

Aquatic Survey

Shoalhaven Starches Bomaderry Plant Modification Works Shoalhaven River, Bomaderry, NSW

1. Introduction, project understanding and background

Lesryk Environmental Pty Ltd (Lesryk) is aware that Shoalhaven Starches Pty Ltd, a subsidiary of the Manildra Group, are proposing to undertake modification works to their factory site, this located off Bolong Road, Bomaderry, NSW. The factory site is present on the northern bank of the Shoalhaven River, the modification required to enhance and expand the facilities grain handling and storage capacity.

Broadly, components of the proposed factory modification works include the:

- establishment of a conveyor belt within 10 metres (m) of (north of) the Shoalhaven River, this being located in existing disturbed environments
- within the south-western portion of the site, works to extend the existing rock revetment wall, this potentially including the conducting of activities within the Shoalhaven River. To achieve this, the following will occur:
 - placement of armour rock underlayer material within the river bed
 - excavation and preparation of the riverbed to receive new revetment materials
- stabilisation of existing sections of eroded bank
- delivery and placement of materials via barges, cranes, or other plants that would be operating within the river
- temporary in-water construction zone establishment (e.g., buoys, silt curtains).

Lesryk is aware that the proposed factory modification is a declared State Significant Development (SSD).

Pre-lodgement consultation was undertaken with relevant stakeholders, this including DPIRD – Fisheries. On 11 June 2025 DPIRD – Fisheries provided a response, this, among other matters, noting:

- the Shoalhaven River is considered Type 1, Class 1 Key Fish Habitat (KFH)
- Seagrass (*Zostera* sp.), marine vegetation, has historically been mapped along the edge of the bank in front of the Bolong Road site
- a full assessment of the risk-weighted consequences for the proposal is required
- a careful evaluation of how the proposal avoids serious or irreversible damage to key fish habitats and fisheries resources is needed
- an assessment as to how the proposal meets the Policy and objects of the NSW *Fisheries Management Act 1994* (FM Act) is required.





Figure 1. Project locality

As components of the factory modification works listed above have the potential to impact the aquatic ecology present within, or in proximity to, the area investigated, Lesryk was engaged by Allen Price Pty Ltd, on behalf of Shoalhaven Starches Pty Ltd, to prepare this aquatic report. The purpose of this report is to provide an assessment of the aquatic habitats present within the stretch of the Shoalhaven River that is subject to the above works, and to consider the potential for the works on have an adverse impact on these.

To inform this assessment, Lesryk conducted both a desktop assessment and a field investigation of both the subject site and adjacent areas. The desktop assessment included a review of current literature, relevant government databases and mapping.

As indicated in the correspondence received from DPIRD-Fisheries at the pre-lodgement stage, and with reference to the Fisheries NSW Spatial Data Portal (DPIRD 2025a), this stretch of the Shoalhaven River is mapped as Key Fish Habitat (KFH) (Figure 1). The section of the Shoalhaven River at the subject site is a Strahler 7th order tidal waterway, classified as Class 1 – Major (KFH) per the classification scheme presented in Table 2 of the *Policy and guidelines for fish habitat conservation and management – Update 2013* (DPI 2013).

Major KFH is defined in the Guidelines as “Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected fish species or ‘critical habitat.’”

Within waterways mapped as KFH, aquatic habitats are further categorised into three types (NSW DPI 2013):

- Type 1 – Highly sensitive key fish habitat
- Type 2 – Moderately sensitive key fish habitat
- Type 3 – Minimally sensitive key fish habitat.

The Fisheries NSW Spatial Data Portal (DPIRD 2025b), along with estuarine macrophyte mapping available on the Central Resource for the Sharing and Enabling of Environmental Data in NSW (SEED) portal (State of NSW & NSW DCCEE 2010), identifies areas of estuarine macrophytes, such as *Zostera* seagrasses, as being previously mapped in proximity to the subject site (Figure 2).

Section 205 (2) of the FM Act states:

‘A person must not harm any such marine vegetation (being mangroves, seagrasses or any other marine vegetation declared by the regulations to be marine vegetation to which this section applies), in a protected area, except under the authority of a permit issued by the Minister under this Part. Section 205 (3) of the FM Act lists a number of species that constitute mangroves and seagrass, these including *Aegiceras corniculatum* (River Mangrove), *Avicennia marina* (Grey Mangrove), *Heterozostera nigricalulis* (Eel Grass), *Posidonia australis* (Strap Weed), *Zostera capricorni* (Eel Grass), *Zostera muelleri subsp. capricorni* (Eel Grass) and *Zostera muelleri subsp. muelleri* (Eel Grass).

As the SEED portal indicated the presence of *Zostera* seagrasses near the existing factory site, and as works are proposed in the Shoalhaven River, to confirm and, if necessary, assess/consider the impact of the works on marine vegetation, a field survey was conducted.

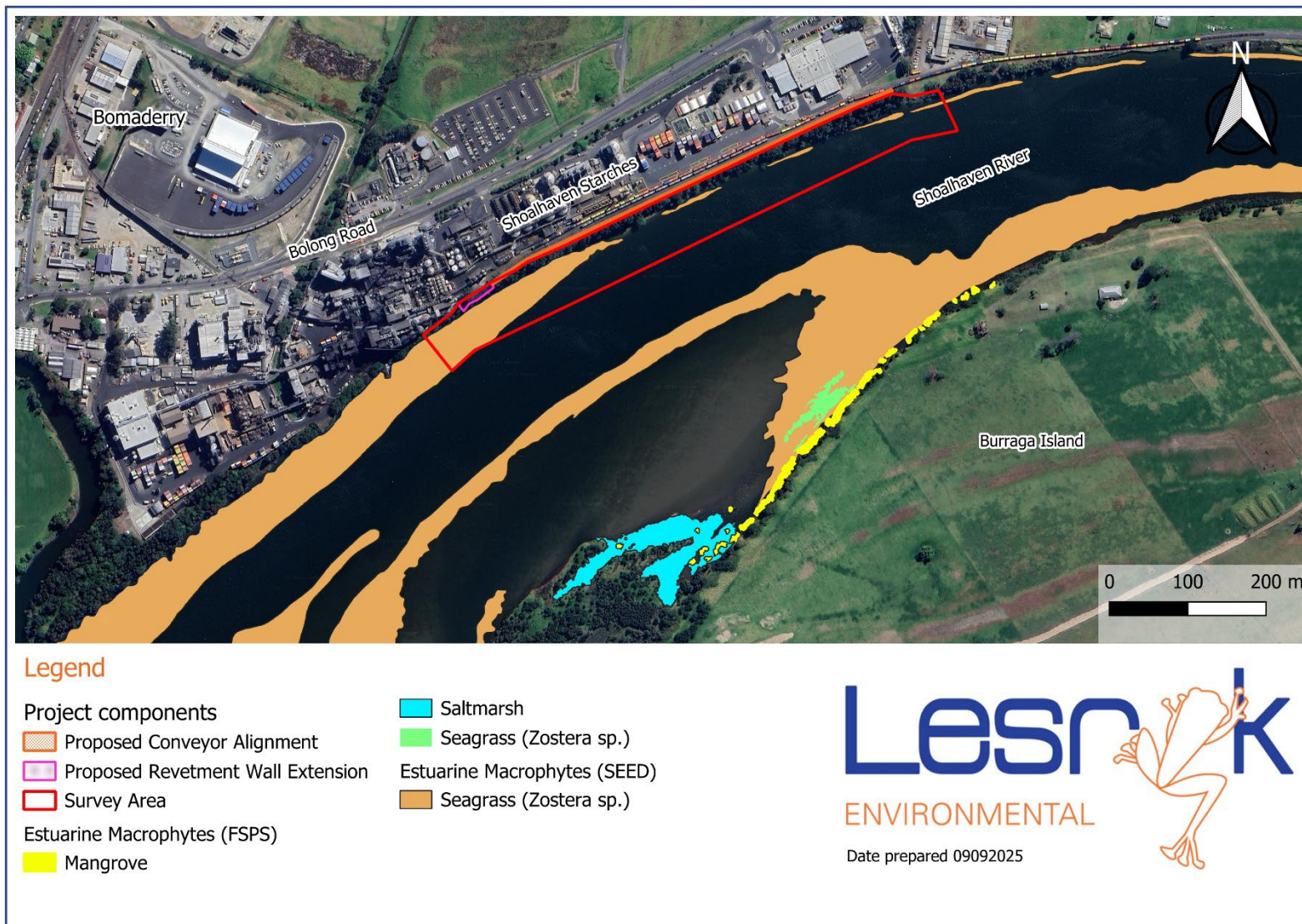


Figure 2. Previously mapped estuarine macrophytes

For the purpose of this assessment, unless a specific aspect is discussed, the areas that would be disturbed by the works will hereafter be referred to as the subject site, whilst the area directly affected by the proposal (subject land or construction footprint), and any additional areas likely to be affected by the works, either directly or indirectly, will be referred to as the study area.

For ease of reference, the works that will be conducted within or close to the Shoalhaven River will be referred to as the 'proposal' or 'proposed activity'.

Lesryk notes that, to achieve the objectives of the proposed activity, the works may include use of a barge. Use of this would need to ensure that there is sufficient water depth to operate the barge effectively without affecting the passage or presence of fish.

In addition, the movement of this craft should not interact with the bed of the Shoalhaven River thereby disturbing the aquatic environments present. The barge should not be located in one position for the entirety of the project (thereby overshadowing aquatic environments). Securing of the barge (e.g. use of anchors) should not interfere with the mangroves recorded.

2. Field investigation and methods

A field investigation of the subject site and surrounding areas was conducted by Harry Engel¹ (B.Mar.Sc), Lara Van Rooyen (B.Env), and Oliver Wallace (B.Env.Bio) on 6 September 2025 between 1030 and 1530 hours.

For reference, the weather conditions experienced at the time of the assessment were mild temperatures (17.6°C), clear skies (0% cloud cover), and light breeze (15 kmh⁻¹ NNE). Aquatic conditions experienced at the time of the field survey were moderate-low temperatures (14.4°C) and low visibility (≈1 m), and inspection being conducted across the low-mid tide periods (0.64-1.37 m).

The purpose of the field investigation was to identify to composition of the benthic and riparian environments, and those aquatic and terrestrial plants, habitats and species (particularly vertebrates) present near, and in close proximity to, the subject site, particularly any that are of State and/or national conservation significance as listed under the Schedules to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and FM Act.

A 6.1 m long Mclay hardtop boat with 80 horsepower outboard motor was used to accessed and traversed the site.

To achieve the objectives of the aquatic investigation, several survey methods were employed, these described below.

2.1 Tow-camera running transects

The benthic environment within the study area was surveyed through use of a SeavuTM explorer live stream housing and a GoProTM. The tow-camera was deployed in the water column and towed behind the boat. A live video feed was established from the tow-camera to

¹ Diving Qualifications: Harry Engel – Perform restricted diving for scientific purposes: CR100453, Lara van Rooyen – PADI open water: 2504A10631, Oliver Wallace – SSI Open Water: 731013V4604201741952-AU

the camera operator aboard the boat. Starting at one end of the study area, transects were run by the boat parallel to the shoreline at a constant rate of 4 knots. Three transects were run, these established at approximately 5, 20 and 30 m from the shoreline (Figure 3). As the transects were run, the camera operator monitored the live video feed from the tow-camera and adjusted the camera's positioning such that a constant height of about 0.5 m above the riverbed, and a viewing angle of 45° below the horizontal, was maintained. As the transects were run, the live video feed was monitored and notes were made on the characteristics of the benthic environment, including substrate composition, presence of aquatic macrophytes, presence of aquatic fauna, and habitat features such as boulders and large snags.

The GPS (Global Positioning System) coordinates of any of these features were recorded.

2.2 Baited Remote Underwater Video (BRUV)

A BRUV was used to survey the fish species assemblage present within the study area. The BRUV device consists of a weighted frame to which a GoPro Hero 10 Black™ and bait container (plastic mesh basket that was about 10 centimetres [cm] by 10 cm in size) are affixed, such that the bait container is within the camera's field of view, at a distance of 0.5 m. The camera was set to record video, prior to the BRUV device being lowered to the river bed.

A total of four BRUV deployments were conducted, each for a period of 20 minutes. Once the device was deployed, the boat evacuated the area around the device for the period of the deployment so as to minimise disturbance of any aquatic fauna around the device. The BRUV surveys were conducted after the tow-camera transects, so that the deployment locations could be selected to achieve a representative sample of the different benthic habitat types identified by the transects.

For reference, the BRUV deployment locations are presented in Figure 3.

The bait used with the BRUV device were fillets of mackerel.

2.3 SCUBA-assisted dive

Detailed inspections of the benthic environment that is present in the area within, and adjacent to, both the existing rock revetment wall and the footprint of the proposed rock revetment wall extension was conducted through a SCUBA assisted dive, this undertaken by two suitably qualified ecologists. The dive was initiated from the support vessel, and the divers traversed the water's surface toward the survey area before descending the water column. The divers traversed the riverbed around the existing rock revetment wall and made observations of the benthic environment and any aquatic fauna present. Slates were used to record any observations made during the dive. The path followed by the divers is presented in Figure 3. A maximum depth of about 8.3 m was achieved.

All appropriate safety precautions and maritime requirements were followed throughout the duration of the SCUBA-assisted dive, including, but not limited to: a pre-dive safety briefing, display of the International Code Flag Alpha ('diver below' flag) from the support vessel, emergency standby oxygen supply, and conformation to decompression regimes. One Ecologist, with suitable qualifications, remained aboard the support vessel to supervise the divers for the duration of the dive.

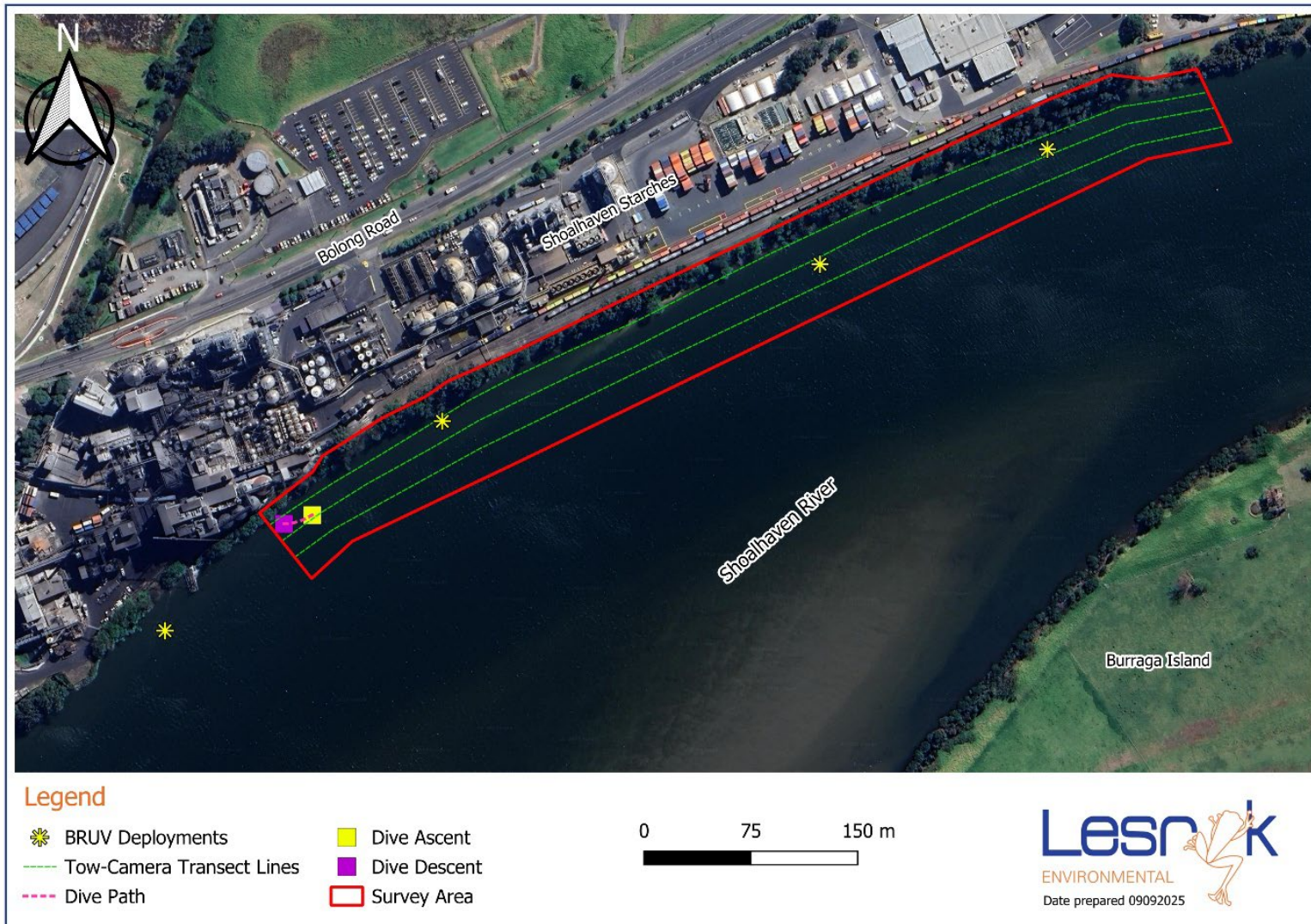


Figure 3. Surveys conducted during field investigation

2.4 Surface observations

Throughout the duration of the field investigation, continuous observations were made of the environment within, and surrounding, the study area from the water's surface. Binoculars were used to identify avifauna present in the area. GPS was used to record the location of any species of State and/or national conservation significance that were identified.

A slow sweep was made alongside the northern bank of the river, and notes made on the bank condition and composition of the riparian vegetation. The GPS coordinates of any notable features, including areas of mangrove and significant bank erosion, were recorded.

3. Limitations

The region surrounding the study area experienced 74.8 mm cumulative rainfall in the fortnight prior to the field investigation (BOM 2025). This, within the area surveyed, resulted in elevated turbidity (visibility $\approx$ 1 - 2 m) and reduced salinity in the water column.

The aquatic conditions present at the time of the field investigation constrained several elements of the survey methods employed.

Whilst the bait container placed in front of the BRUV, and therefore any fish interacting with it, were clearly visible to the camera, the reduced visibility affected the ability to identify any fish that may have been attracted to the bait, but did not come within 1.5 m of the camera lense.

Divers commenced inspection of the benthic environment around the footprint of the proposed rock revetment wall extension, including a traverse along the base of the existing rock wall; therefore, effectively surveying the seafloor for approximately 2 m from the existing wall, during which no seagrass or other aquatic habitats were found. However, further dives in deeper water were terminated due to safety risks associated with reduced visibility and, the ability to survey these areas using other methodology (such as the tow camera).

For the tow-camera transects, the camera operator was able to maintain the camera at a consistent height of approximately 0.5-0.75 m above the riverbed, which allowed clear imagery of substrate composition, aquatic macrophytes, and habitat features such as boulders and large snags. This component of the investigation was not affected by the reduced visibility.

It is noted that increased turbidity and reduced salinity in estuarine and riverine systems following periods of heavy rainfall is known to influence the behaviour and distribution of fish species. Under highly turbid conditions, many species may exhibit reduced activity or relocate upstream or downstream in response to altered salinity gradients (Cyrus & Blaber 1992). These responses can temporarily affect local assemblage composition and reduce detectability of fish species by the survey methods employed.

Despite the influence of the constraints experienced at the time of the survey, the combination of the tow-camera data, SCUBA observations, and supporting contextual information, provided sufficient detail to characterise the benthic environment and assess the presence or absence of fish habitats within, and proximate to, the subject site. Accordingly, the findings of the field investigation are considered robust and sufficiently adequate to meet the objectives of this assessment.

Not all animals can be fully accounted for within any given study area. The presence of species is not static; it changes over time, often in response to longer term natural forces that can, at any time, be dramatically influenced by climatic factors or human-made disturbances.

4. Results

4.1 Aquatic habitats present

The field investigation confirmed that the aquatic environment present was variable across the study area. Tow-camera transects revealed the presence of sand flats, sand with scattered cobbles and pebbles, and areas of fine silt sediments. In addition, accumulations of large woody debris (snags) and isolated boulders were observed across sections of the riverbed, providing areas of structural complexity.

Four small patches of mangrove habitat were present along the riverbank. Each patch consisted of a single Grey Mangrove (*Avicennia marina* subsp. *australasica*) tree, with associated pneumatophore fields ranging in area from about 1.7 - 7 m², totalling approximately 23 m². The mangroves were positioned in the intertidal zone on the riverbank and their approximate locations are noted in Figure 4.

No seagrass beds were detected within the study area. Neither the tow-camera transects, nor the SCUBA-assisted dive identified the presence of *Zostera*, *Posidonia*, or any other seagrass taxa. Similarly, no extensive beds of other submerge aquatic macrophytes were observed. During the survey, no floating remnants of seagrass were noted and none were noted washed up on the shore near the proposal area.

It is noted that the spatial accuracy of the mapped features presented in Figure 4 is limited. This map is provided to illustrate the general location and relative extent of habitats observed, rather than to serve as precise habitat distribution data.



Figure 4. Habitat composition identified during field investigation

4.2 Species recorded

The fish recorded during the investigation, along with their detection method(s), are listed in Table 1.

In October 2024, Lesryk conducted a survey of the fish assemblages present in another proximate stretch of the Shoalhaven River, this present about 150 m upstream of the proposed activity (authors field notes). The fish recorded during that previous surveys are also presented in Table 1.

Table 1 – Fish species recorded

Key:

A – Species recorded during the current survey

B – Species recorded during the October 2024 Survey

Common Name	Scientific Name	Detection Method	A	B
Yellowfin Bream	<i>Acanthopagrus australis</i>	Observed from boat, recorded on tow camera, observed on BRUV	x	x
Mullet	<i>Mugil cephalus</i>	Observed from boat, recorded on tow camera, observed on BRUV	x	x
Silver-biddy	<i>Gerres oyena</i>	Observed from boat		x
Smooth Toadfish	<i>Tetractenos glaber</i>	Observed from boat, recorded on tow camera, observed on BRUV	x	x
Unknown fingerling	N/A	Observed from boat, recorded on tow camera, observed on BRUV	x	x

None of the fish recorded during the current or previous survey are listed under either the EPBC or FM Acts.

No State or Federally listed threatened fish are known from the reach of the Shoalhaven River in which the proposed activity will occur.

Reference to the Federal Government's Protected Matters Search Tool notes that the Black Rockcod (*Epinephelus daemeli*), Macquarie Perch (*Macquaria australasica*) and Australian Grayling (*Prototroctes maraena*), these listed as Vulnerable, Endangered and Vulnerable under the EPBC Act respectively, are identified as 'species or species habitat may occur within area' (Cth DCCEEW 2025).

Considering the profiles provided on these fish it is noted that:

- The Black Rockcod is '*a territorial species that inhabits caves, gutters and crevices. They are usually found in depths up to 50 m, although individuals have been collected from below 100 m. Juveniles are found inshore, often in coastal rockpools and estuaries. In NSW, it occurs along the coast*' [DPIRD 2025c].
- Macquarie Perch is a freshwater species, occupying habitats '*with lots of cover such as aquatic vegetation, snags, boulders and overhanging banks*'. [DPIRD 2025c].
- The Australian Grayling is primarily a freshwater species (larvae do migrate out to sea for the first 4 to 6 months [DPIRD 2025c]) and as such would not be present as a resident species.

The necessary habitat requirements of these fish are not present within, or near, the proposed activity. As such, none would be present within or close to, and therefore adversely affected by, the proposed activity.

Pipefish, pipehorse, seadragons, seahorse and ghostpipefish are listed as protected fish. Within the area investigated, no habitats suitable for these species were noted

Twenty-four native, and two introduced, bird species were observed during the field investigation; two of which, the White-bellied Sea-eagle (*Haliaeetus leucogaster*) and the Eastern Osprey (*Pandion cristatus*) are listed as Vulnerable under the Schedules to the NSW *Biodiversity Conservation Act 2016* (BC Act). The locations of where these threatened species were observed are presented in Figure 5. A complete list of the terrestrial and avian species observed during the field investigation is presented in Appendix B.

Within the proposed activity area, no roosting or breeding habitat for the White-bellied Sea-eagle or Eastern Osprey is present. During the survey, no large stick nests, such as those regularly/repeatedly used by these raptors were noted, and no white-wash accumulations seen. Both of these fish-eating birds may forage over, and within, the Shoalhaven River, though it is not considered that the proposed activity would have a significant effect on these species or their habitats. The works will not present a barrier to the movement, foraging or interbreeding requirements of either of these species, nor will it fragment or isolate areas of their habitat. As neither would be significantly affected, further considerations that draw on the criteria provided under section 7.3 of the BC Act are not required.

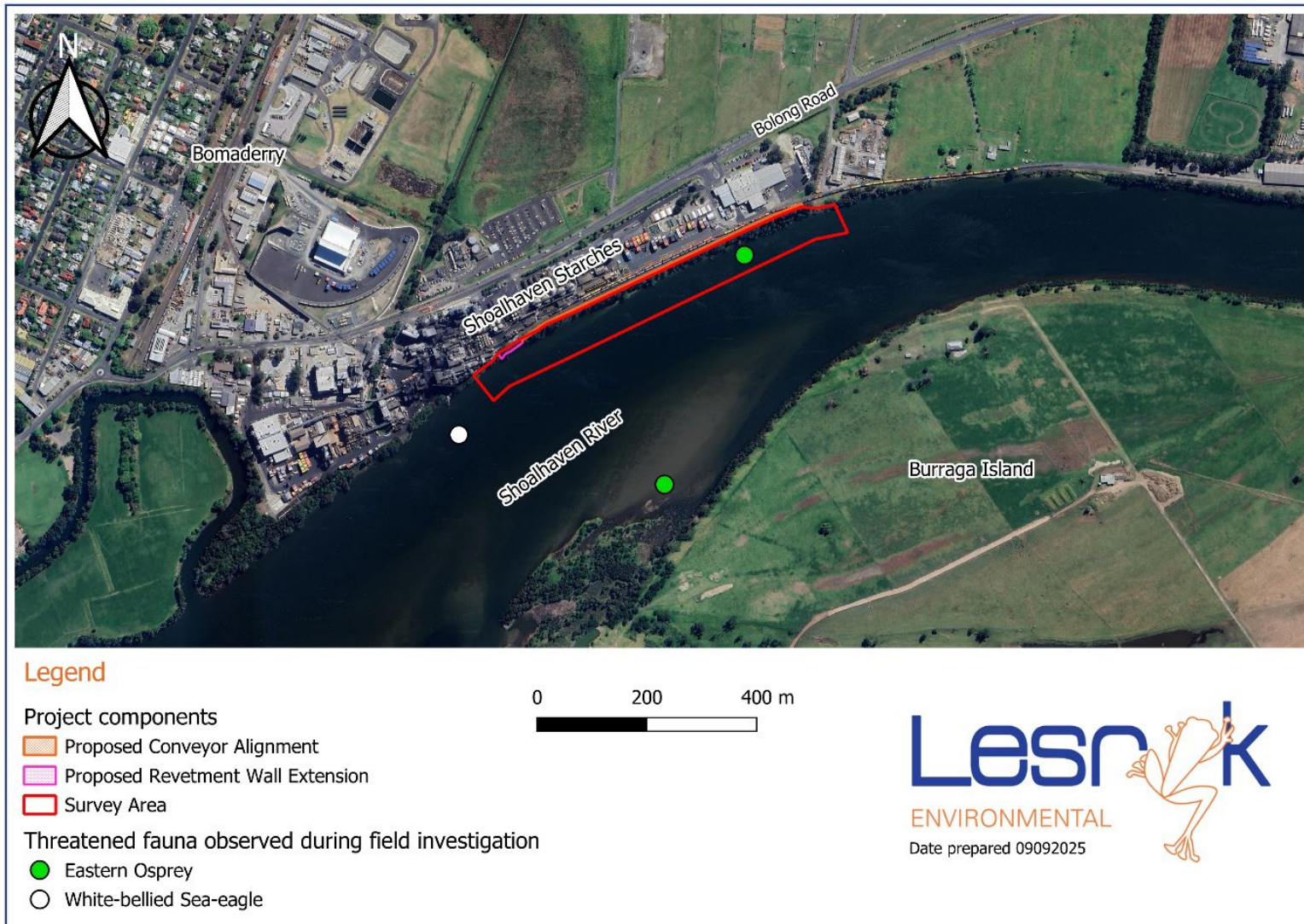


Figure 5. Threatened fauna species observed during field investigation

4.3 Determination of Key Fish Habitat Type

The Shoalhaven River is mapped as KFH.

The aquatic habitats recorded during the field investigation were assessed against the habitat categories set out in the *Policy and Guidelines for Fish Habitat Conservation and Management – Update 2013* (DPI 2013). This assessment considered both the character and extent of each habitat component within the study area and the criteria used to define KFH Types. Table 2 summarises the results of this assessment.

Table 2 – Habitat components and KFH Type determination for the study area

Habitat Component (per <i>Policy and Guidelines for Fish Habitat Conservation and Management – update 2013</i>)	Character and Extent within Study Area	KFH Type within Study Area
<i>Posidonia</i> seagrasses	Not detected during tow-camera transects or SCUBA-assisted dive.	Absent
<i>Zostera</i> , <i>Heterozostera</i> , <i>Halophila</i> and <i>Ruppia</i> seagrasses	Not detected during tow-camera transects or SCUBA-assisted dive.	Absent
Coastal wetlands (saltmarsh, freshwater wetlands, floodplain wetlands)	Not present within, or adjacent to, the study area.	Absent
Critical rocky reef (spawning/nursery areas)	No areas identified as critical rocky reef; only small patches of submerged boulders present.	Absent
Critical gravel beds (spawning/nursery areas)	Not detected; substrates dominated by sand and silt with scattered cobbles/pebbles ($\approx 30\%$ cover).	Absent
Freshwater habitats with in-stream gravel beds	Site is estuarine (tidal influence present); not applicable.	N/A
Freshwater habitats with rocks >500 mm (two dimensions)	Site is estuarine; not applicable.	N/A
Freshwater habitats with snags >300 mm diameter or >3 m length	Site is estuarine; not applicable.	N/A
Freshwater habitats with native aquatic plants	Site is estuarine; not applicable.	N/A
Coastal lagoons, lakes and estuaries (mapped as sensitive fish habitat)	Site is within the tidal Shoalhaven River; not mapped as sensitive estuarine habitat.	Absent
Aquatic reserves, marine parks, critical habitat listings	None present within, or adjacent to, the study area.	Absent
Mangroves	Four small patches of <i>Avicennia marina</i> ($\approx 23 \text{ m}^2$ total intertidal area) along northern riverbank.	Type 2
Rocky reef (non-critical)	Small submerged patch of boulders ($\approx 200 \text{ mm}$ diameter); larger boulders form existing revetment wall (>300 mm diameter, artificial).	Type 2

Habitat Component (per <i>Policy and Guidelines for Fish Habitat Conservation and Management – update 2013</i>)	Character and Extent within Study Area	KFH Type within Study Area
Gravel beds (non-critical)	Sand-dominated substrate with scattered pebbles and cobbles (10-100 mm, ≈ 30% cover).	Type 2
Sandy substrates	Widespread across study area.	Type 2
Mudflats / silt substrates	Present in patches within study area.	Type 2
Snags / woody debris (non-critical)	One large accumulation of woody debris; several large logs >300 mm diameter or >3 m length. Scattered small woody debris along northern bank.	Type 2
Artificial structures providing habitat (e.g., jetties, pilings, revetments, breakwalls)	Existing rock revetment wall along the riverbank comprised of large boulders.	Type 2
Riparian vegetation influencing aquatic habitat values	Northern bank supports scattered Grey Mangroves and riparian vegetation; bank erosion observed in places.	Type 2

As shown in Table 2, no seagrass, saltmarsh, freshwater wetlands, or mapped sensitive estuarine habitats were present within the study area. These features are primary triggers for Type 1 KFH under the Guidelines. The site is estuarine (tidally influenced Shoalhaven River) and, therefore, the freshwater-specific Type 1 categories (e.g. in-stream gravel beds, large rocks, snags, native aquatic plants) are not applicable.

Observed habitats – including mangroves, sand with scattered cobbles/pebbles, silt patches, accumulations of woody debris, and rocky material associated with the existing revetment wall – are all recognised under the Guidelines as Type 2 KFH. While these habitats are important for providing structural complexity, refuge, and foraging areas, they do not meet the criteria for critical habitats essential to the survival and productivity of fish stocks.

On this basis, the aquatic habitats within the works footprint and surrounding survey area are determined to constitute Type 2 KFH.

5. Discussion

With regards to Section 5.5(1) of the *Environmental Planning and Assessment Act 1979* an investigation of a section of the Shoalhaven River that may be directly or indirectly affected by the expansion of the Shoalhaven Starches Pty Ltd facility that is present at Bolong Road, Bomaderry, has been undertaken. The investigation has been conducted to ‘*examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity*’.

To address this matter, site investigations that included surveys of the aquatic environments present within, and close to, the predicted areas of disturbance were undertaken, these combines with a review of publicly available data bases and literature sources.

The survey methods employed to determine the aquatic environments and those species present was compliant with descriptions provided in the existing scientific literature.

Part 7, Section 205(1) Marine vegetation—regulation of harm of the FM Act, applies to—

- (a) *mangroves, or*
- (b) *seagrasses, or*
- (c) *any other marine vegetation declared by the regulations to be marine vegetation to which this section applies, but does not apply to protected marine vegetation under section 204A*

Clarification of “(c) any other marine vegetation,” in reference to the Fisheries Management (General) Regulation 2019 s.228(1), states, *The following are declared to be marine vegetation to which section 205 of the Act applies—*

- (a) *attached marine and estuarine macroalgae²,*
- (b) *saltmarsh in a protected area.*

Within the area investigated, 4 mangroves were recorded and no seagrasses or areas of saltmarsh were observed. No habitats important to native fish were noted during the course of the underwater investigations.

The FM Act sets out provisions to protect marine vegetation (mangroves, seagrass and seaweeds whether alive or dead) from ‘harm.’ ‘Harm’ under the FM Act means *gather, cut, pull up, destroy, poison, dig up, remove, injure, prevent light from reaching or otherwise harm the marine vegetation, or any part of it.*

The aquatic habitats within the works footprint and surrounding survey area were determined to constitute Type 2 – Moderately sensitive KFH.

The proposed activity will not affect the passage of fish or the habitats of any threatened species listed under the FM Act.

Based on a worst-case scenario, if the retention of the mangroves is not possible, a Part 7 s.205 of the FM Act permit to harm marine vegetation would normally be required where protected marine vegetation is present and harm cannot be avoided.

A component of the proposed activity involves the extension of the existing rock revetment wall, this present within water land. It is considered that this conforms to the definitions of ‘Dredging and reclamation’ as provided under s.201 of the FM Act.

Section 219 of the FM Act relates to the passage of fish not being blocked. In accordance with s.219(c) of the FM Act. The proposed activity, including the use of the barge, is to ensure that no obstructions to the movement of fish are created.

The proposed activity is deemed SSD. With regards to the above three matters, it is noted that, pursuant to the provisions of s.4.41 of the *NSW Environmental Planning and*

² s.288(3) of the Fisheries Management (General) Regulation 2019 identifies marine and estuarine macroalgae to mean *those species of non-microscopic plants commonly known as seaweeds that belong to the plant classification divisions of Rhodophyta, Phaeophyta and Chlorophyta that are endemic to New South Wales marine and estuarine waters.*

Assessment Act 1979, the following authorisations are not required for SSD that is authorised by a development consent granted:

- (b) a permit under section 201, 205 or 219 of the FM Act.

6. Conclusions

The field investigation and desktop review undertaken for this assessment have provided a clear characterisation of the estuarine habitats present within, and adjacent to, the proposed activity. Field investigations confirmed the presence of sandy and silty substrates, scattered cobbles and pebbles, accumulations of woody debris, isolated boulders, small patches of *Avicennia marina* (Grey Mangrove), and the existing rock revetment wall. No seagrass beds, saltmarsh, or other mapped sensitive estuarine habitats were detected.

Comparison with government spatial datasets revealed a discrepancy between previously mapped estuarine macrophytes and observations made in the field investigation. While Fisheries NSW and SEED portal mapping indicated the historical presence of seagrasses (e.g., *Zostera* spp.) near the subject site, these features were not detected during tow-camera transects or SCUBA inspections. This indicates that available mapping in the locality is outdated or inaccurate, and that seagrass meadows are no longer present near the proposed activity.

The works to extend the existing revetment wall are not considered to have a serious and irreversible impact to key fish habitats or fisheries resources as these were not observed to be present in the areas investigated.

While the Shoalhaven River is classified more broadly as Class 1 – Major key fish habitat under the *Policy and guidelines for fish habitat conservation and management – Update 2013*, assessment of the observed habitats against the criteria set out in the Guidelines determined that all aquatic habitats within the study area conform to Type 2 KFH. These habitats provide foraging opportunities, shelter, and structural complexity for fish and other aquatic biota, but do not meet the criteria for Type 1 KFH, which include critical habitats such as seagrass meadows, saltmarsh, and recognised spawning or nurse grounds. This means that the works footprint, and adjacent areas potentially subject to indirect impact, contain estuarine habitats of moderate ecological importance and that potential impacts can be managed effectively through the application of appropriate mitigation and management measures during construction. To ensure that residual impacts are minimised and ecological values maintained, a suite of recommended bio-engineered solutions and habitat management measures are outlined in section 7 of this report.

The objects of the FM Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. In particular, the objects of this Act include:

- (a) to conserve fish stocks and key fish habitats, and
- (b) to conserve threatened species, populations and ecological communities of fish and marine vegetation, and
- (c) to promote ecologically sustainable development, including the conservation of biological diversity,

and, consistently with those objects:

- (d) to promote viable commercial fishing and aquaculture industries, and
- (e) to promote quality recreational fishing opportunities, and
- (f) to appropriately share fisheries resources between the users of those resources, and
- (g) to provide social and economic benefits for the wider community of New South Wales, and
- (h) to recognise the spiritual, social and customary significance to Aboriginal persons of fisheries resources and to protect, and promote the continuation of, Aboriginal cultural fishing.

Based on the outcomes of the field survey, it is not considered that the works within the section of the Shoalhaven River that are to be impacted by the proposed activity will be inconsistent with the objectives of the FM Act. The works will not affect fish stocks, key fish habitats, threatened species or marine vegetation.

The proposed activity is a deemed SSD. Approval under 201, 205 or 219 of the FM Act are not required for SSD.

7. Recommendations

The following recommendations are presented to ensure that the works are undertaken in an ecologically sustainable manner:

- Applicable erosion and sediment controls are to be implemented during the course of the works. These should be monitored and maintained throughout the course of the project.
 - Erosion and sedimentation control devices employed in the Shoalhaven River such as floating booms, should not prevent the passage of fish species.
- Erosion and sediment controls are not to be removed until all exposed surfaces are stabilised. These structures should be monitored, particularly after periods of heavy rainfall.
- To prevent runoff directly entering the Shoalhaven River, permanent diversion channels should be included within the construction plans. This will assist in diverting any site or stormwater runoff into the existing stormwater management system.
- Areas where bank erosion was observed near the proposed activity should be remediated and stabilised. In stabilising these areas, consultation with an ecological or bush regeneration firm should be entered into to ensure outcomes that benefit the localities terrestrial and aquatic flora and fauna communities are achieved.
- To ensure they are not indirectly affected, and to retain/permit the development of a riparian corridor, all recorded mangroves within 10 m of the proposed works should be flagged on site prior to works. These are to be retained and where applicable (on land) a 5 m wide buffer exclusion fence installed around them.
 - The positions of the mangroves should be clearly located on site through the erection of temporary bunting or similar to prevent any indirect impacts on these plants arising during the course of the works. This should be done in consultation with a botanist or similar qualified person.
- In consultation with a suitably qualified bush regeneration firm, particularly one familiar with estuarine environments, replanting of the area in front, and atop of, the toe of the existing and extended revetment wall, or within this structure through appropriate design, with mangroves and other native plants should occur.
- In consultation with a suitably qualified commercial company, stabilisation of existing eroded areas within proximity of the works must be conducted before commencement. This will prevent sediment laden runoff from entering into the Shoalhaven River.
- All vehicle movements on site, where possible, should be restricted to the north of the works. This ensuring there are no vehicles traversing on the riverbank, increasing possible erosion.

- Spot checks on machinery/equipment used will be conducted daily before works commence to reduce the risk of water contamination (i.e., associated with fuel or oil leaks).
- If a spill occurs, both Shoalhaven Starches Pty Ltd environmental advisor (or similar officer) and the NSW EPA will be notified immediately.
- DPIRD Fisheries (1800 043 536) must be immediately notified of any fish kills in the vicinity of the proposed activity. In such cases, all activities other than emergency response procedures are to cease until the issue is rectified and written approval to proceed is provided by DPIRD Fisheries.
- Spill kits must be maintained on-site at all times. The type and nature of the kit must be commensurate to the type and quantity of any hazardous material used on-site.
- If machinery/equipment requires re-fuelling, this would occur within a bunded area at a minimum 50 m from the Shoalhaven River.
- If stored on the barge, materials (e.g. oils, chemicals) will be stored in an appropriate cabinet or container with impervious flooring and sufficient capacity to contain 110% of the largest container protected in a bunded area to prevent leaks or spills entering the water. These containers will only be removed for a specific activity and then returned.
- The barge will be refuelled off-site.
- To prevent seabed disturbance, all barge mobilisation and movement will be done during favourable tide, wind and low wave/wash conditions, with the pushing vessel operated to minimise sediment disturbance and prevent strike or disturbance to seabed aquatic habitats.
- Use of the barge should not:
 - interact with the bed of the Shoalhaven River
 - be located in one position for the entirety of the project (thereby overshadowing aquatic environments)
 - interfere with the four mangroves recorded
 - prevent the passage of fish.

8. Bibliography

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Appendix A - Photographic record



Character of the existing rock revetment.

Photograph taken facing north east.



Character of vegetation present along the river bank

Grey mangrove present in centre of image

Photograph taken facing north.



Character of areas along river bank that have existing amounts of heavy erosion



Character of historic bank
stabilisation present along the river
bank adjacent to the works area

Appendix B – Terrestrial fauna species recorded during the field investigation

Key

V – species is Vulnerable under the EPBC/BC Acts

M – species is Migratory under the EPBC Act

Ma – species is Marine under the EPBC Act

* – introduced species

EPBC Act	BC Act	Common Name	Family & Scientific Name	Detection Method
		Birds		
			Anatidae	
		Pacific Black Duck	<i>Anas superciliosa</i>	Observed
			Columbidae	
		*Rock Dove	<i>Columba livia</i>	Observed
			Phalacrocoracidae	
		Pied Cormorant	<i>Phalacrocorax varius</i>	Observed
		Little Pied Cormorant	<i>Microcarbo melanoleucos</i>	Observed
		Great Cormorant	<i>Phalacrocorax carbo</i>	Observed
		Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	Observed
			Pelecanidae	
Ma		Australian Pelican	<i>Pelecanus conspicillatus</i>	Observed
			Ardeidae	
Ma		Great Egret	<i>Ardea alba</i>	Observed
		Striated Heron	<i>Butorides striata</i>	Observed
			Threskiornidae	
Ma		Australian White Ibis	<i>Threskiornis molucca</i>	Observed
			Accipitridae	
M, Ma	V	Eastern Osprey	<i>Pandion cristatus</i>	Observed
Ma		Whistling Kite	<i>Haliastur sphenurus</i>	Observed
Ma	V	White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>	Observed
			Charadriidae	
		Masked Lapwing	<i>Vanellus miles</i>	Observed
			Laridae	
Ma		Silver Gull	<i>Chroicocephalus novaehollandiae</i>	Observed
M, Ma		Caspian Tern	<i>Hydroprogne caspia</i>	Observed
			Cacatuidae	
		Galah	<i>Eolophus roseicapillus</i>	Observed
			Maluridae	
		Superb Fairy-wren	<i>Malurus cyaneus</i>	Observed
			Meliphagidae	
		Noisy Miner	<i>Manorina melanocephala</i>	Observed
		Lewin's Honeyeater	<i>Meliphaga lewinii</i>	Heard Calling
			Pachycephalidae	
		Golden Whistler	<i>Pachycephala inornata</i>	Heard Calling
			Artamidae	
		Australian Magpie	<i>Gymnorhina tibicen</i>	Observed

EPBC Act	BC Act	Common Name	Family & Scientific Name	Detection Method
			Rhipiduridae	
		Willie Wagtail	<i>Rhipidura leucophrys</i>	Observed
			Monarchidae	
		Magpie-lark	<i>Grallina cyanoleuca</i>	Heard Calling
			Hirundinidae	
		Welcome Swallow	<i>Hirundo neoxena</i>	Observed
			Passeridae	
		*House Sparrow	<i>Passer domesticus</i>	Observed