7. Climate change risk assessment- INLAND WATERS

Key				
Probability (**P**)	UC- Uncertain	P- Possible	L- Likely	Almost Certain- A.C
Consequences (**C**)	UK- Unknown	L- Low	Mod- Moderate	M- Major
Risk rating (**R**)	L- Low	Mod- Moderate	H- High	Cr-Critical

Climate Hazard	Freshwater Environments	Aquatic Biodiversity	Freshwater Fishery Resources	Water Resources
Increased incidence of destructive wild fires	• Fire incursions into and degradation of fire sensitive wetland riparian communities **P-C-R –** L-Mod-H • Increased grazing /stock pressure on unburnt riparian/wetland fire refugia **P-C-R –** P-Mod-Mod • Degradation of structural, floristic and functional integrity of riverine corridor riparian vegetation with resultant impacts to bank stability **P-C-R –** P-Mod-Mod	• Loss of fire sensitive plant (& associated fauna) species from regional ecosystems associated with alluvial land zone 3. **P-C-R –** L-Mod-H • Impacts to the condition and functionality of dry season aquatic refugia including enhanced prospect of critical water quality impacts in late dry season / wet season initiation period (via reduced shading, elevated temperature, reduced DO, elevated turbidity, eutrophication) with concomitant impacts to biodiversity **P-C-R –** L-Mod-H	• Reduced viability of aestivation habitat utilised by freshwater long-neck turtles **P-C-R –** P-Mod-Mod • Reduced carrying capacity and nursery function for impacted floodplain and main channel habitats utilised by fishery associated species **P-C-R –** P-L-L	• Reduced ground cover at onset of wet season and reduced trapping capacity of burnt riparian and wetland vegetation resulting in increased capacity for soil erosion and mobilization of elevated basin sediment loads with concomitant impacts to receiving ecosystem water quality and geomorphic condition **P-C-R –** L-Mod-H • Increased rates of run off from burnt catchments resulting in reduced recharge of groundwater aquifers **P-C-R –** P-Mod-Mod

Climate Hazard	Freshwater Environments	Aquatic Biodiversity	Freshwater Fishery Resources	Water Resources
Increased intensity and/or magnitude of high rainfall events (incl. flood and cyclones)	• Destructive disturbance of riverine corridor riparian vegetation via sustained inundation, bank erosion, scalding and gullying of drainage line frontage areas **P-C-R –** AC-M-Cr • Modified physical environment and geomorphic impact to riverine corridor banks, channels, pools and bed via enhanced erosion / scour / sediment deposition **P-C-R –** AC-M-Cr • More sustained inundation of floodplains resulting in reduced cover (during recovery period) and impacts to resilience and carrying capacity of associated vegetation communities. **P-C-R –** AC-Mod-Mod • Potentially beneficial scouring /flushing of exotic aquatic weed infestations from floodplain/ delta wetlands providing enhanced control opportunities **P-C-R –** L-Mod-Mod	• Potential for enhanced dispersal of basin weed and exotic fish species to new lower /adjoining catchment sites **P-C-R –** L-Mod-Mod • Potential for enhanced establishment of riparian weed species within disturbed riverine corridors **P-C-R –** L-Mod-Mod • Changed connectivity / inundation patterns altering waterhole community composition **P-C-R –** L-L-L • Subject to event timing, potential positive or negative impacts to riparian and wetland vegetation utilised by waterbirds as nesting resources **P-C-R –** P-Mod-Mod • Subject to event frequency, periodic or sustained loss of macrophyte habitats from channel and floodplain areas subject to high flow scouring **P-C-R –** L-Mod-Mod	• Subject to event timing, potentially beneficial impacts to fisheries recruitment via nursery habitat inundation, increased contribution of floodplain carbon / productivity subsidies and provision of basin habitat connectivity. **P-C-R –** AC-Mod-H	• Greater capacity for basin soil erosion, and export of elevated suspended and bed sediment loads to receiving ecosystems including floodplain lagoons, main channel waterholes and coastal systems. **P-C-R –** AC-Mod-H • Greater prospect of mining associated contaminant loads in retention facilities (i.e. tailings dams), being released via overflow events to receiving aquatic ecosystems **P-C-R –** L-Mod-Mod-H • Potentially enhanced recharge of shallow alluvial aquifers within floodplains and adjoining riverine corridors **P-C-R –** L-UK-L • Potentially enhanced rates of refilling of water supply storages to full supply levels ensuring for environmental allocations **P-C-R –** P-L-L

Climate Hazard	Freshwater Environments	Aquatic Biodiversity	Freshwater Fishery Resources	Water Resources
Increased storm surge and rising sea levels	• Saltwater intrusion into previously fresh reaches of coastal drainage networks **P-C-R –** AC-Mod-H • Breaching of coastal inter-swale swamps by tides/storm surge and alteration from fresh to brackish/saline with loss of associated fringing vegetation communities **P-C-R –** AC-Mod-H • Upstream retreat and replacement of freshwater riparian vegetation by marine communities **P-C-R –** AC-Mod-H • Changes to the structural and floristic integrity of wetland riparian vegetation due to storm surge / cyclone disturbance regime **P-C-R –** L-Mod-H	• Sea level rise driven inundation, contraction and loss of wetland habitats and associated biodiversity associated with the freshwater – brackish – marine interface zone **P-C-R –** AC-Mod-H • Salinisation of coastal freshwater wetlands and marginal vegetation utilised by breeding aggregations of waterbirds **P-C-R –** L-Mod-H • Inundation and contraction marine plain wetland habitats utilised by migratory wader birds **P-C-R –** L-Mod-H	• Inundation, salinisation and contraction of sedge swamp *Eleocharis spp* barramundi nursery habitats **P-C-R –** AC-Mod-H	• Intrusion of marine water into shallow coastal groundwater aquifers with concomitant impacts to dependent vegetation and aquatic ecosystems. **P-C-R –** AC-Mod-H • Increased bank erosion and elevated sediment loads in lower reaches /coastal drainage systems associated with destructive disturbance and salinisation driven loss of stabilizing riparian vegetation and local catchment cover **P-C-R –** P-L-Mod

Climate Hazard	Freshwater Environments	Aquatic Biodiversity	Freshwater Fishery Resources	Water Resources
Longer dry seasons	• Changes in river/stream flow regimes toward greater duration of low and no flows **P-C-R –** AC-M-Cr • Contraction of more mesic (moist) riparian vegetation communities associated with river corridors, wetlands and springs **P-C-R –** AC-Mod-H • Reduced baseflow inputs and reduced volumes /shallower refugial waterholes resulting in greater late dry season degradation of water quality (higher temperatures, lower DO, higher salinity, eutrophication) **P-C-R –** L-Mod-H • Reduction in extent of functional fire refugia and greater intrusion and impact of late dry season fires into fire sensitive riparian vegetation communities **P-C-R –** L-Mod-H • Increased pressure of grazing stock and feral animals on frontage and fringing habitats and water quality associated with perennial /refugial waterholes **P-C-R –** AC-M-Cr • Later onset of wet seasons of shorter duration delaying wetland inundation, habitat resetting and biota recruitment processes and driving temporal and spatial shifts in primary productivity and food web dynamics **P-C-R –** L-Mod-H	• Reduced number, extent and functional viability of dry season aquatic refugia and associated loss of biodiversity. **P-C-R –** AC-Mod-H • Reduction in faunal feeding and nesting resources associated with riparian vegetation of riverine corridors and wetlands and associated impacts to dependent terrestrial biodiversity. **P-C-R –** L-Mod-H • Reduced flows and other identified factors contributing to poor water quality in refugial pools could promote exotic fish species with broader tolerances **P-C-R–** P-Mod-Mod	• Late initiation of connective flows (required for adults to join breeding aggregations), delayed nursery habitat inundation and reduced flow based productivity pulses could lead to late and reduced recruitment of fishery species. **P-C-R –** AC-Mod-H • Reduced extent of perennial floodplain lagoon and main channel water hole habitat reduces adult and juvenile populations of fishery species. **P-C-R –** L-Mod-H	• Reduced river /stream baseflows to flush wet season run in and/or irrigation / STP tailwater contaminant loads through drainage system **P-C-R –** L-Mod-H • Less ground cover on scalded and drought affected catchments resulting in higher rates of soil erosion and elevated basin loads and exports of suspended and bed load sediment **P-C-R –** L-Mod-H • Greater proportion of run off from scalded and drought affected catchments resulting in less infiltration and aquifer recharge **P-C-R –** L-Mod-H • Reduced discharge volume from shallow unconfined aquifers (e.g. associated with Mitchell River) **P-C-R –** L-Mod-H • Greater water resource demands for human /agricultural uses with impact to residual available for environmental allocations **P-C-R –** L-Mod-H

Climate Hazard	Freshwater Environments	Aquatic Biodiversity	Freshwater Fishery Resources	Water Resources
Continued warming of temperature, including more hot days	• Changes to instream biogeochemical processes including rates of decomposition, respiration and trophic metabolism with consequent changes to dissolved oxygen (generation of anoxic conditions), elevated nutrient levels and metal solubility **P-C-R –** AC-M-Cr • Greater likelihood of waterhole stratification and generation of anoxic sub surface layers **P-C-R -** LModH • Greater evaporation rates leading to reduced extent of perennial aquatic habitat refugia being maintained through dry season **P-C-R -** LModH	• Exceedance of thermal thresholds for aquatic species particularly within dry season refugial waterholes and consequent loss of aquatic biodiversity from systems **P-C-R –** ACModH • Exceedance of thermal thresholds for plant species within fringing riparian vegetation communities and consequent loss of plant species and dependent biodiversity associated with riparian communities **P-C-R –** ACModH • Greater incidence of disease breakouts in refugial waterholes associated with thermal stress and enhanced growing condition for pathogens **P-C-R–** P-Mod-Mod • Greater establishment opportunities for invasive exotic fish and aquatic / riparian weed species that have broader low dissolved oxygen /thermal tolerances **P-C-R–** P-Mod-Mod	• Reduced dissolved oxygen in shallow coastal and floodplain nursery wetlands (and upper estuarine nursery habitats) decreasing freshwater fishery species carrying capacity and recruitment levels **P-C-R -** LModH • Impacts of low dissolved oxygen driven fish kills on adult and juvenile populations of fishery species within vulnerable habitat types (floodplain lagoons, refugial channel waterholes) **P-C-R –** L-Mod-Mod	• Greater opportunities for water quality impacts associated with: reduced dissolved oxygen carrying capacity; enhanced mobilization of nutrients from sediments, increased solubility of metals and generation of favorable conditions for blue-green algae outbreaks **P-C-R –** AC-M-Cr

Climate Hazard	Freshwater Environments	Aquatic Biodiversity	Freshwater Fishery Resources	Water Resources
Increasing atmospheric CO_2 concentration and acidification of rain and surface waters	• Lower pH waters in catchments with limited buffering capacity affecting the shell forming capacity and abundances of diatoms and mollusks with flow on impacts associated with a loss of their ecological functions including as grazers and phytoplankton filterers **P-C-R -** LModH • Higher carbon : nitrogen and phosphorous ratios in phytoplankton decreasing their nutritive value and driving trophic shifts in food webs **P-C-R –** L-Mod-Mod • Woody vegetation growth promoted relative to grassy vegetation promoting woodland thickening on floodplains with flow on effects to flow hydrology and food chain carbon sources **P-C-R -** PModMod	• Greater growth rates in woody weed species impacting riparian and floodplain vegetation communities **P-C-R -** PLMod	• Increased mortality of fish larvae and juveniles may result from acidification effects on sensory systems and behavior, leading to decline in recruitment to adult populations. **P-C-R -** PModH • Reduced aerobic capacity in some fish due to acidification could exacerbate other climate change impacts (e.g. reduced dissolved DO). **P-C-R -** PModH	• Lower rainfall pH altering solute composition and increasing mobilization of soluble metals in catchment run off with greater capacity for toxic impacts in receiving waters downstream of contaminant sources **P-C-R –** L-Mod-Mod • Higher algal / phytoplankton production in the surface waters of stratified water bodies leading to eutrophication and/or blue green algae impacts to water quality **P-C-R -** LModH