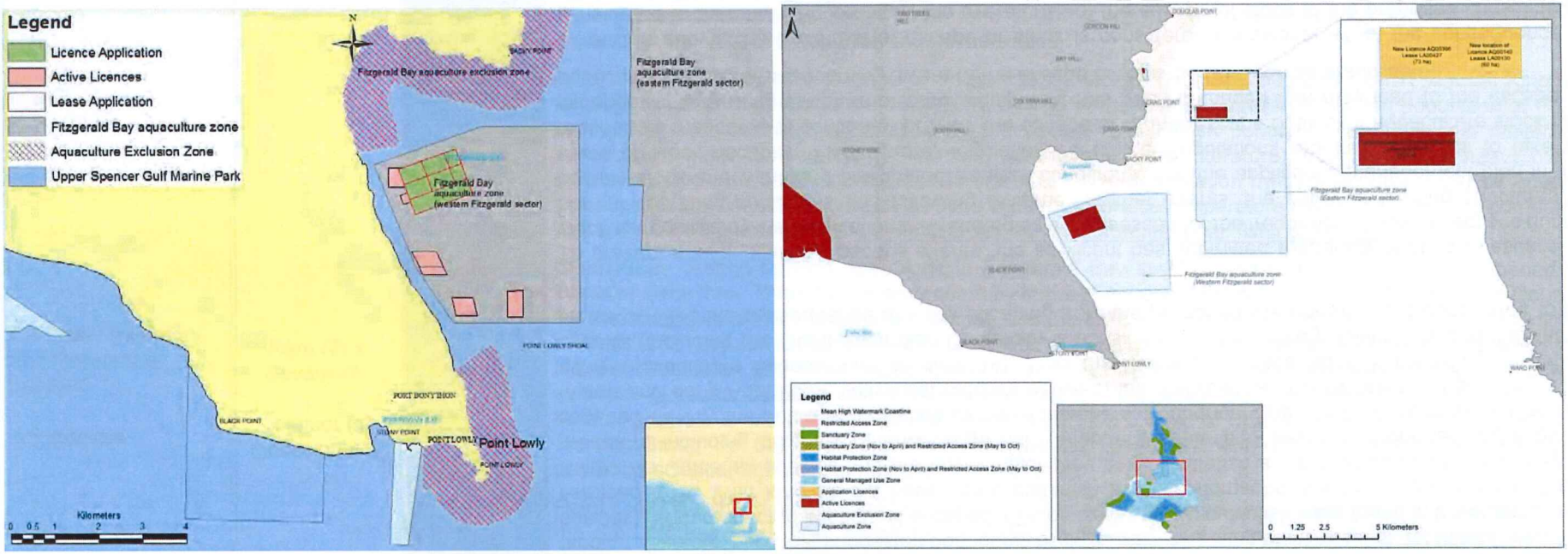
Updated information to supplement original Ecological Sustainable Development (ESD) Risk Assessment for Clean Seas Fitzgerald Bay aquaculture sites:

- Western sector - AQ00397 (new) and movement of 6 sites (FF00026, FF00027, FF00028, FF00029, FF00095 and FF00096).
- Eastern sector - AQ00396 (new) movement of 1 site (AQ00140).



At the time the original ESD risk assessments were undertaken (2018 and 2019), advice from SARDI on the intensity and direction of finfish nutrient plumes and previous SARDI research on the feeding behaviour of escaped kingfish suggested there was no concern in regard to impacts to the Giant Australian Cuttlefish (GAC). Therefore, no further risk assessment was undertaken for GAC or included in the original ESD risk assessment.

However, due to the increase in concerns from the public and the Conservation Council SA related to potential impacts to GAC from finfish escapes and nutrient pollution, and the availability of new scientific information, PIRSA have reviewed and updated the risk events in the ESD relating to Escape and Listed migratory and Threatened Species with respect to GAC to include the most recent information and science available (see below). After consideration of available data, both risks were considered to be low.

2.2 Escape	Occasional (5) x Minor (1)	Low (5)	The likelihood of escape is considered occasional, based on reports of four escape events with an estimated loss of approximately 2100 fish in the last 24 months (as of May 2021). The applicant has stated that all above-water infrastructure will be inspected above every two days by company staff, with below-water inspections every four days by dive teams (weather permitting) as part of general operations. This aims to ensure the integrity of farming infrastructure and therefore minimise the risk of escape events. The risk to the environment as a result of escape is considered to be low since YTK are native to South Australia, wild populations can be found in Spencer Gulf, and Clean Seas use broodstock captured from South Australian waters. Research has shown escaped YTK are poor feeders and unlikely to survive. A report by Fowler *et al.* (2003) was initiated after a series of escape events and concluded it was likely that the YTK which researchers caught in northern Spencer Gulf were escaped YTK, based on body shape and ear-bone structure [14]. Sampling for this study occurred within weeks of three escape events (two reported on 31 January 2003, one on 6 April 2003) and that it took 17 fishing days to capture 77 YTK in northern Spencer Gulf. Two-thirds of YTK that were caught had empty stomachs and those that had fed exhibited feeding characteristics that suggested poor survival skills, such as eating plant material (for this carnivorous species). With respect to impacts of escaped YTK on cuttlefish, no cuttlefish were found in the stomachs of escaped YTK. Wild kingfish did have some cuttlefish in their stomachs, but they were not the Giant Australian Cuttlefish species and are not a major prey item. Cuttlefish are a food source for a variety of predators including dolphins, sharks, large fish (snapper), seals and seabirds. Reported sightings of escaped YTK by the public and catches by the researchers, throughout Spencer Gulf, decreased after late March and early April 2003, with most catches between late February and early March, suggesting YTK either moved from Spencer Gulf or died [14]. Thus the likelihood of escaped YTK predating on native species, including the Giant Australian Cuttlefish, is considered to be unlikely. Given this and the native status of YTK, the consequence of stock escaping from the proposed site operations is considered to be minor. To prevent and/or minimise escape events, the applicant has submitted a strategy relating to escape of stock as required by the Regulations. All strategies are assessed for the frequency of site inspections during normal operating conditions and following extreme weather events; the ability of farming structures to contain stock and withstand anticipated weather conditions; and the applicant's management plan in the event of stock escapes. Furthermore, regulation 26 of the Regulations requires licensees to take all reasonable measures to contain or prevent the escape or further escape of stock if aquaculture stock has escaped, or a farming structure or other equipment has been damaged that may lead to the escape of aquaculture stock, after becoming aware of the escape or damage (as soon as practicable). Given the above, the likelihood of escape of stock is considered occasional whilst the consequence is considered to be minor. Accordingly, the overall risk of the escape of stock at the proposed consolidated site is considered to be low.

4.1 Listed migratory and threatened species	Rare (2) x Severe (3)	Low (6)	The Giant Australian Cuttlefish (GAC) is the world's largest cuttlefish species, growing to 50 cm in mantle length and over 10 kg in weight. The conservation status of the GAC is Near Threatened (Population decreasing). The species is short lived with a life cycle of 1-2 years. Point Lowly, in South Australia's northern Spencer Gulf, is the only known site where GAC form dense spawning aggregations. The annual spawning aggregation of GAC at Point Lowly declined by 90% between 1999 and 2012. It has since recovered to relatively high levels, and over the last 10 years has demonstrated the population's capacity to fluctuate over relatively short time scales. In 2013, SARDI evaluated a range of environmental factors (including nutrients from Yellowtail Kingfish farming) to better understand the 1999-2012 decline in the Giant Australian Cuttlefish population at Point Lowly. The best scientific explanation for the decline in cuttlefish population abundance is related to variations in water temperature (in line with mounting scientific literature), but rainfall and heavy metal pollutants have also been documented to correlate. In a presentation by Dr Mike Steer (SARDI Aquatic Sciences) to the Whyalla Council on 24 June 2020, sea surface temperature since 2013 has also correlated well with cuttlefish abundance: www.pir.sa.gov.au/fishing/recreational_fishing/cuttlefish. Clean Seas ceased farming operations in Fitzgerald Bay in 2012 and cuttlefish numbers happened to increase since then. There has been concern by some members of the public and the Conservation Council SA that there is a direct link between farming and the GAC population decline. A more recent exploratory analysis (2021) by some members of the cuttlefish working group found a negative correlation between the number of cuttlefish and finfish aquaculture in Fitzgerald Bay with a 2-4 year lag. However there is no clear evidence of cause. Drawing correlations in the absence of a factor (such as farming) can be misleading. Further analysis is warranted in the future and would be a topic of discussion at the ongoing Cuttlefish Working Group. For the purpose of this science based risk assessment, reliance will be on peer reviewed published science, and advice from scientific experts. Point Lowly is approximately 6 km south of the proposed aquaculture site. To address any potential risk to the GAC aggregations from finfish farming, the South Australian Research and Development Institute (SARDI) undertook oceanographic modelling in 2020 to demonstrate the spatial footprint of aquaculture-related nutrients and other derived organic matter from the proposed farms in the Upper Spencer Gulf. The 2020 modelling was based on the estimated biomass to be held on the sites (3,000 tonnes). The modelling was rerun in June 2021 based on a biomass of 4,245 tonnes (maximum biomass for the zone). Both modelling studies demonstrated the nutrient levels are expected to remain well below the Australian and New Zealand Environment and Conservation Council (ANZECC) 2000 water quality guideline trigger values both within and outside the zone. Those trigger values are used to determine when impact may occur for the purpose of initiating environmental monitoring to detect any impact and implement appropriate management strategies. Maximum ammonium levels were estimated at less than the south-central (SA) guidelines of 50 ug N/L, or more conservative south-east guidelines of 15 ug N/L which have both been used previously. The modelling also demonstrated strong tidal flows of more than 0.6 meters per second in the vicinity of the aquaculture zone, together with other hydrodynamic variables, quickly disperse nutrients from the finfish farms. Nutrients are dispersed over distances of 5-10 km predominately to the north, after

			which they fall within background levels. Due to seasonal feeding regimes and kingfish growth, nutrient inputs are at their peak in March and at their lowest between June to October, which includes the period when the GAC are aggregating (in May to July). Based on regional circulation patterns, the SARDI modelling demonstrated a negligible to minimal impact of aquaculture to the west and south of Point Lowly (where the Giant Australian Cuttlefish largely aggregate) because of aquaculture derived nutrients. Despite nutrient plumes being under ANZECC guideline trigger values, ongoing environmental monitoring is required by the licence holder, so any potential impacts would be detected early. Furthermore, while GAC aggregations are not within nutrient plumes and are not considered to be at risk from aquaculture derived nutrients, GAC populations will be monitored independently (e.g. SARDI, Universities, community groups, GAC tourism operators) so an understanding of their population trends over time will be known. Therefore the likelihood of finfish farming nutrients impacting GAC aggregations is rare and the overall risk is considered to be low.