every 30 seconds. In some plots the interval between plots is increased to show better clarity of the movement of the ship. These track envelope plots show multiple simulation runs for a given design ship. The starting position of the ship is shown in grey and the positions of the tugs are in blue or pink.

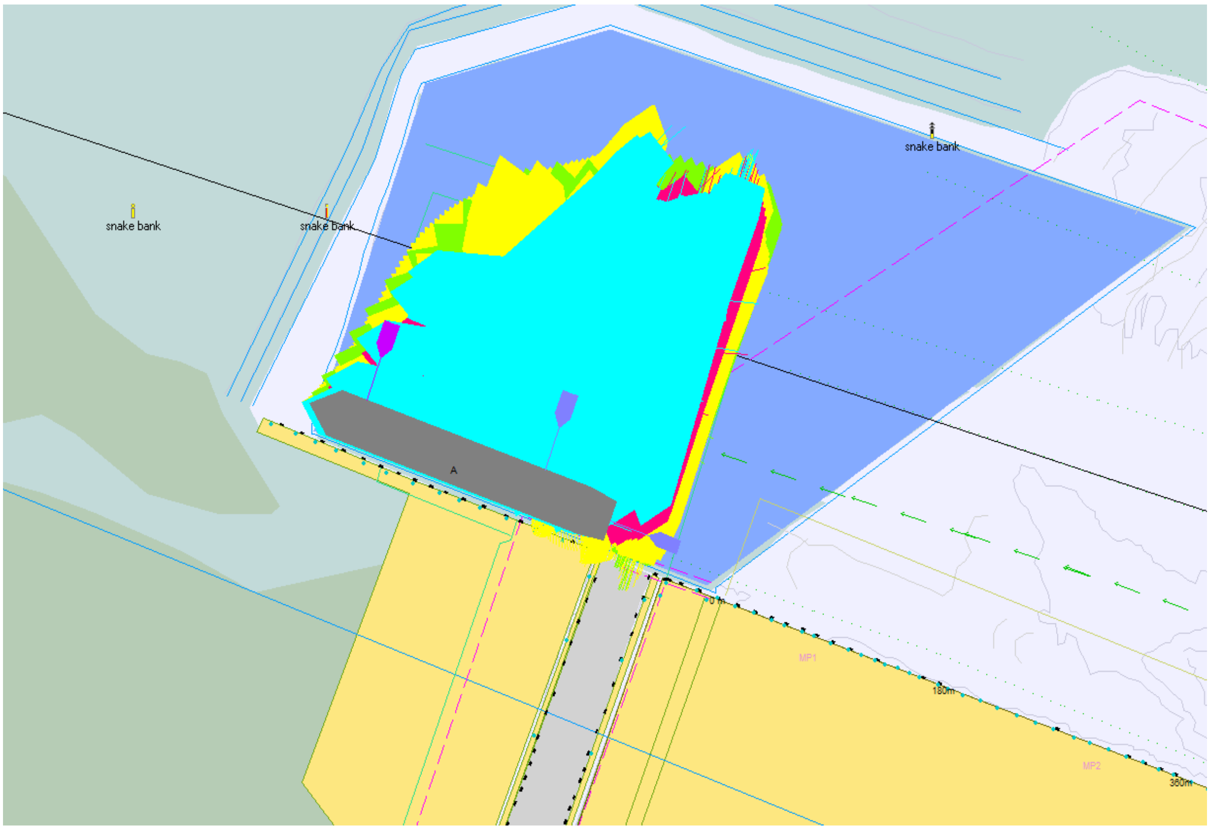
Runs for larger ships 200m plus only



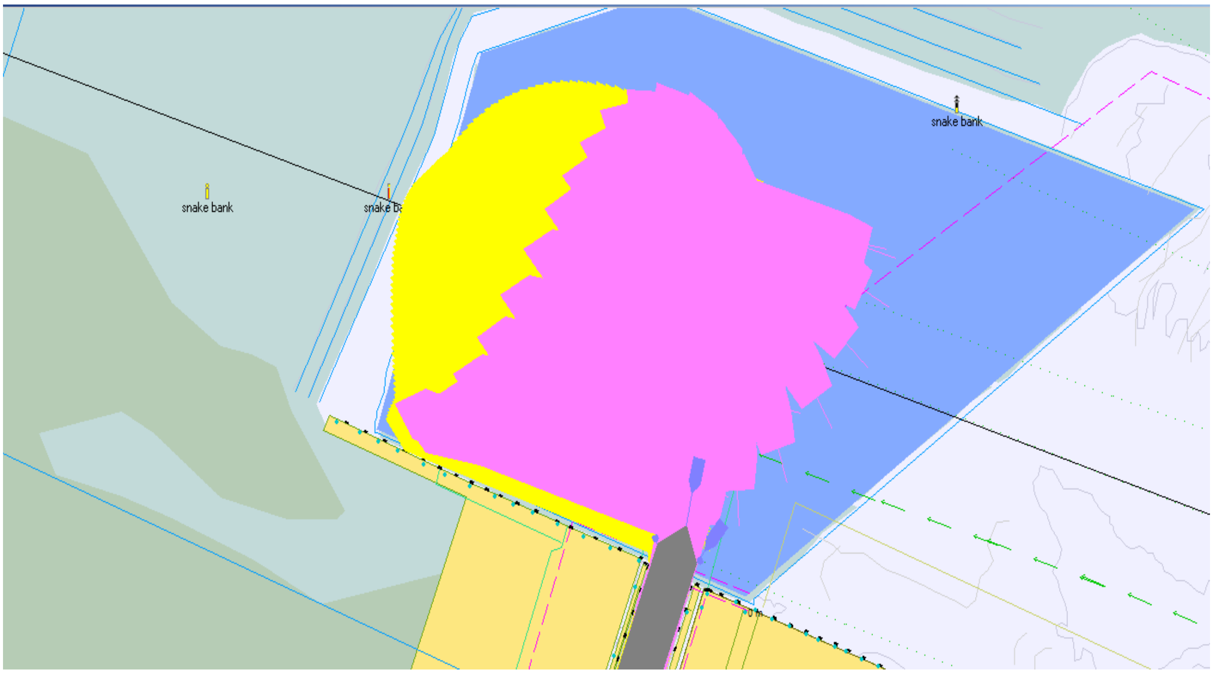
Shansi Arrivals Run 008-010



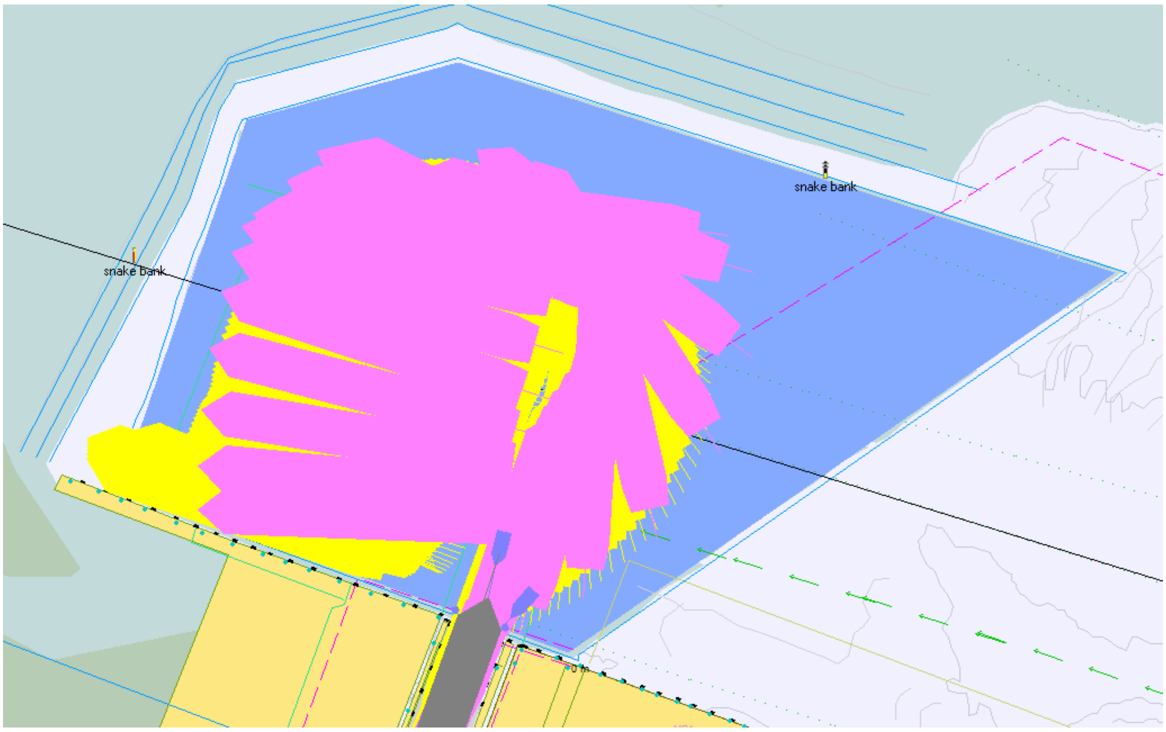
SPOT Arrivals Run 11- 43-44



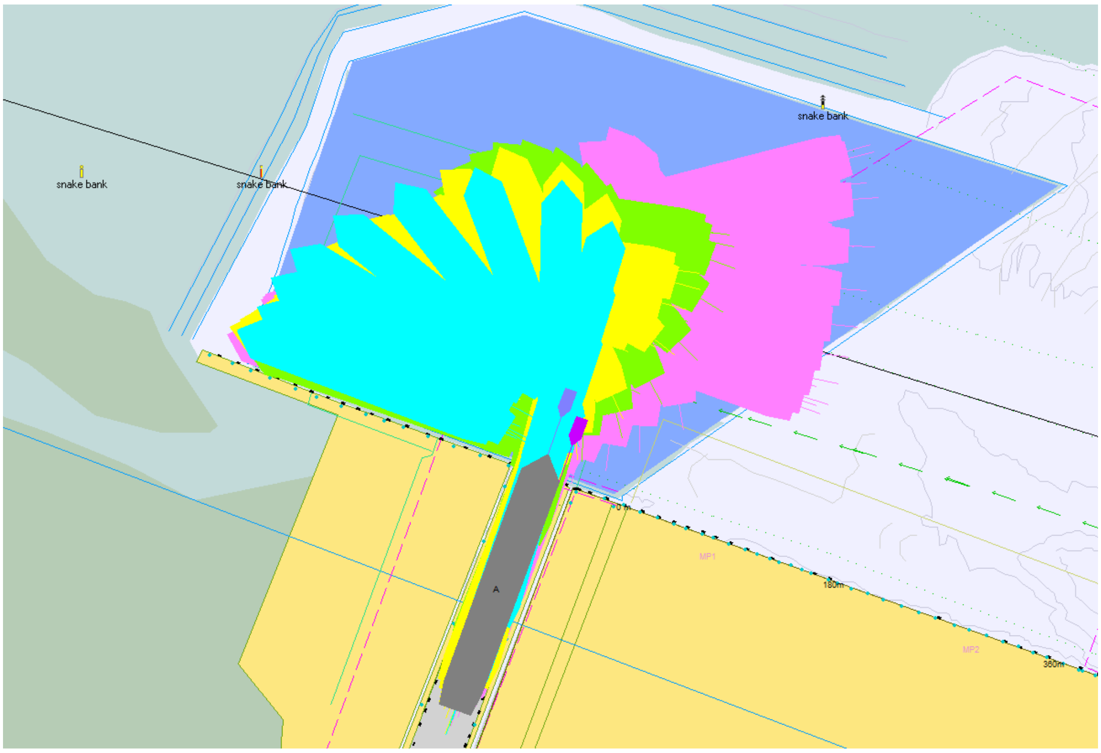
BANU Arrival s Runs 37-42



BANU Departures Runs 34-35



Shansi Departures Runs 28-29



SPOT Departure Runs 21-24

5.13 Conclusions from July Simulations

The new turning basin is now defined in Figure 2 shown below. It has a depth of 11.5m on the northern boundary and 14.5m on the southern boundary. It is a polygon shape outlined in green. It is based on a maximum design ship size of 230m.

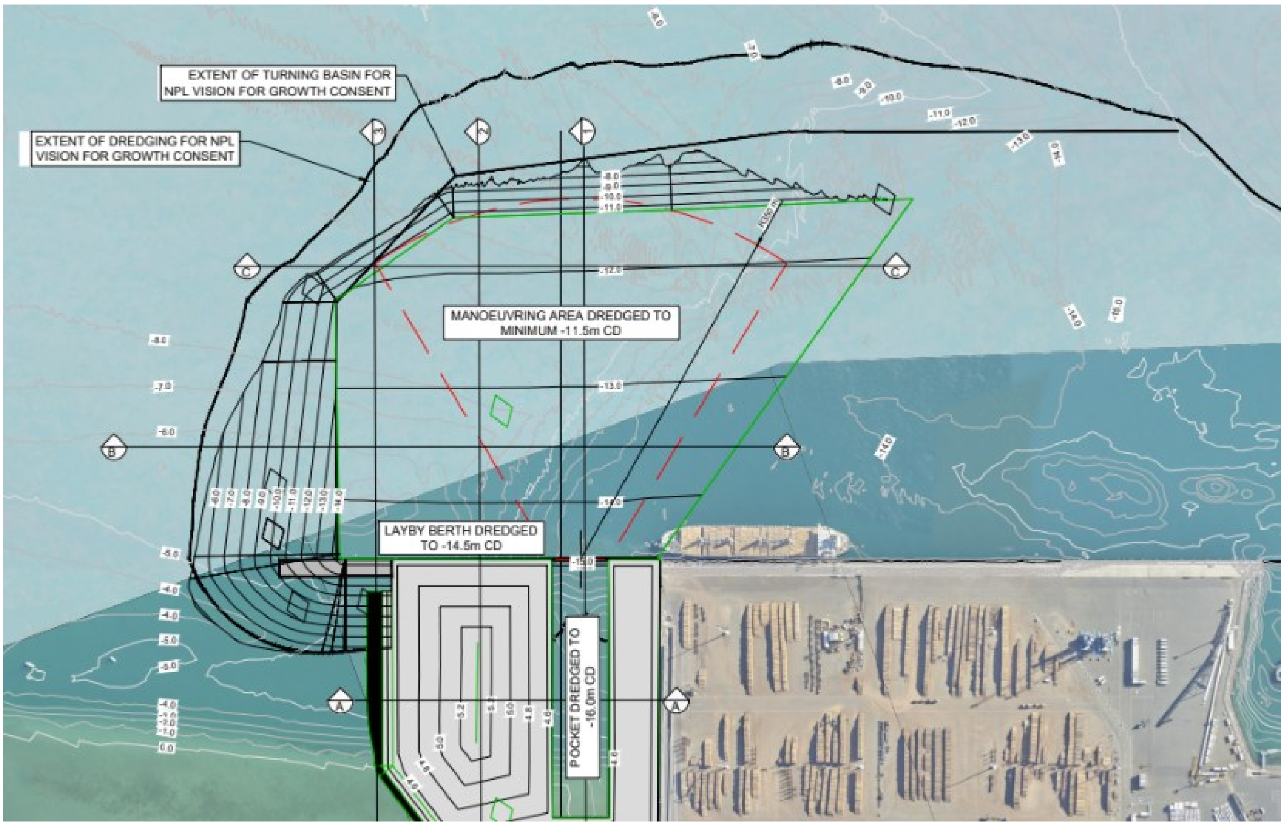


Figure 2 New turning basin design outlined in green

The following conclusions are offered as a result of the July simulations:

- New Turning basin meets an international standard for the design ships[1]
- New Turning basin based on a northern boundary of 11.5m depth provides adequate underkeel clearance for the design ships up to a draft of 8.5m in all tides for a tidal range of 2.3m (weak spring tide)
- The operational window for design ships of draft 8.5m is limited to slack HW or slack LW for both arrivals and departures for a weak spring tide range 2.3m. Winds are limited to 15 knots gusting 20 knots.
- Ships using the dock will be constrained by large ships moored at the layup berth if positioned too far east.
- Emergency simulations involving loss of a tug during arrivals and departures showed the ship could be stabilized and remain safely within the new turning basin.
- Ships with excessive stern trim can be difficult to control as was seen in these simulations. This should be further tested with full mission simulation using pilots and harbourmasters. Responsibility for maximum allowable trim rests with the harbourmaster.[2]

[1] Port Engineering Planning, Construction, Maintenance, and Security G. Tsinker pg. 714; and **https://forcetechnology.com/en/articles/turning-basin**

[2] Maritime Transport Act 1994 Section 33F

Appendix 6 Containership Docking Report Example

Loading condition for Shansi

LOADING CONDITION

NAME	DES	MASS t	FILL %	XM m	YM m	ZM m	FRSM tm
CONTENTS= (RHO=1)							
CREW+EFF	crew, effects	5.0	0.0	8.40	0.00	22.00	0.00
PROVISION	provisions	10.0	0.0	0.00	-5.00	17.00	0.00
LASHING	lashing material	50.0	0.0	99.66	0.00	17.00	0.00
SUBTOTAL		65.0		77.31	-0.77	17.38	0.00
CONTENTS=Cooling water (RHO=1)							
STCW	Stern Tube Cooling Water Tank	31.9	100.0	8.11	0.00	3.41	0.00
CONTENTS=Fresh Water (RHO=1)							
FWP	Sanitary Fresh Water Tank PS	12.7	10.0	-0.23	5.40	11.97	304.56
FWS	Sanitary Fresh Water Tank SB	7.2	10.0	-0.90	-6.26	12.26	144.62
TWTK	Technical Water Tank	2.8	10.0	1.23	-6.42	11.98	0.00
SUBTOTAL		22.7		-0.27	0.23	12.06	449.18
CONTENTS=Heavy Fuel Oil (RHO=0.98)							
HFOST3P	HFO Storage Tank 03 PS	46.0	16.3	46.10	4.02	2.47	0.00
HFOSERV1	HFO Daily Tank 01	45.4	98.0	25.00	-9.32	13.06	0.00
HFOSETT1	HFO Settling Tank 01	45.4	98.0	27.38	-9.32	13.06	0.00
FOSETT2	FO LS Settling Tank 02	30.3	98.0	20.66	-9.32	13.06	0.00
FOSERV2	FO LS Daily Tank 02	30.3	98.0	22.24	-9.32	13.06	0.00
SUBTOTAL		197.3		29.38	-6.21	10.59	0.00
CONTENTS=Lubricating Oil (RHO=0.9)							
MELOST	ME LO Tank	1.9	9.8	17.30	-9.32	11.54	0.00
MELOSETT	ME LO Settling Tank	1.9	9.8	18.49	-9.32	11.54	0.00
COST1	Cylinder Oil Storage Tank 1	1.6	9.8	18.29	7.16	8.77	0.00
COST2	Cylinder Oil Storage Tank 2	1.6	9.8	16.71	7.16	8.77	0.00
AELOSETT	AE LO Settling Tank	1.3	9.8	16.32	-9.32	11.54	0.00
AELOST	AE LO Tank	2.0	9.8	14.34	-10.89	11.51	0.00
LOCIRC	ME LO Circulating Tank	13.9	68.6	20.22	0.00	0.93	0.00
SUBTOTAL		24.1		18.80	-1.95	5.09	0.00
CONTENTS=Diesel Oil (RHO=0.85)							
MDOD01	MDO Daily Tank 01	16.7	73.5	19.48	-8.38	9.91	0.00
MDOD02	MDO Daily Tank 02	16.7	73.5	17.10	-8.38	9.91	0.00
SUBTOTAL		33.5		18.29	-8.38	9.91	0.00
CONTENTS=Miscellaneous (RHO=1)							
SLUD	Sludge Oil Tank	14.2	50.0	24.22	2.97	0.97	9.26
CWDR	Cooling Water Drain Tank	1.6	20.0	11.24	0.00	0.48	1.33
BWH	Bilge Water Holding Tank	5.4	20.0	14.10	0.00	0.42	8.51
BFW	Boiler Feed Water Tank	1.8	10.0	13.45	-8.33	9.05	1.80
BWS	Bilge Water Settling Tank	6.1	20.0	19.89	9.00	8.69	25.54
BLW	Black Water Tank	24.9	50.0	4.23	-9.83	12.82	35.92
GRW	Grey Water Tank	41.3	50.0	7.25	-10.12	12.68	62.59
WOT	Waste Oil Tank	12.1	50.0	29.03	0.36	0.51	33.42
SUBTOTAL		107.4		12.48	-5.36	8.71	178.37
CONTENTS=Water Ballast (RHO=1.025)							
WBFP	WB Fore Peak Tank	61.3	14.2	185.66	0.00	2.83	175.06
WB1SAP	WB Tank CH1 AFT PS	465.6	100.0	157.84	8.87	6.20	0.00
WB1SAS	WB Tank CH1 AFT SB	465.6	100.0	157.84	-8.87	6.20	0.00
WB3DP	WB Tank CH3 DB PS	648.6	100.0	103.03	8.55	0.88	0.00
WB3DS	WB Tank CH3 DB SB	949.4	100.0	103.15	-6.36	0.87	0.00
WB3SFP	WB Tank CH3 Side Fore PS	425.7	100.0	113.06	13.02	6.58	0.00
WB3SFS	WB Tank CH3 Side Fore SB	425.7	100.0	113.06	-13.02	6.58	0.00
WB2AP	WB Tank CH2 AFT PS	502.3	100.0	130.28	10.81	4.19	0.00
WB2AS	WB Tank CH2 AFT SB	415.1	67.0	130.34	-7.05	1.45	3356.42
WB2FP	WB Tank CH2 FWD PS	490.9	100.0	143.69	10.17	4.32	0.00
WB2FS	WB Tank CH2 FWD SB	615.0	100.0	143.74	-8.38	3.62	0.00
WB1D	WB Tank CH1 DB C	864.1	100.0	166.08	-0.04	1.87	0.00
SUBTOTAL		6329.3		132.93	0.29	3.41	3531.48
TOTAL		6811.2		125.50	-0.05	3.91	4159.03
Lightweight		12350.0		82.50	0.03	12.38	
Deadweight		6811.2		125.50	-0.05	3.91	
Total weight		19161.2		97.79	0.00	9.37	

F L O A T I N G   P O S I T I O N

Draught moulded	5.078	m	KM	14.92	m
Trim	0.000	m	KG	9.37	m
Heel, PS=+	0.0	deg			
TA	5.078	m	GM0	5.55	m
TF	5.079	m	GMCORR	-0.31	m
Trimming moment	9	tonm	GM	5.24	m

Appendix 7 Qualifications and Experience Northport Simulation Staff

7.1 Bruce Goodchild Northport Simulation Manager

Professional Profile

Currently Manager Simulation for Northport and recently retired (July 2026) as Harbourmaster (Commercial) Northland Regional Council and Business and Environmental Sustainability manager Northport. Based at Northport for the past seven years and managed all the simulation studies as shown in Appendix 1 of this report. He has overseen commercial shipping activities in Northland and development of approved Pilot Training and proficiency programs in Whangarei Harbour and the Bay of Islands. He has reviewed safety management systems for Northport, Northland Regional Council, Channel Terminal Services, Golden Bay Cement, Wellington Centreport and Picton Marlborough Sounds. Has undertaken risk assessments, reviews, training and simulation feasibility studies for the past 30 years for major Australian and New Zealand ports. Seagoing qualifications are held up to Master Class 1 for ships of unlimited tonnage on international voyages. Other qualifications include post graduate diploma in hydrographic surveying (Category A), post graduate certificate in tertiary teaching and a diploma auditing. He has held positions as Partner in marine simulation firms (Australia and Italy), Program Head of Navigation at the Australian Maritime College and Director of marine consultancy firms in Australia and New Zealand. Sea experience includes deck officer, chief officer, trainee pilot and hydrographic surveyor. A keen yachtsman he has lived on the harbour for the past three years on his schooner at Taurikura Bay transiting by launch twice daily the proposed shipyard and dry dock turning basin area. Full qualifications are shown in attached CV.

I, Bruce Goodchild confirm compliance with the Environment Court Practice Note 2023 (Code of Conduct for Expert Witnesses).

7.2 Paul Watchman Northport Simulation Instructor and Modeller

Professional Profile

Maritime and project specialist with a foundation in deep sea shipping, several years experience as Chief Officer on the New Zealand coastal trade, and current experience at Northport (last four years) as a Port Services officer and an IMO Model Course 6.10-qualified ship simulator instructor/ assessor. Hands on experience includes simulation area and ship modelling, with project work spanning port and marine operations, simulation based feasibility and risk assessment, pilotage and tug assessment, incident investigation, emergency response, consulting and training. Strong technical writer able to translate complex operational evidence into clear findings, risk documentation, reports and decision ready material. Full qualifications are shown in attached CV.

7.3 Calypso Science Tidal Stream Modelling

Company Profile

Calypso Science is a New Zealand scientific consultancy providing numerical modelling and analytical services in physical oceanography. Purpose is to provide science based decision making and best practice in the marine and coastal environment. They have provided hydrodynamic modelling to ports in Australia and New Zealand for use in simulation studies. They have implemented nearly one thousand regional models to downscale the tidal currents and elevations for the world's coastlines and continental shelves at a 400m resolution. The model has been validated against observations and is used with confidence to power the Predict wind recreational product suite worldwide. Calypso Science provided a real time hydrodynamic model for North Tugz and Northport in Whangarei Harbour at 25- 50m resolution since 2024.