Attachment 08 – Offshore Marine Environment Risk Assessment

The risk assessment matrix applied for the offshore environmental risk assessment evaluates likelihood and consequence based on standard risk assessment methodology. The risk assessment was considered for three phases of the offshore activity: drilling, pipeline, well and pipeline operations. These are described in further detail in this document.

RISK CONSEQUENCES APPLIED

The consequences applied in the offshore risk assessment are defined as follows:

	SAFETY *(Impact to GBE or contracting personnel)*	**ENVIRONMENT** *(Impact to the physical and ecological environment and cultural heritage)*	**FINANCIAL** *(eg. due to loss of revenue, business interruption, commodity trading, asset loss)*	**REPUTATION/SOCIAL** *(eg. services interruption, community interruption)*	**REGULATION** *(eg. OHS, environment, industrial relations, trade practices, industry acts)*
5 Catastrophic	Multiple fatalities or serious irreversible disability (>30%) to multiple persons	Effects at the landscape level (hundreds or thousands of square kilometres or hectares). A very large group of plants or animals affected. Entire habitat type or species population. Several populations of one or more threatened species or habitats experiences mortalities. Permanent impact (e.g., >50 years) and irreversible. Rehabilitation is unlikely to be successful. Habitat or species is highly unlikely to recolonise. An extensive hydrocarbon spill (e.g., over 100,000 litres) that requires clean up over weeks or months. Permanent loss of item/place of international or national cultural heritage significance.	EBIT Impact, loss or deterioration from expectation greater than $30m. CASH FLOW Severe cash flow crisis. Difficulty to source funds. Probable credit rating downgrade.	State-wide or national interest/outrage beyond the area of operations. Business or residency is no longer viable. Permanent exclusion from operations or nuisance that cannot be mitigated. Community outrage, conflict between neighbours/towns over months to years.	Very significant fines and prosecutions. Prolonged multiple litigations and fines.
4 Major	Single fatality or major permanent injury / illness or moderate irreversible disability (<30%) to one or more persons.	Extensive area of effect (hundreds of square kilometers or hectares). Large group of plants or animals affected. Nearly an entire habitat type or species population affected. One or more populations of a threatened species or habitat experiences injuries or mortalities. Long-term duration of impact (e.g., 20-50 years), wholly or partially reversible damage. Active rehabilitation required over many years. Habitat or species is unlikely to recolonise. A very large hydrocarbon spill (e.g., up to 100,000 litres) that requires clean up over weeks. Damage to item/place of international or national cultural heritage significance that is very difficult to repair or may result in permanent scarring. Permanent impact.	EBIT Impact, loss or deterioration from expectation greater than $3m but less than $30m. CASH FLOW Loss of flexibility and/or increase in cost to source funds.	Very large community affected (e.g., multiple suburbs/towns or city, entire fishery). High increased cost of living or business operations (e.g., hundreds of thousands of dollars), high-level/long-term nuisance. Business or residency unlikely to remain viable. Long-term (e.g., months) exclusion from operations. Community outrage, conflict between neighbours/towns.	Major breach of regulation and significant prosecution including class actions.
3 Serious	Serious reversible / temporary injury / illness (e.g. lost time > 3 days or hospitalisation or Alternate/Restricted Duties > 1 month).	Localised to extensive effect (tens of square kilometres or hectares). Large group of plants or animals affected. Partial habitat or population loss. A small population of a threatened species is affected. Long-term duration of impacts (e.g., 10-20 years), reversible damage. Active rehabilitation required over years. Habitat or species is likely to recolonise.	EBIT Impact, loss or deterioration from expectation greater than $300k but less than $3m. CASH FLOW Material impact to cash flow.	Large community affected (e.g., town/s of several thousand people, dozens of fisheries licencees). Moderate increased cost of living or business operations (e.g., tens of thousands of dollars), high-level	Serious breach of law/regulation with investigation or report to authority with possible prosecution. Performance Infringement Notice.

	SAFETY *(Impact to GBE or contracting personnel)*	ENVIRONMENT *(Impact to the physical and ecological environment and cultural heritage)*	FINANCIAL *(eg. due to loss of revenue, business interruption, commodity trading, asset loss)*	REPUTATION/SOCIAL *(eg. services interruption, community interruption)*	REGULATION *(eg. OHS, environment, industrial relations, trade practices, industry acts)*
		A large hydrocarbon spill (e.g., up to 10,000 litres) that takes several days to clean up. Serious (e.g., extensive) but repairable damage to item/place of international or national cultural heritage significance. Repair/restoration may take months or years.		nuisance. Business or residency may not remain viable. Long-term (e.g., weeks to one month) exclusion from operations. Noticeable community unrest/tension.	
2 **Moderate**	Reversible temporary injury/illness requiring Medical Treatment (e.g. lost time or Alternate/Restricted Duties for < 1 month).	Moderately localised extent of effect (<10 square kilometres or hectares). Minor impact on a small to medium sized group of plants or animals. A small number of individuals of a threatened species is affected. Medium-term duration of impact (e.g., 5-10 years), reversible damage. Active rehabilitation may be required over weeks to months. Habitat or species is highly likely to recolonise. A medium-sized hydrocarbon spill (e.g., up to 1,000 litres) that requires clean up over several days. Repairable damage to item/place of state or national cultural heritage significance. Repair/restoration may take weeks or months.	EBIT Impact or loss greater than $30K but less than $300k. CASH FLOW Impact to project or business unit cash flow.	Small number of people or small community affected (e.g., town of several hundred people, <20 fisheries licencees). Minor increased cost of living or business operations (e.g., thousands of dollars), medium-level nuisance. Short-term (up to several days) exclusion from normal operations. Some community unrest/tension, some locally-based complaints.	Breach of law/regulation or non-compliance. Minor legal issues Minor litigation possible.
1 **Minor**	Injury / illness not requiring Medical Treatment (no lost time, no Alternate / Restricted Duties) First Aid. Report Only.	Localised effect (<1 square kilometre or hectare). Little or no effect on small number of plants or animals or habitat. No threatened species are affected. Short to medium-term duration of impact (e.g., several months to 5 years), reversible damage. No active rehabilitation likely. Habitat or species will recolonise. A small hydrocarbon spill (e.g., less than 100 litres) that requires no active clean up. No visible damage to item/place of local, state, national or international cultural heritage significance.	EBIT Impact or loss greater than $3K but less than $30K. CASH FLOW No significant impact.	Up to several individuals affected (e.g., multiple landholders, <5 fishing licencees). Minor increased cost of living or business operations (e.g., hundreds of dollars), low-level nuisance, minimal or no exclusion from normal operations. No community unrest.	Local investigation. Minor breach of regulation. On the spot fine or technical non-compliance. Prosecution unlikely.

LIKELIHOOD			CONSEQUENCE				
			1	2	3	4	5
			Minor	Moderate	Serious	Major	Catastrophic
5	Almost Certain	Impact is occurring now. Could occur within days to weeks. 99% chance of occurring within the next year.	Medium	High	High	Extreme	Extreme
4	Likely	Balance of probability will occur. Could occur within weeks to months. >50% chance of occurring within the next year.	Low	Medium	High	Extreme	Extreme
3	Possible	May occur shortly but a distinct probability it won't. Could occur within months to years. >10% chance of occurring within the next year.	Low	Medium	Medium	High	High
2	Unlikely	May occur but not anticipated. Could occur years to decades >1% chance of occurring within the next year.	Low	Low	Medium	High	High
1	Remote	Occurrence requires exceptional circumstances. Exceptionally unlikely event in the long term future. <1% chance of occurring within the next year.	Low	Low	Low	Medium	High

OFFSHORE MARINE ENVIRONMENTAL RISK ASSESSMENT – DRILLING

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
IMPACTS (EVENTS THAT *WILL* HAPPEN)									
1. Generation of Underwater Sound	Engine noise transmitted through the drill rig hull. Propeller/thruster noise from the support vessels. Sound generated through the drill bit. Vertical siesmic profiling (VSP) (if undertaken).	Temporary and localised physiological or pathological impacts to local populations of marine fauna, including plankton, fish, cetaceans, pinnipeds, avifauna, benthic invertebrates and turtles.	** The standard for offshore impact assessment is that because the activity/hazard WILL occur, the likelihood is 100%. This skews things unfavourably towards a higher risk rank if multiplied with consequence. Therefore, we use consequence only.*	Minor		The VSP contractor will use personnel trained and experienced in undertaking MMO duties to implement EPBC Act Policy Statement 2.1 (Part A Standard Management Procedures, Section A.3) during VSP operations. - Pre-start visual observations out to 3 km for 30 minutes. - Soft-starts over a 30-minute period. - Reducing power if cetaceans are observed within the 'low power zone' (within 3 km of the sound source). Cetacean sightings are reported to the DoEE. Support vessel engines and thrusters are well maintained.		Minor	
2. Potential disruption to fisheries from underwater sound (indirect impact)	Engine noise transmitted through the drill rig hull. Propeller/thruster noise from the support vessels. Sound generated through the drill bit. Vertical siesmic profiling (VSP) (if undertaken).	Temporary and localised disruption to commercial fisheries (likely limitd to one rock lobster fisherman).		Minor		The location and timing of the activities will be communicated to local marine users, through notifications via AMSA, the Australian Hydrographic Service and via direct communications from GB Energy. The vessels used for the activity will be readily identifiable to other vessels. The activities will not be undertaken concurrently with recreational fishing competitions.		Minor	

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
3. Discharge of drill cuttings and muds	Drill cuttings and muds discharged through the drilling program.	Localised increased turbidity of the water column. Smothering of benthic habitat and fauna. Alteration of benthic substrate. Potential toxicity impacts to fauna. Reduction of visual amenity from turbidity plumes.		Minor		The contractor ensures that only PLONOR, 'D'/'E' (non-CHARM) or 'Gold'/'Silver' (CHARM) OCNS-rated base fluids and additives are used in the drilling fluid system to minimise ecotoxicity impacts to marine fauna. Where for technical reasons an additive is required that has not been registered with CEFAS (and therefore does not have a rating), GB Energy will apply the CHARM, or in the case of non-CHARMable products, the OCNS process to calculate the CHARM rating or OCNS grouping. Only additives with a hazard quotient of <30 (silver/gold ranking) or an OCNS grouping of D/E will be used. In accordance with the Fluid Program, the shaker screens and hydro-cyclone are used during drilling the lower well sections to maximise fluid separation from cuttings prior to overboard disposal. Operation of the separation treatment system is monitored on a full-time basis by the Derrickman/ Shaker-Hand to ensure system performance. Drilling fluid testing is performed by the Mud Engineer working under the supervision of the Drilling Supervisor at least twice per day. Consideration of alternative cuttings disposal methods (e.g., skip & ship [i.e., transfer from rig to vessel, and then vessel to shore or vessel to deeper or less sensitive waters] will take place if the dispersion modelling shows unacceptable risks to reef or sponge habitats (though such impacts are not expected).		Minor	

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
4. Discharge of cement	Discharge of cement slurry during system testing. Dry vement from the bulk tanks may be blown overboard during windy conditions in preparation for the cement job. Washing the cement unit and flushing hoses to prevent curing. Cement overspill at the seabed during cementing of well structural casing jobs.	Localised increased turbidity of the water column. Smothering of benthic habitat and fauna. Alteration of benthic substrate. Potential toxicity impacts to fauna. Reduction of visual amenity from turbidity plumes.		Minor		The cement engineer ensures that only PLONOR, 'D'/'E' (non-CHARM) or 'Gold'/'Silver' (CHARM) OCNS-rated cement additives are used to minimise ecotoxicity impacts to marine fauna. Where for technical reasons an additive is required that has not been registered with CEFAS (and therefore does not have a rating), GB Energy will apply the CHARM, or in the case of non-CHARMable products, the OCNS process to calculate the CHARM rating or OCNS grouping. Only additives with a hazard quotient of <30 (silver/gold ranking) or an OCNS grouping of D/E will be used. Once good cement returns are noted at the seabed by the ROV Technician, the mixing and pumping of cement will cease, and displacement of the string with drilling fluid will begin. Bulk dry cement remaining onboard the drill rig at the completion of drilling will be disposed of by either backloading to a support vessel (if safe to do so) or leaving onboard for the next operator.		Minor	
5. Seabed disturbance	Rig positioning (soft pinning). Drilling. P&A activities/XT installation. Dropped objects (e.g.,deck equipment). Vessel grounding. Vessel anchoring (in emergency situations only).	Localised turbidity of the water column at the seabed. Physical removal or disturbance of seabed sediments. Temporary and localised smothering of seabed habitat (e.g., rocky reef, sponge gardens).		Minor		The results of the geophysical and geotechnical investigations will be used to inform the MODU location and confirm the proposed OAW location is free from seabed obstacles. Support vessel Masters use bathymetric mapping (obtained during the geophysical and geotechnical investigations) and Global Positioning System (GPS) to avoid mapped seabed obstacles and monitor vessel clearances to ensure there is clearance at all times between the vessel and the seabed. The MODU will be pinned directly on location and will not undergo a softpinning exercise, thereby preventing the creation of scour channels in the seabed. MODU-specific jack-up procedures are used to ensure compliance with stability criteria, reduce the risk of foundation shift or failure. Large bulky items are securely fastened to or stored on the MODU deck and vessel decks to prevent loss to sea.		Minor	

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
						A crane handling and transfer procedure is in place and implemented by crane operators (and others, such as dogmen) to prevent dropped objects. The crane operators are trained to be competent in the handling and transfer procedure to prevent dropped objects. Visual inspection of lifting gear is undertaken every quarter by a qualified competent person (e.g., maritime officer) and lifting gear is tested regularly in line with the vessel PMS. The ROV is deployed to search for (and retrieve, where possible), non-buoyant dropped objects so that there are no obstacles on the seabed at the completion of the activity. Dropped objects left behind at the end of the activity (that cannot be retrieved) will be reported internally and to ERR.		Minor	
6. Atmospheric Emissions	Combustion of marine diesel from rig, rig equipment and support vessels. Flaring of hydrocarbons (if well testing takes place). Painting and paint storage, resulting in the release of fugitive Volatile Organic Carbons (VOCs) as vapours. Release of Ozone Depleting Substances (ODS) from refrigerants used in the centralised air-conditioning system during maintenance activities.	Decrease in air quality due to gaseous emissions and particulates from diesel combustion. Contribution to the incremental build-up of greenhouse gases in the atmosphere (influencing climate change).		Minor		Combustion systems operate in accordance with MARPOL Annex VI (Prevention of Air Pollution from Ships) requirements. - Vessels greater than 400 gross tonnes will have in place a current International Air Pollution Prevention (IAPP) certificate and Ship Energy Efficiency Management Plan (SEEMP). - Only marine-grade low sulphur (no greater than 3.5% m/m) diesel will be used. - Vessels >400 gross tonnes must ensure that firefighting and refrigeration systems are managed to minimise Ozone Depleting Substances (ODS). There will be no incineration of waste within Victorian state waters. All fuel-burning equipment and the HVAC system will be maintained in accordance with planned maintenance systems. Fuel use will be measured, recorded and reported for abnormal consumption so that corrective action can be taken in the event of abnormal (i.e., higher than required) fuel use.		Minor	

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
7. Light glow/light emissions	Rig operations - navigation and deck lighting is 24/7. Support vessels - navigation and deck lighting is 24/7. ROV operation (underwater).	Localised light glow may act as an attractant to light-sensitive species (e.g., seabirds, squid, zooplankton), in turn affecting predator-prey dynamics (due to attraction to or disorientation from light). Temporary reduction in visual amenity for residents in and visitors to Golden Beach and Paradise Beach.		Minor		Light glow is minimised by managing external lighting in accordance with AMSA Marine Orders (e.g., Part 30 – Prevention of Collisions and Part 59, Offshore Support Vessel Operations). External lights will not face the ocean wherever practicable (they will face inboard).		Minor	
8. Discharge of treated sewage and grey water	Use of ablutions, laundry and galley facilities on the rig and support vessels.	Temporary and localised reduction in water quality (up to 50 m horizontally and 10 m vertically from the discharge point).		Minor		All sewage and grey water will be treated in a MARPOL Annex IV-compliant sewage treatment plant (STP) prior to discharge. In the event of a STP malfunction, untreated sewage and grey water will only be discharged when > 12 nm from shore (in accordance with MARPOL Annex IV). The STPs will be maintained in accordance with the relevant PMS.		Minor	
9. Discharge of cooling water and reverse osmosis (brine)	Seawater is used as a heat exchange medium for cooling machinery engines on vessels. Brine is created through the vessel desalination processes for potable water generation.	Temporary and localised increase in sea water temperature, causing thermal stress to marine biota. Temporary and localised increase in sea surface salinity, potentially causing harm to fauna unable to tolerate higher salinity. Potential toxicity impacts to marine fauna from residual biocide and scale inhibitors.		Minor		Engines and associated equipment that require cooling by water will be maintained in accordance with the relevant vessel or drill rig maintenance system so that they are operating within accepted parameters. Only ONCS ‘Gold’/’Silver’ (CHARM) or ‘D’/’E’ (non-CHARM)-rated chemicals are used in the cooling and brine water systems. The Electrolytic Marine Growth Protection System is maintained in accordance with the PMS to ensure it is operating efficiently (without the use of chemicals).		Minor	
10. Discharge of putrescible waste	Generation of galley and mess room food wastes.	Temporary and localised increase in nutrient content of surface and near-surface water quality (up to 100 m horizontally and 10 m vertically from the discharge point). Temporary increase in scavenging behaviour of pelagic fish and seabirds.		Minor		Putrescible waste discharges will not take place within State waters. Putrescible waste discharges outside of state waters will comply with MARPOL Annex V requirements: - A Garbage Management Plan is in place (for vessels >100 gross tonnes or certified to carry 15 persons or more) that sets out the procedures for minimising, collecting, storing, processing and discharging garbage. - Food waste will be macerated to <25 mm prior to discharge. - In the event of macerator malfunction, un-macerated putrescible waste will be discharged when >12 nm from shore (vessel) or taken back to shore (rig). - Non-putrescible galley waste will either be incinerated or returned to shore for disposal.		Minor	

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
11. Discharge of bilge water and deck drainage	Fluids from closed deck drainage and machinery spaces. Decks not bunded that drain directly to the sea. Deck washing activities. Chemical or hydrocarbon spill or leak washed overboard.	Temporary and localised reduction in water quality (up to 100 m horizontally and 10 m vertically from the discharge point). Acute toxicity to marine fauna through ingestion of contaminated water in a localised mixing zone (in the event of malfunction of the OWS or an uncontrolled spill emanating from an open drainage area).		Minor		For the MODU and support vessels > 400 gross tonnes, all bilge water passes through a MARPOLcompliant OWS set to limit OIW to <15 ppm prior to overboard discharge. The OWS is maintained in accordance with the vessel PMS. The OWS is calibrated in accordance with the PMS to ensure the 15 ppm OIW limit is met. The residual oil from the OWS is pumped to tanks and disposed of onshore. Deck cleaning detergents are biodegradable. Hydrocarbon and chemical storage areas (process areas) are bunded and drain to the bilge tank (or equivalent). Portable bunds and/or drip trays are used to collect spills or leaks from equipment that is not contained within a permanently bunded area (non-process areas). The vessel crews are competent in spill response and have appropriate response resources in order to prevent or minimise hydrocarbon or chemical spills discharging overboard.		Minor	
						Fully stocked SMPEP response kits and scupper plugs or equivalent drainage control measures are readily available to the deck crews and used in the event of a spill to deck to prevent or minimise discharge overboard. The vessel-specific Shipboard Marine Pollution Emergency Plan (SMPEP) is implemented in the event of a large spill of hydrocarbons or chemicals overboard.		Minor	
12. Disturbance to beach goers, swimmers and divers	Physical presence of drill rig close to shore (~3 km). Vertical seismic profiling (VSP). Temporary exclusion from short sections of beaches for safety reasons.	Disruption to normal recreational activities. Injury to swimmers/divers due to proximity of underwater noise to swimming/diving activities (primarily duringVSP).		Minor		GB Energy will liaise with the rock lobster fisherman to ensure he is not diving during VSP. Support vessel/s will monitor nearshore area during VSP and on notification or visual sighting of a swimmer or diver in acoustic-induced distress, the VSP source will be shut down immediately. Continued consultation will occur with stakeholders before and during all project activities.		Minor	

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
RISKS (EVENTS THAT *MAY* HAPPEN)									
13. Accidental overboard release of hazardous and/or non-hazardous waste	Loss overboard of: • Paper and cardboard; • Wooden pallets; • Scrap steel, metal, aluminium, cans; • Glass; • Plastics; • Hydrocarbons, hydraulic oils and lubricants; • Hydrocarbon-contaminated materials (e.g., oily rags, pipe dope, oil filters); • Batteries, empty paint cans, aerosol cans and fluorescent tubes; • Contaminated personal protective equipment (PPE); • Laboratory wastes (such as acids and solvents); and • Larger dropped objects such as sea containers, ROV and skip bins/crates.	Marine pollution (litter and a temporary and localised reduction in water quality). Injury and entanglement of individual animals (such as seabirds and seals) and smothering or pollution of benthic habitats.	Possible	Minor	Low	A MARPOL Annex V-compliant Garbage Management Plan (GMP) is in place for all vessels >100 gross tonnes or certified to carry 15 persons or more) that sets out the procedures for minimising, collecting, storing, processing and discharging garbage. Waste is stored, handled and disposed of in accordance with the GMP. This may include measures such as: - No discharge overboard of general wastes or plastics of any kind. - Waste containers are covered with secure lids to prevent solid wastes from blowing overboard. - All solid wastes are stored in designated areas before being sent ashore for recycling, disposal or treatment. - Any liquid waste storage on deck must have at least one barrier to minimise the risk of spills to deck entering the ocean. This can include containment lips on deck (primary bunding) and/or secondary containment measures (bunding, containment pallet, transport packs, absorbent pad barriers) in place. - Correct segregation of solid and hazardous wastes. Vessel and rig crews and visitors are inducted into waste management procedures at the start of the activities to ensure they understand how to implement the relevant GMP. Solid waste that is accidentally discharged overboard is recovered if reasonably practicable. A chemical locker is available, bunded and used for the storage of all greases and non-bulk chemicals (i.e., those not in tote tanks) so as to prevent discharge overboard.	Unlikely	Minor	Low

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
14. Introduction of invasive marine species from the vessel/rig hulls and/or ballast water	Translocation of foreign species through biofouling of the drill rig legs and/or vessel hull and niches (e.g., sea chests, bilges, strainers). Discharge of MODU and support vessel ballast water containing foreign species.	Reduction in native marine species diversity and abundance. Displacement of native marine species. Socio-economic impacts on commercial fisheries. Reduction of conservation values of protected areas.	Possible	Serious	Medium	Drill rig and vessel contractor pre-qualifications are undertaken to ensure biofouling and ballast water controls meet EP requirements. Drill rig and support vessels are managed in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry. This means: - Conducting in-water inspection by divers or inspection in drydock if deemed necessary. - Biofouling risk will be assessed, with cleaning of hull and internal seawater systems undertaken if deemed necessary. - Anti-fouling coating status taken into account, with antifouling renewal undertaken if deemed necessary. All vessels >400 gross tonnes carry current International Anti-fouling System (IAFS) Certificates and are complaint with and Marine Order Part 98 (Anti-fouling Systems). Drill rig and support vessels will fulfil the requirements of the Australian Ballast Water Management Requirements (DAWR, 2017, v7). This includes requirements to: - Carry a valid Ballast Water Management Plan. - Submit a Ballast Water Report (BWR) through the Maritime Arrivals Reporting System (MARS). - If intending to discharge internationally-sourced ballast water, submit BWR through MARS at least 12 hours prior to arrival. - If intending to discharge Australian-sourced ballast water, seek a low-risk exemption through MARS. - Hold a Ballast Water Management Certificate. - Ensure all ballast water exchange operations are recorded in a Ballast Water Record System.	Unlikely	Serious	Medium

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
15. Displacement of or interference with third-party vessels and activities	Enforcement of a small-radius (i.e., 500-m) petroleum safety zone (PSZ) around the drill rig for the duration of drilling for third-party vessel operators (e.g., commercial and recreational fishing vessels).	Exclusion of other marine users in the PSZ. Loss of commercial fish catches.	*Using reputation & social category:* Possible	Moderate	Medium	GB Energy will undertake thorough pre-activity consultation with fishing stakeholders to ensure that commercial fishers are aware of the activity operations, timing and safety exclusion zone requirements. Maritime Safety Victoria will be notified of drilling no less than four weeks prior to enable the promulgation of Notice to Mariners. A temporary PSZ is established for the duration of drilling. The drill rig and support vessels are readily identifiable to third-party vessels. Visual and radar watch is maintained on the bridge of the support vessels at all times. A support vessel will remain nearby the drill rig at all times in order to intercept third-party vessels that may breach the PSZ. The Vessel Master and deck officers have a valid SCTW certificate in accordance with AMSA Marine Order 70 (seafarer certification) (or equivalent) to operate radio equipment to warn of potential third-party spatial conflicts. The support vessel Masters issue warnings (e.g., radio warning, flares, lights/horns) to third-party vessels approaching the PSZ in order to prevent a collision. GB Energy will apply to NOPSEMA to enter and work within the Bass Strait Area to be Avoided (ATBA) for all vessels >200 gross tonnes. In the event of a collision: - The Vessel Master will sound the general alarm, manoeuvre the vessel to minimise the effects of the collision and implement all other measures as outlined in the vessel or structure collision procedure (or equivalent). - Vessel collisions will be reported to AMSA if that collision has or is likely to affect the safety, operation or seaworthiness of the vessel or involves serious injury to personnel.	*Using reputation & social category:* Unlikely	Moderate	Low

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
16. Vessel strike or entanglement with megafauna (e.g., whales, dolphins, seals).	Movement of the support vessels and towed rig throughout the project area.	Injury or death of individual animals	Unlikely	Minor	Low	The Australian Guidelines for Whale and Dolphin Watching for sea-faring activities will be implemented by the support vessels, which means: - Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone. - No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod/group. - Do not encourage bow riding. - If animals are bow riding, do not change course or speed suddenly. - If there is a need to stop, reduce speed gradually. Vessel crew will complete an environmental induction covering the above-listed requirements for vessel and megafauna interactions. Support vessel strike causing injury to or death of a cetacean is reported via the online National Ship Strike Database within 72 hours of the incident.	Remote	Minor	Low

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
17. Hydrocarbon release (MDO/dry gas) *At this point, it is assumed that because the GB gas is 'dry', in the event of a well blowout, there would be no or very little release of liquids. As such, LoWC response is concentrated on gas plumes, which present more of a safety risk than an environmental risk.*	A vessel-to-vessel collision (e.g., third-party vessel with a project vessel). Vessel grounding (e.g., in shallow waters). Refuelling. Spills from onboard hydrocarbons storage or equipment day tanks. Loss of well control.	Temporary and localised reduction in water quality. Tainting of commercial fisheries species. Injury and death of species such as seabirds and turtles.	Unlikely	Minor	Low	<u>Preparedness:</u> The results of the geophysical and geotechnical investigations will be used to confirm the location of the well in order to avoid shallow gas hazards. No refuelling of support vessels will take place on location (this will be done in port). The drill rig and support vessels have an approved SMPEP (or equivalent appropriate to class) that is implemented in the event of a fuel tank rupture and spill. Drill rig and support vessel crews will be trained in spill response techniques in accordance with the SMPEP and vessel training matrix. Within 4 weeks prior to drilling, a desktop oil spill response exercise will be conducted to test interfaces between the SMPEP, OPEP, NatPlan and VicPlan. A Relief Well Plan is prepared ahead of drilling. A functional and reliable blowout preventor (BOP) is installed, and an independent survey ensures the BOP is compliant with API Standard 53 (Blowout Prevention Equipment Systems for Drilling Wells). An Integrated Acceptance Test (IAT) Part 2 is undertaken on the BOP prior to BOP use. The GB Energy Drilling Supervisor accepts the IAT Part 2 as complete prior to use of the BOP.	Remote	Minor	Low

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
						The well is safely drilled in accordance with designs and documents prepared specifically for the well in order to minimise the possibility of a well blowout. These plans include: - WOMP (NOPSEMA-accepted). - Safety Case and/or Safety Case revision (NOPSEMA-accepted). - Drilling Program. - Well control bridging document between the drill rig contractor and GB Energy. - Drilling fluid program. - Cement program. - P&A or suspension program. - BOP testing procedure. The BOP is installed with the riser and is not removed until the well is plugged in order to prevent a well blowout. The BOP is pressure tested prior to deployment, upon initial latch-up with the wellhead and every 21 days in accordance with API Standard 53. The BOP is function tested every 7 days. The well casing is pressure tested after installation prior to drilling ahead. The driller continuously monitors mud flow parameters (pressure, pump rate, return liquid volumes, alarms, etc) to ensure that the primary well control barrier (the mud system) is operating as designed.			

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
						Cement testing (for strength, etc) will take place in accordance with the Cement Program prior to downhole use to ensure it will cure properly and isolate the well from formations. All senior offshore personnel are trained and qualified to IWCF/IADC WellCap well control standards so that well control emergencies are efficiently and properly managed. The Drilling Supervisor monitors and ensures that two barriers are maintained at all times after installation of the BOP. The Drilling Superintendent will run at least one (frequency determined by the Emergency Response Plan, ERP) well control exercise (e.g., BOP drill) during the drilling campaign in accordance with the Drilling Program. A desktop emergency response exercise is undertaken within 4 weeks of drilling commencing. <u>Response:</u> The drill rig OIM and vessel masters will authorise actions in accordance with the vessel-specific SMPEP (or equivalent according to class) and the activity-specific OPEP to limit the release of MDO. In the event of a well blowout, the Relief Well Plan will be implemented to stem the flow of hydrocarbons. <u>Reporting:</u> GB Energy will report a hydrocarbon spill to regulatory authorities within 2 hours of becoming aware of the loss of containment.			
Hydrocarbon Spill Response Activities (risks) (NB: response strategies are tailored to diesel spill, given the likely absence of liquids from the GB field)									

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
1. Spill surveillance and tracking	Aerial observation. Vessel-based observations. Utilisation of satellite-tracking buoys.	Disturbance to marine and coastal fauna from increased vessel and aerial activity.	Unlikely	Minor	Low	<u>Preparedness:</u> An Oil Pollution Emergency Plan (OPEP) is in place. The drill rig and support vessels have SMPEPs in place. Access to operational response capabilities is maintained via GB Energy's contract with ORCA. GB Energy undertakes a desktop spill response exercise within 4 weeks of drilling to test response capability. GB Energy ensures that ORCA undertakes regular inspection and testing for its oil spill response equipment. <u>Response:</u> The OPEP is implemented in the event of a Level 2 or 3 hydrocarbon spill. This involves: - An Incident Action Plan (IAP) is prepared by the IMT Planning Officer within the first 24 hours after the spill starts, which is used to guide response activities. - Visual observations from aircraft are initiated within 12 hours of request (subject to daylight hours). - Real-time oil spill trajectory modelling (OSTM) results are provided by RPS to GB Energy within 4 hours of notification of the spill. - Surveillance aircraft will ensure buffer distances of 500 m (helicopters) and 300 m (fixed wing) are maintained around cetaceans in accordance with EPBC Regulations 2000 (Part 8). - An operational NEBA is prepared to determine the net benefits of each response strategy. <u>Response-specific controls:</u> • Personnel and equipment resources are deployed to site to undertake responses activities within timeframes outlined in the IAP.	Unlikely	Minor	Low

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
2. Protection and deflection booming	Minor disturbance to substrate at anchor points. Can cause heavy oiling if oil concentrated by the booming strategy. Disturbance to beaches and dune system from vehicle and foot access and associated amenities. Additional vessel activity; - Boom deployment and management. - Waste collection.maintenance of booms management. - Fauna trapped in booms.	Disturbance to marine and coastal fauna, habitats and cultural sensitivities.	Unlikely	Minor	Low	<u>Preparedness:</u> As per '*spill surveillance and tracking.'* <u>Response:</u> Within 6 hours of spill event notification, the shoreline clean-up assessment techniques (SCAT) team has mobilised to area of predicted impact (daylight hours permitting). An operational NEBA is prepared by the IMT to determine the net benefits of a booming strategy for the estuarine areas predicted to be contacted by MDO within 4 hours of receiving oil spill trajectory modelling (OSTM). Personnel and equipment resources are deployed to site to undertake the protection and deflection activities within timeframes outlined in the IAP. Booming activities continue until such time as no further sheen is visible on the sea surface, as the direction of the IMT leader. <u>Response-specific controls:</u> Access to shoreline is via established tracks (with track edges fenced with bunting if required). Access outside of existing tracks and pathways is determined in consultation with local DELWP representatives. Vessels do not anchor in and booms are not anchored to areas of OSRA-mapped or visible kelp forest, reef, sponge gardens or seagrass meadows. Adequate monitoring personnel are in place at booming locations to maintain and attend to the operability of booms, including the release of fauna caught in booms (where safe to do so). Vessel Masters maintain buffer distanced around cetaceans in accordance with the Guidelines for Whale and Dolphin Watching. Waste storage tanks and hoses are located within a contained, impervious area. Collected waste is disposed in accordance with Victorian EPA waste disposal requirements.	Unlikely	Minor	Low

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
3. Shoreline assessment and clean-up	Additional personnel activity on beaches. Mechanical access to and activity on beaches. Loss of shoreline sediment. Waste collection and transport.	Disturbance to coastal fauna and habitats. Disturbance to Aboriginal cultural heritage. Temporary exclusion of the public from beaches. Secondary contamination along shoreline.	Unlikely	Minor	Low	<u>Preparedness:</u> As per '*spill surveillance and tracking.'* <u>Response:</u> The SCAT team is mobilised to site within 6-24 hours of notification of the spill (daylight hours permitting). SCAT information is provided to the IMT Leader for inclusion into the operational NEBA. If the operational NEBA identifies that shoreline clean-up is required, the IAP includes this information. Shoreline clean-up resources are deployed to site within timeframes identified in the IAP. <u>Response-specific controls:</u> Access to shoreline is via established tracks (with track edges fenced with bunting if required). Access outside of existing tracks and pathways is determined in consultation with local DELWP representatives. Mobile equipment to be driven as close to the water's edge as possible to prevent impacts to shoreline birds. Clean-up will keep to the inter-tidal zone as far as possible. In consultation with the local DELWP representative, known occurrences of Aboriginal cultural heritage are flagged for avoidance.	Unlikely	Minor	Low
						Waste storage is located within a contained, impervious area. Oiled waste is transported in accordance with Victorian EPA waste disposal requirements. All access points (personnel and equipment) will be controlled via designated access points through decontamination facilities.			

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
4. Oiled wildlife response (OWR)	Hazing of target fauna may deter non-target species from their normal activities (resting, feeding, breeding, etc.). Distress, injury or death of target fauna from inappropriate handling and treatment. Euthanasia of target individual animals that cannot be treated or have no chance of rehabilitation. Damage to shoreline environmental sensitivities from the establishment of OWR response centres.	Distress, injury or death of fauna through inappropriate handling.	Unlikely	Minor	Low	<u>Preparedness:</u> As per *'spill surveillance and tracking.'* <u>Response:</u> DELWP personnel are mobilised to site within 12 hours of the notification from the SCAT team that fauna are at risk. OWR kits are mobilised to site within 12 hours of the notification from the SCAT team that fauna are at risk. An operational NEBA is undertaken to determine net benefits of undertaking OWR. If an operational NEBA identifies that OWR is required, the IAP includes measures to guide the response, with personnel and equipment deployed to relevant locations. <u>Response-specific controls:</u> Environmental briefings are conducted prior to clean-up commencing in order to identify risks and suitable controls. Access to shoreline is via established tracks (with track edges fenced with bunting if required). Access outside of existing tracks and pathways is determined in consultation with local DELWP representatives. Mobile equipment to be driven as close to the water's edge as possible to prevent impacts to shoreline birds. Wildlife is only handled and treated by DELWP-trained or Phillip Island Nature Park wildlife clinic oiled wildlife responders.	Unlikely	Minor	Low

OFFSHORE MARINE ENVIRONMENTAL RISK ASSESSMENT – PIPELAY ACTIVITIES

Assumes pipe lay barge used (rather than pipelay vessel) due to shallow waters along with anchor handling vessels (e.g., SEMAC 1.)

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood*	Consequence	Rating*		Likelihood*	Consequence	Rating*
IMPACTS (EVENTS THAT *WILL* HAPPEN)									
1. Generation of underwater sound	Engine noise transmitted through the hull from the pipe lay barge anchor handling vessels.	Temporary and localised physiological or pathological impacts to local populations of marine fauna.	** The standard for offshore impact assessment is that because the activity/hazard WILL occur, the likelihood is 100%. This skews things unfavourably towards a higher risk rank if multiplied with consequence. Therefore, we use consequence only.*	Minor		Pipelay vessel engines are well maintained. Cetacean sightings are reported to the DoEE.		Minor	
2. Seabed disturbance	Laying of pipeline on or trenching pipeline within seabed. Dropped objects (e.g.,deck equipment). Pipe lay barge anchoring. Pipelay barge grounding.	Localised turbidity of the water column at the seabed. Smothering of seabed habitat. Seabed damage and displacement of small areas of seabed habitat (e.g., sponge gardens and/or rocky reef). * *There are no recorded shipwrecks located in the project area.*		Minor		Pipeline route will be chosen to avoid or minimise intersection with seabed sensitivities, such as rocky reef and sponge gardens (based on geophysical survey results and habitat assessment study). Avoid objects being dropped overboard by securely fastening equipment to the vessel decks. The ROV is deployed to search for (and retrieve, where possible), non-buoyant dropped objects so that there are no obstacles on the seabed at the completion of the activity. Dropped objects left behind at the end of the activity (that cannot be retrieved) will be reported internally and to ERR.		Minor	

3. Atmospheric Emissions	Combustion of marine diesel.	Decrease in air quality due to gaseous emissions and particulates from diesel combustion and contribution to the incremental build-up of greenhouse gases in the atmosphere (influencing climate change).		Minor		Combustion systems operate in accordance with MARPOL Annex VI (Prevention of Air Pollution from Ships) requirements. - Vessels >400 gross tonnes will have in place a current International Air Pollution Prevention (IAPP) certificate and Ship Energy Efficiency Management Plan (SEEMP). - Only marine-grade low sulphur (not > 3.5% m/m) diesel will be used. - Vessels >400 gross tonnes must ensure that firefighting and refrigeration systems are managed to minimise Ozone Depleting Substances (ODS). There will be no incineration of waste within Victorian state waters. All fuel-burning equipment and the HVAC systems will be maintained in accordance with PMS. Fuel use will be measured, recorded and reported for abnormal consumption so that corrective action can be taken in the event of abnormal (i.e., higher than required) fuel use.		Minor		
4. Light glow/light emissions	Pipe lay barge - navigation and deck lighting is 24/7. Anchor handling vessels - navigation and deck lighting is 24/7. ROV operation (underwater).	Localised light glow may act as an attractant to light-sensitive species (e.g., seabirds, squid, zooplankton), in turn affecting predator-prey dynamics (due to attraction to or disorientation from light). Temporary reduction in visual amenity for residents in and visitors to Golden Beach and Paradise Beach.		Minor		Light glow is minimised by managing external lighting in accordance with AMSA Marine Orders (e.g., Part 30 – Prevention of Collisions and Part 59, Offshore Support Vessel Operations). External lights will not face the ocean wherever practicable (they will face inboard).		Minor		

5. Discharge of treated sewage and grey water	Use of ablutions, laundry and galley facilities on the pipelay barge and anchor handling vessels.	Temporary and localised reduction in water quality (up to 50 m horizontally and 10 m vertically from the discharge point).		Minor		All sewage and grey water will be treated in a MARPOL Annex IV-compliant sewage treatment plant (STP) prior to discharge. In the event of a STP malfunction, untreated sewage and grey water will only be discharged when > 12 nm from shore (in accordance with MARPOL Annex IV). The STPs will be maintained in accordance with the relevant PMS.		Minor		
6. Discharge of cooling water and reverse osmosis (brine)	Seawater is used as a heat exchange medium for cooling machinery engines on pipe lay barge and anchor handling vessels. Brine is created through the vessel desalination processes for potable water generation.	Temporary and localised increase in sea water temperature, causing thermal stress to marine biota. Temporary and localised increase in sea surface salinity, potentially causing harm to fauna unable to tolerate higher salinity. Potential toxicity impacts to marine fauna from residual biocide and scale inhibitors.		Minor		Engines and associated equipment that require cooling by water will be maintained in accordance with the relevant vessel or drill rig maintenance system so that they are operating within accepted parameters. Only ONCS 'Gold'/'Silver' (CHARM) or 'D'/'E' (non-CHARM)-rated chemicals are used in the cooling and brine water systems. The Electrolytic Marine Growth Protection System is maintained in accordance with the PMS to ensure it is operating efficiently (without the use of chemicals).		Minor		
7. Discharge of putrescible waste	Generation of galley and mess room food wastes.	Temporary and localised increase in nutrient content of surface and near-surface water quality (up to 100 m horizontally and 10 m vertically from the discharge point). Temporary increase in scavenging behaviour of pelagic fish and seabirds.		Minor		Putrescible waste discharges will not take place within State waters. Putrescible waste discharges outside of state waters will comply with MARPOL Annex V requirements: - A Garbage Management Plan is in place (for vessels >100 gross tonnes or certified to carry 15 persons or more) that sets out the procedures for minimising, collecting, storing, processing and discharging garbage. - Food waste will be macerated to <25 mm prior to discharge. - In the event of macerator malfunction, un-macerated putrescible waste will be discharged when >12 nm from shore (vessel) or taken back to shore (rig). - Non-putrescible galley waste will either be incinerated or returned to shore for disposal.		Minor		

8. Discharge of bilge water and deck drainage	Fluids from closed deck drainage and machinery spaces. Decks not bunded that drain directly to the sea. Deck washing activities. Chemical or hydrocarbon spill or leak washed overboard.	Temporary and localised reduction in water quality (up to 100 m horizontally and 10 m vertically from the discharge point). Acute toxicity to marine fauna through ingestion of contaminated water in a localised mixing zone (in the event of malfunction of the OWS or an uncontrolled spill emanating from an open drainage area).		Minor		For the pipe lay barge and anchor handling vessels > 400 gross tonnes, all bilge water passes through a MARPOL-compliant OWS set to limit OIW to <15 ppm prior to overboard discharge. The OWS is maintained in accordance with the vessel PMS. The OWS is calibrated in accordance with the PMS to ensure the 15 ppm OIW limit is met. The residual oil from the OWS is pumped to tanks and disposed of onshore. Deck cleaning detergents are biodegradable. Hydrocarbon and chemical storage areas (process areas) are bunded and drain to the bilge tank (or equivalent). Portable bunds and/or drip trays are used to collect spills or leaks from equipment that is not contained within a permanently bunded area (non-process areas). The vessel crews are competent in spill response and have appropriate response resources in order to prevent or minimise hydrocarbon or chemical spills discharging overboard.		Minor		
						Fully stocked SMPEP response kits and scupper plugs or equivalent drainage control measures are readily available to the deck crews and used in the event of a spill to deck to prevent or minimise discharge overboard. The vessel-specific Shipboard Marine Pollution Emergency Plan (SMPEP) is implemented in the event of a large spill of hydrocarbons or chemicals overboard.				
9. Pipeline hydrotesting	Pipeline leak testing using water treated with biocide, fluorescein dye and oxygen scavenger. Loss of chemicals in the water column (through leaks and/or planned discharges).	Localised and temporary toxicity impacts to fauna in the water column around the discharge point.		Minor		Only low-toxicity chemical additives that are PLONOR, ‘D’/’E’ (non-CHARM) or ‘Gold’/’Silver’ (CHARM) OCNS-rated will be used in the hydrotest water.		Minor	

RISKS (EVENTS THAT *MAY* HAPPEN)									
Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood	Consequence	Rating		Likelihood	Consequence	Rating
10. Disturbance to beach goers, swimmers and divers	Physical presence of pipe lay barge and anchor handling vessels close to the beach. Noise created by engines/thrusters of anchor handling vessels. Temporary exclusion from short sections of beaches for safety reasons (depending on where HDD exit point is).	Disruption to normal recreational activities. Injury to swimmers/divers due to proximity of underwater noise to swimming/diving activities.	*Using safety category:* Almost certain	Minor	Medium	Beach exclusion zone will be in place during pipe lay. GB Energy will liaise with the rock lobster fisherman to ensure he is not diving during pipe lay. Continued consultation will occur with stakeholders before and during all project activities.	*Using safety category:* Possible	Minor	Low

11. Accidental overboard release of hazardous and/or non-hazardous waste	Loss overboard of: • Paper and cardboard; • Wooden pallets; • Scrap steel, metal, aluminium, cans; • Glass; • Plastics; • Hydrocarbons, hydraulic oils and lubricants; • Hydrocarbon-contaminated materials (e.g., oily rags, pipe dope, oil filters); • Batteries, empty paint cans, aerosol cans and fluorescent tubes; • Contaminated personal protective equipment (PPE); • Laboratory wastes (such as acids and solvents); and • Larger dropped objects such as sea containers, ROV and skip bins/crates.	Marine pollution (litter and a temporary and localised reduction in water quality). Injury and entanglement of individual animals (such as seabirds and seals) and smothering or pollution of benthic habitats.	Possible	Minor	Low	A MARPOL Annex V-compliant Garbage Management Plan (GMP) is in place for all vessels >100 gross tonnes or certified to carry 15 persons or more) that sets out the procedures for minimising, collecting, storing, processing and discharging garbage. Waste is stored, handled and disposed of in accordance with the GMP. This may include measures such as: - No discharge overboard of general wastes or plastics of any kind. - Waste containers are covered with secure lids to prevent solid wastes from blowing overboard. - All solid wastes are stored in designated areas before being sent ashore for recycling, disposal or treatment. - Any liquid waste storage on deck must have at least one barrier to minimise the risk of spills to deck entering the ocean. This can include containment lips on deck (primary bunding) and/or secondary containment measures (bunding, containment pallet, transport packs, absorbent pad barriers) in place. - Correct segregation of solid and hazardous wastes.	Unlikely	Minor	Low
						Vessel and rig crews and visitors are inducted into waste management procedures at the start of the activity to ensure they understand how to implement the GMP. A chemical locker is available, bunded and used for the storage of all greases and non-bulk chemicals (i.e., those not in tote tanks) so as to prevent discharge overboard. Solid waste that is accidentally discharged overboard is recovered (if reasonably practicable).			

12. Introduction of invasive marine species from the pipe lay barge and vessel hulls and/or ballast water	Discharge of vessel ballast water containing foreign species. Translocation of foreign species through biofouling of the vessel hull and niches (e.g., sea chests, bilges, strainers).	Reduction in native marine species diversity and abundance. Displacement of native marine species. Socio-economic impacts on commercial fisheries. Reduction of conservation values of protected areas.	Possible	Serious	Medium	Vessel contractor pre-qualifications are undertaken to ensure biofouling and ballast water controls meet EP requirements. Vessels are managed in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry. This means: - Conducting in-water inspection by divers or inspection in drydock if deemed necessary. - Biofouling risk will be assessed, with cleaning of hull and internal seawater systems undertaken if deemed necessary. - Anti-fouling coating status taken into account, with antifouling renewal undertaken if deemed necessary. All vessels >400 gross tonnes carry a current International Anti-fouling System (IAFS) Certificates and is complaint with and Marine Order Part 98 (Anti-fouling Systems). Anchor handling vessels will fulfil the requirements of the Australian Ballast Water Management Requirements (DAWR, 2017, v7). This includes requirements to: - Carry a valid Ballast Water Management Plan. - Submit a Ballast Water Report (BWR) through the Maritime Arrivals Reporting System (MARS). - If intending to discharge internationally-sourced ballast water, submit BWR through MARS at least 12 hours prior to arrival. - If intending to discharge Australian-sourced ballast water, seek a low-risk exemption through MARS. - Hold a Ballast Water Management Certificate. - Ensure all ballast water exchange operations are recorded in a Ballast Water Record System.	Unlikely	Moderate	Low

13. Displacement of or interference with third-party vessels and activities	Enforcement of a small-radius (i.e., 500-m) safety exclusion zone for the duration of pipe lay for third-party vessel operators (e.g., commercial and recreational fishing vessels).	Damage to or loss of fishing equipment and loss of commercial fish catches. Exclusion of other marine users in the petroleum activity area.	*Using reputation & social category:* Possible	Moderate	Medium	GB Energy will undertake thorough pre-activity consultation with fishing stakeholders to ensure that commercial fishers are aware of the activity operations, timing and safety exclusion zone requirements. Maritime Safety Victoria will be notified of the activity no less than four weeks prior to enable the promulgation of Notice to Mariners. A temporary Safety Exclusion Zone is established for the duration of the pipe lay activity. The pipe lay barge and anchor handling vessels are readily identifiable to third-party vessels. Visual and radar watch is maintained on the bridge of the anchor handling vessels at all times. The Vessel Master and deck officers have a valid SCTW certificate in accordance with AMSA Marine Order 70 (seafarer certification) (or equivalent) to operate radio equipment to warn of potential third-party spatial conflicts. The anchor handling support vessel Masters issue warnings (e.g., radio warning, flares, lights/horns) to third-party vessels approaching the safety exclusion zone in order to prevent a collision. GB Energy will apply to NOPSEMA to enter and work within the Bass Strait Area to be Avoided (ATBA) for all vessels >200 gross tonnes. In the event of a collision: - The Vessel Master will sound the general alarm, manoeuvre the vessel to minimise the effects of the collision and implement all other measures as outlined in the vessel or structure collision procedure (or equivalent). - Vessel collisions will be reported to AMSA if that collision has or is likely to affect the safety, operation or seaworthiness of the vessel or involves serious injury to personnel.	*Using reputation & social category:* Unlikely	Moderate	Low	

14. Vessel strike or entanglement with megafauna (e.g., whales, dolphins, seals).	Movement of the pipe lay barge and anchor handling vessels in the project area. * *Barge and vessel speeds will be too slow to result in collisions.*	Injury or death of individual animals	Unlikely	Minor	Low	The Australian Guidelines for Whale and Dolphin Watching for sea-faring activities will be implemented, which means: - Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone. - No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod/group. - Do not encourage bow riding. - If animals are bow riding, do not change course or speed suddenly. - If there is a need to stop, reduce speed gradually. Anchor handling vessel crew will complete an environmental induction covering the above-listed requirements. <u>Incident response:</u> Vessel strike causing injury to or death of a cetacean is reported via the online National Ship Strike Database within 72 hours of the incident.	Remote	Minor	Low
15. Hydrocarbon release - marine diesel	Vessel-to-vessel collision (e.g., third-party vessel with the pipe lay barge or anchor handling vessel). Vessel grounding. Spills from onboard hydrocarbons storage or equipment day tanks.	Temporary and localised reduction in water quality. Tainting of commercial fisheries species. Injury and death of species such as seabirds and shorebirds.	Possible	Serious	Medium	No refuelling of vessels will take place on location (this will be done in port). The vessels have an approved SMPEP (or equivalent appropriate to class) that is implemented in the event of a fuel tank rupture and spill. Vessel crews will be trained in spill response techniques in accordance with the SMPEP and vessel training matrix. Within 4 weeks of the activity, a desktop oil spill response exercise will be conducted to test interfaces between the SMPEP, OPEP and VicPlan. <u>Response:</u> The Vessel Masters will authorise actions in accordance with the vessel-specific SMPEP (or equivalent according to class) and the activity-specific OPEP to limit the release of MDO. <u>Reporting:</u> GB Energy will report a hydrocarbon spill to ERR and MSV within 2 hours of becoming aware of the loss of containment.	Unlikely	Moderate	Low

Hydrocarbon Spill Response Activities (risks)									
1. Spill surveillance and tracking	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low
2. Protection and deflection booming	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low
3. Shoreline assessment and clean-up	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low
4. Oiled wildlife response (OWR)	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low

OFFSHORE MARINE ENVIRONMENTAL RISK ASSESSMENT – WELL AND PIPELINE OPERATIONS

Relates mostly to occasional vessel-based inspection and maintenance activities

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood	Consequence	Rating*		Likelihood	Consequence	Rating*
Routine vessel operations hazards									
1. Generation of Underwater Sound	Engine noise transmitted through the hull and propeller noise from the vessel undertaking maintenance visits. Subsea maintenance activity.	Temporary and localised physiological or pathological impacts to local populations of marine fauna, including plankton, fish, cetaceans, pinnipeds, avifauna, benthic invertebrates and turtles.	** The standard for offshore impact assessment is that because the activity/hazard WILL occur, the likelihood is 100%. This skews things unfavourably towards a higher risk rank if multiplied with consequence. Therefore, we use consequence only.*	Minor		Vessel engines and thrusters are well maintained.		Minor	

2. Atmospheric Emissions	Combustion of marine diesel from vessels.	Decrease in air quality due to gaseous emissions and particulates from diesel combustion. Contribution to the incremental build-up of greenhouse gases in the atmosphere (influencing climate change).		Minor		Combustion systems operate in accordance with MARPOL Annex VI (Prevention of Air Pollution from Ships) requirements. - Vessels greater than 400 gross tonnes will have in place a current International Air Pollution Prevention (IAPP) certificate and Ship Energy Efficiency Management Plan (SEEMP). - Only marine-grade low sulphur (no greater than 3.5% m/m) diesel will be used. - Vessels >400 gross tonnes must ensure that firefighting and refrigeration systems are managed to minimise Ozone Depleting Substances (ODS). There will be no incineration of waste within Victorian state waters. All fuel-burning equipment and the HVAC system will be maintained in accordance with planned maintenance system. Fuel use will be measured, recorded and reported for abnormal consumption so that corrective action can be taken in the event of abnormal (i.e., higher than required) fuel use.		Minor	
3. Light glow/light emissions	Vessel navigation and deck lighting is 24/7. ROV operation (underwater).	Localised light glow may act as an attractant to light-sensitive species (e.g., seabirds, squid, zooplankton), in turn affecting predator-prey dynamics (due to attraction to or disorientation from light). Temporary reduction in visual amenity for residents in and visitors to Golden Beach and Paradise Beach.		Minor		Light glow is minimised by managing external lighting in accordance with AMSA Marine Orders (e.g., Part 30 – Prevention of Collisions and Part 59, Offshore Support Vessel Operations). External lights will not face the ocean wherever practicable (they will face inboard).		Minor	
4. Discharge of treated sewage and grey water	Use of ablutions, laundry and galley facilities on the vessel.	Temporary and localised reduction in water quality (up to 50 m horizontally and 10 m vertically from the discharge point).		Minor		All sewage and grey water will be treated in a MARPOL Annex IV-compliant sewage treatment plant (STP) prior to discharge. In the event of a STP malfunction, untreated sewage and grey water will only be discharged when > 12 nm from shore (in accordance with MARPOL Annex IV). The STP will be maintained in accordance with the relevant PMS.		Minor	

5. Discharge of cooling water and reverse osmosis (brine)	Seawater is used as a heat exchange medium for cooling machinery engines on pipe lay barge and anchor handling vessels. Brine is created through the vessel desalination processes for potable water generation.	Temporary and localised increase in sea water temperature, causing thermal stress to marine biota. Temporary and localised increase in sea surface salinity, potentially causing harm to fauna unable to tolerate higher salinity. Potential toxicity impacts to marine fauna from residual biocide and scale inhibitors.		Minor		Engines and associated equipment that require cooling by water will be maintained in accordance with the relevant vessel or drill rig maintenance system so that they are operating within accepted parameters. Only ONCS 'Gold'/'Silver' (CHARM) or 'D'/'E' (non-CHARM)-rated chemicals are used in the cooling and brine water systems. The Electrolytic Marine Growth Protection System is maintained in accordance with the PMS to ensure it is operating efficiently (without the use of chemicals).		Minor	
6. Discharge of putrescible waste	Generation of galley and mess room food wastes.	Temporary and localised increase in nutrient content of surface and near-surface water quality (up to 100 m horizontally and 10 m vertically from the discharge point). Temporary increase in scavenging behaviour of pelagic fish and seabirds.		Minor		Putrescible waste discharges will not take place within State waters. Putrescible waste discharges outside of state waters will comply with MARPOL Annex V requirements: - A Garbage Management Plan is in place (for vessels >100 gross tonnes or certified to carry 15 persons or more) that sets out the procedures for minimising, collecting, storing, processing and discharging garbage. - Food waste will be macerated to <25 mm prior to discharge. - In the event of macerator malfunction, un-macerated putrescible waste will be discharged when >12 nm from shore (vessel) or taken back to shore (rig). - Non-putrescible galley waste will either be incinerated or returned to shore for disposal.		Minor	

7. Discharge of bilge water and deck drainage	Fluids from closed deck drainage and machinery spaces. Decks not bunded that drain directly to the sea. Deck washing activities. Chemical or hydrocarbon spill or leak washed overboard.	Temporary and localised reduction in water quality (up to 100 m horizontally and 10 m vertically from the discharge point). Acute toxicity to marine fauna through ingestion of contaminated water in a localised mixing zone (in the event of malfunction of the OWS or an uncontrolled spill emanating from an open drainage area).		Minor		For any vessel >400 gross tonnes, all bilge water passes through a MARPOL-compliant OWS set to limit OIW to <15 ppm prior to overboard discharge. The OWS is maintained in accordance with the vessel PMS. The OWS is calibrated in accordance with the PMS to ensure the 15 ppm OIW limit is met. The residual oil from the OWS is pumped to tanks and disposed of onshore. Deck cleaning detergents are biodegradable. Hydrocarbon and chemical storage areas (process areas) are bunded and drain to the bilge tank (or equivalent). Portable bunds and/or drip trays are used to collect spills or leaks from equipment that is not contained within a permanently bunded area (non-process areas). The vessel crews are competent in spill response and have appropriate response resources in order to prevent or minimise hydrocarbon or chemical spills discharging overboard.		Minor	
						Fully stocked SMPEP response kits and scupper plugs or equivalent drainage control measures are readily available to the deck crews and used in the event of a spill to deck to prevent or minimise discharge overboard. The vessel-specific Shipboard Marine Pollution Emergency Plan (SMPEP) is implemented in the event of a large spill of hydrocarbons or chemicals overboard.			
Activity-specific hazards									
8. Discharge of hydraulic fluids at the wellhead.	Actuation of wellhead valves.	Loss of several litres of hydraulic fluid with each actuation (several thousand litres per year likely), resulting in localised reduction of water quality.		Minor		Only low-toxicity hydraulic fluid that is PLONOR, ‘D’/’E’ (non-CHARM) or ‘Gold’/’Silver’ (CHARM) OCNS-rated will be used.		Minor	

9. Maintenance activities resulting in seabed disturbance, chemical discharges, discharge of gas and/or condensate, removal of marine growth. *(still too early in project to undertake detailed risk assessment for this hazard)*	Physical contact with seabed from maintenance tooling. Vessel anchoring. Physical removal of marine growth on wellhead/s. Replacement of wellhead chokes. Inline inspection of pipeline.	Localised and temporary turbidity at the seabed. Localised and temporary disturbance to benthic habitats. Loss of habitat provided by removing fouling on the wellhead/ and/or parts of pipeline. Methane consuming bacteria could result in temporary and localised loss of oxygen in water column.	*Assuming no pipeline freespan rectification required given gentle slope of seabed. This could change once pipeline design has progressed.*	Minor		Anchoring is only undertaken if dynamic positioning is not available or feasible. Anchoring only takes place in areas mapped as excluding sensitive habitat (e.g., rocky reef, sponge gardens). ROV Operators are experienced in ROV operations. They are able to undertake a choke replacement. Only sand blasting, brushing or high-pressure water jetting is used for grit-blasting (not chemicals). Any gas condensate in the well is displaced with MEG prior to choke replacement. Only low-toxicity chemical additives that are PLONOR, 'D'/'E' (non-CHARM) or 'Gold'/'Silver' (CHARM) OCNS-rated will be used in the hydrotest water.		Minor	

Activity Hazard	Source of Hazard	Known/Potential Impact	Untreated (inherent) Hazard			Management Commitments	Treated (residual) Hazard		
			Likelihood	Consequence	Score		Likelihood	Consequence	Score
RISKS (EVENTS THAT *MAY* HAPPEN)									
10. Accidental overboard release of hazardous and/or non-hazardous waste	Loss overboard of: • Paper and cardboard; • Wooden pallets; • Scrap steel, metal, aluminium, cans; • Glass; • Plastics; • Hydrocarbons, hydraulic oils and lubricants; • Hydrocarbon-contaminated materials (e.g., oily rags, pipe dope, oil filters); • Batteries, empty paint cans, aerosol cans and fluorescent tubes; • Contaminated personal protective equipment (PPE); • Laboratory wastes (such as acids and solvents); and • Larger dropped objects such as sea containers, ROV and skip bins/crates.	Marine pollution (litter and a temporary and localised reduction in water quality). Injury and entanglement of individual animals (such as seabirds and seals) and smothering or pollution of benthic habitats.	Possible	Minor	Low	A MARPOL Annex V-compliant Garbage Management Plan (GMP) is in place for all vessels >100 gross tonnes or certified to carry 15 persons or more) that sets out the procedures for minimising, collecting, storing, processing and discharging garbage. Waste is stored, handled and disposed of in accordance with the GMP. This may include measures such as: - No discharge overboard of general wastes or plastics of any kind. - Waste containers are covered with secure lids to prevent solid wastes from blowing overboard. - All solid wastes are stored in designated areas before being sent ashore for recycling, disposal or treatment. - Any liquid waste storage on deck must have at least one barrier to minimise the risk of spills to deck entering the ocean. This can include containment lips on deck (primary bunding) and/or secondary containment measures (bunding, containment pallet, transport packs, absorbent pad barriers) in place. - Correct segregation of solid and hazardous wastes.	Unlikely	Minor	Low

11. Introduction of invasive marine species from vessel hulls and/or ballast water	Discharge of vessel ballast water containing foreign species. Translocation of foreign species through biofouling of the vessel hull and niches (e.g., sea chests, bilges, strainers).	Reduction in native marine species diversity and abundance. Displacement of native marine species. Socio-economic impacts on commercial fisheries. Reduction of conservation values of protected areas.	Possible	Serious	Medium	Vessel contractor pre-qualifications are undertaken to ensure biofouling and ballast water controls meet EP requirements. Locally-based (e.g., Lakes Entrance) vessel/s used for maintenance and inspection activities wherever practicable. Vessels are managed in accordance with the National Biofouling Management Guidance for the Petroleum Production and Exploration Industry. This means: - Conducting in-water inspection by divers or inspection in drydock if deemed necessary. - Biofouling risk will be assessed, with cleaning of hull and internal seawater systems undertaken if deemed necessary. - Anti-fouling coating status taken into account, with antifouling renewal undertaken if deemed necessary. All vessels >400 gross tonnes carry a current International Anti-fouling System (IAFS) Certificates and is complaint with and Marine Order Part 98 (Anti-fouling Systems). Anchor handling vessels will fulfil the requirements of the Australian Ballast Water Management Requirements (DAWR, 2017, v7). This includes requirements to: - Carry a valid Ballast Water Management Plan. - Submit a Ballast Water Report (BWR) through the Maritime Arrivals Reporting System (MARS). - If intending to discharge internationally-sourced ballast water, submit BWR through MARS at least 12 hours prior to arrival. - If intending to discharge Australian-sourced ballast water, seek a low-risk exemption through MARS. - Hold a Ballast Water Management Certificate. - Ensure all ballast water exchange operations are recorded in a Ballast Water Record System.	Unlikely	Moderate	Low

12. Displacement of or interference with third-party vessels and activities	Enforcement of a small-radius (i.e., 500-m) safety exclusion zone for the duration of pipe lay for third-party vessel operators (e.g., commercial and recreational fishing vessels).	Damage to or loss of fishing equipment and loss of commercial fish catches. Exclusion of other marine users in the petroleum activity area.	*Using reputation & social category:* Possible	Moderate	Medium	GB Energy will undertake pre-activity consultation with fishing stakeholders to ensure that commercial fishers are aware of the timing of maintenance activities and safety exclusion zone requirements. Maritime Safety Victoria will be notified of the activity no less than four weeks prior to enable the promulgation of Notice to Mariners. The vessel is readily identifiable to third-party vessels. The wellhead and pipeline are marked on the navigation charts, including the Petroleum Safety Zone around the wellhead/s. Visual and radar watch is maintained on the bridge of the vessel at all times. The Vessel Master and deck officers have a valid SCTW certificate in accordance with AMSA Marine Order 70 (seafarer certification) (or equivalent) to operate radio equipment to warn of potential third-party spatial conflicts. The anchor handling support vessel Masters issue warnings (e.g., radio warning, flares, lights/horns) to third-party vessels approaching the safety exclusion zone in order to prevent a collision.	*Using reputation & social category:* Unlikely	Moderate	Low
						GB Energy will apply to NOPSEMA to enter and work within the Bass Strait Area to be Avoided (ATBA) for all vessels >200 gross tonnes. In the event of a collision: - The Vessel Master will sound the general alarm, manoeuvre the vessel to minimise the effects of the collision and implement all other measures as outlined in the vessel or structure collision procedure (or equivalent). - Vessel collisions will be reported to AMSA if that collision has or is likely to affect the safety, operation or seaworthiness of the vessel or involves serious injury to personnel.			

13. Vessel strike or entanglement with megafauna (e.g., whales, dolphins, seals).	Movement of the vessel in the project area. * *Vessel speeds will likely be too slow to result in collisions.*	Injury or death of individual animals	Unlikely	Minor	Low	The Australian Guidelines for Whale and Dolphin Watching for sea-faring activities will be implemented, which means: - Caution zone (300 m either side of whales and 150 m either side of dolphins) – vessels must operate at no wake speed in this zone. - No approach zone (100 m either side of whales and 50 m either side of dolphins) – vessels should not enter this zone and should not wait in front of the direction of travel or an animal or pod/group. - Do not encourage bow riding. - If animals are bow riding, do not change course or speed suddenly. - If there is a need to stop, reduce speed gradually. Vessel crew will complete an environmental induction covering the above-listed requirements. <u>Incident response:</u> Vessel strike causing injury to or death of a cetacean is reported via the online National Ship Strike Database within 72 hours of the incident.	Remote	Minor	Low
14. Hydrocarbon release (MDO/dry gas/ condensate)	Vessel-to-vessel collision. Vessel grounding. Spills from onboard hydrocarbons storage or equipment day tanks.	Temporary and localised reduction in water quality. Tainting of commercial fisheries species. Injury and death of species such as seabirds and shorebirds.	Possible	Serious	Medium	As per '*Displacement of or interference with third-party vessels and activities*.' No refuelling of vessel will take place on location (this will be done in port). The vessels have an approved SMPEP (or equivalent appropriate to class) that is implemented in the event of a fuel tank rupture and spill. Vessel crews will be trained in spill response techniques in accordance with the SMPEP and vessel training matrix. <u>Response:</u> The Vessel Masters will authorise actions in accordance with the vessel-specific SMPEP (or equivalent according to class) and the activity-specific OPEP to limit the release of MDO. <u>Reporting:</u> GB Energy will report a hydrocarbon spill to ERR and MSV within 2 hours of becoming aware of the loss of containment.	Unlikely	Moderate	Low
Hydrocarbon Spill Response Activities (risks)									
1. Spill surveillance and tracking	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low

2. Protection and deflection booming	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low
3. Shoreline assessment and clean-up	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low
4. Oiled wildlife response (OWR)	As per drilling.	As per drilling.	Unlikely	Moderate	Low	As per drilling.	Unlikely	Minor	Low