SIRSI Marina Upgrade

Aquatic Ecology and Marine Sediment Assessment

4 July 2024

Prepared on behalf of Essex Develop

Ocean Environmental
2024

Executive Summary

Ocean Environmental was engaged by Essex Development to undertake an aquatic ecology and sediment contamination assessment to support a Development Application (DA) for the proposed demolition and redevelopment of SIRSI Marina, 122-128 Crescent Road, Newport, New South Wales (NSW). The marina redevelopment is proposed to be fully within the current lease area and remain within its on-water footprint.

The proposed marina redevelopment will differ from the existing facilities as follows:

- Removal of the existing slipway facilities and other onshore commercial marina activities.
- Reduction of the number of berths from 36 to 9, to cater for vessels up to a maximum length of 22 m (which is the same as the current maximum vessel berth length accommodated at the marina).
- Changes in the marina layout and direction of vessels. The upgraded marina would have similar or reduced encroachment into the waterway and lower berthing density in the southern section that current.
- Change to a 'bow in' berthing arrangement with an aim to minimise any seafloor disturbance / prop scouring during vessel berthing and reversing.

This report includes a review of existing information relating to aquatic (marine) ecology for the site, results of a site walkover and diver based aquatic habitat field survey undertaken to describe the aquatic habitats present within and adjacent to the existing marina and proposed works area, an assessment of marine sediment quality within the footprint of the proposed works and an assessment of potential impacts and identification of mitigation and/or management measures for the proposed marina upgrade works. Consultation with the NSW Department of Primary Industries (DPI) (Fisheries) was undertaken in May 2024 following the completion of the final marina design and layout.

In summary the following were found:

- Aquatic vegetation – A review of the NSW Department of Primary Industry (DPI) estuarine vegetation mapping and the field survey confirmed that no aquatic vegetation in the form of seagrass, mangroves or saltmarsh occurred within the footprint of the existing marina or immediately adjacent areas. The seafloor within the marina footprint was comprised of very fine unvegetated soft sediment with some areas of oyster shell/rock rubble, mainly inshore. Some scattered and small marine macroalgae in poor condition and with a high degree of sedimentation was observed attached to the existing marina structures such as wharf piles and pontoons. This macroalgae is not expected to provide any significant or high quality habitat for marine fauna. No shading of marine vegetation will result from the redevelopment of the marina.
- Filamentous brown algae covered most of the intertidal and shallow subtidal areas at the site including rocky seafloor areas, pontoons and piles.

- A NSW DPI Part 7 Permit to Harm Marine Vegetation will not be required for the proposed activity considering the lack of seagrass, mangroves or saltmarsh, or large habitat forming macroalgae (e.g. Ecklonia or Sargassum) at the site.
- A NSW DPI Part 7 Permit to Dredge/Reclaim will not be required for the proposed activity as no dredging is proposed and no reclamation will occur.
- No marine protected areas occur within or near to the study site and will not be impacted by the proposed works.
- No mapped Coastal Wetlands or Littoral Rainforests occur near to the study site and will not be impacted by the proposal.
- Matters of National Environmental Significance (MNES) (relating to aquatic habitats) under the EPBC Act 1999 occurring within 5 km of the study area were assessed, with the following results:
    - No Wetlands of International Importance occur within a 5 km radius of the study site and will not be impacted by the proposal.
    - The Great Barrier Reef Marine Park does not occur within a 5 km radius of the study site and will not be impacted by the proposal.
    - The Commonwealth Marine Area is not located within a 5 km radius of the study site and will not be impacted by the proposal.
    - Eight (8) listed threatened ecological communities (terrestrial and aquatic) occur within a 5 km radius of the study site. None of these occur within or adjacent to the proposed works area and will not be impacted by the proposal.
    - A number of threatened and/or protected and marine, coastal and migratory species have the potential to occur within a 5 km radius of the site, however, considering the lack of suitable habitat available at the site for most of these species, none are expected to occur more than occasionally or be significantly impacted by the proposal.
- Other matters protected under the EPBC Act (relating to aquatic habitats) occurring within 5 km of the study area include:
    - 81 Listed Marine Species.
    - 14 Whales and other Cetaceans.
    - No Critical Habitats.
    - No Australian Marine Parks.
    - No Habitat Critical to the Survival of Marine Turtles.
    - No Nationally Important Wetlands.
    - No Key Ecological Features (Marine).
    - 4 Biologically Important Areas.
- No declared Critical Habitat (listed under the FM Act 1994 or EPBC Act 1999) or Areas of Outstanding Biodiversity Value (listed under the BC Act 2016) occur within the study area and will not be impacted by the proposal.
- A number of threatened and protected marine and coastal fauna listed under State and Commonwealth legislation have the potential to occur within the general study area, however, considering the available habitat it is not expected that any of these species would be found at the site any more frequently than occasionally, and no significant impacts on any of these fauna would occur from the proposed works.

The sediment quality investigation found that a number of contaminants tested for were above the ANZG (2018) default sediment quality guideline values (DGVs) for sediments. These included:

- Metals - arsenic, copper, lead and zinc.
- Tributyltin (TBT).
- Sum of Total Petroleum Hydrocarbons (TPHs) fraction C10 - C36.

There were a number of organochlorine (OC) pesticides which had levels above the laboratory Level Of Reporting (LOR) (DDD, DDE and DDT) as well as Polycyclic Aromatic hydrocarbon (PAHs), TPHs and Total Recoverable Hydrocarbons (TRHs). The presence of these specific metals, TBT and hydrocarbons is likely related to the historical use of the site as a commercial marina facility (via antifouling and fuels). The presence of pesticides is most likely a result of catchment inputs into this waterway and levels may have increased following the recent heavy rainfall and flooding in the Sydney area just prior to the sampling being undertaken.

An assessment of impacts on local hydrology and tidal flow, as well as the potential for increased prop wash as a result of the marina upgrade was undertaken by Royal HaskoningDHV (June 2024) and is used to inform this aquatic ecology assessment. The Royal HaskoningDHV report determined that:

- Given the minimal (<10%) occupation of the waterway cross-sectional area by the upgraded marina structure and the generally reduced vessel berthing density when compared to the existing marina, the proposed marina upgrade would not be expected to significantly alter the tidal flow of water in and out of Winji Jimmi Bay relative to existing conditions. As such the influence of the proposed facility on e-folding times would be minimal, with no untoward consequences expected for water quality or marine ecology within the bay.
- Given the reduction in number of berths from 36 to 9 berths and the cessation of the previous boat maintenance and repair business, the frequency of boat movements to and from the proposed upgraded marina servicing residents of the onshore development would be expected to be reduced in comparison to the existing situation. As such, given the low speed ingress and egress into the Bay (4 knots), retained 22 m maximum vessel size, and reduced boat movements, vessel access to the proposed marina would not be expected to increase impacts (from present levels) to marine vegetation.

Considering the overall significance of potential impacts to aquatic flora and fauna:

- There will be no significant impacts on marine flora or fauna listed under the FM Act 1994, so further assessment via a Species Impact Statement (SIS) will not be required.
- There will be no significant impacts on any threatened fauna or Endangered Ecological Communities (EECs) listed under the BC Act 2016, therefore, a Species Impact Statement (SIS) will not be necessary and entry into the Biodiversity Offsets Scheme (BOS) under the BC Act 2016 will not be required.

- No significant impacts on any threatened fauna or EECs listed under the EPBC Act 1999 will occur, therefore, no additional assessment in the form of an Environmental Impact Statement (EIS) or referral to the Commonwealth Environment Minister for consideration and approval is required.

Potential direct and indirect impacts on coastal and aquatic habitats associated with the proposed marina upgrade are described. Potential impacts are expected to be temporary, localised and are able to be managed or mitigated effectively. There will be no significant changes to hydrology in the local waterway caused by the marina upgrade which will result in significant, or otherwise, impacts on marina habitats. Overall, with the adoption of appropriate mitigation and management during the proposed marina upgrade, the proposed works are expected to be able to be undertaken without causing any significant harm to the local aquatic environment.

Table of Contents

Figures

Appendices

Introduction

Ocean Environmental was engaged by Essex Development to undertake an aquatic ecology and sediment contamination assessment to support a Development Application (DA) for the proposed demolition and redevelopment of SIRSI Marina.

Study Location

SIRSI Marina is located at122-128 Crescent Road, Newport, New South Wales (NSW) (Figure 1). The marina redevelopment is proposed to be fully within the current lease area and remain within its on-water footprint.

Figure 1 Location of SIRSI Marina, Newport.

Existing Structures

The existing marina facilities at SIRSI Marina are shown in Figure 2 and include a hardstand area, three marina arms, a floating pontoon for dinghy storage and a concrete boat ramp.

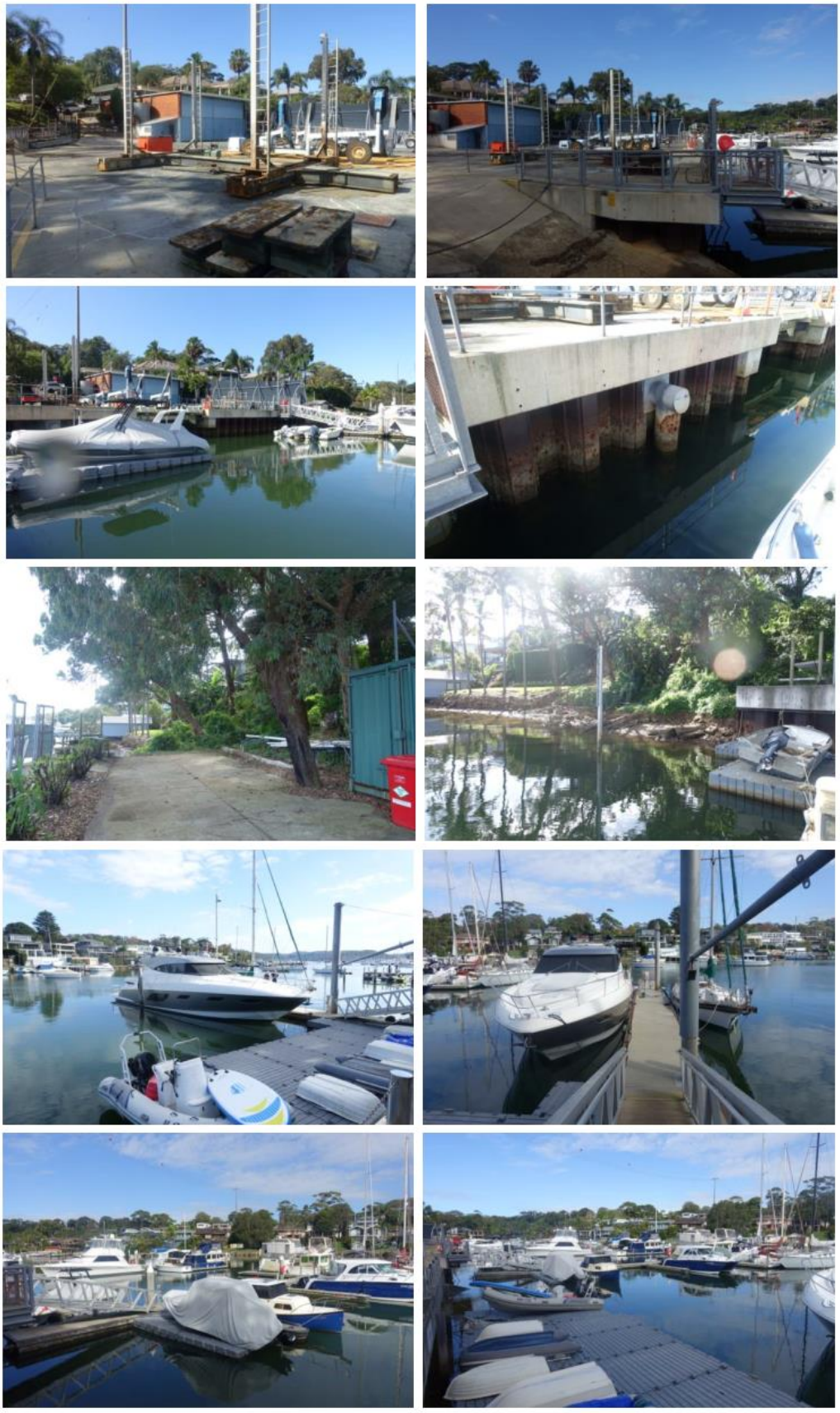

Figure 2 Existing Facilities at SIRSI Marina, Newport.

Proposed Marina Upgrade

Essex Development are proposing to upgrade the waterfront facilities in front of adjoining land as part of a single proposal development being supported by all associated approval stakeholders.

The upgraded marina would comprise 9 floating pontoons that are secured in position by restraint piles located at intervals along each pontoon arm. Typical marina pontoons would have a freeboard (height above waterline) of 400 mm and a similar draught (depth below waterline). Each pontoon arm would be secured by three restraint piles with a nominal diameter of 500 - 600 mm. The proposed marina layout overlaid is shown in Figure 3. Plans are provided in **Appendix A**.

No land will be reclaimed beyond the existing concrete seawall at the marina site and no dredging will be required.

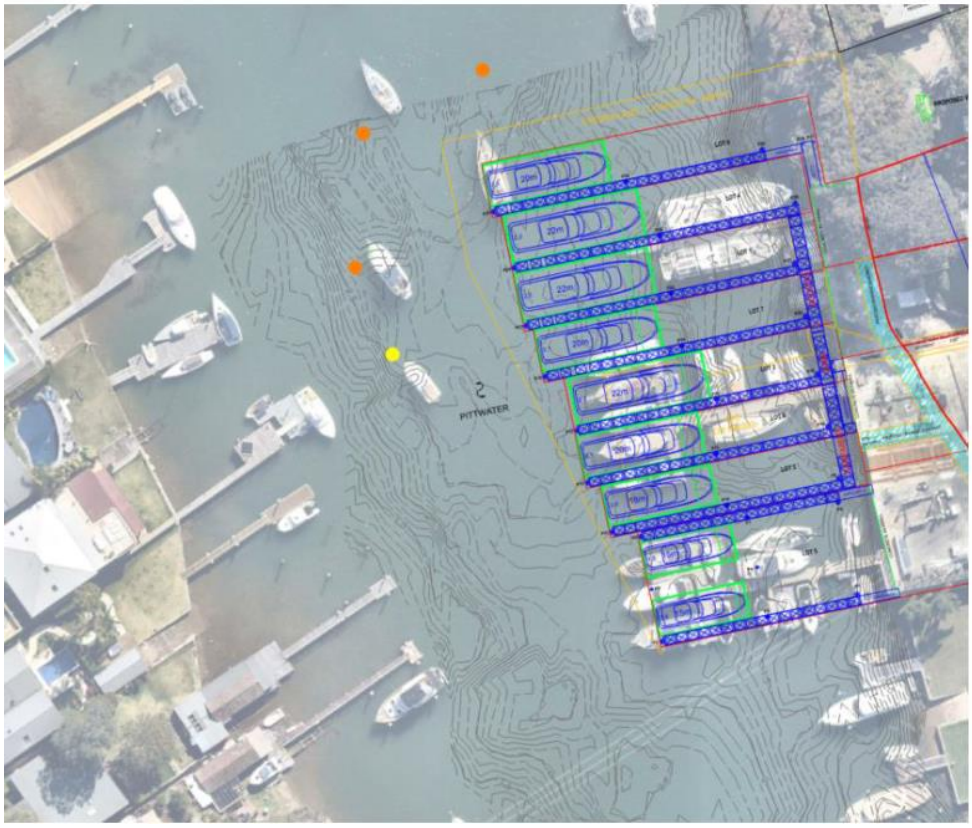

Figure 3 Aerial photo overlay of proposed marina layout.

The proposed marina redevelopment will differ from the existing facilities as follows:

- Removal of the existing slipway facilities and other onshore commercial marina activities.
- Reduction of the number of berths from 36 to 9, to cater for vessels up to a maximum length of 22 m (which is the same as the current maximum vessel berth length accommodated at the marina).

- Changes in the marina layout and direction of vessels. The upgraded marina would have similar or reduced encroachment into the waterway and lower berthing density in the southern section that current.
- Change to a 'bow in' berthing arrangement with an aim to minimise any seafloor disturbance / prop scouring during vessel berthing and reversing.

The work will require the existing structures over water and on water to be removed, appropriate remediation and the construction of a new floating concrete marina with arms utilised as a berth attached to the adjoining land.

Demolition work will be minor as the existing structures are of a light-weight system and structurally independent from anything from the shore (land). Removal of associated lighting fixtures, water and power services will occur after terminating and making safe.

The proposed plan is anticipated to involve the following steps:

1. Site establishment.
2. Siteworks – site survey and piling works being removal of forty-six (46) associated piles made of concrete and timber then reinstate approximately twenty (20) piles of a modern concrete, steel and plastic engineered solution.
3. Services will be reinstated under modern Australian standard AS3962.
4. All work will be carried out under the AS3962 standard.

Objectives of the Work

The existing facility has been in place for over 50 years and now does not meet the current surrounding environment. The objectives of this development as considered with the town planning consultants and Council are for the structure to be removed and a replacement activity commensurate with the existing use but using emerging modern technology and modern demands and needs.

Plant and Equipment

The following plant and equipment are anticipated to be used in the work:

- Pile barge, crawler crane and hammer
- Work punt and tug
- Excavator / backhoe
- Piling hammer
- Air compressor
- Hand operated tools
- Small vehicles – transient.

Scope of Work – Aquatic Ecology and Sediment Quality Assessment

Ocean Environmental was engaged to undertake an Aquatic Ecology and Sediment Quality Assessment to assess the potential impacts of the proposed marina upgrade (specifically for the water side upgrades) on the aquatic environment.

This report includes a review of existing aquatic ecological data for the study area, as well as the results of a field survey undertaken in May 2022. It outlines the potential impacts of the proposed marina construction and operation on the aquatic environment and includes mitigation measures to minimise or avoid impacts to aquatic habitats and fauna during construction.

Consultation

NSW Department of Primary Industries (DPI) Fisheries

In May 2024, Ocean Environmental consulted with NSW DPI Fisheries to determine matters of concern to be addressed in the aquatic ecology report. The response received from NSW DPI is included at **Appendix B**. A summary of their recommendations is below:

Item	Comments / Where Addressed
NSW DPI have no objections to the submission of the DA for the proposed marina at 122 Crescent Rd, Newport.	Noted
NSW DPI provided their general requirements for an aquatic ecology assessment.	These are covered in the background data review, field survey, impacts and mitigations sections of this report.
We note that the site is located within a shallow, narrow bay. Given the facilities proposed, we suggest that the aquatic ecology assessment determines whether these would change hydrology or e-folding time within the bay and if so, whether this would adversely affect water quality and marine ecology within the bay.	Royal HaskoningDHV prepared a letter to Essex Development on 14 June 2024 to address this matter. A summary of key points is below: *"Given the minimal (<10%) occupation of the waterway cross-sectional area by the upgraded marina structure and the generally reduced vessel berthing density when compared to the existing marina (i.e. 36 existing berths vs 9 proposed berths), the proposed marina upgrade would not be expected to significantly alter the tidal flow of water in and out of Winji Jimmi Bay relative to existing conditions. As such the influence of the proposed facility on e-folding times would be minimal, with no untoward consequences expected for water quality or marine ecology within the bay."* Considering these statements, Ocean Environmental also concurs that there will be no adverse effects on water quality and marine ecology which differ significantly from current marina arrangements.

Item	Comments / Where Addressed
We also note that marine vegetation is located on both sides of the head of the bay. Given that large vessels are proposed to be berthed at the facilities, we suggest that the AEA determines whether propellor wash to the seabed (that could potentially constitute dredging) would occur at the berths or during ingress and egress to the bay, and if so, whether this would significantly increase impacts (from present levels) to marine vegetation (e.g. from turbidity, wash, mobilised contaminants) caused by vessel movements generally (i.e. would impacts from the proposal significantly contribute to cumulative impacts on marine vegetation?).	Royal HaskoningDHV prepared a letter to Essex Development on 14 June 2024 to address this matter. They concluded that: *"Given the improved position of berthed vessels away from shallow shoreline areas, 'bow in' berthing arrangement, expected reduced boat movements, and the absence of sensitive marine vegetation in close proximity to the marina, it is considered that vessel manoeuvring at the proposed marina would not result in any significant increased impacts to marine vegetation from seabed disturbance when compared to the existing situation".* Given this statement, and the changes to marina layout, it is expected that prop scour would not increase from current levels and may well be reduced.

Northern Beaches Council

Essex Development provided the following items raised by Council in a pre-DA meeting relating to aquatic ecology:

Item	Comments / Where Addressed
These common SEARS may be applicable to the DA: 1. Predictions of any vegetation clearing, including marine vegetation. 2. A detailed assessment of the potential impacts on any critical habitats, protected species, threatened species, populations, endangered ecological communities or their habitats. 3. A biodiversity assessment in accordance with the former Office of Environment and Heritage guidelines	1. No clearing of marine vegetation will occur as no marine vegetation occurs at the site. 2. Refer to Sections on Critical Habitats / Areas of Outstanding Biodiversity Value, Matters of National Environmental Significance and Threatened and Protected Fauna. 3. A biodiversity assessment in accordance with OEH guidelines is not relevant to aquatic ecology – this is for

Item	Comments / Where Addressed
4. An aquatic habitat assessment in accordance with Department of Primary industries guidelines. 5. A detailed description of the measures to avoid, minimise, mitigate and offset biodiversity impacts.	terrestrial ecology assessments which are not covered in this report. 4. This was undertaken and results are reported in Aquatic Ecology Field Survey . 5. Refer to Potential Impacts and Mitigations. No offsetting will be required in relation to the aquatic habitat, as there will be no loss of aquatic vegetation which would result in this requirement.
Council has suggested a shoreline naturalisation is included in the proposal. They state: "Where possible naturalised seawall should replace the existing concrete structures. The use of sandstone boulders is recommended to create habitat features. The Marina design is to incorporate habitat friendly structures (fish hotel, living seawall tiles, etc)."	Essex Development and Ocean Environmental acknowledge that newly built or replaced seawalls should try to incorporate measures within the publication Environmentally Friendly Seawalls - A guide to improving the environmental value of seawalls and seawall-lined foreshores in estuaries (OEH 2009) where possible, to increase the value of aquatic habitat provided. And that other structures such as living seawall tiles may also be used to increase complexity and biodiversity. However, in the case of SISRSI Marina this is not considered to be the best way forward. Adaptive reuse and retention of the existing seawall is planned to maintain the structural integrity of the foreshore. This adaptive reuse will also reduce the potential impacts on aquatic ecology and water quality that may result from demolition of the existing wall.
Council refers to the waterfront land being in degraded. And state, it should be restored and rehabilitated – from a section of their DCP. This should also be considered and addressed in the Ecology Report.	The aquatic ecology report does not cover matters relating to terrestrial land works or rehabilitation of vegetation. However, it is recommended that suitable native planting is used to help rehabilitate any areas of land which are impacted by the construction works and decrease the risk of erosion of foreshore areas and flow on effects

Item	Comments / Where Addressed
	to adjacent aquatic habitats and water quality.

Background Data Review

Aquatic Habitats

Estuarine Vegetation Mapping (NSW DPI)

All marine vegetation in NSW is protected under the NSW *Fisheries Management Act* (FM Act) *1994*. Marine vegetation, including saltmarsh, mangroves, seagrasses and macroalgae (seaweeds), provides shelter and nursery areas for aquatic fauna and is an essential component of the food chain in estuarine and coastal environments. It also stabilises sediments and shorelines and protects water quality in estuaries for recreational users. NSW DPI administers legislation which protects marine vegetation on public water land and foreshores.

Marine vegetation within the study area was mapped using the NSW DPI Fisheries Spatial Data Portal (NSW DPI 2024). No aquatic vegetation has been mapped within the marina footprint or within an ~100 m radius of the marina (Figure 4). Some very small mangrove patches are identified around 100 m north of the marina while more extensive areas of mangroves, saltmarsh and Zostera seagrass are mapped in the small bay to the west. No aquatic vegetation apart from some small macroalgae attached to pontoons and piles was observed at the site.

In NSW, *Posidonia australis* is listed as an endangered population in Pittwater under the FM Act. Nationally, *P. australis* in the Pittwater estuary is specifically included under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). No Posidonia seagrass was observed in the study area and is not expected to occur in the southern reaches of the waterway with typically poor flushing, fine sediments, often high turbidity as well as stormwater inputs.

Figure 4 Aquatic vegetation mapped in the local area in relation to the study site (NSW DPI).

Key Fish Habitat

One of the objectives of the FM Act is to 'conserve key fish habitats'. To achieve the objectives of the FM Act, NSW DPI Fisheries has identified 'Key Fish Habitats' (KFH) as those aquatic habitats that are important to the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally, and the survival and recovery of threatened aquatic species. KFH is defined to include all marine and estuarine habitats up to highest astronomical tide (HAT) level (that reached by 'king' tides) and most permanent and semipermanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments to the top of the bank. The entire Pittwater waterway is mapped as KFH including the study area. KFH was mapped using the Fisheries Spatial Data Portal and is shown in Figure 5.

Figure 5 Key Fish Habitat mapped in the local area in relation to the study site (NSW DPI).

Waterway and Fish Habitat Classification (NSW DPI)

Under the Fisheries NSW *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI 2013) (Table 2), the marine area adjacent to the proposed works would be considered as a *CLASS 1 – Major Key Fish Habitat*, i.e. "a marine or estuarine waterway or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected species or 'critical habitat'".

Considering the specific attributes of the aquatic habitats in the immediate study area (refer to this section and field survey results), and in accordance with Table 1 of the Policy, the marine construction area would be classed as TYPE 3 – Minimally sensitive key fish habitat (as it includes unstable or unvegetated sand or mud substrate, coastal and estuarine sandy beaches with minimal or no in-fauna) (NSW DPI 2013).

Coastal Wetlands

The *Coastal Management Act 2016* replaces the *Coastal Protection Act 1979* and establishes a new strategic framework and objectives for managing coastal issues in NSW. The Act defines the coastal zone as comprising four coastal management areas:

1. Coastal wetlands and littoral rainforests – areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
2. Coastal vulnerability area – areas subject to coastal hazards such as coastal erosion and tidal inundation.
3. Coastal environment area – areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.
4. Coastal use area – land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

Coastal Wetlands and Littoral Rainforests in the study area were mapped using the NSW Fisheries Spatial Data Portal. No Coastal Wetlands or Littoral Rainforests are located in the vicinity of the proposed works and will not be impacted by the proposal (Figure 6). The study area is located within the Coastal Environment Area and Coastal Use Area (see Figure 7 and Figure 8).

Figure 6 Coastal Wetlands and Littoral Rainforest mapped in the study area.

Figure 7 Coastal Environment Area in the study area.

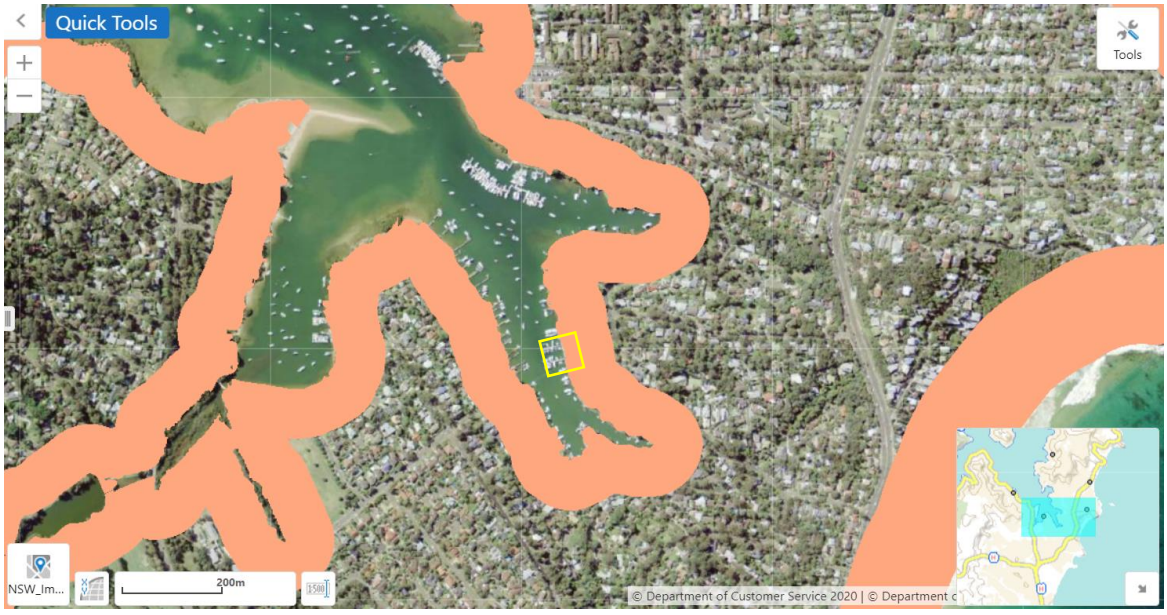

Figure 8 Coastal Use Area in the study area.

New South Wales Oyster Reefs

The closest mapped Oyster Reefs are ~300 m from the site as shown in Figure 9.

Figure 9 NSW Oyster Reefs in the study area.

Marine Protected Areas

Marine Parks in NSW are identified, managed, and protected under the *Marine Estate Management Act 2014*. Marine Parks aim to conserve marine biodiversity and support marine science, recreation, and education.

The NSW system of marine protected areas includes:

- 6 Marine Parks – multiple use marine parks cover around one third (~345,000 ha) of the NSW marine estate.
- 12 Aquatic Reserves – which cover ~2,000 ha of the NSW marine estate.
- National Parks and Nature Reserves – include ~20,000 ha of estuarine and oceanic habitats.

A map of the location of NSW Marine Parks is provided in Figure 10. The closest marine protected area to the study site is Barrenjoey Head Aquatic Reserve, located approximately 15 km away from the study area. This will not be impacted by the proposed works.

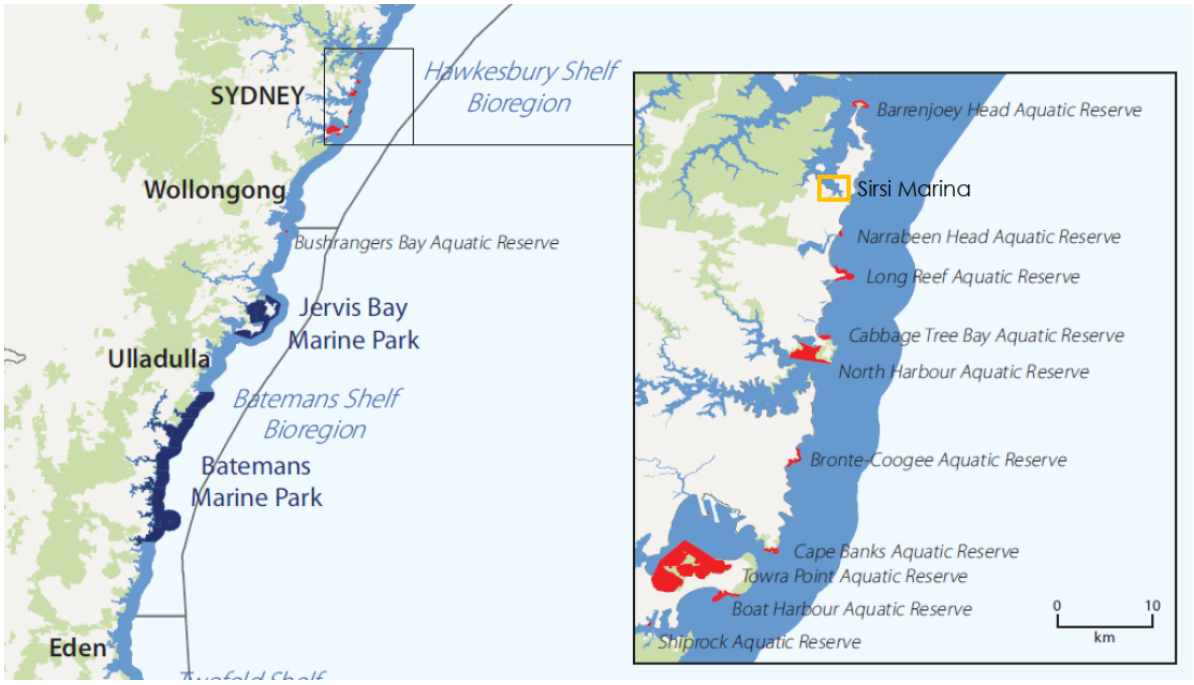

Figure 10 Marine protected areas in the vicinity of the study area (NSW DPI 2024).

Critical Habitats / Areas of Outstanding Biodiversity Value

This section identifies land declared as Critical Habitat (under the FM Act and EPBC Act) and Areas of Outstanding Biodiversity Value (AOBVs) (under the Biodiversity Conservation Act 2016 (BC Act)) located within the study area.

Fisheries Management Act 1994

Critical Habitat is defined under the FM Act as 'the whole or any part of the habitat of an endangered species, population or ecological community that is critical to the survival of the species, population or ecological community'. The Register of Critical Habitat under the FM Act includes:

1. Grey Nurse Shark Critical Habitat – Various locations in NSW are listed, none of which are in the vicinity of the study site. https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/732969/GNS-critical-habitat-2013-declaration.pdf

Register of Critical Habitat under the NSW FM Act 1994 (NSW DPI 2024): http://www.dpi.nsw.gov.au/fishing/species-protection/conservation/what/register

Biodiversity Conservation Act 2016

The BC Act gives the Minister for the Environment the power to declare Areas of Outstanding Biodiversity Value (AOBV). AOBVs are special areas that contain irreplaceable biodiversity values that are important to the whole of NSW, Australia or globally. AOBVs in NSW include:

1. Cabbage Tree Island, Port Stephens, NSW – Critical Habitat for Gould's petrel (*Pterodroma leucoptera*).
2. Manly, Sydney Harbour, NSW – Critical Habitat for little penguin (*Eudyptula minor*).
3. Stotts Island Nature Reserve, NSW – Mitchell's Rainforest Snail (*Thersites mitchellae*).
4. Wollemi National Park, NSW - Wollemi Pine (*Wollemia nobilis*).

No AOBVs are located within the study area and will not be impacted by the proposal.

Register of AOBVs - https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/areas-of-outstanding-biodiversity-value/area-of-outstanding-biodiversity-value-register

Environment Protection and Biodiversity Conservation Act 1999

The Register of Critical Habitat for species listed under the EPBC Act indicates that no areas of listed Critical Habitat under this Act occur within the study area (DCCEEW 2024) (https://www.environment.gov.au/cgi-bin/sprat/public/publicregisterofcriticalhabitat.pl).

Areas of Critical Habitat identified under the EPBC Act include:

1. *Diomedea exulans* (Wandering Albatross) - Macquarie Island, TAS.
2. *Lepidium ginninderrense* (Ginninderra Peppercress) - Northwest corner Belconnen Naval Transmission Station, ACT.
3. *Manorina melanotis* (Black-eared Miner) - Gluepot Reserve, Taylorville Station and Calperum Station, excluding the area of Calperum Station south and east of Main Wentworth Road.
4. *Thalassarche cauta* (Shy Albatross) - Albatross Island, The Mewstone, *Pedra Branca*, TAS.
5. *Thalassarche chrysostoma* (Grey-headed Albatross) - Macquarie Island, TAS.

Matters of National Environmental Significance

A Protected Matters Search under the EPBC Act 1999 was undertaken to determine whether any Matters of National Environmental Significance (MNES) associated with marine and coastal habitats occur within a 5 km radius of the marina and have the potential to be impacted by the proposal (see **Appendix C**).

The following information regarding MNES is applicable to the proposal:

- No Wetlands of International Importance occur and will not be impacted by the proposal.
- The Great Barrier Reef Marine Park does not occur and will not be impacted by the proposal.

- The Commonwealth Marine Area does not occur and will not be impacted by the proposal.
- Eight (8) listed threatened ecological communities occur within 5 km of the marina:

  o Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and Southeast Queensland ecological community.

  o Coastal Swamp Sclerophyll Forest of New South Wales and Southeast Queensland.

  o Coastal Upland Swamps in the Sydney Basin Bioregion.

  o Eastern Suburbs Banksia Scrub of the Sydney Region.

  o Littoral Rainforest and Coastal Vine Thickets of Eastern Australia.

  o *Posidonia australis* seagrass meadows of the Manning-Hawkesbury ecoregion.

  o River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.

  o Subtropical and Temperate Coastal Saltmarsh.

  None of these threatened ecological communities occur at the study site and will not be impacted by the marina upgrade (water based works).

- 100 Listed Threatened Species (including marine and terrestrial species) have the potential to occur.
- 62 Listed Migratory Species (including marine and terrestrial species) have the potential to occur.

Other Matters listed under the EPBC Act relevant to the proposal include:

- 81 Listed Marine Species have the potential to occur.
- 14 Whales and Other Cetaceans have the potential to occur.
- No Critical Habitats occur.
- No Australian Marine Parks occur.
- No Nationally Important Wetlands occur.
- No Key Ecological Features (Marine) occur.
- No Habitat Critical to the Survival of Turtles occurs.

Threatened and Protected Fauna

Fisheries Management Act 1994

Threatened and protected marine species listed under Schedules 4 to 5 of the FM Act (see **Appendix D**) were reviewed to satisfy requirements of the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (NSW DPI 2013).

Marine species, populations and ecological communities listed as endangered, critically endangered and/or vulnerable (i.e. Schedule 4, 4A and 5) under the NSW FM Act with the potential to occur within Pittwater and adjacent coastal areas are listed below.

Schedule 4: Endangered Species, Populations and Ecological Communities:

- Scalloped hammerhead shark (*Sphyrna lewini*) - endangered species.
- Southern bluefin tuna (*Thunnus maccoyii*) - endangered species.
- Marine worm (*Hadrachaeta aspeta*) - species presumed extinct.
- Green sawfish (*Pristis zijsron*) - species presumed extinct.
- Bennett's seaweed (*Vanvoorstia bennettiana*) - species presumed extinct.
- *Posidonia australis* Hook.f. (1858), seagrass (Pittwater population) endangered population.

Schedule 4A: Critically Endangered Species and Ecological Communities

- Grey nurse shark (*Carcharius taurus*) - critically endangered species.
- Marine slug (*Smeagol hilaris*) - critically endangered species.
- Marine brown algae (*Nereia lophocladia*) - critically endangered species.

Schedule 5: Vulnerable Species and Ecological Communities

- Great white shark (*Carcharodon carcharias*) - vulnerable species.
- Black cod (*Epinephelus daemelii*) - vulnerable species.
- Great hammerhead shark (*Sphyrna mokarran*) - vulnerable species.

Protected Species

- All species of the families 'Syngnathidae', 'Solenostomidae' and 'Pegasidae' (i.e. seahorses, sea dragons, pipefishes, pipehorses).
- Ballina angelfish, *Chaetodontoplus ballinae*.
- Bluefish, *Girella cyanea*.
- Eastern blue devil fish, *Paraplesiops bleekeri*.
- Elegant wrasse, *Anampses elegans*.
- Estuary cod, *Epinephelus coioides*.
- Giant Queensland groper, *Epinephelus lanceolatus*.
- Herbsts nurse shark, *Odontaspis ferox*.

Considering the aquatic habitat located within and adjacent to the proposed marina none of these species are expected to utilise the study area more than very occasionally. Considering the proposed activity, potential impacts and available mitigation measures, the proposed works are not expected to cause any long term or significant impact on any threatened or protected species listed under the FM Act 1994, nor are they expected to impact on the viability of any local populations, or place any of them at the risk of extinction.

Biodiversity Conservation Act 2016

An online database search for threatened and protected species listed under the NSW BC Act recorded within a 10 km radium of the study site (using the BioNet Atlas of NSW Wildlife) was undertaken. The full Atlas of NSW Wildlife search results are provided in **Appendix E.** The search listed 21 threatened marine species (including a number of unidentified species) recorded within the study area (Table 1).

Appendix E also lists several marine and migratory birds which may use the general study area for roosting and feeding. However, due to the lack of natural foreshore habitat at the site no nesting of marine or migratory birds is expected to occur here. Considering the habitat at the site, no species listed in Table 1 are expected to occur here more than very occasionally.

Considering the scope of the proposed activity, its potential impacts on marine and coastal fauna and available mitigation / management measures, the proposed works are not expected to cause any long term or significant impact on any of these species, nor will they impact on the viability of local populations or place any of them at the risk of extinction.

Table 1 Threatened and protected marine species listed under the BC Act 2016 recorded in the study area.

Common Name	Species Name	Status (BC Act)
Green Turtle	*Chelonia mydas*	Vulnerable, Protected
Loggerhead Turtle	*Caretta caretta*	Endangered, Protected
Elegant Seasnake	*Hydrophis elegans*	Protected
Yellow Bellied Seasnake	*Hydrophis platurus*	Protected
Little Penguin	*Eudyptula minor*	Protected
Dugong	*Dugong dugon*	Endangered, Protected
Australian Fur-seal	*Arctocephalus pusillus doriferus*	Vulnerable, Protected
Leopard Seal	*Hydrurga leptonyx*	Protected
Southern Right Whale	*Eubalaena australis*	Endangered, Protected
Humpback Whale	*Megaptera novaeangliae*	Vulnerable, Protected
Sperm Whale	*Physeter macrocephalus*	Vulnerable, Protected
Pygmy Sperm Whale	*Kogia breviceps*	Protected
Common Dolphin	*Delphinus delphis*	Protected
Long-finned Pilot Whale	*Globicephala melas*	Protected
Dusky Dolphin	*Lagenorhynchus obscurus*	Protected
Long-beaked (Indo Pacific) Bottlenose Dolphin	*Tursiops aduncus*	Protected
Bottlenose Dolphin	*Tursiops truncatus*	Protected

Environment Protection and Biodiversity Conservation Act 1999

An online database search for species listed under the EPBC Act with the potential to occur in the study area (within a 5 km radius of the site) was made using the EPBC Act Protected Matters Search Tool. Full search results are provided in **Appendix C**.

The EPBC Act Protected Matters Search listed 100 threatened species (marine and terrestrial), 62 listed migratory species (marine and terrestrial), 81 listed marine species and 14 whales and other cetaceans, with the potential to occur within a 5 km radius of the study site. The threatened and protected marine species under the EPBC Act 1999 are listed in Table 2. The likelihood of occurrence of these species (as determined by the database) is provided. However, considering the habitat available at the site, none of these species are expected to occur more than very occasionally. Marine/migratory birds also have the potential to use aquatic habitats and marine structures within the general study area / Pittwater for roosting and foraging on occasion, although they are not expected to nest at the study site considering the lack of suitable habitat and nature of the existing site. These bird species are identified in the Protected Matters Search (see **Appendix C**).

None of the species listed are expected to occur at the site more than very occasionally considering their habitat requirements and the aquatic habitat present at the site. The proposed works are not expected to cause any long term or significant impact on any of these listed species, nor will they impact on the viability of local populations or place any of these species or populations at risk of extinction.

Table 2 Threatened and protected marine species listed under the EPBC Act 1999 with the potential to occur in the study area.

Common Name	Species Name	Status	Likelihood of Occurrence
Black Cod	*Epinephelus daemelii*	V	Species or species habitat likely to occur within area
White's Seahorse	*Hippocampus whitei*	E	Species or species habitat known to occur within area
Blue Warehou	*Seriolella brama*	CD	Species or species habitat known to occur within area
Southern Bluefin Tuna	*Thunnus maccoyii*	CD	Species or species habitat likely to occur within area
Loggerhead Turtle	*Caretta caretta*	E, M, L	Species or species habitat known to occur within area
Green Turtle	*Chelonia mydas*	V, M, L	Foraging, feeding or related behaviour known to occur within area
Leatherback Turtle	*Dermochelys coriacea*	E, M, L	Foraging, feeding or related behaviour known to occur within area
Hawksbill Turtle	*Eretmochelys imbricata*	V, M, L	Species or species habitat known to occur within area

Common Name	Species Name	Status	Likelihood of Occurrence
Flatback Turtle	*Natador depressus*	V, M, L	Foraging, feeding or related behaviour known to occur within area
Yellow Bellied Sea Snake	*Pelamis platurus*	L	Species or species habitat may occur within area
Grey Nurse Shark (east coast pop'n)	*Carcharias taurus*	CE	Species or species habitat known to occur within area
Great White Shark	*Carcharodon carcharias*	V, M	Species or species habitat known to occur within area
School Shark	*Galeorhinus galeus*	CD	Species or species habitat may occur within area
Scalloped Hammerhead	*Sphyrna lewini*	CD	Species or species habitat likely to occur within area
Whale Shark	*Rhincodon typus*	V, M	Species or species habitat may occur within area
Oceanic Whitetip Shark	*Carcharhinus longimanus*	M	Species or species habitat may occur within area
Porbeagle	*Lamna nasus*	M	Species or species habitat likely to occur within area
Reef Manta Ray	*Manta alfredi*	M	Species or species habitat may occur within area
Giant Manta Ray	*Manta birostris*	M	Species or species habitat may occur within area
New Zealand Fur Seal	*Arctocephalus forsteri*	L	Species or species habitat may occur within area
Australian Fur Seal	*Arctocephalus pusillus*	L	Species or species habitat may occur within area
Pygmy Right Whale	*Caperea marginata*	M, W	Foraging, feeding or related behaviour may occur within area
Blue Whale	*Balaenoptera musculus*	E, M, W	Species or species habitat may occur within area
Southern Right Whale	*Eubalaena australis*	E, M, W	Species or species habitat likely to occur within area
Humpback Whale	*Megaptera novaeangliae*	V, M, W	Species or species habitat known to occur within area
Bryde's Whale	*Balaenoptera edeni*	M, W	Species or species habitat may occur within area
Killer Whale	*Orcinus orca*	M, W	Species or species habitat may occur within area
Minke Whale	*Balaenoptera acutorostrata*	W	Species or species habitat may occur within area

Common Name	Species Name	Status	Likelihood of Occurrence
Australian Humpback Dolphin	*Sousa sahulensis as Sousa chinensis*	M, W	Species or species habitat likely to occur within area
Spotted Dolphin	*Stenella attenuata*	W	Species or species habitat may occur within area
Indian Ocean Bottlenose Dolphin	*Tursiops aduncus*	W	Species or species habitat likely to occur within area
Bottlenose Dolphin	*Tursiops truncatus s. str*	W	Species or species habitat may occur within area
Dusky Dolphin	*Lagenorhynchus obscurus*	M, W	Species or species habitat may occur within area
Common Dolphin	*Delphinus delphis*	W	Species or species habitat may occur within area
Risso's Dolphin	*Grampus griseus*	W	Species or species habitat may occur within area
Dugong	Dugong dugon	M, L	Species or species habitat may occur within area
White's Seahorse	*Hippocampus whitei*	E, L	Species or species habitat known to occur within area
Syngnathids (other)	20 species	L	Species or species habitat may occur within area
Cauliflower Soft Coral	*Dendronephthya australis*	E	Species or species habitat may occur within area

EPBC Act Status – L = listed marine species, V = vulnerable, E = endangered, CD = conservation dependent, CE = critically endangered, W = whales and other cetaceans, M = migratory.

Aquatic Ecology Field Survey

An aquatic ecology field survey was undertaken on 1 May 2022 in accordance with the NSW Fisheries Guidelines. The survey was undertaken around mid-tide between the hours of 11.30 am and 1 pm. Conditions were overcast with moderate winds. Water temperature was ~18°C and underwater visibility was poor at <2 m following an extended period of heavy rainfall and flooding in the Sydney area in early 2022.

The survey was undertaken within the area shown in Figure 11 and aimed to:

- Ground truth any mapped aquatic vegetation within the study area.
- Identify and describe intertidal and subtidal habitats at the site and adjacent areas.
- Describe the marine flora and fauna at the study site.

Figure 11 Approximate extent of the habitat field survey.

Field Survey Results

The intertidal habitat occurring within and immediately adjacent to the existing marina included a small muddy and rocky beach area north of the site, which was backed by terrestrial vegetation (mainly weed species and planted grass and palms). Habitat was also provided by intertidal surfaces of existing marina piles, pontoons and the steel seawall in front of the hardstand area. Existing structures were observed to be either bare or colonised in some places by sessile invertebrates (mainly Sydney rock oysters) and marine algae (typically small brown algae and filamentous algae) with a high degree of sedimentation. No aquatic vegetation including seagrass, mangroves or saltmarsh were observed to occur in the intertidal areas of the site.

Subtidal habitat within and adjacent to the marina area was comprised of an unvegetated silty seafloor. Some areas of subtidal surfaces of existing piles and pontoons were inhabited by small amounts of small brown algae and filamentous algae. No aquatic vegetation (seagrass) was present within the subtidal zone at the site. Images of the intertidal and subtidal habitats are provided in Figure 12.

Figure 12 Images of the intertidal and subtidal habitats at the site.

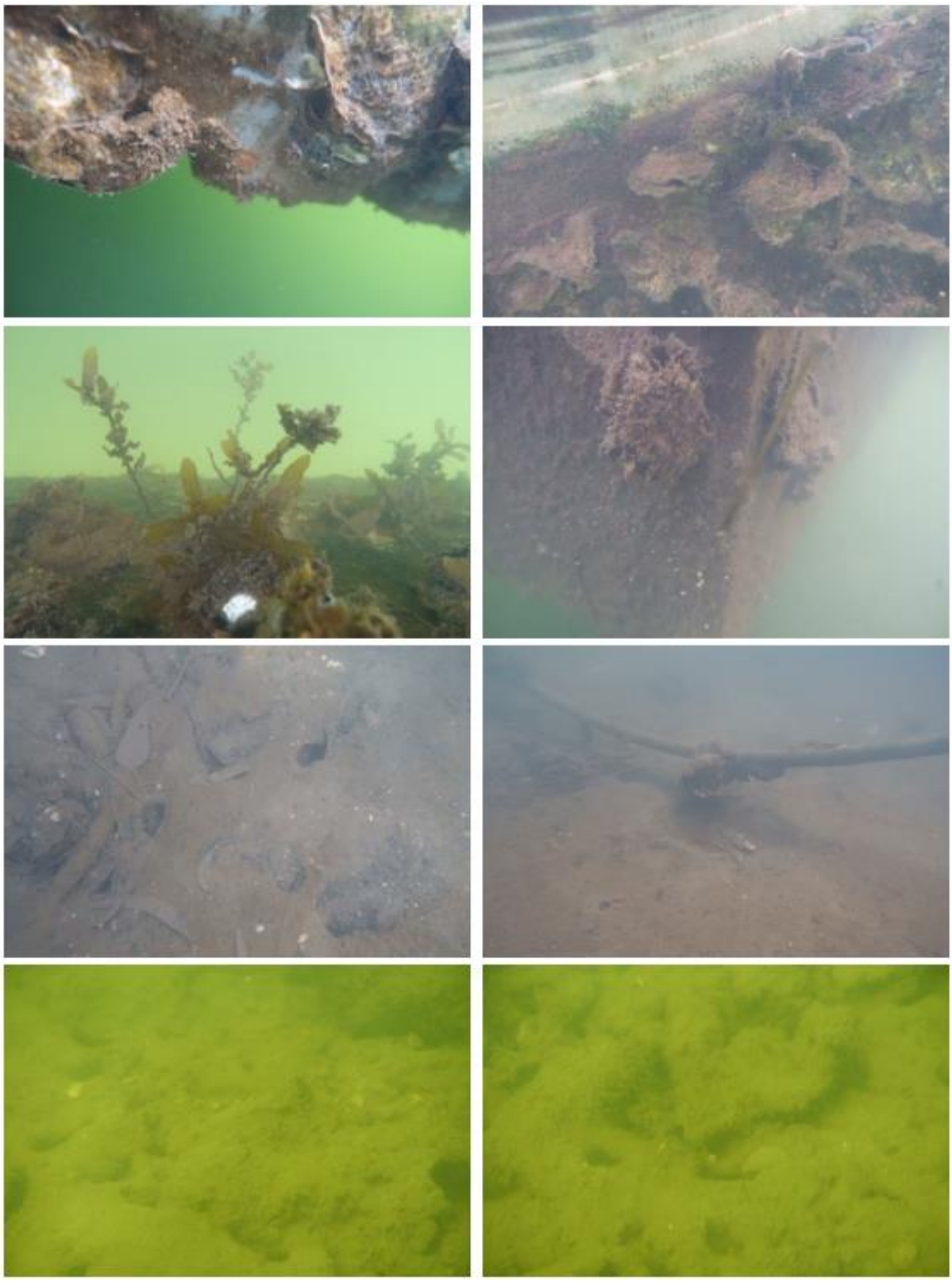

Figure 12 Images of the intertidal and subtidal habitats at the site.

Sediment Quality

A Sediment Quality Assessment was undertaken to determine the potential for contamination of marine sediments within the marina lease area and assess potential impacts of disturbance during construction activities such as piling.

As no dredging or excavation of sediments is required sampling and analysis of surface sediments only (to 30 cm depth) was proposed and undertaken using divers. The assessment did not cover land based soils at the site.

The sediment sampling design and analysis was undertaken with consideration of the sediment quality guidelines listed below:

- ANZG Sediment Quality Guidelines (2018)
- National Assessment Guidelines for Dredging (NAGD 2009)
- NSW EPA Waste Classification Guidelines Part 1: Classifying waste (NSW EPA 2014)
- NSW Acid Sulfate Soils Assessment Guidelines (Ahern et al. 1998). Published by the Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia.

Sampling and Analysis

Contaminants and Particle Size Distribution

In accordance with the number of samples required under the NAGD (2009), six sediment sampling sites (Figure 13) were selected within representative areas of the marina lease area.

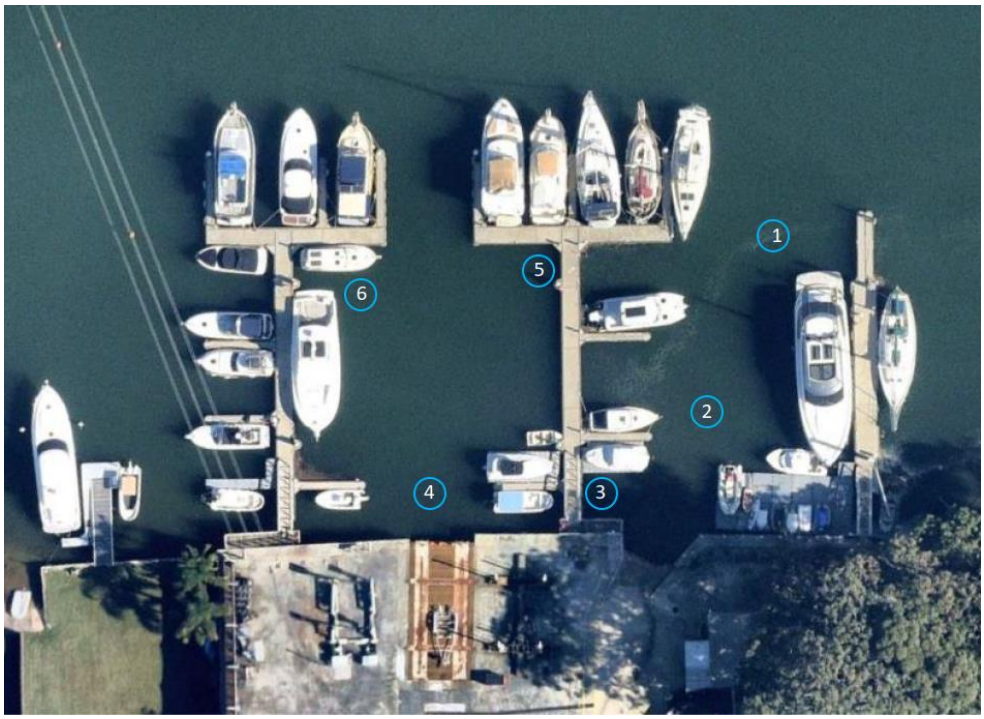

Figure 13 Location of sediment sampling sites within the lease area.

Surface sediment cores were collected (to 30 cm depth) at each site using divers. Samples were sent for testing of a range of potential contaminants and particle size distribution (PSD) as below.

- Particle size analysis by hydrometer (PSD)
- Total organic carbon (TOC)
- Heavy metals/metalloids (x 21 metals)
- Organotin compounds (TBT, DBT, MBT)
- OP/OC pesticides
- PCBs/PAHs
- TRHs/TPHs/BTEXN
- Nutrients - Nitrate as N, Nitrite as N, Nitrate + Nitrite as N (NOx)

Acid Sulphate Soils (ASS)

Four of the six sediment sampling sites were also tested for potential acid sulphate soils (PASS) and acid sulphate soils (ASS). These were Sites 2, 3, 4 and 5. This number of sites is in accordance with the NSW ASS Assessment Guidelines (Ahern et al. 1998) for areas <1 ha. Laboratory testing for ASS included pH field/fox, pH and SPOCAS. However, as no dredging or excavation of sediments is proposed during construction, no issues associated with ASS have the potential to occur as sediments will not be exposed to oxygen.

Laboratory testing

The parameters tested by the NATA accredited analytical laboratory (ALS Environmental) were rationalised based on the potential for contamination at the site. There are a number of parameters listed under the NAGD/NSW EPA Guidelines which are not considered to be of concern and were excluded from the testing as listed below.

- Radionuclides (gross beta/alpha activity in soils)
- Methyl mercury
- Cyanide, bromide, chloride, flouride
- Hexavalent and trivalent chromium
- Sulfate
- Phenols
- VOCs.

Sediment Quality Results

Sediment quality results are provided with summary statistics (min, max, mean and median values) in **Appendix F** and summarised below. Original laboratory reports are provided in **Appendix G**.

Considering that no dredging will occur at the site and that no onshore or offshore disposal of sediments would be required, results were compared to the ANZG (2018) sediment quality guidelines only.

Particle Size Analysis

Particle size analysis was undertaken for each sediment sample. Most samples were similar in their particle size distribution and were reported as having almost equal sand, silt and clay components, with the exception of Site 3 which had a higher proportion of sand than any other site.

Contaminants

Contaminant levels in sediments were compared against the ANZG default sediment quality guideline values (DGVs) (2018) where available. All raw data are tabulated in **Appendix F** and laboratory reports provided in **Appendix G**.

Nutrients

The following nutrients were tested for:

- Nitrite as N
- Nitrate as N
- Nitrite plus Nitrate as N (NOx).

All samples returned concentrations of Nitrite as N below the laboratory level of reporting (LOR) of 0.10 mg/kg. Concentrations of Nitrate as N were detected in all samples and ranged from 0.10 mg/kg to 0.30 mg/kg. There are no ANZG (2018) guidelines for nutrients in sediments.

Total Organic Carbon

Concentrations of total organic carbon (TOC) were low in all samples and ranged from just 1.5% to 3.57%. There are no ANZG (2018) guidelines for TOC.

Acid Sulphate Soils

The acid sulphate soil test results are summarised as follows:

- The field pH (F) results varied from 8.1 to 8.2 indicating no actual acidity, with values representative of typical marine influenced samples.
- The pH (Fox) results varied from 7.1 to 7.3. Values of pH (Fox) <3 are indicative of sediments with a strong potential to generate acid. These sediments are not considered to have a strong potential to generate acid.
- The reaction rate was 'extreme' (4) for all samples. Reaction rates range from 'slight' (1) to 'extreme' (4).

Field screening tests confirmed that sediments within all substrata tested were not actual acid sulphate soils (AASS) however extreme reaction rates indicate that they may be potential acid sulphate soils (PASS).

The acid sulphate soil potential was also assessed using the SPOCAS analysis suite.

The SPOCAS suite and acid sulphate soil assessment method was adopted from Ahern et al (1998). The results of the SPOCAS suite testing are summarised in **Appendix F**.

Notwithstanding the results above, no dredging or excavation of marine sediments is proposed at the site so no issues associated with ASS would occur from the proposed marina upgrade works.

Metals and Metalloids

The following metals were tested for in sediments, with results as indicated. Raw data are provided in **Appendix F** with summary statistics, including min, max, mean and median values. Metals highlighted red were found to exceed the ANZG (2018) DGVs at one or more sites.

- Aluminium – concentrations ranged from 4,170 mg/kg to 8,180 mg/kg. There are no ANZG (2018) guidelines for aluminium.
- Antimony – all samples had concentrations that were either below the laboratory LOR of 0.5 mg/kg and ranged to 0.73 mg/kg. No ANZG (2018) exceedances were detected.
- Arsenic – concentrations ranged from 8.76 mg/kg to 20.6 mg/kg. The ANZG (2018) DGV of 20 mg/kg was exceeded (but very minimally) at two sites (Site 4 and Site 6).
- Barium – concentrations ranged from 40 mg/kg to 80 mg/kg. There are no ANZG (2018) guidelines for barium.
- Beryllium – all samples had concentrations below the laboratory LOR of 1 mg/kg. There are no ANZG (2018) guidelines for beryllium.
- Cadmium – all samples had low concentrations, from below the laboratory LOR of 0.1 mg/kg to 0.3 mg/kg. No ANZG (2018) exceedances were detected.
- Chromium – concentrations ranged from 14.60 mg/kg to 22.40 mg/kg. No ANZG (2018) guideline exceedances were detected.
- Cobalt – concentrations ranged from 1.9 mg/kg to 2.8 mg/kg. There are no ANZG (2018) guidelines for cobalt.
- Copper – concentrations ranged from 209 mg/kg to 1,220 mg/kg. The ANZG (2018) DGV of 65 mg/kg was exceeded at all sites.
- Iron – concentrations of iron were high in all samples and ranged from 20,800 mg/kg to 34,700 mg/kg. There are no ANZG (2018) guidelines for iron.
- Lead – concentrations ranged from 34.5 mg/kg to 102 mg/kg. The ANZG (2018) DGV of 50 mg/kg was exceeded at Sites 2, 3 and 4.
- Manganese – concentrations ranged from 57 mg/kg to 89 mg/kg. There are no ANZG (2018) guidelines for manganese.
- Molybdenum – all samples had low concentrations ranging from below the laboratory LOR of 2 mg/kg to 2 mg/kg. There are no ANZG (2018) guidelines for molybdenum.
- Nickel – concentrations ranged from 4 mg/kg to 11.1 mg/kg. No ANZG (2018) exceedances were detected for nickel.
- Selenium – concentrations ranged from 0.20 mg/kg to 0.40 mg/kg. There are no ANZG (2018) guidelines for selenium.

- Silver – concentrations ranged from 0.1 mg/kg to 0.3 mg/kg. No ANZG (2018) guideline exceedances were detected.
- Thallium – all samples had concentrations below the laboratory LOR of 5 mg/kg. There are no ANZG (2018) guidelines for thallium.
- Tin – all samples had concentrations either below the laboratory LOR of 5 mg/kg and ranging to 18 mg/kg. There are no ANZG (2018) guidelines for tin (excluding TBT as tin – discussed later).
- Vanadium – concentrations ranged from 22.5 mg/kg to 44.9 mg/kg. There are no ANZG (2018) guidelines for vanadium.
- Zinc – concentrations ranged from 116 mg/kg to 356 mg/kg. Three samples exceeded the ANZG (2018) DGV of 200 mg/kg (Sites 2, 3 and 4).

Organotins

Organotin results are as follows:

- Monobutyltin - The concentration of the organotin compound monobutyltin (MBT) ranged from 4 µgSn/kg to 66 µgSn/kg. There are no ANZG (2018) DGVs for MBT.
- Dibutyltin - The concentration of organotin compound dibutyltin (DBT) ranged from 14 µgSn/kg to 157 µgSn/kg. There are no ANZG (2018) DGVs for MBT.
- Tributyltin - The concentration of organotin compound tributyltin (TBT) was quite high in all samples ranging from 118 µgSn/kg to 2,010 µgSn/kg. Highest values were recorded from Sites 2, 3 and 4 and all samples exceeded the ANZG (2018) DGV for TBT of 9 µgSn/kg.

Other Organics

A wide range of other organics, including pesticides and hydrocarbons, were tested for in the sediments collected. The full list of analytes tested under each of the general groups is provided below with a summary of results. Data is provided in **Appendix F.**

- Polychlorinated Biphenyls (PCBs) (as Aroclors) – all samples were below the laboratory LOR.
- BTEXN (Benzene, Toluene, Ethylbenzene, meta- & para-Xylene, ortho-Xylene, Total Xylenes, Sum of BTEX, Naphthalene) – all samples were below the laboratory LOR.
- Triazine pesticides – all samples were below the laboratory LOR.
- Toxaphene (insecticide) – all samples were below the laboratory LOR.
- Organophosphorus (OP) Pesticides – all samples were below the laboratory LOR.
- Organochlorine (OC) Pesticides – all samples were below the laboratory LOR apart from DDD, DDE and DDT. No ANZG (2018) DGVs are available for these pesticides.
- Carbamate Pesticides – all samples were below the laboratory LOR.
- Phenoxyacetic Acid Herbicides (PAHs) – there were a number of PAHs detected above laboratory screening levels as shown in **Appendix F**. However, the sum of PAHs did not exceed the ANZG (2018) DGV of 10,000 ug/kg for 'sum of PAHs'.

- Total Petroleum Hydrocarbons (C15 - C28 Fraction, C29 – C36 Fraction and C10 - C36 Fraction (sum)) and Total Recoverable Hydrocarbons (>C16 - C34 Fraction, >C34 - C40 Fraction and >C10 - C40 Fraction (sum)) were both detected above laboratory screening levels. The sum of the C10 - C36 TPH fraction exceeded the ANZG (2018) DGV of 550 mg/kg at sites 2 and 3.

Summary

A number of contaminants tested were found to be above the ANZG (2018) DGVs for sediments. These included:

- Metals – arsenic (but only very slightly), copper, lead and zinc.
- Tributyltin (TBT).
- Sum of TPH fraction C10 - C36.

There were a number of organochlorine (OC) Pesticides which had levels above the laboratory LOR (DDD, DDE and DDT) as well as PAHs, TPHs and TRHs.

The presence of these specific metals, TBT and hydrocarbons is likely related to the historical use of the site as a marina and slipway facility (via antifouling and fuels). Levels of many contaminants were highest at sites 2, 3 and 4, which are located further inshore towards the base of the slipway, further providing evidence for this impact source.

The presence of pesticides is most likely a result of catchment inputs into this waterway and levels may have increased following the recent heavy rainfall and flooding in the Sydney area.

Potential Impacts and Mitigations

Potential Impacts

Aquatic Habitats and Marine Vegetation

Potential impacts of construction and operation on aquatic habitats and fauna associated with the marina upgrade are outlined below. No significant adverse change to the operational impacts on habitats or fauna are expected to occur as no change to the use of the marina facility is proposed apart from cessation of commercial slipway activities.

Key Fish Habitat Types (NSW DPI 2013)

There may be potential indirect impacts on TYPE 2 – Moderately Sensitive Key Fish Habitat located within the general study area as follows.

- Potential sedimentation of small algae growing on artificial structures (i.e. TYPE 2 Fish Habitat) located within the proposed works area. Noting that algae was scarce and already highly sedimented. No large macroalgae occurred.

Marine Protected Areas and Environmentally Sensitive Lands

- The study area does not occur within a marine protected area and no marine protected areas will be impacted by the proposal.
- No Coastal Wetlands or Littoral Rainforests occur within the study area and will not be impacted by the Proposal.
- No areas of Critical Habitat or AOBVs for species listed under the FM Act, BC Act or EPBC Act occur within the study area and will not be impacted by the proposal.
- No KEFs occur within the study area and will not be impacted by the proposal.

Impacts on Marine Habitats in the Study Area

Potential construction and operational related impacts on marine habitats can be summarised as:

- Removal of a very small amount of marine vegetation (small brown algae and filamentous algae) occurring on marina piles which will be removed during demolition of the existing marina.
- Minor, short term and highly localised reductions in light availability through increased turbidity levels in the immediate construction zone through the activity of vessels and piling. Noting that turbidity in this area of the waterway is often quite high and no subtidal marine vegetation (e.g. seagrass) or other sensitive habitats (e.g. intertidal or subtidal reefs) occurs in the study area.

- Minor, short term and highly localised reductions in light availability through increased turbidity may occur through the activity of vessels coming in and out of berth during operation. Again, as the turbidity in this area of the waterway is often quite high, and no subtidal marine vegetation (e.g. seagrass) or other sensitive habitats (e.g. intertidal or subtidal reefs) occur, this will not cause any detrimental effects on marine flora.
- Impacts of water pollution (e.g. accidental spills of fuels/oils from construction vessels, vehicles or equipment, illegal or accidental discharges from vessels during marina operation on marine habitats and fauna or birds that may come into contact with such spills.
- Impacts of water pollution related to the use of concrete in or above the water (e.g. accidental spills into waterways). Concrete is highly alkaline and impacts on water quality can indirectly kill marine fauna.
- No impacts to seagrass, mangroves or saltmarsh will occur as they do not occur within the construction or marina lease area and safeguards will be adopted to avoid any impacts outside of this area.

Considering the scope and location of the proposed activity, and the safeguards available to manage/mitigate any impacts, no significant impacts on aquatic habitat and flora are expected to occur from the proposal.

Marine Fauna

Potential construction and operational related impacts on marina fauna can be summarised as:

- Loss of existing habitat provided by existing marina piles. Noting that new piles are to be installed and will provide similar habitat to that which will be removed, and overtime will become inhabited by the same species as currently occur. Diversity on existing piles is very low with the only sessile fauna identified to be rock oysters.
- Direct and highly localised impacts on benthic infauna which may reside within the soft sediments located within the proposed footprint of any new piles to be installed.
- Entanglement / ingestion of fauna in marine debris that is accidentally or illegally allowed to enter the waterway during construction activities or from recreational marina users.
- Impacts of floating plant and cable strike on large mammals (unlikely to occur considering the proposal and very low likelihood of occurrence of such fauna).
- Indirect impacts from water pollution (outlined further below).
- Lighting impacts – Proposed lighting for the upgraded marina is not expected to be significantly different to existing marina lighting or increase impacts from current.
- There are likely to be short term noise impacts during the proposed construction works and marina operation. These will potentially include vehicle and vessel construction equipment engine noise, marine barge and excavator noise, hammering and drilling tool noise and general noise associated with the existing

marina demolition and piling for the new pontoons. Noise impacts have the potential to affect the behaviour of mobile aquatic biota, especially fish, birds and mammals. If present in the study area during construction, they are most likely to avoid or leave the area and any impacts are not considered to be significant.
- Potential translocation of invasive species into Pittwater which are not currently known to occur in this area via construction vessels and equipment or recreational vessels.

Considering the scope and location of the proposed activity, and the safeguards available to manage/mitigate any impacts, no significant impacts on marine fauna or any threatened or protected marine species are expected to occur.

Aquaculture

No aquaculture occurs within the study area and no impacts on aquaculture are expected to occur.

Waterways and Water Quality

The proposed demolition and construction work have the potential to create water pollution, generate general waste and have impacts on local water quality. Operational activities also have the potential to create water pollution and waste. These in turn can impact on local aquatic habitats and the fauna they support. Potential pollution / waste related impacts of the proposed works are outlined below:

- All construction activities have the potential to generate general rubbish and there is the potential for water pollution resulting from chemical, fuel or oil leaks from construction vessels and equipment. Similarly, the use of recreational vessels during marina operation has the potential to result in these impacts.
- Hazardous substances in the water may cause harm to aquatic vertebrates (e.g. shorebirds, fish, mammals and reptiles) via toxic effects of chemicals and the high potential for oil/fuels to attach to feathers/fur of birds and mammals. Depending on the magnitude, such pollution events can be extremely harmful to aquatic fauna (causing illness, loss of ability to feed, swim or fly, loss of ability to source or consume food and drowning).
- Accidental release of general domestic waste during operation or demolition / construction waste into the waterway can pollute aquatic habitats and also cause harm to the fauna utilising them, particularly through ingestion and/or entanglement. Ingestion and/or entanglement of marine fauna in marine debris is listed as a Key Threatening Process under the BC Act 2016 and the EPBC Act 1999. There are a number of threatened / protected and other marine and coastal fauna known to occur, or which have the potential to occur, in the local area, which are at risk if waste is not managed correctly during the proposed activity.

- Disturbance of land based soils and unvegetated marine sediments may occur during demolition activities and the installation of new piles, as well as through the general action of construction vessels.
- Disturbance of terrestrial soils (and associated runoff) or direct disturbance of marine sediments can result in increases in turbidity in the waterway. Turbidity increases may result in short term reductions in light penetration, which, if sustained, can impact light requiring marine vegetation and sessile/filter feeding organisms (e.g. oysters and ascidians).
- As the marine sediments at the site have quite a high fines content the potential for turbidity impacts associated with their disturbance is also high and must be managed adequately. In addition, these sediments have levels of some metals, TBT and hydrocarbons which are above the ANZG (2018) default sediment quality guidelines, so prevention of initial disturbance and spread during construction and operation is required.

Mitigation and Management

Recommended mitigations and management are outlined below. These include measures to mitigate impacts associated with waterways and water quality, waste, sediments and soils, and aquatic biodiversity. These should be included within a Construction Environment Management Plan (CEMP) for the proposal.

Aquatic Habitats and Marine Vegetation + Marine Fauna

Safeguards to be implemented for protection of aquatic biodiversity are:

- Implementation of and adherence to a defined Marine Construction Zone to ensure protection of aquatic habitats and associated marine fauna.
- All construction vessels will be well maintained and regularly serviced to ensure they are in proper working order and reduce the likelihood of fuel / oil leaks and spills.
- Oil and sewage spill response kits will be readily available on the construction vessels and training should be provided to construction staff on their use. The location of these should be clearly marked.
- Post construction a seabed clearance survey will be undertaken to ensure that this has occurred (i.e. no construction related items are left behind).
- To reduce the spread of suspended sediments generated during piling, and the potential for sedimentation of habitats and the spread of potentially contaminated sediments outside of the works area, silt curtains must be used around the immediate area of piling and/or in-water works.
- To reduce the potential for lighting related impacts on marine fauna, construction activities will be undertaken during standard construction hours to reduce the overall need for construction related artificial lighting and associated impacts.
- The risk of vessel strike and injury to large marina fauna (e.g. marine mammals) during construction may be reduced through the adoption of the following:

  - Vessels will maintain the required NPWS exclusion zone with whales (minimum 100 m and 300 m if a calf is present) when travelling to site where required.
  - Site inductions and training.
  - Marine fauna awareness in the local waterway by vessel operators so appropriate speeds and clearance can be adopted when cetaceans are nearby. This is unlikely within the study area but may be required when travelling to the site.
- To reduce the potential for noise impacts on marine fauna during piling (specifically marine mammals) the following will be applied:
  - Pre-start Observation: The Contractor must visually monitor the local waterway (within and outside the marina area) before the commencement of piling. If no mammals have been sighted during the soft-start procedure (gradually increase of power) full impact piling may commence.
  - In relation to piling, or example, to practice the soft start method, a pile is initially driven with low hammer energy. As the pile is driven further into the soil, the hammer energy is increased as necessary to achieve soil penetration. The soft start method is intended to be a warning mechanism for fauna so that they can vacate the area before maximum hammer energy is reached (Reinhalla and Dardis 2014).
- Shut-Down requirements:
  - Piling is not permitted between 6.00 pm and 7.00 am to provide respite from potential avoidance, noise and vibration impacts.
  - If any mammals are spotted within the marina or nearby area piling must cease immediately or as soon as safe to do so until the mammals have moved outside of the area.
  - All piling must cease for a minimum of 30 minutes after the last sighting of a mammals within the marina area. Piling must recommence at the prestart observation after the 30 minutes shutdown has elapsed.
- Silencers on engines and machinery should be used if feasible to minimise general construction noise impacts on aquatic fauna.
- Construction vessel antifouling will be maintained to avoid the attachment and potential translocation of invasive species into and out of Pittwater.
- Ballast water management will be implemented:
  - Ballast water exchange by domestic vessels will be avoided.
  - Domestic vessels will manage ballast water in accordance with the Australian Ballast Water Management Requirements (Department of Agriculture and Water Resources 2016).
  - Any ballast water exchange from international vessels will be undertaken in accordance with the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) (IMO 2016).
- DPI Fisheries (1800 043 536) is to be immediately notified of any fish or marine mammal kills within the construction area. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and written approval to proceed is provided by DPI Fisheries.
- Any injured marine mammals must be immediately reported to the ORRCA 24 hour hotline on 02 9415 3333 or NPWS on 1300 361 967. ORRCA representatives will quickly mobilise to site and attempt to capture and treat the stricken animal.

Depending upon the location of the animal and the circumstances that surround the injury, construction activities may need to cease or be altered to enable the rescue of the animal.

Waterways and Water Quality

Safeguards to be implemented for waterways and water quality include:

- A construction environment management plan (CEMP) and operational environment management plan (OEMP) should be developed and identify all reasonably foreseeable risks relating to water pollution and describe how these risks will be managed during construction and operation.
- Measures to avoid water quality impacts should be outlined in the CEMP and OEMP. These shall include a procedure for using spill kits in the event of a spill and all construction personnel shall be informed of the procedure and their roles and responsibilities in that procedure.
- A turbidity curtain with a minimum drop of 4 m and floating booms will be used locally around the perimeter of all in-water demolition work and construction work (e.g. piling) to limit the spread of sediment plumes generated by these activities and the spread of potentially contaminated sediments.
- Appropriate storage and bunding of chemicals, fuels and oils during construction works should be maintained at all times. These areas should be well defined and signed. Storage of chemicals, fuels and oils should not occur over water or on the marine barge.
- All chemicals and fuels required during construction are to be used in accordance with relevant Material Safety Data Sheets (MSDS).
- Environmentally friendly/water-based drilling fluids will be used for pile drilling activities if required.
- All construction equipment, vehicles and barges should be well maintained and regularly serviced to reduce the likelihood of oil/fuel leaks and spills. Prior to use on site all machinery should be appropriately cleaned, degreased and serviced. Visual inspection of vehicles, plant and equipment shall be carried out by the Contractor.
- No refueling of any equipment should be undertaken within 50 m of waterways. If this is not possible, a refueling procedure with detailed environmental controls are to be articulated in the CEMP for the project.
- Spill response kits should be located at the site during construction - all contractors should be trained in the use of these.
- A spill/emergency response management plan will be prepared by the contractor and will include methods to stop any spill, contain and control the flow, clean up the spill, record the spill, and include contact details of the relevant authorities to be notified in the event of a spill. The spill/emergency response management plan will be included in the CEMP and spill response should be included as part of any site induction. The spill response management plan should include the contact details of the authorities that are to be notified in the event of a spill.

- The seabed will be inspected for refuse following construction and if found this will be removed and disposed of at an appropriate waste facility.
- Construction works should be postponed in the event of heavy rainfall or other extreme weather events (e.g. flooding) to reduce the potential cumulative effects of increased turbidity on the waterway and aquatic habitats.
- Appropriate and easily accessible waste and recycling facilities must be provided at the marina for recreational users.
- Vessels at berth should be encouraged to minimise use of engine when not actively entering or leaving to reduce potential for prop scouring. Vessels should be encouraged to avoid unnecessary revving of engine while at berth for similar.
- Recreational vessels will be required to berth with their bow facing the foreshore, 'bow in', to reduce the potential for prop scour of the seafloor.
- No sewage discharges to the waterway from commercial or recreational vessels are to be allowed.
- Residents should be encouraged to use environmentally friendly and biodegradable products for washing down of above water components.
- Pollution incidents are to be reported as per the Duty to Notify Provisions of the POEO Act 1997.

Waste

Safeguards to be implemented for waste are:

- A Waste Management Plan will be prepared and implemented as part of the CEMP. The Plan will include:
  - Sustainable practices and measures to avoid and minimise waste associated with the proposal.
  - Classification of wastes and management options (re-use, recycle, stockpile, disposal) in accordance with the Waste Classification Guidelines (NSW EPA 2014).
  - Statuary approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions.
  - Procedures for storage, transport and disposal.
  - Monitoring, record keeping and reporting.
  - The Plan will follow the resource management hierarchy principles embodied in the Waste Avoidance and Resource Recovery Act 2001.
- Any demolition products generated should be contained during works and then removed from the site and disposed of appropriately.
- All general solid waste/litter (e.g. food scraps and packaging) generated should be contained to prevent them entering the waterway. This waste should be disposed of appropriately onshore with recycling as required.
- No wastes will be disposed of into the waterway.

Sediments and Soils

Safeguards to be implemented for sediments and soils are as follows:

- Appropriate sediment and erosion management controls to minimise water and sediment quality impacts from surface runoff and in-water activities during both demolition and construction are to be included in the CEMP and implemented by the Contractor(s) in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004).
- All erosion and sediment controls are to be in place prior to the commencement of any construction works, inspected regularly, and maintained throughout construction, and removed only once all disturbed areas have been reinstated.
- A site specific Erosion and Sediment Control Plan (ESCP) will be prepared as part of the CEMP.

Guideline Documents for Marina Operation

The following guideline documents for marinas are recommended to be referred to in the development of the CEMP and OEMP for the SIRSI Marina.

1. Environmental Action for Marinas, Boat Sheds and Slipways (Department of Environment and Climate Change NSW 2007) - https://www.hornsby.nsw.gov.au/__data/assets/pdf_file/0019/125380/Environmental-Action-for-Marinas-Boatsheds-and-Slipways.pdf

2. National biofouling management guidelines for marinas, slipways, boat maintenance and recreational boating facilities (Commonwealth of Australia 2021). https://www.marinepests.gov.au/sites/default/files/Documents/National%20biofouling%20management%20guidelines%20for%20marinas%2C%20slipways%2C%20boat%20maintenance%20and%20recreational%20boating%20facilities.pdf

3. 10 Tips for a Fish Friendly Marina (NSW DPI Fisheries 2016) - https://www.marinas.net.au/documents/item/1085

References

DAWE (2024). EPBC Act Protected Matters Search Tool. http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf

DAWE (2024). Register of Critical Habitat. http://www.environment.gov.au/cgi-bin/sprat/public/publicregisterofcriticalhabitat.pl

DPIE (2024). Area of Outstanding Biodiversity Value register. https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/areas-of-outstanding-biodiversity-value/area-of-outstanding-biodiversity-value-register

DPIE (2024). NSW Fisheries Spatial Data Portal. https://www.dpi.nsw.gov.au/about-us/research-development/spatial-data-portal

NSW DPI (2013). Policy and guidelines for fish habitat conservation and management. Update 2013.

NSW DPI (2024). Register of critical habitat. http://www.dpi.nsw.gov.au/fishing/species-protection/conservation/what/register

NSW Government (2024). Atlas of NSW Wildlife Search. https://www.environment.nsw.gov.au/atlaspublicapp/ui_modules/atlas_/atlassearch.aspx

Marine Pest Sectoral Committee (2021). National biofouling management guidelines for marinas, slipways, boat maintenance and recreational boating facilities, Department of Agriculture, Water and the Environment, Canberra, January. CC BY 4.0. https://www.marinepests.gov.au/sites/default/files/Documents/National%20biofouling%20management%20guidelines%20for%20marinas%2C%20slipways%2C%20boat%20maintenance%20and%20recreational%20boating%20facilities.pdf

Department of Environment and Climate Change NSW (2007). Environmental Action for Marinas, Boat Sheds and Slipways. https://www.hornsby.nsw.gov.au/__data/assets/pdf_file/0019/125380/Environmental-Action-for-Marinas-Boatsheds-and-Slipways.pdf

Appendix A – Plans

CROWN LAND - LICENCE No. 460612

MGA

No.50
TWO STOREY
BRICK & CLAD
RESIDENCE

T H E A V E N U E

PROPOSED VISTA POINT

LOT 8

LOT 4

LOT 1

LOT 2

LOT 7

LOT 6

LOT 3

LOT 5

295
DP 820302

REVISED LEASE BOUNDARIES

INITIAL MARINA DESIGN
SEE DRAWING 11369-003 (E)

GANGWAY

RAMP

JETTY

CONCRETE SEAWALL

ACCESS FLOR

EASEMENT

PROPOSED RIGHT OF CARRIAGEWAY

PROPOSED DRAINAGE EASEMENT

PROPOSED EASEMENT FOR ACCESS

HIGH WATER MARK

FORESHORE BUILDING LINE

NEW HEADWALL

IN-GROUND TRANSMISSION LINE EASEMENT

EXISTING OVERHEAD TRANSMISSION LINE EASEMENT

PITTWATER

22
DP 553811

No.120
1&2 STOREY
RENDERED RESIDENCE

No.118
1&2 STOREY
RENDERED RESIDENCE

21
DP 553811

NOTES:

1. Contour interval generated using sounding dataset at 0.5m intervals.
2. This plan has been prepared at the scale shown for the plot size stated and should be reproduced at that plot size when assessing data.
3. Due to environmental factors, bathymetry and contacts are valid at the time of survey only.
4. This plan should not be relied upon for any other purpose or used by any party outside of the project remit as the plan may not contain sufficient information for that purpose or use.
5. Proposed pile locations and number are indicative only. Final pile specifications by approved engineering plans.
6. Berths are bow in only.

LEGEND:

PRINT IN COLOUR

LOT AND DP:
LOTS 2&3 IN DP 210342
LOT 1 IN DP 503390
LOT 21 IN DP545339
LOTS 111&112 IN DP 556902
LOT 295 IN DP 820302

CLIENT: ESSEX DEVELOP

ADDRESS: 122-128 CRESCENT ROAD, NEWPORT

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02 9521 5737 | www.boxallsurveyors.com.au | ACN 114 644 058

TITLE: PLAN OF PROPOSED MARINA OVERLAY

REV	DATE	REVISION DETAILS

ORIGIN LEVELS: SSM43648 RL 19.333 AHD
AZIMUTH: MGA20 DATUM: CHART
SURVEY: SM DATE: 24.03.2023
DRAWN: SL DATE: 01.05.2024
APPROVED: SL DATE: 01.05.2024
SCALE: 1:200 SHEET 1 OF 1
DRAWING No: 11369-013 REV: - SIZE: A1

Appendix B – NSW DPI Consultation Response

RE: Request for Comment - Proposed Marina, 122 Crescent Rd, Newport

1 message

Craig Blount <craig.blount@dpi.nsw.gov.au> Mon, May 13, 2024 at 2:36 PM
To: ocean environmental <oceanenviron@gmail.com>, Karthika Krishna Pillai <karthika.krishnapillai@dpi.nsw.gov.au>
Cc: Marco Silva <marco@essexdevelop.com.au>, Matt Potter <matt.potter@rhdhv.com>, Mike Jarvin <mj@advancedmm.com.au>, Stephen Ethos jBA Gouge <sgouge@ethosurban.com>

Thankyou for consulting us Katie,

We have no objection to the submission of the DA for a Proposed Marina at 122 Crescent Rd, Newport. In the event the proposal is referred to us by Council, or an agency, we have attached our general requirements for an assessment.

We note that the site is located within a shallow, narrow bay. Given the facilities proposed, we suggest that the AEA determines whether these would change hydrology or e-folding time within the bay and if so, whether this would adversely affect water quality and marine ecology within the bay.

We also note that marine vegetation is located on both sides of the head of the bay. Given that large vessels are proposed to be berthed at the facilities, we suggest that the AEA determines whether prop wash to the seabed (that could potentially constitute dredging) would occur at the berths or during ingress and egress to the bay, and if so, whether this would significantly increase impacts (from present levels) to marine vegetation (e.g. from turbidity, wash, mobilised contaminants) caused by vessel movements generally (ie would impacts from the proposal significantly contribute to cumulative impacts on marine vegetation?).

We hope this is of assistance,

Kind regards, Craig & Karthika

Craig Blount | Senior Fisheries Manager – Coastal Systems Unit

NSW Department of Primary Industries | Fisheries

66 Harrington St, The Rocks, Sydney, NSW, 2000

M: 0418 925 757| E: craig.blount@dpi.nsw.gov.au

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES AVAILABLE AT:
https://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats/toolkit

Submit permit applications via email to: ahp.central@dpi.nsw.gov.au

Turnaround times: from date of receipt of application, please allow up to 28 days for Land Owners Consent, Permits and Consultations. Please allow up to 40 days for Integrated Development Applications.

DPI Fisheries acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

From: ocean environmental <oceanenviron@gmail.com>
Sent: Thursday, 2 May 2024 3:53 PM
To: Karthika Krishna Pillai <karthika.krishnapillai@dpi.nsw.gov.au>; Craig Blount <craig.blount@dpi.nsw.gov.au>
Cc: Marco Silva <marco@essexdevelop.com.au>; Matt Potter <matt.potter@rhdhv.com>; Mike Jarvin <mj@advancedmm.com.au>; Stephen Ethos jBA Gouge <sgouge@ethosurban.com>
Subject: Request for Comment - Proposed Marina, 122 Crescent Rd, Newport

Dear Karthika and Craig,

Following on from our discussion on 15th April, I have attached a formal letter of request for DPI Fisheries to provide comments / requirements for assessment for the proposed marina upgrade at 122 Crescent St, Newport.

It would be appreciated if confirmation of your requirements and any feedback, as well as outlining no objection to the submission of the DA, could be provided by Friday 10 May 2024 if possible.

Thanks in advance,

Katie.

Kind Regards,

Dr Katie Smythe

Ocean Environmental

Marine Consulting Services

e: oceanenviron@gmail.com

p: 0425325410

a: 124 Mitchell St, Merewether, NSW, 2291

General information requirements for environmental assessment .pdf
130K

General information requirements for environmental assessment

Fisheries NSW recommends that development proposals comply with the *Policy and Guidelines for Fish Habitat Conservation and Management (2013)* (referred to hereafter as P&GLs) (found at https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/fish-habitat-conservation)

Issue	Information requirements for environmental assessment
A: General Requirements	▪ site address and contact details ▪ property description (e.g. Lot and DP numbers) ▪ a clear description of the proposal including details of construction methods and materials ▪ map(s) of the development area and adjacent areas - this should include nearby waterways, adjacent infrastructure (such as jetties) and land use ▪ clear photographs of the site (at low and high tide in estuaries), including photographs of any riparian and aquatic vegetation present (including pest species such as *Caulerpa taxifolia*) ▪ location of any oyster leases or other aquaculture facilities and recreational and commercial fishing areas within the subject waterway ▪ a description of the potential direct and indirect impacts on aquaculture, commercial and recreational fishing from the development ▪ a clear description of the physical and hydrological features of the development area (which may extend upstream and downstream of the development site in the case of flowing rivers or tidal waterways) ▪ approximate depth contours within 20 metres of the proposal ▪ a clear description of aquatic environments including: - fish in the locality, including threatened and protected species, populations, ecological communities, pest species or presence of 'critical habitat' under the FM Act or EPBC Act - an aquatic and riparian vegetation survey map of the area which shows the location and/or coverage of saltmarsh, mangrove, seagrass, macroalgae, macrophytes, riparian vegetation and snags - description of aquatic habitat TYPE on site (see Table 1 in the P&GLs) - description of the waterway CLASS (see Table 2 in the P&GLs) ▪ details of the nature, timing, magnitude and duration of the proposed disturbance to the aquatic environment ▪ assessments of predicted impacts upon any threatened species (fish and marine vegetation) (i.e. completion of a 7 part test and/or species impact statement(s)) and other aquatic flora and fauna ▪ details of any mitigation measures to limit environmental impacts ▪ details of the general regional context, any protected areas, other developments in the area, and/or cumulative impacts ▪ a copy of the land owner's consent where relevant ▪ notification of any other matters relevant to the proposal and of interest to NSW DPI
Dredging and reclamation activities	• purpose of works • type(s) and distribution of marine vegetation in the vicinity of the proposed works • method of dredging to be used • timing and duration of works • dimension of area of works including levels and volume of material to be extracted or placed as fill • nature of sediment to be dredged, including Acid Sulphate Soil, contaminated soils etc • method of marking area subject to works • environmental safeguards to be used during and after works • measures for minimising harm to fish habitat under the proposal • spoil type and source location for reclamation activities • method of disposal of dredge material • location and duration of spoil stockpiling, if planned
Activities that damage marine vegetation	• type of marine vegetation to be harmed • map and density distribution of marine vegetation • reasons for harming marine vegetation • methods of harming marine vegetation • construction details • duration of works/activities • measures for minimising harm to marine vegetation under the proposal and details of compensatory habitat development to replace lost vegetation. • method and location of transplanting activities or disposal or marine vegetation.
Activities that block fish passage	• type of activity eg works in a stream that change flow or morphological characteristics • length of time fish passage is to be restricted • timing of proposed restriction • remediation works

B. Aquatic habitat assessment	The aim of the aquatic assessment should be to define the presence of 'key fish habitat' within the study site, adjacent areas (upstream and downstream), and the broader regional area. There may be a range of potential fish habitats that could be impacted by a particular activity. Some points to consider include: ▪ geomorphic characteristics of the waterway (i.e. what characteristics of a CLASS 1-4 waterway does it have (see Table 2 in P&GLs)? Is it a gully, intermittent stream or major river? Does it have deep pools or in-stream gravel beds? Is it a wetland? Does the watercourse connect with other watercourses upstream or downstream? What is the slope/gradient?) ▪ is it mapped as key fish habitat? (see www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats#KFH for maps of key fish habitat per Local Government Area) ▪ flow regime of the watercourse (e.g. is it an intermittent or permanently flowing stream? What is the range of water velocity of the flow? What are the maximum and minimum or percentile flows (in megalitres/day) for the watercourse?) ▪ description of local wave and current regimes (in tidal areas) ▪ description of the water quality (e.g. discolouration, sedimentation, turbidity, pH, dissolved oxygen, nutrients) ▪ types of surrounding land use (e.g. agricultural, urban, aquaculture) ▪ condition of riparian vegetation (i.e. present or absent. Are the species native or exotic? Is the density of vegetation thick or sparse?) ▪ condition of freshwater aquatic vegetation (i.e. present or absent. Are the species native or exotic? Is the density of vegetation thick or sparse? Is it continuous or sparse in coverage? What is the aerial extent of major vegetation types? Is the vegetation healthy or degraded?) ▪ condition of marine vegetation (i.e. information on type, species, shoot density and/or percentage cover. Is the vegetation continuous or sparse in coverage? What is the aerial extent? Is the vegetation healthy or degraded? Is wrack (dead seagrass or macroalgae) present?) ▪ presence of wetlands nearby (including freshwater wetlands and saltmarsh) (i.e. are wetlands protected under any legislation (e.g. SEPP 14 coastal wetlands, Ramsar wetlands)? Are the wetlands in a healthy or degraded condition?) ▪ substrate type (e.g. rock, sand, gravel, silt) ▪ presence of refuge areas (e.g. adjacent wetlands, upstream pools) ▪ presence of spwning areas (e.g. gravel beds, snags, reed beds, saltmarshes) ▪ presence of natural or artificial barriers to fish passage upstream and downstream (e.g. waterfalls, cascades, weirs, dams, floodgates, road crossings) ▪ types of migratory fish or other aquatic species likely to inhabit the areas (based on known distribution range within the scientific literature) ▪ timing of construction in relation to any fish migration seasons ▪ timing of construction in relation to flow conditions relative to expected wet seasons presence of any listed threatened or protected aquatic species or 'critical habitat' under the FM Act and EPBC Act
C. Aquatic fauna assessment	For aquatic fauna studies, sites where fish and/or other aquatic fauna are well documented, and no threatened species are recorded, a site inspection and desktop review of the study site and regional area may be the required level of assessment. During the completion of the planning phase for a new project, it may be determined that a detailed aquatic survey is required. Detailed surveys are to be undertaken only after direct consultation with NSW DPI as permits are required for sampling aquatic fauns under the FM Act. The Department of Planning and Infrastructure has developed a document entitled *Aquatic Ecology in Environmental Impact Assessment* (Lincoln-Smith 2003) which may also assist in the survey design. Note that a detailed survey may be required: a) where the project is on a CLASS 1 or 2 watercourse (see Table 2 in P&GLs) or where it has been identified that there may be a significant impact on a threatened aquatic species; and/or b) where the project crosses through, over or within a 'critical habitat' and a Species Impact Statement is required.
D. Assessment of likely impacts	• indicate the location, nature and extent of habitat removal or modification (both direct and indirect) which may result from the proposed action; • discuss the potential impact of the modification or removal of habitat (potential direct and indirect sources of impact are stated in the letter with this attachment). **Note:** In defining the proposal area, discussion must be provided regarding possible indirect effects of the proposal on species/habitats in the area surrounding the subject site: for example, through altered hydrological regimes, soil erosion or pollution.
E. Ameliorative measures	The environmental assessment should consider and provide detail on how the proposal has been or may be modified and managed to minimise impacts and conserve aquatic habitat on the subject site and in the study area.

Guidelines for assessment

Title	Location
Policy and Guidelines for Fish Habitat Conservation and Management (2013)	https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/fish-habitat-conservation)
Fish Passage Requirements for Waterway Crossings and *Policy (2003) and Guidelines for Fish Friendly Waterway Crossings (2003)*	https://www.dpi.nsw.gov.au/fishing/habitat/threats/barriers
Degradation of native riparian vegetation along NSW watercourses is listed as a key threatening process (KTP) under the Fisheries Management Act DPI-Fisheries recommends that this activity is avoided.	https://www.dpi.nsw.gov.au/fishing/threatened-species/what-current/key-threatening-processes/degradation-of-native-riparian-vegetation

Appendix C – EPBC Act Protected Matters Search

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	8
Listed Threatened Species:	100
Listed Migratory Species:	62

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	18
Commonwealth Heritage Places:	None
Listed Marine Species:	81
Whales and Other Cetaceans:	14
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	11
Key Ecological Features (Marine):	None
Biologically Important Areas:	4
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Natural			
Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves	NSW	Listed place	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community known to occur within area	In feature area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community likely to occur within area	In feature area
Eastern Suburbs Banksia Scrub of the Sydney Region	Critically Endangered	Community may occur within area	In feature area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area	In buffer area only
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	Endangered	Community likely to occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
FISH			
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat known to occur within area	In feature area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Seriolella brama Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Thunnus maccoyii](#) Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
FROG			
[Heleioporus australiacus](#) Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Litoria aurea](#) Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Mixophyes balbus](#) Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area	In feature area
MAMMAL			
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
[Chalinolobus dwyeri](#) Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Dasyurus maculatus maculatus (SE mainland population)](#) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area
[Isoodon obesulus obesulus](#) Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area	In feature area
[Petauroides volans](#) Greater Glider [254]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Petaurus australis australis](#) Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Petrogale penicillata			
Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Potorous tridactylus tridactylus			
Long-nosed Potoroo (northern) [66645]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
OTHER			
Dendronephthya australis			
Cauliflower Soft Coral [90325]	Endangered	Species or species habitat may occur within area	In feature area
PLANT			
Acacia bynoeana			
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area	In feature area
Acacia terminalis subsp. terminalis MS			
Sunshine Wattle (Sydney region) [88882]	Endangered	Species or species habitat likely to occur within area	In feature area
Asterolasia elegans			
[56780]	Endangered	Species or species habitat known to occur within area	In feature area
Caladenia tessellata			
Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Cryptostylis hunteriana			
Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Darwinia biflora [14619]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat known to occur within area	In feature area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat likely to occur within area	In feature area
Grevillea caleyi Caley's Grevillea [9683]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Grevillea shiressii [19186]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Haloragodendron lucasii Hal [6480]	Endangered	Species or species habitat may occur within area	In buffer area only
Kunzea rupestris [8798]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Lasiopetalum joyceae [20311]	Vulnerable	Species or species habitat known to occur within area	In feature area
Leptospermum deanei Deane's Tea-tree [21777]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Microtis angusii Angus's Onion Orchid [64530]	Endangered	Species or species habitat may occur within area	In buffer area only
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat known to occur within area	In feature area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat known to occur within area	In feature area
Prostanthera densa Villous Mintbush [12233]	Vulnerable	Species or species habitat known to occur within area	In feature area
Prostanthera junonis Somersby Mintbush [64960]	Endangered	Species or species habitat may occur within area	In feature area
Prostanthera marifolia Seaforth Mintbush [7555]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area	In buffer area only
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Syzygium paniculatum](#) Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
REPTILE			
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Hoplocephalus bungaroides](#) Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
SHARK			
[Carcharias taurus (east coast population)](#) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
SNAIL			
Meridolum maryae			
Maroubra Woodland Snail, Maroubra Land Snail [89884]	Endangered	Species or species habitat known to occur within area	In feature area

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In feature area
Calonectris leucomelas			
Streaked Shearwater [1077]		Species or species habitat known to occur within area	In feature area
Diomedea antipodensis			
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche carteri			
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta			
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita			
Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche impavida			
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris			
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini			
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi			
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Migratory Marine Species			
Balaenoptera edeni			
Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Caperea marginata			
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
[Symposiachrus trivirgatus as Monarcha trivirgatus](#) Spectacled Monarch [83946]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area	In feature area
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Australian Postal Corporation		
Commonwealth Land - Australian Postal Commission [13228]	NSW	In buffer area only
Commonwealth Land - Australian Postal Commission [13224]	NSW	In buffer area only
Commonwealth Land - Australian Postal Commission [13239]	NSW	In buffer area only
Commonwealth Land - Australian Postal Corporation [16525]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [13223]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [13222]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [13225]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [13221]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [13226]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [13240]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [13241]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [11831]	NSW	In buffer area only

Defence

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - Defence Service Homes Corporation [13220]	NSW	In buffer area only
Defence - PITTWATER DIVING ANNEX (forms part of "RAN Torpedo Range") [10028]	NSW	In buffer area only
Defence - PITTWATER DIVING ANNEX (forms part of "RAN Torpedo Range") [10026]	NSW	In buffer area only
Defence - PITTWATER DIVING ANNEX (forms part of "RAN Torpedo Range") [10027]	NSW	In buffer area only
Defence - Defence Housing Authority		
Commonwealth Land - Defence Housing Authority [13238]	NSW	In buffer area only
Unknown		
Commonwealth Land - [13227]	NSW	In buffer area only

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Anous stolidus			
Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes			
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea as Puffinus griseus			
Sooty Shearwater [82651]		Species or species habitat likely to occur within area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat likely to occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Stercorarius skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area	In buffer area only
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat may occur within area overfly marine area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In feature area
Fish			
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area	In feature area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area	In feature area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In feature area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat known to occur within area	In feature area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In feature area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Stigmatopora nigra](#) Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
[Syngnathoides biaculeatus](#) Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
[Urocampus carinirostris](#) Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
[Vanacampus margaritifer](#) Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area
Mammal			
[Arctocephalus forsteri](#) Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
[Arctocephalus pusillus](#) Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In feature area
[Dugong dugon](#) Dugong [28]		Species or species habitat may occur within area	In feature area
Reptile			
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area	In feature area

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat likely to occur within area	In feature area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Garigal	National Park	NSW	In buffer area only
Ku-ring-gai Chase	National Park	NSW	In buffer area only
Narrabeen	Aquatic Reserve	NSW	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Construction of a high-capacity fibre optic submarine cable	2006/2914	Not Controlled Action	Completed	In feature area
Demolition of Ablutions Block, Snapper Island, NSW	2018/8303	Not Controlled Action	Completed	In feature area
Dog swimming area	2002/870	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Installation of Sydney-Guam Submarine Cable	2007/3848	Not Controlled Action	Completed	In buffer area only
Japan-Guam-Australia Sunshine Coast Branch Marine Cable Route Survey (JGA) QLD	2018/8373	Not Controlled Action	Completed	In buffer area only
Residential subdivision of 62 Hillside Road, Newport, NSW	2017/8044	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Construction and operation of a subsea telecommunications cable, between Sydney and New Zealand	2015/7480	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Japan-Guam-Australia (JGA) Fibre Optic Cable project	2016/7795	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Tasman Global Access submarine cable marine route survey, Narrabeen, NSW	2015/7442	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed	In feature area

Biologically Important Areas			
Scientific Name	Behaviour	Presence	Buffer Status
Dolphins			
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]	Breeding	Likely to occur	In feature area
Seabirds			
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging	Likely to occur	In feature area
Sharks			

Scientific Name	Behaviour	Presence	Buffer Status
Carcharias taurus Grey Nurse Shark [64469]	Foraging	Known to occur	In feature area

Whales			
Megaptera novaeangliae Humpback Whale [38]	Foraging	Known to occur	In feature area

Bioregional Assessments

SubRegion	BioRegion	Website	Buffer Status
Sydney	Sydney Basin	BA website	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of Agriculture Water and the Environment
GPO Box 858
Canberra City ACT 2601 Australia
+61 2 6274 1111

Appendix D – FM Act Schedules

Fisheries Management Act 1994 No 38

Current version for 20 January 2023 to date (accessed 15 May 2023 at 10:39)

Schedule 4

Schedule 4 Endangered species, populations and ecological communities

(Section 220C)

Part 1 Endangered species

Fish

Archaeophya adamsi Fraser, 1959	Adam's Emerald Dragonfly
Austrocordulia leonardi	Sydney Hawk Dragonfly
**Dendronephthya australis* (Kükenthal, 1905)	Cauliflower Soft Coral
Hippocampus whitei (Bleeker, 1855)	White's Seahorse
**Maccullochella ikei* Rowland	Eastern Freshwater Cod
**Maccullochella macquariensis* (Cuvier)	Trout Cod
**Macquaria australasica* (Cuvier, 1830)	Macquarie Perch
Mogurnda adspersa (Castelnau, 1878)	Southern Purplespotted Gudgeon, Purple Spotted Gudgeon
Nannoperca australis Günther, 1861	Southern Pygmy Perch
**Nannoperca oxleyana* Whitley	Oxleyan Pygmy Perch
**Prototroctes maraena* (Günther, 1864)	Australian Grayling
Sphyrna lewini (Griffith & Smith, 1834)	Scalloped Hammerhead Shark
Thunnus maccoyii	Southern Bluefin Tuna

Marine vegetation

Part 2 Endangered populations

Fish

Ambassis agassizii Steindachner, 1866, Agassiz's glassfish, olive perchlet, western New South Wales population

Craterocephalus amniculus (Crowley and Ivanstoff, 1990), Darling River Hardyhead, Hunter River population

Gadopsis marmoratus, river blackfish, Snowy River population

Tandanus tandanus (Mitchell, 1838), freshwater catfish, eel tailed catfish, Murray-Darling Basin population

Marine vegetation

**Posidonia australis* Hook.*f.* (1858), seagrass, Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie populations

Part 3 Endangered ecological communities

Aquatic ecological community in the natural drainage system of the lower Murray River catchment (as described in the recommendation of the Fisheries Scientific Committee to list the ecological community)

Aquatic ecological community in the natural drainage system of the lowland catchment of the Darling River (described in the recommendation of the Fisheries Scientific Committee to list that aquatic ecological community, as the area covered by that recommendation)

Aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River (described in the recommendation of the Fisheries Scientific Committee to list that aquatic ecological community, as the area covered by that recommendation)

Aquatic ecological community in the catchment of the Snowy River in NSW (as described in the final determination of the Fisheries Scientific Committee to list that aquatic ecological community)

Part 4 Species presumed extinct

Fish

Hadrachaeta aspeta Hutchings, 1977	Marine Worm
**Pristis zijsron* Bleeker, 1851	Green Sawfish
Metaprotella haswelliana Mayer, 1882	Haswells Caprellid

Marine vegetation

**Vanvoorstia bennettiana* (Harvey) Papenfuss (1956)	Bennetts Seaweed

Fisheries Management Act 1994 No 38

Current version for 20 January 2023 to date (accessed 15 May 2023 at 10:39)

Schedule 4A

Schedule 4A Critically endangered species and ecological communities

(Section 220C)

Part 1 Critically endangered species

Fish

**Carcharias taurus* Rafinesque, 1810	Greynurse Shark
**Craterocephalus fluviatilis* (McCulloch, 1913)	Murray Hardyhead
Euastacus dharawalus (Morgan, 1997)	Fitzroy Falls Spiny Crayfish
Galaxias rostratus	Flathead Galaxias
Galaxias tantangara (Raadik, 2014)	Stocky Galaxias
Notopala hanleyi (Frauenfeld, 1864)	Hanley's River Snail
Notopala sublineata (Conrad, 1850)	Darling River Snail
Smeagol hilaris Tillier & Ponder, 1992	Marine Slug

Marine vegetation

Nereia lophocladia J. Agardh (1897)	Marine Brown Alga

Part 2 Critically endangered ecological communities

Fisheries Management Act 1994 No 38

Current version for 20 January 2023 to date (accessed 15 May 2023 at 10:39)

Schedule 5

Schedule 5 Vulnerable species and ecological communities

(Section 220C)

Part 1 Vulnerable species

Fish

Austropetalia tonyana (Theischinger, 1995)	Alpine Redspot Dragonfly
Bidyanus bidyanus (Mitchell, 1838)	Silver Perch
Branchinella buchananensis Geddes, 1981	Buchanans Fairy Shrimp
**Carcharodon carcharias* (Linnaeus, 1758)	White Shark, Great White Shark
Epinephelus daemelii (Günther, 1876)	Black Rockcod, Black Cod
Euastacus armatus (von Martens 1866)	Murray Crayfish
Microrchestia bousfieldi Lowry & Peart, 2010	Bousfields Marsh-hopper
Sphyrna mokarran Ruppell, 1837	Great Hammerhead Shark

Marine vegetation

Part 2 Vulnerable ecological communities

Appendix E – BC Act BioNet Atlas of NSW Wildlife

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Animals in selected area [North: -33.61 West: 151.26 East: 151.36 South: -33.71] returned a total of 21,161 records of 451 species.

Report generated on 18/06/2022 4:09 PM

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Actinopterygii	Poeciliidae	T013	*Gambusia holbrooki*	*	Mosquito Fish			3	
Animalia	Amphibia	Myobatrachidae	3134	*Crinia signifera*		Common Eastern Froglet	P		175	
Animalia	Amphibia	Myobatrachidae	3116	*Pseudophryne australis*		Red-crowned Toadlet	V,P		50	
Animalia	Amphibia	Myobatrachidae	3117	*Pseudophryne bibronii*		Bibron's Toadlet	P		1	
Animalia	Amphibia	Myobatrachidae	3158	*Uperoleia laevigata*		Smooth Toadlet	P		6	
Animalia	Amphibia	Hylidae	3166	*Litoria aurea*		Green and Golden Bell Frog	E1,P	V	2	
Animalia	Amphibia	Hylidae	3171	*Litoria caerulea*		Green Tree Frog	P		9	
Animalia	Amphibia	Hylidae	3180	*Litoria dentata*		Bleating Tree Frog	P		2	
Animalia	Amphibia	Hylidae	3183	*Litoria fallax*		Eastern Dwarf Tree Frog	P		69	
Animalia	Amphibia	Hylidae	3184	*Litoria freycineti*		Freycinet's Frog	P		9	
Animalia	Amphibia	Hylidae	3187	*Litoria gracilenta*		Dainty Green Tree Frog	P		14	
Animalia	Amphibia	Hylidae	3191	*Litoria latopalmata*		Broad-palmed Frog	P		2	
Animalia	Amphibia	Hylidae	3204	*Litoria peronii*		Peron's Tree Frog	P		257	
Animalia	Amphibia	Hylidae	3206	*Litoria phyllochroa*		Leaf-green Tree Frog	P		2	
Animalia	Amphibia	Hylidae	3214	*Litoria tyleri*		Tyler's Tree Frog	P		7	
Animalia	Amphibia	Hylidae	3215	*Litoria verreauxii*		Verreaux's Frog	P		15	
Animalia	Amphibia	Limnodynastidae	3042	*Heleioporus australiacus*		Giant Burrowing Frog	V,P	V	21	
Animalia	Amphibia	Limnodynastidae	3058	*Limnodynastes dumerilii*		Eastern Banjo Frog	P		1	
Animalia	Amphibia	Limnodynastidae	3061	*Limnodynastes peronii*		Brown-striped Frog	P		262	
Animalia	Amphibia	Limnodynastidae	3063	*Limnodynastes tasmaniensis*		Spotted Grass Frog	P		4	
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*		Loggerhead Turtle	E1,P	E	3	
Animalia	Reptilia	Cheloniidae	2007	*Chelonia mydas*		Green Turtle	V,P	V	10	
Animalia	Reptilia	Cheloniidae	T110	*Cheloniidae sp.*		unidentified sea turtle	P		3	
Animalia	Reptilia	Chelidae	2017	*Chelodina longicollis*		Eastern Snake-necked Turtle	P		34	
Animalia	Reptilia	Chelidae	2951	*Emydura macquarii macquarii*		Macquarie River Turtle	P		1	
Animalia	Reptilia	Chelidae	9057	*Emydura sp.*		Unidentified Emydura	P		1	
Animalia	Reptilia	Carphodactylidae	2129	*Phyllurus platurus*		Broad-tailed Gecko	P		23	
Animalia	Reptilia	Carphodactylidae	2687	*Saltuarius swaini*		Southern Leaf-tailed Gecko	P		4	
Animalia	Reptilia	Carphodactylidae	2138	*Underwoodisaurus milii*		Thick-tailed Gecko	P		2	
Animalia	Reptilia	Diplodactylidae	2118	*Amalosia lesueurii*		Lesueur's Velvet Gecko	P		3	
Animalia	Reptilia	Pygopodidae	2170	*Lialis burtonis*		Burton's Snake-lizard	P		5	
Animalia	Reptilia	Pygopodidae	2174	*Pygopus lepidopodus*		Common Scaly-foot	P		7	
Animalia	Reptilia	Scincidae	2464	*Acritoscincus platynotus*		Red-throated Skink	P		8	
Animalia	Reptilia	Scincidae	2559	*Concinnia tenuis*		Barred-sided Skink	P		1	
Animalia	Reptilia	Scincidae	5170	*Cryptoblepharus pulcher*		Elegant Snake-eyed Skink	P		2	
Animalia	Reptilia	Scincidae	2331	*Cryptoblepharus virgatus*		Cream-striped Shinning-skink	P		5	
Animalia	Reptilia	Scincidae	2375	*Ctenotus robustus*		Robust Ctenotus	P		1	
Animalia	Reptilia	Scincidae	2386	*Ctenotus taeniolatus*		Copper-tailed Skink	P		8	
Animalia	Reptilia	Scincidae	2408	*Egernia cunninghami*		Cunningham's Skink	P		2	
Animalia	Reptilia	Scincidae	2557	*Eulamprus quoyii*		Eastern Water-skink	P		49	
Animalia	Reptilia	Scincidae	2450	*Lampropholis delicata*		Dark-flecked Garden Sunskink	P		107	
Animalia	Reptilia	Scincidae	2451	*Lampropholis guichenoti*		Pale-flecked Garden Sunskink	P		63	
Animalia	Reptilia	Scincidae	T117	*Lampropholis sp.*		unidentified grass skink	P		5	
Animalia	Reptilia	Scincidae	2430	*Liopholis whitii*		White's Skink	P		4	
Animalia	Reptilia	Scincidae	2542	*Saiphos equalis*		Three-toed Skink	P		13	
Animalia	Reptilia	Scincidae	2452	*Saproscincus mustelinus*		Weasel Skink	P		10	
Animalia	Reptilia	Scincidae	2583	*Tiliqua rugosa*		Shingle-back	P		1	
Animalia	Reptilia	Scincidae	2580	*Tiliqua scincoides*		Eastern Blue-tongue	P		171	
Animalia	Reptilia	Agamidae	2194	*Amphibolurus muricatus*		Jacky Lizard	P		4	
Animalia	Reptilia	Agamidae	2252	*Intellagama lesueurii*		Eastern Water Dragon	P		100	
Animalia	Reptilia	Agamidae	5075	*Intellagama lesueurii lesueurii*		Eastern Water Dragon	P		8	
Animalia	Reptilia	Agamidae	2177	*Pogona barbata*		Bearded Dragon	P		3	
Animalia	Reptilia	Varanidae	2271	*Varanus gouldii*		Gould's Goanna	P		3	

Animalia	Reptilia	Varanidae	2287	*Varanus rosenbergi*		Rosenberg's Goanna	V,P		33
Animalia	Reptilia	Varanidae	9056	*Varanus sp.*		Unidentified Goanna	P		3
Animalia	Reptilia	Varanidae	2283	*Varanus varius*		Lace Monitor	P		48
Animalia	Reptilia	Typhlopidae	2599	*Anilios nigrescens*		Blackish Blind Snake	P		8
Animalia	Reptilia	Pythonidae	2625	*Morelia spilota*		Carpet & Diamond Pythons	P		9
Animalia	Reptilia	Pythonidae	5096	*Morelia spilota spilota*		Diamond Python	P		37
Animalia	Reptilia	Colubridae	2630	*Boiga irregularis*		Brown Tree Snake	P		23
Animalia	Reptilia	Colubridae	2633	*Dendrelaphis punctulatus*		Common Tree Snake	P		93
Animalia	Reptilia	Elapidae	2640	*Acanthophis antarcticus*		Common Death Adder	P		8
Animalia	Reptilia	Elapidae	2647	*Cacophis squamulosus*		Golden-crowned Snake	P		108
Animalia	Reptilia	Elapidae	5136	*Cryptophis nigrescens*		Eastern Small-eyed Snake	P		1
Animalia	Reptilia	Elapidae	2655	*Demansia psammophis*		Yellow-faced Whip Snake	P		9
Animalia	Reptilia	Elapidae	2669	*Furina diadema*		Red-naped Snake	P		2
Animalia	Reptilia	Elapidae	2674	*Hemiaspis signata*		Black-bellied Swamp Snake	P		10
Animalia	Reptilia	Elapidae	2754	*Hydrophis elegans*		Elegant Seasnake	P		1
Animalia	Reptilia	Elapidae	2770	*Hydrophis platurus*		Yellow-bellied Seasnake	P		6
Animalia	Reptilia	Elapidae	2693	*Pseudechis porphyriacus*		Red-bellied Black Snake	P		99
Animalia	Reptilia	Elapidae	2699	*Pseudonaja textilis*		Eastern Brown Snake	P		14
Animalia	Reptilia	Elapidae	2734	*Vermicella annulata*		Bandy-bandy	P		2
Animalia	Aves	Megapodiidae	0008	*Alectura lathami*		Australian Brush-turkey	P		205
Animalia	Aves	Phasianidae	0009	*Coturnix pectoralis*		Stubble Quail	P		1
Animalia	Aves	Phasianidae	9046	*Coturnix sp.*		Unidentified Quail	P		7
Animalia	Aves	Phasianidae	0902	*Gallus gallus*	*	Red Junglefowl			2
Animalia	Aves	Phasianidae	0903	*Pavo cristatus*	*	Indian Peafowl			3
Animalia	Aves	Phasianidae	0950	*Phasianus colchicus*	*	Common Pheasant			1
Animalia	Aves	Phasianidae	0012	*Synoicus chinensis*		King Quail	P		11
Animalia	Aves	Phasianidae	0011	*Synoicus ypsilophora*		Brown Quail	P		2
Animalia	Aves	Anatidae	0210	*Anas castanea*		Chestnut Teal	P		22
Animalia	Aves	Anatidae	0211	*Anas gracilis*		Grey Teal	P		7
Animalia	Aves	Anatidae	0948	*Anas platyrhynchos*	*	Mallard			12
Animalia	Aves	Anatidae	0212	*Anas rhynchotis*		Australasian Shoveler	P		1
Animalia	Aves	Anatidae	0208	*Anas superciliosa*		Pacific Black Duck	P		121
Animalia	Aves	Anatidae	0215	*Aythya australis*		Hardhead	P		5
Animalia	Aves	Anatidae	0217	*Biziura lobata*		Musk Duck	P		3
Animalia	Aves	Anatidae	0202	*Chenonetta jubata*		Australian Wood Duck	P		99
Animalia	Aves	Anatidae	0203	*Cygnus atratus*		Black Swan	P		2
Animalia	Aves	Podicipedidae	0061	*Tachybaptus novaehollandiae*		Australasian Grebe	P		6
Animalia	Aves	Columbidae	0033	*Chalcophaps indica*		Emerald Dove	P		1
Animalia	Aves	Columbidae	0028	*Columba leucomela*		White-headed Pigeon	P		7
Animalia	Aves	Columbidae	0957	*Columba livia*	*	Rock Dove			21
Animalia	Aves	Columbidae	0031	*Geopelia cuneata*		Diamond Dove	P		2
Animalia	Aves	Columbidae	0032	*Geopelia humeralis*		Bar-shouldered Dove	P		9
Animalia	Aves	Columbidae	9931	*Geopelia striata*		Peaceful Dove	P		4
Animalia	Aves	Columbidae	0044	*Leucosarcia melanoleuca*		Wonga Pigeon	P		7
Animalia	Aves	Columbidae	0027	*Lopholaimus antarcticus*		Topknot Pigeon	P		10
Animalia	Aves	Columbidae	0029	*Macropygia phasianella*		Brown Cuckoo-Dove	P		22
Animalia	Aves	Columbidae	0043	*Ocyphaps lophotes*		Crested Pigeon	P		142
Animalia	Aves	Columbidae	0034	*Phaps chalcoptera*		Common Bronzewing	P		5
Animalia	Aves	Columbidae	0035	*Phaps elegans*		Brush Bronzewing	P		7
Animalia	Aves	Columbidae	0021	*Ptilinopus regina*		Rose-crowned Fruit-Dove	V,P		3
Animalia	Aves	Columbidae	0023	*Ptilinopus superbus*		Superb Fruit-Dove	V,P		4
Animalia	Aves	Columbidae	0989	*Spilopelia chinensis*	*	Spotted Turtle-Dove			92
Animalia	Aves	Podargidae	0313	*Podargus strigoides*		Tawny Frogmouth	P		318
Animalia	Aves	Caprimulgidae	0330	*Eurostopodus mystacalis*		White-throated Nightjar	P		1
Animalia	Aves	Aegothelidae	0317	*Aegotheles cristatus*		Australian Owlet-nightjar	P		14
Animalia	Aves	Apodidae	0335	*Apus pacificus*		Fork-tailed Swift	P	C,J,K	2
Animalia	Aves	Apodidae	0334	*Hirundapus caudacutus*		White-throated Needletail	P	V,C,J,K	8
Animalia	Aves	Diomedeidae	0086	*Diomedea exulans*		Wandering Albatross	E1,P	E	1
Animalia	Aves	Diomedeidae	0093	*Phoebetria palpebrata*		Light-mantled Sooty Albatross	P		1
Animalia	Aves	Diomedeidae	0091	*Thalassarche cauta*		Shy Albatross	V,P	V	3
Animalia	Aves	Diomedeidae	0090	*Thalassarche chrysostoma*		Grey-headed Albatross	P	E	1
Animalia	Aves	Diomedeidae	0088	*Thalassarche melanophris*		Black-browed Albatross	V,P	V	1
Animalia	Aves	Procellariidae	0072	*Ardenna carneipes*		Flesh-footed Shearwater	V,P	J,K	1
Animalia	Aves	Procellariidae	0070	*Ardenna grisea*		Sooty Shearwater	P	J	5
Animalia	Aves	Procellariidae	0069	*Ardenna pacifica*		Wedge-tailed Shearwater	P	J	4
Animalia	Aves	Procellariidae	0071	*Ardenna tenuirostris*		Short-tailed Shearwater	P	C,J,K	33
Animalia	Aves	Procellariidae	0085	*Pelecanoides urinatrix*		Common Diving-Petrel	P		1
Animalia	Aves	Procellariidae	0068	*Puffinus gavia*		Fluttering Shearwater	P		6
Animalia	Aves	Procellariidae	0913	*Puffinus huttoni*		Hutton's Shearwater	P		1
Animalia	Aves	Spheniscidae	0005	*Eudyptula minor*		Little Penguin	P		45
Animalia	Aves	Fregatidae	0095	*Fregata ariel*		Lesser Frigatebird	P	C,J,K	1

Animalia	Aves	Sulidae	0104	*Morus serrator*	Australasian Gannet	P		19
Animalia	Aves	Anhingidae	8731	*Anhinga novaehollandiae*	Australasian Darter	P		18
Animalia	Aves	Phalacrocoracidae	0100	*Microcarbo melanoleucos*	Little Pied Cormorant	P		96
Animalia	Aves	Phalacrocoracidae	0096	*Phalacrocorax carbo*	Great Cormorant	P		14
Animalia	Aves	Phalacrocoracidae	T021	*Phalacrocorax sp.*	Unidentified Cormorant	P		19
Animalia	Aves	Phalacrocoracidae	0097	*Phalacrocorax sulcirostris*	Little Black Cormorant	P		38
Animalia	Aves	Phalacrocoracidae	0099	*Phalacrocorax varius*	Pied Cormorant	P		51
Animalia	Aves	Pelecanidae	0106	*Pelecanus conspicillatus*	Australian Pelican	P		77
Animalia	Aves	Ardeidae	0186	*Ardea intermedia*	Intermediate Egret	P		1
Animalia	Aves	Ardeidae	0189	*Ardea pacifica*	White-necked Heron	P		4
Animalia	Aves	Ardeidae	0197	*Botaurus poiciloptilus*	Australasian Bittern	E1,P	E	2
Animalia	Aves	Ardeidae	0977	*Bubulcus ibis*	Cattle Egret	P		4
Animalia	Aves	Ardeidae	0193	*Butorides striata*	Striated Heron	P		14
Animalia	Aves	Ardeidae	8712	*Casmerodius modesta*	Eastern Great Egret	P		8
Animalia	Aves	Ardeidae	0185	*Egretta garzetta*	Little Egret	P		2
Animalia	Aves	Ardeidae	0188	*Egretta novaehollandiae*	White-faced Heron	P		116
Animalia	Aves	Ardeidae	0191	*Egretta sacra*	Eastern Reef Egret	P		3
Animalia	Aves	Ardeidae	8703	*Ixobrychus dubius*	Australian Little Bittern	P		3
Animalia	Aves	Ardeidae	0196	*Ixobrychus flavicollis*	Black Bittern	V,P		13
Animalia	Aves	Ardeidae	0192	*Nycticorax caledonicus*	Nankeen Night Heron	P		8
Animalia	Aves	Threskiornithidae	0181	*Platalea regia*	Royal Spoonbill	P		15
Animalia	Aves	Threskiornithidae	0179	*Threskiornis moluccus*	Australian White Ibis	P		25
Animalia	Aves	Threskiornithidae	0180	*Threskiornis spinicollis*	Straw-necked Ibis	P		5
Animalia	Aves	Accipitridae	0222	*Accipiter cirrocephalus*	Collared Sparrowhawk	P		4
Animalia	Aves	Accipitridae	0221	*Accipiter fasciatus*	Brown Goshawk	P		25
Animalia	Aves	Accipitridae	0220	*Accipiter novaehollandiae*	Grey Goshawk	P		12
Animalia	Aves	Accipitridae	T047	*Accipiter sp.*	Unidentified goshawk	P		1
Animalia	Aves	Accipitridae	0224	*Aquila audax*	Wedge-tailed Eagle	P		13
Animalia	Aves	Accipitridae	0234	*Aviceda subcristata*	Pacific Baza	P		29
Animalia	Aves	Accipitridae	0219	*Circus approximans*	Swamp Harrier	P		6
Animalia	Aves	Accipitridae	0232	*Elanus axillaris*	Black-shouldered Kite	P		13
Animalia	Aves	Accipitridae	0233	*Elanus scriptus*	Letter-winged Kite	P		1
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V,P		42
Animalia	Aves	Accipitridae	0228	*Haliastur sphenurus*	Whistling Kite	P		20
Animalia	Aves	Accipitridae	0225	*Hieraaetus morphnoides*	Little Eagle	V,P		7
Animalia	Aves	Accipitridae	0230	*^^Lophoictinia isura*	Square-tailed Kite	V,P,3		4
Animalia	Aves	Accipitridae	8739	*^^Pandion cristatus*	Eastern Osprey	V,P,3		21
Animalia	Aves	Falconidae	0239	*Falco berigora*	Brown Falcon	P		2
Animalia	Aves	Falconidae	0240	*Falco cenchroides cenchroides*	Nankeen Kestrel	P		27
Animalia	Aves	Falconidae	0235	*Falco longipennis*	Australian Hobby	P		5
Animalia	Aves	Falconidae	0237	*Falco peregrinus*	Peregrine Falcon	P		21
Animalia	Aves	Falconidae	9043	*Falco sp.*	Unidentified Falcon	P		1
Animalia	Aves	Rallidae	0059	*Fulica atra*	Eurasian Coot	P		5
Animalia	Aves	Rallidae	0056	*Gallinula tenebrosa*	Dusky Moorhen	P		35
Animalia	Aves	Rallidae	0046	*Hypotaenidia philippensis*	Buff-banded Rail	P		31
Animalia	Aves	Rallidae	0045	*Lewinia pectoralis*	Lewin's Rail	P		8
Animalia	Aves	Rallidae	0058	*Porphyrio porphyrio*	Purple Swamphen	P		70
Animalia	Aves	Rallidae	0050	*Porzana pusilla*	Baillon's Crake	P		3
Animalia	Aves	Rallidae	0051	*Porzana tabuensis*	Spotless Crake	P		3
Animalia	Aves	Burhinidae	0174	*Burhinus grallarius*	Bush Stone-curlew	E1,P		49
Animalia	Aves	Burhinidae	0175	*Esacus magnirostris*	Beach Stone-curlew	E4A,P		1
Animalia	Aves	Haematopodidae	0131	*Haematopus fuliginosus*	Sooty Oystercatcher	V,P		10
Animalia	Aves	Charadriidae	0140	*Charadrius bicinctus*	Double-banded Plover	P		1
Animalia	Aves	Charadriidae	0136	*Pluvialis squatarola*	Grey Plover	P	C,J,K	1
Animalia	Aves	Charadriidae	0133	*Vanellus miles*	Masked Lapwing	P		147
Animalia	Aves	Charadriidae	0134	*Vanellus miles novaehollandiae*	[Spur-winged Plover]	P		1
Animalia	Aves	Rostratulidae	0170	*Rostratula australis*	Australian Painted Snipe	E1,P	E	3
Animalia	Aves	Scolopacidae	0168	*Gallinago hardwickii*	Latham's Snipe	P	J,K	1
Animalia	Aves	Scolopacidae	0153	*Limosa lapponica*	Bar-tailed Godwit	P	C,J,K	4
Animalia	Aves	Scolopacidae	0149	*Numenius madagascariensis*	Eastern Curlew	P	CE,C,J,K	8
Animalia	Aves	Scolopacidae	0150	*Numenius phaeopus*	Whimbrel	P	C,J,K	2
Animalia	Aves	Scolopacidae	0160	*Xenus cinereus*	Terek Sandpiper	V,P	C,J,K	2
Animalia	Aves	Turnicidae	9037	*Turnix sp.*	Unidentified Button-quail	P		1
Animalia	Aves	Turnicidae	0014	*Turnix varius*	Painted Button-quail	P		5
Animalia	Aves	Laridae	0122	*Anous stolidus*	Common Noddy	P	C,J	1
Animalia	Aves	Laridae	0110	*Chlidonias hybrida*	Whiskered Tern	P		1
Animalia	Aves	Laridae	0125	*Chroicocephalus novaehollandiae*	Silver Gull	P		104
Animalia	Aves	Laridae	0112	*Hydroprogne caspia*	Caspian Tern	P	J	1
Animalia	Aves	Laridae	0126	*Larus pacificus*	Pacific Gull	P		2
Animalia	Aves	Laridae	0953	*Sterna hirundo*	Common Tern	P	C,J,K	1
Animalia	Aves	Laridae	0114	*Sterna striata*	White-fronted Tern	P		1

Animalia	Aves	Laridae	0115	*Thalasseus bergii*	Crested Tern	P	J	20	
Animalia	Aves	Cacatuidae	0269	*Cacatua galerita*	Sulphur-crested Cockatoo	P		426	
Animalia	Aves	Cacatuidae	8878	*Cacatua galerita galerita*		P		1	
Animalia	Aves	Cacatuidae	0271	*Cacatua sanguinea*	Little Corella	P		51	
Animalia	Aves	Cacatuidae	T187	*Cacatua sp.*		P		3	
Animalia	Aves	Cacatuidae	0272	*Cacatua tenuirostris*	Long-billed Corella	P		17	
Animalia	Aves	Cacatuidae	0268	*^^Callocephalon fimbriatum*	Gang-gang Cockatoo	V,P,3	E	2	
Animalia	Aves	Cacatuidae	0265	*^Calyptorhynchus lathami*	Glossy Black-Cockatoo	V,P,2		81	
Animalia	Aves	Cacatuidae	9070	*Calyptorhynchus sp.*	Unidentified Black-cockatoo	P		1	
Animalia	Aves	Cacatuidae	0273	*Eolophus roseicapilla*	Galah	P		97	
Animalia	Aves	Cacatuidae	8867	*Eolophus roseicapilla albiceps*		P		2	
Animalia	Aves	Cacatuidae	0274	*Nymphicus hollandicus*	Cockatiel	P		3	
Animalia	Aves	Cacatuidae	0267	*Zanda funereus*	Yellow-tailed Black-Cockatoo	P		24	
Animalia	Aves	Psittacidae	0281	*Alisterus scapularis*	Australian King-Parrot	P		98	
Animalia	Aves	Psittacidae	0258	*Glossopsitta concinna*	Musk Lorikeet	P		39	
Animalia	Aves	Psittacidae	0260	*Glossopsitta pusilla*	Little Lorikeet	V,P		10	
Animalia	Aves	Psittacidae	0309	*^^Lathamus discolor*	Swift Parrot	E1,P,3	CE	17	
Animalia	Aves	Psittacidae	0310	*Melopsittacus undulatus*	Budgerigar	P		2	
Animalia	Aves	Psittacidae	0302	*^^Neophema pulchella*	Turquoise Parrot	V,P,3		1	
Animalia	Aves	Psittacidae	0282	*Platycercus elegans*	Crimson Rosella	P		47	
Animalia	Aves	Psittacidae	8893	*Platycercus elegans elegans*		P		1	
Animalia	Aves	Psittacidae	0288	*Platycercus eximius*	Eastern Rosella	P		98	
Animalia	Aves	Psittacidae	T039	*Platycercus sp.*	Unidentified Rosella	P		6	
Animalia	Aves	Psittacidae	0256	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	P		27	
Animalia	Aves	Psittacidae	9947	*Trichoglossus haematodus*	Rainbow Lorikeet	P		1181	
Animalia	Aves	Psittacidae	8882	*Trichoglossus haematodus moluccanus*		P		5	
Animalia	Aves	Cuculidae	0338	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	P		23	
Animalia	Aves	Cuculidae	0339	*Cacomantis variolosus*	Brush Cuckoo	P		1	
Animalia	Aves	Cuculidae	0349	*Centropus phasianinus*	Pheasant Coucal	P		21	
Animalia	Aves	Cuculidae	0342	*Chalcites basalis*	Horsfield's Bronze-Cuckoo	P		5	
Animalia	Aves	Cuculidae	0343	*Chalcites lucidus*	Shining Bronze-Cuckoo	P		10	
Animalia	Aves	Cuculidae	8922	*Cuculus optatus*	Oriental Cuckoo	P	C,J,K	2	
Animalia	Aves	Cuculidae	0347	*Eudynamys orientalis*	Eastern Koel	P		60	
Animalia	Aves	Cuculidae	8930	*Eudynamys orientalis cyanocephala*		P		1	
Animalia	Aves	Cuculidae	0337	*Heteroscenes pallidus*	Pallid Cuckoo	P		2	
Animalia	Aves	Cuculidae	0348	*Scythrops novaehollandiae*	Channel-billed Cuckoo	P		74	
Animalia	Aves	Strigidae	0246	*^^Ninox connivens*	Barking Owl	V,P,3		28	
Animalia	Aves	Strigidae	9922	*Ninox novaeseelandiae*	Southern Boobook	P		72	
Animalia	Aves	Strigidae	0248	*^^Ninox strenua*	Powerful Owl	V,P,3		501	
Animalia	Aves	Tytonidae	9923	*Tyto javanica*	Eastern Barn Owl	P		13	
Animalia	Aves	Tytonidae	0250	*^^Tyto novaehollandiae*	Masked Owl	V,P,3		4	
Animalia	Aves	Alcedinidae	0319	*Ceyx azureus*	Azure Kingfisher	P		24	
Animalia	Aves	Alcedinidae	0322	*Dacelo novaeguineae*	Laughing Kookaburra	P		603	
Animalia	Aves	Alcedinidae	0324	*Todiramphus macleayii*	Forest Kingfisher	P		2	
Animalia	Aves	Alcedinidae	0326	*Todiramphus sanctus*	Sacred Kingfisher	P		53	
Animalia	Aves	Meropidae	0329	*Merops ornatus*	Rainbow Bee-eater	P		1	
Animalia	Aves	Coraciidae	0318	*Eurystomus orientalis*	Dollarbird	P		83	
Animalia	Aves	Pittidae	0352	*Pitta versicolor*	Noisy Pitta	P		8	
Animalia	Aves	Menuridae	0350	*Menura novaehollandiae*	Superb Lyrebird	P		37	
Animalia	Aves	Climacteridae	0558	*Cormobates leucophaea*	White-throated Treecreeper	P		20	
Animalia	Aves	Ptilonorhynchidae	0679	*Ptilonorhynchus violaceus*	Satin Bowerbird	P		6	
Animalia	Aves	Maluridae	0529	*Malurus cyaneus*	Superb Fairy-wren	P		181	
Animalia	Aves	Maluridae	0536	*Malurus lamberti*	Variegated Fairy-wren	P		44	
Animalia	Aves	Maluridae	8131	*Malurus lamberti lamberti*		P		2	
Animalia	Aves	Maluridae	9038	*Malurus sp.*	Unidentified Fairy-wren	P		1	
Animalia	Aves	Acanthizidae	0486	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	P		5	
Animalia	Aves	Acanthizidae	0470	*Acanthiza lineata*	Striated Thornbill	P		7	
Animalia	Aves	Acanthizidae	0471	*Acanthiza nana*	Yellow Thornbill	P		17	
Animalia	Aves	Acanthizidae	0475	*Acanthiza pusilla*	Brown Thornbill	P		52	
Animalia	Aves	Acanthizidae	0484	*Acanthiza reguloides*	Buff-rumped Thornbill	P		2	
Animalia	Aves	Acanthizidae	9042	*Acanthiza sp.*	Unidentified Thornbill	P		1	
Animalia	Aves	Acanthizidae	0460	*Gerygone levigaster*	Mangrove Gerygone	P		2	
Animalia	Aves	Acanthizidae	0454	*Gerygone mouki*	Brown Gerygone	P		17	
Animalia	Aves	Acanthizidae	0453	*Gerygone olivacea*	White-throated Gerygone	P		4	
Animalia	Aves	Acanthizidae	0498	*Hylacola pyrrhopygia*	Chestnut-rumped Heathwren	P		6	
Animalia	Aves	Acanthizidae	0505	*Origma solitaria*	Rockwarbler	P		1	
Animalia	Aves	Acanthizidae	0488	*Sericornis frontalis*	White-browed Scrubwren	P		101	
Animalia	Aves	Acanthizidae	0465	*Smicrornis brevirostris*	Weebill	P		4	
Animalia	Aves	Pardalotidae	0565	*Pardalotus punctatus*	Spotted Pardalote	P		102	
Animalia	Aves	Pardalotidae	0976	*Pardalotus striatus*	Striated Pardalote	P		11	
Animalia	Aves	Meliphagidae	0591	*Acanthorhynchus tenuirostris*	Eastern Spinebill	P		70	

Animalia	Aves	Meliphagidae	0638	*Anthochaera carunculata*	Red Wattlebird	P		146
Animalia	Aves	Meliphagidae	0710	*Anthochaera chrysoptera*	Little Wattlebird	P		112
Animalia	Aves	Meliphagidae	0603	*Anthochaera phrygia*	Regent Honeyeater	E4A,P	CE	39
Animalia	Aves	Meliphagidae	T210	*Anthochaera sp.*	Unidentified Wattlebird	P		14
Animalia	Aves	Meliphagidae	0614	*Caligavis chrysops*	Yellow-faced Honeyeater	P		51
Animalia	Aves	Meliphagidae	0641	*Entomyzon cyanotis*	Blue-faced Honeyeater	P		1
Animalia	Aves	Meliphagidae	0619	*Lichenostomus melanops*	Yellow-tufted Honeyeater	P		22
Animalia	Aves	Meliphagidae	0597	*Lichmera indistincta*	Brown Honeyeater	P		2
Animalia	Aves	Meliphagidae	0634	*Manorina melanocephala*	Noisy Miner	P		444
Animalia	Aves	Meliphagidae	0633	*Manorina melanophrys*	Bell Miner	P		3
Animalia	Aves	Meliphagidae	0605	*Meliphaga lewinii*	Lewin's Honeyeater	P		61
Animalia	Aves	Meliphagidae	0583	*Melithreptus brevirostris*	Brown-headed Honeyeater	P		2
Animalia	Aves	Meliphagidae	8303	*Melithreptus gularis gularis*	Black-chinned Honeyeater (eastern subspecies)	V,P		1
Animalia	Aves	Meliphagidae	0578	*Melithreptus lunatus*	White-naped Honeyeater	P		7
Animalia	Aves	Meliphagidae	0586	*Myzomela sanguinolenta*	Scarlet Honeyeater	P		19
Animalia	Aves	Meliphagidae	0617	*Nesoptilotis leucotis*	White-eared Honeyeater	P		12
Animalia	Aves	Meliphagidae	0646	*Philemon citreogularis*	Little Friarbird	P		2
Animalia	Aves	Meliphagidae	0645	*Philemon corniculatus*	Noisy Friarbird	P		15
Animalia	Aves	Meliphagidae	0632	*Phylidonyris niger*	White-cheeked Honeyeater	P		71
Animalia	Aves	Meliphagidae	8339	*Phylidonyris niger niger*		P		2
Animalia	Aves	Meliphagidae	0631	*Phylidonyris novaehollandiae*	New Holland Honeyeater	P		80
Animalia	Aves	Meliphagidae	0613	*Ptilotula fusca*	Fuscous Honeyeater	P		5
Animalia	Aves	Meliphagidae	0625	*Ptilotula penicillata*	White-plumed Honeyeater	P		3
Animalia	Aves	Cinclosomatidae	0436	*Cinclosoma punctatum*	Spotted Quail-thrush	P		1
Animalia	Aves	Psophodidae	0421	*Psophodes olivaceus*	Eastern Whipbird	P		201
Animalia	Aves	Neosittidae	0549	*Daphoenositta chrysoptera*	Varied Sittella	V,P		3
Animalia	Aves	Campephagidae	0424	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	P		78
Animalia	Aves	Campephagidae	8525	*Coracina novaehollandiae melanops*		P		5
Animalia	Aves	Pachycephalidae	0408	*Colluricincla harmonica*	Grey Shrike-thrush	P		16
Animalia	Aves	Pachycephalidae	0398	*Pachycephala pectoralis*	Golden Whistler	P		41
Animalia	Aves	Pachycephalidae	0401	*Pachycephala rufiventris*	Rufous Whistler	P		13
Animalia	Aves	Pachycephalidae	8426	*Pachycephala rufiventris rufiventris*		P		2
Animalia	Aves	Oriolidae	0671	*Oriolus sagittatus*	Olive-backed Oriole	P		30
Animalia	Aves	Oriolidae	0432	*Sphecotheres vieilloti*	Australasian Figbird	P		31
Animalia	Aves	Artamidae	8519	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V,P		1
Animalia	Aves	Artamidae	0543	*Artamus leucoryn*	White-breasted Woodswallow	P		3
Animalia	Aves	Artamidae	0544	*Artamus personatus*	Masked Woodswallow	P		2
Animalia	Aves	Artamidae	0700	*Cracticus nigrogularis*	Pied Butcherbird	P		32
Animalia	Aves	Artamidae	T022	*Cracticus sp.*	Unidentified Butcherbird	P		30
Animalia	Aves	Artamidae	0702	*Cracticus torquatus*	Grey Butcherbird	P		146
Animalia	Aves	Artamidae	8489	*Cracticus torquatus torquatus*		P		4
Animalia	Aves	Artamidae	0705	*Gymnorhina tibicen*	Australian Magpie	P		407
Animalia	Aves	Artamidae	8499	*Gymnorhina tibicen tibicen*		P		4
Animalia	Aves	Artamidae	0694	*Strepera graculina*	Pied Currawong	P		232
Animalia	Aves	Artamidae	T906	*Strepera sp.*		P		4
Animalia	Aves	Artamidae	0697	*Strepera versicolor*	Grey Currawong	P		5
Animalia	Aves	Dicruridae	0673	*Dicrurus bracteatus*	Spangled Drongo	P		14
Animalia	Aves	Rhipiduridae	0361	*Rhipidura albiscapa*	Grey Fantail	P		72
Animalia	Aves	Rhipiduridae	8447	*Rhipidura albiscapa alisteri*		P		3
Animalia	Aves	Rhipiduridae	0364	*Rhipidura leucophrys*	Willie Wagtail	P		80
Animalia	Aves	Rhipiduridae	0362	*Rhipidura rufifrons*	Rufous Fantail	P		9
Animalia	Aves	Corvidae	0930	*Corvus coronoides*	Australian Raven	P		152
Animalia	Aves	Corvidae	9067	*Corvus sp.*	Unidentified Corvid	P		9
Animalia	Aves	Monarchidae	0415	*Grallina cyanoleuca*	Magpie-lark	P		64
Animalia	Aves	Monarchidae	0373	*Monarcha melanopsis*	Black-faced Monarch	P		14
Animalia	Aves	Monarchidae	0366	*Myiagra cyanoleuca*	Satin Flycatcher	P		4
Animalia	Aves	Monarchidae	9955	*Myiagra inquieta*	Restless Flycatcher	P		1
Animalia	Aves	Monarchidae	0365	*Myiagra rubecula*	Leaden Flycatcher	P		10
Animalia	Aves	Monarchidae	9078	*Myiagra sp.*	unidentified Flycatcher	P		1
Animalia	Aves	Petroicidae	0392	*Eopsaltria australis*	Eastern Yellow Robin	P		85
Animalia	Aves	Petroicidae	0380	*Petroica boodang*	Scarlet Robin	V,P		2
Animalia	Aves	Petroicidae	0384	*Petroica rosea*	Rose Robin	P		6
Animalia	Aves	Cisticolidae	0525	*Cisticola exilis*	Golden-headed Cisticola	P		2
Animalia	Aves	Acrocephalidae	0524	*Acrocephalus australis*	Australian Reed-Warbler	P		21
Animalia	Aves	Acrocephalidae	8584	*Acrocephalus australis australis*		P		1
Animalia	Aves	Locustellidae	0509	*Cincloramphus mathewsi*	Rufous Songlark	P		1
Animalia	Aves	Locustellidae	0523	*Cincloramphus timoriensis*	Tawny Grassbird	P		6
Animalia	Aves	Locustellidae	0522	*Poodytes gramineus*	Little Grassbird	P		9
Animalia	Aves	Hirundinidae	0357	*Hirundo neoxena*	Welcome Swallow	P		121
Animalia	Aves	Hirundinidae	0359	*Petrochelidon nigricans*	Tree Martin	P		3

Animalia	Aves	Pycnonotidae	0990	*Pycnonotus jocosus*	*	Red-whiskered Bulbul			62
Animalia	Aves	Turdidae	0991	*Turdus merula*	*	Eurasian Blackbird			2
Animalia	Aves	Turdidae	0779	*Zoothera lunulata*		Bassian Thrush	P		7
Animalia	Aves	Sturnidae	0998	*Acridotheres tristis*	*	Common Myna			80
Animalia	Aves	Sturnidae	0999	*Sturnus vulgaris*	*	Common Starling			23
Animalia	Aves	Zosteropidae	0574	*Zosterops lateralis*		Silvereye	P		97
Animalia	Aves	Dicaeidae	0564	*Dicaeum hirundinaceum*		Mistletoebird	P		12
Animalia	Aves	Estrildidae	0662	*Neochmia temporalis*		Red-browed Finch	P		93
Animalia	Aves	Estrildidae	8621	*Neochmia temporalis temporalis*			P		4
Animalia	Aves	Estrildidae	0655	*Stizoptera bichenovii*		Double-barred Finch	P		10
Animalia	Aves	Passeridae	0995	*Passer domesticus*	*	House Sparrow			17
Animalia	Mammalia	Ornithorhynchidae	1001	*Ornithorhynchus anatinus*		Platypus	P		4
Animalia	Mammalia	Tachyglossidae	1003	*Tachyglossus aculeatus*		Short-beaked Echidna	P		32
Animalia	Mammalia	Dasyuridae	1027	*Antechinus flavipes*		Yellow-footed Antechinus	P		1
Animalia	Mammalia	Dasyuridae	1956	*Antechinus mimetes*		Mainland Dusky Antechinus	P		3
Animalia	Mammalia	Dasyuridae	T093	*Antechinus sp.*		Unidentified Antechinus	P		4
Animalia	Mammalia	Dasyuridae	1674	*Antechinus stuartii*		Brown Antechinus	P		66
Animalia	Mammalia	Dasyuridae	1008	*Dasyurus maculatus*		Spotted-tailed Quoll	V,P	E	12
Animalia	Mammalia	Peramelidae	1710	*Isoodon obesulus obesulus*		Southern Brown Bandicoot (eastern)	E1,P	E	18
Animalia	Mammalia	Peramelidae	9047	*Isoodon sp.*		Unidentified Brown Bandicoot	P		1
Animalia	Mammalia	Peramelidae	T081	*Isoodon/Perameles sp.*		unidentified Bandicoot	P		73
Animalia	Mammalia	Peramelidae	1097	*Perameles nasuta*		Long-nosed Bandicoot	P		881
Animalia	Mammalia	Phascolarctidae	1162	*Phascolarctos cinereus*		Koala	E1,P	E	66
Animalia	Mammalia	Burramyidae	1150	*Cercartetus nanus*		Eastern Pygmy-possum	V,P		407
Animalia	Mammalia	Petauridae	1138	*Petaurus breviceps*		Sugar Glider	P		44
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*		Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill	E2,V,P		1
Animalia	Mammalia	Petauridae	1137	*Petaurus norfolcensis*		Squirrel Glider	V,P		7
Animalia	Mammalia	Petauridae	T084	*Petaurus sp.*		Glider	P		1
Animalia	Mammalia	Pseudocheiridae	1129	*Pseudocheirus peregrinus*		Common Ringtail Possum	P		1574
Animalia	Mammalia	Acrobatidae	1147	*Acrobates pygmaeus*		Feathertail Glider	P		59
Animalia	Mammalia	Phalangeridae	1736	*Trichosurus cunninghami*		Mountain Brushtail Possum	P		1
Animalia	Mammalia	Phalangeridae	T082	*Trichosurus sp.*		brushtail possum	P		45
Animalia	Mammalia	Phalangeridae	1113	*Trichosurus vulpecula*		Common Brushtail Possum	P		1102
Animalia	Mammalia	Phalangeridae	1739	*Trichosurus vulpecula vulpecula*			P		1
Animalia	Mammalia	Macropodidae	T108	*Macropod sp.*		unidentified macropod	P		1
Animalia	Mammalia	Macropodidae	1265	*Macropus giganteus*		Eastern Grey Kangaroo	P		2
Animalia	Mammalia	Macropodidae	T085	*Macropus sp.*		kangaroo / wallaby	P		60
Animalia	Mammalia	Macropodidae	1261	*Notamacropus rufogriseus*		Red-necked Wallaby	P		1
Animalia	Mammalia	Macropodidae	1266	*Osphranter robustus*		Common Wallaroo	P		1
Animalia	Mammalia	Macropodidae	1242	*Wallabia bicolor*		Swamp Wallaby	P		2290
Animalia	Mammalia	Pteropodidae	1280	*Pteropus poliocephalus*		Grey-headed Flying-fox	V,P	V	140
Animalia	Mammalia	Pteropodidae	T087	*Pteropus sp.*		Flying-fox	P		31
Animalia	Mammalia	Rhinolophidae	1303	*Rhinolophus megaphyllus*		Eastern Horseshoe-bat	P		34
Animalia	Mammalia	Emballonuridae	1321	*Saccolaimus flaviventris*		Yellow-bellied Sheathtail-bat	V,P		1
Animalia	Mammalia	Molossidae	1324	*Austronomus australis*		White-striped Freetail-bat	P		27
Animalia	Mammalia	Molossidae	1329	*Micronomus norfolkensis*		Eastern Coastal Free-tailed Bat	V,P		22
Animalia	Mammalia	Molossidae	T454	*Molossidae sp.*		unidentified mastiff bat	P		11
Animalia	Mammalia	Molossidae	1940	*Ozimops planiceps*		South-eastern Free-tailed Bat			1
Animalia	Mammalia	Molossidae	1938	*Ozimops ridei*		Eastern Free-tailed Bat	P		31
Animalia	Mammalia	Vespertilionidae	1353	*Chalinolobus dwyeri*		Large-eared Pied Bat	V,P	V	18
Animalia	Mammalia	Vespertilionidae	1349	*Chalinolobus gouldii*		Gould's Wattled Bat	P		89
Animalia	Mammalia	Vespertilionidae	1351	*Chalinolobus morio*		Chocolate Wattled Bat	P		14
Animalia	Mammalia	Vespertilionidae	1372	*Falsistrellus tasmaniensis*		Eastern False Pipistrelle	V,P		3
Animalia	Mammalia	Vespertilionidae	1357	*Myotis macropus*		Southern Myotis	V,P		39
Animalia	Mammalia	Vespertilionidae	1334	*Nyctophilus gouldi*		Gould's Long-eared Bat	P		3
Animalia	Mammalia	Vespertilionidae	T092	*Nyctophilus sp.*		long-eared bat	P		6
Animalia	Mammalia	Vespertilionidae	1361	*Scoteanax rueppellii*		Greater Broad-nosed Bat	V,P		8
Animalia	Mammalia	Vespertilionidae	1365	*Scotorepens orion*		Eastern Broad-nosed Bat	P		6
Animalia	Mammalia	Vespertilionidae	1022	*Vespadelus darlingtoni*		Large Forest Bat	P		3
Animalia	Mammalia	Vespertilionidae	1377	*Vespadelus pumilus*		Eastern Forest Bat	P		2
Animalia	Mammalia	Vespertilionidae	1378	*Vespadelus regulus*		Southern Forest Bat	P		5
Animalia	Mammalia	Vespertilionidae	T088	*Vespadelus sp.*		Unidentified Eptesicus	P		3
Animalia	Mammalia	Vespertilionidae	1025	*Vespadelus troughtoni*		Eastern Cave Bat	V,P		2
Animalia	Mammalia	Vespertilionidae	1379	*Vespadelus vulturnus*		Little Forest Bat	P		30
Animalia	Mammalia	Miniopteridae	1346	*Miniopterus australis*		Little Bent-winged Bat	V,P		59
Animalia	Mammalia	Miniopteridae	3330	*Miniopterus orianae oceanensis*		Large Bent-winged Bat	V,P		100
Animalia	Mammalia	Muridae	1415	*Hydromys chrysogaster*		Water-rat	P		6
Animalia	Mammalia	Muridae	1412	*Mus musculus*	*	House Mouse			17
Animalia	Mammalia	Muridae	1455	*Pseudomys novaehollandiae*		New Holland Mouse	P	V	3

Animalia	Mammalia	Muridae	1395	*Rattus fuscipes*		Bush Rat	P		408
Animalia	Mammalia	Muridae	1398	*Rattus lutreolus*		Swamp Rat	P		10
Animalia	Mammalia	Muridae	1409	*Rattus norvegicus*	*	Brown Rat			9
Animalia	Mammalia	Muridae	1408	*Rattus rattus*	*	Black Rat			154
Animalia	Mammalia	Muridae	T094	*Rattus sp.*		rat	P		2
Animalia	Mammalia	Dugongidae	1558	*Dugong dugon*		Dugong	E1,P		1
Animalia	Mammalia	Otariidae	1882	*Arctocephalus pusillus doriferus*		Australian Fur-seal	V,P		1
Animalia	Mammalia	Otariidae	T099	*Arctocephalus sp.*		Unidentified Fur-seal	P		4
Animalia	Mammalia	Otariidae	9040	*Seal sp.*		Unidentified Seal	P		9
Animalia	Mammalia	Phocidae	1549	*Hydrurga leptonyx*		Leopard Seal	P		2
Animalia	Mammalia	Canidae	1905	*Canis familiaris*	*	Dog			27
Animalia	Mammalia	Canidae	1531	*Canis lupus*	*	Dingo, domestic dog			15
Animalia	Mammalia	Canidae	1532	*Vulpes vulpes*	*	Fox			57
Animalia	Mammalia	Felidae	1536	*Felis catus*	*	Cat			37
Animalia	Mammalia	Leporidae	1510	*Oryctolagus cuniculus*	*	Rabbit			65
Animalia	Mammalia	Equidae	1512	*Equus caballus*	*	Horse			6
Animalia	Mammalia	Bovidae	1518	*Bos taurus*	*	European cattle			1
Animalia	Mammalia	Balaenidae	1561	*Eubalaena australis*		Southern Right Whale	E1,P	E	3
Animalia	Mammalia	Balaenopteridae	1575	*Megaptera novaeangliae*		Humpback Whale	V,P	V	5
Animalia	Mammalia	Physeteridae	1578	*Physeter macrocephalus*		Sperm Whale	V,P		2
Animalia	Mammalia	Kogiidae	1581	*Kogia breviceps*		Pygmy Sperm Whale	P		1
Animalia	Mammalia	Delphinidae	1616	*Delphinus delphis*		Common Dolphin	P		4
Animalia	Mammalia	Delphinidae	9039	*Dolphin sp.*		Unidentified Dolphin	P		2
Animalia	Mammalia	Delphinidae	1606	*Globicephala melas*		Long-finned Pilot Whale	P		1
Animalia	Mammalia	Delphinidae	1625	*Lagenorhynchus obscurus*		Dusky Dolphin	P		1
Animalia	Mammalia	Delphinidae	1899	*Tursiops aduncus*		Indo-Pacific Bottlenose Dolphin	P		3
Animalia	Mammalia	Delphinidae	1900	*Tursiops truncatus*		Bottlenose Dolphin	P		4
Animalia	Arachnida	Hexathelidae	I018	*Atrax robustus*		Sydney funnelweb spider			1
Animalia	Arachnida	Araneidae	I203	*Argiope keyserlingi*		St Andrew's Cross spider			2
Animalia	Arachnida	Tetragnathidae	I210	*Nephila edulis*		Australian Golden Orb-weaving Spider			1
Animalia	Arachnida	Tetragnathidae	I132	*Nephila plumipes*					3
Animalia	Arachnida	Tetragnathidae	I103	*Phonognatha graeffei*		leafcurling spider			3
Animalia	Insecta	Chrysomelidae	I040	*Agasicles hygrophila*	*	Alligatorweed flea beetle			1
Animalia	Insecta	Curculionidae	I041	*Cyrtobagous salviniae*	*	Salvinia weevil			1
Animalia	Insecta	Apidae	I081	*Apis mellifera*	*	honey bee			1
Animalia	Insecta	Apidae	I012	*Nomia sp.*					1
Animalia	Insecta	Libellulidae	I197	*Diplacodes bipunctata*		Wandering Percher			1
Animalia	Insecta	Libellulidae	I151	*Diplacodes haematodes*		scarlet percher			1
Animalia	Insecta	Libellulidae	I079	*Orthetrum caledonicum*		blue skimmer			2
Animalia	Gastropoda	Camaenidae	I093	*Meridolum sp.*					1
Animalia	Unknown	Unknown Fauna	T350	*Fauna sp.*		Unidentified Fauna			62
Animalia	Unknown	Unknown Fauna	T351	*Mammal sp.*		Unidentified Mammal			4
Animalia	Unknown	Unknown Fauna	T202	*Microchiroptera suborder*		Unidentified Microbat			15
Animalia	Unknown	Unknown Fauna	T1049	*Possum sp.*		unidentified possum			13
Animalia	Unknown	Unknown Fauna	9117	*Reptile sp.*		Unidentified Reptile			2
Animalia	Insecta	Coenagrionidae	I147	*Ischnura heterosticta*		common bluetail			1

Appendix F – Sediment Quality Results

									Summary Statistcs				ANZG (2018)
		Site	S1	S2	S3	S4	S5	S6	Min	Max	Average	Median	DSQGVs
Analyte grouping/Analyte	Unit	LOR											
EA002: pH 1:5 (Soils)													
pH Value	pH Unit	0.1	8.1	8.1	8.2	8.2	8.2	8.2	8.10	8.20	8.17	8.20	
EA003 :pH (field /fox)													
pH (F)	pH Unit	0.1	----	8.1	8.1	8.1	8.2	----	8.10	8.20	8.13	8.10	
pH (Fox)	pH Unit	0.1	----	7.3	7.2	7.1	7.2	----	7.10	7.30	7.20	7.20	
Reaction Rate	Reaction Unit	1	----	4	4	4	4	----	4.00	4.00	4.00	4.00	
EA029-A: pH Measurements													
pH KCl (23A)	pH Unit	0.1	----	8.7	8.6	8.8	8.8	----	8.60	8.80	8.73	8.75	
pH OX (23B)	pH Unit	0.1	----	7.7	7.5	7.8	8	----	7.50	8.00	7.75	7.75	
EA029-B: Acidity Trail													
Titratable Actual Acidity (23F)	mole H+ / t	2	----	<2	<2	<2	<2	----					
Titratable Peroxide Acidity (23G)	mole H+ / t	2	----	<2	<2	<2	<2	----					
Titratable Sulfidic Acidity (23H)	mole H+ / t	2	----	<2	<2	<2	<2	----					
sulfidic - Titratable Actual Acidity (s-23F)	% pyrite S	0.020	----	<0.020	<0.020	<0.020	<0.020	----					
sulfidic - Titratable Peroxide Acidity (s-23G)	% pyrite S	0.020	----	<0.020	<0.020	<0.020	<0.020	----					
sulfidic - Titratable Sulfidic Acidity (s-23H)	% pyrite S	0.020	----	<0.020	<0.020	<0.020	<0.020	----					
EA029-C: Sulfur Trail													
KCl Extractable Sulfur (23Ce)	%S	0.020	----	0.11	0.088	0.089	0.097	----	0.09	0.11	0.10	0.09	
Peroxide Sulfur (23De)	%S	0.020	----	0.408	0.576	0.448	0.358	----	0.36	0.58	0.45	0.43	
Peroxide Oxidisable Sulfur (23E)	%S	0.020	----	0.298	0.488	0.359	0.261	----	0.26	0.49	0.35	0.33	
acidity - Peroxide Oxidisable Sulfur (a-23E)	mole H+ / t	10	----	186	304	224	162	----	162.00	304.00	219.00	205.00	
EA029-D: Calcium Values													
KCl Extractable Calcium (23Vh)	% Ca	0.020	----	0.271	0.217	0.205	0.223	----	0.21	0.27	0.23	0.22	
Peroxide Calcium (23Wh)	% Ca	0.020	----	1.4	1.38	0.849	1.47	----	0.85	1.47	1.27	1.39	
Acid Reacted Calcium (23X)	% Ca	0.020	----	1.13	1.16	0.644	1.24	----	0.64	1.24	1.04	1.15	
acidity - Acid Reacted Calcium (a-23X)	mole H+ / t	10	----	565	581	322	621	----	322.00	621.00	522.25	573.00	
sulfidic - Acid Reacted Calcium (s-23X)	%S	0.020	----	0.905	0.932	0.515	0.996	----	0.52	1.00	0.84	0.92	
EA029-E: Magnesium Values													
KCl Extractable Magnesium (23Sm)	% Mg	0.020	----	0.171	0.131	0.122	0.145	----	0.12	0.17	0.14	0.14	
Peroxide Magnesium (23Tm)	% Mg	0.020	----	0.296	0.207	0.21	0.234	----	0.21	0.30	0.24	0.22	
Acid Reacted Magnesium (23U)	% Mg	0.020	----	0.124	0.076	0.087	0.09	----	0.08	0.12	0.09	0.09	
Acidity - Acid Reacted Magnesium (a-23U)	mole H+ / t	10	----	102	63	72	74	----	63.00	102.00	77.75	73.00	
sulfidic - Acid Reacted Magnesium (s-23U)	%S	0.020	----	0.164	0.101	0.115	0.118	----	0.10	0.16	0.12	0.12	
EA029-F: Excess Acid Neutralising Capacity													
Excess Acid Neutralising Capacity (23Q)	% CaCO3	0.020	----	3.38	2.71	1.56	3.55	----	1.56	3.55	2.80	3.05	
acidity - Excess Acid Neutralising Capacity (a-23Q)	mole H+ / t	10	----	675	542	311	710	----	311.00	710.00	559.50	608.50	
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	%S	0.020	----	1.08	0.868	0.498	1.14	----	0.50	1.14	0.90	0.97	
EA029-H: Acid Base Accounting													
ANC Fineness Factor		0.5	----	1.5	1.5	1.5	1.5	----	1.50	1.50	1.50	1.50	
Net Acidity (sulfur units)	%S	0.02	----	<0.02	<0.02	<0.02	<0.02	----					
Net Acidity (acidity units)	mole H+ / t	10	----	<10	<10	<10	<10	----					
Liming Rate	kg CaCO3/t	1	----	<1	<1	<1	<1	----					
Net Acidity excluding ANC (sulfur units)	%S	0.02	----	0.3	0.49	0.36	0.26	----	0.26	0.49	0.35	0.33	
Net Acidity excluding ANC (acidity units)	mole H+ / t	10	----	186	304	224	162	----	162.00	304.00	219.00	205.00	
Liming Rate excluding ANC	kg CaCO3/t	1	----	14	23	17	12	----	12.00	23.00	16.50	15.50	
EA055: Moisture Content (Dried @ 105-110°C)													
Moisture Content	%	1.0	35.1	43.5	29	39.2	40.2	35.2	29.00	43.50	37.03	37.20	
EA150: Particle Sizing													
+75µm	%	1	36	54	80	39	39	44	36.00	80.00	48.67	41.50	
+150µm	%	1	22	39	50	19	14	17	14.00	50.00	26.83	20.50	
+300µm	%	1	16	24	16	8	5	5	5.00	24.00	12.33	12.00	
+425µm	%	1	15	18	7	5	3	3	3.00	18.00	8.50	6.00	
+600µm	%	1	14	15	4	4	2	2	2.00	15.00	6.83	4.00	
+1180µm	%	1	12	11	2	2	1	1	1.00	12.00	4.83	2.00	
+2.36mm	%	1	10	8	<1	1	<1	<1	1.00	10.00	6.33	8.00	
+4.75mm	%	1	<1	<1	<1	<1	<1	<1					
+9.5mm	%	1	<1	<1	<1	<1	<1	<1					
+19.0mm	%	1	<1	<1	<1	<1	<1	<1					
+37.5mm	%	1	<1	<1	<1	<1	<1	<1					
+75.0mm	%	1	<1	<1	<1	<1	<1	<1					
EA150: Soil Classification based on Particle Size													
Clay (<2 µm)	%	1	26	21	14	23	23	24	14.00	26.00	21.83	23.00	
Silt (2-60 µm)	%	1	33	24	5	36	33	30	5.00	36.00	26.83	31.50	
Sand (0.06-2.00 mm)	%	1	31	46	80	40	43	45	31.00	80.00	47.50	44.00	
Gravel (>2mm)	%	1	10	9	1	1	1	1	1.00	10.00	3.83	1.00	
Cobbles (>6cm)	%	1	<1	<1	<1	<1	<1	<1					
EG005(ED093)-SD: Total Metals in Sediments by ICP-AES													
Aluminium	mg/kg	50	5970	6460	4170	8010	7000	5760	4170.00	8010.00	6228.33	6215.00	
Iron	mg/kg	50	20800	30800	21000	34700	27700	25700	20800.00	34700.00	26783.33	26700.00	
EG005(ED093)T: Total Metals by ICP-AES													
Barium	mg/kg	10	40	50	80	70	40	40	40.00	80.00	53.33	45.00	
Beryllium	mg/kg	1	<1	<1	<1	<1	<1	<1					
Molybdenum	mg/kg	2	<2	<2	2	2	<2	<2	2.00	2.00	2.00	2.00	
Tin	mg/kg	5	<5	18	17	8	<5	<5	8.00	18.00	14.33	17.00	
Thallium	mg/kg	5	<5	<5	<5	<5	<5	<5					
EG020-SD: Total Metals in Sediments by ICPMS													
Antimony	mg/kg	0.50	<0.50	0.73	<0.50	<0.50	<0.50	<0.50	0.73	0.73	0.73	0.73	2.00
Arsenic	mg/kg	1.00	16.5	15.9	8.76	20.3	17.2	20.6	8.76	20.60	16.54	16.85	20.00
Cadmium	mg/kg	0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	0.30	0.30	0.30	0.30	1.50
Chromium	mg/kg	1.0	15.4	19.1	22.4	22.1	16.2	14.6	14.60	22.40	18.30	17.65	80.00
Copper	mg/kg	1.0	209	834	1220	564	320	246	209.00	1220.00	565.50	442.00	65.00
Cobalt	mg/kg	0.5	2.4	2.8	2	2.8	1.9	1.9	1.90	2.80	2.30	2.20	
Lead	mg/kg	1.0	34.5	102	58.4	73.3	49.6	46.5	34.50	102.00	60.72	54.00	50.00
Manganese	mg/kg	10	74	89	57	87	71	65	57.00	89.00	73.83	72.50	
Nickel	mg/kg	1.0	4	8.2	11.1	6.7	4.5	4.2	4.00	11.10	6.45	5.60	21.00
Selenium	mg/kg	0.1	0.3	0.3	0.2	0.4	0.3	0.3	0.20	0.40	0.30	0.30	
Silver	mg/kg	0.1	0.2	0.2	0.2	0.3	0.1	0.1	0.10	0.30	0.18	0.20	1.00
Vanadium	mg/kg	2.0	38.7	36.3	22.5	44.9	36	35.7	22.50	44.90	35.68	36.15	
Zinc	mg/kg	1.0	116	356	314	239	152	128	116.00	356.00	217.50	195.50	200.00
EG035T: Total Recoverable Mercury by FIMS													
Mercury	mg/kg	0.01	0.7	0.68	0.66	1.66	2.17	1.25	0.66	2.17	1.19	0.98	
EK057G: Nitrite as N by Discrete Analyser													
Nitrite as N (Sol.)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EK058G: Nitrate as N by Discrete Analyser													
Nitrate as N (Sol.)	mg/kg	0.1	0.2	0.3	0.1	0.1	0.2	0.1	0.10	0.30	0.17	0.15	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser													
Nitrite + Nitrate as N (Sol.)	mg/kg	0.1	0.2	0.3	0.1	0.1	0.2	0.1	0.10	0.30	0.17	0.15	
EP003: Total Organic Carbon (TOC) in Soil													
Total Organic Carbon	%	0.02	1.5	3.52	3.57	2.33	2.22	1.76	1.50	3.57	2.48	2.28	
EP068C: Triazines													
Atrazine	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					
Simazine	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					
EP069: Toxaphene													
Toxaphene	mg/kg	2	<2	<2	<2	<2	<2	<2					
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons													
C6 - C9 Fraction	mg/kg	3	<3	<3	<3	<3	<3	<3					
C10 - C14 Fraction	mg/kg	3	<6	45	56	20	6	13	6.00	56.00	28.00	20.00	550.00
C15 - C28 Fraction	mg/kg	3	101	352	397	194	138	183	101.00	397.00	227.50	188.50	550.00
C29 - C36 Fraction	mg/kg	5	103	388	406	230	155	197	103.00	406.00	246.50	213.50	550.00
C10 - C36 Fraction (sum)	mg/kg	3	204	785	859	444	299	393	204.00	859.00	497.33	418.50	550.00
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons													
C6 - C10 Fraction	mg/kg	3	<3	4	8	<3	<3	<3	4.00	8.00	6.00	6.00	
>C10 - C16 Fraction	mg/kg	3	<12	66	76	26	<12	25	25.00	76.00	48.25	46.00	
C6 - C10 Fraction minus BTEX (F1)	mg/kg	3.0	<3.0	4	8	<3.0	<3.0	<3.0	4.00	8.00	6.00	6.00	
>C16 - C34 Fraction	mg/kg	3	161	541	593	318	226	286	161.00	593.00	354.17	302.00	
>C34 - C40 Fraction	mg/kg	5	82	335	348	203	134	168	82.00	348.00	211.67	185.50	
>C10 - C40 Fraction (sum)	mg/kg	3	243	942	1020	547	360	479	243.00	1020.00	598.50	513.00	
EP080-SD: BTEXN													
Benzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					
Toluene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					
Ethylbenzene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					
meta- & para-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					
ortho-Xylene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					
Total Xylenes	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
Sum of BTEX	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					
Naphthalene	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					
EP090: Organotin Compounds													
Monobutyltin	µgSn/kg	1	4	66	23	13	6	4	4.00	66.00	19.33	9.50	
Dibutyltin	µgSn/kg	1	14	157	85	95	34	19	14.00	157.00	67.33	59.50	
Tributyltin	µgSn/kg	0.5	139	2010	1550	750	197	118	118.00	2010.00	794.00	473.50	9.00
EP130A: Organophosphorus Pesticides (Ultra-trace)													
Bromophos-ethyl	µg/kg	10	<10	<10	<10	<10	<10	<10					
Carbophenothion	µg/kg	10	<10	<10	<10	<10	<10	<10					
Chlorfenvinphos (E)	µg/kg	10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0					
Chlorfenvinphos (Z)	µg/kg	10	<10	<10	<10	<10	<10	<10					
Chlorpyrifos	µg/kg	10	<10	<10	<10	<10	<10	<10					

Chlorpyrifos-methyl	µg/kg	10	<10	<10	<10	<10	<10	<10					
Demeton-S-methyl	µg/kg	10	<10	<10	<10	<10	<10	<10					
Diazinon	µg/kg	10	<10	<10	<10	<10	<10	<10					
Dichlorvos	µg/kg	10	<10	<10	<10	<10	<10	<10					
Dimethoate	µg/kg	10	<10	<10	<10	<10	<10	<10					
Ethion	µg/kg	10	<10	<10	<10	<10	<10	<10					
Fenamiphos	µg/kg	10	<10	<10	<10	<10	<10	<10					
Fenthion	µg/kg	10	<10	<10	<10	<10	<10	<10					
Malathion	µg/kg	10	<10	<10	<10	<10	<10	<10					
Azinphos Methyl	µg/kg	10	<10	<10	<10	<10	<10	<10					
Monocrotophos	µg/kg	10	<10	<10	<10	<10	<10	<10					
Parathion	µg/kg	10	<10	<10	<10	<10	<10	<10					
Parathion-methyl	µg/kg	10	<10	<10	<10	<10	<10	<10					
Pirimphos-ethyl	µg/kg	10	<10	<10	<10	<10	<10	<10					
Prothiofos	µg/kg	10	<10	<10	<10	<10	<10	<10					
EP131A: Organochlorine Pesticides													
Aldrin	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
alpha-BHC	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
beta-BHC	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
delta-BHC	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
4,4`-DDD	µg/kg	0.50	<0.50	27.4	102	11.6	5.76	2.02	2.02	102.00	29.76	11.60	
4,4`-DDE	µg/kg	0.50	2.44	26.6	79.9	21.4	9.12	4.41	2.44	79.90	23.98	15.26	
4,4`-DDT	µg/kg	0.50	<0.50	30.2	45.1	14.7	10.4	11.4	10.40	45.10	22.36	14.70	
Sum of DDD + DDE + DDT	µg/kg	0.50	2.44	84.2	227	47.7	25.3	17.8	2.44	227.00	67.41	36.50	
Dieldrin	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					2.80
alpha-Endosulfan	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
beta-Endosulfan	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
Endosulfan sulfate	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
Endosulfan (sum)	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
Endrin	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					2.70
Endrin aldehyde	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
Endrin ketone	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
Heptachlor	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
Heptachlor epoxide	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
Hexachlorobenzene (HCB)	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
gamma-BHC	µg/kg	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25					
Methoxychlor	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
cis-Chlordane	µg/kg	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25					
trans-Chlordane	µg/kg	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25					
Total Chlordane (sum)	µg/kg	0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25					
Oxychlordane	µg/kg	0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					
EP131B: Polychlorinated Biphenyls (as Aroclors)													
Total Polychlorinated biphenyls	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					34.00
Aroclor 1016	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					
Aroclor 1221	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					
Aroclor 1232	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					
Aroclor 1242	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					
Aroclor 1248	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					
Aroclor 1254	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					
Aroclor 1260	µg/kg	5.0	<15.6	<15.6	<15.6	<15.6	<15.6	<15.6					
EP132B: Polynuclear Aromatic Hydrocarbons													
Naphthalene	µg/kg	5	<25	56	60	<25	<25	<5	56.00	60.00	58.00	58.00	
2-Methylnaphthalene	µg/kg	5	<25	<25	<25	<25	<25	<5					
Acenaphthylene	µg/kg	4	29	53	57	54	41	29	29.00	57.00	43.83	47.00	
Acenaphthene	µg/kg	4	<25	<25	36	<25	<25	5	5.00	36.00	20.50	20.50	
Fluorene	µg/kg	4	<25	<25	28	<25	<25	6	6.00	28.00	17.00	17.00	
Phenanthrene	µg/kg	4	96	134	113	118	89	63	63.00	134.00	102.17	104.50	
Anthracene	µg/kg	4	30	50	44	50	34	25	25.00	50.00	38.83	39.00	
Fluoranthene	µg/kg	4	225	317	252	292	222	136	136.00	317.00	240.67	238.50	
Pyrene	µg/kg	4	221	315	289	296	226	135	135.00	315.00	247.00	257.50	
Benz(a)anthracene	µg/kg	4	89	139	154	124	101	66	66.00	154.00	112.17	112.50	
Chrysene	µg/kg	4	90	144	168	122	101	93	90.00	168.00	119.67	111.50	
Benzo(b+j)fluoranthene	µg/kg	4	109	166	200	148	120	93	93.00	200.00	139.33	134.00	
Benzo(k)fluoranthene	µg/kg	4	63	85	129	87	50	46	46.00	129.00	76.67	74.00	
Benzo(e)pyrene	µg/kg	4	73	114	150	102	82	60	60.00	150.00	96.83	92.00	
Benzo(a)pyrene	µg/kg	4	129	190	234	178	141	102	102.00	234.00	162.33	159.50	
Perylene	µg/kg	4	34	50	61	49	37	28	28.00	61.00	43.17	43.00	
Benzo(g.h.i)perylene	µg/kg	4	97	149	175	134	104	71	71.00	175.00	121.67	119.00	
Dibenz(a.h)anthracene	µg/kg	4	<25	26	38	<25	<25	12	12.00	38.00	25.33	26.00	
Indeno(1.2.3.cd)pyrene	µg/kg	4	72	110	133	100	77	54	54.00	133.00	91.00	88.50	
Coronene	µg/kg	5	<25	54	60	46	36	26	26.00	60.00	44.40	46.00	
Sum of PAHs	µg/kg	4	1360	2150	2380	1900	1460	1050	1050.00	2380.00	1716.67	1680.00	10000.00
EP201: Carbamate Pesticides by LCMS													
Oxamyl	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Methomyl	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
3-Hydroxy Carbofuran	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Aldicarb	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Bendiocarb	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Thiodicarb	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Carbofuran	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Carbaryl	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Methiocarb	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
EP202A: Phenoxyacetic Acid Herbicides by LCMS													
4-Chlorophenoxy acetic acid	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
2.4-DB	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Dicamba	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Mecoprop	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
MCPA	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
2.4-DP	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
2.4-D	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Triclopyr	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
2.4.5-TP (Silvex)	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
2.4.5-T	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
MCPB	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Picloram	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Clopyralid	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
Fluroxypyr	mg/kg	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					
EP068S: Organochlorine Pesticide Surrogate													
Dibromo-DDE	%	0.05	100	76.3	92.1	84.2	82	94.4	76.30	100.00	88.17	88.15	
EP068T: Organophosphorus Pesticide Surrogate													
DEF	%	0.05	101	79.6	95.6	86.3	82.8	94.8	79.60	101.00	90.02	90.55	
EP069: Surrogate													
Decachlorobiphenyl	%	0.1	105	102	114	109	95	104	95.00	114.00	104.83	104.50	
EP080-SD: TPH(V)/BTEX Surrogates													
1.2-Dichloroethane-D4	%	0.2	92.7	107	115	95.4	106	99.6	92.70	115.00	102.62	102.80	
Toluene-D8	%	0.2	87.9	97.3	107	93.1	99.8	94.6	87.90	107.00	96.62	95.95	
4-Bromofluorobenzene	%	0.2	88	93.1	98.8	88.3	95	89.5	88.00	98.80	92.12	91.30	
EP090S: Organotin Surrogate													
Tripropyltin	%	0.5	ND	ND	ND	ND	ND	ND					
EP130S: Organophosphorus Pesticide Surrogate													
DEF	%	10	74.1	49.4	70.5	58.5	82	62.2	49.40	82.00	66.12	66.35	
EP131S: OC Pesticide Surrogate													
Dibromo-DDE	%	0.50	63.3	50.4	56.3	58.2	66.1	51.4	50.40	66.10	57.62	57.25	
EP131T: PCB Surrogate													
Decachlorobiphenyl	%	0.5	65.6	109	71.9	53.1	68.8	62.5	53.10	109.00	71.82	67.20	
EP132T: Base/Neutral Extractable Surrogates													
2-Fluorobiphenyl	%	10	127	121	114	108	113	89.9	89.90	127.00	112.15	113.50	
Anthracene-d10	%	10	154	112	103	121	117	102	102.00	154.00	118.17	114.50	
4-Terphenyl-d14	%	10	132	115	119	122	118	85.1	85.10	132.00	115.18	118.50	
EP201S: Carbamate Surrogate													
4-Bromo-3.5-dimethylphenyl-N-methylcarbamate	%	0.02	108	104	104	106	109	108	104.00	109.00	106.50	107.00	
EP202S: Phenoxyacetic Acid Herbicide Surrogate													
2.4-Dichlorophenyl Acetic Acid	%	0.02	58.8	64.7	53.6	58.3	54.9	56	53.60	64.70	57.72	57.15	

Appendix G – Sediment Quality Laboratory Reports

Appendix F – Sediment Laboratory Reports

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Sammy Soliman, Essex Develop	TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date): 5 days	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Newcastle	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact?	Yes / No / N/A
PROJECT: Sirsi Marina PROJECT NO.:	ALS QUOTE NO.: SY/014/22	COC SEQUENCE NUMBER (Circle)	
ORDER NUMBER: NA PURCHASE ORDER NO.: NA	COUNTRY OF ORIGIN: Australia	COC: 1 2 3 4 5 6 7	
PROJECT MANAGER: Katie Smythe	CONTACT PH: 0425 325 410	OF: 1 2 3 4 5 6 7	
SAMPLER: Katie Smythe	SAMPLER MOBILE: 0425 325 410	Free ice / frozen ice bricks present upon receipt?	(Yes) / No / N/A
COC Emailed to ALS? Yes	EDD FORMAT (or default):	Random Sample Temperature on Receipt:	°C
Email Reports to: oceanenviron@gmail.com		Other comment:	-10.1
Email Invoice to: sammy@essexdevelop.com.au, oceanenviron@gmail.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Katie Newton			PP
DATE/TIME: 3/5/22	DATE/TIME: 3-5-22 2:50	DATE/TIME: 3.5.22 5m	DATE/TIME: 3/5/22 2240

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Marine Sediments. All samples immediatley FROZEN on 1/5/22 after sampling and for delivery. Please HOLD ALL REMAINING SAMPLE from each jar in case of potential future analysis.

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	EA150H	EP003	EA055-103	EN020D	EA003	EN020PR	EA029	SD-03	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	S1	1/05/2022	S	1 x plastic bag, 2 x jar	3	x	x	x	x				x	
2	S2	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
3	S3	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
4	S4	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
5	S5	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
6	S6	1/05/2022	S	1 x plastic bag, 2 x jar	3	x	x	x	x				x	
					TOTAL	22								

EP90 / ALS Brisbane
EP69 / ALS Melbourne

Subcon / Forward Lab / Split WO
Lab / Analysis: H7-6
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
WO No: ES 2215086
Attached By PO / Internal Sheet

Environmental Division
Sydney
Work Order Reference
ES2215086

Telephone : +61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preser Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0690 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Sammy Soliman, Essex Develop	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☐ Standard TAT (List due date): 5 days ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle) Custody Seal Intact? Yes No N/A Free ice / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: -10.1 °C Other comment:
OFFICE: Newcastle			
PROJECT: Sirsi Marina PROJECT NO.:	ALS QUOTE NO.: SY/014/22	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	
ORDER NUMBER: NA PURCHASE ORDER NO.: NA	COUNTRY OF ORIGIN: Australia		
PROJECT MANAGER: Katie Smythe CONTACT PH: 0425 325 410			
SAMPLER: Katie Smythe SAMPLER MOBILE: 0425 325 410	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:
COC Emailed to ALS? Yes EDD FORMAT (or default):	*Katie Newton*		
Email Reports to: oceanenviron@gmail.com	DATE/TIME: 3/5/22	DATE/TIME: 3-5-22 2:50	DATE/TIME: 3.5.22 5pm
Email Invoice to: sammy@essexdevelop.com.au, oceanenviron@gmail.com			RECEIVED BY: PP DATE/TIME: 3/5/22 7:40

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Marine Sediments. All samples immediatley FROZEN on 1/5/22 after sampling and for delivery. Please HOLD ALL REMAINING SAMPLE from each jar in case of potential future analysis.

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	EG005T(solids)	SD-02	EP080-SD	EP071-SD	EP090(solids)	EN34	EA002	EK058G (solids)	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	S1	1/05/2022	S	1 x plastic bag, 2 x jar	3	x	x	x	x	x	x	x	x	
	S2	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
	S3	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
	S4	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
	S5	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x	x	x	x	x	
	S6	1/05/2022	S	1 x plastic bag, 2 x jar	3	x	x	x	x	x	x	x	x	
				TOTAL	22									

LAB OF ORIGIN: NEWCASTLE

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

☐GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5800 E: gladstone@alsglobal.com

☐MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

☐NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsglobal.com

☐WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT: Sammy Soliman, Essex Develop	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): 5 days ☐ Non Standard or urgent TAT (List due date):	**FOR LABORATORY USE ONLY (Circle)** Custody Seal Intact? Yes No (N/A) Free ice / frozen ice bricks present upon receipt? (Yes) No N/A Random Sample Temperature on Receipt: °C Other comment: −10.1
OFFICE: Newcastle			
PROJECT: Sirsi Marina **PROJECT NO.:**	**ALS QUOTE NO.:** SY/014/22	**COC SEQUENCE NUMBER (Circle)** COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7	
ORDER NUMBER: NA **PURCHASE ORDER NO.:** NA	**COUNTRY OF ORIGIN:** Australia		
PROJECT MANAGER: Katie Smythe **CONTACT PH:** 0425 325 410			
SAMPLER: Katie Smythe **SAMPLER MOBILE:** 0425 325 410	**RELINQUISHED BY:** *Katie Newton* DATE/TIME: 3/5/22	**RECEIVED BY:** DATE/TIME: 3.5.22 2:50	**RELINQUISHED BY:** DATE/TIME: 3.5.22 5pm
COC Emailed to ALS? Yes **EDD FORMAT (or default):**			**RECEIVED BY:** PM DATE/TIME: 3/5/22 7:04
Email Reports to: oceanenviron@gmail.com			
Email Invoice to: sammy@essexdevelop.com.au, oceanenviron@gmail.com			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Marine Sediments. All samples immediatley FROZEN on 1/5/22 after sampling and for delivery. Please HOLD ALL REMAINING SAMPLE from each jar in case of potential future analysis.

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	EP202 (solids)	EP201 (solids)	EP068C	EP069					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	S1	1/05/2022	S	1 x plastic bag, 2 x jar	3	x	x	x	x					
	S2	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x					
	S3	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x					
	S4	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x					
	S5	1/05/2022	S	2 x plastic bag, 2 x jar	4	x	x	x	x					
	S6	1/05/2022	S	1 x plastic bag, 2 x jar	3	x	x	x	x					
				TOTAL	22									

LAB QA/QC WE

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES2215086**	Page	: 1 of 19
Client	: **OCEAN ENVIRONMENTAL**	Laboratory	: Environmental Division Sydney
Contact	: DR KATHRYN SMYTHE	Contact	: Customer Services ES
Address	: 124 MITCHELL STREET MEREWETHER 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Sirisi Marina	Date Samples Received	: 03-May-2022 14:50
Order number	: ----	Date Analysis Commenced	: 05-May-2022
C-O-C number	: ----	Issue Date	: 23-May-2022 15:01
Sampler	: Kaite Smythe		
Site	: ----		
Quote number	: SY/014/22		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Organics, Stafford, QLD
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP090-Organotin: Sample 'S3' shows poor duplicate results due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- EA150H: Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1 2006 was not requested by the client. Typical sediment SPD values used for calculations and consequently NATA endorsement does not apply to hydrometer results.
- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP068: Where reported, Total OCP is the sum of the reported concentrations of all Organochlorine Pesticides at or above LOR.
- EP080-SD: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP131A: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP131A : Positive OC results are confirmed by re-extraction and re-analysis.
- ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5
- EP090-Organotin: Particular samples required dilution due to the presence of high level contaminants. Surrogate recovery has not been determined.
- EP132B-SD : Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- EP131B : Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- ASS: EA029 (SPOCAS): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime ($CaCO_3$) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m3 in-situ soil, multiply reported results x wet bulk density of soil in t/m3.
- ASS: EA003 (NATA Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	S1	S2	S3	S4	S5
			Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.1	8.1	8.2	8.2	8.2
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	----	8.1	8.1	8.1	8.2
pH (Fox)	----	0.1	pH Unit	----	7.3	7.2	7.1	7.2
Reaction Rate	----	1	Reaction Unit	----	4	4	4	4
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	8.7	8.6	8.8	8.8
pH OX (23B)	----	0.1	pH Unit	----	7.7	7.5	7.8	8.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.020	% pyrite S	----	<0.020	<0.020	<0.020	<0.020
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.020	% pyrite S	----	<0.020	<0.020	<0.020	<0.020
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.020	% pyrite S	----	<0.020	<0.020	<0.020	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.020	% S	----	0.110	0.088	0.089	0.097
Peroxide Sulfur (23De)	----	0.020	% S	----	0.408	0.576	0.448	0.358
Peroxide Oxidisable Sulfur (23E)	----	0.020	% S	----	0.298	0.488	0.359	0.261
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	186	304	224	162
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.020	% Ca	----	0.271	0.217	0.205	0.223
Peroxide Calcium (23Wh)	----	0.020	% Ca	----	1.40	1.38	0.849	1.47
Acid Reacted Calcium (23X)	----	0.020	% Ca	----	1.13	1.16	0.644	1.24
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	565	581	322	621
sulfidic - Acid Reacted Calcium (s-23X)	----	0.020	% S	----	0.905	0.932	0.515	0.996
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.020	% Mg	----	0.171	0.131	0.122	0.145
Peroxide Magnesium (23Tm)	----	0.020	% Mg	----	0.296	0.207	0.210	0.234
Acid Reacted Magnesium (23U)	----	0.020	% Mg	----	0.124	0.076	0.087	0.090
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	102	63	72	74

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	S1	S2	S3	S4	S5
			Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values - Continued								
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.020	% S	----	0.164	0.101	0.115	0.118
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	----	3.38	2.71	1.56	3.55
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	675	542	311	710
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	----	1.08	0.868	0.498	1.14
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	----	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	----	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	----	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.30	0.49	0.36	0.26
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	186	304	224	162
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	14	23	17	12
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	35.1	43.5	29.0	39.2	40.2
EA150: Particle Sizing								
+75µm	----	1	%	36	54	80	39	39
+150µm	----	1	%	22	39	50	19	14
+300µm	----	1	%	16	24	16	8	5
+425µm	----	1	%	15	18	7	5	3
+600µm	----	1	%	14	15	4	4	2
+1180µm	----	1	%	12	11	2	2	1
+2.36mm	----	1	%	10	8	<1	1	<1
+4.75mm	----	1	%	<1	<1	<1	<1	<1
+9.5mm	----	1	%	<1	<1	<1	<1	<1
+19.0mm	----	1	%	<1	<1	<1	<1	<1
+37.5mm	----	1	%	<1	<1	<1	<1	<1
+75.0mm	----	1	%	<1	<1	<1	<1	<1
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	26	21	14	23	23
Silt (2-60 µm)	----	1	%	33	24	5	36	33

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S1	S2	S3	S4	S5
				Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
					Result	Result	Result	Result	Result
EA150: Soil Classification based on Particle Size - Continued									
Sand (0.06-2.00 mm)	----	1	%		31	46	80	40	43
Gravel (>2mm)	----	1	%		10	9	1	1	1
Cobbles (>6cm)	----	1	%		<1	<1	<1	<1	<1
EG005(ED093)-SD: Total Metals in Sediments by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		5970	6460	4170	8010	7000
Iron	7439-89-6	50	mg/kg		20800	30800	21000	34700	27700
EG005(ED093)T: Total Metals by ICP-AES									
Barium	7440-39-3	10	mg/kg		40	50	80	70	40
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Molybdenum	7439-98-7	2	mg/kg		<2	<2	2	2	<2
Tin	7440-31-5	5	mg/kg		<5	18	17	8	<5
Thallium	7440-28-0	5	mg/kg		<5	<5	<5	<5	<5
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg		<0.50	0.73	<0.50	<0.50	<0.50
Arsenic	7440-38-2	1.00	mg/kg		16.5	15.9	8.76	20.3	17.2
Cadmium	7440-43-9	0.1	mg/kg		<0.1	0.3	<0.1	<0.1	<0.1
Chromium	7440-47-3	1.0	mg/kg		15.4	19.1	22.4	22.1	16.2
Copper	7440-50-8	1.0	mg/kg		209	834	1220	564	320
Cobalt	7440-48-4	0.5	mg/kg		2.4	2.8	2.0	2.8	1.9
Lead	7439-92-1	1.0	mg/kg		34.5	102	58.4	73.3	49.6
Manganese	7439-96-5	10	mg/kg		74	89	57	87	71
Nickel	7440-02-0	1.0	mg/kg		4.0	8.2	11.1	6.7	4.5
Selenium	7782-49-2	0.1	mg/kg		0.3	0.3	0.2	0.4	0.3
Silver	7440-22-4	0.1	mg/kg		0.2	0.2	0.2	0.3	0.1
Vanadium	7440-62-2	2.0	mg/kg		38.7	36.3	22.5	44.9	36.0
Zinc	7440-66-6	1.0	mg/kg		116	356	314	239	152
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg		0.70	0.68	0.66	1.66	2.17
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		<0.1	<0.1	<0.1	<0.1	<0.1
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		0.2	0.3	0.1	0.1	0.2
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		0.2	0.3	0.1	0.1	0.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	S1	S2	S3	S4	S5
			Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
				Result	Result	Result	Result	Result
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	**1.50**	**3.52**	**3.57**	**2.33**	**2.22**
EP068C: Triazines								
Atrazine	1912-24-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Simazine	122-34-9	0.05	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
EP069: Toxaphene								
Toxaphene	8001-35-2	2	mg/kg	<2	<2	<2	<2	<2
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	3	mg/kg	<3	<3	<3	<3	<3
C10 - C14 Fraction	----	3	mg/kg	<6	**45**	**56**	**20**	**6**
C15 - C28 Fraction	----	3	mg/kg	**101**	**352**	**397**	**194**	**138**
C29 - C36 Fraction	----	5	mg/kg	**103**	**388**	**406**	**230**	**155**
^ **C10 - C36 Fraction (sum)**	----	3	mg/kg	**204**	**785**	**859**	**444**	**299**
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons								
C6 - C10 Fraction	C6_C10	3	mg/kg	<3	**4**	**8**	<3	<3
>C10 - C16 Fraction	----	3	mg/kg	<12	**66**	**76**	**26**	<12
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg	<3.0	**4.0**	**8.0**	<3.0	<3.0
>C16 - C34 Fraction	----	3	mg/kg	**161**	**541**	**593**	**318**	**226**
>C34 - C40 Fraction	----	5	mg/kg	**82**	**335**	**348**	**203**	**134**
^ **>C10 - C40 Fraction (sum)**	----	3	mg/kg	**243**	**942**	**1020**	**547**	**360**
EP080-SD: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	91-20-3	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
EP090: Organotin Compounds								
Monobutyltin	78763-54-9	1	µgSn/kg	**4**	**66**	**23**	**13**	**6**
Dibutyltin	1002-53-5	1	µgSn/kg	**14**	**157**	**85**	**95**	**34**
Tributyltin	56573-85-4	0.5	µgSn/kg	**139**	**2010**	**1550**	**750**	**197**
EP130A: Organophosphorus Pesticides (Ultra-trace)								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	S1	S2	S3	S4	S5
			Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
				Result	Result	Result	Result	Result
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	<10	<10	<10
Carbophenothion	786-19-6	10	µg/kg	<10	<10	<10	<10	<10
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg	<10.0	<10.0	<10.0	<10.0	<10.0
Chlorfenvinphos (Z)	18708-87-7	10	µg/kg	<10	<10	<10	<10	<10
Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	<10	<10	<10
Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	<10	<10	<10
Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	<10	<10	<10
Diazinon	333-41-5	10	µg/kg	<10	<10	<10	<10	<10
Dichlorvos	62-73-7	10	µg/kg	<10	<10	<10	<10	<10
Dimethoate	60-51-5	10	µg/kg	<10	<10	<10	<10	<10
Ethion	563-12-2	10	µg/kg	<10	<10	<10	<10	<10
Fenamiphos	22224-92-6	10	µg/kg	<10	<10	<10	<10	<10
Fenthion	55-38-9	10	µg/kg	<10	<10	<10	<10	<10
Malathion	121-75-5	10	µg/kg	<10	<10	<10	<10	<10
Azinphos Methyl	86-50-0	10	µg/kg	<10	<10	<10	<10	<10
Monocrotophos	6923-22-4	10	µg/kg	<10	<10	<10	<10	<10
Parathion	56-38-2	10	µg/kg	<10	<10	<10	<10	<10
Parathion-methyl	298-00-0	10	µg/kg	<10	<10	<10	<10	<10
Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	<10	<10	<10
Prothiofos	34643-46-4	10	µg/kg	<10	<10	<10	<10	<10
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
alpha-BHC	319-84-6	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
beta-BHC	319-85-7	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
delta-BHC	319-86-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
4.4`-DDD	72-54-8	0.50	µg/kg	<0.50	**27.4**	**102**	**11.6**	**5.76**
4.4`-DDE	72-55-9	0.50	µg/kg	**2.44**	**26.6**	**79.9**	**21.4**	**9.12**
4.4`-DDT	50-29-3	0.50	µg/kg	<0.50	**30.2**	**45.1**	**14.7**	**10.4**
^ Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-29-2	0.50	µg/kg	**2.44**	**84.2**	**227**	**47.7**	**25.3**
Dieldrin	60-57-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
alpha-Endosulfan	959-98-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
beta-Endosulfan	33213-65-9	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Endosulfan sulfate	1031-07-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
^ Endosulfan (sum)	115-29-7	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	S1	S2	S3	S4	S5
			Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit	ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
				Result	Result	Result	Result	Result
EP131A: Organochlorine Pesticides - Continued								
Endrin	72-20-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Endrin aldehyde	7421-93-4	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Endrin ketone	53494-70-5	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Heptachlor	76-44-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Heptachlor epoxide	1024-57-3	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
Methoxychlor	72-43-5	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
^ Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	<0.25	<0.25	<0.25
Oxychlordane	27304-13-8	0.50	µg/kg	<0.50	<0.50	<0.50	<0.50	<0.50
EP131B: Polychlorinated Biphenyls (as Aroclors)								
^ Total Polychlorinated biphenyls	----	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
Aroclor 1016	12674-11-2	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
Aroclor 1221	11104-28-2	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
Aroclor 1232	11141-16-5	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
Aroclor 1242	53469-21-9	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
Aroclor 1248	12672-29-6	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
Aroclor 1254	11097-69-1	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
Aroclor 1260	11096-82-5	5.0	µg/kg	<15.6	<15.6	<15.6	<15.6	<15.6
EP132B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	5	µg/kg	<25	**56**	**60**	<25	<25
2-Methylnaphthalene	91-57-6	5	µg/kg	<25	<25	<25	<25	<25
Acenaphthylene	208-96-8	4	µg/kg	**29**	**53**	**57**	**54**	**41**
Acenaphthene	83-32-9	4	µg/kg	<25	<25	**36**	<25	<25
Fluorene	86-73-7	4	µg/kg	<25	<25	**28**	<25	<25
Phenanthrene	85-01-8	4	µg/kg	**96**	**134**	**113**	**118**	**89**
Anthracene	120-12-7	4	µg/kg	**30**	**50**	**44**	**50**	**34**
Fluoranthene	206-44-0	4	µg/kg	**225**	**317**	**252**	**292**	**222**
Pyrene	129-00-0	4	µg/kg	**221**	**315**	**289**	**296**	**226**
Benz(a)anthracene	56-55-3	4	µg/kg	**89**	**139**	**154**	**124**	**101**
Chrysene	218-01-9	4	µg/kg	**90**	**144**	**168**	**122**	**101**
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	**109**	**166**	**200**	**148**	**120**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S1	S2	S3	S4	S5
				Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
					Result	Result	Result	Result	Result
EP132B: Polynuclear Aromatic Hydrocarbons - Continued									
Benzo(k)fluoranthene	207-08-9	4	µg/kg		63	85	129	87	50
Benzo(e)pyrene	192-97-2	4	µg/kg		73	114	150	102	82
Benzo(a)pyrene	50-32-8	4	µg/kg		129	190	234	178	141
Perylene	198-55-0	4	µg/kg		34	50	61	49	37
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		97	149	175	134	104
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		<25	26	38	<25	<25
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		72	110	133	100	77
Coronene	191-07-1	5	µg/kg		<25	54	60	46	36
^ Sum of PAHs	----	4	µg/kg		1360	2150	2380	1900	1460
EP201: Carbamate Pesticides by LCMS									
Oxamyl	23135-22-0	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Methomyl	16752-77-5	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
3-Hydroxy Carbofuran	16655-82-6	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Aldicarb	116-06-3	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Bendiocarb	22781-23-3	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Thiodicarb	59669-26-0	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Carbofuran	1563-66-2	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Carbaryl	63-25-2	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Methiocarb	2032-65-7	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
2.4-DB	94-82-6	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Dicamba	1918-00-9	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Mecoprop	93-65-2	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
MCPA	94-74-6	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
2.4-DP	120-36-5	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
2.4-D	94-75-7	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Triclopyr	55335-06-3	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
2.4.5-T	93-76-5	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
MCPB	94-81-5	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Picloram	1918-02-1	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Clopyralid	1702-17-6	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02
Fluroxypyr	69377-81-7	0.02	mg/kg		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S1	S2	S3	S4	S5
				Sampling date / time	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00	01-May-2022 00:00
Compound	CAS Number	LOR	Unit		ES2215086-001	ES2215086-002	ES2215086-003	ES2215086-004	ES2215086-005
					Result	Result	Result	Result	Result
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		100	76.3	92.1	84.2	82.0
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		101	79.6	95.6	86.3	82.8
EP069: Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		105	102	114	109	95.0
EP080-SD: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		92.7	107	115	95.4	106
Toluene-D8	2037-26-5	0.2	%		87.9	97.3	107	93.1	99.8
4-Bromofluorobenzene	460-00-4	0.2	%		88.0	93.1	98.8	88.3	95.0
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		Not Determined	Not Determined	Not Determined	Not Determined	Not Determined
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		74.1	49.4	70.5	58.5	82.0
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		63.3	50.4	56.3	58.2	66.1
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		65.6	109	71.9	53.1	68.8
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		127	121	114	108	113
Anthracene-d10	1719-06-8	10	%		154	112	103	121	117
4-Terphenyl-d14	1718-51-0	10	%		132	115	119	122	118
EP201S: Carbamate Surrogate									
4-Bromo-3.5-dimethylphenyl-N-methylcarbamate	672-99-1	0.02	%		108	104	104	106	109
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.02	%		58.8	64.7	53.6	58.3	54.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S6	----	----	----	----
				Sampling date / time	01-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2215086-006	--------	--------	--------	--------
					Result	----	----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**8.2**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		**35.2**	----	----	----	----
EA150: Particle Sizing									
+75µm	----	1	%		**44**	----	----	----	----
+150µm	----	1	%		**17**	----	----	----	----
+300µm	----	1	%		**5**	----	----	----	----
+425µm	----	1	%		**3**	----	----	----	----
+600µm	----	1	%		**2**	----	----	----	----
+1180µm	----	1	%		**1**	----	----	----	----
+2.36mm	----	1	%		<1	----	----	----	----
+4.75mm	----	1	%		<1	----	----	----	----
+9.5mm	----	1	%		<1	----	----	----	----
+19.0mm	----	1	%		<1	----	----	----	----
+37.5mm	----	1	%		<1	----	----	----	----
+75.0mm	----	1	%		<1	----	----	----	----
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		**24**	----	----	----	----
Silt (2-60 µm)	----	1	%		**30**	----	----	----	----
Sand (0.06-2.00 mm)	----	1	%		**45**	----	----	----	----
Gravel (>2mm)	----	1	%		**1**	----	----	----	----
Cobbles (>6cm)	----	1	%		<1	----	----	----	----
EG005(ED093)-SD: Total Metals in Sediments by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		**5760**	----	----	----	----
Iron	7439-89-6	50	mg/kg		**25700**	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES									
Barium	7440-39-3	10	mg/kg		**40**	----	----	----	----
Beryllium	7440-41-7	1	mg/kg		<1	----	----	----	----
Molybdenum	7439-98-7	2	mg/kg		<2	----	----	----	----
Tin	7440-31-5	5	mg/kg		<5	----	----	----	----
Thallium	7440-28-0	5	mg/kg		<5	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS									
Antimony	7440-36-0	0.50	mg/kg		<0.50	----	----	----	----
Arsenic	7440-38-2	1.00	mg/kg		**20.6**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S6	----	----	----	----
				Sampling date / time	01-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2215086-006	--------	--------	--------	--------
					Result	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS - Continued									
Cadmium	7440-43-9	0.1	mg/kg		<0.1	----	----	----	----
Chromium	7440-47-3	1.0	mg/kg		**14.6**	----	----	----	----
Copper	7440-50-8	1.0	mg/kg		**246**	----	----	----	----
Cobalt	7440-48-4	0.5	mg/kg		**1.9**	----	----	----	----
Lead	7439-92-1	1.0	mg/kg		**46.5**	----	----	----	----
Manganese	7439-96-5	10	mg/kg		**65**	----	----	----	----
Nickel	7440-02-0	1.0	mg/kg		**4.2**	----	----	----	----
Selenium	7782-49-2	0.1	mg/kg		**0.3**	----	----	----	----
Silver	7440-22-4	0.1	mg/kg		**0.1**	----	----	----	----
Vanadium	7440-62-2	2.0	mg/kg		**35.7**	----	----	----	----
Zinc	7440-66-6	1.0	mg/kg		**128**	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.01	mg/kg		**1.25**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg		<0.1	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N (Sol.)	14797-55-8	0.1	mg/kg		**0.1**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg		**0.1**	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		**1.76**	----	----	----	----
EP068C: Triazines									
Atrazine	1912-24-9	0.05	mg/kg		<0.05	----	----	----	----
Simazine	122-34-9	0.05	mg/kg		<0.05	----	----	----	----
EP069: Toxaphene									
Toxaphene	8001-35-2	2	mg/kg		<2	----	----	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	3	mg/kg		<3	----	----	----	----
C10 - C14 Fraction	----	3	mg/kg		**13**	----	----	----	----
C15 - C28 Fraction	----	3	mg/kg		**183**	----	----	----	----
C29 - C36 Fraction	----	5	mg/kg		**197**	----	----	----	----
^ C10 - C36 Fraction (sum)	----	3	mg/kg		**393**	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons									
C6 - C10 Fraction	C6_C10	3	mg/kg		<3	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S6	----	----	----	----
				Sampling date / time	01-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2215086-006	--------	--------	--------	--------
					Result	----	----	----	----
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons - Continued									
>C10 - C16 Fraction	----	3	mg/kg		**25**	----	----	----	----
C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	3.0	mg/kg		<3.0	----	----	----	----
>C16 - C34 Fraction	----	3	mg/kg		**286**	----	----	----	----
>C34 - C40 Fraction	----	5	mg/kg		**168**	----	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	3	mg/kg		**479**	----	----	----	----
EP080-SD: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.2	mg/kg		<0.2	----	----	----	----
Ethylbenzene	100-41-4	0.2	mg/kg		<0.2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		<0.2	----	----	----	----
ortho-Xylene	95-47-6	0.2	mg/kg		<0.2	----	----	----	----
^ **Total Xylenes**	----	0.5	mg/kg		<0.5	----	----	----	----
^ **Sum of BTEX**	----	0.2	mg/kg		<0.2	----	----	----	----
Naphthalene	91-20-3	0.2	mg/kg		<0.2	----	----	----	----
EP090: Organotin Compounds									
Monobutyltin	78763-54-9	1	µgSn/kg		**4**	----	----	----	----
Dibutyltin	1002-53-5	1	µgSn/kg		**19**	----	----	----	----
Tributyltin	56573-85-4	0.5	µgSn/kg		**118**	----	----	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace)									
Bromophos-ethyl	4824-78-6	10	µg/kg		<10	----	----	----	----
Carbophenothion	786-19-6	10	µg/kg		<10	----	----	----	----
Chlorfenvinphos (E)	18708-86-6	10.0	µg/kg		<10.0	----	----	----	----
Chlorfenvinphos (Z)	18708-87-7	10	µg/kg		<10	----	----	----	----
Chlorpyrifos	2921-88-2	10	µg/kg		<10	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	10	µg/kg		<10	----	----	----	----
Demeton-S-methyl	919-86-8	10	µg/kg		<10	----	----	----	----
Diazinon	333-41-5	10	µg/kg		<10	----	----	----	----
Dichlorvos	62-73-7	10	µg/kg		<10	----	----	----	----
Dimethoate	60-51-5	10	µg/kg		<10	----	----	----	----
Ethion	563-12-2	10	µg/kg		<10	----	----	----	----
Fenamiphos	22224-92-6	10	µg/kg		<10	----	----	----	----
Fenthion	55-38-9	10	µg/kg		<10	----	----	----	----
Malathion	121-75-5	10	µg/kg		<10	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S6	----	----	----	----
				Sampling date / time	01-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2215086-006	--------	--------	--------	--------
					Result	----	----	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued									
Azinphos Methyl	86-50-0	10	µg/kg		<10	----	----	----	----
Monocrotophos	6923-22-4	10	µg/kg		<10	----	----	----	----
Parathion	56-38-2	10	µg/kg		<10	----	----	----	----
Parathion-methyl	298-00-0	10	µg/kg		<10	----	----	----	----
Pirimphos-ethyl	23505-41-1	10	µg/kg		<10	----	----	----	----
Prothiofos	34643-46-4	10	µg/kg		<10	----	----	----	----
EP131A: Organochlorine Pesticides									
Aldrin	309-00-2	0.50	µg/kg		<0.50	----	----	----	----
alpha-BHC	319-84-6	0.50	µg/kg		<0.50	----	----	----	----
beta-BHC	319-85-7	0.50	µg/kg		<0.50	----	----	----	----
delta-BHC	319-86-8	0.50	µg/kg		<0.50	----	----	----	----
4.4`-DDD	72-54-8	0.50	µg/kg		**2.02**	----	----	----	----
4.4`-DDE	72-55-9	0.50	µg/kg		**4.41**	----	----	----	----
4.4`-DDT	50-29-3	0.50	µg/kg		**11.4**	----	----	----	----
^ **Sum of DDD + DDE + DDT**	72-54-8/72-55-9/50-29-2	0.50	µg/kg		**17.8**	----	----	----	----
Dieldrin	60-57-1	0.50	µg/kg		<0.50	----	----	----	----
alpha-Endosulfan	959-98-8	0.50	µg/kg		<0.50	----	----	----	----
beta-Endosulfan	33213-65-9	0.50	µg/kg		<0.50	----	----	----	----
Endosulfan sulfate	1031-07-8	0.50	µg/kg		<0.50	----	----	----	----
^ **Endosulfan (sum)**	115-29-7	0.50	µg/kg		<0.50	----	----	----	----
Endrin	72-20-8	0.50	µg/kg		<0.50	----	----	----	----
Endrin aldehyde	7421-93-4	0.50	µg/kg		<0.50	----	----	----	----
Endrin ketone	53494-70-5	0.50	µg/kg		<0.50	----	----	----	----
Heptachlor	76-44-8	0.50	µg/kg		<0.50	----	----	----	----
Heptachlor epoxide	1024-57-3	0.50	µg/kg		<0.50	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.50	µg/kg		<0.50	----	----	----	----
gamma-BHC	58-89-9	0.25	µg/kg		<0.25	----	----	----	----
Methoxychlor	72-43-5	0.50	µg/kg		<0.50	----	----	----	----
cis-Chlordane	5103-71-9	0.25	µg/kg		<0.25	----	----	----	----
trans-Chlordane	5103-74-2	0.25	µg/kg		<0.25	----	----	----	----
^ **Total Chlordane (sum)**	----	0.25	µg/kg		<0.25	----	----	----	----
Oxychlordane	27304-13-8	0.50	µg/kg		<0.50	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors)									
^ **Total Polychlorinated biphenyls**	----	5.0	µg/kg		<15.6	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S6	----	----	----	----
				Sampling date / time	01-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2215086-006	--------	--------	--------	--------
					Result	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors) - Continued									
Aroclor 1016	12674-11-2	5.0	µg/kg		<15.6	----	----	----	----
Aroclor 1221	11104-28-2	5.0	µg/kg		<15.6	----	----	----	----
Aroclor 1232	11141-16-5	5.0	µg/kg		<15.6	----	----	----	----
Aroclor 1242	53469-21-9	5.0	µg/kg		<15.6	----	----	----	----
Aroclor 1248	12672-29-6	5.0	µg/kg		<15.6	----	----	----	----
Aroclor 1254	11097-69-1	5.0	µg/kg		<15.6	----	----	----	----
Aroclor 1260	11096-82-5	5.0	µg/kg		<15.6	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	5	µg/kg		<5	----	----	----	----
2-Methylnaphthalene	91-57-6	5	µg/kg		<5	----	----	----	----
Acenaphthylene	208-96-8	4	µg/kg		**29**	----	----	----	----
Acenaphthene	83-32-9	4	µg/kg		**5**	----	----	----	----
Fluorene	86-73-7	4	µg/kg		**6**	----	----	----	----
Phenanthrene	85-01-8	4	µg/kg		**63**	----	----	----	----
Anthracene	120-12-7	4	µg/kg		**25**	----	----	----	----
Fluoranthene	206-44-0	4	µg/kg		**136**	----	----	----	----
Pyrene	129-00-0	4	µg/kg		**135**	----	----	----	----
Benz(a)anthracene	56-55-3	4	µg/kg		**66**	----	----	----	----
Chrysene	218-01-9	4	µg/kg		**93**	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg		**93**	----	----	----	----
Benzo(k)fluoranthene	207-08-9	4	µg/kg		**46**	----	----	----	----
Benzo(e)pyrene	192-97-2	4	µg/kg		**60**	----	----	----	----
Benzo(a)pyrene	50-32-8	4	µg/kg		**102**	----	----	----	----
Perylene	198-55-0	4	µg/kg		**28**	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	4	µg/kg		**71**	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	4	µg/kg		**12**	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg		**54**	----	----	----	----
Coronene	191-07-1	5	µg/kg		**26**	----	----	----	----
^ Sum of PAHs	----	4	µg/kg		**1050**	----	----	----	----
EP201: Carbamate Pesticides by LCMS									
Oxamyl	23135-22-0	0.02	mg/kg		<0.02	----	----	----	----
Methomyl	16752-77-5	0.02	mg/kg		<0.02	----	----	----	----
3-Hydroxy Carbofuran	16655-82-6	0.02	mg/kg		<0.02	----	----	----	----
Aldicarb	116-06-3	0.02	mg/kg		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S6	----	----	----	----
				Sampling date / time	01-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2215086-006	--------	--------	--------	--------
					Result	----	----	----	----
EP201: Carbamate Pesticides by LCMS - Continued									
Bendiocarb	22781-23-3	0.02	mg/kg		<0.02	----	----	----	----
Thiodicarb	59669-26-0	0.02	mg/kg		<0.02	----	----	----	----
Carbofuran	1563-66-2	0.02	mg/kg		<0.02	----	----	----	----
Carbaryl	63-25-2	0.02	mg/kg		<0.02	----	----	----	----
Methiocarb	2032-65-7	0.02	mg/kg		<0.02	----	----	----	----
EP202A: Phenoxyacetic Acid Herbicides by LCMS									
4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg		<0.02	----	----	----	----
2.4-DB	94-82-6	0.02	mg/kg		<0.02	----	----	----	----
Dicamba	1918-00-9	0.02	mg/kg		<0.02	----	----	----	----
Mecoprop	93-65-2	0.02	mg/kg		<0.02	----	----	----	----
MCPA	94-74-6	0.02	mg/kg		<0.02	----	----	----	----
2.4-DP	120-36-5	0.02	mg/kg		<0.02	----	----	----	----
2.4-D	94-75-7	0.02	mg/kg		<0.02	----	----	----	----
Triclopyr	55335-06-3	0.02	mg/kg		<0.02	----	----	----	----
2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg		<0.02	----	----	----	----
2.4.5-T	93-76-5	0.02	mg/kg		<0.02	----	----	----	----
MCPB	94-81-5	0.02	mg/kg		<0.02	----	----	----	----
Picloram	1918-02-1	0.02	mg/kg		<0.02	----	----	----	----
Clopyralid	1702-17-6	0.02	mg/kg		<0.02	----	----	----	----
Fluroxypyr	69377-81-7	0.02	mg/kg		<0.02	----	----	----	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.05	%		**94.4**	----	----	----	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.05	%		**94.8**	----	----	----	----
EP069: Surrogate									
Decachlorobiphenyl	2051-24-3	0.1	%		**104**	----	----	----	----
EP080-SD: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		**99.6**	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		**94.6**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.2	%		**89.5**	----	----	----	----
EP090S: Organotin Surrogate									
Tripropyltin	----	0.5	%		**Not Determined**	----	----	----	----
EP130S: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	10	%		**62.2**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	S6	----	----	----	----
				Sampling date / time	01-May-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2215086-006	--------	--------	--------	--------
					Result	----	----	----	----
EP131S: OC Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.50	%		**51.4**	----	----	----	----
EP131T: PCB Surrogate									
Decachlorobiphenyl	2051-24-3	0.5	%		**62.5**	----	----	----	----
EP132T: Base/Neutral Extractable Surrogates									
2-Fluorobiphenyl	321-60-8	10	%		**89.9**	----	----	----	----
Anthracene-d10	1719-06-8	10	%		**102**	----	----	----	----
4-Terphenyl-d14	1718-51-0	10	%		**85.1**	----	----	----	----
EP201S: Carbamate Surrogate									
4-Bromo-3.5-dimethylphenyl-N-methylcarbamate	672-99-1	0.02	%		**108**	----	----	----	----
EP202S: Phenoxyacetic Acid Herbicide Surrogate									
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.02	%		**56.0**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**

Compound	CAS Number	Recovery Limits (%) Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	49	147
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	35	143
EP069: Surrogate			
Decachlorobiphenyl	2051-24-3	70	130
EP080-SD: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	67	137
Toluene-D8	2037-26-5	74	134
4-Bromofluorobenzene	460-00-4	73	137
EP090S: Organotin Surrogate			
Tripropyltin	----	35	130
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	14	102
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	119
EP131T: PCB Surrogate			
Decachlorobiphenyl	2051-24-3	10	106
EP132T: Base/Neutral Extractable Surrogates			
2-Fluorobiphenyl	321-60-8	55	135
Anthracene-d10	1719-06-8	70	136
4-Terphenyl-d14	1718-51-0	57	127
EP201S: Carbamate Surrogate			
4-Bromo-3.5-dimethylphenyl-N-methylcarbamate	672-99-1	59	137
EP202S: Phenoxyacetic Acid Herbicide Surrogate			
2.4-Dichlorophenyl Acetic Acid	19719-28-9	45	139

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA003 :pH (field/fox)

(SOIL) EA029-D: Calcium Values

(SOIL) EA029-E: Magnesium Values

(SOIL) EA029-F: Excess Acid Neutralising Capacity

(SOIL) EA029-H: Acid Base Accounting

(SOIL) EA029-G: Retained Acidity

(SOIL) EA029-A: pH Measurements

(SOIL) EA029-C: Sulfur Trail

(SOIL) EA029-B: Acidity Trail

(SOIL) EP090: Organotin Compounds

(SOIL) EP090S: Organotin Surrogate

(SOIL) EP003: Total Organic Carbon (TOC) in Soil

Analysis conducted by ALS Melbourne, NATA accreditation no. 825, site no. 13778 (Chemistry).

(SOIL) EP069: Toxaphene

(SOIL) EP069: Surrogate

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA150: Particle Sizing

Certificate of Analysis

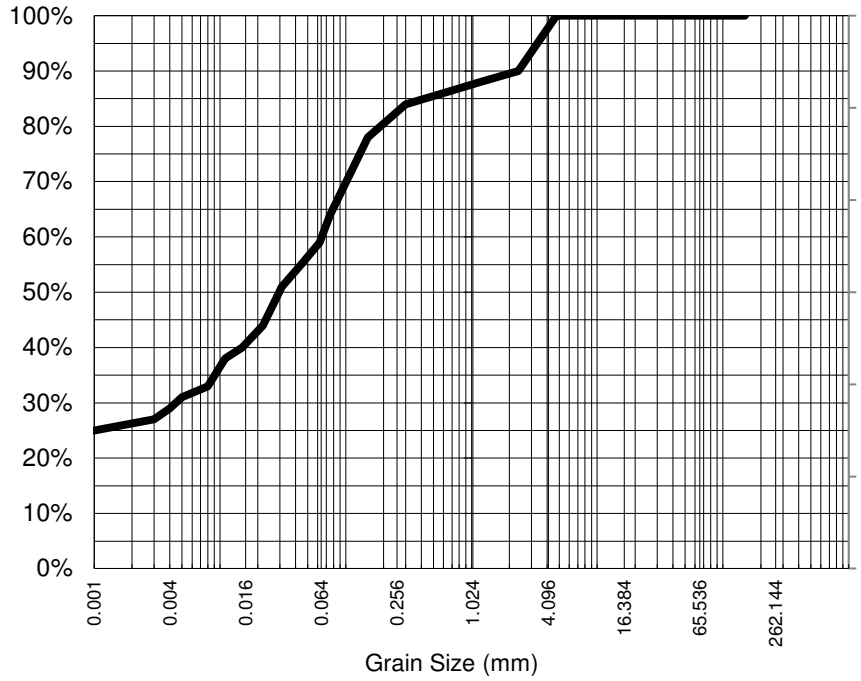
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	KATHRYN SMYTHE	**DATE REPORTED:**	12-May-2022
COMPANY:	OCEAN ENVIRONMENTAL	**DATE RECEIVED:**	3-May-2022
ADDRESS:	124 Mitchell Street Merewether	**REPORT NO:**	ES2215086-001 / PSD
PROJECT:	Sirisi Marina	**SAMPLE ID:**	S1

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	90%
1.18	88%
0.600	86%
0.425	85%
0.300	84%
0.150	78%
0.075	64%
Particle Size (microns)	
44	55%
31	51%
22	44%
15	40%
11	38%
8	33%
5	31%
4	29%
1	25%

Median Particle Size (mm)*	0.030

Analysis Notes

Samples analysed as received.

** Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1—2006 was not requested by the client . Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 9-May-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND, SHELL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) N/R

NATA Accreditation: 825 Site: Newcastle
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NATA
WORLD RECOGNISED ACCREDITATION

Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

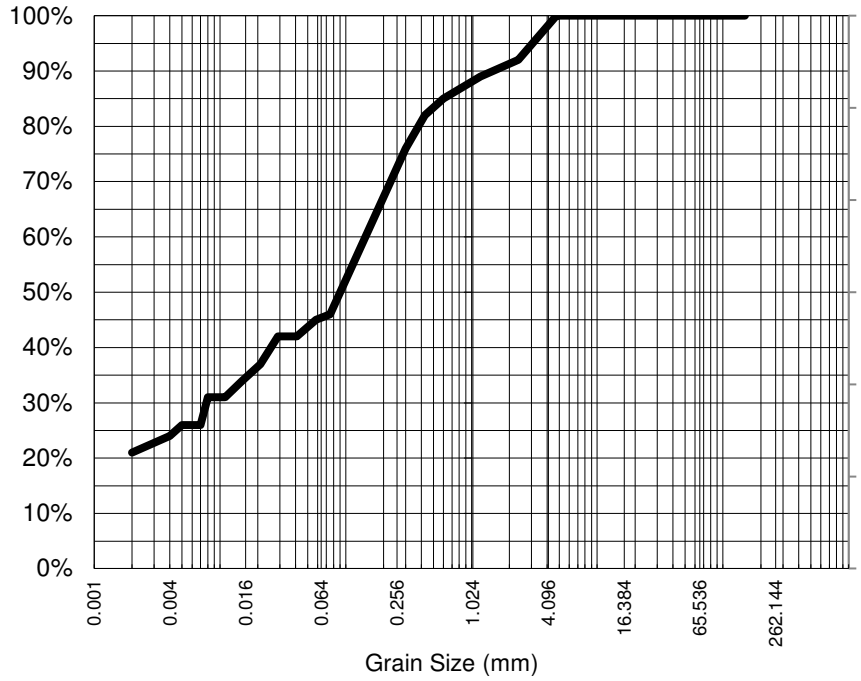
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	KATHRYN SMYTHE	**DATE REPORTED:**	12-May-2022
COMPANY:	OCEAN ENVIRONMENTAL	**DATE RECEIVED:**	3-May-2022
ADDRESS:	124 Mitchell Street Merewether	**REPORT NO:**	ES2215086-002 / PSD
PROJECT:	Sirisi Marina	**SAMPLE ID:**	S2

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	92%
1.18	89%
0.600	85%
0.425	82%
0.300	76%
0.150	61%
0.075	46%
Particle Size (microns)	
41	42%
29	42%
21	37%
15	34%
11	31%
8	31%
7	26%
5	26%
2	21%

Median Particle Size (mm)*	0.095

Analysis Notes

Samples analysed as received.

** Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1—2006 was not requested by the client . Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 9-May-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND, SHELL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) N/R

NATA Accreditation: 825 Site: Newcastle
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Laboratory Supervisor
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Certificate of Analysis

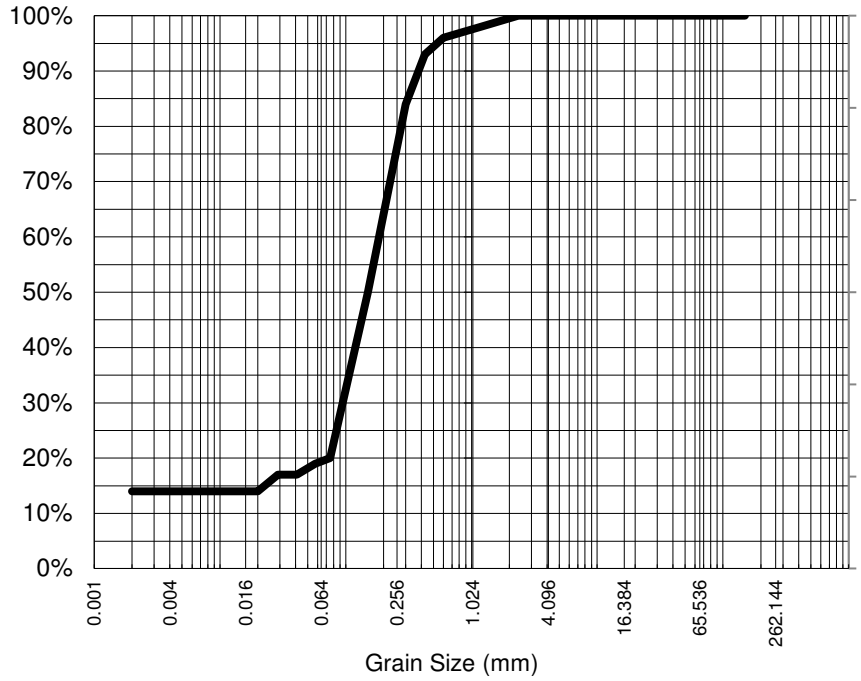
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	KATHRYN SMYTHE	**DATE REPORTED:**	12-May-2022
COMPANY:	OCEAN ENVIRONMENTAL	**DATE RECEIVED:**	3-May-2022
ADDRESS:	124 Mitchell Street Merewether	**REPORT NO:**	ES2215086-003 / PSD
PROJECT:	Sirisi Marina	**SAMPLE ID:**	S3

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	98%
0.600	96%
0.425	93%
0.300	84%
0.150	50%
0.075	20%
Particle Size (microns)	
57	19%
41	17%
29	17%
20	14%
15	14%
10	14%
7	14%
5	14%
2	14%

Median Particle Size (mm)*	0.150

Analysis Notes

Samples analysed as received.

** Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1—2006 was not requested by the client . Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 9-May-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND, SHELL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) N/R

NATA
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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

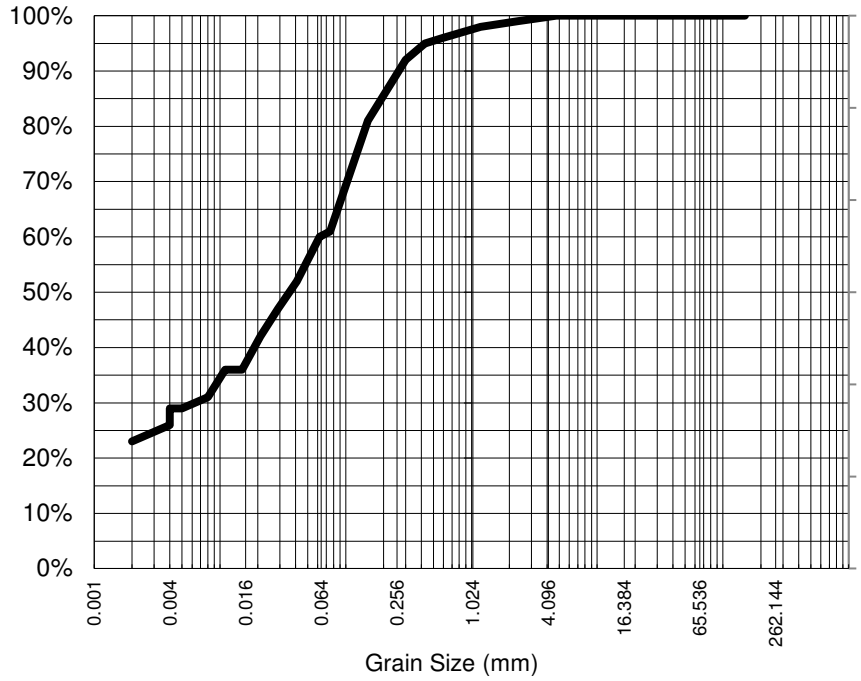
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	KATHRYN SMYTHE	**DATE REPORTED:**	12-May-2022
COMPANY:	OCEAN ENVIRONMENTAL	**DATE RECEIVED:**	3-May-2022
ADDRESS:	124 Mitchell Street Merewether	**REPORT NO:**	ES2215086-004 / PSD
PROJECT:	Sirisi Marina	**SAMPLE ID:**	S4

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	98%
0.600	96%
0.425	95%
0.300	92%
0.150	81%
0.075	61%
Particle Size (microns)	
41	52%
29	47%
21	42%
15	36%
11	36%
8	31%
5	29%
4	29%
2	23%

Median Particle Size (mm)*	0.036

Analysis Notes

Samples analysed as received.

** Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1—2006 was not requested by the client . Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 9-May-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND, SHELL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) N/R

NATA Accreditation: 825 Site: Newcastle
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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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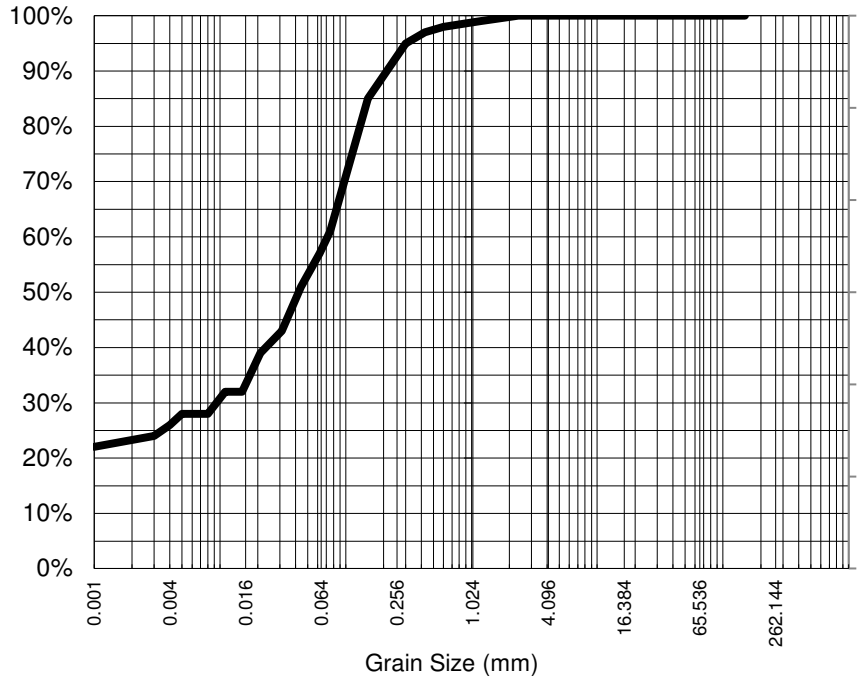
Newcastle, NSW

CLIENT:	KATHRYN SMYTHE	**DATE REPORTED:**	12-May-2022
COMPANY:	OCEAN ENVIRONMENTAL	**DATE RECEIVED:**	3-May-2022
ADDRESS:	124 Mitchell Street Merewether	**REPORT NO:**	ES2215086-005 / PSD
PROJECT:	Sirisi Marina	**SAMPLE ID:**	S5

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	99%
0.600	98%
0.425	97%
0.300	95%
0.150	85%
0.075	61%
Particle Size (microns)	
44	51%
31	43%
21	39%
15	32%
11	32%
8	28%
5	28%
4	26%
1	22%

Median Particle Size (mm)*	0.042

Analysis Notes

Samples analysed as received.

** Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1—2006 was not requested by the client . Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 9-May-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND, SHELL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) N/R

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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

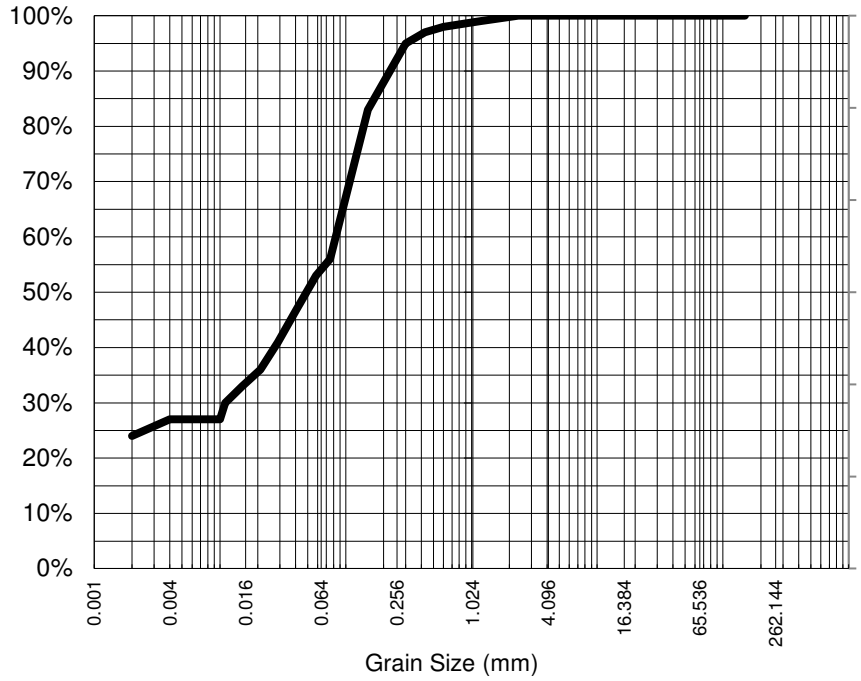
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	KATHRYN SMYTHE	**DATE REPORTED:**	12-May-2022
COMPANY:	OCEAN ENVIRONMENTAL	**DATE RECEIVED:**	3-May-2022
ADDRESS:	124 Mitchell Street Merewether	**REPORT NO:**	ES2215086-006 / PSD
PROJECT:	Sirisi Marina	**SAMPLE ID:**	S6

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	99%
0.600	98%
0.425	97%
0.300	95%
0.150	83%
0.075	56%
Particle Size (microns)	
41	47%
29	41%
21	36%
15	33%
11	30%
10	27%
7	27%
5	27%
2	24%

Median Particle Size (mm)*	0.050

Analysis Notes

Samples analysed as received.

** Soil Particle Density required for Hydrometer analysis according to AS 1289.3.5.1—2006 was not requested by the client . Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 9-May-22

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND, SHELL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) N/R

NATA
WORLD RECOGNISED ACCREDITATION

Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **ES2215086**	Page	: 1 of 19
Client	: **OCEAN ENVIRONMENTAL**	Laboratory	: Environmental Division Sydney
Contact	: DR KATHRYN SMYTHE	Contact	: Customer Services ES
Address	: 124 MITCHELL STREET MEREWETHER 2291	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: Sirisi Marina	Date Samples Received	: 03-May-2022
Order number	: ----	Date Analysis Commenced	: 05-May-2022
C-O-C number	: ----	Issue Date	: 23-May-2022
Sampler	: Kaite Smythe		
Site	: ----		
Quote number	: SY/014/22		
No. of samples received	: 6		
No. of samples analysed	: 6		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Matt Frost	Assistant Laboratory Manager	Brisbane Organics, Stafford, QLD
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG005(ED093)-SD: Total Metals in Sediments by ICP-AES (QC Lot: 4339186)									
ES2215086-001	S1	EG005-SD: Aluminium	7429-90-5	50	mg/kg	5970	4920	19.3	0% - 20%
		EG005-SD: Iron	7439-89-6	50	mg/kg	20800	21700	4.3	0% - 20%
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 4339187)									
ES2215856-042	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	130	80	41.9	0% - 50%
		EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Tin	7440-31-5	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Thallium	7440-28-0	5	mg/kg	<5	<5	0.0	No Limit
ES2215086-001	S1	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	40	30	0.0	No Limit
		EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Tin	7440-31-5	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Thallium	7440-28-0	5	mg/kg	<5	<5	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QC Lot: 4339184)									
ES2215086-001	S1	EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	0.70	0.70	0.0	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 4338014)									
ES2215911-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.1	7.4	3.9	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 4339221)									
ES2215895-006	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.5	8.4	1.3	0% - 20%
ES2215086-002	S2	EA002: pH Value	----	0.1	pH Unit	8.1	8.2	0.0	0% - 20%
EA003 :pH (field/fox) (QC Lot: 4329192)									
EM2207568-008	Anonymous	EA003: pH (F)	----	0.1	pH Unit	8.0	8.1	0.0	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	7.5	7.6	1.7	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA029-A: pH Measurements (QC Lot: 4326904)									
EB2211578-001	Anonymous	EA029: pH KCl (23A)	----	0.1	pH Unit	8.5	8.6	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.5	7.5	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 4326904)									
EB2211578-001	Anonymous	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-C: Sulfur Trail (QC Lot: 4326904)									
EB2211578-001	Anonymous	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	1.15	1.13	1.8	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	2.06	2.07	0.4	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.916	0.944	3.0	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	572	589	3.0	0% - 20%
EA029-D: Calcium Values (QC Lot: 4326904)									
EB2211578-001	Anonymous	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.641	0.629	1.8	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	1.28	1.28	0.0	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.636	0.648	1.8	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.509	0.518	1.8	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	318	323	1.8	0% - 20%
EA029-E: Magnesium Values (QC Lot: 4326904)									
EB2211578-001	Anonymous	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.438	0.432	1.4	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.820	0.815	0.6	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.382	0.383	0.0	0% - 50%
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.504	0.506	0.2	0% - 20%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	315	315	0.0	0% - 20%
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 4326904)									
EB2211578-001	Anonymous	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.994	0.984	1.0	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.318	0.315	1.0	0% - 50%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	198	197	1.0	0% - 50%
EA029-H: Acid Base Accounting (QC Lot: 4326904)									
EB2211578-001	Anonymous	EA029: ANC Fineness Factor	----	0.5	-	1.5	1.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-H: Acid Base Accounting (QC Lot: 4326904) - continued									
EB2211578-001	Anonymous	EA029: Net Acidity (sulfur units)	----	0.02	% S	0.09	0.10	11.4	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.92	0.94	3.0	0% - 20%
		EA029: Liming Rate	----	1	kg CaCO3/t	4	5	0.0	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	43	44	3.0	0% - 20%
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	58	65	11.4	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	572	589	3.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4338018)									
ES2215872-006	Anonymous	EA055: Moisture Content	----	0.1	%	20.3	18.9	7.1	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4339191)									
ES2215086-004	S4	EA055: Moisture Content	----	0.1	%	39.2	40.3	2.8	0% - 20%
ES2215856-038	Anonymous	EA055: Moisture Content	----	0.1	%	16.5	16.3	0.9	0% - 50%
EG020-SD: Total Metals in Sediments by ICPMS (QC Lot: 4339185)									
ES2215086-001	S1	EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
		EG020-SD: Selenium	7782-49-2	0.1	mg/kg	0.3	0.2	0.0	No Limit
		EG020-SD: Silver	7440-22-4	0.1	mg/kg	0.2	0.2	0.0	No Limit
		EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	<0.50	0.0	No Limit
		EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	2.4	1.5	45.2	No Limit
		EG020-SD: Arsenic	7440-38-2	1	mg/kg	16.5	11.3	37.4	0% - 50%
		EG020-SD: Chromium	7440-47-3	1	mg/kg	15.4	13.2	15.3	0% - 50%
		EG020-SD: Copper	7440-50-8	1	mg/kg	209	212	1.6	0% - 20%
		EG020-SD: Lead	7439-92-1	1	mg/kg	34.5	29.1	17.1	0% - 20%
		EG020-SD: Nickel	7440-02-0	1	mg/kg	4.0	3.0	29.6	No Limit
		EG020-SD: Zinc	7440-66-6	1	mg/kg	116	108	7.4	0% - 20%
		EG020-SD: Manganese	7439-96-5	10	mg/kg	74	52	34.8	No Limit
		EG020-SD: Vanadium	7440-62-2	2	mg/kg	38.7	34.6	11.3	0% - 50%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4338012)									
ES2215911-001	Anonymous	EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<5.0	<5.0	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4339220)									
ES2215086-002	S2	EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4338013)									
ES2215911-001	Anonymous	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	8.3	7.1	15.4	0% - 50%
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4339219)									
ES2215086-002	S2	EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	0.3	0.2	0.0	No Limit
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 4335806)									
EP2205372-007	Anonymous	EP003: Total Organic Carbon	----	0.02	%	0.14	0.15	0.0	No Limit
EB2211578-001	Anonymous	EP003: Total Organic Carbon	----	0.02	%	0.28	0.28	0.0	0% - 50%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 4335808)									
ES2215086-005	S5	EP003: Total Organic Carbon	----	0.02	%	2.22	2.24	0.6	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP068C: Triazines (QC Lot: 4323626)									
ES2215086-001	S1	EP068: Atrazine	1912-24-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
		EP068: Simazine	122-34-9	0.05	mg/kg	<0.05	<0.05	0.0	No Limit
EP069: Toxaphene (QC Lot: 4337284)									
ES2215086-005	S5	EP069: Toxaphene	8001-35-2	2	mg/kg	<2	<2	0.0	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 4320968)									
ES2215086-001	S1	EP071-SD-SV: C10 - C14 Fraction	----	3	mg/kg	<6	<6	0.0	No Limit
		EP071-SD-SV: C15 - C28 Fraction	----	3	mg/kg	101	102	1.8	No Limit
		EP071-SD-SV: C10 - C36 Fraction (sum)	----	3	mg/kg	204	206	1.0	0% - 50%
		EP071-SD-SV: C29 - C36 Fraction	----	5	mg/kg	103	104	1.1	No Limit
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QC Lot: 4336237)									
ES2215086-001	S1	EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	<3	0.0	No Limit
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QC Lot: 4320968)									
ES2215086-001	S1	EP071-SD-SV: >C10 - C16 Fraction	----	3	mg/kg	<12	<12	0.0	No Limit
		EP071-SD-SV: >C16 - C34 Fraction	----	3	mg/kg	161	163	1.4	0% - 50%
		EP071-SD-SV: >C10 - C40 Fraction (sum)	----	3	mg/kg	243	247	1.6	0% - 50%
		EP071-SD-SV: >C34 - C40 Fraction	----	5	mg/kg	82	84	2.2	No Limit
EP080-SD: BTEXN (QC Lot: 4336237)									
ES2215086-001	S1	EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
EP090: Organotin Compounds (QC Lot: 4324024)									
ES2215086-003	S3	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	1550	# 2200	34.3	0% - 20%
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	23	54	80.3	No Limit
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	85	# 236	94.3	0% - 20%
ES2215086-005	S5	EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	197	202	2.5	0% - 20%
		EP090: Monobutyltin	78763-54-9	1	µgSn/kg	6	4	42.1	No Limit
		EP090: Dibutyltin	1002-53-5	1	µgSn/kg	34	38	11.9	0% - 20%
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 4320822)									
ES2215086-001	S1	EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Carbophenothion	786-19-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorfenvinphos (E)	18708-86-6	10	µg/kg	<10.0	<10.0	0.0	No Limit
		EP130: Chlorfenvinphos (Z)	18708-87-7	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Diazinon	333-41-5	10	µg/kg	<10	<10	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 4320822) - continued									
ES2215086-001	S1	EP130: Dichlorvos	62-73-7	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Dimethoate	60-51-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Ethion	563-12-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Fenthion	55-38-9	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Malathion	121-75-5	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion	56-38-2	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	<10	0.0	No Limit
		EP130: Prothiofos	34643-46-4	10	µg/kg	<10	<10	0.0	No Limit
EP131A: Organochlorine Pesticides (QC Lot: 4320821)									
ES2215086-001	S1	EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	<0.25	0.0	No Limit
		EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDD	72-54-8	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: 4.4`-DDE	72-55-9	0.5	µg/kg	2.44	2.73	11.2	No Limit
		EP131A: 4.4`-DDT	50-29-3	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Sum of DDD + DDE + DDT	72-54-8/72-55-9/50-2	0.5	µg/kg	2.44	2.73	11.2	No Limit
		EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
		EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	<0.50	0.0	No Limit
EP131B: Polychlorinated Biphenyls (as Aroclors) (QC Lot: 4320820)									
ES2215086-001	S1	EP131B: Total Polychlorinated biphenyls	----	5	µg/kg	<15.6	<15.6	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP131B: Polychlorinated Biphenyls (as Aroclors) (QC Lot: 4320820) - continued									
ES2215086-001	S1	EP131B: Aroclor 1016	12674-11-2	5	µg/kg	<15.6	<15.6	0.0	No Limit
		EP131B: Aroclor 1221	11104-28-2	5	µg/kg	<15.6	<15.6	0.0	No Limit
		EP131B: Aroclor 1232	11141-16-5	5	µg/kg	<15.6	<15.6	0.0	No Limit
		EP131B: Aroclor 1242	53469-21-9	5	µg/kg	<15.6	<15.6	0.0	No Limit
		EP131B: Aroclor 1248	12672-29-6	5	µg/kg	<15.6	<15.6	0.0	No Limit
		EP131B: Aroclor 1254	11097-69-1	5	µg/kg	<15.6	<15.6	0.0	No Limit
		EP131B: Aroclor 1260	11096-82-5	5	µg/kg	<15.6	<15.6	0.0	No Limit
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4320827)									
EB2212039-001	Anonymous	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	0.0	No Limit
EB2212039-013	Anonymous	EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	<4	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP132B: Polynuclear Aromatic Hydrocarbons (QC Lot: 4320827) - continued									
EB2212039-013	Anonymous	EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	<4	0.0	No Limit
		EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	<5	0.0	No Limit
		EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	<5	0.0	No Limit
EP201: Carbamate Pesticides by LCMS (QC Lot: 4327899)									
EB2211953-019	Anonymous	EP201: Oxamyl	23135-22-0	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: Methomyl	16752-77-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: 3-Hydroxy Carbofuran	16655-82-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: Aldicarb	116-06-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: Bendiocarb	22781-23-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: Thiodicarb	59669-26-0	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: Carbofuran	1563-66-2	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: Carbaryl	63-25-2	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP201: Methiocarb	2032-65-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 4319649)									
EM2207621-003	Anonymous	EP202: 4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4-DB	94-82-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Dicamba	1918-00-9	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Mecoprop	93-65-2	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: MCPA	94-74-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4-DP	120-36-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4-D	94-75-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Triclopyr	55335-06-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4.5-T	93-76-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: MCPB	94-81-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Picloram	1918-02-1	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Clopyralid	1702-17-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Fluroxypyr	69377-81-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
EM2207729-001	Anonymous	EP202: 4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4-DB	94-82-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 4319649) - continued									
EM2207729-001	Anonymous	EP202: Dicamba	1918-00-9	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Mecoprop	93-65-2	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: MCPA	94-74-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4-DP	120-36-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4-D	94-75-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Triclopyr	55335-06-3	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: 2.4.5-T	93-76-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: MCPB	94-81-5	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Picloram	1918-02-1	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Clopyralid	1702-17-6	0.02	mg/kg	<0.02	<0.02	0.0	No Limit
		EP202: Fluroxypyr	69377-81-7	0.02	mg/kg	<0.02	<0.02	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EG005(ED093)-SD: Total Metals in Sediments by ICP-AES (QCLot: 4339186)								
EG005-SD: Aluminium	7429-90-5	50	mg/kg	<50	15910 mg/kg	96.6	88.2	136
EG005-SD: Iron	7439-89-6	50	mg/kg	<50	31660 mg/kg	100	70.0	109
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 4339187)								
EG005T: Barium	7440-39-3	10	mg/kg	<10	90.5 mg/kg	95.7	65.0	136
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	----	----	----	----
EG005T: Molybdenum	7439-98-7	2	mg/kg	<2	----	----	----	----
EG005T: Tin	7440-31-5	5	mg/kg	<5	----	----	----	----
EG005T: Thallium	7440-28-0	5	mg/kg	<5	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 4339184)								
EG035T-LL: Mercury	7439-97-6	0.01	mg/kg	<0.01	0.087 mg/kg	79.3	72.0	116
EA029-A: pH Measurements (QCLot: 4326904)								
EA029: pH KCl (23A)	----	0.1	pH Unit	<0.1	4.4 pH Unit	99.5	70.0	130
EA029: pH OX (23B)	----	0.1	pH Unit	<0.1	4.2 pH Unit	105	70.0	130
EA029-B: Acidity Trail (QCLot: 4326904)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	19 mole H+ / t	93.3	70.0	130
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	27.5 mole H+ / t	100	70.0	130
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 4326904)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.064 % S	78.7	70.0	130
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.161 % S	105	70.0	130
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 4326904)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.020	0.133 % Ca	81.1	70.0	130
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.020	0.189 % Ca	95.8	70.0	130
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	----	----	----	----
EA029-E: Magnesium Values (QCLot: 4326904)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.020	0.246 % Mg	98.4	70.0	130

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EA029-E: Magnesium Values (QCLot: 4326904) - continued								
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.020	0.231 % Mg	108	70.0	130
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 4326904)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.020	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	<0.020	----	----	----	----
EA029-H: Acid Base Accounting (QCLot: 4326904)								
EA029: ANC Fineness Factor	----	0.5	-	<0.5	----	----	----	----
EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 4339185)								
EG020-SD: Antimony	7440-36-0	0.5	mg/kg	<0.50	1.54 mg/kg	109	70.0	130
EG020-SD: Arsenic	7440-38-2	1	mg/kg	<1.00	110 mg/kg	83.5	80.0	139
EG020-SD: Cadmium	7440-43-9	0.1	mg/kg	<0.1	0.8 mg/kg	91.8	83.0	127
EG020-SD: Chromium	7440-47-3	1	mg/kg	<1.0	20.3 mg/kg	84.6	73.0	130
EG020-SD: Copper	7440-50-8	1	mg/kg	<1.0	49 mg/kg	80.2	76.0	130
EG020-SD: Cobalt	7440-48-4	0.5	mg/kg	<0.5	10.7 mg/kg	84.8	81.0	130
EG020-SD: Lead	7439-92-1	1	mg/kg	<1.0	57.4 mg/kg	94.4	74.0	130
EG020-SD: Manganese	7439-96-5	10	mg/kg	<10	536 mg/kg	90.0	76.0	130
EG020-SD: Nickel	7440-02-0	1	mg/kg	<1.0	14.7 mg/kg	90.3	83.0	130
EG020-SD: Selenium	7782-49-2	0.1	mg/kg	<0.1	----	----	----	----
EG020-SD: Silver	7440-22-4	0.1	mg/kg	<0.1	2.75 mg/kg	99.4	64.0	148
EG020-SD: Vanadium	7440-62-2	2	mg/kg	<2.0	60.1 mg/kg	84.0	84.0	131
EG020-SD: Zinc	7440-66-6	1	mg/kg	<1.0	125.8 mg/kg	87.9	82.0	137
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4338012)								
EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	2.5 mg/kg	101	85.0	111
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4339220)								
EK057G: Nitrite as N (Sol.)	14797-65-0	0.1	mg/kg	<0.1	2.5 mg/kg	101	85.0	111
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4338013)								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.5 mg/kg	103	88.0	118
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4339219)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4339219) - continued								
EK059G: Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	<0.1	2.5 mg/kg	95.4	88.0	118
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 4335806)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	0.55 %	102	80.0	120
				<0.02	27.5 %	101	80.0	120
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 4335808)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	0.55 %	101	80.0	120
				<0.02	27.5 %	101	80.0	120
EP068C: Triazines (QCLot: 4323626)								
EP068: Atrazine	1912-24-9	0.05	mg/kg	<0.05	0.5 mg/kg	90.7	68.0	116
EP068: Simazine	122-34-9	0.05	mg/kg	<0.05	0.5 mg/kg	91.6	69.0	113
EP069: Toxaphene (QCLot: 4337284)								
EP069: Toxaphene	8001-35-2	2	mg/kg	<2	10 mg/kg	97.8	64.0	132
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 4320968)								
EP071-SD-SV: C10 - C14 Fraction	----	3	mg/kg	<3	5 mg/kg	94.4	73.0	119
EP071-SD-SV: C15 - C28 Fraction	----	3	mg/kg	<3	7.5 mg/kg	98.7	70.0	130
EP071-SD-SV: C29 - C36 Fraction	----	5	mg/kg	<5	5 mg/kg	96.1	84.0	118
EP071-SD-SV: C10 - C36 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 4336237)								
EP080-SD: C6 - C9 Fraction	----	3	mg/kg	<3	6.2 mg/kg	117	61.0	133
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons (QCLot: 4320968)								
EP071-SD-SV: >C10 - C16 Fraction	----	3	mg/kg	<3	6.25 mg/kg	95.1	78.0	118
EP071-SD-SV: >C16 - C34 Fraction	----	3	mg/kg	<3	8.75 mg/kg	96.8	74.0	138
EP071-SD-SV: >C34 - C40 Fraction	----	5	mg/kg	<5	3.75 mg/kg	96.0	63.0	131
EP071-SD-SV: >C10 - C40 Fraction (sum)	----	3	mg/kg	<3	----	----	----	----
EP080-SD: BTEXN (QCLot: 4336237)								
EP080-SD: Benzene	71-43-2	0.2	mg/kg	<0.2	0.2 mg/kg	121	66.0	122
EP080-SD: Toluene	108-88-3	0.2	mg/kg	<0.2	0.2 mg/kg	121	70.0	130
EP080-SD: Ethylbenzene	100-41-4	0.2	mg/kg	<0.2	0.2 mg/kg	116	66.0	126
EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	<0.2	0.4 mg/kg	115	59.0	129
EP080-SD: ortho-Xylene	95-47-6	0.2	mg/kg	<0.2	0.2 mg/kg	114	66.0	126
EP090: Organotin Compounds (QCLot: 4324024)								
EP090: Monobutyltin	78763-54-9	1	µgSn/kg	<1	1.25 µgSn/kg	118	36.0	128
EP090: Dibutyltin	1002-53-5	1	µgSn/kg	<1	1.25 µgSn/kg	103	42.0	132
EP090: Tributyltin	56573-85-4	0.5	µgSn/kg	<0.5	1.25 µgSn/kg	121	52.0	139
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 4320822)								
EP130: Bromophos-ethyl	4824-78-6	10	µg/kg	<10	50 µg/kg	98.8	49.0	117

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 4320822) - continued								
EP130: Carbophenothion	786-19-6	10	µg/kg	<10	50 µg/kg	81.1	54.0	104
EP130: Chlorfenvinphos (E)	18708-86-6	10	µg/kg	<10.0	5 µg/kg	81.5	48.0	156
EP130: Chlorfenvinphos (Z)	18708-87-7	10	µg/kg	<10	50 µg/kg	89.6	53.0	119
EP130: Chlorpyrifos	2921-88-2	10	µg/kg	<10	50 µg/kg	96.1	54.0	112
EP130: Chlorpyrifos-methyl	5598-13-0	10	µg/kg	<10	50 µg/kg	92.1	52.0	108
EP130: Demeton-S-methyl	919-86-8	10	µg/kg	<10	50 µg/kg	78.0	51.0	109
EP130: Diazinon	333-41-5	10	µg/kg	<10	50 µg/kg	83.1	57.0	121
EP130: Dichlorvos	62-73-7	10	µg/kg	<10	50 µg/kg	79.3	48.0	104
EP130: Dimethoate	60-51-5	10	µg/kg	<10	50 µg/kg	82.0	52.0	120
EP130: Ethion	563-12-2	10	µg/kg	<10	50 µg/kg	87.6	51.0	121
EP130: Fenamiphos	22224-92-6	10	µg/kg	<10	50 µg/kg	81.1	50.0	120
EP130: Fenthion	55-38-9	10	µg/kg	<10	50 µg/kg	76.6	48.0	112
EP130: Malathion	121-75-5	10	µg/kg	<10	50 µg/kg	86.9	51.0	121
EP130: Azinphos Methyl	86-50-0	10	µg/kg	<10	50 µg/kg	75.8	45.0	127
EP130: Monocrotophos	6923-22-4	10	µg/kg	<10	50 µg/kg	78.5	48.0	128
EP130: Parathion	56-38-2	10	µg/kg	<10	50 µg/kg	79.1	49.0	125
EP130: Parathion-methyl	298-00-0	10	µg/kg	<10	50 µg/kg	83.6	51.0	119
EP130: Pirimphos-ethyl	23505-41-1	10	µg/kg	<10	50 µg/kg	88.5	48.0	120
EP130: Prothiofos	34643-46-4	10	µg/kg	<10	50 µg/kg	98.6	51.0	117
EP131A: Organochlorine Pesticides (QCLot: 4320821)								
EP131A: Aldrin	309-00-2	0.5	µg/kg	<0.50	5 µg/kg	52.2	38.0	139
EP131A: alpha-BHC	319-84-6	0.5	µg/kg	<0.50	5 µg/kg	46.5	17.6	136
EP131A: beta-BHC	319-85-7	0.5	µg/kg	<0.50	5 µg/kg	48.2	30.5	131
EP131A: delta-BHC	319-86-8	0.5	µg/kg	<0.50	5 µg/kg	49.7	37.0	140
EP131A: 4.4`-DDD	72-54-8	0.5	µg/kg	<0.50	5 µg/kg	52.1	25.9	141
EP131A: 4.4`-DDE	72-55-9	0.5	µg/kg	<0.50	5 µg/kg	39.2	35.0	129
EP131A: 4.4`-DDT	50-29-3	0.5	µg/kg	<0.50	5 µg/kg	97.1	23.4	138
EP131A: Sum of DDD + DDE + DDT	72-54-8/72-5 5-9/50-2	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Dieldrin	60-57-1	0.5	µg/kg	<0.50	5 µg/kg	55.4	30.2	140
EP131A: alpha-Endosulfan	959-98-8	0.5	µg/kg	<0.50	5 µg/kg	52.6	38.0	140
EP131A: beta-Endosulfan	33213-65-9	0.5	µg/kg	<0.50	5 µg/kg	54.3	32.0	152
EP131A: Endosulfan sulfate	1031-07-8	0.5	µg/kg	<0.50	5 µg/kg	# -15.8	36.0	155
EP131A: Endosulfan (sum)	115-29-7	0.5	µg/kg	<0.50	----	----	----	----
EP131A: Endrin	72-20-8	0.5	µg/kg	<0.50	5 µg/kg	82.4	25.8	158
EP131A: Endrin aldehyde	7421-93-4	0.5	µg/kg	<0.50	5 µg/kg	49.3	20.1	118
EP131A: Endrin ketone	53494-70-5	0.5	µg/kg	<0.50	5 µg/kg	54.1	13.4	135
EP131A: Heptachlor	76-44-8	0.5	µg/kg	<0.50	5 µg/kg	52.4	39.0	155
EP131A: Heptachlor epoxide	1024-57-3	0.5	µg/kg	<0.50	5 µg/kg	50.4	34.0	148

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP131A: Organochlorine Pesticides (QCLot: 4320821) - continued								
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.5	µg/kg	<0.50	5 µg/kg	47.8	26.1	152
EP131A: gamma-BHC	58-89-9	0.25	µg/kg	<0.25	5 µg/kg	46.0	31.2	137
EP131A: Methoxychlor	72-43-5	0.5	µg/kg	<0.50	5 µg/kg	60.2	36.0	152
EP131A: cis-Chlordane	5103-71-9	0.25	µg/kg	<0.25	5 µg/kg	51.8	36.0	142
EP131A: trans-Chlordane	5103-74-2	0.25	µg/kg	<0.25	5 µg/kg	52.2	29.5	138
EP131A: Total Chlordane (sum)	----	0.25	µg/kg	<0.25	----	----	----	----
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 4320820)								
EP131B: Total Polychlorinated biphenyls	----	5	µg/kg	<5.0	50 µg/kg	84.8	45.0	115
EP131B: Aroclor 1016	12674-11-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1221	11104-28-2	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1232	11141-16-5	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1242	53469-21-9	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1248	12672-29-6	5	µg/kg	<5.0	----	----	----	----
EP131B: Aroclor 1254	11097-69-1	5	µg/kg	<5.0	50 µg/kg	84.8	45.0	115
EP131B: Aroclor 1260	11096-82-5	5	µg/kg	<5.0	----	----	----	----
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 4320827)								
EP132B-SD: Naphthalene	91-20-3	5	µg/kg	<5	25 µg/kg	87.6	63.0	129
EP132B-SD: 2-Methylnaphthalene	91-57-6	5	µg/kg	<5	25 µg/kg	87.6	64.0	128
EP132B-SD: Acenaphthylene	208-96-8	4	µg/kg	<4	25 µg/kg	89.5	65.0	129
EP132B-SD: Acenaphthene	83-32-9	4	µg/kg	<4	25 µg/kg	88.2	68.0	132
EP132B-SD: Fluorene	86-73-7	4	µg/kg	<4	25 µg/kg	90.0	68.0	124
EP132B-SD: Phenanthrene	85-01-8	4	µg/kg	<4	25 µg/kg	88.4	64.0	134
EP132B-SD: Anthracene	120-12-7	4	µg/kg	<4	25 µg/kg	88.5	65.0	131
EP132B-SD: Fluoranthene	206-44-0	4	µg/kg	<4	25 µg/kg	87.9	64.0	130
EP132B-SD: Pyrene	129-00-0	4	µg/kg	<4	25 µg/kg	87.7	67.0	133
EP132B-SD: Benz(a)anthracene	56-55-3	4	µg/kg	<4	25 µg/kg	88.8	62.0	130
EP132B-SD: Chrysene	218-01-9	4	µg/kg	<4	25 µg/kg	86.5	65.0	133
EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	4	µg/kg	<4	25 µg/kg	84.2	68.0	120
EP132B-SD: Benzo(k)fluoranthene	207-08-9	4	µg/kg	<4	25 µg/kg	84.4	61.0	133
EP132B-SD: Benzo(e)pyrene	192-97-2	4	µg/kg	<4	25 µg/kg	84.6	63.0	127
EP132B-SD: Benzo(a)pyrene	50-32-8	4	µg/kg	<4	25 µg/kg	86.6	66.0	118
EP132B-SD: Perylene	198-55-0	4	µg/kg	<4	25 µg/kg	84.6	69.0	119
EP132B-SD: Benzo(g.h.i)perylene	191-24-2	4	µg/kg	<4	25 µg/kg	80.5	66.0	120
EP132B-SD: Dibenz(a.h)anthracene	53-70-3	4	µg/kg	<4	25 µg/kg	83.9	64.0	122
EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	4	µg/kg	<4	25 µg/kg	82.3	64.0	120
EP132B-SD: Coronene	191-07-1	5	µg/kg	<5	25 µg/kg	84.0	68.0	136
EP132B-SD: Sum of PAHs	----	4	µg/kg	<4	----	----	----	----

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP201: Carbamate Pesticides by LCMS (QCLot: 4327899)								
EP201: Oxamyl	23135-22-0	0.02	mg/kg	<0.02	0.04 mg/kg	102	73.8	122
EP201: Methomyl	16752-77-5	0.02	mg/kg	<0.02	0.04 mg/kg	96.2	74.9	129
EP201: 3-Hydroxy Carbofuran	16655-82-6	0.02	mg/kg	<0.02	0.04 mg/kg	100	79.5	131
EP201: Aldicarb	116-06-3	0.02	mg/kg	<0.02	0.04 mg/kg	97.8	82.2	138
EP201: Bendiocarb	22781-23-3	0.02	mg/kg	<0.02	0.04 mg/kg	103	76.4	138
EP201: Thiodicarb	59669-26-0	0.02	mg/kg	<0.02	0.04 mg/kg	100	75.9	129
EP201: Carbofuran	1563-66-2	0.02	mg/kg	<0.02	0.04 mg/kg	102	78.2	128
EP201: Carbaryl	63-25-2	0.02	mg/kg	<0.02	0.04 mg/kg	101	66.0	124
EP201: Methiocarb	2032-65-7	0.02	mg/kg	<0.02	0.04 mg/kg	102	70.2	144
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 4319649)								
EP202: 4-Chlorophenoxy acetic acid	122-88-3	0.02	mg/kg	<0.02	0.1 mg/kg	75.2	54.4	128
EP202: 2.4-DB	94-82-6	0.02	mg/kg	<0.02	0.1 mg/kg	77.7	45.5	130
EP202: Dicamba	1918-00-9	0.02	mg/kg	<0.02	0.1 mg/kg	83.1	51.7	135
EP202: Mecoprop	93-65-2	0.02	mg/kg	<0.02	0.1 mg/kg	69.9	60.0	130
EP202: MCPA	94-74-6	0.02	mg/kg	<0.02	0.1 mg/kg	79.6	56.8	131
EP202: 2.4-DP	120-36-5	0.02	mg/kg	<0.02	0.1 mg/kg	79.3	50.0	141
EP202: 2.4-D	94-75-7	0.02	mg/kg	<0.02	0.1 mg/kg	78.0	68.5	131
EP202: Triclopyr	55335-06-3	0.02	mg/kg	<0.02	0.1 mg/kg	77.4	50.8	141
EP202: 2.4.5-TP (Silvex)	93-72-1	0.02	mg/kg	<0.02	0.1 mg/kg	79.5	40.8	126
EP202: 2.4.5-T	93-76-5	0.02	mg/kg	<0.02	0.1 mg/kg	73.1	57.4	139
EP202: MCPB	94-81-5	0.02	mg/kg	<0.02	0.1 mg/kg	77.9	38.9	137
EP202: Picloram	1918-02-1	0.02	mg/kg	<0.02	0.1 mg/kg	69.1	48.7	129
EP202: Clopyralid	1702-17-6	0.02	mg/kg	<0.02	0.1 mg/kg	76.4	49.4	106
EP202: Fluroxypyr	69377-81-7	0.02	mg/kg	<0.02	0.1 mg/kg	80.4	53.2	128

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG035T: Total Recoverable Mercury by FIMS (Low Level) (QCLot: 4339184)							
ES2215086-001	S1	EG035T-LL: Mercury	7439-97-6	0.05 mg/kg	# Not Determined	70.0	130
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 4339185)							
ES2215086-002	S2	EG020-SD: Arsenic	7440-38-2	50 mg/kg	87.3	70.0	130
		EG020-SD: Cadmium	7440-43-9	50 mg/kg	91.0	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG020-SD: Total Metals in Sediments by ICPMS (QCLot: 4339185) - continued							
ES2215086-002	S2	EG020-SD: Chromium	7440-47-3	50 mg/kg	118	70.0	130
		EG020-SD: Copper	7440-50-8	250 mg/kg	108	70.0	130
		EG020-SD: Lead	7439-92-1	250 mg/kg	81.0	70.0	130
		EG020-SD: Nickel	7440-02-0	50 mg/kg	95.6	70.0	130
		EG020-SD: Zinc	7440-66-6	250 mg/kg	109	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4338012)							
ES2215911-001	Anonymous	EK057G: Nitrite as N (Sol.)	14797-65-0	250 mg/kg	98.0	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4339220)							
ES2215086-002	S2	EK057G: Nitrite as N (Sol.)	14797-65-0	2.5 mg/kg	97.0	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4338013)							
ES2215911-001	Anonymous	EK059G: Nitrite + Nitrate as N (Sol.)	----	25 mg/kg	101	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4339219)							
ES2215086-002	S2	EK059G: Nitrite + Nitrate as N (Sol.)	----	2.5 mg/kg	102	70.0	130
EP069: Toxaphene (QCLot: 4337284)							
ES2215086-002	S2	EP069: Toxaphene	8001-35-2	10 mg/kg	84.6	54.2	138
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 4320968)							
ES2215086-001	S1	EP071-SD-SV: C10 - C14 Fraction	----	14 mg/kg	74.8	70.0	130
		EP071-SD-SV: C15 - C28 Fraction	----	59 mg/kg	110	70.0	130
		EP071-SD-SV: C29 - C36 Fraction	----	42 mg/kg	99.3	70.0	130
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons (QCLot: 4336237)							
ES2215086-001	S1	EP080-SD: C6 - C9 Fraction	----	6.5 mg/kg	130	70.0	130
EP080-SD: BTEXN (QCLot: 4336237)							
ES2215086-001	S1	EP080-SD: Benzene	71-43-2	0.5 mg/kg	120	70.0	130
		EP080-SD: Toluene	108-88-3	0.5 mg/kg	122	70.0	130
		EP080-SD: Ethylbenzene	100-41-4	0.5 mg/kg	126	70.0	130
		EP080-SD: meta- & para-Xylene	108-38-3 106-42-3	0.5 mg/kg	124	70.0	130
		EP080-SD: ortho-Xylene	95-47-6	0.5 mg/kg	125	70.0	130
EP090: Organotin Compounds (QCLot: 4324024)							
ES2215086-002	S2	EP090: Monobutyltin	78763-54-9	1.25 µgSn/kg	# Not Determined	20.0	130
		EP090: Dibutyltin	1002-53-5	1.25 µgSn/kg	# Not Determined	20.0	130
		EP090: Tributyltin	56573-85-4	1.25 µgSn/kg	# Not Determined	20.0	130
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 4320822)							

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 4320822) - continued							
ES2215086-001	S1	EP130: Bromophos-ethyl	4824-78-6	50 µg/kg	61.3	36.0	144
		EP130: Carbophenothion	786-19-6	50 µg/kg	71.0	38.0	120
		EP130: Chlorfenvinphos (E)	18708-86-6	5 µg/kg	49.4	49.0	157
		EP130: Chlorfenvinphos (Z)	18708-87-7	50 µg/kg	53.1	53.0	145
		EP130: Chlorpyrifos	2921-88-2	50 µg/kg	79.4	60.0	140
		EP130: Chlorpyrifos-methyl	5598-13-0	50 µg/kg	72.2	56.0	126
		EP130: Demeton-S-methyl	919-86-8	50 µg/kg	66.5	9.70	148
		EP130: Diazinon	333-41-5	50 µg/kg	64.2	60.0	122
		EP130: Dichlorvos	62-73-7	50 µg/kg	56.1	33.0	123
		EP130: Dimethoate	60-51-5	50 µg/kg	61.2	36.0	142
		EP130: Ethion	563-12-2	50 µg/kg	52.9	48.0	136
		EP130: Fenamiphos	22224-92-6	50 µg/kg	51.0	42.0	136
		EP130: Fenthion	55-38-9	50 µg/kg	68.3	35.0	131
		EP130: Malathion	121-75-5	50 µg/kg	57.2	55.0	141
		EP130: Azinphos Methyl	86-50-0	50 µg/kg	52.8	23.5	132
		EP130: Monocrotophos	6923-22-4	50 µg/kg	61.0	35.0	153
		EP130: Parathion	56-38-2	50 µg/kg	61.5	57.0	147
		EP130: Parathion-methyl	298-00-0	50 µg/kg	61.9	48.0	140
		EP130: Pirimphos-ethyl	23505-41-1	50 µg/kg	56.5	45.0	137
		EP130: Prothiofos	34643-46-4	50 µg/kg	55.4	51.0	137
EP131A: Organochlorine Pesticides (QCLot: 4320821)							
ES2215086-001	S1	EP131A: Aldrin	309-00-2	5 µg/kg	41.9	23.4	153
		EP131A: alpha-BHC	319-84-6	5 µg/kg	43.8	17.6	156
		EP131A: beta-BHC	319-85-7	5 µg/kg	30.1	24.9	153
		EP131A: delta-BHC	319-86-8	5 µg/kg	43.6	25.2	147
		EP131A: 4.4`-DDD	72-54-8	5 µg/kg	57.5	25.9	150
		EP131A: 4.4`-DDE	72-55-9	5 µg/kg	61.3	31.2	125
		EP131A: 4.4`-DDT	50-29-3	5 µg/kg	75.3	23.4	163
		EP131A: Dieldrin	60-57-1	5 µg/kg	45.2	30.2	140
		EP131A: alpha-Endosulfan	959-98-8	5 µg/kg	109	28.8	135
		EP131A: beta-Endosulfan	33213-65-9	5 µg/kg	56.8	22.6	141
		EP131A: Endosulfan sulfate	1031-07-8	5 µg/kg	68.8	16.1	156
		EP131A: Endrin	72-20-8	5 µg/kg	99.4	17.7	162
		EP131A: Endrin aldehyde	7421-93-4	5 µg/kg	45.9	20.1	116
		EP131A: Endrin ketone	53494-70-5	5 µg/kg	33.5	13.4	151
		EP131A: Heptachlor	76-44-8	5 µg/kg	47.1	23.8	170
		EP131A: Heptachlor epoxide	1024-57-3	5 µg/kg	58.6	28.3	140
		EP131A: Hexachlorobenzene (HCB)	118-74-1	5 µg/kg	37.3	17.7	144
		EP131A: gamma-BHC	58-89-9	5 µg/kg	35.3	21.8	158

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP131A: Organochlorine Pesticides (QCLot: 4320821) - continued							
ES2215086-001	S1	EP131A: Methoxychlor	72-43-5	5 µg/kg	43.7	24.4	158
		EP131A: cis-Chlordane	5103-71-9	5 µg/kg	34.7	27.3	139
		EP131A: trans-Chlordane	5103-74-2	5 µg/kg	44.9	29.5	138
EP131B: Polychlorinated Biphenyls (as Aroclors) (QCLot: 4320820)							
ES2215086-001	S1	EP131B: Total Polychlorinated biphenyls	----	50 µg/kg	67.5	44.0	136
		EP131B: Aroclor 1254	11097-69-1	50 µg/kg	67.5	44.0	136
EP132B: Polynuclear Aromatic Hydrocarbons (QCLot: 4320827)							
EB2212039-001	Anonymous	EP132B-SD: Naphthalene	91-20-3	25 µg/kg	92.3	70.0	130
		EP132B-SD: 2-Methylnaphthalene	91-57-6	25 µg/kg	92.2	70.0	130
		EP132B-SD: Acenaphthylene	208-96-8	25 µg/kg	108	70.0	130
		EP132B-SD: Acenaphthene	83-32-9	25 µg/kg	92.3	70.0	130
		EP132B-SD: Fluorene	86-73-7	25 µg/kg	92.7	70.0	130
		EP132B-SD: Phenanthrene	85-01-8	25 µg/kg	90.4	70.0	130
		EP132B-SD: Anthracene	120-12-7	25 µg/kg	97.0	70.0	130
		EP132B-SD: Fluoranthene	206-44-0	25 µg/kg	88.1	70.0	130
		EP132B-SD: Pyrene	129-00-0	25 µg/kg	87.2	70.0	130
		EP132B-SD: Benz(a)anthracene	56-55-3	25 µg/kg	96.2	70.0	130
		EP132B-SD: Chrysene	218-01-9	25 µg/kg	86.0	70.0	130
		EP132B-SD: Benzo(b+j)fluoranthene	205-99-2 205-82-3	25 µg/kg	77.9	70.0	130
		EP132B-SD: Benzo(k)fluoranthene	207-08-9	25 µg/kg	82.4	70.0	130
		EP132B-SD: Benzo(e)pyrene	192-97-2	25 µg/kg	81.6	70.0	130
		EP132B-SD: Benzo(a)pyrene	50-32-8	25 µg/kg	84.5	70.0	130
		EP132B-SD: Perylene	198-55-0	25 µg/kg	78.0	70.0	130
		EP132B-SD: Benzo(g.h.i)perylene	191-24-2	25 µg/kg	85.1	70.0	130
		EP132B-SD: Dibenz(a.h)anthracene	53-70-3	25 µg/kg	91.4	70.0	130
		EP132B-SD: Indeno(1.2.3.cd)pyrene	193-39-5	25 µg/kg	89.8	70.0	130
		EP132B-SD: Coronene	191-07-1	25 µg/kg	91.8	70.0	130
EP201: Carbamate Pesticides by LCMS (QCLot: 4327899)							
EB2211953-019	Anonymous	EP201: Oxamyl	23135-22-0	0.04 mg/kg	96.0	74.0	152
		EP201: Methomyl	16752-77-5	0.04 mg/kg	95.9	75.0	145
		EP201: 3-Hydroxy Carbofuran	16655-82-6	0.04 mg/kg	97.9	80.0	146
		EP201: Aldicarb	116-06-3	0.04 mg/kg	92.9	82.0	138
		EP201: Bendiocarb	22781-23-3	0.04 mg/kg	95.2	76.0	142
		EP201: Thiodicarb	59669-26-0	0.04 mg/kg	90.7	76.0	148
		EP201: Carbofuran	1563-66-2	0.04 mg/kg	91.9	78.0	140
		EP201: Carbaryl	63-25-2	0.04 mg/kg	95.6	63.0	139
		EP201: Methiocarb	2032-65-7	0.04 mg/kg	92.5	70.0	144

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 4319649)							
EM2207621-003	Anonymous	EP202: Mecoprop	93-65-2	0.1 mg/kg	71.0	60.0	140
		EP202: MCPA	94-74-6	0.1 mg/kg	64.3	57.0	143
		EP202: 2.4-D	94-75-7	0.1 mg/kg	74.5	68.0	139
		EP202: Triclopyr	55335-06-3	0.1 mg/kg	66.0	51.0	145
		EP202: 2.4.5-T	93-76-5	0.1 mg/kg	71.0	57.0	142
		EP202: Picloram	1918-02-1	0.1 mg/kg	63.7	49.0	138
		EP202: Clopyralid	1702-17-6	0.1 mg/kg	60.7	49.0	149

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2215086**	Page	: 1 of 14
Client	: **OCEAN ENVIRONMENTAL**	Laboratory	: Environmental Division Sydney
Contact	: DR KATHRYN SMYTHE	Telephone	: +61-2-8784 8555
Project	: Sirisi Marina	Date Samples Received	: 03-May-2022
Site	: ----	Issue Date	: 23-May-2022
Sampler	: Kaite Smythe	No. of samples received	: 6
Order number	: ----	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **Duplicate outliers exist - please see following pages for full details.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
EP090: Organotin Compounds	ES2215086--003	S3	**Dibutyltin**	1002-53-5	94.3 %	0% - 20%	**RPD exceeds LOR based limits**
EP090: Organotin Compounds	ES2215086--003	S3	**Tributyltin**	56573-85-4	34.3 %	0% - 20%	**RPD exceeds LOR based limits**
Laboratory Control Spike (LCS) Recoveries							
EP131A: Organochlorine Pesticides	QC-MRG2-43208210	----	**Endosulfan sulfate**	1031-07-8	-15.8 %	36.0-155%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EG035T: Total Recoverable Mercury by FIMS (Low Lev	ES2215086--001	S1	**Mercury**	7439-97-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP090: Organotin Compounds	ES2215086--002	S2	**Monobutyltin**	78763-54-9	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP090: Organotin Compounds	ES2215086--002	S2	**Dibutyltin**	1002-53-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP090: Organotin Compounds	ES2215086--002	S2	**Tributyltin**	56573-85-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Samples Submitted							
EP131T: PCB Surrogate	ES2215086-002	S2	**Decachlorobiphenyl**	2051-24-3	109 %	10.0-106 %	**Recovery greater than upper data quality objective**
EP132T: Base/Neutral Extractable Surrogates	ES2215086-001	S1	**Anthracene-d10**	1719-06-8	154 %	70.0-136 %	**Recovery greater than upper data quality objective**
EP132T: Base/Neutral Extractable Surrogates	ES2215086-001	S1	**4-Terphenyl-d14**	1718-51-0	132 %	57.0-127 %	**Recovery greater than upper data quality objective**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
S1	13-May-2022	08-May-2022	**5**	16-May-2022	13-May-2022	**3**

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA002: pH 1:5 (Soils) - Analysis Holding Time Compliance						
Soil Glass Jar - Unpreserved S2, S3, S4, S5, S6	15-May-2022	08-May-2022	**7**	16-May-2022	15-May-2022	**1**
EK057G: Nitrite as N by Discrete Analyser						
Soil Glass Jar - Unpreserved S1	13-May-2022	08-May-2022	**5**	16-May-2022	15-May-2022	**1**
Soil Glass Jar - Unpreserved S2, S3, S4, S5, S6	15-May-2022	08-May-2022	**7**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser						
Soil Glass Jar - Unpreserved S1	----	----	----	16-May-2022	15-May-2022	**1**

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Matrix Spikes (MS)					
Total Metals by ICP-AES	0	6	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) S1	**01-May-2022**	**13-May-2022**	08-May-2022	×	**16-May-2022**	13-May-2022	×
Soil Glass Jar - Unpreserved (EA002) S2, S3, S4, S5, S6	**01-May-2022**	**15-May-2022**	08-May-2022	×	**16-May-2022**	15-May-2022	×

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA003 :pH (field/fox)							
Snap Lock Bag - frozen (EA003) S2, S3, S4, S5	**01-May-2022**	**11-May-2022**	24-Jan-2025	✓	**11-May-2022**	09-Aug-2022	✓
EA029-A: pH Measurements							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓
EA029-B: Acidity Trail							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓
EA029-C: Sulfur Trail							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓
EA029-D: Calcium Values							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓
EA029-E: Magnesium Values							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓
EA029-F: Excess Acid Neutralising Capacity							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓
EA029-G: Retained Acidity							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓
EA029-H: Acid Base Accounting							
Snap Lock Bag - frozen (EA029) S2, S3, S4, S5	**01-May-2022**	**10-May-2022**	24-Jan-2025	✓	**10-May-2022**	08-Aug-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
S1	**01-May-2022**	**----**	----	----	**13-May-2022**	15-May-2022	✓
Soil Glass Jar - Unpreserved (EA055)							
S2, S3, S4, S5, S6	**01-May-2022**	**----**	----	----	**15-May-2022**	15-May-2022	✓
EA150: Particle Sizing							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**----**	----	----	**12-May-2022**	28-Oct-2022	✓
EA150: Soil Classification based on Particle Size							
Snap Lock Bag - Friable Asbestos/PSD Bag (EA150H)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**----**	----	----	**12-May-2022**	28-Oct-2022	✓
EG005(ED093)-SD: Total Metals in Sediments by ICP-AES							
Soil Glass Jar - Unpreserved (EG005-SD)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**15-May-2022**	28-Oct-2022	✓	**16-May-2022**	28-Oct-2022	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**15-May-2022**	28-Oct-2022	✓	**16-May-2022**	28-Oct-2022	✓
EG020-SD: Total Metals in Sediments by ICPMS							
Soil Glass Jar - Unpreserved (EG020-SD)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**15-May-2022**	28-Oct-2022	✓	**16-May-2022**	28-Oct-2022	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T-LL)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**15-May-2022**	29-May-2022	✓	**16-May-2022**	29-May-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK057G)							
S1	**01-May-2022**	**13-May-2022**	08-May-2022	×	**16-May-2022**	15-May-2022	×
Soil Glass Jar - Unpreserved (EK057G)							
S2, S3, S4, S5, S6	**01-May-2022**	**15-May-2022**	08-May-2022	×	**16-May-2022**	17-May-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Soil Glass Jar - Unpreserved (EK059G)							
S1	**01-May-2022**	**13-May-2022**	29-May-2022	✓	**16-May-2022**	15-May-2022	×
Soil Glass Jar - Unpreserved (EK059G)							
S2, S3, S4, S5, S6	**01-May-2022**	**15-May-2022**	29-May-2022	✓	**16-May-2022**	17-May-2022	✓
EP003: Total Organic Carbon (TOC) in Soil							
Soil Glass Jar - Unpreserved (EP003)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**13-May-2022**	29-May-2022	✓	**13-May-2022**	29-May-2022	✓
EP068C: Triazines							
Soil Glass Jar - Unpreserved (EP068)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**12-May-2022**	15-May-2022	✓	**16-May-2022**	21-Jun-2022	✓
EP069: Toxaphene							
Soil Glass Jar - Unpreserved (EP069)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**13-May-2022**	15-May-2022	✓	**13-May-2022**	22-Jun-2022	✓
EP080-SD / EP071-SD: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071-SD-SV)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**06-May-2022**	15-May-2022	✓	**12-May-2022**	15-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP080-SD)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**13-May-2022**	15-May-2022	✓	**13-May-2022**	15-May-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP080-SD / EP071-SD: Total Recoverable Hydrocarbons							
Soil Glass Jar - Unpreserved (EP071-SD-SV)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**06-May-2022**	15-May-2022	✓	**12-May-2022**	15-Jun-2022	✓
Soil Glass Jar - Unpreserved (EP080-SD)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**13-May-2022**	15-May-2022	✓	**13-May-2022**	15-May-2022	✓
EP080-SD: BTEXN							
Soil Glass Jar - Unpreserved (EP080-SD)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**13-May-2022**	15-May-2022	✓	**13-May-2022**	15-May-2022	✓
EP090: Organotin Compounds							
Soil Glass Jar - Unpreserved (EP090)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**10-May-2022**	15-May-2022	✓	**13-May-2022**	19-Jun-2022	✓
EP130A: Organophosphorus Pesticides (Ultra-trace)							
Soil Glass Jar - Unpreserved (EP130)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**05-May-2022**	15-May-2022	✓	**11-May-2022**	14-Jun-2022	✓
EP131A: Organochlorine Pesticides							
Soil Glass Jar - Unpreserved (EP131A)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**05-May-2022**	15-May-2022	✓	**11-May-2022**	14-Jun-2022	✓
EP131B: Polychlorinated Biphenyls (as Aroclors)							
Soil Glass Jar - Unpreserved (EP131B)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**05-May-2022**	15-May-2022	✓	**11-May-2022**	14-Jun-2022	✓
EP132B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP132B-SD)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**05-May-2022**	15-May-2022	✓	**10-May-2022**	14-Jun-2022	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP201: Carbamate Pesticides by LCMS							
Soil Glass Jar - Unpreserved (EP201)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**10-May-2022**	15-May-2022	✓	**10-May-2022**	19-Jun-2022	✓
EP202A: Phenoxyacetic Acid Herbicides by LCMS							
Soil Glass Jar - Unpreserved (EP202)							
S1, S2, S3, S4, S5, S6	**01-May-2022**	**05-May-2022**	15-May-2022	✓	**05-May-2022**	14-Jun-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Carbamate Pesticides by LCMS	EP201	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	29	**10.34**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB's (Ultra-trace)	EP131B	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	3	29	**10.34**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH field/fox	EA003	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	3	23	**13.04**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Toxaphene by GCMS	EP069	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fractions Only	EP071-SD-SV	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Carbamate Pesticides by LCMS	EP201	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	7	**28.57**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	7	**28.57**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB's (Ultra-trace)	EP131B	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Control Samples (LCS) - Continued							
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	4	23	**17.39**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Toxaphene by GCMS	EP069	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fractions Only	EP071-SD-SV	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Carbamate Pesticides by LCMS	EP201	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	7	**28.57**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	7	**28.57**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB's (Ultra-trace)	EP131B	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Fe and Al in Sediments by ICPAES	EG005-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	23	**8.70**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Toxaphene by GCMS	EP069	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fractions Only	EP071-SD-SV	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Carbamate Pesticides by LCMS	EP201	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	2	7	**28.57**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N - Soluble by Discrete Analyser	EK057G	2	7	**28.57**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organochlorine Pesticides (Ultra-trace)	EP131A	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organotin Analysis	EP090	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
PAHs in Sediments by GCMS(SIM)	EP132B-SD	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PCB's (Ultra-trace)	EP131B	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Pesticides by GCMS	EP068	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS (Low Level)	EG035T-LL	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	0	6	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Total Metals in Sediments by ICPMS	EG020-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Toxaphene by GCMS	EP069	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TPH - Semivolatile Fractions Only	EP071-SD-SV	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX in Sediments	EP080-SD	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
pH field/fox	EA003	SOIL	In house: Referenced to Ahern et al 1998 - determined on a 1:5 soil/water extract designed to simulate field measured pH and pH after the extract has been oxidised with peroxide.
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	SOIL	In house: Referenced to Ahern et al 2004 - a suspension peroxide oxidation method following the 'sulfur trail' by determining the level of 1M KCL extractable sulfur and the sulfur level after oxidation of soil sulphides. The 'acidity trail' is followed by measurement of TAA, TPA and TSA. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3
Total Fe and Al in Sediments by ICPAES	EG005-SD	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3). LORs per NODG
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Metals in Sediments by ICPMS	EG020-SD	SOIL	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. Analyte list and LORs per NODG.
Total Mercury by FIMS (Low Level)	EG035T-LL	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Nitrite as N - Soluble by Discrete Analyser	EK057G	SOIL	In house: Referenced to APHA 4500-NO3- B. Nitrite in a water extract is determined by direct colourimetry by Discrete Analyser.
Nitrate as N - Soluble by Discrete Analyser	EK058G	SOIL	In house: Referenced to APHA 4500-NO3- F. Nitrate in the 1:5 soil:water extract is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx)- Soluble by Discrete Analyser	EK059G	SOIL	In house: Thermo Scientific Method D08727 and NEMI (National Environmental Method Index) Method ID: 9171. This method covers the determination of total oxidised nitrogen (NOx-N) and nitrate (NO3-N) by calculation, Combined oxidised Nitrogen (NO2+NO3) in a water extract is determined by direct colourimetry by Discrete Analyser.

Analytical Methods	Method	Matrix	Method Descriptions
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automatically measured by infra-red detector.
Pesticides by GCMS	EP068	SOIL	In house: Referenced to USEPA SW 846 - 8270 Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
Toxaphene by GCMS	EP069	SOIL	In house: Referenced to USEPA 8276. Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This technique is compliant with NEPM Schedule B(3).
TPH - Semivolatile Fractions Only	EP071-SD-SV	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX in Sediments	EP080-SD	SOIL	In house: Referenced to USEPA SW 846 - 8260 Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve.
Organotin Analysis	EP090	SOIL	In house: Referenced to USEPA SW 846 - 8270 Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.
Organophosphorus Pesticides (Ultra-trace)	EP130	SOIL	In house: Referenced to USEPA Method 3640 (GPC cleanup), 8141 (GC/FPD - Capillary Column) This technique is compliant with NEPM Schedule B(3)
Organochlorine Pesticides (Ultra-trace)	EP131A	SOIL	In house: Referenced to USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/µECD/µECD) This technique is compliant with NEPM Schedule B(3)
PCB's (Ultra-trace)	EP131B	SOIL	In house: Referenced to USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/µECD/µECD) This technique is compliant with NEPM Schedule B(3)
PAHs in Sediments by GCMS(SIM)	EP132B-SD	SOIL	In house: Referenced to USEPA 8270 GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.
Carbamate Pesticides by LCMS	EP201	SOIL	In house: Referenced to USEPA Method 8318 LCMS (ES in positive mode). Residues of carbamates are extracted from soil samples using acetonitrile. The extract is evaporated to near dryness and the residues are dissolved in HPLC mobile phase prior to instrumental analysis.
Phenoxyacetic Acid Herbicides (LCMS - Standard DL)	EP202	SOIL	In house: LCMS (Electrospray in negative mode). Residues of acid herbicides are extracted from soil samples under the alkaline condition. An aliquot of the alkaline aqueous phase is taken and acidified before a SPE cleanup. After eluting off from the SPE cartridge, residues of acid herbicides are dissolved in HPLC mobile phase prior to instrument analysis.

Preparation Methods	Method	Matrix	Method Descriptions
Drying only	EN020D	SOIL	In house
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Extraction for Carbamates in Soils	EP201-PR	SOIL	In house: Referenced to USEPA Method 8318
Extraction for Phenoxy Acid Herbicides in Soils.	EP202-PR	SOIL	In-House: Alkaline extract followed by SPE clean up of acidified portion of the sample extract.
Dry and Pulverise (up to 100g)	GEO30	SOIL	#
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids (Option A - Concentrating)	ORG17A	SOIL	In house: Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Tumbler Extraction of Solids/ Sample Cleanup	ORG17A-UTP	SOIL	In house: Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. Samples are extracted, concentrated (by KD) and exchanged into an appropriate solvent for GPC and florisil cleanup as required.
Tumbler Extraction of Solids for LVI (Non-concentrating)	ORG17D	SOIL	In house: 10g of sample, Na2SO4 and surrogate are extracted with 50mL 1:1 DCM/Acetone by end over end tumbling. An aliquot is concentrated by nitrogen blowdown to a reduced volume for analysis if required.
Organotin Sample Preparation	ORG35	SOIL	In house: 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.