

APPENDIX M FM ACT HABITAT ASSESSMENT AND ASSESSMENT OF SIGNIFICANCE

M.1 FM ACT HABITAT ASSESSMENT

The table in this Appendix present the habitat evaluation for threatened species and ecological communities listed under the NSW FM Act and those identified as potentially occurring in the area according to the Commonwealth Protected Matters search tool.

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species (where relevant). The assessment of potential impact is based on the nature of the proposal, the ecology of the species and its likelihood of occurrence. The following classifications are used:

Presence of habitat:

Present: Potential or known habitat is present within the study area

Absent: No potential or known habitat is present within the study area

Likelihood of occurrence

Unlikely: Species known or predicted within the locality but unlikely to occur in the study area

Possible: Species could occur in the study area

Present: Species was recorded during the field investigations

Possible to be impacted

No: The proposal would not impact this species or its habitats. No AoS is necessary for this species

Yes: The proposal could impact this species or its habitats. An AoS has been applied to these entities.

Species and Status	Description of habitat ¹	Presence of habitat	Likelihood of occurrence	Potential for impact?
Fish				
Flathead Galaxias <i>Galaxius rostratus</i> CE EPBC CE FM	Below 150 m in altitude. Billabongs, lakes, swamps, and rivers, with preference for still or slow-flowing waters.	No No suitable permanent water above 150 m in altitude.	Unlikely Within species distribution.	No No suitable habitat in study area.
Murray Hardyhead <i>Craterocephalus fluviatilis</i> CE FM	Mostly recorded in saline lakes that are moderately acidic to highly alkaline and have relatively low turbidity. Margins of lakes, wetlands, backwaters, and billabongs. Open water, shallow, slow-flowing or still habitats, with sand or silt substrates. Also, deeper habitats with dense aquatic vegetation.	No No lakes, backwaters, billabongs with deep water.	Unlikely Within historic species distribution.	No No suitable habitat in study area.
Stocky Galaxias <i>Galaxias tantangara</i> CE FM	Small, cold, clear and fast-flowing alpine creek, flowing through open forest of eucalypts, low shrubs and tussock grass.	No No alpine creeks.	Unlikely Outside species distribution.	No No suitable habitat in study area.
Australian Grayling <i>Prototroctes marena</i> E FM	Migrates between rivers, estuaries and coastal seas. Mostly in freshwater rivers and streams, usually in cool, clear waters with gravel substrate and alternating pool and riffle zones.	No No coastal habitat.	Unlikely Outside species distribution.	No No suitable habitat in study area.
Eastern Freshwater Cod <i>Maccullochella ikei</i> E FM	Clear flowing rivers with rocky substrate and large amounts of in-stream cover.	No No flowing rivers.	Unlikely Outside species distribution.	No No suitable habitat in study area.
Eel Tailed Catfish <i>Tandanus tandanus</i>	Inhabits slow moving streams, lakes and ponds with fringing vegetation. It swims close to the sand or gravel bottoms. This species is more abundant in lakes than in flowing water.	No No flowing rivers.	Unlikely Outside species distribution.	No No suitable habitat in study area.

¹ Information sourced from species profiles on NSW DPI species list or the Australian Government's *Species Profiles and Threats* database (SPRAT) unless otherwise stated.

OEI threatened species database: <https://www.dpi.nsw.gov.au/fishing/species-protection/conservation/what-current>

SPRAT: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Species and Status	Description of habitat ¹	Presence of habitat	Likelihood of occurrence	Potential for impact?
Olive Perchlet <i>Ambassis agassizii</i> E FM	Inhabits the vegetated edges of lakes, creeks, swamps, wetlands and rivers, where it is often associated with woody habitat and aquatic vegetation in areas with little or no flow, particularly backwaters.	No No flowing or suitable permanent water.	Unlikely Within historic species distribution.	No No suitable habitat in study area.
Oxleyan Pygmy Perch <i>Nannoperca oxleyana</i> E FM	Coastal lowlands, mostly coastal floodplains in swamps, creeks and lakes of coastal Banksia heath.	No No coastal habitat.	Unlikely Outside species distribution.	No No suitable habitat in study area.
Southern Pygmy Perch <i>Nannoperca australis</i> E FM	Slow-flowing waters and still, vegetated habitats in small streams, lakes, billabongs and wetlands.	No No flowing or suitable permanent water.	Unlikely Within species distribution.	No No suitable habitat in study area.
Southern Purple Spotted Gudgeon <i>Mogurnda adspersa</i> E FM	Rivers, creeks, and billabongs with slow-flowing or still waters or in streams with low turbidity. Cover in the form of aquatic or overhanging vegetation, leaf litter, rocks or snags.	No No suitable slow-flowing or still permanent water.	Unlikely Outside current known species distribution.	No No suitable habitat in study area.
Trout Cod <i>Maccullochella macquariensis</i> E FM	The species is usually associated with deeper water (pools) and instream cover such as logs and boulders	No No suitable permanent water with large woody or rock debris.	Unlikely Outside species distribution.	No No suitable habitat in study area.
Murray Cod <i>Maccullochella peelii</i> V EPBC	Slow flowing, turbid water in streams and rivers, favouring deeper water around boulders, undercut banks, overhanging vegetation and logs.	No No deep, slow-flowing streams or rivers.	Unlikely Within species distribution.	No No suitable habitat in study area.
Macquarie Perch <i>Macquaria australasica</i> E EPBC E FM	Rivers, in clear, deep, rocky holes with plenty of cover including aquatic vegetation, large boulders, large woody debris, and overhanging banks.	No No deep water with plenty of cover.	Unlikely Within species distribution.	No No suitable habitat in study area.

Species and Status	Description of habitat ¹	Presence of habitat	Likelihood of occurrence	Potential for impact?
Silver Perch <i>Bidyanus bidyanus</i> V FM	Faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin.	No No fast-flowing water.	Unlikely Within species distribution.	No No suitable habitat in study area.
Darling River Hardyhead population in the Hunter River catchment <i>Craterocephalus amniculus</i> EP FM	North-east part of the Murray-Darling Basin, especially MacIntyre, Namoi and other border rivers. The Hunter River population is the only known occurrence in an eastward flowing river.	No Outside Hunter River catchment.	No Outside population distribution.	No Population not in study area.
Flathead Galaxias <i>Galaxias rostratus</i> V FM	Historically collected from a variety of habitats including billabongs, lakes, swamps and rivers, usually in still or slow-flowing waters.	No No flowing or suitable permanent water.	Unlikely Within species distribution.	No No suitable habitat in study area.
Murray-Darling Basin population of Eel-tailed Catfish <i>Tandanus tandanus</i> EP FM	Diverse range of freshwater environments including rivers, creeks, lakes, billabongs and lagoons. Clear, sluggish or still waters, but also found in flowing streams with turbid waters. Substrates range from mud to gravel and rock.	Possible Small freshwater dams with sand/mud substrate.	Unlikely Not recorded in locality.	No Species not recorded in locality.
Snowy River population of River Blackfish <i>Gadopsis marmoratus</i> EP FM	Clear flowing streams with good instream cover such as woody debris, aquatic vegetation and undercut banks.	No Outside Snowy River catchment.	No Outside population distribution.	No Population not in study area.
Western population of Olive Perchlet <i>Ambassis agassizii</i> EP FM	Western (Murray-Darling) population is limited to a few localities in Darling drainage upstream from Bourke.	No Outside Darling drainage system upstream from Bourke.	No Outside population distribution.	No Population not in study area.
Grey Nurse Shark <i>Carcharias taurus</i> CE FM	Inshore coastal waters along coast of NSW and southern Queensland.	No No coastal habitat.	No Outside species distribution.	No No suitable habitat in study area.

Species and Status	Description of habitat ¹	Presence of habitat	Likelihood of occurrence	Potential for impact?
Scalloped Hammerhead Shark <i>Sphyrna lewini</i> E FM	Tropical and warm temperate seas between 45°N and 34°S, inshore and over continental shelf and in adjacent deep water from surface to at least 275 m depth.	No No marine habitat.	No Outside species distribution.	No No suitable habitat in study area.
Great Hammerhead Shark <i>Sphyrna mokarran</i> V FM	Occurs along coastlines, continental shelves and adjacent drop-offs to about 80 m depth.	No No marine habitat.	No Outside species distribution.	No No suitable habitat in study area.
White Shark <i>Carcharodon carcharias</i> V FM	Inshore habitats to outer continental shelf and slope areas.	No No marine habitat.	No Outside species distribution.	No No suitable habitat in study area.
Southern Bluefin Tuna <i>Thunnus maccoyii</i> E FM	Oceanic waters on seaward side of continental shelf.	No No marine habitat.	No Outside species distribution.	No No suitable habitat in study area.
Black Rockcod <i>Epinephelus daemeli</i> V FM	Caves, gutters and beneath bommies on rocky reefs, from near shore environments to depths of at least 50 m.	No No marine habitat.	No Outside species distribution.	No No suitable habitat in study area.
River Blackfish				
Invertebrates				
Darling River Snail <i>Notopala sublineata</i> CE FM	Darling River and its tributaries. Artificially introduced hard surfaces including irrigation pipelines.	No No artificial surfaces in waterways.	Unlikely Outside species distribution.	No No suitable habitat in study area.
Hanley's River Snail <i>Notopala hanleyi</i> CE FM	Artificially introduced hard surfaces including irrigation pipelines.	No No artificial surfaces in waterways.	Unlikely Outside species distribution.	No No suitable habitat in study area.

Species and Status			Description of habitat ¹	Presence of habitat	Likelihood of occurrence	Potential for impact?
Fitzroy Falls Spiny Crayfish			Creates burrows in soft stream bed below waterline.	No No suitable permanent streams.	Unlikely Outside species distribution.	No No suitable habitat in study area.
<i>Euastachus dharawalus</i>						
CE FM						
Murray Crayfish			Lotic waters of southern Murray-Darling Basin. Habitats ranging from pasture to sclerophyll forest, large and small streams. Deep flowing water proximal to clay banks, wood or rock cover.	No No suitable permanent lotic habitat	Possible Within species distribution.	No No suitable habitat in study area.
<i>Euastachus armatus</i>						
V FM						
Marine Slug			Small isolated location at Merry Beach, south of Ulladulla, NSW.	No No marine habitat.	No Outside species distribution.	No No suitable habitat in study area.
<i>Smeagol hiliaris</i>						
CE FM						
Adams Dragonfly		Emerald	Narrow, shaded riffle zones with moss and abundant riparian vegetation in small to moderate sized creeks with gravel or sandy bottoms.	No No suitable moist, shaded riffle zones.	No Outside species distribution.	No No suitable habitat in study area.
<i>Archaeophya adamsi</i>						
E FM						
Sydney Hawk Dragonfly			Deep river pools with cooler water and permanent flow.	No No deep water or permanent flow.	No Outside species distribution.	No No suitable habitat in study area.
<i>Austrocordulia leonardi</i>						
E FM						
Alpine Redspot Dragonfly			Amongst rocks, logs and moss within the splash zone of waterfalls or in the nearby stream edge.	No No waterfalls or moist rocky streams.	No Outside species distribution.	No No suitable habitat in study area.
<i>Austropetalia tonyana</i>						
V FM						
Bousfield Marsh Hopper			Mangrove swamps and salt marshes in eastern Australia.	No No coastal habitat.	No Outside species distribution.	No No suitable habitat in study area.
<i>Microrchestia bousfieldi</i>						
V FM						
Buchanans Fairy Shrimp			Lake Buchanan in southwest Queensland, and Gidgee and Burkanoko Lakes in northwest NSW.	No No lake habitat.	No Outside species distribution.	No No suitable habitat in study area.
<i>Branchinella buchananensis</i>						
V FM						

Species and Status	Description of habitat ¹	Presence of habitat	Likelihood of occurrence	Potential for impact?
Plants				
Marine Brown Alga <i>Nereia lophocladia</i> CE FM	Port Phillip Heads in Victoria and Muttonbird Island, Coffs Harbour in NSW.	No No coastal habitat.	No Outside species distribution.	No No suitable habitat in study area.
<i>Posidonia australis</i> seagrass, Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie populations EP FM	Coarse sandy to fine silty sediments between the low tide and approximately 10 m in depth.	No No marine habitat.	No Outside species distribution.	No No suitable habitat in study area.
Endangered Ecological Community				
Lowland Darling River aquatic ecological community EEC FM	Natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches, and the floodplains of the Darling River within NSW, including Menindee Lakes and Barwon River.	No Not in Darling River catchment.	No Outside community distribution.	No No suitable habitat in study area.
Lowland Lachlan River aquatic ecological community EEC FM	Natural rivers, creeks, streams and associated lagoons, billabongs, lakes, wetlands, paleochannels, floodrunners, effluent streams (those that flow away from the river) and the floodplains of the Lachlan River within NSW, including Lake Brewster, Lake Cargelligo and Lake Cowal.	No Not in Lachlan River catchment.	No Outside community distribution.	No No suitable habitat in study area.

Species and Status	Description of habitat ¹	Presence of habitat	Likelihood of occurrence	Potential for impact?
Lowland Murray River aquatic ecological community EEC FM	Natural creeks, rivers, and associated lagoons, billabongs and lakes of the regulated portions of the Murray River (also known as the River Murray) downstream of Hume Weir, the Murrumbidgee River downstream of Burrinjuck Dam, the Tumut River downstream of Blowering Dam and all their tributaries anabranches and effluents including Billabong Creek, Yanco Creek, Colombo Creek, and their tributaries, the Edward River and the Wakool River and their tributaries, anabranches and effluents, Frenchmans Creek, the Rufus River and Lake Victoria.	Yes Back Creek flows into Billabong Creek	Yes Within community distribution.	Yes AoS Completed.
Snowy River aquatic ecological community EEC FM	Rivers, creeks and streams of the Snowy River catchment. This includes Snowy, Eucumbene, Thredbo (or Crackenback), Gungarlin Mowamba, Bombala, McLaughlin, Delegate, Pinch and Jacobs Rivers and their tributaries.	No Not in Snowy River catchment.	No Outside community distribution.	No No suitable habitat in study area.

CE FM = listed as Critically Endangered under Schedule 4A of the NSW *Fisheries Management Act 1994*.

E FM = listed as Endangered under Schedule 4 of the NSW *Fisheries Management Act 1994*.

V FM = listed as Vulnerable under Schedule 5 of the NSW *Fisheries Management Act 1994*.

EP = listed as an Endangered Population under Schedule 4 of the NSW *Fisheries Management Act 1994*.

EEC = listed as an Endangered Ecological Community under Schedule 4 of the NSW *Fisheries Management Act 1994*.

M.2 FM ACT ASSESSMENT OF SIGNIFICANCE

The FM Act specifies a set of seven factors which must be considered by decision makers in assessing the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats. These factors are collectively referred to as the 'seven-part test' or AoS. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

Ecological Communities

Lowland Murray River aquatic ecological community.

- a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.**

The Lowland Murray River aquatic ecological community occurs within the study area, though Back Creek and Middle Creek (tributaries of Billabong Creek) are ephemeral and do not provide permanent habitat for any threatened aquatic flora or fauna species listed under the FM Act. None of the key management areas for these threatened species occur in the study area, and they were not recorded during the site visit. None of the key management areas for these threatened aquatic species occur in the study area. Therefore, it is considered unlikely that the proposal would have an adverse impact on the lifecycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

- b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction**

The Lowland Murray River aquatic ecological community occurs within the study area, though Back Creek and Middle Creek (tributaries of Billabong Creek) are ephemeral and do not provide permanent habitat for any threatened populations of aquatic flora or fauna species listed under the FM Act. None of the key management areas for listed threatened populations occur in the study area and none were recorded during the site visit. No key management areas for threatened aquatic populations occur in the study area. Therefore, it is considered unlikely that the proposal would have an adverse impact on the lifecycle of any viable threatened population of aquatic species, placing them at risk of extinction.

- c) in case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

- i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
 - ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinct**
- i. The Lowland Murray River aquatic ecological community occurs within the study area, though Back Creek and Middle Creek (tributaries of Billabong Creek) are Class 4 ephemeral creeks that run into Billabong Creek following high rainfall events. The proposal would not intrude within 10 m of Back Creek, protecting the integrity of the riparian zone and remnant PCT 5 – River Red Gum herbaceous – grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the Eastern Riverina Bioregion. Middle Creek has been previously cleared, grazed and cropped and is currently dominated by PCT 76 – Grey Box tall grassy woodland (derived grassland) on alluvial loam and clay soils in the NSW South Western Slopes and

Riverina Bioregions. The impacts on these vegetation communities have been extensively addressed in the BDAR (Appendix H). The proposal would not modify natural flows or the extent of the Lowland Murray River EEC such that it would be likely to put this EEC at risk of extinction.

- ii. Back Creek and Middle Creek are rarely inundated (unlikely fish habitat) and the proposal would not disrupt natural flows through landform modification. The proposal would not likely contribute to key threatening processes that would place the Lowland Murray River EEC at risk of extinction such as removing woody or rocky substrates, degrade riparian zones of flowing creeks or introduce pest species likely to impact aquatic food webs.

d) in relation to the habitat of a threatened species, population or ecological community:

- i. **the extent to which habitat is likely to be removed or modified as a result of the action proposed,**
 - ii. **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
 - iii. **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.**
- i. Back Creek and Middle Creek are rarely inundated (unlikely fish habitat) and the proposal would not disrupt natural flows through landform modification. Aquatic habitat would not be removed or significantly modified as a result of the proposal.
 - ii. The proposal does not include any landform modifications that would isolate or fragment aquatic habitat or alter the natural flows of either Back Creek or Middle Creek.
 - iii. The proposal would not remove, modify or fragment any aquatic habitat. Both Back Creek and Middle Creek would continue to function normally following high rainfall events. No key habitat for any threatened aquatic species or population was identified during background searches or site surveys.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

The development site does not include critical habitat for the any threatened aquatic species or populations. No direct or indirect adverse impacts on critical habitat belonging to the Lower Murray River aquatic ecological community are likely to be caused by the proposal.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The development site is not located within or near any aquatic habitat that is part of a recovery plan or threat abatement plan for the Lower Murray River aquatic ecological community. It is not anticipated that the proposal would either directly or indirectly impact any such plans.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Five (7) key threatening processes (KTP) are relevant to the proposed work including:

- Modification of natural river flows as a result of dams or cut and fill.

- Spawning failures and habitat loss resulting from cold water (or hot water) releases from dams.
- Predation, competition, diseases and habitat modification from introduced fish species.
- Degradation of the riparian (riverbank) zone through stock access and clearing native vegetation, leading to loss of shelter and increased sedimentation.
- Removal

The clearing of native vegetation is considered a major contributor to the loss of biodiversity. In the determination, the NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than 2 ha in extent, may have significant impacts on biological diversity'. It is not expected that roadside vegetation would be impacted as a result of the proposal. However, given that the development area has been previously disturbed and fragmented from clearing for agriculture and construction of Galong Road, the vegetation adjacent to the proposal area that provides important habitat connectivity for this locality would not be impacted, it is considered unlikely for there to be significant impacts on biodiversity.

The removal of dead wood and trees on the ground caused by human activity has been recognised as a factor contributing to loss of biological diversity. Dead wood and dead trees provide essential habitat for a wide variety of native animals and are important to ecosystem function. The proposed works would require the removal of mature trees and stags in the development footprint. As part of the mitigation measures, it has been recommended that coarse woody debris is to be retained and placed in adjacent areas instead of being taken off site where practicable. With the implementation of this measure, the proposal is unlikely to contribute to this KTP.

A number of exotic perennial grasses are already present at the development site including *Chloris gayana* (Rhodes Grass), *Chloris virgata* (Feathertop Rhodes Grass), *Eragrostis curvula* (African Lovegrass), *Phalaris* (*Phalaris sp.*), *Paspalum* (*Paspalum dilatatum*) and Cocksfoot (*Dactylis glomerate*). Perennial exotic grasses invade and may dominate native plant communities competing with, and displacing, many native species. Dense monocultures of perennial grasses that develop after invasion threaten local vegetation at all sites that are affected. This may result in local and regional declines of many native species and communities, possibly to the extent that they become endangered. The proposed works involves disturbance that can lead to the establishment of exotic perennial grasses. All of the examples listed above were recorded in the proposal area during the site survey, but Cane Needle Grass, Chilean Needle Grass and Serrated Tussock are also listed within the Hilltops (west) Local Land Services region. These species could therefore occur in the proposal area and potentially spread as a result of disturbance from the proposed works. As part of the mitigation measures, it has been recommended that construction machinery will be cleaned prior to entering and exiting work sites and regular targeted control of priority weeds would be undertaken to reduce the risk of weeds being introduced and spread. With the implementation of this measure, the proposal is unlikely to contribute to this KTP.

A large number of exotic vines and scramblers have become established in New South Wales. Exotic vines and scramblers have significant adverse effects on biodiversity. They typically smother native vegetation and seedlings as well as prevent recruitment, especially in riparian areas. The proposed works involves disturbance that can lead to the establishment of exotic vines and scramblers. During the site survey, no exotic vines or scramblers were identified within the study area. As part of the mitigation measures, it has been recommended that construction machinery will be cleaned prior to entering and exiting work sites, and regular targeted control of weeds would be undertaken to reduce the risk of exotic vines and scramblers being introduced. With the implementation of this measure, the proposal is unlikely to contribute to this KTP.

Tree hollows are cavities form in the trunk or branches of a living or dead tree. Hollows are usually more characteristic of older, mature to over mature trees. Larger, older trees provide a greater density of hollows per tree. As such, large old hollow-bearing trees are relatively more valuable to hollow-using fauna than younger hollow-bearing trees. Many vertebrates are known to select hollows with specific characteristics, indicating that suitable hollows represent a fraction of the total hollow resource. The proposed works would result in the removal of up to 58 HBTs. As part of the mitigation measures, it has been recommended that an ecologist will be onsite to undertake a pre-clearance survey and a clearing survey whilst the tree/s are being removed to reduce the risk of fauna being displaced or injured. With the implementation of this measure, the proposal is unlikely to contribute to this KTP.

Conclusion

The impacts of the proposal on the assessed threatened species and ecological community listed under the FM Act are considered to be manageable. A significant impact is considered unlikely based on the following conclusions:

1. The amount of habitat to be removed or disturbed by the proposal is relatively small in the local context.
2. No fragmentation or isolation of habitat would occur.
3. No substantial contribution to any key threatening process would be expected.