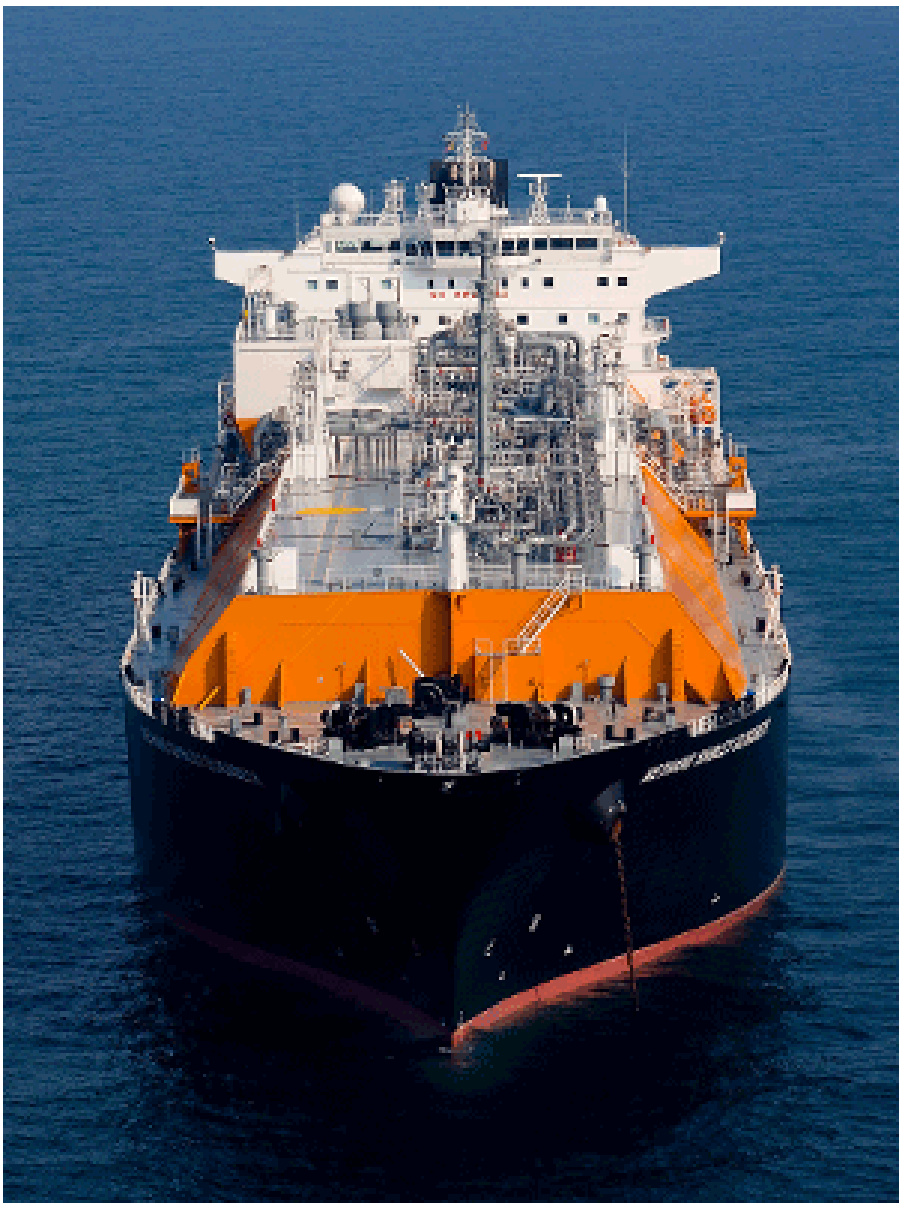
Anchorage and Harbour Transit Safety Zones
Port of Gladstone



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1.0 PURPOSE

The purpose of this document is to describe the proposed safety zone for LNG carriers transiting Gladstone harbour channels.

The Society of International Gas Tanker and Terminal Operators (SIGTTO) publication, *LNG Operations in Port Areas*, section 3.5.3, recommends establishment of an exclusion zone around a transiting gas tanker to prevent encounters with traffic which may hinder its progress or have the potential to penetrate its hull. Gladstone port rules require 30-minute separation for Panamax size bulk carriers, and 1-hour separation for Cape-size bulk carriers. The Harbour Master has proposed that the existing Gladstone Panamax port rules be applied to LNG carriers, which require 30-minute separation between vessels in the channels navigating in the same general direction.

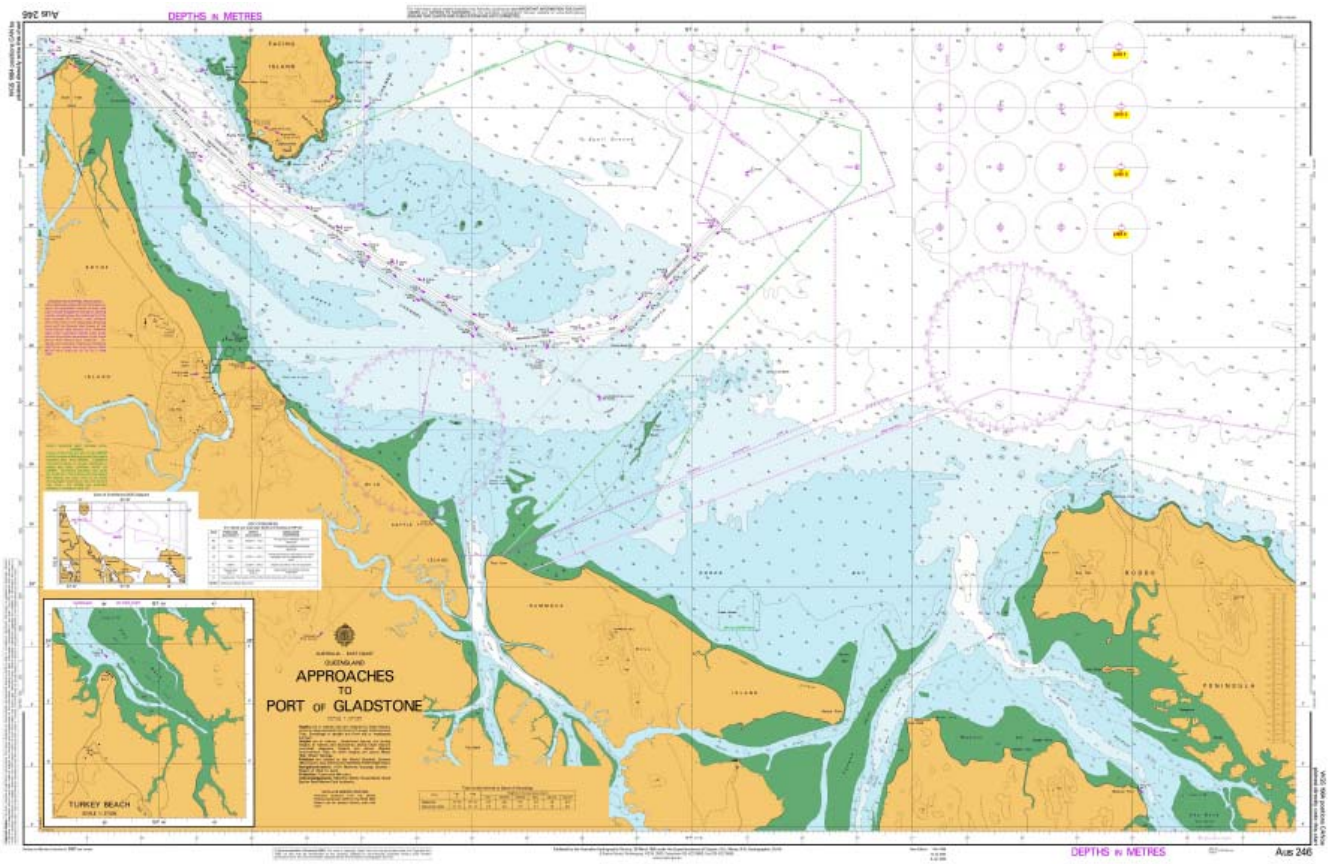
2.0 HAZARDS

During ballast transit, LNG cargo tanks may contain a small quantity of heel (LNG cargo retained from the previous voyage to maintain the tanks in a cold condition.) During the loaded transit, the LNG cargo tanks will be about 98% full of LNG cargo. All LNG carriers have double hull protection around the cargo tanks. The space between inner and outer hulls will be empty during the loaded outbound transit, and may contain water ballast during the inward transit. Whether in ballast or loaded, the cargo tanks are at or slightly above atmospheric pressure.

Most LNG carriers' deck piping does not normally contain LNG except during bulk cargo transfer alongside the berth. Two exceptions are the spray header during internal tank spraying to maintain the cargo tanks in a cold condition for loading and the liquid header during liquid line cool down, in preparation for loading. Both of these operations utilize a small LNG spray pump (50 m3/hr capacity) inside the LNG tank, rather than a main cargo pump (1700 m3/hr capacity). All vapour generated during internal tank spraying and liquid line cool down is contained within the cargo tanks and handled by the boil-off system to either burn as fuel for the ship's engines, or reliquified onboard to return to the cargo tanks as liquid. Vapour is not released to atmosphere by these operations. Any accidental release from a piping leak is very unlikely and should it occur would be relatively small due to the slow pumping rate of a spray pump. During the loaded outbound transit, natural boil-off is handled by the boil-off system, again to either burn as fuel for the ship's engines or reliquified onboard to return to the cargo tanks as liquid. In the event of an unlikely failure in the boil-off system, venting through the forward heater and vent mast riser would be required. Under these circumstances, the warm gas can be expected to rise from the forward vent mast.

3.0 LNGC AT ANCHOR

Safety zone considerations at anchor outside the harbour are the same as any other anchored ship, i.e. avoid anchoring near the channel and near other anchored vessels. Internal tank spraying is the only cargo operation conducted at anchor. Small boats nearby are not a safety concern to the LNGC for potential collision risk However, the large ship itself is a hazard to small boats in close proximity due to the anchor and its chain in the water, potential propeller movement, overhead obstructions, and the sheer size of the ship compared to a small boat, should the small boat lose steering control or fail to keep a lookout. It is recommended that small boats keep at least 50m away from the LNGC at anchor due to the hazards of operating near a large vessel. Exceptions for pilot boats, tugs, and service boats with business at the LNGC will be routinely made, as these operators should be familiar with the hazards of operating near a large ship and should manoeuvre their vessel accordingly. Dedicated LNG anchorages are being established east of the existing E3, E6, E9, and E12 anchorages.



4.0 LNGC HARBOUR TRANSIT

SIGTTO's publication "LNG Operations in Port Areas" section 3.5.3 states:

- *The "moving safety zone" is to prevent other traffic from hindering the LNGC's progress in the channel, and prevent encounters with traffic having the potential to penetrate its hull. The dimensions should be determined in the context of the specific conditions of a port.*

- *In an exceptionally long access channel, it may be acceptable for traffic proceeding in the opposite direction to proceed so far and then stop in a "passing place", but in all cases the transiting gas carrier must have priority.*

- *Where traffic is proceeding in the same direction as the tanker the zone may extend some 1 to 2 miles ahead of the gas carrier, a distance determined by the distance required to bring the following gas carrier safely to a stop. Traffic following the gas carrier should be excluded for a similar distance, allowing scope for the gas carrier to slow down to manoeuvre without it being impeded by the approach of following ships. In general, no gas tanker should be overtaken in a channel, regardless of the width of the channel. In general, traffic should not cross closer than 1.5 miles ahead or 0.5 miles astern of a gas carrier.*

- *In some circumstances it may be prudent to deploy a patrol craft to escort a transiting gas tanker. This may be either a small craft that can patrol well ahead of the gas carrier advising other traffic to keep clear, or a tug that can enforce the zone by deliberately putting itself between an approaching vessel and the gas carrier. In some ports a tug, of sufficient power to assist a gas carrier to turn in the case of emergency is preferred. A tug need not necessarily be an "escort tug", capable of assisting the gas carrier at full transit speed, but one of sufficient power enabling it to alter its trajectory at low speed.*

At Gladstone, a 1-hour separation is applied to Cape-size bulk carriers, and ½ hour separation is applied to Panamax bulk carriers by the Vessel Traffic System (VTS) controller, under the Harbour Master's direction. Following discussions with the Harbour Master, a ½-hour separation between LNG ships and other deep draft vessels will be observed. Due to the constraints of operating in a narrow channel, 2 escort tugs will be utilized during the inbound and outbound transits to avoid grounding in the event of an unexpected casualty on the LNG carrier. When tethered to the LNG carrier, an escort tug can be expected to achieve about a 10 kt water speed. Due to the slower LNGC transit speed with escort tugs, the separation distance for a ship following astern should not be less than 1.5 miles to avoid crowding the LNGC at turns and to give sufficient room to bring the following vessel to a stop in the event of a casualty on the LNGC ahead. Under no circumstances should the LNGC or another vessel attempt to overtake one another during the harbour transit.

An educational campaign for small boaters should emphasize the requirement for the LNGC to remain in the channel, and a small boat's obligation under rule 9 of the International Regulations for Preventing Collisions at Sea COLREG's to avoid impeding the progress of a ship which can operate only within the channel. Attention to the forward visibility limitations of a large ship should be emphasised. An escort boat at the bow is not normally required to enforce the safety zone against small boats. Boats larger than 10m LOA are required to contact Gladstone VTS before entering the channels. It is expected that VTS will advise such boats of the LNGC transit, and request they keep clear.

4.1 Security Zone

The maritime security authority in Australia has classified Gladstone Harbour as Security Level 1. A security zone for LNG ships transiting the harbour is not required at Security Level 1 (the International Ship and Port Facility Security Code ISPS default security level). If the maritime security authority in Australia determines that the security level at Gladstone should be elevated to Security Level 2 or 3, an official escort boat such as Queensland State Police or the Harbour Master may be required to deter small boats from passing closer than the ½ mile security zone to the transiting LNGC. The official escort would have authority to order a small boat away, and an additional tug escort running ahead of the LNGC may be able to place its hull between an approaching boat and the LNGC. Further enhanced security measures during the harbour transit may be incorporated in the vessel and port security plans. There should be regular communication between the LNG industry and the local and state maritime security authorities regarding any change in the threat assessment.

4.2 Additional Safety Zone for LNG Cargo

No additional safety zone for LNG cargoes is required beyond the navigational safety requirement. As discussed in section 2 above, LNG ships burn the boil-off gas as fuel or reliquify it. Flammable vapours are not released during the transit. All LNG ships have double hull protection around the cargo tanks. Collision with a small ship would not be expected to penetrate the cargo tank and cause a release.

Similarly, due to the low harbour transit speed, and tethered escort tugs, an unlikely allision with a fixed object would not rupture an LNG cargo tank. The cargo volumes in the deck piping are not significant.

4.3 Cargo Loading Safety Zone at the Berth

While the LNG carrier is loading at the berth, a 200 to 250 m (to be confirmed by regulatory authorities) safety zone to exclude uncontrolled ignition sources is recommended. This distance is based on the dispersion distance to Lower Flammable Limit LFL of a vapour cloud for the largest credible spill during loading and stable environmental conditions.

5.0 CONCLUSIONS

a. At anchor outside the harbour, a 50 m safety zone for the safety of small craft around large vessels is recommended.

b. During LNGC transit, a ½-hour separation between another vessel proceeding in the same general direction ahead or astern of the LNGC is recommended.

c. The LNGC must always have priority in the channel. Once the LNG carrier's transit has commenced, other small vessel traffic encountered en route should be expected to leave the channel clear for the LNG carrier.

d. Overtaking the LNGC by large ships, at any time during the transit, should not be permitted.

e. A campaign should be implemented to educate small boaters on hazards from approaching large ships which cannot manoeuvre outside the channels.

f. No special LNG cargo specific safety zone is required.

g. The recommended safety zone at the berth for LNG cargo loading is 200 to 250 m (tbc).

h. No LNG security zone is required when the maritime security risk is low. A security zone with an official escort may be required when the maritime security risk is deemed moderate to high.