Framework Dredge Management Plan

Overseas Passenger Terminal Berthing Infrastructure Project

Port Authority of New South Wales

10 February 2026

→ **The Power of Commitment**

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1. Background

1.1 Purpose and content of this plan

The Circular Quay Overseas Passenger Terminal (OPT) in Sydney, NSW is operated by Port Authority of NSW (Port Authority) and used to dock large commercial cruise liners. The OPT immediately abuts the ferry routes that originate and end in Circular Quay. Porth Authority is developing a berth improvement plan to address scour and sedimentation issues at the seabed in the vicinity of the OPT. Areas of seabed scour could undermine existing maritime infrastructure unless works are undertaken to stabilise the seabed. Similarly, the accumulated sediments are considered a hazard to safe navigation, limiting the manoeuvrability of vessels already constrained by draught draft proving a safety risk as a result. In order to facilitate installation of seabed scour protection, Port Authority is proposing to dredge up to 23,000 m^3 of sediment from the berthing area of the OPT. The location of the dredge footprint is shown in Figure 1. The dredged materials are proposed to be disposed of partially to the Sydney Offshore Spoil Ground (SOSG) and partially to a land-based licensed facility.

Disposal of dredge materials to the SOSG is regulated under the *Environment Protection (Sea Dumping) Act 1981*. Port Authority was granted a Sea Dumping Permit (SDP) SD2023-4058 in 2024, by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), the regulating authority for SDP applications. The permit was granted on the 28th February 2024 and is valid until the 28th February 2026, however dredging activities are yet to commence at the time of this report. DCCEEW has since granted Sea Dumping Permit SD2023-4058 (Variation No. 1, issued 20 January 2026), which supersedes the original 2024 permit and is valid until 30 September 2027. A number of field investigations and assessments had been undertaken to support the SDP application (detailed in Section 2). Based on the characterised chemical conditions of the dredge materials from these investigations and assessments, Port Authority proposes to dispose only a part of the 23,000 m^3 dredge material to the SOSG under the pending SDP (18, 100 m^3), and the remaining volume will be initially transferred to Bays Port Precinct (Glebe Island/White Bay) for offloading, treatment and disposal to a land-based, NSW EPA licensed facility (facility to be determined). The lateral extents of materials proposed to be disposed of to the SOSG and to a land-based facility are shown in Figure 1.

Port Authority successfully sought 19-month extension for the permit SD2023-4058, as the project has been delayed and no dredging or disposal activities have been undertaken since the issuance of the permit. Revision 1 of the Framework Dredge Management Plan (FDMP) is a revision of the original Revision 0 version (GHD, 2023), incorporating the revised dredging program as described in Section 2.4. Revision 2 of the FDMP contains an administrative change of Revision 1 of the FDMP, to include the date when the Variation No.1 of the Permit was granted, and when Revision 1 of the FDMP was approved by the Delegate of the Minister for the Environment and Water. This FDMP forms a part of the approved SDP extension , as well as providing the framework for the capital dredging and ocean disposal activities by Port Authority over the lifetime of the SDP, including:

– Overall management framework;
– Description of the project;
– Description of the existing environment at the dredging site (the OPT) and the SOSG;
– Description of the materials to be disposed to the SOSG;
– Description of potential impacts as a result of disposal to the SOSG;
– Management strategies and actions to be incorporated in the ocean disposal activities;
– Contingency arrangements
– Monitoring and reporting.

This FDMP provides the framework to guide the preparation of a detailed operational dredge management plan / construction environmental management plan to be developed by the appointed dredge contractor or included within specific contract conditions accepted by the dredge contractor, prior to the commencement of the dredging activities.

This FDMP, in accordance with leading practice for dredging projects internationally, uses risk-informed decision making as the basis for the management framework. The information provided in this FDMP has been prepared in accordance with the *National Assessment Guidelines for Dredging (NAGD)* (Commonwealth of Australia, 2009).

For clarity, this FDMP intends to outline management strategies and actions to be implemented during the dredging, transportation and sea disposal of materials destined for the SOSG ('materials for offshore disposal'), including management measures during dredging to minimise cross contamination with materials destined for a land-based facility ('materials for onshore disposal'). This FDMP does not cover management measures for the dredging, transportation, offloading, treatment and disposal of materials for onshore disposal, as such materials are excluded from sea dumping activities and not part of the SDP application. The management measures for the dredging, transportation, offloading, treatment and disposal of materials for onshore disposal have been outlined in the Review of Environmental Factors (REF, ARUP, 2020) for the overall Berthing Infrastructure Project.

1.2 Overall management framework

Port Authority is the proponent for this capital dredging project. A Project Manager will be nominated by Port Authority, who will have overall responsibility for the project including compliance with the SDP conditions. The dredging contactor is responsible for the implementation of the dredging campaign in accordance with the requirements of Port Authority, the REF and the SDP conditions including this FDMP.

The sea disposal activities for materials for offshore disposal is to be conducted in accordance with conditions of the SDP to be granted, and the requirements of Port Authority as detailed in the contract between Port Authority and the dredging contractor undertaking the works.

1.3 Regulatory framework

1.3.1 Commonwealth legislation, regulation and guidelines

Commonwealth Environment Protection (Sea Dumping) Act 1981

In Australia, ocean disposal of dredged material within and outside of State and Territory waters is regulated by the DCCEEW under the Commonwealth Environment Protection (*Sea Dumping) Act 1989* and the NAGD. The development of this legislation and guidelines has been guided by the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972* (London Convention) and the more recent 1996 Protocol to the London Convention, to which Australia is a signatory. These agreements aim to prevent pollution of the sea from the disposal of wastes or other matter, including dredged material.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a process for the assessment and approval of proposed actions that are likely to have a significant impact on matters of national environmental significance or on Commonwealth land.

Other Commonwealth legislation, regulation and guidelines

Other applicable Commonwealth legislation and guidelines include, but are not limited to, the following Acts, Regulations (and relevant amendments):

- Protection of the Seas (Prevention of Pollution from Ships) Act 1983;
- Australian Ballast Water Management Requirements Version 8 2020;
- Biosecurity Act 2015;
- Biosecurity Regulations 2016;
- National Water Quality Management Strategy (Commonwealth Government of Australia 1992);
- Shipping Registration Act 1981;
- Maritime Safety (Domestic Commercial Vessel) National Law Act 2012;
- Marine Safety (Domestic Commercial Vessel) National Law Regulation 2013;
- Maritime Transport & Offshore Facilities Security Act 2003;
- Maritime Transport & Offshore Facilities Security Regulations 2003; and
- Marine Orders.

Legend

- Site boundary
- Lot boundary

Paper Size ISO A4

0 10 20 30 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Port Authority of New South Wales Overseas Passenger Terminal - Circular Quay
Framework Dredge Management Plan

Project No. **12594615**
Revision No. **0**
Date **13 Jan 2026**

Site Location Plan

Figure 1

Data source: General Topo - NSW LPI DTDB 2019. Cadastre - NSW LPI DCDB 2019. Aerial Imagery - Sixmaps 2019 © Department of Customer Service 2020. Created by: dbbanatin

1.3.2 State legislation, regulation and guidelines

The key New South Wales legislation, regulation and guidelines relevant to dredging at the OPT berth include:

- Ports and Maritime Administration Act 1995
- Ports and Maritime Administration Regulation 2012
- Fisheries Management Act 1994
- Maritime Services Act 1935
- Management of Waters and Waterside Lands Regulations—N.S.W.
- Marine Safety Act 1998
- Contaminated Land Management Act 1997
- Protection of the Environment Operations Act 1997
- Biosecurity Act 2015
- Biodiversity Conservation Act 2016
- Biodiversity Conservation Regulation 2017
- Acts administered by NSW Environment Protection Authority (EPA)
- Marine Safety Regulation 2016
- Marine Pollution Act 2012
- Marine Pollution Regulation 2014
- Environmental Planning and Assessment Act 1979

1.4 Other requirements

Health and safety

The capital dredging campaign shall be carried out in accordance with Port Authority health and safety requirements and a Health and Safety Management Plan shall be prepared by the dredging contractor and approved by Port Authority prior to the commencement of each campaign.

Quality assurance

Port Authority and the dredging contractor shall have a Quality System certified by a third party to be compliant with ISO 9001, or equivalent. Quality records shall be kept for dredging and surveys, data management presentation and interpretation.

Survey

Hydrographic survey works will be the ultimate responsibility of Port Authority, however progress survey work may be undertaken by the dredging contractor depending on the terms of the dredging contract. Surveys will be carried out in accordance with the requirements of the contract between PANSW and the dredging contractor.

Port operations

The capital dredging campaign will be carried out within an operating Port. The requirements for operating in the Port are outlined in Port Authority *Port Information for Sydney Harbour and Botany Bay, June 2015*, Port Authority *Harbour Master's Directions for Sydney Harbour and Botany Bay, July 2016* and in consultation with the Port Authority Harbour Master. The requirements of PANSW shall be adhered to whilst any vessels associated with the dredging campaigns operate within Port waters. The works will also need to comply with the NSW Department of Planning and Environment webpage: Approaching Marine Mammals in NSW.

1.5 Stakeholder consultation

PANSW has undertaken consultation with the following stakeholders:

– Foreshores and Waterways Planning and Development Advisory Committee;
– NSW Department of Primary Industries – Fisheries (Note: A letter requesting consultation input to NSW Department of Primary Industries – Fisheries was sent by PANSW however no reply was received);
– Transport for NSW;
– DCCEEW through presentations and submission of sea disposal permit application and supplementary information.

In addition to the above, a Communication Plan will be prepared and implemented as part of the Construction Environmental Management Plan (CEMP), which will also include stakeholder consultation.

1.6 Limitations

This report: has been prepared by GHD for Port Authority of New South Wales and may only be used and relied on by Port Authority of New South Wales for the purpose agreed between GHD and Port Authority of New South Wales as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Port Authority of New South Wales arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

GHD has prepared this report on the basis of information provided by Port Authority of New South Wales and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Project context and description

2.1 Description of the OPT and the BIP project

The OPT is located on the western side of Circular Quay in Sydney Harbour, New South Wales. The OPT has been used as a commercial shipping port since the 1880s, with the OPT operating as a cruise terminal since 1960. Prior to the COVID-19 pandemic, approximately 350 cruise ships visited Sydney Harbour in 2017/18 handling some 1.6 million passengers. Approximately 220 cruise ships berthed at the OPT, which was basically at full capacity during the primary cruise season from October to March each year (ARUP, 2020). Since Australia re-opened its international borders to travellers in 2022, the number of cruise ships berthing at the OPT has bounced back (149 cruise ships are scheduled to berth at the OPT between October 2023 and March 2024 as of September 2023).

Since 2011, cruise ships have mainly berthed at the terminal under Azipod and bow thruster power only, rather than with the assistance of tugs. Hydrographic and diver surveys identified that scouring was occurring at both the southern and northern end of the OPT berth pocket. There was also evidence of loss of the existing scour protection, deposition of large rocks and slumping of an embankment into the berth pocket at the southern end due to scouring. The identified scour and accretion issues pose potential hazards to vessel operations. This includes the potential for further decreasing the under-keel clearance for incoming cruise ships. There is a need for safe, efficient and reliable berthing to ensure the ongoing operation of the OPT.

The BIP project involves dredging up to 23,000 m^3 (including contingency over-dredging volume) of sediment from the berthing area of the OPT. The dredging is planned to allow installation of scour protection devices at the dredge area to future-proof operation of the OPT. Based on previous options assessment, a number of investigations and assessments of the properties of these sediments and feedback from DCCEEW, Port Authority proposes to:

– Dispose of up to approximately 4,900 m^3 of sediments, from the northwestern corner of the dredge area (refer to the Hotspot Exclusion Area in Figure 2), to a land-based licensed facility
– Dispose of approximately 18,100 m^3 of sediments from the remainder of the dredge area, to the SOSG.

Details of the approach used to define the materials that are proposed to be selectively handled and removed for onshore disposal are provided in Section 2.3.2.

2.2 Description of the SOSG

A portion of material from the proposed dredging at the OPT is proposed to be disposed of at the Sydney Offshore Spoil Ground (SOSG), which was originally established by the State Pollution Control Commission (SPCC) in conjunction with the Commonwealth Department of the DCCEEW Sport the Environment, Tourism and Territories (DASETT). The SOSG is now under the responsibility of DCCEEW.

The SOSG is located approximately 10 km offshore of Sydney (Figure 3). The SOSG is approximately rectangular in shape and is defined by the following coordinates in WGS84:

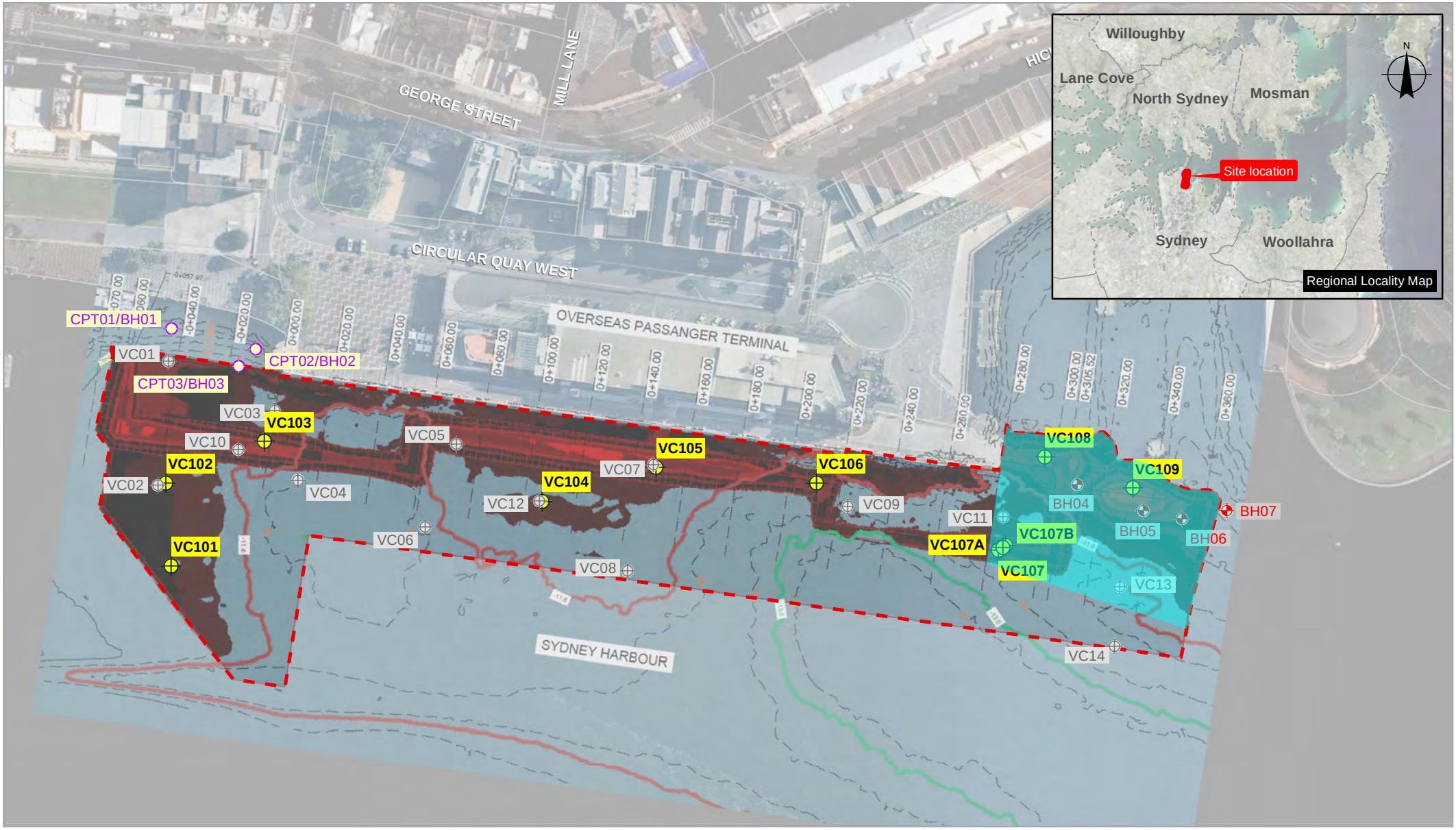
Latitude (South) Longitude (East)

33°51.51’S 151°24.07’E

33°52.91’S 151°24.07’E

33°51.01’S 151°27.97’E

33°52.91’S 151°27.97’E



Legend

- Vibrocore Sampling Locations (GHD, 2022)
- Vibrocore Sampling Locations (GHD, 2019)

Investigation Locations (Coffey, Nov 2019)

- Borehole Locations
- Borehole / CPT Locations
- Site boundary
- Lot boundary
- Design dredging footprint
- Hotspot exclusion area

Paper Size ISO A4

0 10 20 30 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Port Authority of New South Wales
Overseas Passenger Terminal - Circular Quay
Framework Dredge Management Plan

Historical Sampling Locations and Dredging Extent

Project No. **12594615**
Revision No. **0**
Date **13 Jan 2026**

Figure 2

Data source: General Topo - NSW LPI DTDB 2019. Cadastre - NSW LPI DCDB 2019. Aerial Imagery - Sixmaps 2019 © Department of Customer Service 2020; Royal HaskoningDHV, Base dredge plan, 2021.
Created by: dbbanatin

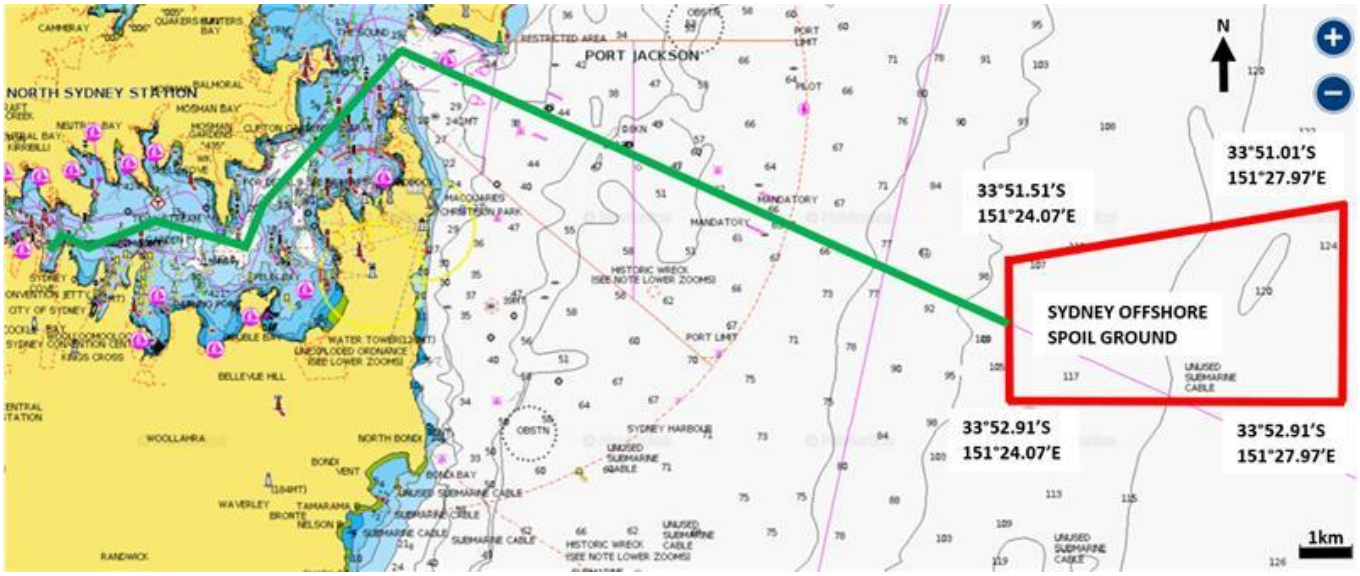

Figure 3 SOSG Location (ref.: Navionics, 2020)

Following consultation with DCCEEW, the materials to be dredged from this project are proposed to be disposed in the north-west quadrant within the SOSG, also identified as the 'Soft Sediment Sub-Site' in Figure 4. This sub-site is defined by the following coordinates in WGS84:

Latitude (South) Longitude (East)

33°51.51'S 151°24.07'E

33°51.27'S 151°26.02'E

33°52.21'S 151°26.02'E

33°52.21'S 151°24.07'E

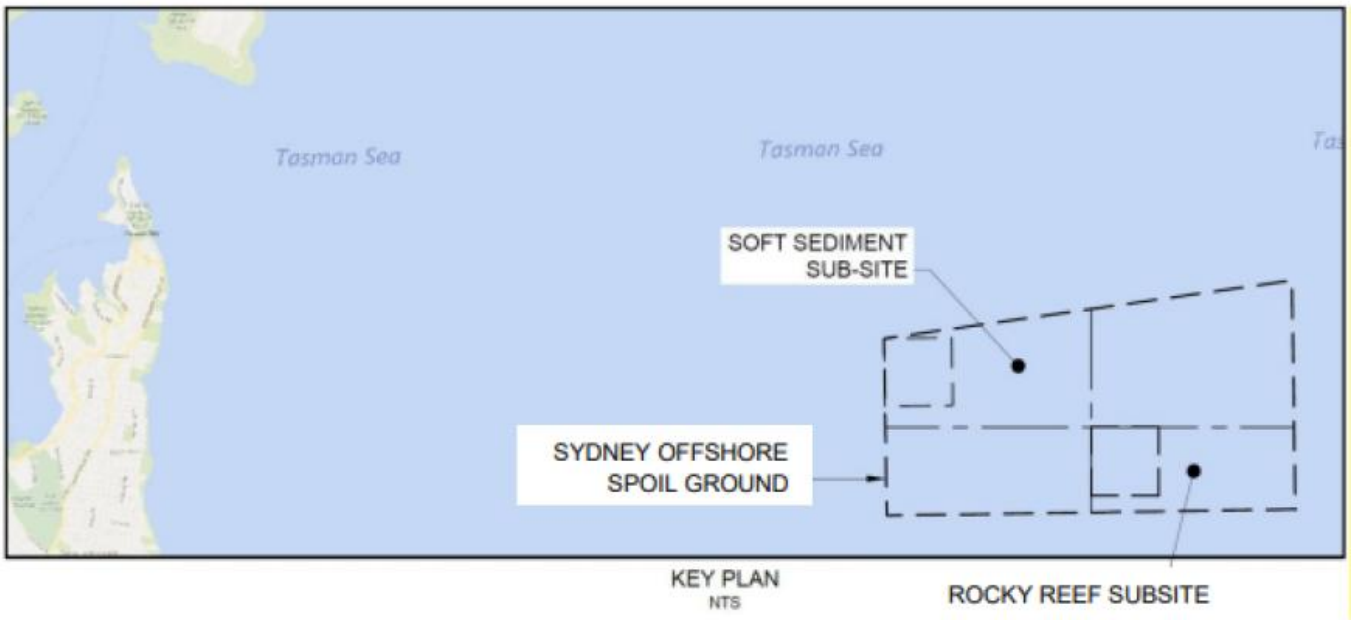

Figure 4 SOSG layout

The water depths at the SOSG are approximately 100 to 130 m below the Chart Datum (CD).

The SOSG has been used on a number of occasions since the 1980s to 1990s for disposal of some 1.5 million m^3 of material (G. Plunkett, 2003). The material has varied in type from clays and silts through to sands, gravels and rock. The ground has also been utilised for small quantities of demolition materials (such as concrete and bricks). From the 2000s, the SOSG has recently been used for maintenance (20,000 m^3 in 2010 campaign, and 9,000 m^3 in the 2019 campaign) and capital (25,000 m^3) dredged material from Garden Island and Caltex Kurnell Facility Capital Dredging 2013 (153,000 m^3). Overall the known volume of materials placed in the SOSG is estimated to be in the order of 1.8 to 1.9 million m^3 (assuming sediment densities in the order of 1.5 to 2 tonne/m^3). The materials previously placed in the SOSG varied in type from clays and silts through to sands, gravels and rock, with small quantities of demolition materials. Most of these materials originated from the Port Jackson area where the BIP project is located, and their descriptions were similar to the materials proposed to be disposed from the BIP project (refer Section 2.3).

Extensive surveys of the SOSG were completed as part of existing Sydney Harbour Tunnel Project. These surveys identified a number of different types of fauna that occupied different areas characterised by “soft” and “hard” sediments. The presence of this ecology indicated that the Spoil Ground was undergoing some recovery, noting this disposal campaign occurred more than twenty years ago.

2.3 Description of materials to be dredged

2.3.1 Physical properties

Based on the recent Sampling Analysis Plan Implementation Report for the SDP application (GHD, 2023), two geological units are expected to be intercepted in the dredging works for the BIP:

– Unit 1 –Depositional estuarine: Clay, Clayey silt, sandy silty clay, clayey sand, silty clayey sand, clayey silty sand, sand, silty clay, medium - high plasticity, pale grey. grey, dark grey, dark grey-black, trace to with clay, silt, fine to coarse sand, fine to medium gravel
– Unit 2 – Residual: Clayey sand, silty sandy clay, silty clayey sand, high plasticity, dark yellow-brown, mottled grey, pale grey mottled red, with silt, trace fine gravel

Unit 1 is a depositional unit with sand as the primary constituent in the majority of samples with varying quantities of silt, clay and gravel. The unit was observed to be grey and dark grey to black in colour. Shells were present throughout the unit both intact and fragmented.

Unit 2 is a residual unit weathering in situ from the sandstone bedrock. The unit was observed to range from sandy clay to clayey sand and was generally medium to high plasticity and dark yellow-brown or grey in colour. Oxidation in the form of red mottling of the grey clay was also observed.

The materials for offshore disposal are expected to comprise both Unit 1 and Unit 2 materials.

2.3.2 Chemical properties

The Supplementary Sampling and Analysis Plan – Implementation Report (GHD, 2023) documented the findings in relation to chemical properties of the sediments proposed to be disposed at the SOSG. In summary:

– The Supplementary Sampling and Analysis Plan was prepared with reference to the NAGD guidelines. The implementation works occurred in November 2022. Vibrocores were advanced at nine locations to a depth of 0.8 to 3.65 m at the OPT site within the dredging footprint.
– From these cores a total of 38 primary samples and 21 secondary samples were collected for chemical analysis and 21 samples for particle size distribution.
– The following key findings from Phase II assessment were noted:
    - The 95% UCL for lead, mercury, silver and zinc exceeded the NAGD screening levels.
    - Dioxins were reported in all samples, however the 95% UCL was less than the preliminary screening criteria derived in enRisk (2021).
    - Concentrations of the remaining screened chemical were below the respective NAGD screening levels.

– Selected samples were advanced to Phase III testing based on the results of the Phase II assessment. Samples were analysed by elutriate testing and bioavailability testing the following key findings were noted:

- Elutriate testing was completed on three samples each for copper, lead, mercury, silver, zinc, TRH, PAH and dioxins.
- TRH, PAH and dioxins all reported no detections in elutriate indicating that these contaminants are not desorbing from the sediment particulates into the surrounding water.
- Detections of copper, lead, mercury, silver and zinc and the results for copper, lead and zinc exceeded ANZG (2018b) 95% marine water guideline criterion, indicating that dredge material has the potential to adversely impact the water quality during loading and disposal with regard to these metals. However, consideration of initial dilution over a four hour period in accordance with the NAGD (2009) suggests that concentrations following initial dilution will remain well below relevant criteria.
- Bioavailability testing was conducted using the AVS-SEM method for sum of cadmium, copper, lead, nickel, silver and zinc. The AVS was reported in excess of the SEM indicating that it cannot be excluded that the metals tested are bioavailable.
- Bioavailability testing was also conducted using dilute acid extraction for mercury and reported concentrations below the limit of reporting in both samples indicating that mercury may not be bioavailable to sediment-ingesting organisms
- Subsequent ecotoxicity testing and weight of evidence assessment suggested that the materials to be dredged at the OPT was considered of low risk for unconfined sea disposal.

From the above assessment, it was noted that the highest levels of lead and zinc were observed in the northwestern corner of the dredging footprint. Based on discussions with the DCCEEW, it has been proposed that sediments from this northwestern corner (up to 4,900 m^3 in volume) will be excluded from the SDP application and disposed separately to a licensed land-based materials. The exclusion of these sediments therefore further reduces the risk of unconfined sea disposal of remaining sediments to the SOSG. The basis for establishing the exclusion zone extent is described in Appendix A.

It should be noted that the currently proposed exclusion zone extent includes a buffering distance (ranging from 5 to 10 m to accommodate existing physical structures) to mitigate the risk of potential cross contamination.

2.4 Proposed dredging activity and volumes

2.4.1 Dredging method

The details of the actual dredging equipment that will be used, and the methods applied, will be dependent on the availability of dredging equipment. It is likely that the dredging will be undertaken by a backhoe dredger or an excavator mounted on a barge. The backhoe or excavator would remove sediment from the harbour floor and transfer it into an adjacent waiting barge. Disposal at the SOSG would then involve transporting the dredged material offshore by barge to the SOSG. This could be undertaken by self-propelled or non-propelled barges, however it is more likely to be non-propelled barges with harbour tugs to tow the hopper barge. Indicative reference equipment is summarised in Table 1.

Table 1 Anticipated dredging equipment

Number of units	Equipment
1	Purpose build backhoe dredger (BHD), consisting of spudded pontoon with permanently installed excavator of a weight of 250-350 tonne capable of dredging to at least 20 m water depth.
2	Two split hopper barges (SHB) with a water volume capacity of 1200 m^3. Two 1200 m^3 SHBs will allow estimated production figures of up to 2,400 m^3 per day
1 or 2	40 tonne bollard pull tugs

2.4.2 Dredging schedule and sequence of dredging works

Port Authority is currently proposing to complete the dredging program during the 2026 offseason for cruise ships in Sydney (April to September 2026), and as a contingency, to undertake any balance of works in the 2027 offseason (April to September 2027), subject to , weather conditions, logistics planning and equipment availability. The dredging and sea disposal works are scheduled to be completed within a period of approximately three to four weeks.

The proposed dredging sequence is:

– The portion of materials to be disposed of offshore will be dredged first, to minimise potential of cross contamination as a result of disturbing materials to be disposed of onshore.
– Dredging is proposed to start from the northern limit of materials to be disposed of offshore and progress southwards, away from materials to be disposed onshore. This will provide assurance that no materials to be disposed onshore is inadvertently included in sea disposal.
– Once dredging of materials proposed for sea disposal is completed and the dredging extent verified, the remaining materials to be disposed onshore will be dredged.

2.5 Dredging spoil disposal

As described in Section 2.1, Port Authority proposes to dispose the dredging spoil to two destinations:

– Up to approximately 4,900 m^3 of sediments, from the northwestern corner of the dredge area (refer Figure 2), is proposed to be disposed of to a land-based licensed facility, following transfer and treatment at Bays Port Precinct (Glebe Island/White Bay).
– Approximately 18,100 m^3 of sediments, from the remainder of the dredge area, is proposed to be transported directly by barge from the OPT, and disposed at the SOSG.

3. Potential impacts – environment, social and amenity considerations

A detailed impacts assessment for disposal of dredge materials from the OPT to the SOSG has previously been presented in the letter to DCCEEW '*SD2020-4001: Supplementary Sampling Analysis Plan Implementation Report and Additional Supporting Information for Sea Dumping Permit Application*' (GHD, 16 March 2023). This section provides a summary of the impact assessment findings for context.

3.1 Impacts to the physical environment

Turbidity level and dispersal of disposed materials

From previous studies at the SOSG, for disposal from a rapid bulk disposal vessel (such as a split-hopper barge), the vast majority of the disposed sediment will sink rapidly to the seabed 100 to 120 m below (estimated water depth in the northwestern quadrant of the SOSG), with only a very small percentage (in the order of 1-5% by wight) will remain in the water column to create turbidity. The material in this advection cloud would be transported (advected) away from the site by the ambient currents and would be unlikely to return. The dominant currents at the SOSG are to the south (Batley and Brockbank, 1990). The advection cloud would disperse and the material in the cloud would settle at its fall velocity, aided by natural flocculation of fine particles that occurs in sea water.

The proposed disposal program involves estimated 23 runs of split hopper barges, each of up to 1,200 m^3 capacity, to dispose up to 18,100 m^3 (in situ volume, or 27,150 m^3 ex situ volume assuming a bulking factor of 1.5) of materials over a three to four week period. This equates to approximately one to two barge loads per day over the three to four week period, and on some days no disposal will occur. Given the relatively small dredge volume, short duration of the works and episodic nature of the disposal operations, no significant turbid plumes are predicted to occur during sea disposal operations.

Zone of impact

Approximately 95-99% of dumped material would impact on the bottom as one high-density jet after the convective descent from the surface. The jet entrains water and expands on its descent. Based on the likely dimensions of the barges and the model of Drapeau et al. (1999), in 110 m of water the radius of the individual impact zones from the placement of individual barge loads is expected to be less than 50 m. Drapeau's model predicts that there would be sufficient kinetic energy in the descending jet to initiate an outward-flowing density current after the dynamic collapse of the jet upon the seabed. This density current would entrain a proportion of the fine particles from the dumped sediment as well as some of the fine particles from the seabed upon contact with sea bed. It is likely that the density current would dissipate all its energy within approximately 200 m of the point of impact and entrained material would begin to settle within this area if conditions were sufficiently quiescent.

Long term movement of dumped material

The material to be disposed of predominantly comprises silty sand and silty clay. Fine and coarse sand require bed shear stresses of approximately 0.2 and 0.5 Pa respectively to initiate movement as bed load. It has been estimated that such bed stresses would occur less than 2% of the time. The sand sized material is not expected to move far from the zone of impact if they move at all. In addition, the SOSG can be considered generally a depositional (non-dispersive) zone for silts and clays (RHDHV, 2019). With the small disposal volume (up to 18,100 m^3), relative to the large area of the SOSG, any long term movement of the disposed dredged material, should it occur, would not be expected to have any significant environmental implications outside of the boundaries of the SOSG.

3.2 Impacts to the biological environment

An impact assessment on marine life at the SOSG as a result of the proposed sea disposal activities was previously presented in the letter to DCCEEW '*SD2020-4001: Supplementary Sampling Analysis Plan Implementation Report and Additional Supporting Information for Sea Dumping Permit Application*' (GHD, 16

March 2023). In summary, the likelihood / magnitude of impacts from sea disposal activities proposed for the BIP project were assessed to be:

– Very Low to Low Magnitude of direct impacts related to the following aspects:
  - Water quality
  - Smothering habitat
  - Physical disturbance of habitat
  - Disturbance of or reduction in quality of threatened species habitat, protected species habitat, other pelagic or avian fauna habitat
  - Underwater noise
– None to low likelihood of direct impacts related to the following aspects:
  - Physical strike or injury to a threatened species or protected species from vessel interactions
  - Fragmentation of habitat used by threatened species. Fragmentation of habitat used by protected species
– Very Low to Low Magnitude / Likelihood of indirect impacts related to the following aspects:
  - Introduction of introduced or invasive species to the SOSG
  - Bioaccumulation or assimilation of potential contaminants by fauna
  - Reduction in benthic habitat for shelter, predator avoidance and to avoid exposure
– None to low likelihood of indirect impacts related to the following aspects:
  - Introduction of introduced or invasive species to the SOSG
  - Increased risk of predation
  - Alteration of the natural hydrological processes
– Generally low risk related to deposition of marine debris due to small volume of materials to be disposed at the SOSG.

Overall, the impact assessment presented in the March 2023 letter found the likelihood and/or magnitude of impacts to the biological environment at the SOSG were very low to low. It should be noted that, this impact assessment has not considered the change of disposal strategy for approximate 4,900 m^3 of sediments at the OPT site to onshore disposal, which were assessed to be containing higher chemical levels. This change of disposal strategy provides further reduction in risk and magnitude of impact as evaluated in the current impact assessment.

3.3 Social and economic uses of the area

Potential uses of the SOSG and surrounds include recreational and commercial fishing and commercial shipping. Given that disposal will only occur in the northwestern quadrant of the SOSG, the intermittent and short duration nature of the disposal activity (up to one to two barge loads per day over a three to four week dredging and disposal period), impact to any commercial, recreational fishers and commercial shipping that may use the SOSG and surrounding area is considered negligible.

4. Monitoring and management plan

4.1 Monitoring and management actions

4.1.1 Compliance Monitoring

The objective of the compliance monitoring is to:

– ensure that the volume of material to be placed at the SOSG is within the limit stated in the permit, and that all material is placed within the agreed boundaries, being the north-western quadrant of the SOSG, also known as the Soft Sediment Sub-Site.

Accordingly, all barges will be required to have an operational Automatic Information Service (AIS) unit operating continuously to monitor the location of the plant. The Contractor will be required to record the time and position when hopper doors are opened (and disposal occurring) and when hopper doors are closed preferably via the AIS system. The Contractor will be required to record the time and location of each load of material that has been placed including the barges track during discharge operations and position at the time of commencement and completion of discharge. This information will be submitted with the daily report and compiled in the weekly progress report.

To assure compliance with the proposed dredging scope and that no materials within the hotspot exclusion extent are included in the sea disposal, the following dredging sequence and monitoring works is proposed:

– The portion of materials to be disposed of offshore will be dredged first, to minimise potential of cross contamination as a result of disturbing materials to be disposed of onshore.
– Dredging is proposed to start from the northern limits of materials (defined by Point A, B and C as shown in Figure 5 and by coordinates tabulated in Table 2) to be disposed of offshore and progress southwards, away from materials to be disposed onshore.
– The intention of this dredging sequence is to provide assurance that no materials to be disposed onshore (i.e. materials within the Hotspot Exclusion Area) is inadvertently included in sea disposal.
– Compliance will be verified by coordinates recorded on GPS devices fitted on dredging equipment. The Contractor shall maintain a record of these coordinates for in its daily reports.
– Once dredging of materials proposed for sea disposal is completed and the dredging extent verified through a bathymetric survey, the remaining materials to be disposed onshore will be dredged.

Table 2 Hotspot Exclusion Area Coordinates

Point ID	Easting	Northing
A	334443	6252272
B	334496	6252265
C	334521	6252342

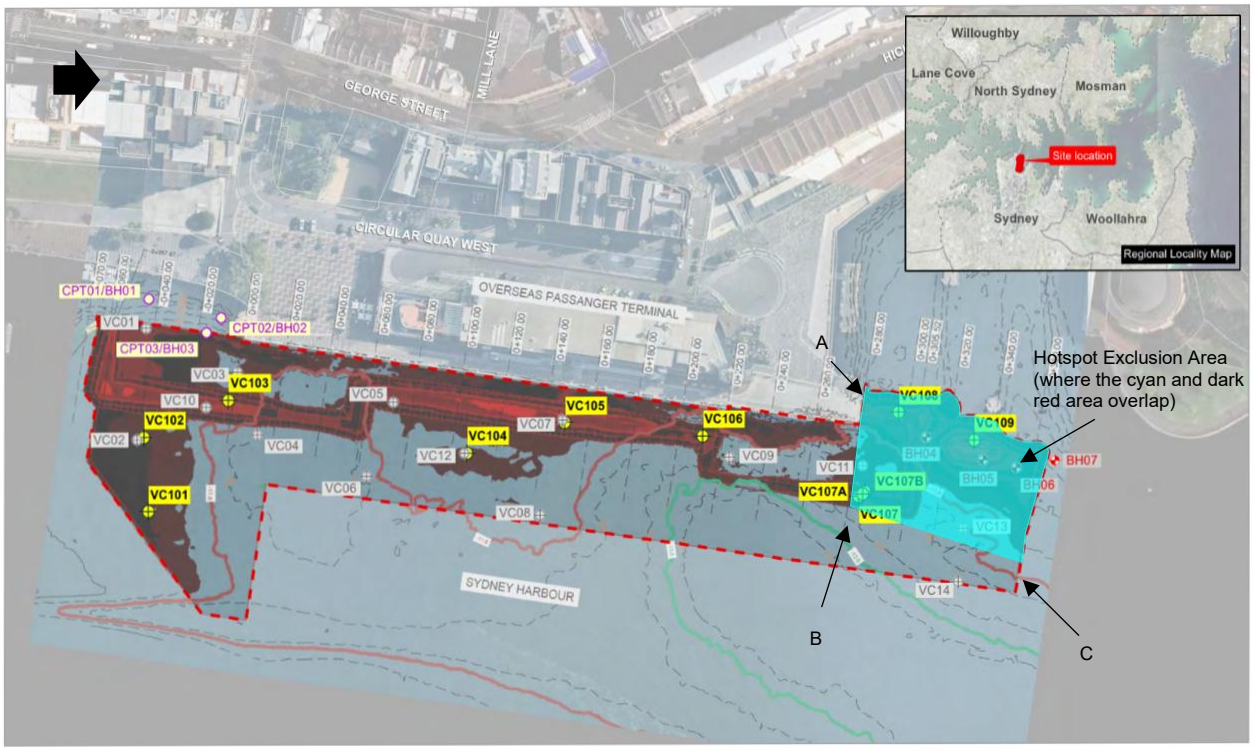

Figure 5 *Hotspot Exclusion Area and Limits*

Mitigating the risk of potential cross contamination from slumping

As Unit 1 marine depositional sediments include unconsolidated sediments, it is expected that slumping of sediments will occur during dredging. However, slumping is not considered to be an issue exacerbating potential cross contamination between the hotspot materials and the remaining dredging footprint while dividing along and near the dividing line, due to the following reasons:

– Figure 6 is a detailed site plan on the northern end of the dredging footprint showing the anticipated dredging depths, based on the scour protection design and existing seafloor level from early 2023.

  As shown, most dredging activities that take place in the vicinity (within 5 m) of the dividing line will be relatively shallow (from no dredging required to up to 2 m below the existing seafloor in limited pockets). Due to the shallow dredging depths, it is unlikely for significant volume of materials to slump and cross the dividing line during dredging in areas to the east and south. Assuming an angle of repose of approximate 18° (approximate 1H:3V batter), the maximum lateral extent of materials remaining in-situ that may slump and move across the dividing line is 6 m, noting this will only occur at the top of the batter as shown in Figure 7, and at greater depth less materials will slump and move sidewards.

– The establishment of dividing line for the hotspot exclusion area was based on chemical data of sediments sampled at 5 locations near the dividing line, which were deemed suitable for unconfined ocean disposal. The buffer of 5 to 10 m was then applied to the east and south of these 5 locations (Appendix A). Therefore, materials that may be affected by slumping while dredging near the dividing line would have been located within this buffer distance and comprised materials suitable for unconfined ocean disposal. As such the potential for slumping to cause cross contamination between the hotspot materials and the remaining dredging footprint is considered negligible.

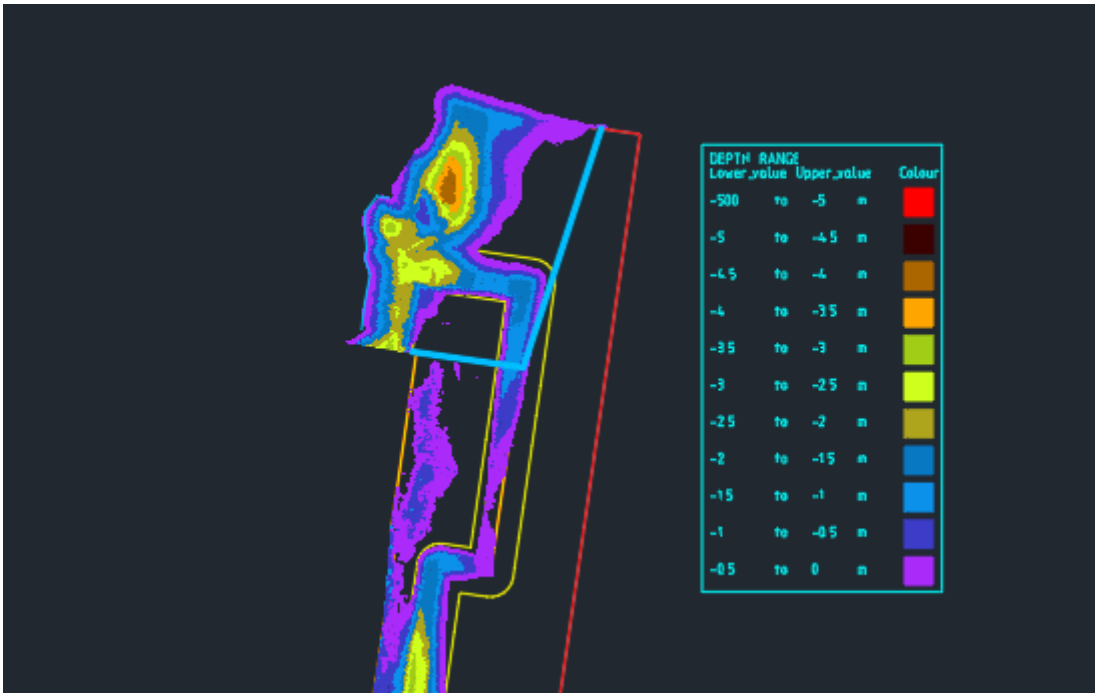

Figure 6 *Dredging depths in and near the hotspot exclusion area*

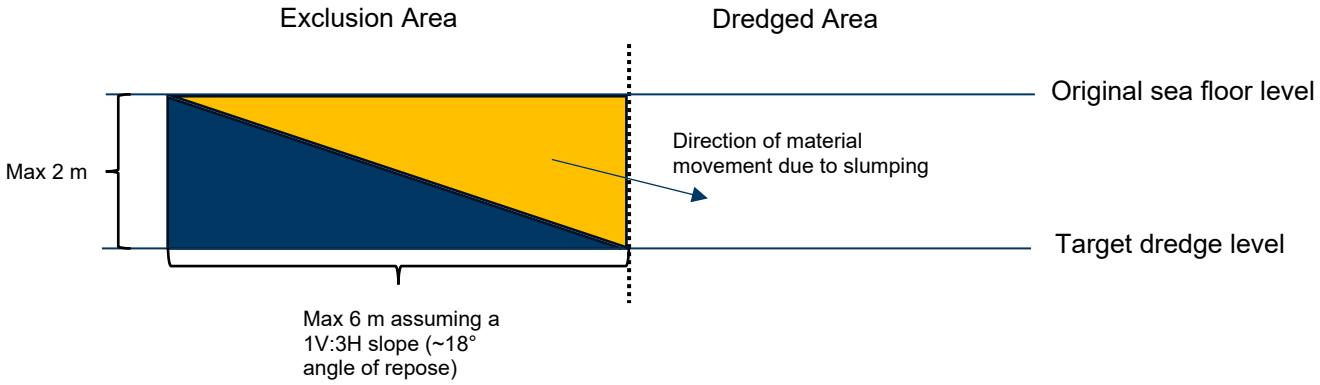

Figure 7 *Schematic drawing on effect of slumping*

In order to supplement the Contractor's records, a bathymetric survey of the dredged material placement area will be undertaken:

– Prior to the commencement of dredging (pre-dredge survey at start of Permit)
– After completion of dredging the materials for offshore disposal, but before commencement of dredging the materials for onshore disposal (to confirm dredging extent is compliant with the SDP and no materials destined for onshore disposal is included in ocean disposal activities).
– Following the completion of all dredged material placement activities (post-dredge clearance survey at the end of the permit period)

The above records and survey data are expected to provide evidence to demonstrate the materials are placed within the proposed disposal area.

4.1.2 Water Quality

The Contractor will develop and comply with a Water Quality Monitoring Plan for this project. The plan will include the following:

– The Contractor is to monitor the turbidity data and adopt a responsive management program for dredging work to achieve compliance with approval conditions.
– No monitoring of the SOSG water quality has been proposed since it is not a continuous activity and there are no controls that can be realistically employed to control turbidity associated with barge disposal given the depth of the water column (>100 m).

4.1.3 Marine Fauna Monitoring

The objective of the marine fauna monitoring is to ensure monitor the intended disposal area for marine fauna at the time of disposal activities such that potential impacts may be limited to the greatest extent possible. In the context of the proposed disposal methodology, it is estimated that only one to two barge load will be placed per day, and on some days during the program no disposal activity will take place.

Given the depth of water column at SOSG, there is no controls that can be realistically employed to monitor marine fauna throughout the water column at the disposal location. Furthermore, the low frequency of placement reduces the likelihood and risk of significant impact to marine fauna. Therefore it is proposed that the following controls will be implemented during disposal operations:

– If disposal occurs during June to October inclusive, binoculars will be used from a suitable observation point on the vessel, for cetaceans/turtles within 300 metres of an intended disposal point
– disposal activities will only commence if no cetaceans/turtles have been observed in the monitoring zone for 10 minutes immediately preceding commencement
– if any cetaceans/turtles are sighted in the monitoring zone, dumping activities must not commence until 20 minutes after the last cetacean is observed to leave the monitoring zone.

4.1.4 Post Disposal Monitoring

The objective of the post disposal monitoring is to identify the zone of impact associated with disposal operations, enable comparison to the predicted extent of impact and inform an assessment of any potential effects on the benthic community in the northwestern quadrant in the SOSG.

Given the small dredging and disposal volume proposed under the current permit application, the water depth at the SOSG, it is considered highly unlikely that ecological monitoring would be capable of isolating any biological impacts attributable to the disposal activities.

It is also noted that previously a post disposal contamination monitoring was proposed to be undertaken at the SOSG by Port Authority to re-establish baseline conditions after placement of materials from the OPT. This proposal was in response to potential cross contamination due to two different projects (the Berthing Infrastructure Project initiated by Port Authority, and the Western Harbour Tunnel project initiated by Transport for NSW) were both considering disposing materials to the same quadrant at the SOSG, which can potentially blur the cause of changes observed post disposal. As at the time of this FDMP, it is understood that Transport for NSW is no longer considering the sea disposal option for the Western Harbour Tunnel project. Furthermore, based on the impact assessment for the BIP project, it is unlikely for contamination conditions throughout the water column and at the seabed within the SOSG to change drastically as a result of material placement from the BIP.

Given the high costs and significant safety risks associated with deep water ecological survey and seabed sampling work, it is instead proposed to undertake a pre-disposal hydrographic survey within the northwestern quadrant of the SOSG along with one follow up hydrographic surveys at one month after completion of the disposal operations.

This approach will test the hypothesis that with the small volume of material to be disposed and the depth of the water column at the SOSG, it is unlikely for notable changes to occur at the sea floor and impact on benthic communities across a large extent within the SOSG.

Once the hydrographic survey results indicate there is minimal change between the pre- and post disposal survey, no further monitoring is considered required. At that point, the surveys will be analysed and a report prepared to present the results and discuss the key findings.

4.2 Reporting

The Contractor shall be responsible for daily progress reporting on the outcomes of compliance monitoring (Section 4.1.1) during the dredging and sea disposal program. The daily reports shall include:

– Number of barge load disposed at the SOSG on the day
– Time and position when hopper doors are opened (and disposal occurring) and when hopper doors are closed preferably via the AIS system.
– Time and location of each load of material that has been placed including the barges track during discharge operations and position at the time of commencement and completion of discharge.
– Turbidity monitoring data at the OPT, as per the Water Quality Monitoring Plan to be developed by the Contractor and accepted by Port Authority to achieve compliance with approval conditions.

The completed daily reports shall be compiled into weekly progress reports for Port Authority's review.

Hydrographic surveys will be undertaken at the following milestones:

– At the OPT:
  - Prior to the commencement of dredging (pre-dredge survey at start of Permit)
  - After completion of dredging the materials for offshore disposal, but before commencement of dredging the materials for onshore disposal (to confirm dredging extent is compliant with the SDP).
  - Following the completion of all dredged material placement activities (post-dredge clearance survey at the end of the permit period)
– At the north-western quadrant of the SOSG:
  - Prior to the commencement of disposal activities (pre-disposal survey)
  - One month after completion of all sea disposal activities (post-disposal survey)

Once the hydrographic survey results indicate there is minimal change between the pre- and post disposal surveys at the SOSG, a report will be prepared by Port Authority or its appointed consultant to evaluate compliance with this FDMP and the SDP conditions.

4.3 Contingency

The monitoring and management measures outlined in this FDMP are considered to be flexible and adaptable to site conditions. In the instance where the outlined measures cannot be implemented due to site, program, safety, logistics or other constraints during dredging and sea disposal activities, the following contingency protocols will be followed:

– The Contractor should notify the appointed Project Manager and Port Authority within 24 hours of becoming aware that any of these measures in this FDMP cannot be implemented.
– The appointed Project Manager and Port Authority shall evaluate the potential impacts of non-compliance with the FDMP measures and related SDP conditions, with the support of subject matter experts if necessary.
– If the potential impacts of non-compliance are evaluated to be material (i.e. the non-compliance may constitute a breach of the SDP conditions), Port Authority shall develop alternative measures to minimise the potential impact, notify DCCEEW of the alternative measures and seek approvals to apply the alternative measures as a contingency.

Appendices

Appendix A

Rationale for establishing hotspot exclusion area

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Sydney, New South Wales 2000
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Your ref: SD2020-4001
Our ref: 12594615

27 September 2023

Leo Rose
Port Authority of New South Wales
John Gorton Building
King Edward Terrace
Parkes ACT 2600 Australia

SD2020-4001: Responses to DCCEEW Request for Information 3

Dear Leo,

1. Introduction

Port Authority of New South Wales (Port Authority) engaged GHD to prepare a Sea Dumping Permit application, for material to be dredged from a proposed capital dredging project at the Overseas Passenger Terminal (OPT) at Circular Quay, NSW. This project is known as the Berthing Infrastructure Project (BIP). A Sea Dumping Permit (SDP) application was submitted to the Department of Agriculture, Water and the Environment (DAWE, now the Department of Climate Change, Energy, the Environment and Water, DCCEEW), on 18 November 2020. This application was referenced by DAWE/DCCEEW as SD2020-4001. The timeline of correspondences associated with this application is briefly described below:

- **18 November 2020**: Sea Dumping Permit Application was submitted to DAWE.
- **14 January 2021**: DAWE issued a letter requesting further information to support the application assessment (RFI 1)
- **16 March 2021**: GHD submitted an interim response to RFI 1 (RFI 1 response).
- **9 April 2021**: DAWE issued a letter requesting further information to support the application assessment, including an additional Sampling Analysis Plan to further characterise sediment to be dredged at the OPT site (RFI 2).
- **Between April 2021 and Dec 2022**: Port Authority discussed an information sharing arrangement with the principal of the Western Harbour Tunnel (WHT) project, Transport for NSW. Port Authority and Transport for NSW agreed to adopt a collaborative approach for the two sea dumping permit applications that were ongoing at the time for the BIP and WHT projects, including use of the baseline data on the Sydney Offshore Spoil Ground (SOSG) collected for the WHT project. This agreement was documented in the letter from Port Authority and Transport for NSW to DAWE dated 1 November 2021.
- **19 May 2022**: GHD submitted the draft Supplementary SAP (SSAP) to DAWE for review.
- **16 June 2022**: DAWE provided review comments to the draft SSAP.
- **20 July 2022**: GHD submitted the final Supplementary SAP to DCCEEW incorporating review comments.
- **21 July 2022**: DCCEEW issued the advice letter accepting the SSAP (GHD, 2022).

– **16 March 2023**: GHD submitted the SSAP Implementation Report (SSAP-IR), along with additional supporting information that included data sourced from the WHT project, in a letter to DCCEEW. The letter provided responses to queries raised in the RFI 2 (responses to RFI 2).
– **10 May 2023**: DCCEEW issued a further request for information (RFI 3) after reviewing the SSAP-IR and responses to RFI 2.

The RFI 3 dated 10 May 2023 is attached to this letter for reference (Attachment A). The primary concern raised in RFI 3 is related to further assessment and/or reclassification or a portion of the materials to be dredged with respect to their suitability for unconfined ocean disposal.

Port Authority and GHD have considered the comments in the RFI 3, and propose an amendment of the sea disposal scope in the SDP application to address concern raised by DCCEEW. This amendment is described in Section 2 of this letter.

In addition, Section 3 of this letter provides responses to the other comment in the RFI 3.

2. Proposed amendment of the sea disposal scope

The RFI 3 Comment 1 described the sediments in the northern end of the dredging area (around vibrocore locations VC108 and VC109) met the NAGD criteria for a hotspot of heavily contaminated sediments, due to elevated level of metals (lead, mercury, and in some cases zinc) found in this area. Figure 1 below shows the locations of VC108 and VC109. DCCEEW requested Port Authority to consider options to appropriately classify material in the vicinity of Vibrocores 108 and 109.

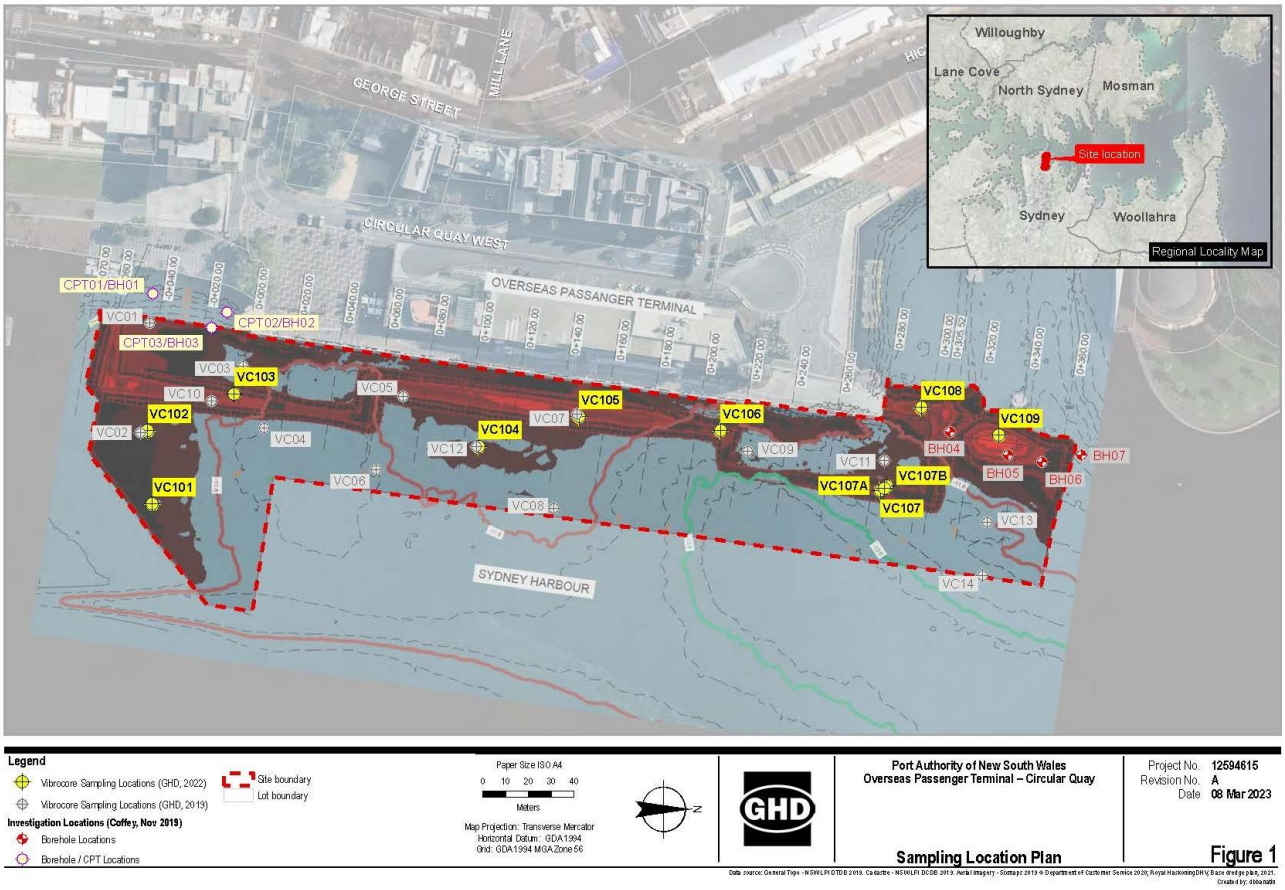


Figure 1 Sampling location plan

Port Authority and GHD have considered a number of options to manage sediments in this area in response to DCCEEW's comments, and propose to reclassify sediments in vicinity of VC108 and VC109 for onshore disposal after reviewing a range of information and project related matters. The extent of sediments to be reclassified for onshore disposal is referred to as the hotspot exclusion zone here in. The proposed hotspot exclusion zone is shown in Figure 2.

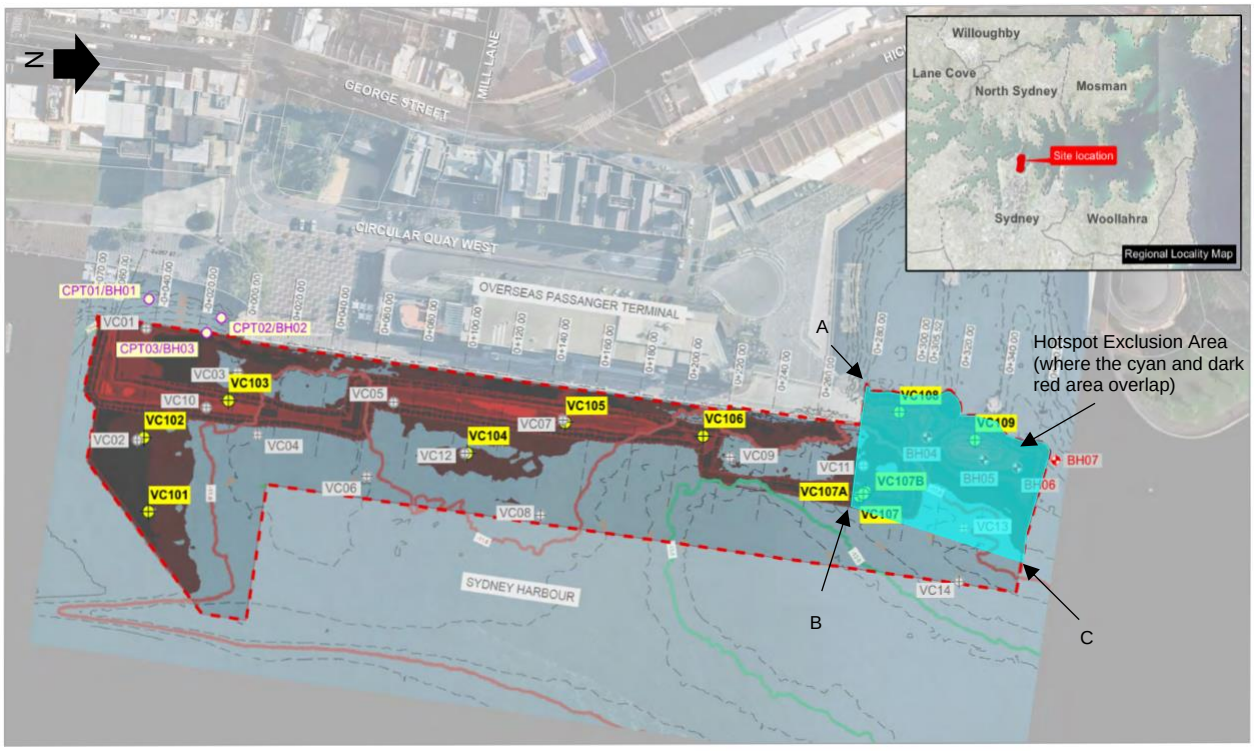


Figure 2 *Extent of hotspot exclusion area (Dark red area = proposed dredging footprint)*

Due to irregular shape of the proposed dredging footprint, for ease of reference, the hotspot exclusion area is defined as the portion of dredging footprint to the north and west of the two lines defined by Point A, B and C of the following MGA 56, 2020 coordinates:

Point ID	Easting	Northing
A	334443	6252272
B	334496	6252265
C	334521	6252342

The basis of defining this hotspot exclusion area includes the following:

Seabed topography in the OPT site

Port Authority completed a bathymetric survey at the OPT site in early 2023 (post the SSAP-IR implementation in November 2022) to understand the seabed topography. Based on the survey data (Figure 3), it is apparent that VC109 was located at a mound that extended further north and west beyond the proposed dredging extent, while VC108 was located at the southern facing slope of the same mound. Figure 4 presents a three-dimensional model of this survey in the northwestern corner of the dredging footprint, along with historical vibrocore and borehole locations conducted in this area from 2019.

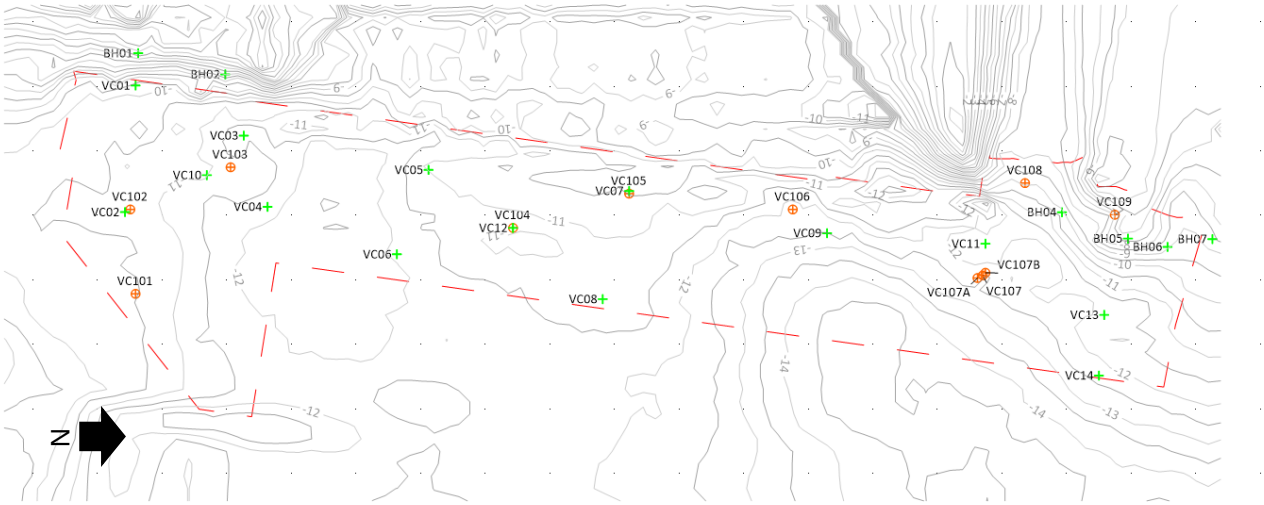
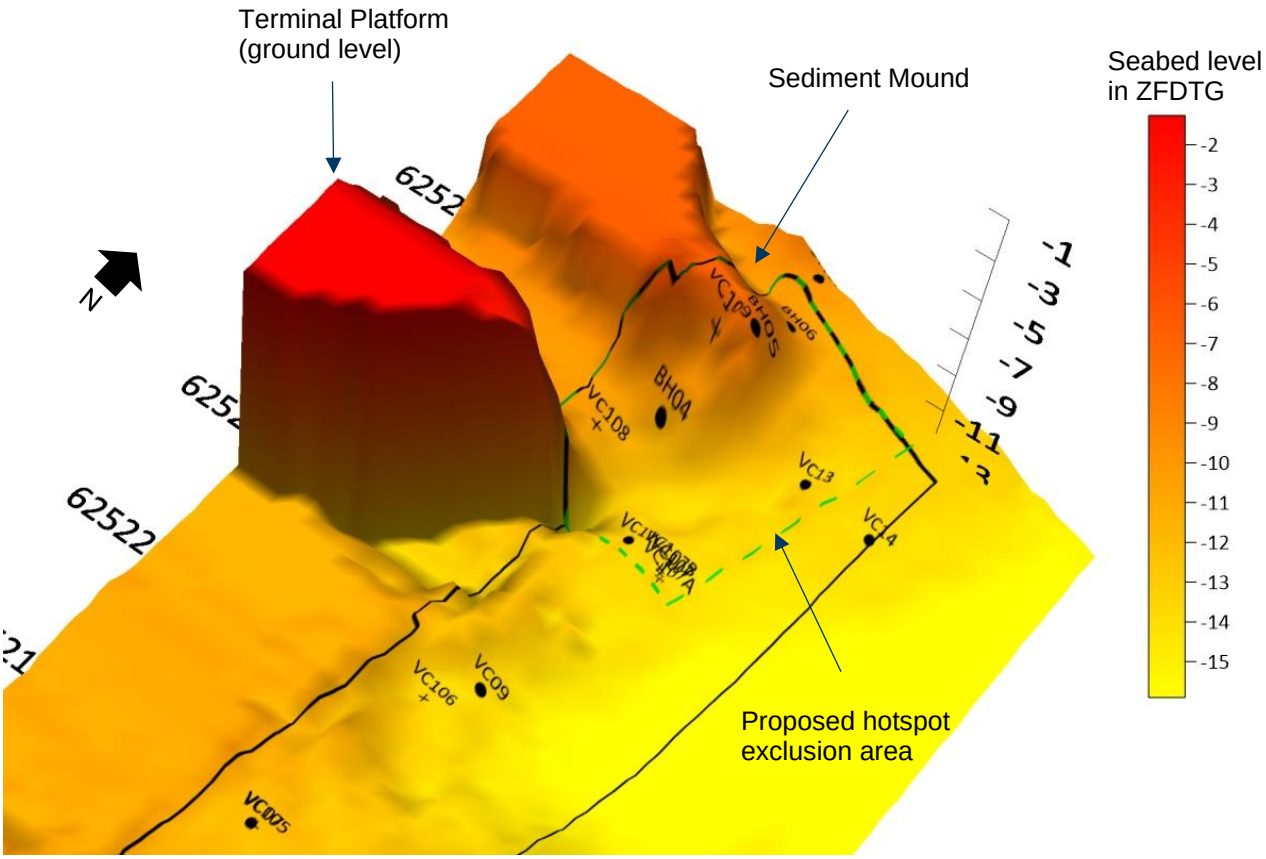


Figure 3 Seabed topographic contours in early 2023 (contour levels relative to Zero on the Fort Denison Tide Gauge, ZFDTG = Chart Datum CD)



The observed mound in seabed topography was notably elevated relative to the remaining of the dredging footprint (top of mound was circa -6 ZFDTG / CD versus -11 to -13 ZFDTG / CD in areas immediately east and south of the mound). This location of this mound coincides with the sampling locations with the highest metal concentrations (VC108 and VC109). The co-occurrence of the metal hotspot (discussed further in the subsection below) and the sediment mound, and the absence of past dredging activities in recent years, suggests it is likely that the metal hotspot is related to the accumulation of sediments high in metal levels over the years in this mound that has not been eroded like the remaining dredging footprint.

Chemical concentrations at and near VC108 and VC109

To understand the distribution of metal concentration within and near the hotspot, available sediment sampling data for metals from the past five years have been collated and presented in Attachment B of this letter. These sampling results were collected in two sampling events at the OPT site:

– The 2019 sampling event, which included collection of multiple discrete, unhomogenised sediment samples that were tested for a suite of chemicals, and a smaller number of sediment samples homogenised over a 0.5 m interval (i.e. with reference to the NAGD sampling protocols). The detailed methodology and findings of this sampling event have been documented in the GHD report "*Overseas Passenger Terminal, Circular Quay, Sediment Contamination Assessment Report*" dated in August 2020, which was submitted to DCCEEW as part of the original SDP application in November 2020.
– The 2022 sampling event, which included collection of multiple sediment samples with reference to the NAGD sampling protocols. The detailed methodology and findings of this event have been documented in the SSAP-IR report.

The locations being considered in this assessment include: VC106, VC107/VC107A/VC107B, VC108, VC109, VC09, VC11, VC13, VC14, BH05, BH06, BH07. No sample was collected and analysed for chemical concentrations at BH04 from the 2019 event. These locations are all located in the north and central north of the dredging footprint, which is the area in concern.

Based on a review of the collated sampling and analysis results, lead has been selected as the key risk driving chemical to evaluate the distribution of contamination in and near the hotspot, in view of the number of observed exceedances of NAGD criterion, as well as it being the most frequently tested chemical in the two sampling events.

The sampling depths of the vibrocore and borehole locations have been converted in to mAHD to allow examination of the vertical distribution of metal levels. The conversion was based on either surveyed seafloor level at the time of sampling, or interpolated based on bathymetric survey contours and the coordinates of the sampling locations recorded at the time of sampling. The converted depths are shown in Attachment B.

Figure 4 presents a summary of the spatial distribution of lead concentrations, grouped in 0.5 m intervals, down to the depth of -14.0 mAHD, based on samples' bottom depth. The -14.0 mAHD cutoff is selected as the proposed dredging depth is limited to -13.1 m relative to the Chart Datum (CD), equivalent to -14.025 mAHD. It is also noted that metal levels in samples collected beyond -14.025 mAHD are low and below the respective NAGD criteria, and as such they are not shown in Figure 4 for concision. Due to this reason, no sample data is shown at VC09.

In Figure 4, the number ranges in brackets represent the depth intervals within each the samples were taken, and the numbers following the brackets represent the lead concentration in mg/kg. Where multiple samples were collected at the same location within the same 0.5 m interval (which were common in the 2019 event), the result shown in Figure 4 was selected using the following order of preference: samples collected with reference to NAGD sampling protocols > samples with the highest lead concentration. Nevertheless, all metal results are presented in Attachment 2 for completeness.

The following observations can be made on Figure 4.

– The highest lead concentrations were observed between -11 m and -12 mAHD at VC108 and VC109. While no deeper sample was collected at VC109, the concentrations in deeper samples at VC108 decreased notably at depths below -12.8 mAHD. The concentrations decreased with increased sampling depths, suggesting the high lead concentrations are present in the portion of sediments elevated above the surrounding seabed.
– As discussed in the 'Seabed topography' section, VC108 and VC109 were located within a mound of sediments, the elevated portion of which appears to be associated with higher metal concentrations. This is further evidenced by sediment samples collected from nearby locations that are outside the elevated mound (VC106, VC107/VC107A/VC107B, VC11, VC13, VC14), all showed notably lower metal concentrations including lead. The seabed levels at these locations ranged from -12.73 mAHD to -13.62 m AHD, which are mostly below the elevation levels at VC108 and VC109 containing metal

concentrations exceeding the NAGD criteria (from -8.7 mAHD to -12.8 mAHD). This further suggests the high metal concentrations found at VC108 and VC109 likely were confined to the sediment mound, rather than wide spread in the area.

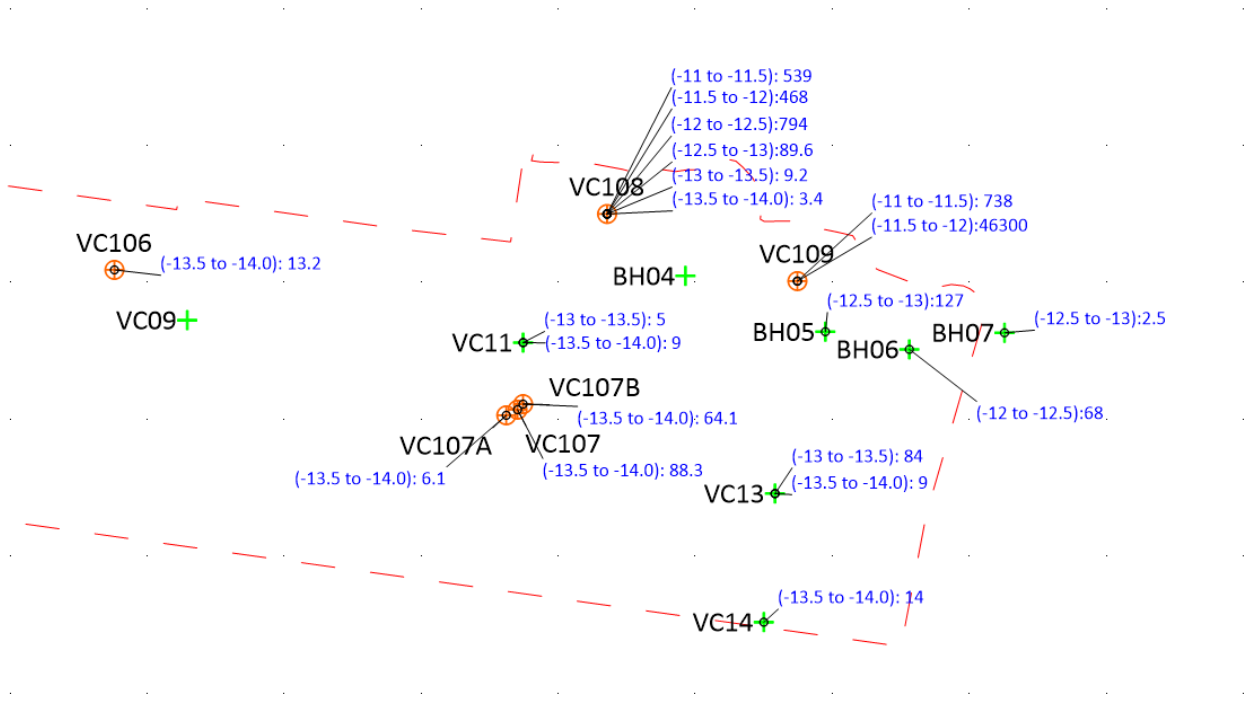


Figure 4 Chemical concentrations in and near VC108 and VC109. Number ranges in brackets represent bottom sampling depths grouped in 0.5 m interval starting from -11 mAHD, and numbers that follow the brackets represent lead concentrations in mg/kg

Rationale for defining the hotspot exclusion zone

Based on the above considerations, we propose to define the hotspot exclusion zone, and amend the sea disposal scope in the SDP to reclassify sediments in the hotspot exclusion zone for onshore disposal. This amendment is based on the following rationale:

- Information presented above indicates the metal hotspot is likely confined with the elevated sediment mound in the northwestern corner of the dredge footprint, based on seabed topography and chemical distribution within and surrounding the mound.
- Sampling results at VC11, VC107, VC107A, VC107B and VC13 surrounding the mounds suggested sediments samples at these locations throughout the vertical sampled profile contained lower metal concentrations. Therefore these sampling locations provide a delineation of the hotspot exclusion area.
- To provide further assurance that the hotspot is excluded from sea disposal scope, the hotspot exclusion area is extended further to the east and south (approximately 5 m in each direction) from VC11, VC107, VC13.
- The hotspot exclusion area shown in Figure 2 and Figure 3 is established using the above rationale.

The proposed sequence of dredging works will involve:

- The sediments outside the hotspot exclusion area will be dredged and removed first for offshore disposal under the approved SDP.
- A bathymetric survey will be undertaken after completion of dredging outside the hotspot exclusion area, to verify completed dredging extent and prevent cross contamination with remaining sediments to be dredged and disposed onshore.
- The remaining sediments will then be dredged and disposed onshore.

The rationale for this proposed dredging sequence is to avoid disturbance of hotspot materials and subsequent dispersion of such sediments within the water column, which can impact the sediments outside the hotspot exclusion zone area once settled. Further details of monitoring and management measures that will be adopted in the dredging program to prevent cross contamination with sediments in the hotspot exclusion area is described in the Framework Dredge Management Plan (GHD, 2023), submitted to DCCEEW for review along with this letter.

3. Responses to RFI 3

DCCEEW's RFI 3 contained two items:

Item 1

DCCEEW comment:

The chemical analysis summary Table LR1a in page 1 of Appendix C, Draft SSAPIR (Figure 1 below) shows that sediment to be dredged falls into two categories:

1. *The majority of the cores have relatively light contamination, with individual samples mostly being uncontaminated, but in some cases having moderate exceedances of Screening Levels for a few metals.*
2. *All the samples from Vibrocore 109, and samples from the top 1.5 m of Vibrocore 108, have lead, mercury and in most cases zinc levels that greatly exceed both the NAGD Screening Levels and High Levels. The most contaminated sample, VC 109_2.5-3.1, has a lead value of 46,300 mg/kg (more than 200 times the NAGD High Level) and a zinc value of 4,270 mg/kg (more than 10 times the NAGD High Level). Most of the above samples also exceed NAGD Screening Levels for copper and silver.*

Figure 3.1 of Draft SSAPIR - Sampling Location Plan, shows these Vibrocores in the sediment accumulation at the northern end of the dredging area (Figure 2 below). These samples meet the NAGD criteria for a hotspot of heavily contaminated sediment. There are no other sampled cores in this area.

Many samples contain lead and mercury at levels significantly higher than any sample used in the sediment toxicity tests. Results of those tests may not be applicable to the sediment in this hot spot.

GHD response:

Detailed response to this item is provided in Section 2 of this letter.

Item 2

DCCEEW comment:

While chemical QA/QC data has been reviewed and validated, this has not been done for the toxicity QA/QC data.

Complete and provide a review and validation of the toxicity QA/QC data.

GHD response:

A review of the validation of the toxicity QA/QC data is provided below.

The sediment and sea water samples used as diluent in the toxicity tests were collected in the field program that implemented the SSAP, and followed the same field QA/QC program as reported in the SSAP-IR. The

sediment samples submitted for toxicity tests were chilled on site upon collection using ice. Upon arrival at the toxicity test laboratory, these sediment samples were purged with nitrogen by the laboratory and stored under refrigerated conditions to minimise alteration of sample properties and extend the holding time of sediment samples. The sediment samples were analysed for toxicity tests within the required holding time.

The NATA accredited ecotoxicity laboratory Ecotox Services Australia incorporated a range of QA/QC methods to ensure quality of test data, which were in accordance with a set of standard operating procedures developed by Ecotox Services Australia with reference to industrial practice guidelines including Batley et al. (2016) *Sediment Quality Assessment: A Practical Guide* and US EPA test methods. The laboratory QA/QC program included the analyses of laboratory QA/QC samples, details of which are provided below in Table 1.

Table 1 Toxicity Laboratory QA/QC Sample Details

Laboratory QA / QC sample	Details
FSW control samples	A FSW control sample (comprising dilution water procured by the laboratory) was tested concurrently with each individual sediment sample as a contingency should the FSW dilution water was required for toxicity analysis (except for the whole sediment tests. It is noted that while FSW dilution water was not used in the toxicity analysis for the project, the results of FSW toxicity analysis provide a further line of evidence that the adopted test methodologies did not have material influence on the toxicity test outcomes. The outcome of the FSW control samples were assessed against respective acceptance criteria, which are set specific for different types of tests.
Diluent (seawater collected from the OPT site) Control Samples	Toxicity tests (except for the whole-sediment tests) were performed using the seawater collected by GHD from the OPT site during the SSAP-IR as the diluent (identified as the sample 'SW' in the toxicity laboratory report). To ensure the diluent used is not causing material toxic effect to the test organisms, a diluent control sample was tested concurrently with each individual sediment sample, and the outcome of the diluent control samples (control mean) were assessed against respective acceptance criteria, which are set specific for different types of tests.
Control sediment samples	Control sediment samples were collected by the laboratory from Bonnet Bay, Hacking River NSW and tested concurrently with the primary samples for whole-sediment toxicity test. The control sediment samples were collected from an area deemed by the laboratory that exhibit no toxicity to the types of test organism, and provides a line of evidence that the test methodology and test environment were not introducing material influence on the toxicity test outcomes
Reference Toxicants (positive controls)	Reference toxicant testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the control samples, reference toxicant test results also may be used to assess the health and sensitivity of the test organisms. Reference toxicant test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity. As part of the toxicity testing program in the SSAP-IR, one reference toxicant testing per sample batch was undertaken for each type of toxicity test. The SSAP-IR program had two sample batches. The reference toxicant test results were compared against the derived Cusum chart limits.
Quadruplicate for whole sediment tests	Toxicity tests with the whole-sediments, without additional dilutions, were run in quadruplicates. This QA/QC protocol provides additional assurance that the toxicity results were precise and reproducible.

Data Quality Criteria for toxicity laboratory QA/QC samples is provided in Table 2

Table 2 Data quality criteria for laboratory QA/QC samples

Data type	Number of samples tested	Acceptance criteria
FSW control samples	20 FSW control samples were analysed for 20 toxicity tests consisting of the following five toxicity test types (3 primary and 1 field duplicate were tested using each test type):	– 1-hr sea urchin fertilisation success test using *Heliocidaris tuberculate:* control mean % ≥70%

Data type	Number of samples tested	Acceptance criteria
	– 1-hr sea urchin fertilisation success test using *Heliocidaris tuberculata* – 72-hr sea urchin larval development test using *Heliocidaris tuberculata* – 48-hr larval development test using the mussel *Mytilus galloprovincialis* – 48-hr larval development test using the Sydney rock oyster *Saccostrea glomerata* – 72-hr marine algal growth test using *Nitzschia closterium*	– 72-hr sea urchin larval development test using *Heliocidaris tuberculate*: control mean % ≥70% – 48-hr larval development test using the mussel *Mytilus galloprovincialis*: control mean % ≥70% – 48-hr larval development test using the Sydney rock oyster *Saccostrea glomerata:* control mean % ≥70% – 72-hr marine algal growth test using *Nitzschia Closterium*: control mean cell density ≥16 x 10^4 cells /mL and control coefficient of variation <20%
Diluent (seawater collected from the OPT site) Control Samples	Similar to the FSW control samples, 20 diluent control samples were analysed for 20 toxicity tests.	Same as the acceptance criteria for FSW control samples
Control sediment samples	Four control sediments were analysed in quadruplicate for the following tests (three primary and 1 field duplicate were tested using each test type): – 10-day whole-sediment toxicity test using the amphipod *Melita plumulosa* – 10-day whole-sediment toxicity test using the bivalve *Tellina deltoidalis*	– 10-day whole-sediment toxicity test using the amphipod *Melita plumulosa* – 10-day whole-sediment toxicity test using the bivalve *Tellina deltoidalis* • Control mean % unaffected at 10 days ≥ 80% • Control mean % unaffected at 96 hours ≥ 80%
Reference Toxicants (positive controls)	The SSAP-IR program had two sample batches. One reference toxicant testing per sample batch was undertaken for each type of toxicity test (total seven).	Acceptance criteria (cusum chart limits) varied and were calculated for individual tests. The calculated cusum chart limits were attached to the toxicity laboratory report.
Quadruplicate for whole sediment tests	All whole sediment tests were analysed in quadruplicate.	The quadruplicate results for each sample were subject to statistical tests to confirm no unacceptable variances between the quadruplicates. The outcomes of these statistical tests were attached to the toxicity laboratory report.

The performance of the QA/QC tests is documented in the laboratory certificate attached in Attachment C. In summary:

– The control means and control coefficient of variation for FSW control samples, diluent control samples and control sediment samples are all within acceptance criteria.

– The reference toxicant outcomes were all within the calculated cusum chart limits.

– The statistical analysis of quadruplicate test results for whole sediment tests showed no unacceptable variances between the duplicate outcomes.

Overall the QA/QC performance of the toxicity test is considered acceptable and the data is usable for assessment. The completed toxicity tests, including test types and methodologies, aligned with the SSAP (GHD, 2022) description.

4. Closing remark

We trust the additional supporting information in this letter provides useful evidence to support DCCEEW's assessment of the SDP application. Should the Department require further information, please do not hesitate to contact the undersigned.

Regards

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Copy to: Rifaee Rasheed – DCCEEW
Kaity Bradey – DCCEEW
Catherine Blaine – Port Authority of NSW
Joseph Dbais – Port Authority of NSW

Attachment:

A DCCEEW RFI 3

B Toxicity test laboratory report

Attachments

Attachment 1

DCCEEW RFI 3

Australian Government
Department of Climate Change, Energy, the Environment and Water

Our reference: SD2020-4001

Mr. Daniel Chakra
Newcastle Port Corporation (trading as Port Authority of New South Wales)
PO Box 25
MILLERS POINT 2000 NSW

Dear Mr. Chakra,

Request for Further Information (RFI 3): Sea Dumping permit application for capital dredging of the Overseas Passenger Terminal at Circular Quay, Sydney, New South Wales – (SD2020-4001)

I refer to the application submitted by Newcastle Port Corporation (trading as Port Authority of New South Wales) for a permit under the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act), received on 18 November 2020, for the capital dredging of the Overseas Passenger Terminal at Circular Quay, Sydney, New South Wales.

The department has reviewed your permit application and identified some areas that require further information or clarification. As a delegate of the Minister for the Environment and Water, I am therefore requesting further information in accordance with subsection 18(3) of the Sea Dumping Act to enable the assessment of the application. The department's comments are provided at Attachment A. Please provide your responses in the table at Attachment A along with any additional documents to address the request. Note this information should be supplementary to your original application, and a new or updated sea dumping permit application form should not be submitted.

The statutory timeframe for issuing the permit is stopped as of the date of this letter. Once the additional information is provided and deemed to be sufficient, we will advise when the 90-day period outlined in subsection 19(2) of the Sea Dumping Act to grant or refuse to grant the permit commences.

If you have any further questions about this request for further information or the permit application process, please contact Leo Rose by phone on 0404 081 982 or email at Leo.Rose@dcceew.gov.au (cc: seadumping@dcceew.gov.au).

Yours sincerely,

Heather Agnew
Director
Sea Dumping Section
Environmental Permitting and Compliance Division
9 May 2023

Australian Government
Department of Climate Change, Energy, the Environment and Water

Attachment A: Request for Further Information (RFI 3) for Sea Dumping Permit Application – Capital Dredging of the Overseas Passenger Terminal at Circular Quay, Sydney, NSW – SD2020-4001.

1. Table Detailing Requests for Further Information (RFI 3)

Ref	Document	DCCEEW Comment	Required Actions / Recommendations	Applicant response
1	**Draft SSAPIR, Table LR1a, Appendix C (page 1 of Appendix C)** **and** **Figure 3.1, page 21 (Sampling Location plan)**	The chemical analysis summary Table LR1a in page 1 of Appendix C, Draft SSAPIR (Figure 1 below) shows that sediment to be dredged falls into two categories: 1. The majority of the cores have relatively light contamination, with individual samples mostly being uncontaminated, but in some cases having moderate exceedances of Screening Levels for a few metals. 2. All the samples from Vibrocore 109, and samples from the top 1.5 m of Vibrocore 108, have lead, mercury and in most cases zinc levels that greatly exceed both the NAGD Screening Levels and High Levels. The most contaminated sample, VC 109_2.5-3.1, has a lead value of 46,300 mg/kg (more than 200 times the NAGD High Level) and a zinc value of 4,270 mg/kg (more than 10 times the NAGD High Level). Most of the above samples also exceed	Consider options to appropriately classify toxicity of material in the vicinity of Vibrocores 108 and 109. Options for further investigation include but are not limited to: · additional toxicity testing, · further delineation of hot spot, and · reclassification of material for onshore disposal. Please provide updated information on selected option and any additional testing results.	

Attachment A

Ref	Document	DCCEEW Comment	Required Actions / Recommendations	Applicant response
		NAGD Screening Levels for copper and silver. Figure 3.1 of Draft SSAPIR - *Sampling Location Plan,* shows these Vibrocores in the sediment accumulation at the northern end of the dredging area (Figure 2 below). These samples meet the NAGD criteria for a hotspot of heavily contaminated sediment. There are no other sampled cores in this area. Many samples contain lead and mercury at levels significantly higher than any sample used in the sediment toxicity tests. Results of those tests may not be applicable to the sediment in this hot spot.		
2	**Draft SSAPIR, Section 4.9.5**	While chemical QA/QC data has been reviewed and validated, this has not been done for the toxicity QA/QC data.	Complete and provide a review and validation of the toxicity QA/QC data.	

Attachment A

GHD

Table LR1a
Summary of Chemical Analyses (non-dioxins, non-nutrients)

Overseas Passenger Terminal
Circular Quay OPT Sediment Investigation SDP Application

					Inorganics	Soil Bulk Density	Organic Indicators		Metals																				
					Naphthalene (value used in F2 calc)	%Moisture (%)	Bulk density*	Total Organic Carbon	Corrected TOC for use in normalisation calculations	Aluminium	Antimony	Arsenic	Cadmium	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Silver	Vanadium	Zinc	Dibutyltin	Dibutyltin (Normalised to 1% OC)	Dibutyltin as Sn	Dibutyltin as Sn (Normalised to 1% OC)	Monobutyltin
					mg/kg	%	G/CM3	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	µg/kg	mg/kg
EQL					0.2	1	0.001	0.02	-	50	0.5	1	0.1	1	0.5	1	50	1	10	0.01	1	0.1	0.1	2	1	1	1	1	0.75
NAGD 2009 - SQG-High Values											25	70	10	370		270		220		1	52		3.7		410				
NAGD 2009 - Screening Level											2	20[#1]	1.5	80		65		50		0.15	21		1		200				
Date	**Field ID**	**Unit**	**Lab Report Number**																										
3/11/2022	VC109_0.0-0.5	Depositional	ES2240098	<0.2	47.7	0.658	3.55	3.55	16,400	2.77	27.0	0.8	37.3	5.9	230	31,700	793	120	9.13	15.1	1.1	5.4	51.4	844	-		<1	<1	-
	VC109_0.5-1.0	Depositional	ES2240098	<0.2	45.1	0.658	4.72	4.72	16,200	0.96	18.9	0.5	32.2	5.3	170	29,900	444	100	9.78	13.1	1.0	6.2	48.3	522	-		<1	<1	-
	VC109_1.0-1.5	Depositional	ES2240098	<0.2	45.7	0.724	4.71	4.71	14,100	1.04	19.9	0.8	26.8	5.2	174	29,800	556	117	9.13	12.7	1.0	2.6	46.7	560	-		<1	<1	-
	FD01 (VC109_1.0-1.5)	Depositional	ES2240098	<0.2	44.3	-	4.62	4.62	14,200	1.15	19.0	1.0	23.0	4.4	143	28,400	473	102	8.24	11.6	0.9	3.0	40.8	469	-		<1	<1	-
	FS01 (VC109_1.0-1.5)	Depositional	941330		49.33		6.40	6.40	-	-	-	0.75	38.0	-	235	-	620	-	11.5	-	-	-	-	730	<1	<1	<500	<500	
	VC109_1.5-2.0	Depositional	ES2240098	<0.2	51.0	0.598	6.20	6.20	18,200	1.29	23.5	0.8	30.3	6.4	193	35,200	554	126	9.19	14.5	1.2	3.6	60.0	566	-		<1	<1	-
	VC109_2.0-2.5	Depositional	ES2240098	0.8	48.5	0.583	5.47	5.47	19,000	1.28	24.4	1.5	32.4	6.1	190	35,900	738	123	11.1	12.8	1.3	3.1	63.1	724	-		<1	<1	-
	VC109_2.5-3.1	Depositional	ES2240098	0.3	36.5	0.736	16.00	10.00	10,800	11.3	17.2	3.1	29.7	3.6	189	21,500	46,300	111	4.75	9.7	0.6	6.2	31.2	4,270	-		<1	<1	-
4/11/2022	VC101_0.0-0.5	Depositional	ES2240098	<0.2	47.3	0.544	2.91	2.91	14,000	<0.50	15.8	0.3	48.6	5.0	123	26,900	258	103	4.16	10.6	0.5	2.0	38.6	381	-		23	7.90	-
	VC101_0.5-1.0	Depositional	ES2240098	<0.2	50.9	0.631	0.96	0.96	14,600	0.81	18.7	0.4	48.6	5.0	123	29,400	314	102	5.58	12.4	0.7	3.3	43.1	394	-		1	1.04	-
	VC101_1.0-1.5	Depositional	ES2240098	<0.2	40.0	0.678	0.88	0.88	14,900	<0.50	14.4	<0.1	23.2	3.0	5.2	25,500	13.1	56	0.05	8.4	0.6	0.2	36.3	21.0	-		<1	<1	-
	VC101_1.5-2.0	Depositional	ES2240098	<0.2	40.3	0.688	0.85	0.85	13,800	<0.50	15.2	<0.1	23.5	3.1	11.3	26,400	27.5	54	0.31	8.2	0.6	0.2	39.7	41.0	-		<1	<1	-
	FD02	Depositional	ES2240098	<0.2	38.6	-	0.91	0.91	14,300	<0.50	16.0	<0.1	20.5	2.8	5.6	24,900	13.9	49	0.07	7.4	0.6	0.2	34.6	22.9	-		1.00		-
	FS02	Depositional	941330	<0.5	41.67		1.30	1.30	-	-	-	<0.4	28.5	-	7.5	-	17.0	-	<0.1	-	-	-	-	27.0	<1	<1	<500	<500	<0.75
	VC101_2.0-2.5	Depositional	ES2240098	<0.2	40.0	0.694	0.84	0.84	10,600	<0.50	12.0	<0.1	19.6	2.5	4.9	24,200	13.1	48	0.04	6.8	0.5	<0.1	35.1	19.0	-		1	1.19	-
	VC101_2.5-3.0	Depositional	ES2240098	<0.2	37.0	0.794	0.77	0.77	13,300	<0.50	13.7	<0.1	19.7	2.8	3.7	24,800	11.5	55	0.01	6.8	0.4	<0.1	36.0	16.6	-		<1	<1	-
	VC101_3.0-3.5	Depositional	ES2240098	<0.2	36.2	0.714	0.88	0.88	11,000	<0.50	15.8	<0.1	16.4	2.4	3.6	22,800	11.2	38	0.02	5.8	0.4	<0.1	33.6	15.0	-		<1	<1	-
	VC108_0.0-0.5	Depositional	ES2240098	<0.2	23.7	1.09	6.45	6.45	10,500	1.94	10.7	0.5	17.0	3.5	59.9	15,400	539	111	3.66	6.4	0.4	1.4	18.2	348	-		<1	<1	-
			ES2242827	<0.2	22.6	1.22	6.73	6.73	9,790	1.32	8.27	0.2	12.1	3.7	35.1	12,500	227	122	2.78	8.5	0.3	0.5	14.4	190	-		<1	<1	-
	VC108_0.5-1.0	Depositional	ES2240098	<0.2	23.0	1.16	3.75	3.75	12,200	1.14	14.3	0.6	11.9	4.4	61.7	16,200	468	140	7.48	6.5	0.4	1.8	19.8	314	-		<1	<1	-
	VC108_1.0-1.5	Depositional	ES2240098	<0.2	35.7	1.04	1.79	1.79	10,900	1.68	15.5	0.9	19.3	3.9	86.5	22,200	794	92	5.42	10.0	0.5	3.0	31.8	428	-		<1	<1	-
	VC108_1.5-2.0	Depositional	ES2240098	<0.2	27.5	0.996	0.82	0.82	5,620	<0.50	11.4	<0.1	12.4	1.5	19.6	13,000	89.6	45	0.74	4.1	0.3	0.6	22.8	27.6	-		<1	<1	-
	VC108_2.0-2.5	Depositional	ES2240098	<0.2	25.0	1.09	0.42	0.42	5,040	<0.50	7.26	<0.1	9.4	1.0	1.8	8,060	9.2	24	<0.01	3.1	0.2	<0.1	12.6	8.8	-		<1	<1	-
	VC108_2.5-3.0	Depositional	ES2240098	<0.2	20.0	1.13	0.18	0.20	2,110	<0.50	5.53	<0.1	4.5	<0.5	<1.0	3,920	3.4	14	<0.01	1.2	0.2	<0.1	9.5	3.4	-		<1	<1	-
	VC108_3.0-3.5	Depositional	ES2240098	<0.2	18.5	1.15	0.21	0.21	2,700	<0.50	6.91	<0.1	3.8	0.5	<1.0	5,020	3.1	18	<0.01	1.0	0.1	<0.1	8.7	2.7	-		<1	<1	-
23/11/2022	VC107_0.0-0.5	Depositional	ES2242827	<0.2	36.2	0.97	0.79	0.79	7,170	<0.50	9.31	<0.1	15.8	2.0	10.4	14,000	88.3	41	0.44	5.8	0.4	0.1	18.9	25.3	-		<1	<1	-
	VC107_0.5-1.0	Depositional	ES2242827	<0.2	28.0	1.16	0.50	0.50	4,990	<0.50	7.87	<0.1	10.4	1.3	1.8	9,470	43.8	34	<0.01	3.6	0.3	<0.1	14.6	9.3	-		<1	<1	-
	VC107_1.0-1.5	Depositional	ES2242827	<0.2	24.8	1.2	0.34	0.34	3,880	<0.50	6.58	<0.1	6.9	0.9	1.1	7,340	3.3	18	<0.01	2.4	0.2	<0.1	10.7	5.6	-		<1	<1	-
	VC107_1.5-2.0	Depositional	ES2242827	<0.2	22.4	1.35	0.38	0.38	3,970	<0.50	7.27	<0.1	5.4	0.9	1.4	6,170	4.2	10	<0.01	1.8	0.2	<0.1	12.9	5.4	-		<1	<1	-
	VC107_2.0-2.5	Depositional	ES2242827	<0.2	21.4	1.27	0.43	0.43	4,940	<0.50	8.49	<0.1	6.4	1.2	1.4	9,170	5.2	16	<0.01	1.9	0.2	<0.1	20.1	5.6	-		<1	<1	-
	VC107_2.5-3.0	Depositional	ES2242827	<0.2	19.2	1.39	0.57	0.57	4,820	<0.50	7.67	<0.1	7.7	1.4	1.8	11,800	6.4	25	<0.01	2.2	0.2	<0.1	21.8	6.5	-		<1	<1	-
	VC107_3.0-3.65	Depositional	ES2242827	<0.2	20.2	1.22	1.70	1.70	3,180	<0.50	4.30	<0.1	2.8	0.8	1.1	10,300	3.1	<10	<0.01	1.1	0.4	<0.1	7.7	3.6	-		<1	<1	-
	VC107A_0.0-0.5	Depositional	ES2242827	<0.2	28.8	1.07	0.78	0.78	4,710	<0.50	8.32	<0.1	12.2	1.3	2.0	9,080	6.1	30	0.02	4.2	0.3	<0.1	11.4	10.2	-		<1	<1	-
	VC107A_0.5-1.0	Depositional	ES2242827	<0.2	34.2	0.965	0.72	0.72	7,450	<0.50	10.8	<0.1	16.3	1.8	2.6	15,100	6.9	37	0.01	5.7	0.4	<0.1	17.7	13.7	-		<1	<1	-
	VC107A_1.0-1.5	Depositional	ES2242827	<0.2	28.6	1.14	0.42	0.42	4,710	<0.50	7.55	<0.1	10.0	1.2	1.5	9,670	4.5	33	<0.01	3.5	0.2	<0.1	13.0	8.5	-		<1	<1	-
	VC107A_1.5-2.0	Depositional	ES2242827	<0.2	26.4	1.2	0.31	0.31	5,160	<0.50	9.32	<0.1	8.4	1.3	1.7	9,840	5.2	22	<0.01	2.9	0.3	<0.1	18.1	6.9	-		<1	<1	-
	VC107A_2.0-2.5	Depositional	ES2242827	<0.2	33.6	0.923	0.62	0.62	11,000	<0.50	13.5	<0.1	14.2	2.6	3.8	19,600	10.8	31	0.01	4.6	0.4	<0.1	35.4	13.9	-		<1	<1	-
	VC107A_2.5-3.0	Depositional	ES2242827	<0.2	19.4	1.52	0.74	0.74	5,300	<0.50	9.06	<0.1	6.6	1.3	1.7	13,500	5.8	19	<0.01	2.1	0.2	<0.1	18.6	6.2	-		<1	<1	-
	VC107A_3.0-3.65	Depositional	ES2242827	<0.2	23.4	1.16	0.71	0.71	4,070	<0.50	7.12	<0.1	3.6	1.3	1.1	6,140	3.0	16	<0.01	2.6	0.4	<0.1	15.5	8.0	-		<1	<1	-
	VC107B_0.0-0.5	Depositional	ES2242827	<0.2	36.2	0.892	0.72	0.72	7,640	<0.50	9.76	<0.1	14.4	1.9	11.0	14,800	64.1	44	0.72	5.3	0.3	<0.1	20.5	22.2	-		<1	<1	-
	VC107B_0.5-1.0	Depositional	ES2242827	<0.2	34.5	0.97	0.70	0.70	7,580	<0.50	9.40	<0.1	14.7	1.7	2.8	15,000	8.3	35	0.02	5.1	0.4	<0.1	17.8	13.1	-		<1	<1	-
	VC107B_1.0-1.5	Depositional	ES2242827	<0.2	28.9	1.18	0.41	0.41	4,660	<0.50	7.36	<0.1	9.4	1.2	1.7	8,870	4.7	30	0.01	3.4	0.2	<0.1	12.6	8.4	-		<1	<1	-
	VC107B_1.5-2.0	Depositional	ES2242827	<0.2	26.4	1.24	0.33	0.33	4,640	<0.50	6.48	<0.1	7.4	1.0	1.4	7,660	3.8	21	<0.01	2.6	0.2	<0.1	12.1	5.9	-		<1	<1	-
	VC107B_2.0-2.5	Depositional	ES2242827	<0.2	27.5	1.16	0.30	0.30	6,890	<0.50	10.4	<0.1	9.3	1.8	2.4	12,400	7.2	22	<0.01	3.6	0.3	<0.1	23.1	8.7	-		<1	<1	-
	VC107B_2.5-3.0	Depositional	ES2242827	<0.2	22.5	1.4	0.41	0.41	5,720	<0.50	7.72	<0.1	7.5	1.2	1.6	10,700	5.6	13	<0.01	2.3	0.2	<0.1	18.4	6.2	-		<1	<1	-
	VC107B_3.0-3.65	Depositional	ES2242827	<0.2	20.8	1.25	0.41	0.41	4,160	<0.50	6.48	<0.1	4.3	0.8	<1.0	8,080	3.2	<10	<0.01	1.3	0.2	<0.1	11.7	3.6	-		<1	<1	-
24/11/2022	VC102_0.0-0.5	Depositional	ES2242827	<0.2	47.8	0.622	3.30	3.30	13,300	0.54	18.5	0.5	51.8	5.0	156	28,700	350	91	4.39	11.8	0.6	2.0	39.6	486	-		<1	<1	-
	VC102_0.5-1.0	Depositional / Residual	ES2242827	<0.2	30.5	1.05	0.07	0.20	27,900	<0.50	13.7	<0.1	41.1	2.4	3.5	37,000	24.6	<10	0.11	3.7	0.8	<0.1	89.6	15.2	-		<1	<1	-
	VC102_1.0-1.2	Residual	ES2242827	<0.2	16.6	1.42	0.10	0.20	14,600	<0.50	1.84	<0.1	15.7	0.6	2.0	4,530	13.8	<10	0.04	2.4	0.4	<0.1	34.8	5.0	-		<1	<1	-
	VC103_0.0-0.5	Depositional	ES2242827	<0.2	19.6	1.3	0.09	0.20	16,700	<0.50	5.58	<0.1	17.5	1.6	6.3	5,140	19.7	11	0.08	3.9	0.2	<0.1	17.9	20.6	-		<1	<1	-
	VC103_0.5-0.8	Depositional	ES2242827	<0.2	15.2	1.55	0.03	0.20	5,650	<0.50	<1.00	<0.1	4.3	<0.5	<1.0	750	2.9	<10	<0.01	<1.0	<0.1	<0.1	4.1	1.9	-		<1	<1	-
	VC104_0.0-0.5	Depositional / Residual	ES2242827	<0.2	23.5	1.38	0.19	0.20	5,420	<0.50	7.01	<0.1	12.8	1.4	28.7	7,640	59.7	25	0.71	2.7	0.2	0.4	14.5	82.0	-		2	10.00	-
	VC104_0.5-0.9	Residual	ES2242827	<0.2	16.1	1.45	0.07	0.20	8,920	<0.50	<1.00	<0.1	7.4	0.6	1.7	1,550	25.5	<10	0.04	1.5	0.2	<0.1	11.1	16.4	-		<1	<1	-
	VC105_0.0-0.5	Depositional	ES2242827	<0.2	30.4	0.979	3.54	3.54	4,080	<0.50	5.58	<0.1	14.1	1.6	39.5	8,090	90.3	33	1.11	3.3	0.2	0.3	13.9	122	-		3	0.85	-
	FD03	Depositional	ES2242827	<0.2	35.1	1.04	1.58	1.58	3,990	<0.50	6.83	<0.1	15.3	1.6	37.0	8,960	86.0	34	1.05	3.6	0.2	0.2	14.2	108	-		3	1.90	-
	FS03	Depositional	945786	<0.5	30	-	3.70	3.70		-	12	<0.4	26	-	67	-	120	-	1.5	6.1	-	-	-	220	<1	<1	<500	<500	<0.75
	VC105_0.5-1.0	Depositional / Residual	ES2242827	<0.2	15.6	1.44	0.09	0.20	9,140	<0.50	<1.00	<0.1	6.7	<0.5	2.3	2,730	9.2	<10	0.03	1.2	<0.1	<0.1	8.4	7.8	-		<1	<1	-
	VC106_0.0-0.5	Residual	ES2242827	<0.2	14.5	1.4	0.11	0.20	7,370	<0.50	1.27	<0.1	7.2	<0.5	1.4	1,220	13.2	<10	0.03	1.3	0.1	<0.1	7.0	5.1	-		2	10.00	-
	VC106_0.5-1.0	Residual	ES2242827	<0.2	14.4	1.55	0.11	0.20	5,680	<0.50	1.44	<0.1	7.0	<0.5	46.5	1,520	13.7	<10	0.08	1.2	0.2	<0.1	8.5	9.9	-		<1	<1	-

Figure 1: Chemical analysis summary Table (*Table LR1a, Appendix C, Draft SSAPIR*) (*Ref 1 RFI 3 Table 1*)

Attachment A

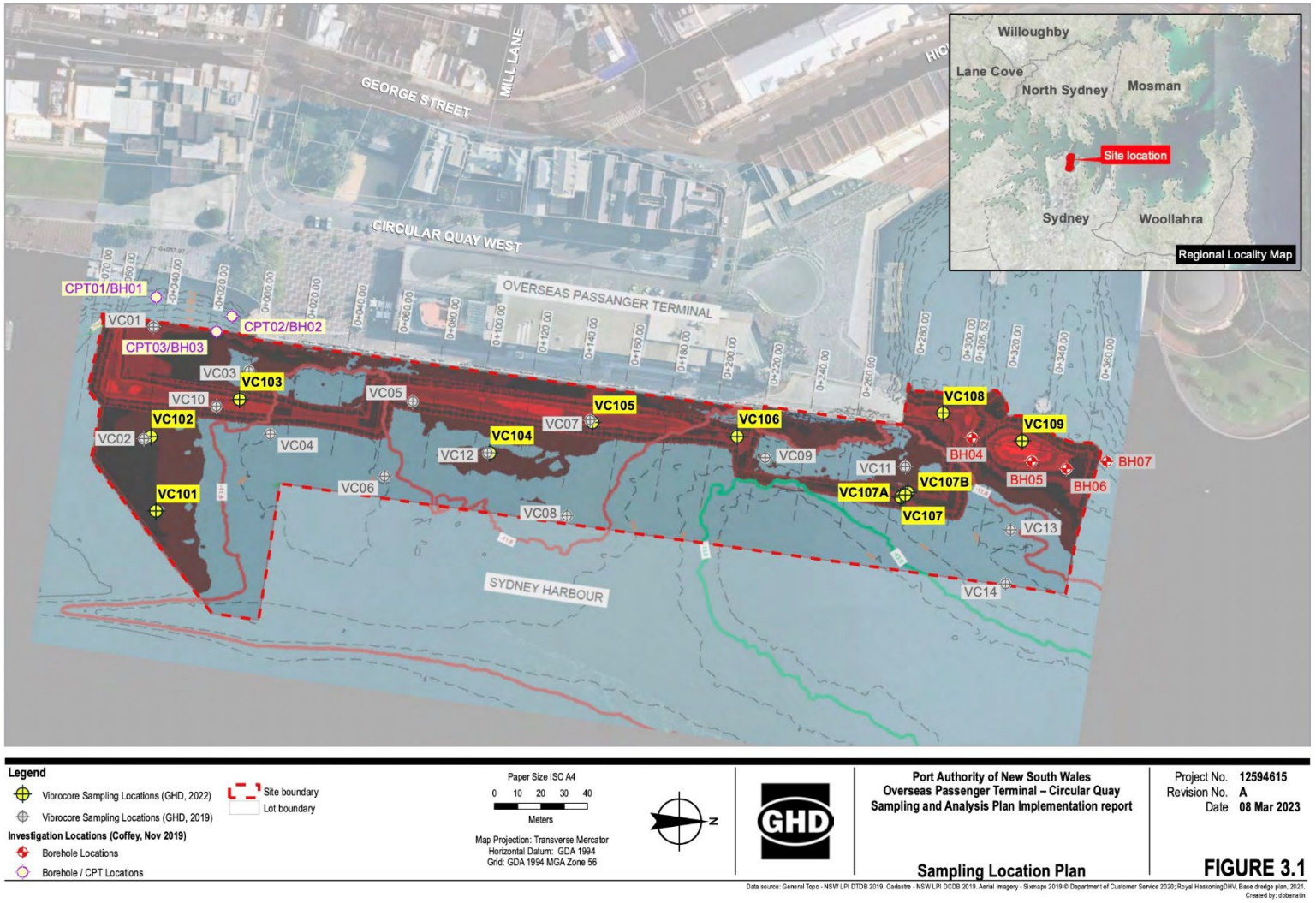

Figure 2: Sampling Location Plan (Figure 3.1, Draft SSAPIR) indicating hot spots (*Ref 1 RFI 3 Table 1*)

2. Attachments

Please list all attachments to your response (if applicable).

Attachment number	**Name of document**	**Number of pages in document**	**Document type** e.g., PDF, JPEG	**Corresponding section(s) of the response it is relevant to**
1				
2				
3				

Insert further rows to the table as required.

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Under the *Privacy Act 1988* (the Privacy Act), 'personal information' means information or an opinion about an identified individual, or an individual who is reasonably identifiable. 'Sensitive information' is a subset of personal information and includes any information or opinion about an individual's racial or ethnic origin, political opinion or association, religious beliefs or affiliations, philosophical beliefs, sexual preferences or practices, trade or professional associations and memberships, union membership, criminal record, health or genetic information and biometric information or templates. This form requests you provide personal information and may also request sensitive personal health information.

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- overseas viewers may not be subject to any privacy obligations or to any principles similar to the Australian Privacy Principles.

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- consent to the department's use and publication of all information in your response for the purposes set out above

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- the information is not in the public domain, readily discoverable or required to be disclosed under any other state or Commonwealth law, and is secret or known to a limited group
- the reasons for keeping the information confidential. For example, for commercial-in-confidence information, that the release of the information would cause competitive detriment to the owner of the information.

Please list any information in your response that you seek to be kept confidential and the reasons for seeking its confidentiality in the table below.

Item number	Location of information in the response	Description of confidential information	Reason for seeking confidentiality

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4. Declaration

I declare that, to the best of my knowledge, the information I have given on, or attached to, this response is complete, current, and correct. I understand that giving false or misleading information is a serious offence**.**

Signed:

Name:

Date:

Attachment 2

Toxicity test laboratory report

Toxicity Testing of Four Marine Sediment Samples: Circular Quay OPT Sediment Investigation

GHD

Test Report

February 2023

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ECOTOX SERVICES AUSTRALIA PTY LIMITED
ABN 95 619 426 201

Toxicity Test Report: TR2130/1

Accredited for compliance with ISO/IEC 17025 - Testing

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 04 & 24 November 2022 07 & 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10754	VC 101 0.0-0.5	Marine sediment sample received 11ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.

*NATA accreditation does not cover the performance of this service

Test Performed:	1-hr sea urchin fertilisation success test using *Heliocidaris tuberculata*
Test Protocol:	ESA SOP 104 (ESA 2014), based on USEPA (2002) and Simon and Laginestra (1996)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment was nitrogen purged on 8 November to extend holing time to 8 weeks. Sediment pore water was extracted from sample" VC 101 0.0-0.5" (Lab ID 10754) by centrifuging the sediment at 3000 rpm for 15 minutes. The pore water was then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration of the extracted pore water was below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the sample.
Source of Test Organisms:	Field collected from South Maroubra, NSW.
Test Initiated:	14 December 2022 at 1510h

Sample 10754:*VC101 0.0-0.5* **Concentration (%)**	**% Fertilised Eggs (Mean ± SD)**	*Vacant*	*Vacant*
FSW Control	91.3 ± 1.7		
Diluent Control	91.5 ± 1.9		
6.3	90.5 ± 1.3		
12.5	92.8 ± 3.1		
25	92.5 ± 2.4		
50	92.3 ± 1.0		
100	91.0 ± 2.0		
IC10 = >100% **EC50 = >100%** **NOEC = 100%** **LOEC = >100%**			

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Toxicity Test Report: TR2130/1

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % fertilised eggs	≥70.0%	91.3%	Yes
Reference Toxicant within cusum chart limits	55.2-57.7µg Cu/L	57.0µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

ESA (2014) ESA SOP 104 - *Sea Urchin Fertilisation Success Test*. Issue No. 13. Ecotox Services Australasia, Sydney NSW.

Simon, J. and Laginestra, E.(1997) Bioassay for testing sublethal toxicity in effluents, using gametes of sea urchin *Heliocidaris tuberculata*. National Pulp Mills Research Program Technical Report No. 20. CSIRO, Canberra ACT

USEPA (2002) Short-term methods for measuring the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. Third Edition. United States Environmental Protection Agency, Office of Water, Washington DC, EPA-821-R-02-014.

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Toxicity Test Report: TR2130/2

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 04 November 2022 07 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10754	VC 101 0.0-0.5	Marine sediment sample received 11ºC in apparent good condition
10848	SW	Aqueous sample, pH 8.1, salinity 35.4‰, total ammonia <2.0mg/L. Sample received at 10ºC in apparent good condition.

Test Performed:	10-day whole-sediment toxicity test using the amphipod *Melita plumulosa*
Test Protocol:	ESA SOP 109 (ESA 2015), based on *Simpson et al.* (2005)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediments were prepared approximately 24 h prior to the initiation of toxicity tests by placing 40g of homogenised sediment into 250mL glass beakers with 200mL of supplied diluent 'SW' (Lab ID 10848). Toxicity tests with the whole-sediments, without additional dilutions, were run in quadruplicate. On the day of testing, the overlying water from each of the test beakers was removed by gently siphoning with a 100mL syringe. Fresh overlying water (supplied diluent 'SW', Lab ID 10848) was added gently by pouring down the sides of the beaker to minimize disturbance of the sediment. A control sediment collected from Bonnet Bay, Hacking River NSW was run concurrently with the sample.
Source of Test Organisms:	In-house cultures, originally sourced from Hawkesbury River, NSW
Test Initiated:	12 December 2022 at 1330h

Sample 10754: VC101 0.0-0.5 **Sample**	**% Unaffected (Mean ± SD)**	*Vacant*	*Vacant*
Control sediment	95.0 ± 6.4		
VC101 0.0-0.5	95.0 ± 6.4		

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected @ 10 days	≥80.0%	95.0%	Yes
Control mean % unaffected @ 96 hours	≥80.0%	100%	Yes
96-hr Reference Toxicant within cusum chart limits	151.2-252.3µg Cu/L	183.79µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA

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Toxicity Test Report: TR2130/2

Citations:

ESA (2015) SOP 109 – *Amphipod Acute Whole-Sediments Test*. Issue No. 5. Ecotox Services Australasia, Sydney, NSW

Simpson, S.L., Batley, G.E., Chariton, A.A., Stauber, J.L., King, C.K., Chapman, J.C., Hyne, R.V., Gale, S.A., Roach, A.C., and Maher, W.A. (2005). Handbook for Sediment Quality Assessment. CSIRO, Bangor, NSW, Australia.

Toxicity Test Report: TR2130/3

Accredited for compliance with ISO/IEC 17025

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:**	PR2130
		Date Sampled:	04 & 24 November 2022
		Date Received:	07 & 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10754	VC 101 0.0-0.5	Marine sediment sample received 11ºC in apparent good condition
10848	SW	Aqueous sample, pH 8.1, salinity 35.4‰, total ammonia <2.0mg/L. Sample received at 10ºC in apparent good condition.

Test Performed:	10-day whole-sediment toxicity test using the bivalve *Tellina deltoidalis*
Test Protocol:	Based on *Simpson et al.* (2005)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediments were prepared approximately 24 h prior to the initiation of toxicity tests by placing 160g of homogenised sediment into 500mL glass beakers with 400mL of supplied diluent 'SW' (Lab ID 10848). Toxicity tests with the whole-sediments, without additional dilutions, were run in quadruplicate. On the day of testing, the overlying water from each of the test beakers was removed by gently siphoning with a 100mL syringe. Fresh overlying water (supplied diluent 'SW', Lab ID 10848) was added gently by pouring down the sides of the beaker to minimize disturbance of the sediment. A control sediment collected from Bonnet Bay, Hacking River NSW was run concurrently with the sample.
Source of Test Organisms:	Field collected from Boronia Park, Lane Cove River, NSW
Test Initiated:	12 December 2022 at 1300h

Sample: *Various*		*Vacant*	*Vacant*
Sample	**% Unaffected (Mean ± SD)**		
Control sediment	100 ± 0.0		
VC101 0.0-0.5	95.0 ± 5.8		

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected @ 10 days	≥80.0%	100%	Yes
Control mean % unaffected @ 96 hours	≥80.0%	100%	Yes
96-hr Reference Toxicant within cusum chart limits	40.7-477.2µg Cu/L	172.3µg Cu/L	Yes

* Reference toxicant cusum chart limits are not available due to limited testing with *Tellina deltoidalis*.

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

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Simpson, S.L., Batley, G.E., Chariton, A.A., Stauber, J.L., King, C.K., Chapman, J.C., Hyne, R.V., Gale, S.A., Roach, A.C., and Maher, W.A. (2005). Handbook for Sediment Quality Assessment. CSIRO, Bangor, NSW, Australia.

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Toxicity Test Report: TR2130/4

Accredited for compliance with ISO/IEC 17025 - Testing

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 04 & 24 November 2022 07 & 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10754	VC 101 0.0-0.5	Marine sediment sample received 11ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.

*NATA accreditation does not cover the performance of this service

Test Performed:	72-hr sea urchin larval development test using *Heliocidaris tuberculata*
Test Protocol:	ESA SOP 105 (ESA 2016), based on APHA (1998), Simon and Laginestra (1996) and Doyle *et al*. (2003)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment was nitrogen purged on 8 November to extend holing time to 8 weeks. Sediment pore water was extracted from sample" VC 101 0.0-0.5" (Lab ID 10754) by centrifuging the sediment at 3000 rpm for 15 minutes. The pore water was then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration of the extracted pore water was below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the sample.
Source of Test Organisms:	Field collected from South Maroubra, NSW.
Test Initiated:	14 December 2022 at 1600h

Sample 10754:*VC101 0.0-0.5* **Concentration (%)**	**% Normal larvae (Mean ± SD)**	*Vacant*	*Vacant*
FSW Control	96.5 ± 1.3		
Diluent Control	95.5 ± 2.5		
6.3	97.0 ± 1.8		
12.5	95.5 ± 2.1		
25	94.8 ± 1.7		
50	96.0 ± 2.6		
100	80.3 ± 3.3 *		
72-hr IC10 = 82.0 (70.47-90.70)% **72-hr EC50 = >100%** **NOEC = 50%** **LOEC = 100%**			

*Significantly lower percentage of normally developed larvae compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)

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Toxicity Test Report: TR2130/4

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % normal larvae	≥70.0%	96.5%	Yes
Reference Toxicant within cusum chart limits	10.6-11.7µg Cu/L	11.2µg Cu/L	Yes

Test Report Authorised by:  Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

APHA (1998) Method 8810 D. Echinoderm Embryo Development Test. In Standard Methods for the Examination of Water and Wastewater, 20th Ed. American Public Health Association, American Water Works Association and the Water Environment Federation, USA.

Doyle, C.J., Pablo, F., Lim, R.P. and Hyne, R.V. (2003) Assessment of metal toxicity in sediment pore water from Lake Macquarie, Australia. *Arch. Environ. Contam. Toxicology*, 44(3): 343-350.

ESA (2016) *ESA SOP 105 - Sea Urchin Larval Development Test*. Issue No. 11. Ecotox Services Australasia, Sydney NSW.

Simon, J. and Laginestra, E.(1997) Bioassay for testing sublethal toxicity in effluents, using gametes of sea urchin *Heliocidaris tuberculata*. National Pulp Mills Research Program Technical Report No. 20. CSIRO, Canberra, ACT.

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Toxicity Test Report: TR2130/5

Accredited for compliance with ISO/IEC 17025 - Testing

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 04 & 24 November 2022 07 & 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10754	VC 101 0.0-0.5	Marine sediment sample received 11ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.

*NATA accreditation does not cover the performance of this service

Test Performed:	48-hr larval development test using the mussel *Mytilus galloprovincialis*
Test Protocol:	ESA SOP 106 (ESA 2016), based on APHA (1998) and USEPA (1996)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Test duration extended to 72hr
Comments on Solution Preparation:	Sediment was nitrogen purged on 8 November to extend holing time to 8 weeks. Sediment pore water was extracted from sample" VC 101 0.0-0.5" (Lab ID 10754) by centrifuging the sediment at 3000 rpm for 15 minutes. The pore water was then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration of the extracted pore water was below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the sample.
Source of Test Organisms:	Farm-reared, Mercury Passage, TAS
Test Initiated:	14 December 2022 at 1700h

Sample 10754:*VC101 0.0-0.5* **Concentration (%)**	**% Normal larvae (Mean ± SD)**	*Vacant*	*Vacant*
FSW Control	73.3 ± 3.0		
Diluent Control	74.3 ± 4.7		
6.3	72.8 ± 3.4		
12.5	73.5 ± 4.8		
25	77.8 ± 4.0		
50	70.5 ± 2.1		
100	68.0 ± 2.2		
72-hr EC10 = >100% **72-hr EC50 = >100%** **NOEC = 100%** **LOEC = >100%**			

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Toxicity Test Report: TR2130/5

QA/QC Parameter	Criterion	This Test	Criterion met?
FSW Control mean % normal	≥70%	73.3%	Yes
Reference Toxicant within cusum chart limits	8.8-12.4µg Cu/L	10.1µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

APHA (1998) *Standard Methods for the Examination of Water and Wastewate*r. 20th Ed. American Public Health Association, American Water Works Association and the Water Environment Federation, Washington, DC, USA.

ESA (2016) *Bivalve Larval Development Test*. Issue No. 15. Ecotox Services Australasia, Sydney, NSW

USEPA (1996) *Bivalve acute toxicity test (embryo larval) OPPTS 850.1055. Ecological Effects Test Guidelines.* United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA/712/C-96/137.

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Toxicity Test Report: TR2130/6

Accredited for compliance with ISO/IEC 17025 - Testing

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 04 & 24 November 2022 07 & 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10754	VC 101 0.0-0.5	Marine sediment sample received 11ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.

*NATA accreditation does not cover the performance of this service

Test Performed:	48-hr larval development test using the Sydney rock oyster *Saccostrea glomerata*
Test Protocol:	ESA SOP 106 (ESA 2016), based on APHA (1998) and Krassoi (1995)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment was nitrogen purged on 8 November to extend holing time to 8 weeks. Sediment pore water was extracted from sample" VC 101 0.0-0.5" (Lab ID 10754) by centrifuging the sediment at 3000 rpm for 15 minutes. The pore water was then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration of the extracted pore water was below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the sample.
Source of Test Organisms:	Farm-reared, Wallis Lakes, NSW.
Test Initiated:	14 December 2022 at 1630h

Sample 10754: *VC 101 0.0-0.5*	*Vacant*	*Vacant*
Concentration (%)	**% Normal larvae (Mean ± SD)**	
FSW Control	74.8 ± 3.9	
Diluent Control	75.0 ± 4.2	
6.3	79.5 ± 3.3	
12.5	79.0 ± 4.8	
25	76.8 ± 4.8	
50	81.0 ± 3.6	
100	73.3 ± 4.6	
48-hr EC10 = >100% **48-hr EC50 = >100%** **NOEC = 100%** **LOEC = >100%**		

QA/QC Parameter	Criterion	This Test	Criterion met?
FSW Control mean % normal	≥70%	74.8%	Yes
Reference Toxicant within cusum chart limits	16.0-36.2µg Cu/L	27.3µg Cu/L	Yes

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Test Report Authorised by:  Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

APHA (1998) Standard Methods for the Examination of Water and Wastewater. 20th Ed. American Public Health Association, American Water Works Association and the Water Environment Federation, Washington, DC.

ESA (2016) SOP 106 – *Bivalve Larval Development Test*. Issue No. 15. Ecotox Services Australasia, Sydney, NSW.

Krassoi, R (1995) Salinity adjustment of effluents for use with marine bioassays: effects on the larvae of the doughboy scallop Chlamys asperrimus and the Sydney rock oyster *Saccostrea commercialis*. *Australasian Journal of Ecotoxicology*, 1: 143-148.

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Toxicity Test Report: TR2130/7

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 04 & 24 November 2022 07 & 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	**Sample Name:**	**Sample Description:**
10754	VC 101 0.0-0.5	Marine sediment sample received 11ºC in apparent good condition
10848	SW	Aqueous sample, pH 8.1, salinity 35.4‰, total ammonia <2.0mg/L. Sample received at 10ºC in apparent good condition.

Test Performed:	72-hr marine algal growth test using *Nitzschia closterium*
Test Protocol:	ESA SOP 110 (ESA 2016), based on Stauber *et al*. (1994)
Test Temperature:	The test was performed at 21±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment was nitrogen purged on 8 November to extend holing time to 8 weeks. Sediment pore water was extracted from sample" VC 101 0.0-0.5" (Lab ID 10754) by centrifuging the sediment at 3000 rpm for 15 minutes. The pore water was then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration of the extracted pore water was below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the sample.
Source of Test Organisms:	In-house culture, originally sourced from CSIRO Microalgae Supply Service, TAS
Test Initiated:	14 December 2022 at 1930h

Sample 10754:*VC101 0.0-0.5* **Concentration (%)**	**Cell Yield (Mean number of cells/mL x10^4 ± SD)**	*Vacant*	*Vacant*
FSW Control	15.4 ± 0.6		
Diluent Control	15.8 ± 0.5		
6.3	15.4 ± 0.7		
12.5	15.5 ± 0.7		
25	16.0 ± 0.6		
50	15.1 ± 0.6		
100	14.6 ± 0.5 *		

72-hr IC10 = >100%
72-hr IC50 = >100%
NOEC = 50%
LOEC = 100%

*Significantly lower cell yield compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)

QA/QC Parameter	**Criterion**	**This Test**	**Criterion met?**
Control mean cell density	≥16.0x10^4 cells/mL	16.4x10^4 cells/mL	Yes
Control coefficient of variation	<20%	4.1%	Yes
Reference Toxicant within cusum chart limits	3.6-8.1µg Cu/L	7.2µg Cu/L	Yes

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Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

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Citations:

ESA (2016) SOP 110 – *Marine Algal Growth Test*. Issue No. 12. Ecotox Services Australasia, Sydney NSW

Stauber, J.L., Tsai, J., Vaughan, G.T., Peterson, S.M. and Brockbank, C.I. (1994) Algae as indicators of toxicity of the effluent from bleached eucalypt kraft pulp mills. National Pulp Mills Research Program, Technical Report No. 3. CSIRO, Canberra, ACT

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Toxicity Test Report: TR2130/8

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Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 23 & 24 November 2022 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10836	VC 107 2.5-3.0	Marine sediment sample received 10ºC* in apparent good condition
10844	VC 104 0.0-0.5	Marine sediment sample received 10ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.
10849	QA1	Marine sediment sample received 10ºC* in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	72-hr sea urchin larval development test using *Heliocidaris tuberculata*
Test Protocol:	ESA SOP 105 (ESA 2016), based on APHA (1998), Simon and Laginestra (1996) and Doyle *et al*. (2003)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment samples were nitrogen purged on 25 November to extend holing time to 8 weeks. Sediment pore water was extracted from samples" VC 107 2.5-3.0", "VC 104 0.0-0.5" and "QA1" (Lab ID 10836, 10844 and 10848, respectively) by centrifuging the sediments at 3000 rpm for 15 minutes. The pore waters were then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration for all of the prepared elutriates were below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the samples.
Source of Test Organisms:	Field collected from South Maroubra, NSW.
Test Initiated:	11 January 2023 at 1930h

Sample 10836: *VC 107 2.5-3.0*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	95.8 ± 1.7
Diluent Control	95.3 ± 1.7
6.3	95.3 ± 2.2
12.5	96.0 ± 3.6
25	97.0 ± 1.8
50	93.0 ± 2.5
100	83.3 ± 3.6 *

72-hr EC10 = 84.7%**
72-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

Sample 10844: *VC 104 0.0-0.5*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	95.8 ± 1.7
Diluent Control	95.3 ± 1.7
6.3	94.8 ± 1.0
12.5	96.3 ± 2.4
25	97.0 ± 1.8
50	95.0 ± 0.8
100	89.5 ± 1.3 *

72-hr EC10 = >100%
72-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

Sample 10849: *QA1*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	95.8 ± 1.7
Diluent Control	95.3 ± 1.7
6.3	96.0 ± 2.5
12.5	96.3 ± 1.9
25	96.0 ± 1.4
50	93.8 ± 2.2
100	85.0 ± 3.7 *

72-hr IC10 = 92.8%**
72-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

*Significantly lower percentage of normally developed larvae compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)
**The 95% confidence limits are not available

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Toxicity Test Report: TR2130/8

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % normal larvae	≥70.0%	95.8%	Yes
Reference Toxicant within cusum chart limits	10.6-11.7µg Cu/L	11.1µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

APHA (1998) Method 8810 D. Echinoderm Embryo Development Test. In Standard Methods for the Examination of Water and Wastewater, 20th Ed. American Public Health Association, American Water Works Association and the Water Environment Federation, USA.

Doyle, C.J., Pablo, F., Lim, R.P. and Hyne, R.V. (2003) Assessment of metal toxicity in sediment pore water from Lake Macquarie, Australia. *Arch. Environ. Contam. Toxicology*, 44(3): 343-350.

ESA (2016) *ESA SOP 105 - Sea Urchin Larval Development Test*. Issue No. 11. Ecotox Services Australasia, Sydney NSW.

Simon, J. and Laginestra, E.(1997) Bioassay for testing sublethal toxicity in effluents, using gametes of sea urchin *Heliocidaris tuberculata*. National Pulp Mills Research Program Technical Report No. 20. CSIRO, Canberra, ACT.

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Toxicity Test Report: TR2130/9

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Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 23 & 24 November 2022 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10836	VC 107 2.5-3.0	Marine sediment sample received 10ºC* in apparent good condition
10844	VC 104 0.0-0.5	Marine sediment sample received 10ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.
10849	QA1	Marine sediment sample received 10ºC* in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	1-hr sea urchin fertilisation success test using *Heliocidaris tuberculata*
Test Protocol:	ESA SOP 104 (ESA 2014), based on USEPA (2002) and Simon and Laginestra (1996)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment samples were nitrogen purged on 25 November to extend holing time to 8 weeks. Sediment pore water was extracted from samples" VC 107 2.5-3.0", "VC 104 0.0-0.5" and "QA1" (Lab ID 10836, 10844 and 10848, respectively) by centrifuging the sediments at 3000 rpm for 15 minutes. The pore waters were then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration for all of the prepared elutriates were below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the samples.
Source of Test Organisms:	Field collected from South Maroubra, NSW.
Test Initiated:	11 January 2023 at 1910h

Sample 10836: *VC 107 2.5-3.0*

Concentration (%)	% Fertilised Eggs (Mean ± SD)
FSW Control	90.3 ± 1.0
Diluent Control	90.8 ± 1.7
6.3	90.8 ± 1.7
12.5	91.5 ± 2.7
25	91.5 ± 1.3
50	92.8 ± 1.7
100	90.5 ± 1.3

IC10 = >100%
EC50 = >100%
NOEC = 100%
LOEC = >100%

Sample 10844: *VC 104 0.0-0.5*

Concentration (%)	% Fertilised Eggs (Mean ± SD)
FSW Control	90.3 ± 1.0
Diluent Control	90.8 ± 1.7
6.3	91.5 ± 1.3
12.5	92.8 ± 1.7
25	91.3 ± 2.6
50	90.8 ± 1.7
100	90.3 ± 3.3

IC10 = >100%
EC50 = >100%
NOEC = 100%
LOEC = >100%

Sample 10849: *QA1*

Concentration (%)	% Fertilised Eggs (Mean ± SD)
FSW Control	90.3 ± 1.0
Diluent Control	90.8 ± 1.7
6.3	91.5 ± 1.3
12.5	92.3 ± 2.2
25	91.8 ± 1.7
50	91.0 ± 1.4
100	90.5 ± 1.3

IC10 = >100%
EC50 = >100%
NOEC = 100%
LOEC = >100%

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Toxicity Test Report: TR2130/9

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % fertilised eggs	≥70.0%	90.3%	Yes
Reference Toxicant within cusum chart limits	55.2-57.6µg Cu/L	56.8µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

ESA (2014) ESA SOP 104 - *Sea Urchin Fertilisation Success Test*. Issue No. 13. Ecotox Services Australasia, Sydney NSW.

Simon, J. and Laginestra, E.(1997) Bioassay for testing sublethal toxicity in effluents, using gametes of sea urchin *Heliocidaris tuberculata*. National Pulp Mills Research Program Technical Report No. 20. CSIRO, Canberra ACT

USEPA (2002) Short-term methods for measuring the chronic toxicity of effluents and receiving waters to marine and estuarine organisms. Third Edition. United States Environmental Protection Agency, Office of Water, Washington DC, EPA-821-R-02-014.

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Toxicity Test Report: TR2130/10

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Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 23 & 24 November 2022 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10836	VC 107 2.5-3.0	Marine sediment sample received 10ºC* in apparent good condition
10844	VC 104 0.0-0.5	Marine sediment sample received 10ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.
10849	QA1	Marine sediment sample received 10ºC* in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	48-hr larval development test using the mussel *Mytilus galloprovincialis*
Test Protocol:	ESA SOP 106 (ESA 2016), based on APHA (1998) and USEPA (1996)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Test duration extended to 72hr
Comments on Solution Preparation:	Sediment samples were nitrogen purged on 25 November to extend holing time to 8 weeks. Sediment pore water was extracted from samples" VC 107 2.5-3.0", "VC 104 0.0-0.5" and "QA1" (Lab ID 10836, 10844 and 10848, respectively) by centrifuging the sediments at 3000 rpm for 15 minutes. The pore waters were then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration for all of the prepared elutriates were below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the samples.
Source of Test Organisms:	Farm-reared, Mercury Passage, TAS
Test Initiated:	11 January 2023 at 2030h

Sample 10836: *VC 107 2.5-3.0*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	70.3 ± 2.2
Diluent Control	70.8 ± 3.1
6.3	72.3 ± 3.5
12.5	71.0 ± 2.2
25	72.3 ± 2.6
50	70.5 ± 2.7
100	66.5 ± 2.4

72-hr EC10 = >100%
72-hr EC50 = >100%
NOEC = 100%
LOEC = >100%

Sample 10844: *VC 104 0.0-0.5*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	70.3 ± 2.2
Diluent Control	70.8 ± 3.1
6.3	71.8 ± 2.2
12.5	72.8 ± 2.2
25	71.3 ± 5.3
50	70.5 ± 4.9
100	63.8 ± 4.1 *

72-hr IC10 = 92.2%**
72-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

Sample 10849: *QA1*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	70.3 ± 2.2
Diluent Control	70.8 ± 3.1
6.3	72.3 ± 3.5
12.5	71.5 ± 1.3
25	70.0 ± 1.8
50	69.0 ± 4.7
100	61.3 ± 2.2 *

72-hr IC10 = 76.5 (34.81-100)%
72-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

*Significantly lower percentage of normally developed larvae compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)
** The 95% Confidence Limits are not availble

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Toxicity Test Report: TR2130/10

QA/QC Parameter	Criterion	This Test	Criterion met?
FSW Control mean % normal	≥70%	70.3%	Yes
Reference Toxicant within cusum chart limits	8.8-12.4µg Cu/L	10.7µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

APHA (1998) *Standard Methods for the Examination of Water and Wastewate*r. 20th Ed. American Public Health Association, American Water Works Association and the Water Environment Federation, Washington, DC, USA.

ESA (2016) *Bivalve Larval Development Test*. Issue No. 15. Ecotox Services Australasia, Sydney, NSW

USEPA (1996) *Bivalve acute toxicity test (embryo larval) OPPTS 850.1055. Ecological Effects Test Guidelines.* United States Environmental Protection Agency. Prevention, Pesticides and Toxic Substances. EPA/712/C-96/137.

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ABN 95 619 426 201

Toxicity Test Report: TR2130/11

Accredited for compliance with ISO/IEC 17025 - Testing

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 23 & 24 November 2022 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10836	VC 107 2.5-3.0	Marine sediment sample received 10ºC* in apparent good condition
10844	VC 104 0.0-0.5	Marine sediment sample received 10ºC* in apparent good condition
10848	SW	Aqueous sample, pH 8.1*, salinity 35.4‰*, total ammonia <2.0mg/L*. Sample received at 10ºC* in apparent good condition.
10849	QA1	Marine sediment sample received 10ºC* in apparent good condition

*NATA accreditation does not cover the performance of this service

Test Performed:	48-hr larval development test using the Sydney rock oyster *Saccostrea glomerata*
Test Protocol:	ESA SOP 106 (ESA 2016), based on APHA (1998) and Krassoi (1995)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment samples were nitrogen purged on 25 November to extend holing time to 8 weeks. Sediment pore water was extracted from samples" VC 107 2.5-3.0", "VC 104 0.0-0.5" and "QA1" (Lab ID 10836, 10844 and 10848, respectively) by centrifuging the sediments at 3000 rpm for 15 minutes. The pore waters were then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration for all of the prepared elutriates were below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the samples.
Source of Test Organisms:	Farm-reared, Wallis Lakes, NSW.
Test Initiated:	11 January 2023 at 2000h

Sample 10836: *VC 107 2.5-3.0*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	82.0 ± 1.8
Diluent Control	83.3 ± 2.2
6.3	83.0 ± 6.3
12.5	84.3 ± 5.4
25	80.0 ± 3.4
50	82.5 ± 3.1
100	74.3 ± 3.9 *

48-hr IC10 = 92.2%**
48-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

Sample 10844: *VC 104 0.0-0.5*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	82.0 ± 1.8
Diluent Control	83.3 ± 2.2
6.3	82.5 ± 3.1
12.5	82.5 ± 3.5
25	82.5 ± 3.1
50	82.5 ± 3.1
100	76.3 ± 6.4 *

48-hr EC10 = >100%
48-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

Sample 10849: *QA1*

Concentration (%)	% Normal larvae (Mean ± SD)
FSW Control	82.0 ± 1.8
Diluent Control	83.3 ± 2.2
6.3	80.8 ± 3.4
12.5	78.5 ± 5.5
25	77.8 ± 2.8
50	78.5 ± 6.7
100	72.8 ± 4.7 *

48-hr IC10 = 76.5%**
48-hr EC50 = >100%
NOEC = 50%
LOEC = 100%

*Significantly lower percentage of normally developed larvae when compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)
** The 95% Confidence Limits are not available

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Toxicity Test Report: TR2130/11

QA/QC Parameter	Criterion	This Test	Criterion met?
FSW Control mean % normal	≥70%	82.0%	Yes
Reference Toxicant within cusum chart limits	16.2-36.6µg Cu/L	30.0µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

Citations:

APHA (1998) Standard Methods for the Examination of Water and Wastewater. 20th Ed. American Public Health Association, American Water Works Association and the Water Environment Federation, Washington, DC.

ESA (2016) SOP 106 – *Bivalve Larval Development Test*. Issue No. 15. Ecotox Services Australasia, Sydney, NSW.

Krassoi, R (1995) Salinity adjustment of effluents for use with marine bioassays: effects on the larvae of the doughboy scallop Chlamys asperrimus and the Sydney rock oyster *Saccostrea commercialis*. *Australasian Journal of Ecotoxicology*, 1: 143-148.

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Toxicity Test Report: TR2130/12

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 23 & 24 November 2022 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10836	VC 107 2.5-3.0	Marine sediment sample received 10ºC in apparent good condition
10844	VC 104 0.0-0.5	Marine sediment sample received 10ºC in apparent good condition
10848	SW	Aqueous sample, pH 8.1, salinity 35.4‰, total ammonia <2.0mg/L. Sample received at 10ºC in apparent good condition.
10849	QA1	Marine sediment sample received 10ºC in apparent good condition

Test Performed:	72-hr marine algal growth test using *Nitzschia closterium*
Test Protocol:	ESA SOP 110 (ESA 2016), based on Stauber *et al*. (1994)
Test Temperature:	The test was performed at 21±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediment samples were nitrogen purged on 25 November to extend holing time to 8 weeks. Sediment pore water was extracted from samples" VC 107 2.5-3.0", "VC 104 0.0-0.5" and "QA1" (Lab ID 10836, 10844 and 10848, respectively) by centrifuging the sediments at 3000 rpm for 15 minutes. The pore waters were then serially diluted with sample "SW" (Lab ID 10848) to achieve the test concentrations. Total ammonia concentration for all of the prepared elutriates were below the detection limit of 2.0mg/L. A FSW control and a Diluent Control (Sample "SW") were tested concurrently with the samples.
Source of Test Organisms:	In-house culture, originally sourced from CSIRO Microalgae Supply Service, TAS
Test Initiated:	11 January 2023 at 1600h

Sample 10836: *VC 107 2.5-3.0*

Concentration (%)	Cell Yield (Mean number of cells/mL x10^4 ± SD)
FSW Control	19.6 ± 1.1
Diluent Control	19.1 ± 0.9
6.3	19.9 ± 0.8
12.5	19.7 ± 0.9
25	19.9 ± 1.1
50	19.5 ± 0.7
100	17.8 ± 0.7 *

72-hr IC10 = >100%
72-hr IC50 = >100%
NOEC = 50%
LOEC = 100%

Sample 10844: *VC 104 0.0-0.5*

Concentration (%)	Cell Yield (Mean number of cells/mL x10^4 ± SD)
FSW Control	19.6 ± 1.1
Diluent Control	19.1 ± 0.9
6.3	19.1 ± 0.9
12.5	18.6 ± 1.1
25	20.3 ± 0.9
50	19.0 ± 0.8
100	18.7 ± 1.0 *

72-hr IC10 = 90.5%**
72-hr IC50 = >100%
NOEC = 50%
LOEC = 100%

Sample 10849: *QA1*

Concentration (%)	Cell Yield (Mean number of cells/mL x10^4 ± SD)
FSW Control	19.6 ± 1.1
Diluent Control	19.1 ± 0.9
6.3	20.1 ± 0.6
12.5	19.7 ± 1.2
25	19.9 ± 0.7
50	19.0 ± 0.9
100	17.6 ± 1.0 *

72-hr IC10 = 95.4%**
72-hr IC50 = >100%
NOEC = 50%
LOEC = 100%

*Significantly lower cell yield compared with the Diluent Control (Dunnett's Test, 1-tailed, P=0.05)
** The 95% Confidence Limits are not available

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Toxicity Test Report: TR2130/12

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean cell density	≥16.0x10^4 cells/mL	20.6x10^4 cells/mL	Yes
Control coefficient of variation	<20%	5.8%	Yes
Reference Toxicant within cusum chart limits	4.1-7.3µg Cu/L	4.7µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA.

Citations:

ESA (2016) SOP 110 – *Marine Algal Growth Test*. Issue No. 12. Ecotox Services Australasia, Sydney NSW

Stauber, J.L., Tsai, J., Vaughan, G.T., Peterson, S.M. and Brockbank, C.I. (1994) Algae as indicators of toxicity of the effluent from bleached eucalypt kraft pulp mills. National Pulp Mills Research Program, Technical Report No. 3. CSIRO, Canberra, ACT

NATA WORLD RECOGNISED ACCREDITATION

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Toxicity Test Report: TR2130/13

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 23 & 24 November 2022 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10836	VC 107 2.5-3.0	Marine sediment sample received 10ºC in apparent good condition
10844	VC 104 0.0-0.5	Marine sediment sample received 10ºC in apparent good condition
10849	QA1	Marine sediment sample received 10ºC in apparent good condition
10848	SW	Aqueous sample, pH 8.1, salinity 35.4‰, total ammonia <2.0mg/L. Sample received at 10ºC in apparent good condition.

Test Performed:	10-day whole-sediment toxicity test using the amphipod *Melita plumulosa*
Test Protocol:	ESA SOP 109 (ESA 2015), based on *Simpson et al.* (2005)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediments were prepared approximately 24 h prior to the initiation of toxicity tests by placing 40g of homogenised sediment into 250mL glass beakers with 200mL of supplied diluent 'SW' (Lab ID 10848). Toxicity tests with the whole-sediments, without additional dilutions, were run in quadruplicate. On the day of testing, the overlying water from each of the test beakers was removed by gently siphoning with a 100mL syringe. Fresh overlying water (supplied diluent 'SW', Lab ID 10848) was added gently by pouring down the sides of the beaker to minimize disturbance of the sediment. A control sediment collected from Bonnet Bay, Hacking River NSW was run concurrently with the sample.
Source of Test Organisms:	In-house cultures, originally sourced from Hawkesbury River, NSW
Test Initiated:	18 January 2023 at 1630h

Sample	% Unaffected (Mean ± SD)	*Vacant*	*Vacant*
Control sediment	96.7 ± 3.9		
VC 107 2.0-3.0	96.7 ± 3.9		
VC 104 0.0-0.5	93.3 ± 7.7		
QA1	95.0 ± 6.4		

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected @ 10 days	≥80.0%	96.7%	Yes
Control mean % unaffected @ 96 hours	≥80.0%	100%	Yes
96-hr Reference Toxicant within cusum chart limits	150.6-249.8µg Cu/L	214.6µg Cu/L	Yes

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

Results are based on the samples in the condition as received by ESA

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Citations:

ESA (2015) SOP 109 – *Amphipod Acute Whole-Sediments Test*. Issue No. 5. Ecotox Services Australasia, Sydney, NSW

Simpson, S.L., Batley, G.E., Chariton, A.A., Stauber, J.L., King, C.K., Chapman, J.C., Hyne, R.V., Gale, S.A., Roach, A.C., and Maher, W.A. (2005). Handbook for Sediment Quality Assessment. CSIRO, Bangor, NSW, Australia.

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Toxicity Test Report: TR2130/14

Accredited for compliance with ISO/IEC 17025

Client:	GHD Pty Ltd Level 15, 133 Castlereagh St Sydney NSW 2000	**ESA Job #:** **Date Sampled:** **Date Received:**	PR2130 23 & 24 November 2022 25 November 2022
Attention:	Carmen Yi	**Sampled By:**	Client
Client Ref:	12594615	**ESA Quote #:**	PL2130_q01

Lab ID No.:	Sample Name:	Sample Description:
10836	VC 107 2.5-3.0	Marine sediment sample received 10ºC in apparent good condition
10844	VC 104 0.0-0.5	Marine sediment sample received 10ºC in apparent good condition
10849	QA1	Marine sediment sample received 10ºC in apparent good condition
10848	SW	Aqueous sample, pH 8.1, salinity 35.4‰, total ammonia <2.0mg/L. Sample received at 10ºC in apparent good condition.

Test Performed:	10-day whole-sediment toxicity test using the bivalve *Tellina deltoidalis*
Test Protocol:	Based on *Simpson et al.* (2005)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	Sediments were prepared approximately 24 h prior to the initiation of toxicity tests by placing 160g of homogenised sediment into 500mL glass beakers with 400mL of supplied diluent 'SW' (Lab ID 10848). Toxicity tests with the whole-sediments, without additional dilutions, were run in quadruplicate. On the day of testing, the overlying water from each of the test beakers was removed by gently siphoning with a 100mL syringe. Fresh overlying water (supplied diluent 'SW', Lab ID 10848) was added gently by pouring down the sides of the beaker to minimize disturbance of the sediment. A control sediment collected from Bonnet Bay, Hacking River NSW was run concurrently with the sample.
Source of Test Organisms:	Field collected from Boronia Park, Lane Cove River, NSW
Test Initiated:	18 January 2023 at 1700h

Sample	% Unaffected (Mean ± SD)	*Vacant*	*Vacant*
Control sediment	100 ± 0.0		
VC 107 2.0-3.0	100 ± 0.0		
VC 104 0.0-0.5	100 ± 0.0		
QA1	100 ± 0.0		

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % unaffected @ 10 days	≥80.0%	100%	Yes
Control mean % unaffected @ 96 hours	≥80.0%	100%	Yes
96-hr Reference Toxicant within cusum chart limits	42.84-467.3µg Cu/L	214.6µg Cu/L	Yes

* Reference toxicant cusum chart limits are not available due to limited testing with *Tellina deltoidalis*.

Test Report Authorised by: Dr Rick Krassoi, Director on 17 February 2023

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Toxicity Test Report: TR2130/14

Results are based on the samples in the condition as received by ESA. This document shall not be reproduced except in full.

Citations:

Simpson, S.L., Batley, G.E., Chariton, A.A., Stauber, J.L., King, C.K., Chapman, J.C., Hyne, R.V., Gale, S.A., Roach, A.C., and Maher, W.A. (2005). Handbook for Sediment Quality Assessment. CSIRO, Bangor, NSW, Australia.

Chain-of-Custody Documentation

Datasheet ID: 601.2
Last Revised: 21 September 2018

Sample Receipt Notification

Attention : Carmen Yi

Client : GHD Pty Ltd
Level 15, 133 Castlereagh St
Sydney NSW 2000

Email : carmen.yi@ghd.com
Telephone : 02 92397630
Facsimile :

Date : 7/11/2022

Re : Receipt of Samples **Pages : 2**

ESA Project : PR2130 ☑ For Review ☐ Additional Documentation Required - Please Respond

Sample Delivery Details

Completed Chain of Custody accompanied samples: YES
Samples received in apparent good condition and correctly bottled: YES
Security seals on sample bottles and esky intact: YES

Date samples received : 7/11/2022
Time samples received : 15:00
No. of samples received : 20
Sample matrix : Sediment
Sample temperature : 11-15°C

Comments : 2x3L bag for each of 7 cores for VC101, 7 cores for VC108 and 6 cores for VC109 received at 11oC in apparent good condition

Contact Details

Projects Manager : Dr Rick Krassoi
Telephone : 61 2 9420 9481
Facsimile : 61 2 9420 9484
Email : rkrassoi@ecotox.com.au

Please contact customer services officer for all queries or issues regarding samples

Note that the chain-of-custody provides definitive information on the tests to be performed

Ecotox Services Australia
ABN 95619426201
Unit 27, 2 Chaplin Drive
Lane Cove NSW 2066 Australia

Phone : 61 2 9420 9481
Fax : 61 2 9420 9484
Email : info@ecotox.com.au

Chain-of-Custody / Service Request Form

Datasheet ID: 601.1
Last Revised: 01 June 2021

Customer: GHD
Contact Name: CARMEN YI
Phone: 0292397630 Email: carmen.yi@ghd.com (please provide an email address for sample receipt notification)
Sampled by: SARAH ECCLESHALL 0459546332

Ship To:
Attention:

Sample Date (day/month /year)	Sample Time	Sample Name (exactly as written on the sample vessel)	Sample Method (eg. Grab, composite etc.)	Number and Volume of Containers (eg 2 x 1L)	Tests Requested (See reverse for guidance)	Comments / Instructions
4/11/22	01:30	VC101_0.0-0.5	vibracore	2x3L		PLs hold + nitrogen purge.
4/11/22	01:30	VC101_0.5-1.0	vibracore	2x3L		
4/11/22	01:30	VC101_1.0-1.5	vibracore	2x3L		
4/11/22	01:30	VC101_1.5-2.0	vibracore	2x3L		
4/11/22	01:30	VC101_2.0-2.5	vibracore	2x3L		
4/11/22	01:30	VC101_2.5-3.0	vibracore	2x3L		
4/11/22	01:30	VC101_3.0-3.5	vibracore	2x3L		

Comments / Instructions

Note that testing will be delayed if an incomplete chain of custody is received

- Additional treatment of samples (i.e. spiking)
- Sub-contracted services (i.e. chemical analyses)
- Dilutions required (if different than 100% down to 6.25%)
- Sample holding time restriction (if applicable)
- Sample used for litigation (if applicable)

Note: An MSDS must be attached if Available

ESA Project Number: PR 2130

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
S Eccleshall	14:35		1500				
Of: GHD	Time: 7/11/22	Of: ESP	Time: 7/11/22	Of:	Time:	Of:	Time:

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

Chain-of-Custody / Service Request Form

Datasheet ID: 601.1
Last Revised: 01 June 2021

Customer: _____ Ship To: _____

Contact Name: As Pg 1 Attention: _____

Phone: _____ Email: _____ (please provide an email address for sample receipt notification)

Sampled by: _____

	Sample Date (day/month /year)	Sample Time	Sample Name (exactly as written on the sample vessel)	Sample Method (eg. Grab, composite etc.)	Number and Volume of Containers (eg 2 x 1L)	Tests Requested (See reverse for guidance)						Comments / Instructions
11°C												**Note that testing will be delayed if an incomplete chain of custody is received** • Additional treatment of samples (i.e. spiking) • Sub-contracted services (i.e. chemical analyses) • Dilutions required (if different than 100% down to 6.25%) • Sample holding time restriction (if applicable) • Sample used for litigation (if applicable) *Note: An MSDS must be attached if Available* **ESA Project Number: PR** 2130
10–												
761	4/11/22	19:30	VC108_0.0-0.5	Vibracor	1x3L							PLS hold + Nitrogen purge
762	4/11/22	19:30	VC108_0.5-1.0	Vibracor	1x3L							
763	4/11/22	19:30	VC108_1.0-1.5	Vibracor	1x3L							
764	4/11/22	19:30	VC108_1.5-2.0	Vibracor	1x3L							
765	4/11/22	19:30	VC108_2.0-2.5	Vibracor	1x3L							
766	4/11/22	19:30	VC108_2.5-3.0	Vibracor	1x3L							
767	4/11/22	19:30	VC108_3.00-3.5	Vibracor	1x3L							

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
S Eccleshall	14:35		1500				
Of: GHD	Time: 7/11/22	Of: ESA	Time: 7/11/22	Of:	Time:	Of:	Time:

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

Chain-of-Custody / Service Request Form

Datasheet ID: 601.1
Last Revised: 01 June 2021

Customer: _____ Ship To: _____

Contact Name: _____ Attention: _____

Phone: _____ Email: _____ (please provide an email address for sample receipt notification)

Sampled by: _____

11°C

10-

Sample Date (day/month /year)	Sample Time	Sample Name (exactly as written on the sample vessel)	Sample Method (eg. Grab, composite etc.)	Number and Volume of Containers (eg 2 x 1L)	Tests Requested (See reverse for guidance)	Comments / Instructions
760 3/11/22	~~0749~~ 15	VC109_0.0-0.5	Vibracore	1x3L		hold ✝ N purge
769 3/11/22	23:15	VC109_0.5-1.0	↓	1x3L		↓
770 3/11/22	23:15	VC109_1.5-2.0		1x3L		
771 3/11/22	23:15	VC109_2.0-2.5		1x3L		
772 3/11/22	23:15	VC109_2.5-3.1		1x3L		
773 3/11/22	23:15	VC109-0-1.5	↓	1x3L		↓

Note that testing will be delayed if an incomplete chain of custody is received

- Additional treatment of samples (i.e. spiking)
- Sub-contracted services (i.e. chemical analyses)
- Dilutions required (if different than 100% down to 6.25%)
- Sample holding time restriction (if applicable)
- Sample used for litigation (if applicable)

Note: An MSDS must be attached if Available

ESA Project Number: PR 2130

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
SEccleshall	14/35		1500				
Of: CHD	Time: 7/11/22	Of: ESA	Time: 7/11/22	Of:	Time:	Of:	Time:

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

Ecotox Services Australia . Unit 27, 2 Chaplin Drive, Lane Cove NSW 2066 AUSTRALIA
Phone: 61 2 9420-9481 Email: info@ecotox.com.au

Datasheet ID: 601.2
Last Revised: 21 September 2018

Sample Receipt Notification

Attention : Carmen Yi

Client : GHD Pty Ltd
Level 15, 133 Castlereagh St
Sydney NSW 2000

Email : carmen.yi@ghd.com
Telephone : 02 92397630
Facsimile :

Date : 28/11/2022

Re : Receipt of Samples **Pages : 2**

ESA Project : PR2130 ☑ For Review ☐ Additional Documentation Required - Please Respond

Sample Delivery Details

Completed Chain of Custody accompanied samples: YES
Samples received in apparent good condition and correctly bottled: YES
Security seals on sample bottles and esky intact: YES

Date samples received : 25/11/2022
Time samples received : 15:20
No. of samples received : 18
Sample matrix : Sediment
Sample temperature : 6-10°C

Comments : 1-2x3L bag for each of 7 cores for VC107, 2 cores for VC106, VC012, VC103, VC104 and VC105 and 1x10L Seawater received at 10oC in apparent good condition

Contact Details

Projects Manager : Dr Rick Krassoi
Telephone : 61 2 9420 9481
Facsimile : 61 2 9420 9484
Email : rkrassoi@ecotox.com.au

Please contact customer services officer for all queries or issues regarding samples

Note that the chain-of-custody provides definitive information on the tests to be performed

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Phone : 61 2 9420 9481
Fax : 61 2 9420 9484
Email : info@ecotox.com.au

Chain-of-Custody / Service Request Form

Datasheet ID: 601.1
Last Revised: 01 June 2021

Customer: GHD
Contact Name: Carmen Yi
Phone: 0292397630 Email: carmen.yi@ghd.com (please provide an email address for sample receipt notification)
Sampled by: SARAH ECCLESHALL (0459546332) GHD Project Number: 12594615

Ship To:
Attention:

10°C

	Sample Date (day/month /year)	Sample Time	Sample Name (exactly as written on the sample vessel)	Sample Method (eg. Grab, composite etc.)	Number and Volume of Containers (eg 2 x 1L)	Tests Requested (See reverse for guidance): Please nitrogen purge and hold pending preliminary chemical results	Comments / Instructions
10831	23/11/22	21:30	VC107_0.0-0.5	Vibracore	2x3L		
10832			VC107_0.5-1.0	Vibracore			
10833			VC107_1.0-1.5	vibracore			
10834			VC107_1.5-2.0	vibracore			
10835			VC107_2.0-2.5	vibracore			
10836			VC107_2.5-3.0	vibracore			
10837			VC107_3.0-3.6	vibracore			

Note that testing will be delayed if an incomplete chain of custody is received

- Additional treatment of samples (i.e. spiking)
- Sub-contracted services (i.e. chemical analyses)
- Dilutions required (if different than 100% down to 6.25%)
- Sample holding time restriction (if applicable)
- Sample used for litigation (if applicable)

Note: An MSDS must be attached if Available

ESA Project Number: PR 2130

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
SARAH Eccleshall	25/11/22		25/11/22				
Of: GHD	Time: 15:20	Of: ERA	Time: 1520	Of:	Time:	Of:	Time:

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

Chain-of-Custody / Service Request Form

ecotox SERVICES AUSTRALIA

Datasheet ID: 601.1
Last Revised: 01 June 2021

Customer: GHD
Contact Name: Carmen Yi
Phone: 0297397630 Email: carmen.yi@ghd.com (please provide an email address for sample receipt notification)
Sampled by: SARAH ECCLESHALL (0459546332)

Ship To:
Attention:
GHD Project Number: 12594615

10°C

	Sample Date (day/month /year)	Sample Time	Sample Name (exactly as written on the sample vessel)	Sample Method (eg. Grab, composite etc.)	Number and Volume of Containers (eg 2 x 1L)	Tests Requested (See reverse for guidance): Please nitrogen purge and hold pending preliminary chemical results						Comments / Instructions
10838	24/11/22	00:45	VC106_0.0-0.5	Vibracore	2x3L							Note that testing will be delayed if an incomplete chain of custody is received • Additional treatment of samples (i.e. spiking) • Sub-contracted services (i.e. chemical analyses) • Dilutions required (if different than 100% down to 6.25%) • Sample holding time restriction (if applicable) • Sample used for litigation (if applicable) *Note: An MSDS must be attached if Available* ESA Project Number: PR 2130
10839			VC106_0.5-1.0	Vibracore	2x3L							
10840		02:07	VC102_0.0-0.5	vibracore	2x3L							
10841			VC102_0.5-1.2	vibracore	1x3L							
10842		03:50	VC103_0.0-0.5	vibracore	2x3L							
10843			VC103_0.5-0.8	vibracore	2x3L							
10844		04:15	VC104_0.0-0.5	vibracore	1x3L							

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
SARAH Eccleshall	25/11/22		25/11/22				
Of: GHD	Time: 15:20	Of: ESA	Time: 1520	Of:	Time:	Of:	Time:

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

Chain-of-Custody / Service Request Form

ecotox SERVICES AUSTRALIA

Datasheet ID: 601.1
Last Revised: 01 June 2021

Customer: GHD
Contact Name: Carmen Yi
Phone: 0297397630 Email: carmen.yi@ghd.com (please provide an email address for sample receipt notification)
Sampled by: SARAH ECCLESHALL (0459546332)

Ship To:
Attention:
GHD Project Number: 12594615

10°C

Sample Date (day/month /year)	Sample Time	Sample Name (exactly as written on the sample vessel)	Sample Method (eg. Grab, composite etc.)	Number and Volume of Containers (eg 2 x 1L)	Tests Requested (See reverse for guidance): Please nitrogen	Purge and hold pending preliminary chemical results				Comments / Instructions
10845 24/11/22	04:15	VC104_0.5-0.9	Vibracore	2x3L						
10846 24/11/22	20:00	VC105_0.5-1.0	Vibracore	2x3L						
10847 ↓	↓	VC105_0.0-0.5	vibracore	1x3L						
10848 24/11/22	20:15	SW	vibracore	1x10L						SEAWATER SAMPLE.
10849 23/11/22		QA1	vibracore	1x3L						
			vibracore							
			vibracore							

Note that testing will be delayed if an incomplete chain of custody is received

- Additional treatment of samples (i.e. spiking)
- Sub-contracted services (i.e. chemical analyses)
- Dilutions required (if different than 100% down to 6.25%)
- Sample holding time restriction (if applicable)
- Sample used for litigation (if applicable)

Note: An MSDS must be attached if Available

ESA Project Number: PR 2130

1) Released By:	Date:	2) Received By:	Date:	3) Released By:	Date:	4) Received By:	Date:
SARAH Eccleshall	25/11/22		25/11/22				
Of: GHD	Time: 15:30	Of: ESA	Time: 1520	Of:	Time:	Of:	Time:

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

Statistical Printouts for the Sea Urchin Fertilisation Test

Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	14/12/2022 15:10	Test ID:	PR2130/02	Sample ID:	VC101 0.0-0.5
End Date:	14/12/2022 16:30	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9300	0.9100	0.8900	0.9200
Diluent Control	0.9300	0.9100	0.8900	0.9300
6.3	0.9100	0.9000	0.8900	0.9200
12.5	0.9100	0.9000	0.9300	0.9700
25	0.9500	0.9100	0.9400	0.9000
50	0.9300	0.9200	0.9100	0.9300
100	0.9000	0.9400	0.9000	0.9000

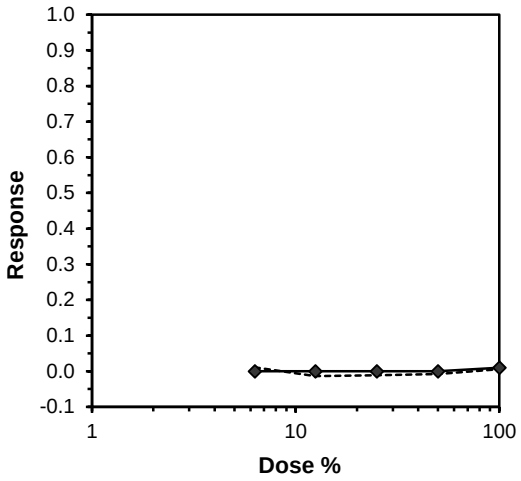
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9125	0.9973	1.2715	1.2327	1.3030	2.352	4					
Diluent Control	0.9150	1.0000	1.2762	1.2327	1.3030	2.650	4	*			0.9190	1.0000
6.3	0.9050	0.9891	1.2580	1.2327	1.2840	1.755	4	0.640	2.410	0.0688	0.9190	1.0000
12.5	0.9275	1.0137	1.3037	1.2490	1.3967	5.059	4	-0.964	2.410	0.0688	0.9190	1.0000
25	0.9250	1.0109	1.2959	1.2490	1.3453	3.529	4	-0.691	2.410	0.0688	0.9190	1.0000
50	0.9225	1.0082	1.2891	1.2661	1.3030	1.375	4	-0.450	2.410	0.0688	0.9190	1.0000
100	0.9100	0.9945	1.2676	1.2490	1.3233	2.930	4	0.302	2.410	0.0688	0.9100	0.9902

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.957649	0.916	0.732191	0.519709
Bartlett's Test indicates equal variances (p = 0.34)	5.67133	15.08627		
The control means are not significantly different (p = 0.84)	0.210341	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Control	100	>100		1	0.042008	0.045875	0.001226	0.001628	0.594568	5, 18

Log-Logit Interpolation (200 Resamples)

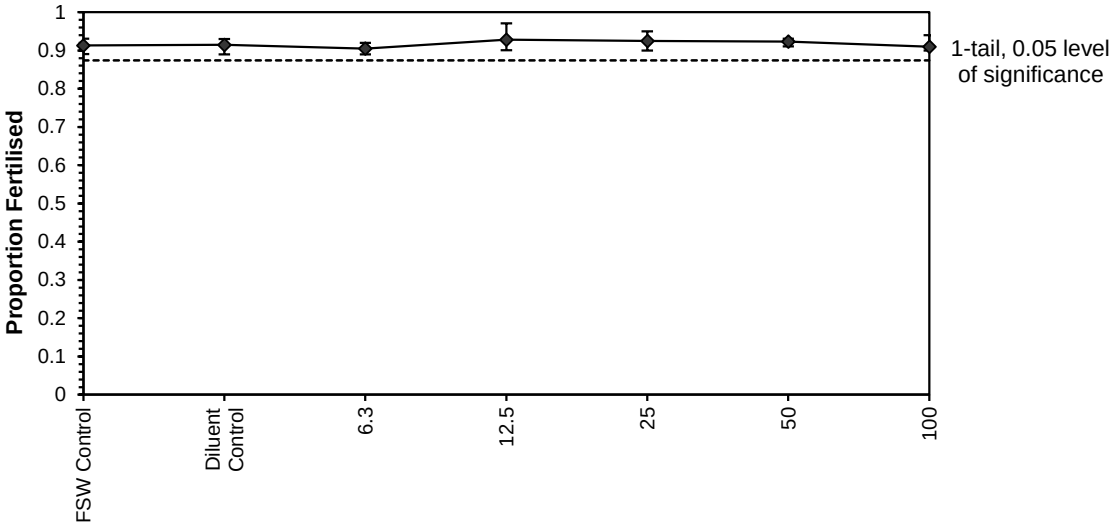
Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	14/12/2022 15:10	Test ID:	PR2130/02	Sample ID:	VC101 0.0-0.5
End Date:	14/12/2022 16:30	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Dose-Response Plot



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	14/12/2022 15:10	Test ID:	PR2130/02	Sample ID:	VC101 0.0-0.5
End Date:	14/12/2022 16:30	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Fertilised	91.25	89.00	93.00	1.71	1.43	4
Diluent Control		91.50	89.00	93.00	1.91	1.51	4
6.3		90.50	89.00	92.00	1.29	1.26	4
12.5		92.75	90.00	97.00	3.10	1.90	4
25		92.50	90.00	95.00	2.38	1.67	4
50		92.25	91.00	93.00	0.96	1.06	4
100		91.00	90.00	94.00	2.00	1.55	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	34.50	34.50	34.50	0.00	0.00	1
Diluent Control		35.40	35.40	35.40	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.30	35.30	35.30	0.00	0.00	1
25		35.20	35.20	35.20	0.00	0.00	1
50		35.10	35.10	35.10	0.00	0.00	1
100		35.00	35.00	35.00	0.00	0.00	1
FSW Control	DO %	99.20	99.20	99.20	0.00	0.00	1
Diluent Control		102.00	102.00	102.00	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.30	35.30	35.30	0.00	0.00	1
25		35.20	35.20	35.20	0.00	0.00	1
50		35.10	35.10	35.10	0.00	0.00	1
100		35.00	35.00	35.00	0.00	0.00	1

Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/03	Sample ID:	VC 107 2.5-3.0
End Date:	11/01/2023 20:30	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9100	0.9000	0.8900	0.9100
Diluent Control	0.9000	0.9100	0.8900	0.9300
6.3	0.9300	0.9100	0.8900	0.9000
12.5	0.8900	0.9200	0.9000	0.9500
25	0.9200	0.9100	0.9300	0.9000
50	0.9100	0.9500	0.9300	0.9200
100	0.9100	0.9200	0.9000	0.8900

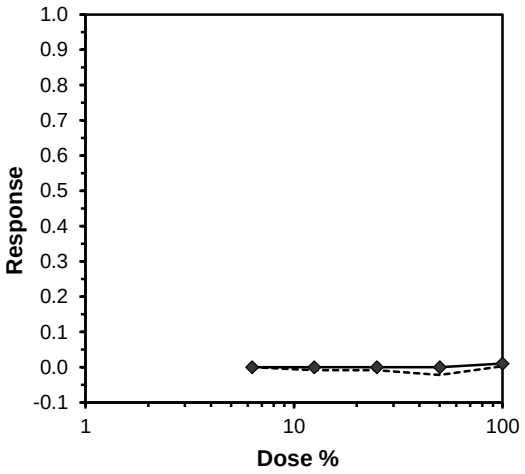
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9025	0.9945	1.2535	1.2327	1.2661	1.277	4					
Diluent Control	0.9075	1.0000	1.2627	1.2327	1.3030	2.386	4	*			0.9145	1.0000
6.3	0.9075	1.0000	1.2627	1.2327	1.3030	2.386	4	0.000	2.410	0.0560	0.9145	1.0000
12.5	0.9150	1.0083	1.2778	1.2327	1.3453	3.900	4	-0.647	2.410	0.0560	0.9145	1.0000
25	0.9150	1.0083	1.2756	1.2490	1.3030	1.821	4	-0.552	2.410	0.0560	0.9145	1.0000
50	0.9275	1.0220	1.2996	1.2661	1.3453	2.614	4	-1.587	2.410	0.0560	0.9145	1.0000
100	0.9050	0.9972	1.2580	1.2327	1.2840	1.755	4	0.204	2.410	0.0560	0.9050	0.9896

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.948465	0.916	0.621274	-0.26108
Bartlett's Test indicates equal variances (p = 0.78)	2.491023	15.08627		
The control means are not significantly different (p = 0.61)	0.541224	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Control	100	>100		1	0.034854	0.038383	0.000939	0.00108	0.520574	5, 18

Log-Logit Interpolation (200 Resamples)

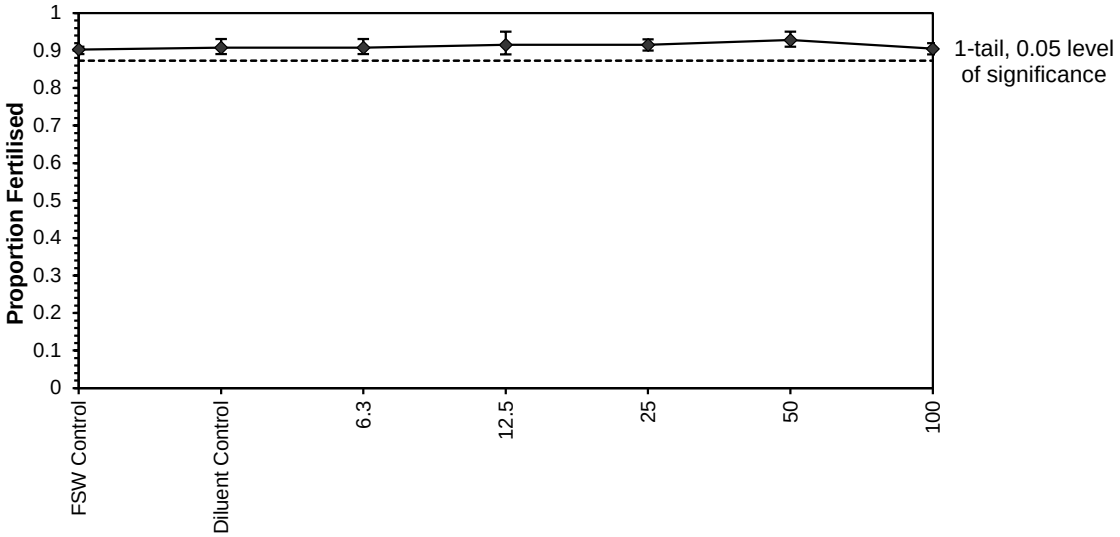
Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/03	Sample ID:	VC 107 2.5-3.0
End Date:	11/01/2023 20:30	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Dose-Response Plot



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/03	Sample ID:	VC 107 2.5-3.0
End Date:	11/01/2023 20:30	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Fertilised	90.25	89.00	91.00	0.96	1.08	4
Diluent Control		90.75	89.00	93.00	1.71	1.44	4
6.3		90.75	89.00	93.00	1.71	1.44	4
12.5		91.50	89.00	95.00	2.65	1.78	4
25		91.50	90.00	93.00	1.29	1.24	4
50		92.75	91.00	95.00	1.71	1.41	4
100		90.50	89.00	92.00	1.29	1.26	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	34.50	34.50	34.50	0.00	0.00	1
Diluent Control		35.40	35.40	35.40	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	99.60	99.60	99.60	0.00	0.00	1
Diluent Control		103.00	103.00	103.00	0.00	0.00	1
6.3		98.60	98.60	98.60	0.00	0.00	1
12.5		95.90	95.90	95.90	0.00	0.00	1
25		91.30	91.30	91.30	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/04	Sample ID:	VC 104 0.0-0.5
End Date:	11/01/2023 20:30	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9100	0.9000	0.8900	0.9100
Diluent Control	0.9000	0.9100	0.8900	0.9300
6.3	0.9200	0.9100	0.9000	0.9300
12.5	0.9500	0.9200	0.9100	0.9300
25	0.9500	0.9100	0.8900	0.9000
50	0.9100	0.9300	0.9000	0.8900
100	0.9100	0.9400	0.9000	0.8600

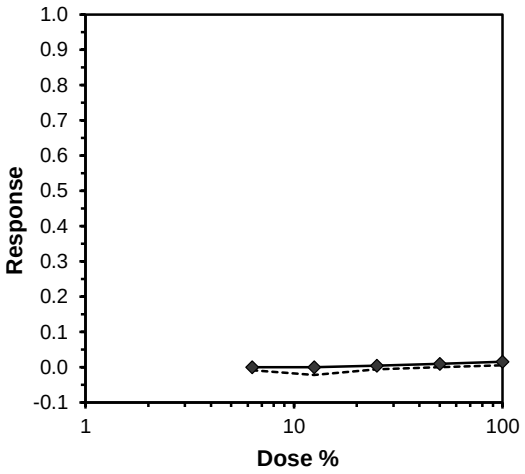
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9025	0.9945	1.2535	1.2327	1.2661	1.277	4					
Diluent Control	0.9075	1.0000	1.2627	1.2327	1.3030	2.386	4	*			0.9167	1.0000
6.3	0.9150	1.0083	1.2756	1.2490	1.3030	1.821	4	-0.465	2.410	0.0665	0.9167	1.0000
12.5	0.9275	1.0220	1.2996	1.2661	1.3453	2.614	4	-1.337	2.410	0.0665	0.9167	1.0000
25	0.9125	1.0055	1.2733	1.2327	1.3453	3.918	4	-0.383	2.410	0.0665	0.9125	0.9955
50	0.9075	1.0000	1.2627	1.2327	1.3030	2.386	4	0.000	2.410	0.0665	0.9075	0.9900
100	0.9025	0.9945	1.2564	1.1873	1.3233	4.456	4	0.228	2.410	0.0665	0.9025	0.9845

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.959395	0.916	0.448276	0.007563
Bartlett's Test indicates equal variances (p = 0.70)	3.009821	15.08627		
The control means are not significantly different (p = 0.61)	0.541224	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Control	100	>100		1	0.04191	0.046153	0.000952	0.001522	0.682391	5, 18

Log-Logit Interpolation (200 Resamples)

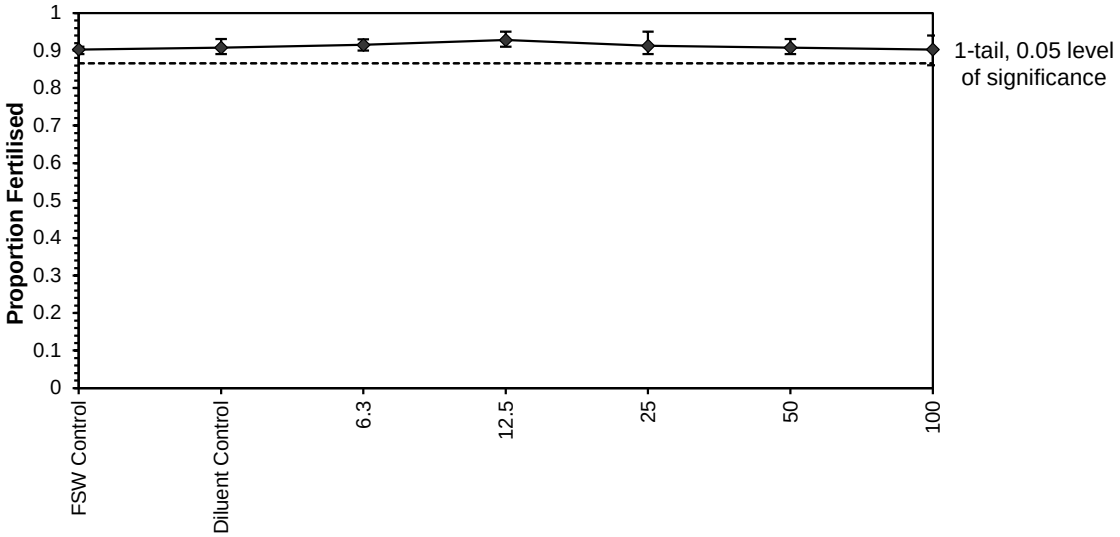
Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/04	Sample ID:	VC 104 0.0-0.5
End Date:	11/01/2023 20:30	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Dose-Response Plot



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/04	Sample ID:	VC 104 0.0-0.5
End Date:	11/01/2023 20:30	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Fertilised	90.25	89.00	91.00	0.96	1.08	4
Diluent Control		90.75	89.00	93.00	1.71	1.44	4
6.3		91.50	90.00	93.00	1.29	1.24	4
12.5		92.75	91.00	95.00	1.71	1.41	4
25		91.25	89.00	95.00	2.63	1.78	4
50		90.75	89.00	93.00	1.71	1.44	4
100		90.25	86.00	94.00	3.30	2.01	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	34.50	34.50	34.50	0.00	0.00	1
Diluent Control		35.40	35.40	35.40	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.40	35.40	35.40	0.00	0.00	1
FSW Control	DO %	99.60	99.60	99.60	0.00	0.00	1
Diluent Control		103.00	103.00	103.00	0.00	0.00	1
6.3		98.30	98.30	98.30	0.00	0.00	1
12.5		95.60	95.60	95.60	0.00	0.00	1
25		93.90	93.90	93.90	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/05	Sample ID:	QA1
End Date:	11/01/2023 20:30	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9100	0.9000	0.8900	0.9100
Diluent Control	0.9000	0.9100	0.8900	0.9300
6.3	0.9300	0.9100	0.9000	0.9200
12.5	0.9500	0.9100	0.9000	0.9300
25	0.9200	0.9100	0.9000	0.9400
50	0.9100	0.9000	0.9300	0.9000
100	0.8900	0.9200	0.9000	0.9100

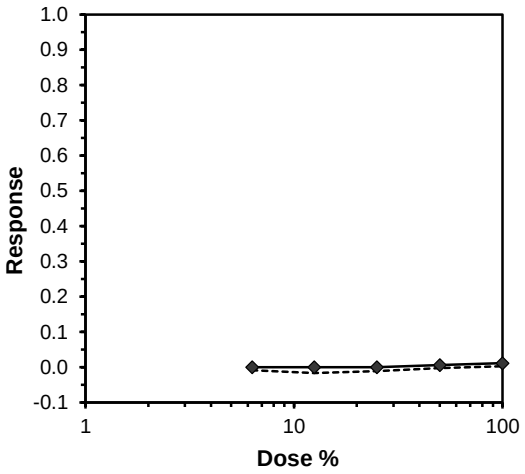
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9025	0.9945	1.2535	1.2327	1.2661	1.277	4					
Diluent Control	0.9075	1.0000	1.2627	1.2327	1.3030	2.386	4	*			0.9156	1.0000
6.3	0.9150	1.0083	1.2756	1.2490	1.3030	1.821	4	-0.604	2.410	0.0512	0.9156	1.0000
12.5	0.9225	1.0165	1.2909	1.2490	1.3453	3.308	4	-1.324	2.410	0.0512	0.9156	1.0000
25	0.9175	1.0110	1.2806	1.2490	1.3233	2.487	4	-0.842	2.410	0.0512	0.9156	1.0000
50	0.9100	1.0028	1.2668	1.2490	1.3030	2.009	4	-0.192	2.410	0.0512	0.9100	0.9939
100	0.9050	0.9972	1.2580	1.2327	1.2840	1.755	4	0.223	2.410	0.0512	0.9050	0.9884

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.951121	0.916	0.4882	-0.73025
Bartlett's Test indicates equal variances (p = 0.89)	1.704946	15.08627		
The control means are not significantly different (p = 0.61)	0.541224	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Control	100	>100		1	0.031689	0.034897	0.000601	0.000903	0.654477	5, 18

Log-Logit Interpolation (200 Resamples)

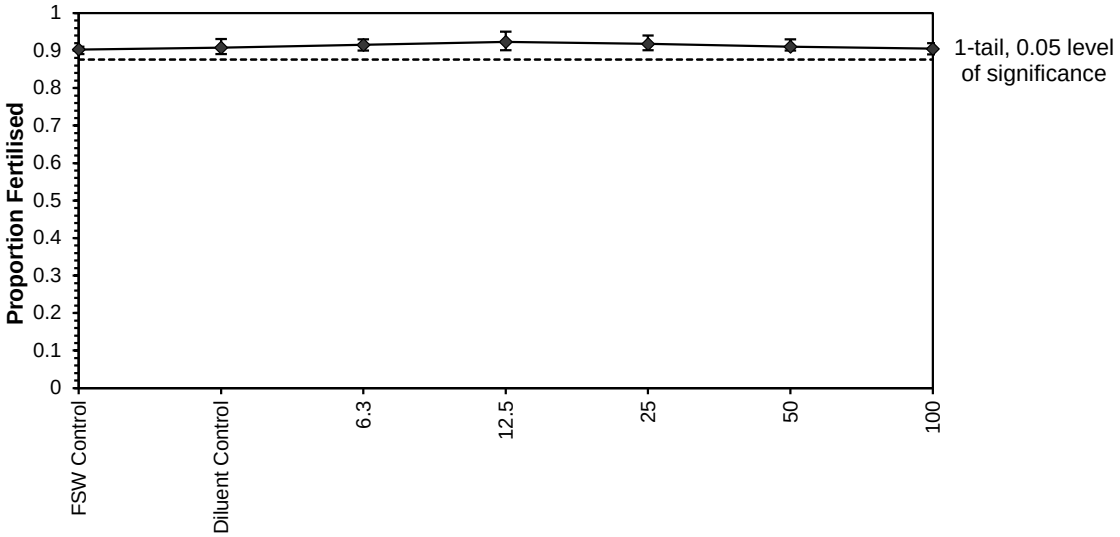
Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/05	Sample ID:	QA1
End Date:	11/01/2023 20:30	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Dose-Response Plot



Sea Urchin Fertilisation Test-Proportion Fertilised

Start Date:	11/01/2023 19:10	Test ID:	PR2130/05	Sample ID:	QA1
End Date:	11/01/2023 20:30	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Fertilised	90.25	89.00	91.00	0.96	1.08	4
Diluent Control		90.75	89.00	93.00	1.71	1.44	4
6.3		91.50	90.00	93.00	1.29	1.24	4
12.5		92.25	90.00	95.00	2.22	1.61	4
25		91.75	90.00	94.00	1.71	1.42	4
50		91.00	90.00	93.00	1.41	1.31	4
100		90.50	89.00	92.00	1.29	1.26	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	34.50	34.50	34.50	0.00	0.00	1
Diluent Control		35.40	35.40	35.40	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.40	35.40	35.40	0.00	0.00	1
25		35.40	35.40	35.40	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	99.60	99.60	99.60	0.00	0.00	1
Diluent Control		103.00	103.00	103.00	0.00	0.00	1
6.3		98.90	98.90	98.90	0.00	0.00	1
12.5		100.20	100.20	100.20	0.00	0.00	1
25		99.60	99.60	99.60	0.00	0.00	1
50		95.90	95.90	95.90	0.00	0.00	1
100		92.30	92.30	92.30	0.00	0.00	1

Statistical Printouts for the Sea Urchin Larval Development Test

Sea Urchin Larval Development Test-Proportion Normal

Start Date:	14/12/2022 16:00	Test ID:	PR2130/02	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 16:00	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	HT-Heliocidaris tuberculata
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9600	0.9500	0.9800	0.9700
Diluent Control	0.9500	0.9900	0.9300	0.9500
6.3	0.9800	0.9500	0.9600	0.9900
12.5	0.9500	0.9300	0.9600	0.9800
25	0.9500	0.9400	0.9700	0.9300
50	0.9500	0.9700	0.9900	0.9300
100	0.7600	0.8100	0.8400	0.8000

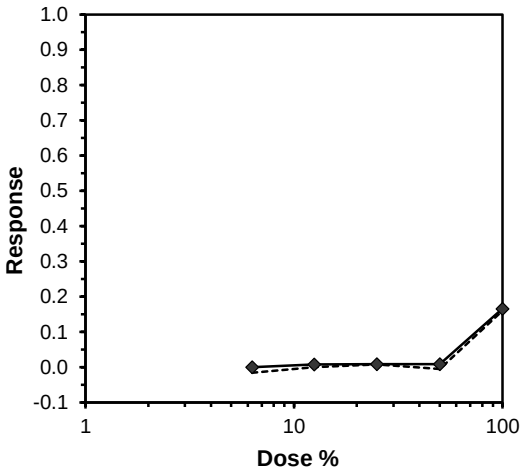
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9650	1.0105	1.3851	1.3453	1.4289	2.598	4					
Diluent Control	0.9550	1.0000	1.3661	1.3030	1.4706	5.308	4	*			0.9625	1.0000
6.3	0.9700	1.0157	1.4036	1.3453	1.4706	4.051	4	-0.923	2.410	0.0979	0.9625	1.0000
12.5	0.9550	1.0000	1.3617	1.3030	1.4289	3.860	4	0.108	2.410	0.0979	0.9550	0.9922
25	0.9475	0.9921	1.3421	1.3030	1.3967	3.002	4	0.590	2.410	0.0979	0.9538	0.9909
50	0.9600	1.0052	1.3789	1.3030	1.4706	5.232	4	-0.317	2.410	0.0979	0.9538	0.9909
*100	0.8025	0.8403	1.1113	1.0588	1.1593	3.727	4	6.273	2.410	0.0979	0.8025	0.8338

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.951358	0.916	0.513321	-0.63113
Bartlett's Test indicates equal variances (p = 0.89)	1.698639	15.08627		
The control means are not significantly different (p = 0.65)	0.470133	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Control	50	100	70.71068	2	0.047486	0.049533	0.046446	0.0033	1.1E-05	5, 18

Log-Logit Interpolation (200 Resamples)

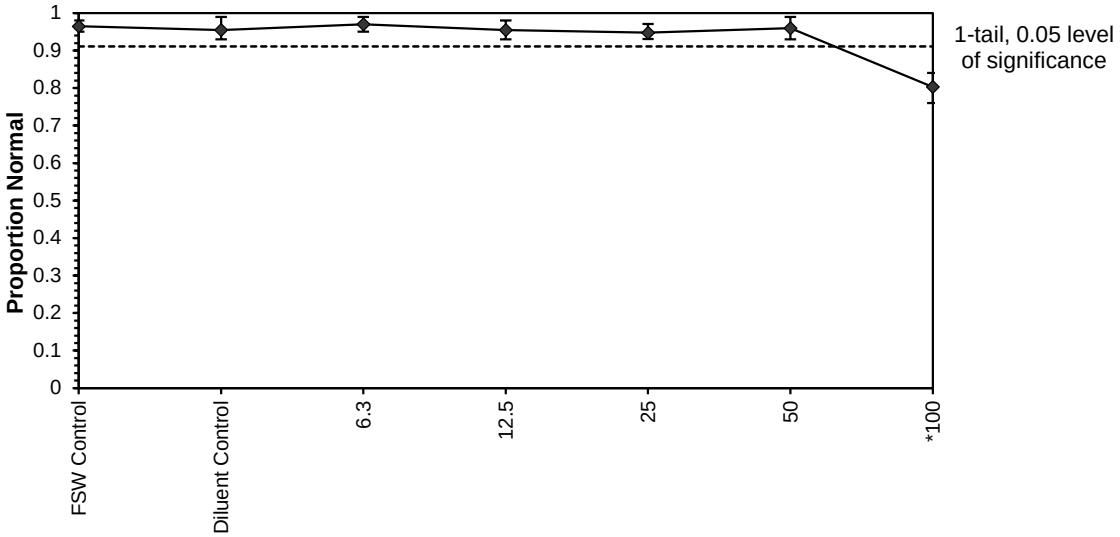
Point	%	SD	95% CL(Exp)		Skew
IC05	66.266	3.483	51.710	73.113	-0.6371
IC10	82.014	3.249	70.472	90.695	-0.0509
IC15	95.770				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	14/12/2022 16:00	Test ID:	PR2130/02	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 16:00	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	HT-Heliocidaris tuberculata
Comments:					

Dose-Response Plot



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	14/12/2022 16:00	Test ID:	PR2130/02	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 16:00	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 104	Test Species:	HT-Heliocidaris tuberculata
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	96.50	95.00	98.00	1.29	1.18	4
Diluent Control		95.50	93.00	99.00	2.52	1.66	4
6.3		97.00	95.00	99.00	1.83	1.39	4
12.5		95.50	93.00	98.00	2.08	1.51	4
25		94.75	93.00	97.00	1.71	1.38	4
50		96.00	93.00	99.00	2.58	1.67	4
100		80.25	76.00	84.00	3.30	2.27	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	34.60	34.60	34.60	0.00	0.00	1
Diluent Control		35.40	35.40	35.40	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.30	35.30	35.30	0.00	0.00	1
25		35.20	35.20	35.20	0.00	0.00	1
50		35.10	35.10	35.10	0.00	0.00	1
100		35.00	35.00	35.00	0.00	0.00	1
FSW Control	DO %	100.40	100.40	100.40	0.00	0.00	1
Diluent Control		102.00	102.00	102.00	0.00	0.00	1
6.3		99.80	99.80	99.80	0.00	0.00	1
12.5		99.60	99.60	99.60	0.00	0.00	1
25		99.10	99.10	99.10	0.00	0.00	1
50		98.20	98.20	98.20	0.00	0.00	1
100		93.00	93.00	93.00	0.00	0.00	1

Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/16	Sample ID:	VC 107 2.5-3.0
End Date:	14/01/2023 19:30	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9800	0.9600	0.9500	0.9400
Diluent Contol	0.9700	0.9500	0.9600	0.9300
6.3	0.9800	0.9600	0.9400	0.9300
12.5	0.9100	0.9600	0.9800	0.9900
25	0.9500	0.9900	0.9800	0.9600
50	0.9500	0.9200	0.9500	0.9000
100	0.8100	0.8400	0.8000	0.8800

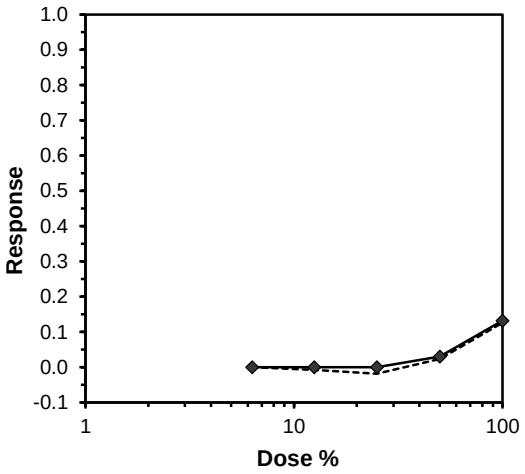
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9575	1.0052	1.3667	1.3233	1.4289	3.330	4					
Diluent Contol	0.9525	1.0000	1.3536	1.3030	1.3967	2.935	4	*			0.9588	1.0000
6.3	0.9525	1.0000	1.3562	1.3030	1.4289	4.120	4	-0.062	2.410	0.0997	0.9588	1.0000
12.5	0.9600	1.0079	1.3838	1.2661	1.4706	6.414	4	-0.729	2.410	0.0997	0.9588	1.0000
25	0.9700	1.0184	1.4036	1.3453	1.4706	4.051	4	-1.208	2.410	0.0997	0.9588	1.0000
50	0.9300	0.9764	1.3059	1.2490	1.3453	3.649	4	1.153	2.410	0.0997	0.9300	0.9700
*100	0.8325	0.8740	1.1508	1.1071	1.2171	4.295	4	4.904	2.410	0.0997	0.8325	0.8683

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.966098	0.916	-0.18599	-0.49798
Bartlett's Test indicates equal variances (p = 0.82)	2.213271	15.08627		
The control means are not significantly different (p = 0.68)	0.434311	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	50	100	70.71068	2	0.050651	0.053117	0.033696	0.003421	1.2E-04	5, 18

Log-Logit Interpolation (200 Resamples)

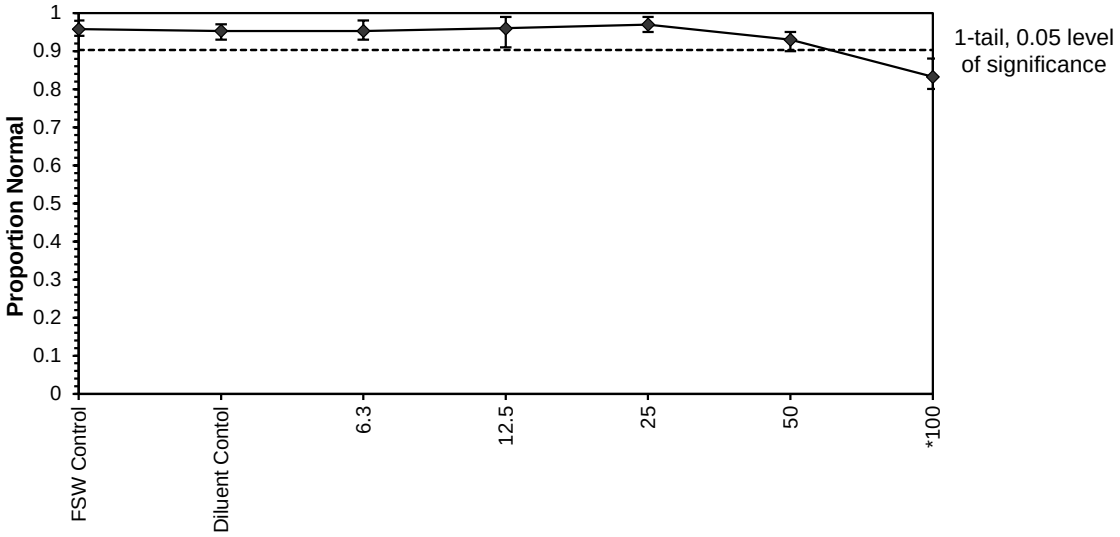
Point	%	SD	95% CL(Exp)		Skew
IC05	60.231	5.962	40.448	76.628	-0.1530
IC10	84.727				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/16	Sample ID:	VC 107 2.5-3.0
End Date:	14/01/2023 19:30	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Dose-Response Plot



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/16	Sample ID:	VC 107 2.5-3.0
End Date:	14/01/2023 19:30	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

		Auxiliary Data Summary					
Conc-%	**Parameter**	**Mean**	**Min**	**Max**	**SD**	**CV%**	**N**
FSW Control	% Normal	95.75	94.00	98.00	1.71	1.36	4
Diluent Contol		95.25	93.00	97.00	1.71	1.37	4
6.3		95.25	93.00	98.00	2.22	1.56	4
12.5		96.00	91.00	99.00	3.56	1.97	4
25		97.00	95.00	99.00	1.83	1.39	4
50		93.00	90.00	95.00	2.45	1.68	4
100		83.25	80.00	88.00	3.59	2.28	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.60	98.60	98.60	0.00	0.00	1
12.5		95.90	95.90	95.90	0.00	0.00	1
25		91.30	91.30	91.30	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/17	Sample ID:	VC 104 0.0-0.5
End Date:	14/01/2023 19:30	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9800	0.9600	0.9500	0.9400
Diluent Contol	0.9700	0.9500	0.9600	0.9300
6.3	0.9400	0.9400	0.9600	0.9500
12.5	0.9300	0.9800	0.9600	0.9800
25	0.9500	0.9900	0.9800	0.9600
50	0.9500	0.9400	0.9500	0.9600
100	0.8900	0.9100	0.9000	0.8800

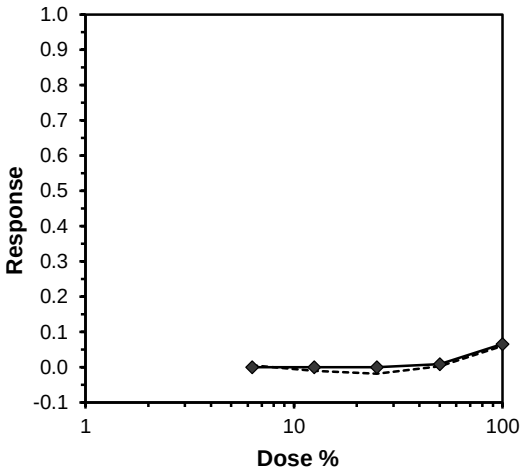
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9575	1.0052	1.3667	1.3233	1.4289	3.330	4					
Diluent Contol	0.9525	1.0000	1.3536	1.3030	1.3967	2.935	4	*			0.9581	1.0000
6.3	0.9475	0.9948	1.3403	1.3233	1.3694	1.640	4	0.467	2.410	0.0685	0.9581	1.0000
12.5	0.9625	1.0105	1.3826	1.3030	1.4289	4.338	4	-1.019	2.410	0.0685	0.9581	1.0000
25	0.9700	1.0184	1.4036	1.3453	1.4706	4.051	4	-1.757	2.410	0.0685	0.9581	1.0000
50	0.9500	0.9974	1.3458	1.3233	1.3694	1.399	4	0.274	2.410	0.0685	0.9500	0.9915
*100	0.8950	0.9396	1.2412	1.2171	1.2661	1.700	4	3.954	2.410	0.0685	0.8950	0.9341

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.984925	0.916	-0.26849	-0.07752
Bartlett's Test indicates equal variances (p = 0.24)	6.744455	15.08627		
The control means are not significantly different (p = 0.68)	0.434311	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	50	100	70.71068	2	0.032983	0.034589	0.012563	0.001615	4.7E-04	5, 18

Log-Logit Interpolation (200 Resamples)

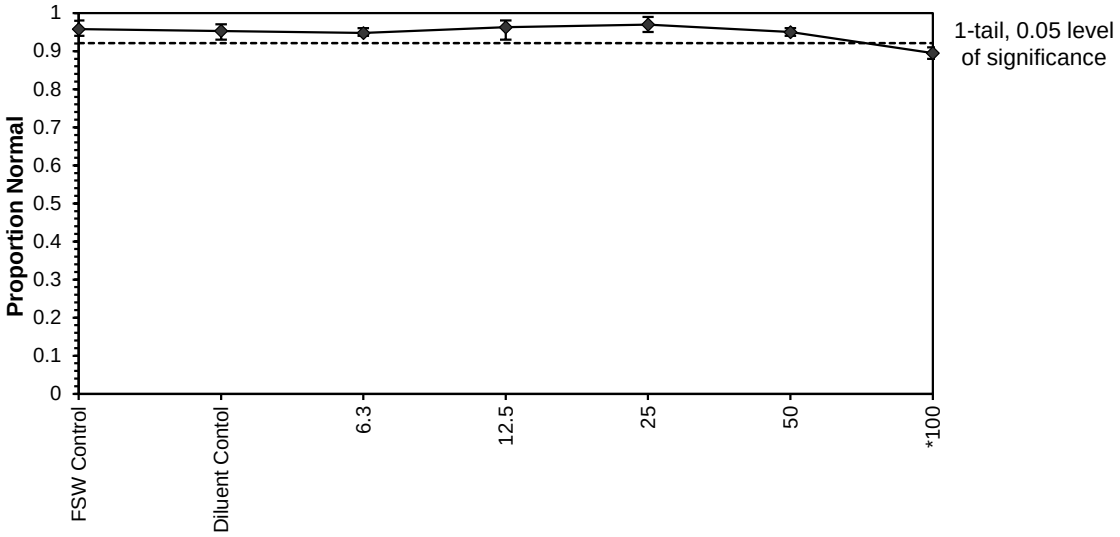
Point	%	SD	95% CL(Exp)	Skew
IC05	86.118			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/17	Sample ID:	VC 104 0.0-0.5
End Date:	14/01/2023 19:30	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Dose-Response Plot



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/17	Sample ID:	VC 104 0.0-0.5
End Date:	14/01/2023 19:30	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	95.75	94.00	98.00	1.71	1.36	4
Diluent Contol		95.25	93.00	97.00	1.71	1.37	4
6.3		94.75	94.00	96.00	0.96	1.03	4
12.5		96.25	93.00	98.00	2.36	1.60	4
25		97.00	95.00	99.00	1.83	1.39	4
50		95.00	94.00	96.00	0.82	0.95	4
100		89.50	88.00	91.00	1.29	1.27	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.40	35.40	35.40	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.30	98.30	98.30	0.00	0.00	1
12.5		95.60	95.60	95.60	0.00	0.00	1
25		93.90	93.90	93.90	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/18	Sample ID:	QA 1
End Date:	14/01/2023 19:30	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Conc-%	1	2	3	4
FSW Control	0.9800	0.9600	0.9500	0.9400
Diluent Contol	0.9700	0.9500	0.9600	0.9300
6.3	0.9500	0.9800	0.9300	0.9800
12.5	0.9600	0.9500	0.9500	0.9900
25	0.9600	0.9500	0.9800	0.9500
50	0.9600	0.9300	0.9500	0.9100
100	0.8600	0.8500	0.8000	0.8900

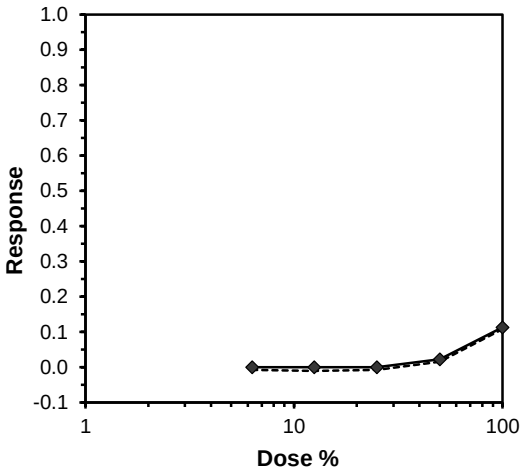
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.9575	1.0052	1.3667	1.3233	1.4289	3.330	4					
Diluent Contol	0.9525	1.0000	1.3536	1.3030	1.3967	2.935	4	*			0.9588	1.0000
6.3	0.9600	1.0079	1.3765	1.3030	1.4289	4.568	4	-0.639	2.410	0.0865	0.9588	1.0000
12.5	0.9625	1.0105	1.3827	1.3453	1.4706	4.321	4	-0.809	2.410	0.0865	0.9588	1.0000
25	0.9600	1.0079	1.3722	1.3453	1.4289	2.876	4	-0.519	2.410	0.0865	0.9588	1.0000
50	0.9375	0.9843	1.3210	1.2661	1.3694	3.461	4	0.910	2.410	0.0865	0.9375	0.9778
*100	0.8500	0.8924	1.1751	1.1071	1.2327	4.420	4	4.976	2.410	0.0865	0.8500	0.8866

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.959788	0.916	0.193166	-0.96175
Bartlett's Test indicates equal variances (p = 0.96)	1.05628	15.08627		
The control means are not significantly different (p = 0.68)	0.434311	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.71068	2	0.042972	0.045065	0.025091	0.002575	1.2E-04	5, 18
Treatments vs Diluent Contol										

Log-Logit Interpolation (200 Resamples)

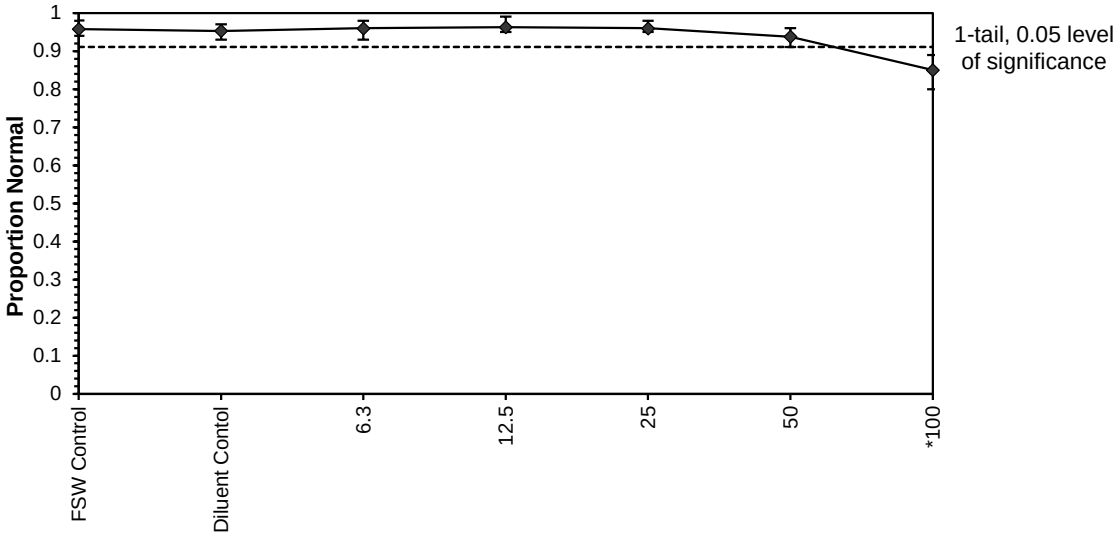
Point	%	SD	95% CL(Exp)		Skew
IC05	65.799	5.979	47.632	84.461	0.0316
IC10	92.838				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/18	Sample ID:	QA 1
End Date:	14/01/2023 19:30	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Dose-Response Plot



Sea Urchin Larval Development Test-Proportion Normal

Start Date:	11/01/2023 19:30	Test ID:	PR2130/18	Sample ID:	QA 1
End Date:	14/01/2023 19:30	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 105	Test Species:	-HELIOCIDARIS TUBERCULATA
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	95.75	94.00	98.00	1.71	1.36	4
Diluent Contol		95.25	93.00	97.00	1.71	1.37	4
6.3		96.00	93.00	98.00	2.45	1.63	4
12.5		96.25	95.00	99.00	1.89	1.43	4
25		96.00	95.00	98.00	1.41	1.24	4
50		93.75	91.00	96.00	2.22	1.59	4
100		85.00	80.00	89.00	3.74	2.28	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.40	35.40	35.40	0.00	0.00	1
25		35.40	35.40	35.40	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.90	98.90	98.90	0.00	0.00	1
12.5		100.20	100.20	100.20	0.00	0.00	1
25		99.60	99.60	99.60	0.00	0.00	1
50		95.90	95.90	95.90	0.00	0.00	1
100		92.30	92.30	92.30	0.00	0.00	1

Statistical Printouts for the Mussel Toxicity Tests

Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	14/12/2022 17:00	Test ID:	PR2130/12	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 17:00	Lab ID:	10754	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Conc-%	1	2	3	4
FSW Control	0.6900	0.7400	0.7600	0.7400
Diluent Contol	0.7300	0.8100	0.7000	0.7300
6.3	0.6800	0.7400	0.7300	0.7600
12.5	0.8000	0.7100	0.7400	0.6900
25	0.8000	0.7300	0.8200	0.7600
50	0.7000	0.6800	0.7100	0.7300
100	0.6800	0.7000	0.6500	0.6900

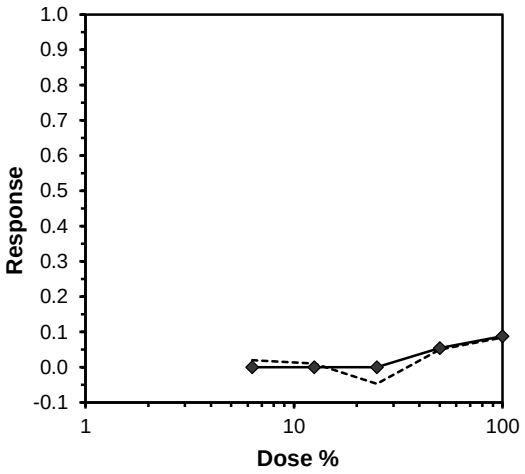
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.7325	0.9865	1.0276	0.9803	1.0588	3.249	4					
Diluent Contol	0.7425	1.0000	1.0399	0.9912	1.1198	5.335	4	*			0.7456	1.0000
6.3	0.7275	0.9798	1.0221	0.9695	1.0588	3.705	4	0.589	2.410	0.0729	0.7456	1.0000
12.5	0.7350	0.9899	1.0313	0.9803	1.1071	5.377	4	0.284	2.410	0.0729	0.7456	1.0000
25	0.7775	1.0471	1.0808	1.0244	1.1326	4.484	4	-1.349	2.410	0.0729	0.7456	1.0000
50	0.7050	0.9495	0.9968	0.9695	1.0244	2.291	4	1.425	2.410	0.0729	0.7050	0.9455
100	0.6800	0.9158	0.9697	0.9377	0.9912	2.377	4	2.321	2.410	0.0729	0.6800	0.9120

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.959292	0.916	0.452755	-0.22204
Bartlett's Test indicates equal variances (p = 0.57)	3.855961	15.08627		
The control means are not significantly different (p = 0.72)	0.37947	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	100	>100		1	0.066048	0.088812	0.005776	0.001832	0.032269	5, 18

Log-Logit Interpolation (200 Resamples)

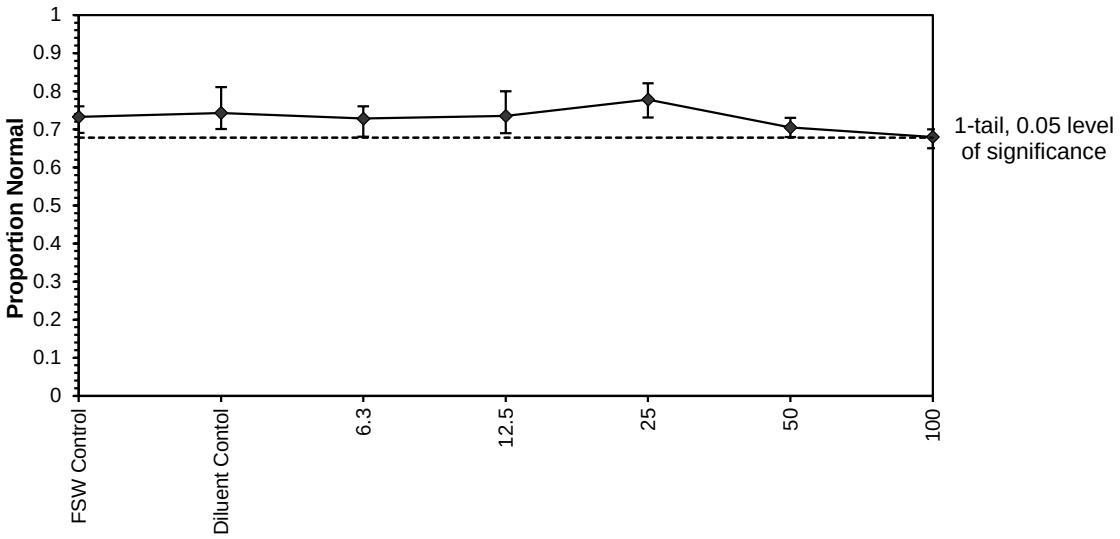
Point	%	SD	95% CL(Exp)	Skew
IC05	47.357			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	14/12/2022 17:00	Test ID:	PR2130/12	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 17:00	Lab ID:	10754	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Dose-Response Plot



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	14/12/2022 17:00	Test ID:	PR2130/12	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 17:00	Lab ID:	10754	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	73.25	69.00	76.00	2.99	2.36	4
Diluent Contol		74.25	70.00	81.00	4.72	2.93	4
6.3		72.75	68.00	76.00	3.40	2.54	4
12.5		73.50	69.00	80.00	4.80	2.98	4
25		77.75	73.00	82.00	4.03	2.58	4
50		70.50	68.00	73.00	2.08	2.05	4
100		68.00	65.00	70.00	2.16	2.16	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	34.60	34.60	34.60	0.00	0.00	1
Diluent Contol		35.40	35.40	35.40	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.30	35.30	35.30	0.00	0.00	1
25		35.20	35.20	35.20	0.00	0.00	1
50		35.10	35.10	35.10	0.00	0.00	1
100		35.00	35.00	35.00	0.00	0.00	1
FSW Control	DO %	100.40	100.40	100.40	0.00	0.00	1
Diluent Contol		102.00	102.00	102.00	0.00	0.00	1
6.3		99.80	99.80	99.80	0.00	0.00	1
12.5		99.60	99.60	99.60	0.00	0.00	1
25		99.10	99.10	99.10	0.00	0.00	1
50		98.20	98.20	98.20	0.00	0.00	1
100		93.00	93.00	93.00	0.00	0.00	1

Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/20	Sample ID:	VC 107 2.5-3.0
End Date:	14/01/2023 20:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Conc-ug/L	1	2	3	4
FSW Control	0.7100	0.7300	0.6800	0.6900
Diluent Contol	0.7100	0.7500	0.6800	0.6900
6.3	0.7600	0.6800	0.7100	0.7400
12.5	0.6800	0.7300	0.7100	0.7200
25	0.7100	0.7000	0.7600	0.7200
50	0.7100	0.6800	0.7400	0.6900
100	0.6500	0.6400	0.6900	0.6800

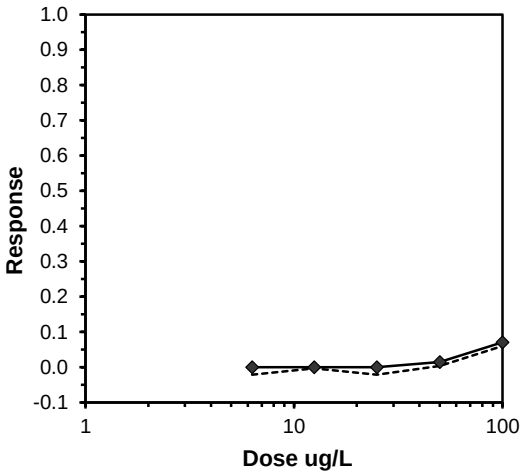
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-ug/L	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.7025	0.9929	0.9941	0.9695	1.0244	2.448	4					
Diluent Contol	0.7075	1.0000	0.9998	0.9695	1.0472	3.440	4	*			0.7156	1.0000
6.3	0.7225	1.0212	1.0166	0.9695	1.0588	3.841	4	-0.773	2.410	0.0523	0.7156	1.0000
12.5	0.7100	1.0035	1.0023	0.9695	1.0244	2.361	4	-0.116	2.410	0.0523	0.7156	1.0000
25	0.7225	1.0212	1.0163	0.9912	1.0588	2.925	4	-0.763	2.410	0.0523	0.7156	1.0000
50	0.7050	0.9965	0.9969	0.9695	1.0357	2.930	4	0.132	2.410	0.0523	0.7050	0.9852
100	0.6650	0.9399	0.9537	0.9273	0.9803	2.646	4	2.125	2.410	0.0523	0.6650	0.9293

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.951761	0.916	0.274604	-0.99174
Bartlett's Test indicates equal variances (p = 0.97)	0.939413	15.08627		
The control means are not significantly different (p = 0.80)	0.270614	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100			0.04857	0.068613	0.00213	0.00094	0.09177	5, 18
Treatments vs Diluent Contol										

Log-Logit Interpolation (200 Resamples)

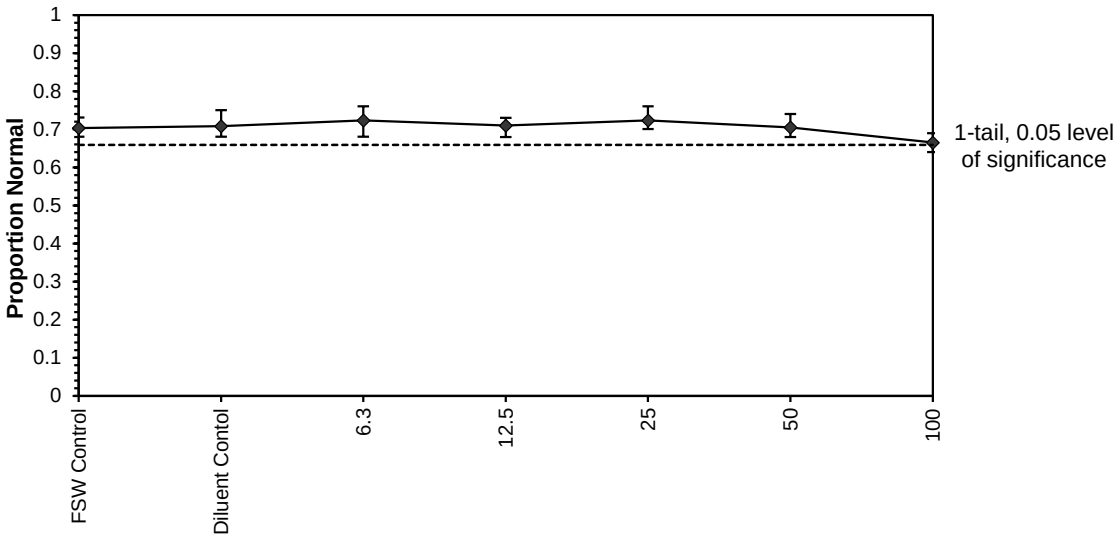
Point	ug/L	SD	95% CL(Exp)	Skew
IC05	77.803			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/20	Sample ID:	VC 107 2.5-3.0
End Date:	14/01/2023 20:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Dose-Response Plot



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/20	Sample ID:	VC 107 2.5-3.0
End Date:	14/01/2023 20:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Auxiliary Data Summary

Conc-ug/L	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	70.25	68.00	73.00	2.22	2.12	4
Diluent Contol		70.75	68.00	75.00	3.10	2.49	4
6.3		72.25	68.00	76.00	3.50	2.59	4
12.5		71.00	68.00	73.00	2.16	2.07	4
25		72.25	70.00	76.00	2.63	2.24	4
50		70.50	68.00	74.00	2.65	2.31	4
100		66.50	64.00	69.00	2.38	2.32	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.60	98.60	98.60	0.00	0.00	1
12.5		95.90	95.90	95.90	0.00	0.00	1
25		91.30	91.30	91.30	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/21	Sample ID:	VC 104 0.0-0.5
End Date:	14/01/2023 20:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Conc-%	1	2	3	4
FSW Control	0.7100	0.7300	0.6800	0.6900
Diluent Contol	0.7100	0.7500	0.6800	0.6900
6.3	0.6900	0.7400	0.7100	0.7300
12.5	0.7200	0.7600	0.7100	0.7200
25	0.7900	0.6800	0.7000	0.6800
50	0.7300	0.6800	0.6500	0.7600
100	0.6900	0.6400	0.5900	0.6300

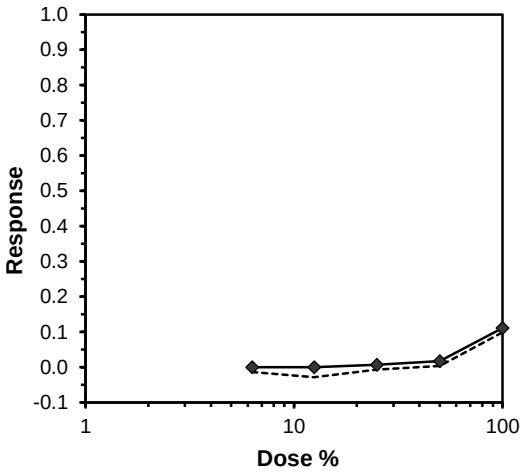
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.7025	0.9929	0.9941	0.9695	1.0244	2.448	4					
Diluent Contol	0.7075	1.0000	0.9998	0.9695	1.0472	3.440	4	*			0.7175	1.0000
6.3	0.7175	1.0141	1.0106	0.9803	1.0357	2.432	4	-0.362	2.410	0.0723	0.7175	1.0000
12.5	0.7275	1.0283	1.0218	1.0021	1.0588	2.467	4	-0.735	2.410	0.0723	0.7175	1.0000
25	0.7125	1.0071	1.0062	0.9695	1.0948	5.951	4	-0.215	2.410	0.0723	0.7125	0.9930
50	0.7050	0.9965	0.9976	0.9377	1.0588	5.440	4	0.072	2.410	0.0723	0.7050	0.9826
*100	0.6375	0.9011	0.9251	0.8759	0.9803	4.645	4	2.490	2.410	0.0723	0.6375	0.8885

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.953382	0.916	0.676503	-0.08921
Bartlett's Test indicates equal variances (p = 0.61)	3.575238	15.08627		
The control means are not significantly different (p = 0.80)	0.270614	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	50	100	70.71068	2	0.067698	0.095634	0.004795	0.0018	0.056838	5, 18

Log-Logit Interpolation (200 Resamples)

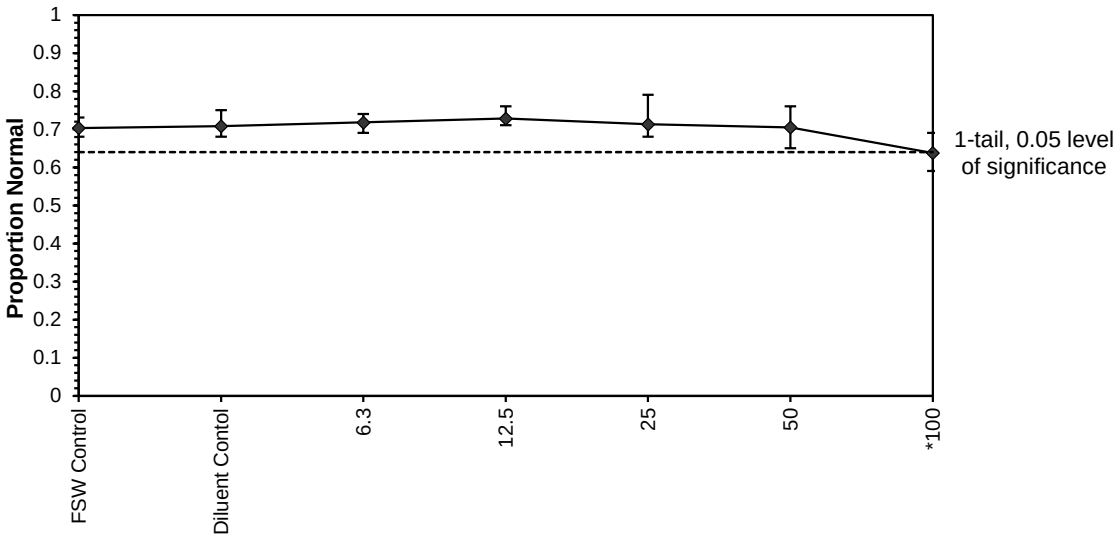
Point	%	SD	95% CL(Exp)	Skew
IC05	64.160			
IC10	92.241			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/21	Sample ID:	VC 104 0.0-0.5
End Date:	14/01/2023 20:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Dose-Response Plot



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/21	Sample ID:	VC 104 0.0-0.5
End Date:	14/01/2023 20:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	70.25	68.00	73.00	2.22	2.12	4
Diluent Contol		70.75	68.00	75.00	3.10	2.49	4
6.3		71.75	69.00	74.00	2.22	2.08	4
12.5		72.75	71.00	76.00	2.22	2.05	4
25		71.25	68.00	79.00	5.25	3.22	4
50		70.50	65.00	76.00	4.93	3.15	4
100		63.75	59.00	69.00	4.11	3.18	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.40	35.40	35.40	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.30	98.30	98.30	0.00	0.00	1
12.5		95.60	95.60	95.60	0.00	0.00	1
25		93.90	93.90	93.90	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/22	Sample ID:	QA1
End Date:	14/01/2023 20:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Conc-%	1	2	3	4
FSW Control	0.7100	0.7300	0.6800	0.6900
Diluent Contol	0.7100	0.7500	0.6800	0.6900
6.3	0.7100	0.6800	0.7400	0.7600
12.5	0.7100	0.7200	0.7300	0.7000
25	0.6800	0.7100	0.6900	0.7200
50	0.6800	0.7400	0.7100	0.6300
100	0.6000	0.5900	0.6400	0.6200

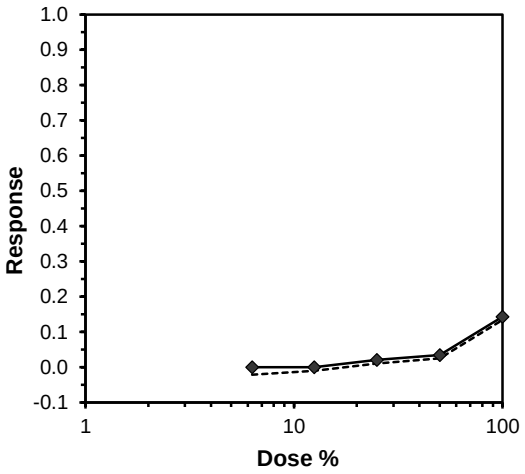
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.7025	0.9929	0.9941	0.9695	1.0244	2.448	4					
Diluent Contol	0.7075	1.0000	0.9998	0.9695	1.0472	3.440	4	*			0.7150	1.0000
6.3	0.7225	1.0212	1.0166	0.9695	1.0588	3.841	4	-0.727	2.410	0.0556	0.7150	1.0000
12.5	0.7150	1.0106	1.0077	0.9912	1.0244	1.419	4	-0.344	2.410	0.0556	0.7150	1.0000
25	0.7000	0.9894	0.9913	0.9695	1.0132	2.010	4	0.368	2.410	0.0556	0.7000	0.9790
50	0.6900	0.9753	0.9811	0.9169	1.0357	5.157	4	0.811	2.410	0.0556	0.6900	0.9650
*100	0.6125	0.8657	0.8990	0.8759	0.9273	2.536	4	4.370	2.410	0.0556	0.6125	0.8566

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.982359	0.916	-0.07286	-0.02206
Bartlett's Test indicates equal variances (p = 0.38)	5.342771	15.08627		
The control means are not significantly different (p = 0.80)	0.270614	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	50	100	70.71068	2	0.051754	0.073112	0.007322	0.001065	9.5E-04	5, 18

Log-Logit Interpolation (200 Resamples)

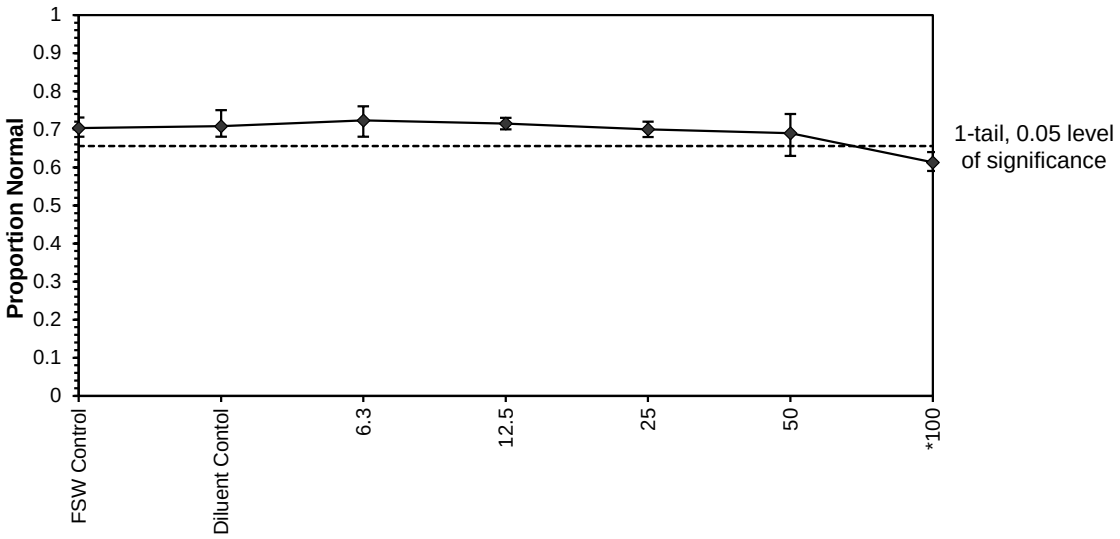
Point	%	SD	95% CL(Exp)		Skew
IC05	55.330	12.582	2.035	72.427	-0.7654
IC10	76.487	9.194	34.811	99.997	-0.5356
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/22	Sample ID:	QA1
End Date:	14/01/2023 20:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Dose-Response Plot



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	11/01/2023 20:30	Test ID:	PR2130/22	Sample ID:	QA1
End Date:	14/01/2023 20:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	MG-Mytilus galloprovincialis
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	70.25	68.00	73.00	2.22	2.12	4
Diluent Contol		70.75	68.00	75.00	3.10	2.49	4
6.3		72.25	68.00	76.00	3.50	2.59	4
12.5		71.50	70.00	73.00	1.29	1.59	4
25		70.00	68.00	72.00	1.83	1.93	4
50		69.00	63.00	74.00	4.69	3.14	4
100		61.25	59.00	64.00	2.22	2.43	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.40	35.40	35.40	0.00	0.00	1
25		35.40	35.40	35.40	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.90	98.90	98.90	0.00	0.00	1
12.5		100.20	100.20	100.20	0.00	0.00	1
25		99.60	99.60	99.60	0.00	0.00	1
50		95.90	95.90	95.90	0.00	0.00	1
100		92.30	92.30	92.30	0.00	0.00	1

Statistical Printouts for the Milky Oyster Larval Development Tests

Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	14/12/2022 16:30	Test ID:	PR2130/13	Sample ID:	VC 101 0.0-0.5
End Date:	16/12/2022 16:30	Lab ID:	10754	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea echinata
Comments:					

Conc-%	1	2	3	4
FSW Control	0.7300	0.7500	0.8000	0.7100
Diluent Contol	0.7600	0.8000	0.7000	0.7400
6.3	0.7600	0.7900	0.8400	0.7900
12.5	0.8100	0.8300	0.8000	0.7200
25	0.7500	0.7900	0.7100	0.8200
50	0.7600	0.8400	0.8100	0.8300
100	0.8000	0.7200	0.7000	0.7100

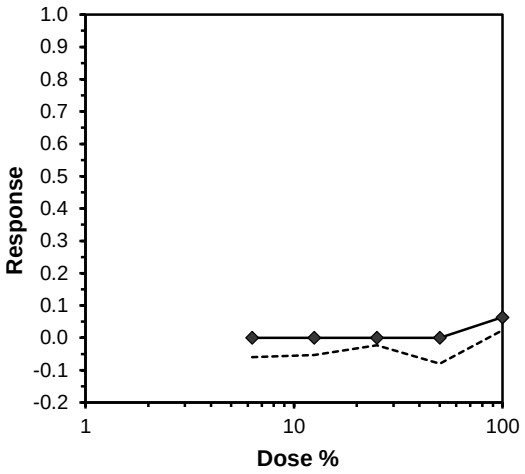
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.7475	0.9967	1.0452	1.0021	1.1071	4.325	4					
Diluent Contol	0.7500	1.0000	1.0482	0.9912	1.1071	4.607	4	*			0.7825	1.0000
6.3	0.7950	1.0600	1.1019	1.0588	1.1593	3.796	4	-1.496	2.410	0.0865	0.7825	1.0000
12.5	0.7900	1.0533	1.0965	1.0132	1.1458	5.272	4	-1.345	2.410	0.0865	0.7825	1.0000
25	0.7675	1.0233	1.0692	1.0021	1.1326	5.308	4	-0.584	2.410	0.0865	0.7825	1.0000
50	0.8100	1.0800	1.1209	1.0588	1.1593	3.972	4	-2.025	2.410	0.0865	0.7825	1.0000
100	0.7325	0.9767	1.0284	0.9912	1.1071	5.179	4	0.552	2.410	0.0865	0.7325	0.9361

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.975861	0.916	-0.05759	-0.84338
Bartlett's Test indicates equal variances (p = 0.99)	0.45399	15.08627		
The control means are not significantly different (p = 0.93)	0.090639	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	100	>100		1	0.07821	0.104158	0.004943	0.002577	0.141207	5, 18

Log-Logit Interpolation (200 Resamples)

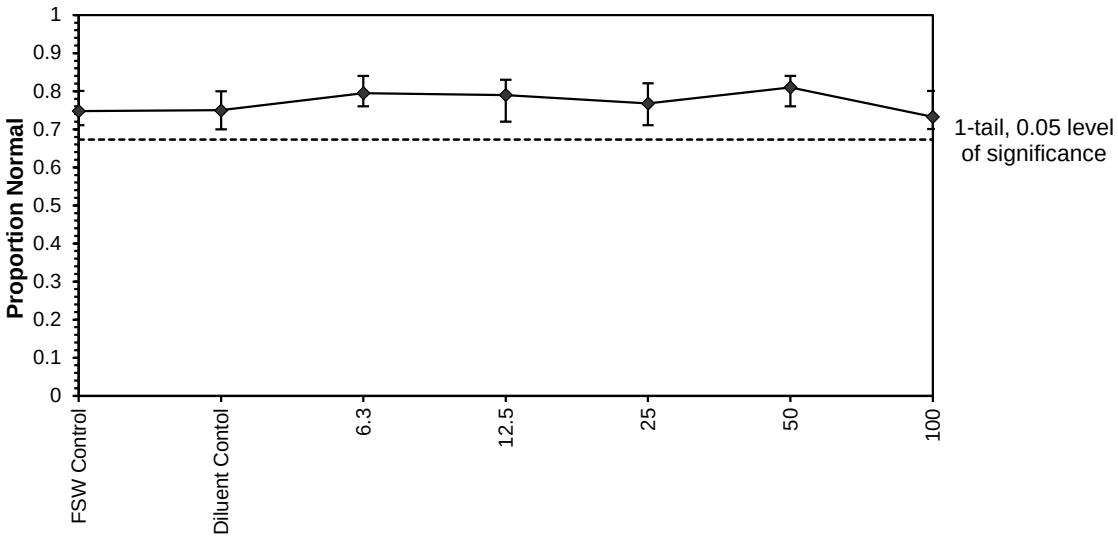
Point	%	SD	95% CL(Exp)	Skew
IC05	86.736			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	14/12/2022 16:30	Test ID:	PR2130/13	Sample ID:	VC 101 0.0-0.5
End Date:	16/12/2022 16:30	Lab ID:	10754	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea echinata
Comments:					

Dose-Response Plot



Bivalve Acute Toxicity Tests-Proportion Normal

Start Date:	14/12/2022 16:30	Test ID:	PR2130/13	Sample ID:	VC 101 0.0-0.5
End Date:	16/12/2022 16:30	Lab ID:	10754	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea echinata
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	74.75	71.00	80.00	3.86	2.63	4
Diluent Contol		75.00	70.00	80.00	4.16	2.72	4
6.3		79.50	76.00	84.00	3.32	2.29	4
12.5		79.00	72.00	83.00	4.83	2.78	4
25		76.75	71.00	82.00	4.79	2.85	4
50		81.00	76.00	84.00	3.56	2.33	4
100		73.25	70.00	80.00	4.57	2.92	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	34.60	34.60	34.60	0.00	0.00	1
Diluent Contol		35.40	35.40	35.40	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.30	35.30	35.30	0.00	0.00	1
25		35.20	35.20	35.20	0.00	0.00	1
50		35.10	35.10	35.10	0.00	0.00	1
100		35.00	35.00	35.00	0.00	0.00	1
FSW Control	DO %	100.40	100.40	100.40	0.00	0.00	1
Diluent Contol		102.00	102.00	102.00	0.00	0.00	1
6.3		99.80	99.80	99.80	0.00	0.00	1
12.5		99.60	99.60	99.60	0.00	0.00	1
25		99.10	99.10	99.10	0.00	0.00	1
50		98.20	98.20	98.20	0.00	0.00	1
100		93.00	93.00	93.00	0.00	0.00	1

Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/23	Sample ID:	VC 107 2.5-3.0
End Date:	13/01/2023 20:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Conc-%	1	2	3	4
FSW Control	0.8100	0.8400	0.8000	0.8300
Diluent Contol	0.8100	0.8400	0.8600	0.8200
6.3	0.8100	0.8700	0.7500	0.8900
12.5	0.9100	0.8600	0.8100	0.7900
25	0.8100	0.7600	0.7900	0.8400
50	0.8400	0.8100	0.7900	0.8600
100	0.7600	0.6900	0.7400	0.7800

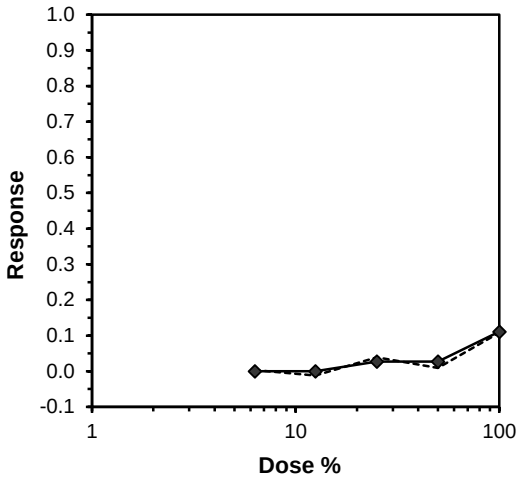
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.8200	0.9850	1.1330	1.1071	1.1593	2.100	4					
Diluent Contol	0.8325	1.0000	1.1497	1.1198	1.1873	2.605	4	*			0.8350	1.0000
6.3	0.8300	0.9970	1.1504	1.0472	1.2327	7.277	4	-0.016	2.410	0.0964	0.8350	1.0000
12.5	0.8425	1.0120	1.1670	1.0948	1.2661	6.579	4	-0.431	2.410	0.0964	0.8350	1.0000
25	0.8000	0.9610	1.1082	1.0588	1.1593	3.815	4	1.040	2.410	0.0964	0.8125	0.9731
50	0.8250	0.9910	1.1403	1.0948	1.1873	3.603	4	0.237	2.410	0.0964	0.8125	0.9731
*100	0.7425	0.8919	1.0394	0.9803	1.0826	4.212	4	2.760	2.410	0.0964	0.7425	0.8892

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.987762	0.916	-0.00329	-0.39647
Bartlett's Test indicates equal variances (p = 0.51)	4.27221	15.08627		
The control means are not significantly different (p = 0.41)	0.875603	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	50	100	70.71068	2	0.077623	0.093191	0.008694	0.003199	0.053309	5, 18

Log-Logit Interpolation (200 Resamples)

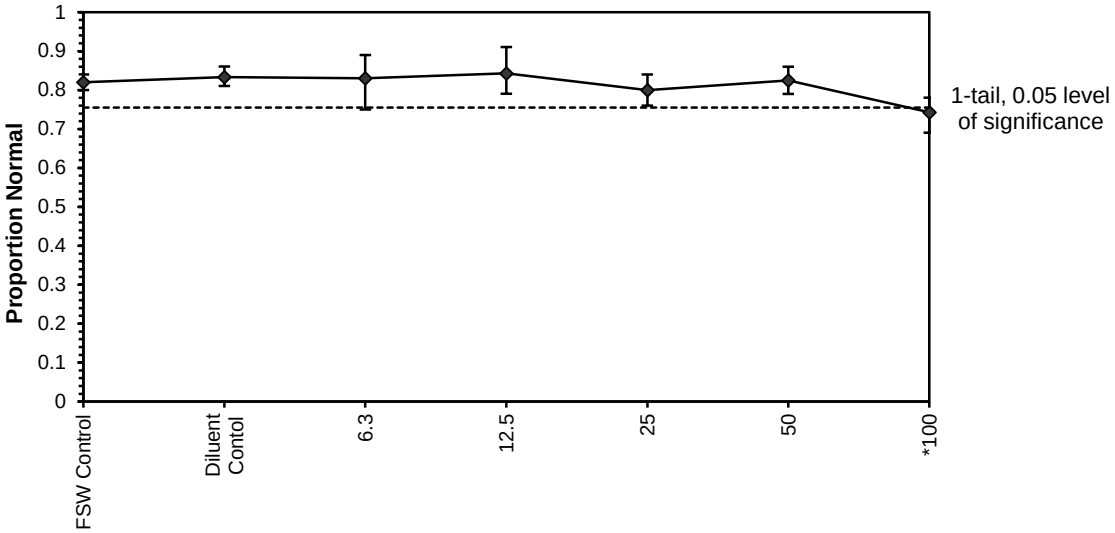
Point	%	SD	95% CL(Exp)		Skew
IC05	61.551	16.344	0.000	82.815	-1.1378
IC10	92.245				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/23	Sample ID:	VC 107 2.5-3.0
End Date:	13/01/2023 20:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Dose-Response Plot



Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/23	Sample ID:	VC 107 2.5-3.0
End Date:	13/01/2023 20:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	82.00	80.00	84.00	1.83	1.65	4
Diluent Contol		83.25	81.00	86.00	2.22	1.79	4
6.3		83.00	75.00	89.00	6.32	3.03	4
12.5		84.25	79.00	91.00	5.38	2.75	4
25		80.00	76.00	84.00	3.37	2.29	4
50		82.50	79.00	86.00	3.11	2.14	4
100		74.25	69.00	78.00	3.86	2.65	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.60	98.60	98.60	0.00	0.00	1
12.5		95.90	95.90	95.90	0.00	0.00	1
25		91.30	91.30	91.30	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/24	Sample ID:	VC 104 0.0-0.5
End Date:	13/01/2023 20:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Conc-%	1	2	3	4
FSW Control	0.8100	0.8400	0.8000	0.8300
Diluent Contol	0.8100	0.8400	0.8600	0.8200
6.3	0.7900	0.8400	0.8100	0.8600
12.5	0.8500	0.7900	0.8600	0.8000
25	0.8100	0.8400	0.8600	0.7900
50	0.8100	0.7900	0.8600	0.8400
100	0.6800	0.7900	0.8300	0.7500

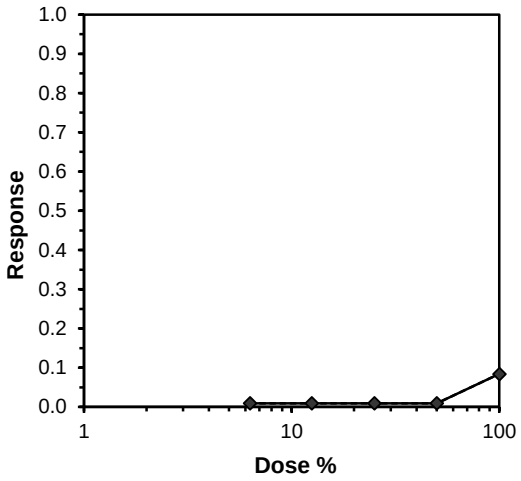
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.8200	0.9850	1.1330	1.1071	1.1593	2.100	4					
Diluent Contol	0.8325	1.0000	1.1497	1.1198	1.1873	2.605	4	*			0.8325	1.0000
6.3	0.8250	0.9910	1.1403	1.0948	1.1873	3.603	4	0.280	2.410	0.0815	0.8250	0.9910
12.5	0.8250	0.9910	1.1406	1.0948	1.1873	4.068	4	0.271	2.410	0.0815	0.8250	0.9910
25	0.8250	0.9910	1.1403	1.0948	1.1873	3.603	4	0.280	2.410	0.0815	0.8250	0.9910
50	0.8250	0.9910	1.1403	1.0948	1.1873	3.603	4	0.280	2.410	0.0815	0.8250	0.9910
*100	0.7625	0.9159	1.0643	0.9695	1.1458	7.040	4	2.526	2.410	0.0815	0.7625	0.9159

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.954713	0.916	-0.14968	-0.46525
Bartlett's Test indicates equal variances (p = 0.75)	2.687555	15.08627		
The control means are not significantly different (p = 0.41)	0.875603	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	50	100	70.71068	2	0.064961	0.077988	0.004103	0.002288	0.165098	5, 18
Treatments vs Diluent Contol										

Log-Logit Interpolation (200 Resamples)

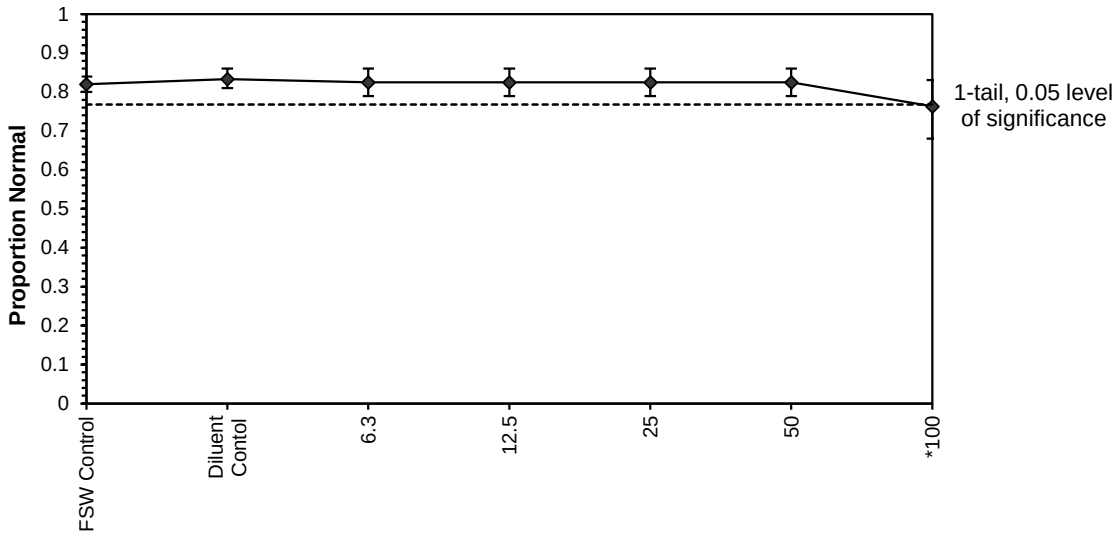
Point	%	SD	95% CL(Exp)	Skew
IC05	74.477			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/24	Sample ID:	VC 104 0.0-0.5
End Date:	13/01/2023 20:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Dose-Response Plot



Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/24	Sample ID:	VC 104 0.0-0.5
End Date:	13/01/2023 20:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	82.00	80.00	84.00	1.83	1.65	4
Diluent Contol		83.25	81.00	86.00	2.22	1.79	4
6.3		82.50	79.00	86.00	3.11	2.14	4
12.5		82.50	79.00	86.00	3.51	2.27	4
25		82.50	79.00	86.00	3.11	2.14	4
50		82.50	79.00	86.00	3.11	2.14	4
100		76.25	68.00	83.00	6.40	3.32	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.40	35.40	35.40	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.30	98.30	98.30	0.00	0.00	1
12.5		95.60	95.60	95.60	0.00	0.00	1
25		93.90	93.90	93.90	0.00	0.00	1
50		89.60	89.60	89.60	0.00	0.00	1
100		90.20	90.20	90.20	0.00	0.00	1

Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/25	Sample ID:	QA1
End Date:	13/01/2023 20:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Conc-%	1	2	3	4
FSW Control	0.8100	0.8400	0.8000	0.8300
Diluent Contol	0.8100	0.8400	0.8600	0.8200
6.3	0.8100	0.8400	0.8200	0.7600
12.5	0.7900	0.7400	0.7500	0.8600
25	0.7900	0.7500	0.7600	0.8100
50	0.8300	0.8500	0.7000	0.7600
100	0.7900	0.6800	0.7100	0.7300

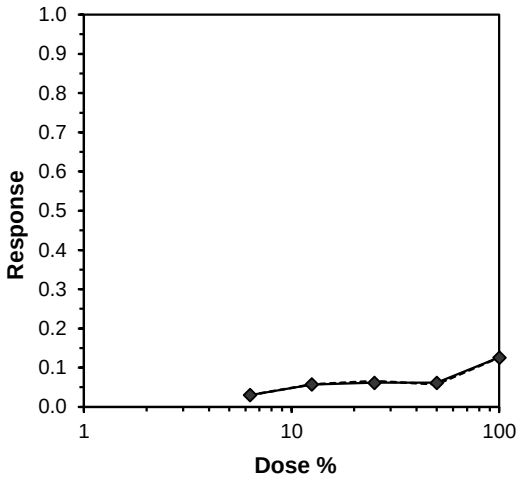
			Transform: Arcsin Square Root					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	0.8200	0.9850	1.1330	1.1071	1.1593	2.100	4					
Diluent Contol	0.8325	1.0000	1.1497	1.1198	1.1873	2.605	4	*			0.8325	1.0000
6.3	0.8075	0.9700	1.1176	1.0588	1.1593	3.804	4	0.823	2.410	0.0941	0.8075	0.9700
12.5	0.7850	0.9429	1.0912	1.0357	1.1873	6.318	4	1.498	2.410	0.0941	0.7850	0.9429
25	0.7775	0.9339	1.0801	1.0472	1.1198	3.082	4	1.783	2.410	0.0941	0.7813	0.9384
50	0.7850	0.9429	1.0922	0.9912	1.1731	7.613	4	1.473	2.410	0.0941	0.7813	0.9384
*100	0.7275	0.8739	1.0227	0.9695	1.0948	5.188	4	3.254	2.410	0.0941	0.7275	0.8739

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.981853	0.916	0.151435	-0.3424
Bartlett's Test indicates equal variances (p = 0.52)	4.184714	15.08627		
The control means are not significantly different (p = 0.41)	0.875603	2.446912		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	50	100	70.71068	2	0.075671	0.090847	0.007148	0.003049	0.083427	5, 18

Log-Logit Interpolation (200 Resamples)

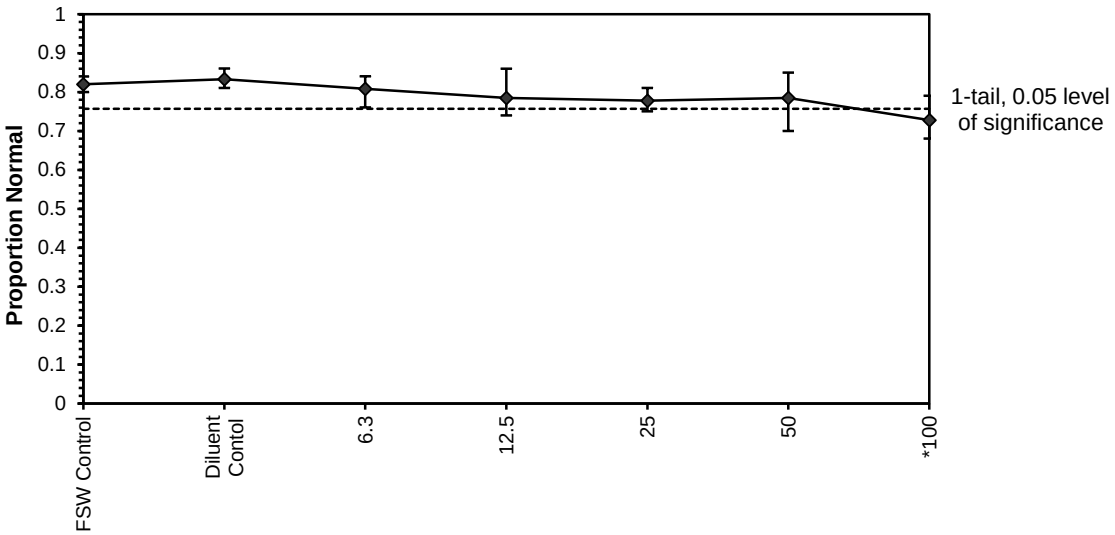
Point	%	SD	95% CL(Exp)		Skew
IC05	10.553	18.473	0.063	92.273	1.1835
IC10	76.527				
IC15	>100				
IC20	>100				
IC25	>100				
IC40	>100				
IC50	>100				



Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/25	Sample ID:	QA1
End Date:	13/01/2023 20:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Dose-Response Plot



Bivalve Larval Development Test-Proportion Normal

Start Date:	11/01/2023 20:00	Test ID:	PR2130/25	Sample ID:	QA1
End Date:	13/01/2023 20:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 106	Test Species:	SE-Saccostrea glomerata
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	% Normal	82.00	80.00	84.00	1.83	1.65	4
Diluent Contol		83.25	81.00	86.00	2.22	1.79	4
6.3		80.75	76.00	84.00	3.40	2.28	4
12.5		78.50	74.00	86.00	5.45	2.97	4
25		77.75	75.00	81.00	2.75	2.13	4
50		78.50	70.00	85.00	6.86	3.34	4
100		72.75	68.00	79.00	4.65	2.96	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
Diluent Contol		34.50	34.50	34.50	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.40	35.40	35.40	0.00	0.00	1
25		35.40	35.40	35.40	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1
FSW Control	DO %	103.00	103.00	103.00	0.00	0.00	1
Diluent Contol		99.60	99.60	99.60	0.00	0.00	1
6.3		98.90	98.90	98.90	0.00	0.00	1
12.5		100.20	100.20	100.20	0.00	0.00	1
25		99.60	99.60	99.60	0.00	0.00	1
50		95.90	95.90	95.90	0.00	0.00	1
100		92.30	92.30	92.30	0.00	0.00	1

Statistical Printouts for the *Nitzschia* Growth Inhibition Tests

Microalgal Cell Yield-Cell Yield

Start Date:	14/12/2022 19:30	Test ID:	PR2130/01	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 19:30	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Conc-%	1	2	3	4	5	6	7	8
FSW Control	16.433	15.633	15.233	15.433	15.933	14.533	15.333	14.633
Diluent Control	15.933	16.333	15.233	15.833				
6.3	14.733	14.933	16.333	15.633				
12.5	15.233	16.433	14.933	15.233				
25	15.633	15.433	16.333	16.633				
50	15.433	14.933	15.733	14.433				
100	14.233	15.333	14.533	14.133				

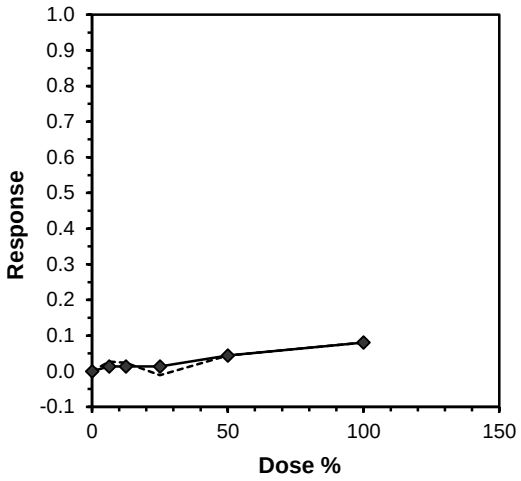
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	15.395	0.9724	15.395	14.533	16.433	4.093	8					
Diluent Control	15.833	1.0000	15.833	15.233	16.333	2.871	4	*			15.833	1.0000
6.3	15.408	0.9732	15.408	14.733	16.333	4.721	4	1.010	2.410	1.014	15.624	0.9868
12.5	15.458	0.9763	15.458	14.933	16.433	4.303	4	0.891	2.410	1.014	15.624	0.9868
25	16.008	1.0111	16.008	15.433	16.633	3.548	4	-0.416	2.410	1.014	15.624	0.9868
50	15.133	0.9558	15.133	14.433	15.733	3.777	4	1.664	2.410	1.014	15.133	0.9558
*100	14.558	0.9195	14.558	14.133	15.333	3.736	4	3.031	2.410	1.014	14.558	0.9195

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.932216	0.916	0.435899	-1.0449
Bartlett's Test indicates equal variances (p = 0.98)	0.701665	15.08627		
The control means are not significantly different (p = 0.25)	1.22547	2.228139		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Control	50	100	70.71068	2	1.013761	0.06403	1.072667	0.353889	0.037084	5, 18

Linear Interpolation (200 Resamples)

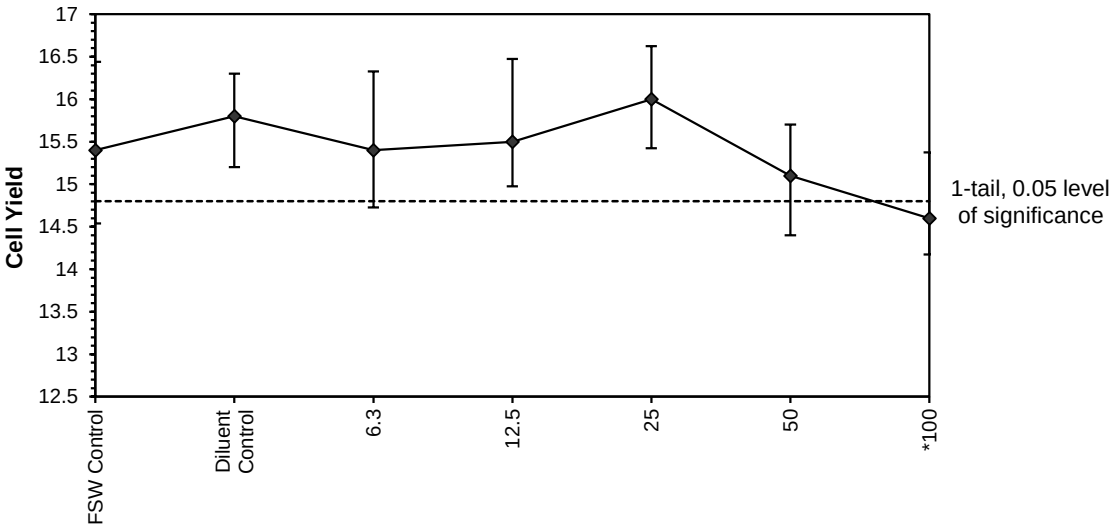
Point	%	SD	95% CL(Exp)	Skew
IC05	57.967			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Microalgal Cell Yield-Cell Yield

Start Date:	14/12/2022 19:30	Test ID:	PR2130/01	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 19:30	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date:	14/12/2022 19:30	Test ID:	PR2130/01	Sample ID:	VC 101 0.0-0.5
End Date:	17/12/2022 19:30	Lab ID:	10754	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	Cell Yield	15.40	14.53	16.43	0.63	5.16	8
Diluent Control		15.83	15.23	16.33	0.45	4.26	4
6.3		15.41	14.73	16.33	0.73	5.54	4
12.5		15.46	14.93	16.43	0.67	5.28	4
25		16.01	15.43	16.63	0.57	4.71	4
50		15.13	14.43	15.73	0.57	5.00	4
100		14.56	14.13	15.33	0.54	5.07	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Control		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	34.60	34.60	34.60	0.00	0.00	1
Diluent Control		35.40	35.40	35.40	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.30	35.30	35.30	0.00	0.00	1
25		35.20	35.20	35.20	0.00	0.00	1
50		35.10	35.10	35.10	0.00	0.00	1
100		35.00	35.00	35.00	0.00	0.00	1

Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/08	Sample ID:	VC107 2.5-3.0
End Date:	14/01/2023 16:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Conc-%	1	2	3	4	5	6	7	8
FSW Control	20.274	21.074	17.974	20.274	18.774	20.574	18.574	18.974
Diluent Contol	19.774	18.674	19.774	17.974				
6.3	19.974	20.874	18.974	19.674				
12.5	18.574	20.274	20.674	19.374				
25	18.474	20.974	20.674	19.574				
50	18.474	19.374	20.174	19.774				
100	17.974	18.674	17.774	16.874				

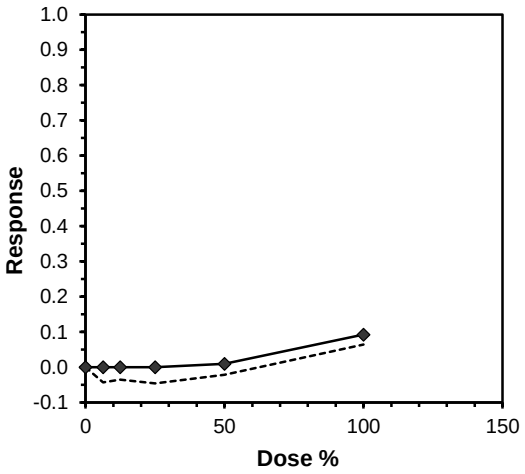
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	19.561	1.0269	19.561	17.974	21.074	5.728	8					
Diluent Contol	19.049	1.0000	19.049	17.974	19.774	4.644	4	*			19.642	1.0000
6.3	19.874	1.0433	19.874	18.974	20.874	3.962	4	-1.324	2.410	1.502	19.642	1.0000
12.5	19.724	1.0354	19.724	18.574	20.674	4.765	4	-1.083	2.410	1.502	19.642	1.0000
25	19.924	1.0459	19.924	18.474	20.974	5.715	4	-1.404	2.410	1.502	19.642	1.0000
50	19.449	1.0210	19.449	18.474	20.174	3.740	4	-0.642	2.410	1.502	19.449	0.9901
100	17.824	0.9357	17.824	16.874	18.674	4.161	4	1.965	2.410	1.502	17.824	0.9074

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.927155	0.916	-0.30739	-1.18523
Bartlett's Test indicates equal variances (p = 0.98)	0.816701	15.08627		
The control means are not significantly different (p = 0.45)	0.793065	2.228139		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	100	>100		1	1.502094	0.078856	2.529667	0.776944	0.02876	5, 18

Linear Interpolation (200 Resamples)

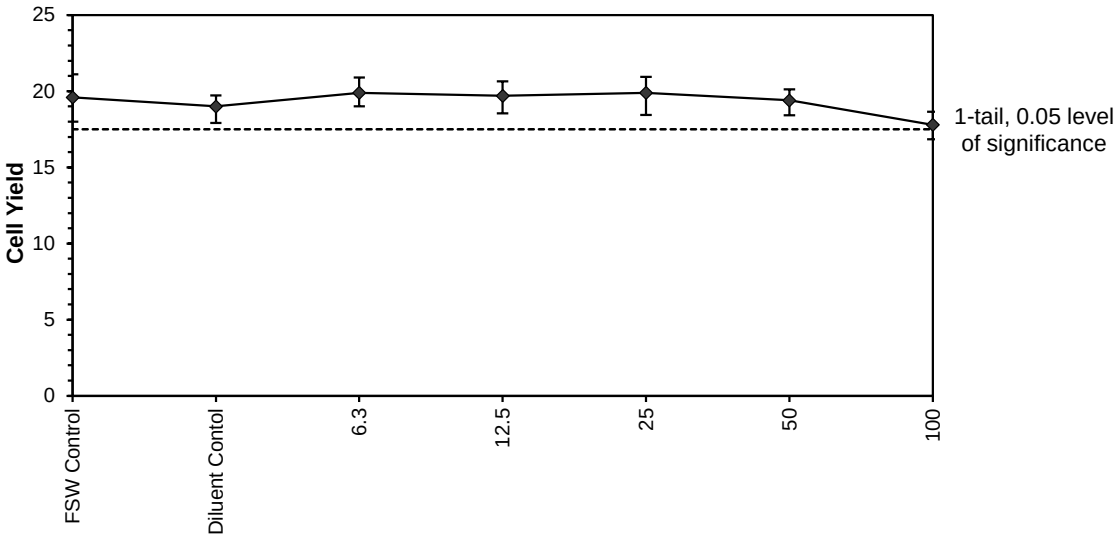
Point	%	SD	95% CL(Exp)	Skew
IC05	74.257			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/08	Sample ID:	VC107 2.5-3.0
End Date:	14/01/2023 16:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/08	Sample ID:	VC107 2.5-3.0
End Date:	14/01/2023 16:00	Lab ID:	10836	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	Cell Yield	19.56	17.97	21.07	1.12	5.41	8
Diluent Contol		19.05	17.97	19.77	0.88	4.94	4
6.3		19.87	18.97	20.87	0.79	4.47	4
12.5		19.72	18.57	20.67	0.94	4.92	4
25		19.92	18.47	20.97	1.14	5.36	4
50		19.45	18.47	20.17	0.73	4.39	4
100		17.82	16.87	18.67	0.74	4.83	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	34.50	34.50	34.50	0.00	0.00	1
Diluent Contol		35.40	35.40	35.40	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1

Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/09	Sample ID:	VC104 0.0-0.5
End Date:	14/01/2023 16:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Conc-%	1	2	3	4	5	6	7	8
FSW Control	20.274	21.074	17.974	20.274	18.774	20.574	18.574	18.974
Diluent Contol	19.774	18.674	19.774	17.974				
6.3	19.374	19.674	17.774	17.674				
12.5	19.374	21.274	19.774	20.574				
25	17.974	19.574	19.674	18.774				
50	18.274	19.974	17.674	18.774				
100	18.974	16.474	16.674	16.174				

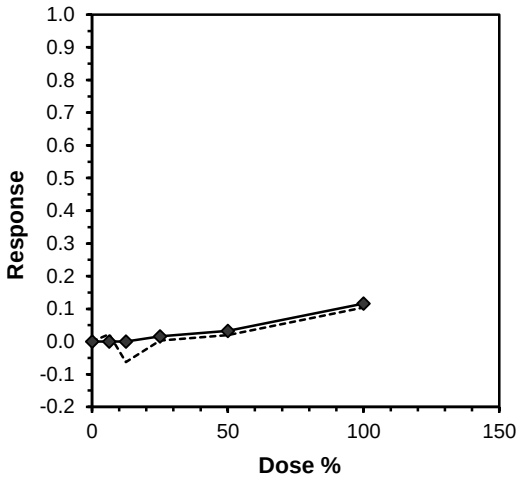
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	19.561	1.0269	19.561	17.974	21.074	5.728	8					
Diluent Contol	19.049	1.0000	19.049	17.974	19.774	4.644	4	*			19.307	1.0000
6.3	18.624	0.9777	18.624	17.674	19.674	5.623	4	0.610	2.410	1.679	19.307	1.0000
12.5	20.249	1.0630	20.249	19.374	21.274	4.178	4	-1.722	2.410	1.679	19.307	1.0000
25	18.999	0.9974	18.999	17.974	19.674	4.175	4	0.072	2.410	1.679	18.999	0.9840
50	18.674	0.9803	18.674	17.674	19.974	5.229	4	0.538	2.410	1.679	18.674	0.9672
*100	17.074	0.8963	17.074	16.174	18.974	7.516	4	2.835	2.410	1.679	17.074	0.8843

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.917737	0.916	0.451483	-0.92279
Bartlett's Test indicates equal variances (p = 0.97)	0.853101	15.08627		
The control means are not significantly different (p = 0.45)	0.793065	2.228139		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	50	100	70.71068	2	1.678972	0.088142	4.179417	0.970694	0.009434	5, 18

Linear Interpolation (200 Resamples)

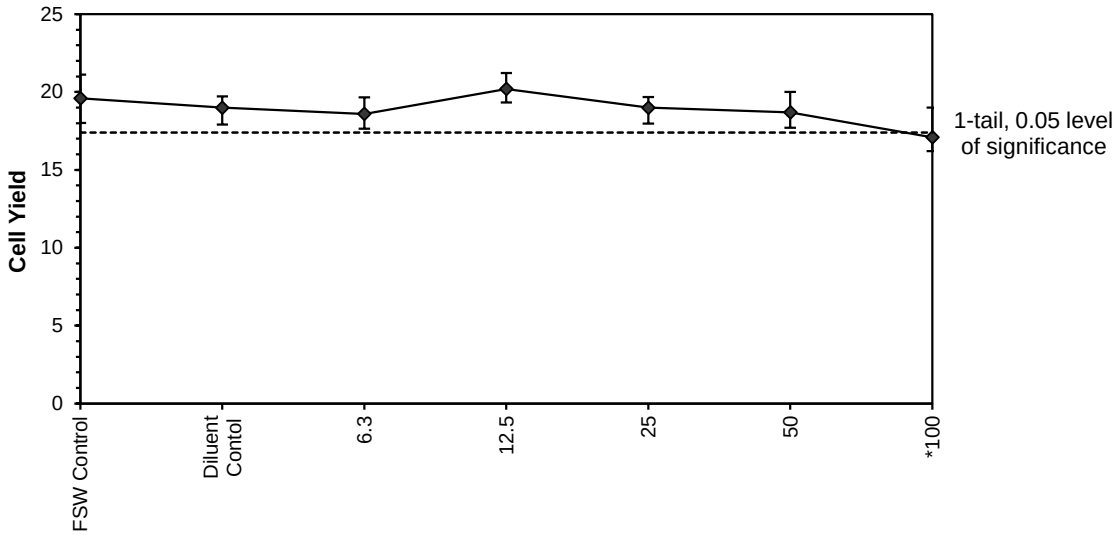
Point	%	SD	95% CL(Exp)	Skew
IC05	60.375			
IC10	90.542			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/09	Sample ID:	VC104 0.0-0.5
End Date:	14/01/2023 16:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/09	Sample ID:	VC104 0.0-0.5
End Date:	14/01/2023 16:00	Lab ID:	10844	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	Cell Yield	19.56	17.97	21.07	1.12	5.41	8
Diluent Contol		19.05	17.97	19.77	0.88	4.94	4
6.3		19.05	17.97	19.77	0.88	4.94	4
12.5		18.62	17.67	19.67	1.05	5.49	4
25		20.25	19.37	21.27	0.85	4.54	4
50		19.00	17.97	19.67	0.79	4.69	4
100		18.67	17.67	19.97	0.98	5.29	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.10	8.10	8.10	0.00	0.00	1
100		8.00	8.00	8.00	0.00	0.00	1
FSW Control	Salinity ppt	34.50	34.50	34.50	0.00	0.00	1
Diluent Contol		35.40	35.40	35.40	0.00	0.00	1
6.3		35.50	35.50	35.50	0.00	0.00	1
12.5		35.50	35.50	35.50	0.00	0.00	1
25		35.50	35.50	35.50	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.40	35.40	35.40	0.00	0.00	1

Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/10	Sample ID:	QA1
End Date:	14/01/2023 16:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Conc-%	1	2	3	4	5	6	7	8
FSW Control	20.274	21.074	17.974	20.274	18.774	20.574	18.574	18.974
Diluent Contol	19.774	18.674	19.774	17.974				
6.3	20.674	19.274	20.174	20.274				
12.5	18.774	18.574	20.474	20.874				
25	19.674	20.774	19.974	19.074				
50	19.574	19.674	17.774	19.074				
100	16.274	18.074	17.374	18.574				

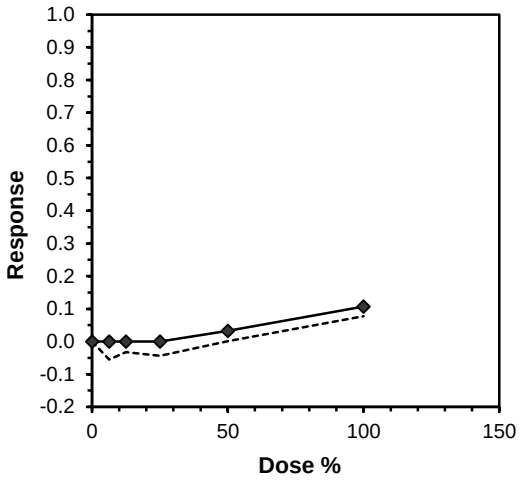
			Transform: Untransformed					1-Tailed			Isotonic	
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
FSW Control	19.561	1.0269	19.561	17.974	21.074	5.728	8					
Diluent Contol	19.049	1.0000	19.049	17.974	19.774	4.644	4	*			19.674	1.0000
6.3	20.099	1.0551	20.099	19.274	20.674	2.940	4	-1.668	2.410	1.517	19.674	1.0000
12.5	19.674	1.0328	19.674	18.574	20.874	5.942	4	-0.993	2.410	1.517	19.674	1.0000
25	19.874	1.0433	19.874	19.074	20.774	3.558	4	-1.311	2.410	1.517	19.674	1.0000
50	19.024	0.9987	19.024	17.774	19.674	4.593	4	0.040	2.410	1.517	19.024	0.9670
100	17.574	0.9226	17.574	16.274	18.574	5.671	4	2.343	2.410	1.517	17.574	0.8933

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.926694	0.916	-0.30108	-1.26497
Bartlett's Test indicates equal variances (p = 0.91)	1.486184	15.08627		
The control means are not significantly different (p = 0.45)	0.793065	2.228139		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test Treatments vs Diluent Contol	100	>100		1	1.517056	0.079642	3.346667	0.7925	0.010256	5, 18

Linear Interpolation (200 Resamples)

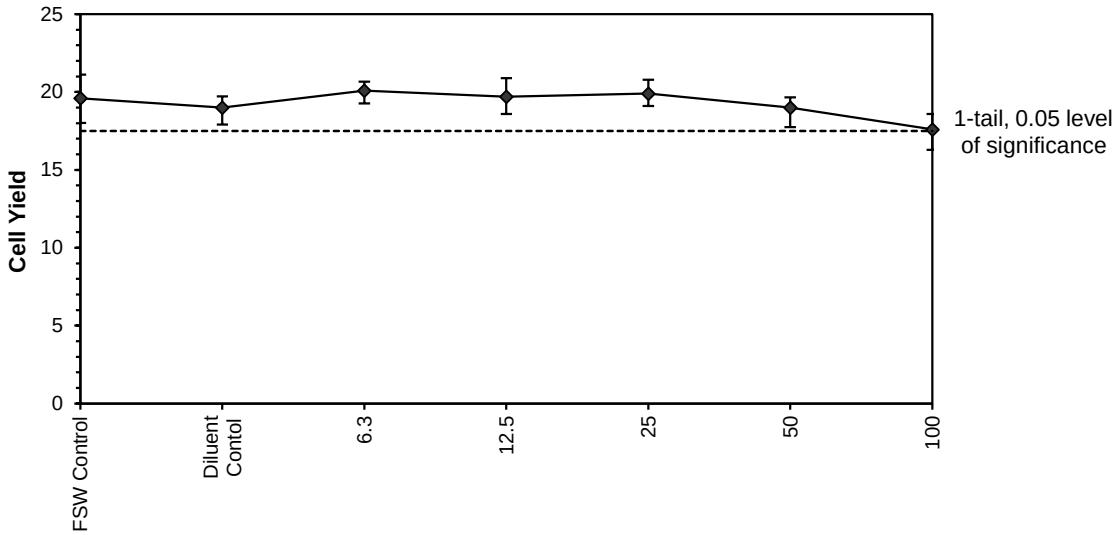
Point	%	SD	95% CL(Exp)	Skew
IC05	61.506			
IC10	95.426			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/10	Sample ID:	QA1
End Date:	14/01/2023 16:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date:	11/01/2023 16:00	Test ID:	PR2130/10	Sample ID:	QA1
End Date:	14/01/2023 16:00	Lab ID:	10849	Sample Type:	SPW-Sediment Pore Water
Sample Date:		Protocol:	ESA 110	Test Species:	NC-Nitzschia closterium
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
FSW Control	Cell Yield	19.56	17.97	21.07	1.12	5.41	8
Diluent Contol		19.05	17.97	19.77	0.88	4.94	4
6.3		20.10	19.27	20.67	0.59	3.82	4
12.5		19.67	18.57	20.87	1.17	5.50	4
25		19.87	19.07	20.77	0.71	4.23	4
50		19.02	17.77	19.67	0.87	4.91	4
100		17.57	16.27	18.57	1.00	5.68	4
FSW Control	pH	8.10	8.10	8.10	0.00	0.00	1
Diluent Contol		8.10	8.10	8.10	0.00	0.00	1
6.3		8.10	8.10	8.10	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.10	8.10	8.10	0.00	0.00	1
50		8.00	8.00	8.00	0.00	0.00	1
100		7.90	7.90	7.90	0.00	0.00	1
FSW Control	Salinity ppt	34.50	34.50	34.50	0.00	0.00	1
Diluent Contol		35.40	35.40	35.40	0.00	0.00	1
6.3		35.40	35.40	35.40	0.00	0.00	1
12.5		35.40	35.40	35.40	0.00	0.00	1
25		35.40	35.40	35.40	0.00	0.00	1
50		35.40	35.40	35.40	0.00	0.00	1
100		35.30	35.30	35.30	0.00	0.00	1

Statistical Printouts for the Amphipod *Melita plumulosa* Whole Sediment Toxicity Tests

Amphipod Acute Whole-Sediment Test-10d % Unaffected

Start Date:	12/12/2022 13:30	Test ID:	PR2130/03	Sample ID:	VC101 0.1-0.5
End Date:	22/12/2022 13:30	Lab ID:	10754	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 108	Test Species:	ML-Melita Plumulosa
Comments:					

Conc-%	1	2	3	4
Ref Sediment	0.9333	1.0000	1.0000	0.8667
VC101 0.0-0.5	0.9333	1.0000	1.0000	0.8667

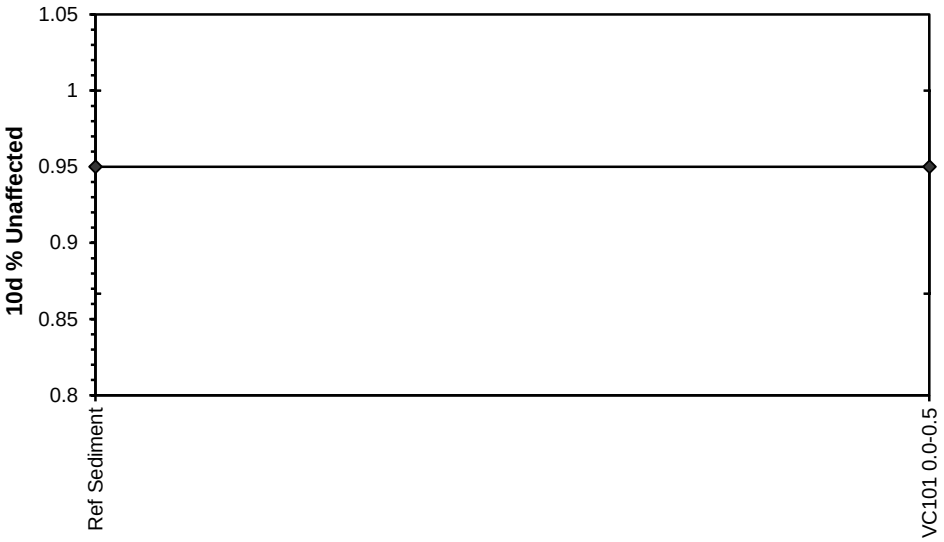
			Transform: Untransformed					Rank	1-Tailed
Conc-%	Mean	N-Mean	Mean	Min	Max	CV%	N	Sum	Critical
Ref Sediment	0.9500	1.0000	0.9500	0.8667	1.0000	6.719	4		
VC101 0.0-0.5	0.9500	1.0000	0.9500	0.8667	1.0000	6.719	4	18.00	11.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.781785	0.818	-0.61536	-1.48099
F-Test indicates equal variances (p = 1.00)	1	47.46723		

Hypothesis Test (1-tail, 0.05)

Wilcoxon Two-Sample Test indicates no significant differences
Treatments vs Ref Sediment

Dose-Response Plot



Amphipod Acute Whole-Sediment Test-10d % Unaffected

Start Date:	12/12/2022 13:30	Test ID:	PR2130/03	Sample ID:	VC101 0.1-0.5
End Date:	22/12/2022 13:30	Lab ID:	10754	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 108	Test Species:	ML-Melita Plumulosa
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
Ref Sediment	% Non-immobilised	95.00	86.67	100.00	6.38	2.66	4
VC101 0.0-0.5		95.00	86.67	100.00	6.38	2.66	4
Ref Sediment	pH	8.20	8.20	8.20	0.00	0.00	1
VC101 0.0-0.5		8.10	8.10	8.10	0.00	0.00	1
Ref Sediment	DO %	90.30	90.30	90.30	0.00	0.00	1
VC101 0.0-0.5		92.00	92.00	92.00	0.00	0.00	1
Ref Sediment	Salinity ppt	35.50	35.50	35.50	0.00	0.00	1
VC101 0.0-0.5		35.40	35.40	35.40	0.00	0.00	1

Amphipod Acute Whole-Sediment Test-10d % Unaffected

Start Date:	18/01/2023 16:30	Test ID:	PR2130/31	Sample ID:	Various
End Date:	28/01/2023 17:30	Lab ID:	Various	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 109	Test Species:	ML-Melita Plumulosa
Comments:					

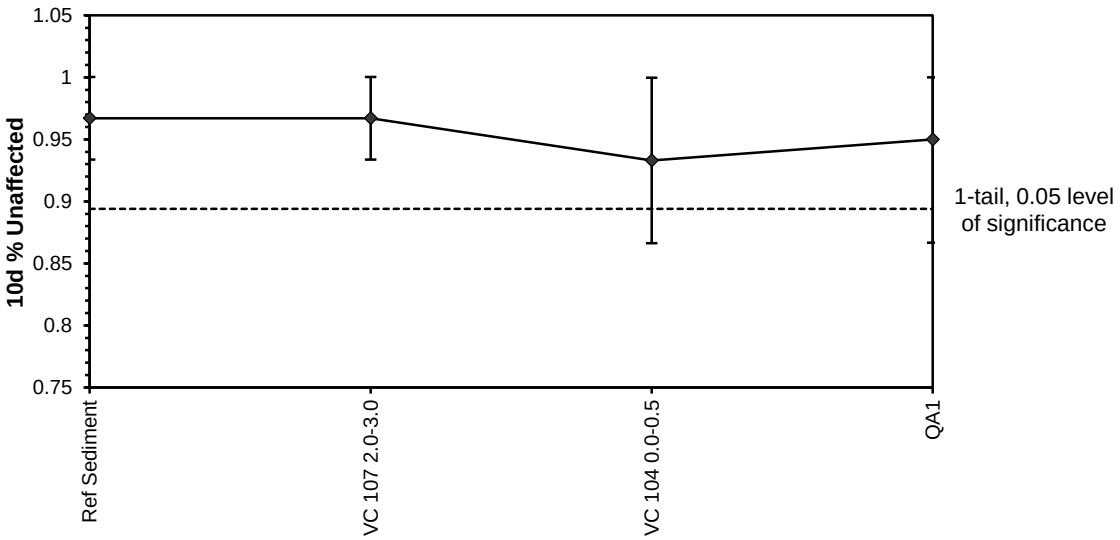
Conc-	1	2	3	4
Ref Sediment	1.0000	0.9333	1.0000	0.9333
VC 107 2.0-3.0	1.0000	1.0000	0.9333	0.9333
VC 104 0.0-0.5	0.8667	1.0000	1.0000	0.8667
QA1	0.8667	1.0000	1.0000	0.9333

			Transform: Untransformed					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Ref Sediment	0.9667	1.0000	0.9667	0.9333	1.0000	3.982	4			
VC 107 2.0-3.0	0.9667	1.0000	0.9667	0.9333	1.0000	3.982	4	0.000	1.943	0.0529
VC 104 0.0-0.5	0.9333	0.9655	0.9333	0.8667	1.0000	8.248	4	0.775	1.943	0.0836
QA1	0.9500	0.9828	0.9500	0.8667	1.0000	6.719	4	0.447	1.943	0.0724

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.894944	0.887	-0.19239	-1.48991
Bartlett's Test indicates equal variances (p = 0.59)	1.931203	11.34487		

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences Treatments vs Ref Sediment	0.072418	0.074915	0.001019	0.003241	0.814806	3, 12

Dose-Response Plot



Amphipod Acute Whole-Sediment Test-10d % Unaffected

Start Date:	18/01/2023 16:30	Test ID:	PR2130/31	Sample ID:	Various
End Date:	28/01/2023 17:30	Lab ID:	Various	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 109	Test Species:	ML-Melita Plumulosa
Comments:					

Auxiliary Data Summary

Conc-	Parameter	Mean	Min	Max	SD	CV%	N
Ref Sediment	% Non-immobilised	96.67	93.33	100.00	3.85	2.03	4
VC 107 2.0-3.0		96.67	93.33	100.00	3.85	2.03	4
VC 104 0.0-0.5		93.33	86.67	100.00	7.70	2.97	4
QA1		95.00	86.67	100.00	6.38	2.66	4
Ref Sediment	pH	8.10	8.10	8.10	0.00	0.00	1
VC 107 2.0-3.0		8.10	8.10	8.10	0.00	0.00	1
VC 104 0.0-0.5		8.10	8.10	8.10	0.00	0.00	1
QA1		8.10	8.10	8.10	0.00	0.00	1
Ref Sediment	DO %	95.10	95.10	95.10	0.00	0.00	1
VC 107 2.0-3.0		95.00	95.00	95.00	0.00	0.00	1
VC 104 0.0-0.5		91.60	91.60	91.60	0.00	0.00	1
QA1		93.20	93.20	93.20	0.00	0.00	1
Ref Sediment	Salinity ppt	35.50	35.50	35.50	0.00	0.00	1
VC 107 2.0-3.0		35.50	35.50	35.50	0.00	0.00	1
VC 104 0.0-0.5		35.40	35.40	35.40	0.00	0.00	1
QA1		35.40	35.40	35.40	0.00	0.00	1

Statistical Printouts for the Bivalve *Tellina deltoidalis* Whole Sediment Toxicity Tests

Tellina Acute Toxicity Test-10d % Unaffected

Start Date:	12/12/2022 13:00	Test ID:	PR2130/06	Sample ID:	VC 101 0.0-0.5
End Date:	22/12/2022 14:30	Lab ID:	10754	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 109	Test Species:	TD-Tellina deltoidalis
Comments:					

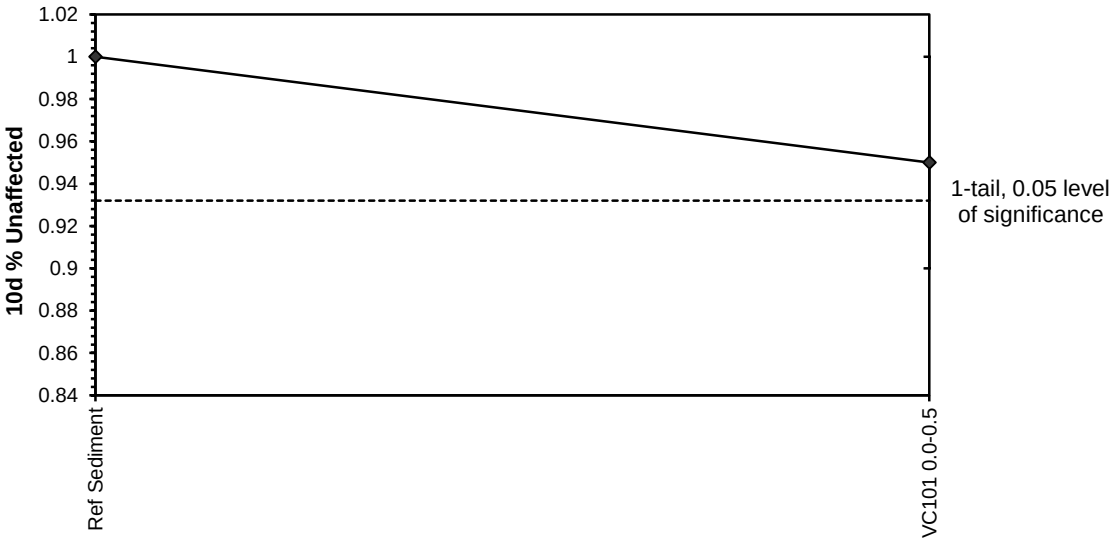
Conc-	1	2	3	4
Ref Sediment	1.0000	1.0000	1.0000	1.0000
VC101 0.0-0.5	0.9000	1.0000	0.9000	1.0000

			Transform: Untransformed					1-Tailed		
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Ref Sediment	1.0000	1.0000	1.0000	1.0000	1.0000	0.000	4			
VC101 0.0-0.5	0.9500	0.9500	0.9500	0.9000	1.0000	6.077	4	1.732	2.353	0.0679

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	0.849347	0.818	3.05E-15	-0.7
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Heteroscedastic t Test indicates no significant differences	0.067936	0.067936	0.005	0.001667	0.133975	1, 6
Treatments vs Ref Sediment						

Dose-Response Plot



Tellina Acute Toxicity Test-10d % Unaffected

Start Date:	12/12/2022 13:00	Test ID:	PR2130/06	Sample ID:	VC 101 0.0-0.5
End Date:	22/12/2022 14:30	Lab ID:	10754	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 109	Test Species:	TD-Tellina deltoidalis
Comments:					

Auxiliary Data Summary

Conc-	Parameter	Mean	Min	Max	SD	CV%	N
Ref Sediment	% Non-immobilised	100.00	100.00	100.00	0.00	0.00	4
VC101 0.0-0.5		95.00	90.00	100.00	5.77	2.53	4
Ref Sediment	pH	8.20	8.20	8.20	0.00	0.00	1
VC101 0.0-0.5		8.10	8.10	8.10	0.00	0.00	1
Ref Sediment	DO %	89.60	89.60	89.60	0.00	0.00	1
VC101 0.0-0.5		91.30	91.30	91.30	0.00	0.00	1
Ref Sediment	Salinity ppt	35.40	35.40	35.40	0.00	0.00	1
VC101 0.0-0.5		35.30	35.30	35.30	0.00	0.00	1

Tellina Acute Whole-Sediment Test-10d % Unaffected

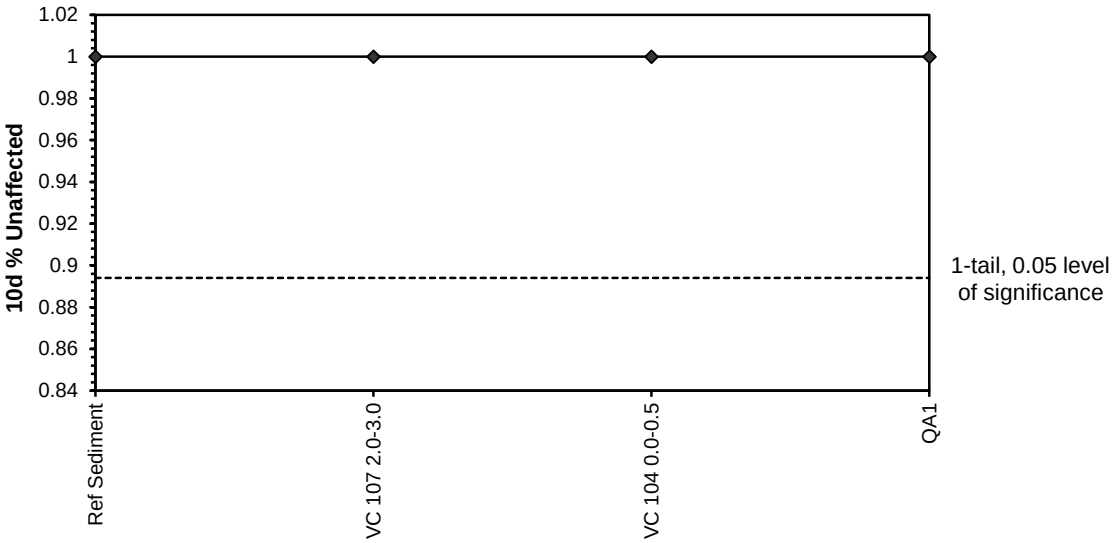
Start Date:	18/01/2023 16:30	Test ID:	PR2130/31	Sample ID:	Various
End Date:	28/01/2023 17:30	Lab ID:	Various	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 109	Test Species:	TD-Tellina deltoidalis
Comments:					

Conc-	1	2	3	4
Ref Sediment	1.0000	1.0000	1.0000	1.0000
VC 107 2.0-3.0	1.0000	1.0000	1.0000	1.0000
VC 104 0.0-0.5	1.0000	1.0000	1.0000	1.0000
QA1	1.0000	1.0000	1.0000	1.0000

			Transform: Untransformed				
Conc-	Mean	N-Mean	Mean	Min	Max	CV%	N
Ref Sediment	1.0000	1.0000	1.0000	1.0000	1.0000	0.000	4
VC 107 2.0-3.0	1.0000	1.0000	1.0000	1.0000	1.0000	0.000	4
VC 104 0.0-0.5	1.0000	1.0000	1.0000	1.0000	1.0000	0.000	4
QA1	1.0000	1.0000	1.0000	1.0000	1.0000	0.000	4

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.05)	1	0.887		
Equality of variance cannot be confirmed				

Dose-Response Plot



Tellina Acute Whole-Sediment Test-10d % Unaffected

Start Date:	18/01/2023 16:30	Test ID:	PR2130/31	Sample ID:	Various
End Date:	28/01/2023 17:30	Lab ID:	Various	Sample Type:	SED-Sediment
Sample Date:		Protocol:	ESA 109	Test Species:	TD-Tellina deltoidalis
Comments:					

Auxiliary Data Summary

Conc-	Parameter	Mean	Min	Max	SD	CV%	N
Ref Sediment	% Non-immobilised	100.00	100.00	100.00	0.00	0.00	4
VC 107 2.0-3.0		100.00	100.00	100.00	0.00	0.00	4
VC 104 0.0-0.5		100.00	100.00	100.00	0.00	0.00	4
QA1		100.00	100.00	100.00	0.00	0.00	4
Ref Sediment	pH	8.10	8.10	8.10	0.00	0.00	1
VC 107 2.0-3.0		8.10	8.10	8.10	0.00	0.00	1
VC 104 0.0-0.5		8.10	8.10	8.10	0.00	0.00	1
QA1		8.10	8.10	8.10	0.00	0.00	1
Ref Sediment	DO %	95.10	95.10	95.10	0.00	0.00	1
VC 107 2.0-3.0		95.00	95.00	95.00	0.00	0.00	1
VC 104 0.0-0.5		91.60	91.60	91.60	0.00	0.00	1
QA1		93.20	93.20	93.20	0.00	0.00	1
Ref Sediment	Salinity ppt	35.50	35.50	35.50	0.00	0.00	1
VC 107 2.0-3.0		35.50	35.50	35.50	0.00	0.00	1
VC 104 0.0-0.5		35.40	35.40	35.40	0.00	0.00	1
QA1		35.40	35.40	35.40	0.00	0.00	1

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